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EDITORIAL

Elderly and Balance Rehabilitation: Current Dynamics and Future Possibilities for Pakistan

Furqan Ahmed Siddiqi[1], Muhammad Ehab Azim[1]

The proportion of elderly population is on the rise worldwide. In 2019, it was reported that 6% of the country's population was elderly and this figure is expected to become triple of the current state by 2050.(1) This shows that an increasing trend of elderly is being observed worldwide and this trend is no different in Pakistan. Such high proportion of chronically ill and frail tend to put increased demand and pressure on health care system.(2)

Pakistan being a low-middle income country with limited high-end health care facilities, it is no hidden fact that elderly are one of the most-neglected population. This neglect results in increased isolation or social restriction, decreased cognitive function and overall decline in health.(3) This has been further aggravated by current crisis of COVID 19 pandemic & lockdowns worldwide.

Such age-related decline also affects the balance and postural stability system of elderly persons resulting in increased risk of fall, which in itself restricts activity and causes secondary deconditioning.(4) Over the past few years, a considerable amount of research has been conducted to explore the possible causes of falls and to determine the relationship and integration of motor or sensory systems for balance control and develop some strategies or techniques for the prevention of falls in elderly. Literature reveals a high fall risk among elderly population of Pakistan (5), resulting in hospitalization, severe limb trauma in 66% of cases and death in 1.3% cases.(6) Additionally, a positive history of fall itself contributes to possibility of falls in future.(7) Considering this impaired balance and fall risk has always been a major concern for elderly and health professionals; hence, emphasis has always been laid on early and appropriate fall risk screening including self-reported measures like activity specific balance confidence & fall efficacy scale etc. or performance based measures like berg balance scale, functional reach test and timed up and go test etc. Similarly, early fall prevention strategies(8), including ergonomic modification, appropriate assistive devices and evidence based balance training regimes including flexibility training, strength training and wobble board training etc. have been used.(9)

Unfortunately, the traditional balance assessment and training method have certain limitations. Most balance intervention lack active participation of individual, hence limited challenge to cognitive aspects of balance in addition to decreased adherence to such programs. Similarly, conventional balance assessment and fall risk screening tools lack ability to identify mechanism of dysfunction and other biomechanical parameters such as ground reaction forces, individual bodily movements etc.(10) Such limitations can now be curbed by integrating latest technology into balance rehabilitation. In previous decades, numerous high-tech balance assessment and training systems such as, postural stability systems, computerized posturography systems, force plate based balance systems, virtual reality and exergaming based balance system, incorporating multiple parameters of balance targeting the multisensory motor-cognitive, integrative and complex nature of balance have been introduced.

Utilization of such systems in our environment can provide health care professionals with tools to drastically improve balance rehabilitation approaches and can, in long term, result in improving the quality of life in elderly, reducing health economic burden by lowing fall incidence due to early and accurate fall screening and intervention. Considering the start of new decade, it is high time to incorporate such dynamic practices into mainstream rehabilitation and health for a drastic shift from conventional practices and develop comprehensive balance care programs for elderly population of our country. Such change will only be possible if government and private sector actively participate to develop policies to provide a holistic and comprehensive balance care and fall screening facilities to vulnerable yet important section of our society.(11)

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A Paradigm Shift Due to Pandemic: From Conventional Care to Telerehabilitation

Muhammad Naveed Babur

Rehabilitation sciences and health profession have not looked the same since the COVID-19 pandemic started to affect Pakistan in late February 2019. A Country with scarce tertiary- care health facilities, growing elderly population, vast sum of persons with disability and majority living in remote rural area with limited logistics; the superimposed lockdowns, fear of contracting COVID-19 and closure of Outpatient Departments have resulted in limited access to health care and rehabilitation facilities, especially to the ones present in remote areas of the country. In addition, it has also resulted in the decrease of contact hours and revenue of almost all health professions and facilities. Rehabilitation clinics had fewer patients walking through their doors during the early stages of pandemic. Many rehabilitation professionals like physical therapists, speech-language therapists, occupational therapists, orthotics and prosthetics are facing an increase in their financial hardships; although the pandemic is more likely to have augmented career pride than declining it.(1) In such a situation, use of telehealth and other video-based consultations have increased.(2)

Earlier to the pandemic, telehealth was an exception to the role of rehabilitation sciences. However, since then Telerehabilitation services have significantly improved but technology challenges among patients and clinics remain a barrier to its broader use.(3)

As Telerehabilitation is defined as "the delivery of rehabilitation services by information and communication technologies" at a distance, it offers a possible alternative or supplement to center -based rehabilitation services. Home-based interventions that can be prescribed through telerehabilitation for pain management, improving physical functions, quality of life,(4) management of musculoskeletal and other related issues include stretching, resistance training, core stability training, TENS, and balance training etc.

Telerehabilitation services include therapeutic interventions, education, consultation, training, and means of networking for a person with disabilities. Using technology to deliver rehabilitation services offers many benefits to not only the rehabilitation experts but also to the patients themselves. It provides the patient with a sense of personal autonomy and empowerment, allowing them to take control in the management of their disorders, (5) decreasing pain, improving ergonomics, movements, and exercising at home.

As telerehabilitation expands patient's continuity of care, improves an opportunity to continue rehabilitation services within the patient's own social and vocational environment, it should lead to better functional outcomes. With the ever-increasing realm of technology, the future generation of rehabilitation experts must be aware of the evolving changes in technology to make rehabilitation an interactive environment with the patient. Researches with focus on exploring such telerehabilitation tools and their effects on patient's condition, experience, and its cross cultural adaptation are necessary. Future challenges might include telehealth adoption, educational costs, exemplary patient care, stress management and new referral sources.(6) Although many challenges have been set into motion for the rehabilitation community, it would be disappointing not to use this time as an opportunity to embrace changes and explore innovation. In the rehabilitation sciences, telerehabilitation and virtual platforms have placed greater emphasis on self and home-care options for patients.(7)

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RESEARCH ARTICLE

Postural Ergonomic Risk Assessment and Work-related Musculoskeletal Symptoms Among Surgeons

Huma Riaz[1], Huma Khan[1], Quratulain[1]

ABSTRACT

Background: Work-related musculoskeletal disorders (WMSDs) develop mainly because of poor work ergonomics. Surgeons are much prone to develop the musculoskeletal symptoms due to nature of their precise work linked with prolong postures.

Objectives: To assess the level of postural ergonomic risk exposure and frequency of work-related musculoskeletal symptoms among Surgeons.

Methods: This was an observational, descriptive cross-sectional survey conducted among surgeons (n=100) working in hospitals of Rawalpindi and Islamabad, Pakistan. Convenient sampling technique was used. Structured survey questionnaire was used to collect demographic data and work details of surgeons. Pre-validated tools such as Quick Exposure Check (QEC) and Body Mapping Tool were also used. SPSS version 21 was used for data entry and analysis.

Results: More than half of the surgeons' working posture exposed them to high 49(49%) and very high ergonomic risk 15(15%). The mean of Quick Exposure Check score was 55.71±14. Majority of the surgeons 64(64%) requires urgent and immediate change of their work posture. A significant difference of QEC score (p= 0.001) between males and females was found. Statistically significant difference (p=0.002) of QEC score among Surgeons. 64(64%) of the participants have reported work-related body pain in lower back 35(35%), neck 29(29%), shoulder 16(16%), wrist 15(15%), ankle 15(15%), upper back 14(14%), hip pain 9(9%), knee 9(9%) and elbows 5(5%).

Conclusion: It is concluded that work- related posture puts surgeons at higher ergonomic risk. Most of them were experiencing work-related musculoskeletal pain in some of their body regions.

Key words: Ergonomic Assessment, Posture, Risk, Work-related disorders, Surgeons

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Introduction:

Ergonomics is a science that deals with safe and effective interaction among workers, tools and their work-related environment.(1) It is concerned with designing and arranging workplace according to a job nature. Maintaining good ergonomics at work helps enhance physical fitness of workers. Ergonomic training reduces the incidence of work-related musculoskeletal disorders (WMSDs).(2) These are injuries or dysfunctions affecting bones, tendons, nerves, muscles, ligaments, joints, cartilages and spinal discs as a result of work - related activity.(3) A variety of risk factors associated with WMSDs has been reported in numerous published studies. They are explained as being occupational/workplace- related, personal/ individualistic and psychosocial.(4, 5)

Surgeons are a distinctive group of healthcare professionals who are at risk of developing WMSDs.(5) Their health and wellbeing is an essential factor that needs consideration.(6) Workplace-related risk factors majorly contribute in developing WMSDs like mechanical stress due to poor ergonomic adaptations of surgical instruments and operating room (OR) that may have a negative effect on surgeons' health as well as quality of life.(7, 8) Contrary to it, even in well-designed operating rooms, having availability of remote-controlled operating tables, ergonomically-designed operating chairs and patient sliding devices, frequent and repetitive activities with prolonged awkward postures while performing surgery exert mechanical load on their body.(9) Literature suggests that despite advancement in designing of surgical instruments and operating room, there are different mechanical risks attached to various types of surgical procedures like prolonged static posture and exerting excessive force while handling heavy surgical instruments. (6, 10) Besides, muscle fatigue can result from performing same surgical tasks repetitively, localized pressure on some body parts while using vibrating surgical tools and reduced degree of

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bodily movement.(5, 10)

Neck, upper back, lower back, shoulder and arm have high prevalence of musculoskeletal disorders and symptoms among surgical specialists.(5, 8, 11-13) Both psychosocial and physical factors contribute to it.(4) Most experienced surgeons performing minimally invasive surgeries are also sufferers of WMSDs.(8) Physical loading in dentistry procedures causes musculoskeletal complaints commonly in upper limb due to repetitive movements of hands. (14, 15) Rambabu T et.al reported 61% musculoskeletal disorders among dental surgeons as compared to other specialty surgeons (37%) and physicians (20%). Stressful, prolonged body postures and repetitive tasks in labor room increase ergonomic risk exposure to back and shoulder among gynecologists.(16) According to survey report of Vijendren A et. al, 47.4% ENT surgeons experienced WMSDs and 85% of them sought treatment.(9) Lower back pain and lateral epicondylitis have been reported in pediatric orthopedic surgeons of North America due to repetitive and forceful nature of their work.(17) Increasing age and long experience are associated with orthopedic trauma surgeons.(18)

Ergonomics risk assessments can be used to identify physical risk factors and which body part is at higher risk, this assessment can determine some risk monitoring and adequate preventive measures.(6) Globally, there are many studies available that have determined musculoskeletal symptomatology among surgeons. However, very limited national literature is available on level of ergonomic risks exposure based on surgical postures. On these grounds, the current study was designed with objectives to assess levels of postural ergonomic risk exposure along with frequency of work-related musculoskeletal symptoms among surgeons of Rawalpindi and Islamabad.

Methods:

This was an observational, descriptive cross-sectional survey. It was conducted from August 2017 to January 2018 in different surgical specialties of two public and three private sector hospitals of the twin cities. After receiving an approval from the research ethical committee of Riphah international university Islamabad (RIPHAH/RCRS/REC/Letter-00460) , the process of data collection was started. Prior permission for data collection was taken from hospital authorities of Capital hospital Islamabad, Islamic international Dental Hospital Islamabad, IIMCT Pakistan Railway General Hospital Rawalpindi, Quaid e Azam International Hospital Islamabad and Maryam Memorial Hospital, Rawalpindi.

The study population consisted of surgeons working in Rawalpindi and Islamabad. The "Raosoft" sample size calculator was used for sample size calculation with 95% confidence level, 5% margin of error, 80% response distribution and assumed population size of 200. The calculated sample size was 111.(19) A total of 111 surgeons were contacted, of which 100 agreed to be part of study. So, the actual sample size was n=100.

The purpose of study was well explained, and informed consent was taken from the surgeons. Non-probability, convenient sampling technique was used. Both male and female surgeons, working at least since last 6 months in same physical environment, willing to be interviewed and photo shot their most sustained posture during surgical procedure were included in the study. While those with previous 6-month history of road traffic accident/trauma, pregnant female surgeon or who refused to be part of study, were excluded.

Structured survey questionnaire was given to the surgeons (n=100), having three sections. The first section consisted of individual characteristics of surgeons and their work-related history. It included questions on age, gender, years of experience, employment status, job sector, prior ergonomic knowledge, specialty, working hours per day, average time duration during surgery and number of surgeries performed per day.

The second section consisted of pre-validated body mapping tool, with the aim of determining work-related musculoskeletal symptoms. It contained questions about body regions that experienced pain and discomfort during the last three months and seven days, affecting activities of their daily living. The above information was collected by the researchers themselves while doing structured interviewing of the surgeons outside the operating rooms.

After conducting MSK symptomatology assessment, exposure to ergonomic risks due to sustained and repeated working postures on different body parts while performing surgery, was analyzed in third section of study questionnaire through pre-validated Quick Exposure Check (QEC).(20) The QEC system focuses mainly on the assessment of workplace risk factors contributing to WMSDs.(21) It combines assessment done by both observer and worker. Direct observation of surgical tasks was done by the researcher. Photographs of most repetitive tasks and sustained postures adopted during surgery were taken using mobile camera (Samsung J2). These photographs were used later for observational postural analysis. The patient confidentiality was not breeched as

only surgeons' working posture was captured and saved with their permissions. Risk exposure scores for back, shoulder/arm, wrist/hand, and neck in relation to particular task were later calculated on QEC tool. Other workplace risk factors like job stress, vibration exposure and work pace were also scored. Based on these calculated QEC score, participants' postures were categorized on predetermined action levels as;≤40% acceptable; 41-50% investigate further; 51-70% investigate further and change soon;>70% investigate and change immediately.(20, 21)

All the data was entered and analyzed in Statistical Package for Social Sciences (SPSS) version 21. The data of QEC score was normally distributed as checked by plotting histogram and value of Shapiro-Wilk test (p=0.616). To compare mean ergonomic risk score between male and female surgeons, independent t-test was employed. To assess difference of ergonomic risk score among surgeons of different specialties and years of experience, one-way ANOVA test was used. P<0.05 was taken as statistically significant.

Results:

The mean age of participants was 33.13±11 years. Employment status was fulltime in 86(86%) and part time in 14(14%). Clinical facility in which surgeons were working was secondary care 44 (44%) and tertiary care 66(66%). Their mean working experience was 7.48±9.51 years. The working hours per day and number of surgeries performed per day, 8.34±2.64 and 3.54±2.12; respectively. Prior ergonomic knowledge was reported by 65(65%) surgeons whereas 35(35%) had no formal ergonomic information.

The mean of calculated QEC score was 55.71±14. The minimum QEC score was 25% and maximum was 93%. As per tool protocol, action levels were determined based on individual ergonomic risk exposure score. Amongst them, 17 (17%) were presented with low-risk exposure which is considered an acceptable value, 19(19%) with moderate exposure that needs further investigation of their work posture, 49(49%) with high risk exposure that requires urgent change in working postures and 15(15%) surgeons were exposed to very high risk, so immediate change of their work posture needed.

Gender wise ergonomic risk assessment was found statistically significant (p=0.001) calculated by independent sample t-test as male surgeons' QEC score was higher as compared to their female counterparts. The analysis done by ANOVA showed statistically significant difference (p=0.002) of QEC score among surgeons' belonging to different Specialties. But ANOVA analysis between QEC score and Surgeons' years of work experience showed non-significant difference (p>0.05) with almost similar QEC mean score between novice and experienced professionals. Their respective QEC scores have been mentioned in Table 1. Table 2 showed exposure level of different body regions to ergonomic risk. Neck, shoulder/arm are more exposed to risks followed by wrist/hand and back. Risk exposure to vibrating tools of surgery was low 78(78%), moderate 18(18%) and high 4(4%). Job stress risk was low 11(11%), moderate 45(45%), high 33(33%) and very high 11(11%). The surgeons 38(38%) found to be at low risk of having

Table 1: Quick Exposure Check (QEC) score among Gender, Specialty, and years of experience in surgeons

Variables	Subcategories	N (%)	QEC-Score (Mean ± S.D)	P value
Gender	Male	48(48%)	60.45±13.71	0.001
	Female	52(52%)	51.33±12.87	
Surgery Specialty	General	15(15%)	54.30±11.73	0.002
	Orthopedic	14(14%)	66.06±16.31	
	Urologist	3(3%)	72.56±.51	
	Gynecologist	23(23%)	49.35±11.25	
	ENT	10(10%)	57.63±11.77	
	Dental	32(32%)	54.81±13.45	
Experience (years)	Less than 2 Years	42(42%)	53.60±13.98	0.54
	2 to 4 Years	20(20%)	55.84±12.29	
	5 to 9 Years	19(19%)	56.89±16.81	
	10 Years and above	19(19%)	59.06±12.80	

[QEC-Quick Exposure Check, Frequency (N)]

Table No 2 shows level of risk exposure of different body regions of surgeons calculated from Quick Exposure Check (QEC)

Exposure Score	Low	Moderate	High	Very High
Back (static)	8 %	13%	12%	2%
Back (Moving)	12%	36%	14%	3%
Shoulder/Arm	32%	51%	15%	22%
Wrist/Hand	24%	50%	23%	3%
Neck	7%	32%	30%	31%

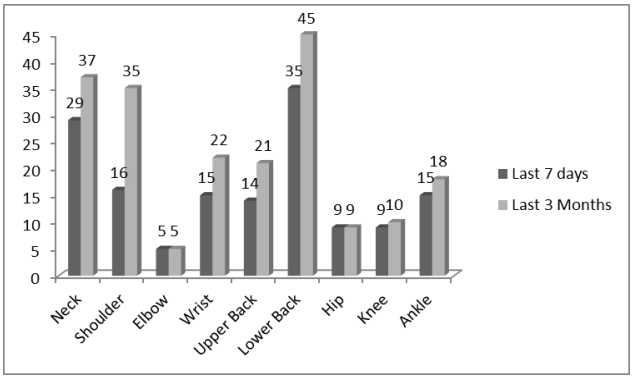

Figure 1: Work -related Musculoskeletal symptoms of surgeons during last 7 Days and last 3 Months

difficulty in keeping up with their work, 58(58%) moderate and only 4(4%) have high work pace risk. According to response of body mapping tool, 64(64%) surgeons had some sort of pain, discomfort, or ache in one or more body regions, while 36(36%) did not have such symptoms. During the last seven days' work related pain/ache/ discomfort and/or numbness among surgeons was high in lower back 35(35%), followed by neck 29 (29%), shoulder 16(16%), wrist 15(15%), ankle 15 (15%). upper back 14(14%), hip pain 9(9%), knee 9(9%) and elbows 5(5%) (Fig.1).During last three months work-related pain/ache/discomfort and/or numbness was reported in lower back 55(55%), followed by neck 37(37%), shoulder 35(35%), upper back 21(21%), ankle 18(18%), knee 10 (10%), hip 9(9%), elbow 5(5%) and wrist 5(5%) (Fig.1).

Discussion:

In the current paper, ergonomic risk exposure was evaluated by analyzing surgeons' work postures, along with investigation of work-related musculoskeletal symptoms. On average this study's participants scored moderate level of ergonomic risk, but a large proportion was exposed to high and very high risks. Neck, shoulder/arm are more exposed to risks followed by wrist/hand and back.

Previous systematic reviews conducted to evaluate evidence of biomechanical risk factors for causing work-related musculoskeletal disorders, reported non-neutral body postures, excessive repetition and heavy lifting to contribute the most. (3, 22) The postural risk exposure assessment of current study supports claim of a study done in Stanford University Medical Center, South America, which reported medium to high level exposure risk among laparoscopic, open and robotic surgeons despite using well-designed surgical instruments.(11) Batham C et al. did postural ergonomic risk exposure assessment through QEC on Indian dentists and found 93.8% were exposed to moderate and high level of postural ergonomic risk.(23) Another descriptive study found high ergonomic risk exposure score in open, laparoscopic and microscopic surgery among surgeons in Tehran hospital.(6) Results of previous literature showed congruency with findings of current study in that more than fifty percent participants(64%) are exposed to postural ergonomic risks at high and very high level (49% and 15% respectively).

A review on epidemiological evidence of WMSDs also added rapid work pace and vibration in physical ergonomic work factors.(22) Specific to surgeon population, a previous study by Park HS et al had commented that dentists were constantly exposed to weak vibration while handling dental hand piece.(24) Another study conducted on orthopedic surgeons to measure hand-arm vibration risk by using hand operated saws, they also had reported neglected risk due to vibration.(25) Although current study focused on multiple specialties but vibration and work pace risks were found to be largely low (78%) and moderate (58%) respectively among surgeons.

Excessive and awkward postural demand on neck, shoulder and arm place higher muscular and joint forces.(26) In past studies, it has been commonly reported that prevalence of musculoskeletal symptoms is high among surgeons due to prolong poor postures.(6, 8, 11, 16-18) Similar results have been reported in current study. A very recent research report by Gutierrez-Diez MC et al concluded lower back (54%), neck (51%) and shoulder (29%) as more affected body zones in

minimal invasive surgical procedures.(8)Likewise, back and shoulders pain was also frequently presented musculoskeletal problem in obstetric and gynecological surgeons.(16) Another study by Saad M et al reported low back pain to be a commonly affected area (29.3%) among orthopedic trauma surgeons.(18) Therefore , results of current study deduced by body mapping tool are found to be consistent with those of previous literature. It is reported in the current study that lower back symptoms were frequent i.e. 35%, followed by neck 29%, shoulder 16%, wrist 15%, ankle 15%, upper back 14%, hip pain 9%, knee 9% and elbows 5% among surgeons.

Some limitations of the current study need to be acknowledged. This was an observational cross-sectional study which evaluated surgeons' postural ergonomic risk exposure at a single point of time. Other important aspects of ergonomics like physical infrastructure of workstation, building and handling of surgical tools or equipment were missed. As multiple surgical specialties were chosen due to lack of sufficient number of surgeons of single specialty in twin cities of Rawalpindi and Islamabad, generalization of study's findings is rather uncertain. In surgical field, application of postural ergonomic guidelines would be a great benefit for both surgeons and patients. So, ergonomic guidelines for operating room should be revised and implemented to avoid future risks of developing musculoskeletal disorders. Ergonomic training and postural awareness programs must be introduced as regular part of training. Strengthening exercises for high-risk areas of body should be practiced, enhancing their capacity to work in pain free environment, and facilitating the delivery of quality care to patients. Further studies are recommended with proper implementation of ergonomic training along with analysis of operating room.

Conclusion:

In conclusion, majority of the surgeons were exposed to moderate and high level of postural ergonomic risks. Male surgeons were more exposed to postural ergonomic risks as they scored high in QEC. Many of them reported work-related pain or discomfort in one or more body regions. The most affected musculoskeletal zone showing both acute and chronic symptoms was upper back, followed by lower back, neck, shoulder and arm. Vibrating tool, work pace and job stress risks' scores were low, moderate, and high, respectively.

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RESEARCH ARTICLE

Evaluation of Piriformis Syndrome in Patients with Low Back Pain Reporting to Public Medical Teaching Institutes in Peshawar

Farhan Haleem[1], Aqsa Yasmin[1], Fizah Mahnoor Khan[1], Muhammad Kashif[1], Maria Jamshed[2], Muhammad Jaffar[1]

ABSTRACT

Background: Piriformis Syndrome is a condition in which damage to the piriformis muscle causes pain in buttock and leg. Robinson described the syndrome as having six key characteristics. Before 1934, it was considered that the sciatica can be caused by impingement of sciatic nerve in pelvic, but new diagnostic technology suggests that it can also be caused by distal foraminal entrapment and Piriformis Syndrome. Piriformis syndrome is underrated and mostly neglected by clinician though it can be a cause of low back pain.

Objectives: To evaluate the piriformis syndrome in patients complaining of low back pain.

Methods: This study was carried out at three different Public Medical Teaching Institutes. Duration of study was 6 months i.e., from March 2018 to August 2018. Sample size of the study was 337 and four different physical tests were performed on patients for diagnosis of Piriformis syndrome.

Results: Piriformis Syndrome was diagnosed among 111(32.9%) study participants among which 56 were male and 55 were females.

Conclusion: Every third patient of low back pain was diagnosed with Piriformis Syndrome. Male to female ratio of Piriformis Syndrome was 1:3.

Key words: Gluteal Region, Low back pain, Piriformis Muscle Syndrome, Sciatic Nerve.

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Introduction

Piriformis Syndrome is a condition that occurs due to irritation of sciatic nerve by piriformis muscle which causes buttock and hip pain. In the lower limb, there is numbness in the posterior medial aspect. This condition is similar in presentation to a true radiculopathy of L5 or S1.(1) It is said to be the secondary cause for the sciatica, low back, and buttock pain. This Syndrome is usually described as a deep, aching type pain with or without signs and symptoms of sciatica along with numbness, pain, and localized tenderness in the area of piriformis muscle. Piriformis syndrome can have comparative presentations as other somatic pain issue, for example, intervertebral disk pathology, lumbosacral radiculopathy (sciatica), sacroiliac disarranges, and trochanteric pathology. (2)

The piriformis muscle is a level, triangular molded, and profound situated gluteal muscle.(3) The piriformis muscle goes about as an outer rotator, powerless abductor, and weak flexor of the hip, giving postural stability amid ambulation and standing. The piriformis muscle is innervated by spinal nerves S1 and S2 and occasionally likewise by L5.(1, 4) In most patients, the sciatic nerve lies below the piriformis muscle, sciatic nerve bifurcate piriformis in 12% of population.(5)

Piriformis Syndrome was first portrayed by Yeomen in 1928.(6) The term "Piriformis Syndrome" was first utilized by Robinson in 1947 when he described the syndrome as having six key attributes: a background marked by injury or direct tumble to the buttock, gluteal or sacroiliac pain transmitting down the leg that regularly constrains ambulation, gluteal decay, a substantial sausage formed mass, positive Lasègue sign, and compounding with bowing or lifting.(4) Ten years after Robinson, a specialist by the name of Freiberg built up a more compact arrangement of criteria for characterizing Piriformis initiated sciatica. Freiberg's three signs for piriformis-instigated sciatica included the sciatic notch tenderness, positive Lasègue (straight leg raise) sign, and change with nonsurgical treatment.(7) Before 1934, it was considered that the sciatica can be caused by impingement of sciatic nerve in the pelvis but new diagnostic technology suggests that it can also be caused by distal foraminal entrapment and piriformis syndrome.(8)

Clinical signs relate, either specifically or by implication, to muscle spasm, coming about nerve

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pressure, or both, tenderness at palpation over the greater trochanter. A few patients have a "sausage formed" mass in the buttock caused by compression of the Piriformis muscle.(1)

The most common symptoms of Piriformis Syndrome include pain increasing after sitting for a prolong time usually more than 15 to 20 minutes. Mostly patients have buttock pain, difficulty in ambulation and pain in internal rotation, hip flexion, adduction of the same side leg, piriformis muscle spasm and dysfunction of sacral region. Compression of the fibular branch of the sciatic nerve frequently causes pain or paresthesia in the back of thigh.(1, 9)

Clinical signs relate, either specifically or by implication, to muscle spasm, coming about nerve pressure, or both, tenderness at palpation over the greater trochanter. A few patients have a "sausage formed" mass in the buttock caused by compression of the piriformis muscle.(1)

In Pakistan, there is a limited literature on prevalence of piriformis syndrome in LBP. The purpose of this study is to raise awareness that piriformis syndrome can be a cause of the lower back pain, so it can be considered in diagnosis and preventive measures could be taken on time.

Methods:

This descriptive study was carried out at three Medical Teaching Hospitals i.e. Khyber Teaching Hospital, Leady Reading Hospital and Hayatabad Medical Complex. Total duration of study was 6 months (from March to August 2018) and sample size calculated for the study was 337. The sample size was calculated by sample calculator in which the prevalence of piriformis syndrome i.e. 32.42% was taken from a literature with a confidence interval of 95% and 5% marginal error. Both male and female patients with low back/buttock pain aged between 20-70 years, willing to participate, were included in the current study, while patients with recent discectomy, with hip/knee pathology, with fractured hip/knee, with malignancy, patients do not meet the above mentioned criteria were excluded from the study. Convenience sampling method was used which means every person, both male and female, meeting the inclusion criteria, was included. Total four special tests such as FAIR test, Pace Sign, Beatty Sign and Freiberg test were used for the diagnosis of piriformis syndrome. Any 3 positive tests among these 4 confirmed diagnosis of piriformis syndrome. Ethical approval was taken from Institutional Research and Ethical Committee of NCS University System, Peshawar (NCS/ PT&R/201/18) . Permission of data collection was also taken from the responsible authorities of the said hospitals. For data collection procedure, researchers' team went to the concerned department of the above-mentioned Public Teaching Hospitals and examined all the patients matching the inclusion criteria. Verbal consent was also taken from participants and their privacy and confidentiality was completely ensured. Data was analysis by SPSS 21. Descriptive analysis was done and for association chi square was applied. P value of <0.05 was considered significant.

Results:

This study concludes that the frequency of piriformis syndrome in patients with low back pain was 111(32.9%) where as 226(67.1%) were tested negative for piriformis syndrome. Total numbers of male participants in the current study were 185 and females were 152. Females were more affected than male as shown in Table 1 and most affected age group was 20-40 years. Among special tests, the FAIR and Freiberg test was relatively more specific than Beatty and Pace Sign as shown in Table 2.

Table 1: Showing the Gender of the Participants

Variables	Attributes	Gender of the Participants		P-Value
		Male	Female	
Piriformis Syndrome Status	Positive	30.27% (n=56)	36.18% (n=55)	0.032
	Negative	69.73% (n=129)	63.82% (n=97)	

Table 2: Showing the distribution of positive and negative tests

Tests	Attributes	Piriformis Syndrome Status		P-value
		Positive	Negative	
FAIR Test	Positive	98.2% (n=111)	1.8% (n=2)	0.001
	Negative	0.0% (n=0)	100.0% (n=224)	
Beatty Sign	Positive	97.5% (n=79)	2.5% (n=2)	0.02
	Negative	12.5% (n=32)	87.5% (n=224)	
Freiberg Test	Positive	89.5% (n=94)	10.5% (n=11)	0.02
	Negative	7.3% (n=17)	92.7% (n=215)	
Pace Sign	Positive	96.6% (n=85)	3.4% (n=3)	0.004
	Negative	10.4% (n=26)	89.6% (n=223)	

Discussion:

Piriformis Syndrome is a condition occurred by irritation of sciatic nerve by piriformis muscle which causes buttock and hip pain. In the lower limb, there is numbness in the posteromedial aspect. This condition is similar in presentation to a true radiculopathy of L5 or S1. (1) The Piriformis muscle is a level and triangular molded, profound situated gluteal muscle. It starts from the front of

the sacrum, sacroiliac joint container, sacro tuberous tendon, predominant edge of more prominent sciatic score, and embeds at the upper part of greater trochanter.(3) Piriformis Syndrome is a condition which damages to the Piriformis muscle; causes pain in buttock and leg. It was first portrayed by Yeomen.(6) Before 1934, it was considered that the sciatica can be caused by impingement of sciatic nerve in the pelvis, but new diagnostic technology suggests that it can also be caused by distal foraminal entrapment and Piriformis Syndrome.(8) Among the low back pain patients, prevalence of Piriformis Syndrome was 17.2%.(2) According to Bernard et al., the prevalence of Piriformis Syndrome in low back pain patients was 0.33%, Pace and Nagle as 6% and Parziale as 5%.(10)

Research on Piriformis Syndrome is lively all over the world, but the knowledge has still not developed that much in Pakistan. There is a limited literature about the prevalence of Piriformis Syndrome in Patients with low back pain in Khyber Pakhtoon Khwa. Our study was designed to identify the prevalence of piriformis syndrome in patients with low back pain, reporting to Government Medical Teaching Institute (MTI) Peshawar, Khyber Pakhtoon Khwa, Pakistan. The simple size was calculated as 337 in which 184 were male and 152 were female participants. The results of our data reveal that among all 337 participants 111(32.93%) reported positive response toward piriformis syndrome while the remaining participants 226(67.11%) out of 337 participants were not affected by piriformis syndrome. Generally, we took a range of 20%-40%, a previous study falling in this range will be in favor of the current study, while below 20% will not support the current study. A study was conducted by Mondal M et al. at Department of Physiotherapy, National Institute for Locomotor Disabilities. The study period was from April 2016 to December 2017. According to this study, the prevalence of Piriformis Syndrome was 79.5% which strongly supports the results of the current study.(11) Another study was conducted by Kean Chen C, and Nizar AJ in Hospital University of Science in Malaysia, Kelantan. The prevalence according to this study was 17.2% which supports the results of our study.(2) Another study was conducted at the department of orthopedics and the department of physical medicine and rehabilitation, RIMS in Imphal by Singh US et al. According to this study, the prevalence was 6.25 which does not support the results of the current study.(12) This difference can be due to different sampling technique, different study settings and population and can also be due to different diagnostic criteria. Though the occurrence of piriformis syndrome is notorious, but Pace and Nagle, Jawish et al, Keskula and Tamburello, Boyajian-O'Neill et al mentioned a range which is 5-36%.(12) Epidemiological figures of the prevalence were not well- defined, but are assessed to be around 12.2% to 27%,(13) as supported by Usham et al. in his study, using same 4 special tests for diagnosis of piriformis syndrome. He reported the prevalence around 6%. This conflict in the results may be due to different population. Further, he reported that FAIR test is most reliable test for diagnosis of piriformis syndrome as its percentage was 93% in affected population which is almost same as our results.(12) On other hand, a literature review was done by Hopiyan et al which also reported the FAIR test to be more effective and diagnostic of piriformis syndrome which evidently supports our results.(14) The main limitations of the current study were the nature of the cross-sectional survey and the convenience sampling technique used.

Conclusion:

Most of the patients with low back pain were diagnosed with Piriformis Syndrome. Male to female ratio of Piriformis Syndrome was 1:3.

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RESEARCH ARTICLE

Frequency of De-Quervain Syndrome in Mobile Users Among Undergraduate Students of Allied Health Sciences Peshawar

Sohail Iqbal[1], Hafsah Gul Khattak[2], Saba Aman[3], Kinza Anwar[2], Babar Ali[3], Hazrat Bilal Malakandi[3]

ABSTRACT

Background: Repetitive strain injuries are more common in mobile phone users due to repetitive use of phone for mobile texting and games. De Quervain syndrome is as a painful complain of the wrist as stenosing tenosynovitis involving abductors of thumb at radial styloid process. The inflammation of first dorsal compartment of wrist triggers pain in De Quervain syndrome. Cell phone users who are involved in repetitive activities of thumb during text messages are more prone to develop repetitive strain injuries.

Objectives: To determine the frequency of De Quervain syndrome in mobile users among under graduate students of allied health sciences Peshawar.

Methods: A cross-sectional study was conducted among undergraduate students in different institutes of allied health sciences Peshawar. Sample size of 384 was selected using convenient sampling technique. Data was collected through self-administered questionnaire and Universal Pain Assessment Tool was used to assess the severity of pain. Finkelstein test was performed to diagnose De Quervain's syndrome. Data was analyzed by using SPSS version 20.

Results: Mean age of the participants was 20.73±1.78 years. Out of 384 participants, 315 (82%) were male and 69 (18%) were females, with male to female ratio 4:1 respectively. Finkelstein test was positive in 223 (58.1%) participants and negative in 161 (41.9%) participants.

Conclusion: The study concluded that mobile phone users are at a greater risk of developing De Quervain's syndrome due to repetitive movement of thumb while mobile texting, playing games without taking rest in -between activities.

Key words: De Quervain syndrome, Finkelstein test, Repetitive strain injury, Wrist pain.

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Introduction:

De Quervain's tenosynovitis was first defined by Fritz De Quervain in 1895. He defined it as a painful complain of the wrist as stenosing tenosynovitis involving abductors of thumb at radial styloid process.(1) The inflammation of first dorsal compartment of wrist triggers pain in De Quervain syndrome. The first dorsal compartment contains tendons of extensor pollicis brevis and abductor pollicis longus.(2) Cell phone users involved in repetitive activities of thumb during text messages are more prone to develop repetitive strain injuries. Repetitive strain injury is a term used for injury occurring due to the same movements performed repeatedly leading to pain and inflammation in soft tissues (muscles, tendons, ligaments).(3) It is seen that smart phone usage is more common in young population due to its numerous attractive and interesting applications. Apart from its beneficial effects of usage, smart phones lead to musculoskeletal disorders.(4) The tremendous increase of cell phones in current era primarily involves the dexterousness of thumb functions. The use of text messages on mobile phones has a great concern on musculoskeletal disorders for the users. Beside soft tissue injuries, carpometacarpal joint of thumb also shows subluxation and arthritis in persons who excessively use cell phones for texting.(5)

The history and clinical examination can easily diagnose this disease. Patient reporting with pain at the site of radial styloid have shown a local tenderness and local swelling in some cases upon their clinical examination.(6) The standard finding in De Quervain's tenosynovitis is a positive Finkelstein test. Finkelstein test is performed when the thumb is flexed into the palm and wrist is ulnar deviated. The test is considered positive if person complains of pain at dorsolateral aspect of wrist joint. For better comparison, the test should be performed on wrist joints bilaterally.(7) According to a report published in 2009, 106 billion messages

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were sent through five mobile networks in Pakistan. Although frequent use of mobile phones and thumb pain due to repetitive strain has a positive relation, no significant research studies have been conducted to create awareness about the consequences of excessive use of mobile phones among general population.(8) The current study will make people aware about the occurrence of De quervain syndrome due to excessive mobile phone use. The objective of the study was to determine the frequency of De Quervain syndrome in mobile users among under-graduate students of Allied Health Sciences, Peshawar.

Methods:

A cross-sectional study design was used to conduct the research. Convenient sampling technique for collection of sample was used, which is a type of non-probability sampling. The data was collected from different institutes of Allied Health Sciences in Peshawar. 384 participants were selected according to inclusion and exclusion criteria. The study included both male and female students, who were using mobile phones and were willing to participate in the study. The study excluded persons who had traumatic wrist injury, had gone through any kind of wrist surgery and person with de quervain disease but not using mobile phone.

After approval from research ethical committee of NCS university (NCS/PES/REC/Letter-00147), 384 mobile phone users fulfilling the inclusion and exclusion criteria were selected. Participants were informed verbally about the aims and objectives of the current study. Informed consent was taken from every participant meeting the inclusion criteria. The confidentiality of participant's information was ensured.

Self-administered questionnaire was used for data collection. Hard copy of the questionnaire was distributed among the participants. Questionnaire had two sections, Demographic characteristics and Questions related to De Quervain tenosynovitis. Data was analyzed by using SPSS version 22. Descriptive statistics were applied to calculate mean and standard deviation of age of participants and duration of symptoms. Frequencies and percentages were calculated for qualitative variables like gender and presence and absence of De Quervain syndrome. Chi-square was applied to determine association between different variables and Finkelstein test. P value <0.05 was considered significant.

Results:

Mean age of the participants was 20.73±1.78 years. Out of 384 participants, 315(82%) were male and 69(18%) were females, with male to female ratio 4:1 respectively. Finkelstein test was positive in 223(58.1%) participants while the test was negative in 161(41.9%) participants.

No significant association (Table 1) between finkelstein test and type of mobile phone was observed. Results showed that in key pad or regular mobile phone users the test was positive in 26 (6.8%) and negative in 19(4.9%) with a total of 45 (11.7%) while in touch screen mobile users test was positive in 178(46.4%) and negative in 130 (33.9%) total of 308(80.2%). The participant who were using both touch screen and keypad the test was positive in 19(4.9%) and negative in 12(3.1%) total of 31(8.1%). It was also noted that mobile phones were frequently used by students for texting. Among 384 students 256(66.7%) students texted <50 texts per day, 88(22.9%) students sent 50-100 texts, 36(9.4%) students sent texts between 100-200 and 4(1%) students sent more than 200 texts per day. (Table 1)

Table 1: Association of Finkelstein test with type of mobile phone used and number of text per day

Variables		Finkelstein test		P-value
	Attributes	Positive	Negative	
Type of mobile use	Keypad	6.8%(n=26)	4.9%(n=19)	0.93
	Touch screen	46.6%(n=178)	33.9%(n=130)	
	Both	4.9 %(n=19)	3.1%(n=12)	
Number of text per day	Less than 50	61.%(n=138)	73.3%(n=118)	0.01
	50-100	23.8%(n=53)	21.7%(n=35)	
	100-200	13 %(n=29)	4.3 %(n=07)	
	More than 200	01%(n=03)	0.6%(n=01)	

Discussion:

De Quervain syndrome is stenosing tenosynovitis of first dorsal compartment of wrist. The first dorsal compartment of wrist includes extensor pollicis brevis and abductor pollicis longus. In this syndrome, tendons become inflamed and person experiences pain at dorsolateral side of wrist sometimes radiating to lateral forearm. Repetitive activities of thumb is considered the cause of this syndrome. Activities of thumb like using mobile phone while texting involves a lot of repetition of thumb making the tendons in first dorsal compartment inflammed.(9)

The findings of our study suggest that De Quervain syndrome is more common in mobile phone users due to frequent use of mobile phone for multiple purpose (e.g. texting, games, internet) but most of the common is sending text messages. Pew research Centre reported that use of mobile phones has increased among teen and young adults in the past few years.(10) Mean age of the participants in the current study was 20.73± 1.77years. Out of the

total number of students who participated in the study, 315(82%) were males and the rest 69(18%) were females. Finkelstein test was positive in 41 (10.7%) females and negative in 28(7.3%) females. In contrast, the test was positive in 182(47.4%) males and negative in 133(34.6%).

A recent study concluded that increasing use of mobile phones was associated with increased risk of developing De Quervain syndrome.67% students showed positive finkelstein test and who were frequent mobile phone users.(11)

According to a survey conducted by Princeton survey research associates, American teens are sending enormous number of text messages to friends and colleagues. Sending text messages in current era is the easiest and fastest way of communication surpassing face to face contacts. (12)

A study conducted on Extensor pollicis longus injury in addition to De Quervain's with text messaging on mobile phones showed that changes were noted clinically and by ultrasound of thumb in persons using mobile phone repetitively. They reported that on clinical examination, finkelstein test was positive in 40% of cases. Moreover, changes were found in first and third compartments through ultrasound examination.(13)

Prevalence study on cumulative trauma disorder in cell phone users in 2010 suggested that use of mobile phone has become very common in young generation, predisposing them to musculoskeletal disorders of hand. Cumulative traumatic disorders were found to be 18.5% in upper limb with greater prevalence of MSK issues in thumb (52%).(14)

A similar study conducted in 2016 to evaluate prevalence of De Quervain syndrome among young mobile users had a mean age of 22.4±4.02. The findings of this study are consistent with the results of the current study that De Quervain is common among young mobile users.(15)

In the world of technology, use of mobile phones is increasing day by day and it is among one the necessities of life.(16)Younger generation is using mobile phone for texting and gaming purpose. Apart from its useful implication in advancement, the use of mobile makes the younger generation prone to musculoskeletal and repetitive strain injuries.(17) Frequent use of mobile phone is a trigger for de quervain syndrome. In order to prevent hand dysfunction, appropriate break should be taken between mobile phone usage.

Conclusion :

The study concluded that mobile phone users from different institutes of Peshawar are prone to develop De Quervain's syndrome due to repetitive movement of thumb while mobile texting, playing games without taking rest in between activities.

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RESEARCH ARTICLE

Comparison of Static Stretching and Muscle Energy Techniques on Hamstring Tightness in Asymptomatic Females

Ayesha Majeed[1], Syeda Rafia Mansoor[2], Ahmad Bilal Arif[3], Muhammad Mudassar Yasin[4], Minahil Wasim[5], Farah Naeem[6]

ABSTRACT

Background: Hamstring flexibility is an essential variable because decreased extensibility can cause injuries, non-specific low back pain and altered lumbopelvic rhythm. Flexibility training is an important component in preventing or rehabilitation of injuries and also a method of improving one's performance in everyday activities and sports.

Objectives: To compare the effects of static stretching & muscle energy techniques on hamstring shortness in females.

Methods: A randomized controlled trial conducted at Department of Health Sciences, Khawaja Fareed University of Engineering & Information Technology Rahim Yar Khan on 50 asymptomatic females. In this study, 50 females were randomly allocated in two groups strictly following the inclusion/ exclusion criteria. Group A received hamstring static stretching, while group B muscle energy techniques (Autogenic inhibition). Informed written consent was taken from each participant. 90-90 test, SLR, Sit and reach test were used as outcome measurement tools of hamstring tightness. 6 sessions in 2 weeks were given to each participant. Baseline as well as follow-up data after 2 consecutive weeks was recorded.

Results: Mean age of participants of Groups A & B were 26±1.2, 26±0.9 years respectively. Group B participants showed marked improvement at 90-90 test, SLR, Sit and reach outcome measurement tools compared to group A as p-value was found less than 0.05 which is considered significant.

Conclusion: Muscle energy techniques particularly autogenic inhibition have better treatment outcome as compared to hamstring static stretching alone in asymptomatic females with hamstring shortness.

Keywords: Autogenic Inhibition, Hamstring Muscle, Manual Therapy, Muscle Energy Techniques, Stretching.

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Introduction:

Flexibility has been defined as the ability of a muscle to lengthen and allows one joint (or more than one joint in a series) to move through a range of motion.(1) A decrease in muscular flexibility reduces not only functional level of an individual but also harms the musculoskeletal system due to overuse.(2) Muscle tightness is caused by a decrease in the ability of a muscle to deform which results in decreased range of motion at the acting joint. Hamstrings are two joint acting muscles and most frequently damaged in body.(3) Static stretching helps in reducing muscle stiffness while enhancing range of motion within a duration of 5 to 30 seconds stretch commonly suitable for athletes or general population. Muscle Energy Technique (MET) is a manual technique developed by osteopaths and is now used in many different manual therapy professions.(4)

One such approach which targets the soft tissues primarily (although it makes a major contribution towards joint mobilization) has been termed as muscle energy technique which is also known as active muscular relaxation technique. It is claimed to be effective for a variety of purposes including lengthening a shortened muscles, as a lymphatic or venous pump to aid the drainage of fluid or blood and increasing the range of motion. (5) An increased stretch tolerance is a possible mechanism behind the increased ROM after the contract-relax exercise program.(6)

Hamstrings have proximal attachment to ischial tuberosity with exception of short head of biceps femoris. Due to this attachment, hamstrings influence pelvic posture. Pelvic is the base of spine and its tilting does affect the sagittal curvatures of spine. Hamstring flexibility is an essential variable

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because decreased extensibility can cause injuries, non-specific LBP and altered Lumbopelvic rhythm. (7)

Flexibility training is an important component in preventing and rehabilitation of injuries. It is a method of improving one's performance in everyday activities and sports.(8) Several researchers have compared different stretching techniques to determine which technique is more effective for increasing range of motion of joints. Stretching has many physical benefits including, improved athletic performance, flexibility, decreased energy expenditure, injury prevention, decreased DOMS, and promotion of healing.(9)

Stretching is also used as pre-exercise training protocol. It has been suggested that it enhances flexibility of muscles, increases physical performance and prevents injury.(10) Stretching increases flexibility of muscles around hip, knee, and trunk. A 15-30s stretch is more effectual than shorter duration stretch. It is as effective as longer duration stretch. Passive stretching has more profound results than dynamic stretching. A 30s to 60s of stretch results in significant increase in ROM. The authors concluded that a 30s of stretch is ideal.(11) Among all the muscle strains associated with sports, the most common are the hamstring strains. 13% of the injuries has been reported in Australian Rules football.(12) The atypical feature of hamstring is that it is bi-arthrodial, made primarily of type II fibers. It has less amount of titan proteins. That is why it has higher risks of strains. These are slow in rehabilitation process and higher in injury rates. (12) Conservative management strategies are helpful in treating low back pain. These include manipulation, exercise therapy, modalities, kinesio taping and myofascial release and flexibility regimen especially of hamstrings.(13)

Methods:

A parallel design randomized controlled trial was conducted on 50 females presented with hamstring tightness strictly following the inclusion and exclusion criteria. The study was conducted at Department of Health Sciences, Khawaja Fareed University of Engineering & Information Technology (KFUEIT) Rahim Yar Khan from September 2019 to April 2020. The inclusion criteria of study was healthy females aged between 20 - 40 years having scores of 90-90 test<50 & SLR<70. Females with any known mental disability, pregnant females, having any active complaint of low back pain or of lower extremity were excluded from this study. Non-probability purposive sampling technique was used & group allocation was randomly done into two respective groups. Total 55 participants were screened out. Out of which 3 did not meet the inclusion criteria & 2 were unable to continue the treatment due to their domestic reasons.

Ethical approval for study was obtained from Research Ethics committee of KFUEIT (Kfueit/ hesc/R-51). Informed written consent was taken from each participant. Demographic details including age, height, weight, BMI were noted as per study requirements. Group A (n=25) received static hamstring stretching & Group B (n=25) participants treated with muscle energy techniques (Autogenic inhibition) Figure 1. Each group was treated for 2 weeks on alternate days making 6 treatment sessions in total. The group wise treatment breakdown of session was as follow: Group A was treated with hamstring static stretching of 30 seconds × 3 times = 1 session and Group B was treated with muscle energy techniques (Autogenic inhibition) with time duration of 20 seconds × 3 times = 1 session. Treatment prognosis was measured in terms of outcomes using SLR, sit and reach test and 90/90 test (known as the Active Knee Extension (AKE) Hamstring Flexibility Test). Data analysis was done using IBM SPSS version 21. Shapiro-Wilk test of normality showed data to be non-normally distributed having p value less than 0.05 so Man Whitney U test was applied for inter group comparisons.

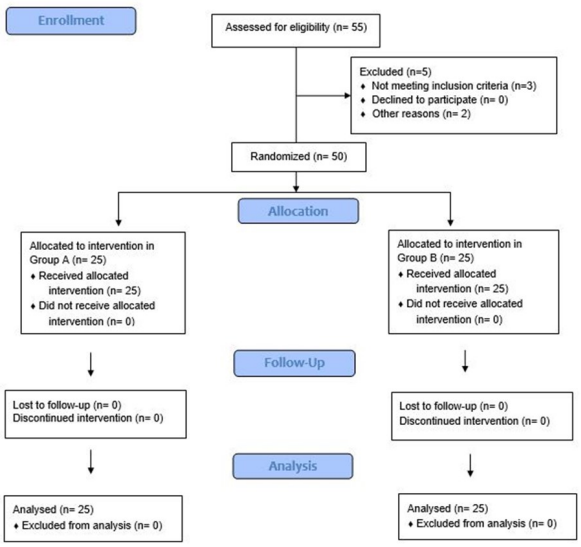

Figure 1: CONSORT Diagram

Results:

Total 50 females with hamstring tightness were recruited in this study. The demographic data details are shown in Table-1. Statistical analysis showed Group B participants having significant improvement compared to group A on sit and reach, SLR, and 90-90 test as p-value was found

less than 0.05 which is considered significant as shown in Table-2.

Table1: Demographic Details

Variable	Group A (n=25) Mean ± S.D	Group B (n=25) Mean ± S.D
Age	26.14 ± 1.2	26.42 ± .93
Height	1.65 ± 0.11	1.69 ± 0.21
Weight	59.60 ± 10.23	60.84 ± 11.67
BMI	21.77 ± 2.95	22.12 ± 2.12

Discussion:

A parallel design randomized controlled trial on fifty subjects was conducted to find the effects of two different static stretching and muscle energy techniques on ROM, balance and muscle activation. Both the techniques showed significant increase in knee extension angle.(14) A systematic review on impact of stretching on sports injury concluded that stretching enhances muscle flexibility which is an important component for athlete's performance.(15) Some studies also showed that there is no effect of stretching on tightness and flexibility of the muscles. Giwon Kim et al carried out a randomized clinical trial determining efficacy of stretching-based rehabilitation on pain, flexibility, and muscle strength. They concluded that stretching effectively eliminates pain and enhances flexibility in patients with hamstring injury.(16) A systematic review done by Diulian M. Medeiros et al under the title of "influence of static stretching on hamstring flexibility in healthy young adults" concluded static stretching to be effective in increasing hamstring flexibility in healthy young adults.(17) Similarly another study observed sustained stretching resulted in increased range of motion in hamstring shortness individuals.(1)

Davis et al conducted a single blinded randomized trial to see the effects of static stretching of muscles, surrounding the knee-on-knee joint position sense". Three different techniques of stretching were conducted to see the effects on ROM and flexibility of hamstrings. Self-stretching, static stretching and PNF were included. Out of all the three, static stretching showed profound effects on flexibility of hamstrings.(18) Ahmed et al showed that there is an equal effect of static stretching and hold relax on hamstrings. Similarly, PNF stretching has also an effect on hamstrings. All the three techniques have same effect but among all static stretching has more pronounced effect.(19) Shadmehr et al concluded in their research work that that there is no considerable difference between passive stretch and muscle energy techniques.(20) Mohamed Serag et al after running a randomized controlled trial, revealed autogenic inhibition to be more effective than reciprocal inhibition technique on reducing hemiplegic children spasticity.(21) Mariana Oliveira Borges et al concluded in their research work that both static hamstring stretching and proprioceptive neuromuscular facilitation have equal efficacy in reducing hamstring shortness.(22)

Conclusion:

In conclusion, muscle energy techniques particularly autogenic inhibition muscle energy technique has better treatment outcome as compared to hamstrings static stretching alone in asymptomatic females of hamstring tightness.

Disclaimer: None

Table 2: Man Whitney U Test for Between Group Comparison at Baseline & Follow-up sessions

Outcome Measurement Variables	Group of Treatment	Median (IQR)	Mean rank	p-value
Active Knee Extension Test at Baseline	Group A	12.00(1)	22.68	0.15
	Group B	11.21(2)	19.42	
Active Knee Extension Test at 6^{th} session	Group A	18.00(5)	31.32	< 0.05
	Group B	20.00(3)	38.58	
Straight Leg Raise Test at baseline	Group A	12.00(3)	22.50	0.72
	Group B	12.00(2)	21.66	
Straight Leg Raise Test at 6^{th} session	Group A	18.00(3)	30.00	0.02
	Group B	21.00(5)	33.44	
Sit & Reach Test at baseline	Group A	14.00(1)	20.14	0.20
	Group B	13.00(2)	20.12	
Sit & Reach Test at 6^{th} session	Group A	20.00(2)	28.00	< 0.05
	Group B	22.00(4)	30.00	

Conflict of Interest: None

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Yasin MM: Analysis, Interpretation of data for the work.
Wasim M: Drafting the work or revising it critically for important intellectual content.
Naeem F: Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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RESEARCH ARTICLE

Effects of Stationary Cycling on Spasticity and Range of Motion in Children with Diplegic Cerebral Palsy: A Quasi Interventional Study

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ABSTRACT

Background: Literature shows that cerebral palsy becomes challenging disability with the passage of time. Various treatment protocols are used to treat balance and coordination problems during rehabilitation programs however effective techniques are still needed to address spasticity and limited range of motion.

Objectives: To determine the effects of stationary cycling on spasticity and range of motion in diplegic cerebral palsy children.

Methods: An interventional study design (Quasi study design) was conducted in Rising Sun Mughalpura branch and Compass Schools for Special Education Lahore in 6 months from Feb 2019 to Aug 2019, after approval of synopsis. 68children with Spastic Diplegic Cerebral Palsy meeting inclusion criteria were enrolled in the study. Sample size was estimated using formula for Sample Size determination in health studies version 2.0.21 WHO. The static bicycle was used as an intervention tool. Two readings were taken before and after treatment. The data was analyzed by using IBM SPSS 20. Qualitative variables age, weight, gender and height were expressed as percentages. As the data found was parametric with a homogenous impression, paired sample t test was used to compare mean score at pre-post levels for ashworth scale and range of motion at knee and ankle joints. A p value less than 0.05 were taken as significant. Ashwroth Scale was used for spasticity and for Range of Motion goniometer was used.

Results: The paired sample statistics of pre-post testing of Ashworth Scale Score for calf muscles (M= 1.02, SD= 0.79), while for hamstring muscles (M= 1.13 SD= 0.84) with the significant p value 0.00. Knee and ankle range was (M=9.70, SD= 0.54) and (M=0.82, SD= 2.69) respectively, with a significant p value 0.00 for both.

Conclusion: It is concluded that stationary cycling has significant role in decreasing spasticity and increasing range of motion in children with diplegic spastic cerebral palsy.afdar

Key words: Ashworth Scale, Diplegic Spastic Cerebral Palsy, Physical Therapy, Stationary Cycling.

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Introduction:

Cerebral palsy is categorized as a group of non-progressive damage to immature brain leading to movement and posture disorders resulting in activity limitation.(1) It is characterized by impairment in perception, sensation, communication, cognition, behavior and various musculoskeletal disorders. In European countries, the incidence is as high as 2-3/1000 live births and among this, 40%is due to low weight and preterm babies.(2)

A study conducted in Pakistan, regarding prevalence of CP children visiting physiotherapy center showed 70-75 %, diagnosed with symptoms of disturbed tone, posture and locomotion. There is no single specific cause of constellation of symptoms known as CP. Most important factors may include birth asphyxia (that is having history of late cry for > 5 minutes after birth), birth trauma, drug abuse, and maternal infections, prematurity and intracranial infections. The most common type of CP is Spastic Cerebral Palsy, which is in almost 75% of the total cases, including in quadriplegic (40%), hemiplegic (21%), and diplegic 39%.(3)

Children with cerebral palsy show low level of physical fitness. Associated impairments that are seen with cerebral palsy are balance issues, coordination, endurance, cardiovascular capacity, pulmonary capacity and overall functional level decline. Clinical specialists and other physiotherapists agree that to maintain muscle strength and cardiopulmonary capacity of cerebral palsy children, it is important to provide maximum level of circulation to children for their physical activity and function.(4) Although there is limited evidence regarding intensity of exercise, still, now a days, tough and aggressive exercise is discouraged in patients with cerebral palsy. Recent scientific debate is on the use of cardiopulmonary fitness for treatment of aforementioned

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impairments in cerebral palsy children.(5) There is running debate that if these fitness type exercise can play role in reducing spasticity and range as well, because these two factors are important to boost function.(6)

Stationary cycling is one aforementioned cardio exercise that may have impact on function overall. Stationary cycling does not require sophisticated coordination and balance. This can enable children to work on high demand exercise of higher intensities because the energy required for balance and coordination is cut off.(7) Cycling can involve multiple group of muscle at a single time. For example, primary movers and antagonists of ankle, knee and hip can be involved at the same time for strength and endurance training.(8) Although children of cerebral palsy can incorporate cycling immediately and independently, however, the difference comes in pattern of muscle activation. There may also be difference in joint mechanics and pedal patterns as compared to those who have not cerebral palsy. There will be difference in response, carrying out and termination pattern of children with cerebral palsy and those of without cerebral palsy.(9)

A study trial in 2017 on task specific training impacts and functional effects in children with cerebral palsy was done with cycle and elliptical. Children both the unilateral and bilateral impairments were included. The improvement was measured by gait speed and cadence length before and after the complete sessions of cycling or elliptical. There was overall improvement in specific measures such as tone of muscles, range and function; however, gait was not significantly different. This would be due to the deficit of dose and training.(9) In 2008, conducted an experimental study concluding that ‘’Rhythmic arm cycling suppresses hyperactive soleus H-reflex amplitude after stroke.’’ However they observed that this suppressive effect is more obvious in neurologically intact participants and is greater when the movement numbers is increased. They proposed that rhythmic arm cycling may potentially be used as a rehabilitation technique to reduce exaggerated reflexes such as those occurring in spasticity.(10)

Many literatures had shown the results in the form of pedals of stationary cycling usage as strengthening exercise after conventional physical therapy treatment that it increased lower limb muscular strength, walking ability, cardiovascular fitness/endurance, eye-hand co-ordination and overall improvement in gross motor functions in spastic CP children. These studies suggested that strengthening exercises, as stationary cycling, did not have negative effect on spasticity of muscles in spastic CP children.(11, 12) Rationale of this study was to find out stationary cycling as a physical therapy intervention as an additional tool to wedge standing and manual stretching rehabilitation to decrease spasticity and increase joint range of motion in spastic diplegic cerebral palsy children, so that CP child can use this intervention as a playful activity and can manage himself his spasticity and joint range of motion of lower limbs without experiencing any pain of wedge standing or manual stretching.

Methods:

This study was carried out at Rising Sun (Mughalpura branch) and Compass Schools for Special Education (Lahore Cantt) in 6 months from Feb 2019 to Aug 2019. Total 68 children aged 7-15 years with Spastic Diplegic Cerebral Palsy scoring on Ashworth Scale of 1, 1±, 2 were enrolled in the study by convenient sampling technique. Subjects with command following problems and significant lower limb contractures were excluded. Sample size was calculated by using formula

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} P(1-P)}{d^2}$$

where margin of error was 0.08 and significance level was 95%. (Sample Size determination in health studies version 2.0.21 WHO). P_o is the proportion of children with spastic diplegic cerebral palsy = 17%. (13) The static bicycle was used as an intervention. Two readings were taken before and after treatment. Written informed consent was obtained from the parents and institute. Ethical approval for the study was obtained from Research ethics committee of University of Health Sciences (UHS/t.DPT/337). Therapy was given for 20 minutes one session to each related spastic CP child for 5 days per week for 4 weeks. The data was entered and analyzed by using IBM SPSS 20. Qualitative variables age, weight, gender and height were expressed in frequency and percentages. To check the normality of data, Shapiro - wilk test was applied, and all data was found normal because p-value was greater than 0.05 for all variables. As the data found was parametric with a homogenous impression, paired sample t test was used to compare mean score at pre-post levels for Ashworth Scale and Range of Motion at Knee and Ankle joints.

Results:

In our study, table 1 shows out of 68 CP children, 50 (73.5%) of participants were male and 18 (26.5%) were females, with highest frequency 10-12 years of age group was 46 (67.6%) while the

most common cause of cerebral palsy was birth asphyxia as 47 (69.1%) were pre-mature delivery the rest of above mentioned variable's detail is given table No.1

Table 2 shows Ashworth scale score for calf and hamstring muscles before and after cycling with mean and standard deviation values 1.85 ± 0.75 , 0.82 ± 0.38 and 1.95 ± 0.81 , 0.82 ± 0.38. The same table also shows range of motion values (Goniometer) of mean and standard deviation for knee terminal extension and ankle dorsiflexion before and after cycling as 21.2±3.13, 11.5±60 and 2.9±1.81, 6.7±2.15 respectively.

Table no. 1 shows the frequency and percentages of age group of children and birth asphyxia.

Variables	Attributes	Percentage (Freq)
Age Group of Children	7-9 years	23.51% (n=16)
	10-12 years	67.60% (n=46)
	13-15 years	8.82 (n=06)
Birth Asphyxia	Premature	69.12% (n=47)
	Term	26.50% (n=18)
	Post Mature	4.43% (n=03)

Table no. 2 Change in Ashworth scale calf and Hamstring muscles, and Range of Motion values for knee terminal extension and ankle dorsiflexion, before and after cycling

Variables	Assessment	Mean± SD	p-value
Ashworth Scale For Calf Muscles	Before Cycling	1.85 ± 0.75	<0.01
	After Cycling	0.82 ± 0.38	
Ashworth Scale For Hemistrings Muscles	Before Cycling	1.95 ± 0.81	<0.01
	After Cycling	0.82 ± 0.38	
Range of Motion of Knee Extension - Terminal	Before Cycling	21.25±3.13	<0.01
	After Cycling	11.54±2.60	
Range of Motion of Ankle Dorsiflexion	Before Cycling	2.94±1.81	<0.01
	After Cycling	6.76±2.15	

Discussion:

It was evaluated the effect of static cycling intervention after conventional physical therapy on 16 spastic diplegic cerebral palsy children in 2017 by conducting RCT. Results proves that static bicycle is a safe and effective means of strengthening exercise for cerebral palsy children, it improves strength of anti-gravity muscles and increase cardiovascular endurance without increasing the muscle tone in these children. This study supports our recent study as our study shows that improvement in range of motion. Lower limb muscles especially calf and hamstring muscles further more level of spasticity was decreased in all lower limb joints and range of motion significantly improved as the results shows that p value was <0.01.(12)

Primary outcome was short term and secondary outcome was long term improvement data was analyzed after three months and was based on the ability of participating in physical activity of daily living, bicycling or involvement in recreational activities or compliance with treatment measured by attendance.(13) A study was done by Toovey R, Spittle AJ, et al in 2019 and they concluded that Current two wheel bicycle abilities preparing for kids with CP in Australia shows highly variable. Development and testing of bicycle abilities specific result measures and interventions and guidance for therapists on thought of environmental and individual variables are justified results are somehow supported to current study as bicycle improve range of motion in spastic CP child however we did not included environmental variables in recent study.(14)

A study was conducted by Toovey R, Reid SM et al on ability of independently ambulant children with cerebral palsy to ride a two-wheel bicycle in which they concluded that an extent of freely ambulant youngsters with CP do gain complex motor skill ability of riding a two-wheel bike, however a significantly little proportion of at any age can ride as compared to their regularly developing peers. In the event that they do figure out how to ride, they do as such at a later age. For further examination into motor-skill learning approaches for ambulant children with CP, while working intimately with families to engage kids and their guardians, and understand their points of view on what impacts figuring out how to ride a bike this study strongly correlate with our study as this study proved child were able to ride a bicycle with minimal limited range of motion and decrease in level of spasticity.(15)

Another study was done in 2019 by Afzal F, Manzoor S et al and they concluded that gross motor function measure, trunk stability, standing time and walking distance have significant effects of activity in combination such as Treadmill, Stationary cycling with modifiable seat and resistance, strengthening exercises with manual resistance, Functional training, quadriceps build up training, standing activity and walking training on children with athetoid cerebral palsy results strongly correlate with the recent study but the

techniques were different as well as population is different. This reference study included athetoid CP child while we included only diplegic CP child. (16)

Literature shows that a study was conducted in 2017 by Pritchard-Wiart L with the Current rehabilitation practices for title of "children with cerebral palsy focus and gaps" Published in Physical & occupational therapy in pediatrics and they concluded that Cycling has been accounted for to be a famous action among youngsters with and without handicaps. A noticeable element of the writing about figuring out how to ride a bicycle was numerous youngsters with inabilities had picked riding a bicycle as an objective of treatment. The way that every one of the kids had picked the objective themselves was thought to assume a significant job in the accomplishment of the gathering. This study correlate with the recent study however with little conflict our study support spastic and range of motion on a single child while previous study proved social, functional and recreational activities between the groups of children.(17) Future studies should focus on evaluate long term effects of these techniques. Additionally, there is need to replace or at least add recreational and sports related activities in order to achieve results in cerebral palsy children. This can increase compliance of children with treatment plan and can be reason of overall mental and psychosocial support in cerebral children. Furthermore, Promotional seminars should be conducted by targeting audience such as parents having cerebral paralyses children so that they themselves can support and encourage their children to take part in useful recreational activities.

Conclusion:

It is concluded that the static cycling has significantly role in decreasing spasticity and increasing range of motion in diplegic spastic cerebral palsy children.

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Author Contribution:

Ghani HM: Conception or design of the work.
Razzaq M: Critical revision of the article for important Intellectual.
Safdar N: Statistical expertise
Umer Bilal: Statistical expertise
Tariq F: Data collection.

OPEN ACCESS

SHORT COMMUNICATION

Biomaterials in Regenerative Medicine

Reem Javed Malik

ABSTRACT

Physiological regenerative system of human body is incapable of restoring the function when an injury exceeds its normal limits. Conventional methods previously being used for repair and rejuvenation of tissues had certain limitations that have brought the biomaterials to the forefront in the area of regenerative medicine. Biomaterials provide optimal support to the tissue during the process of healing and remodeling. Numerous classes of biomaterials are focused on specific applications; most prominent among them are polymers. Biomaterials are now being used in several areas such as fabrication, hematology and blood cell substitutes, tissue engineering, extracorporeal artificial organs, bone and vascular regeneration, stem cell differentiation and soft tissue repair. However, for the success of biomaterials in regenerative medicine , the focus should not only be on the physical, mechanical and chemical properties of the materials but also the fundamental principles of biological interactions and biocompatibility.

Keywords: Biomaterials, Polymers, Regeneration, Regenerative medicine, Tissue engineering

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Introduction:

The term "regeneration" refers to the process of replacement of lost non-functional specialized tissues with healthy specialized cells.(1) Naturally, human body functions to regenerate whenever an injury occurs. However, the regenerative capacity is limited by numerous factors such as type of tissue or any structural defect (physical size of tissue). Need of an external support is necessary whenever the type of injury reaches beyond the normal physiological capacity of the internal regenerative system.(2) Conventional methods in regenerative medicine have numerous limitations and for this reason great emphasis has been laid down on the need of biomaterials in repair and regeneration of tissues.(3) For example in the transplantation of cells, tissues and organs, major limitations were inadequate availability of donor tissues and cultivation of extra tissue in human body.(4) Combining the concepts of cellular biology, biomaterials and molecular signaling led to the advancement of tissue engineering field as well as de-novo synthesis of organs and limbs.(5) Likewise, damaged articular cartilage was previously replaced with metal and plastic implants. Some of the major drawbacks of this treatment strategy were wear particle formation, inflammation, and limited life-time. With the improvement in field of biomaterials, autologous chondrocyte transplantation was developed with proven benefits in healing.(6) Therefore, in order to regenerate human tissues and organs with better functioning, regenerative medicine utilizes the basic concepts of various disciplines including materials science, life sciences and medicine.(7)

Materials used in the regenerative medicine are characterized by numerous properties including density, tensile strength, degradability, modulus and porosity along with many other material and mechanical properties.(8) Certain prerequisites have been proposed by various scientists that must be kept in focus while utilizing any biomaterial in regenerative medicine; the most important of them is the biocompatibility of the material under in-vivo and in-vitro conditions.(3) The material must be able enough to carry out optimal cellular activity for tissue regeneration without stimulating any inflammation or adverse systemic responses in the host body.(9) Furthermore, assessment of a cytotoxicity of the biomaterial is also a key point to consider in regenerative medicine.(3)

The objective of the current study is to highlight numerous applications of biomaterials in the field of regenerative medicine. Additionally, role of carbohydrate polymers in tissue engineering will also be discussed.

Methods & Results:

A mini review was conducted by carrying out an online search using key words such as regenerative medicine, biomaterials, advanced biomaterials, tissue engineering, implants, polymers etc. Boolean operators were used to combine the key words. Literature search was done using search engines and databases including PubMed, Google Scholar, Cochrane and Pakmedinet and the studies related to the topic were identified.

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Latest approaches in regenerative medicine:

Artificial red blood cells substitutes are now used clinically for pre-operative blood dilution or for post hemorrhage resuscitation.(10) Different types of raw materials are used for this purpose depending upon the type of artificial blood being made. For example, Perfluorocarbons (PFC) are used as blood substitute and are chemically inert. Also, their products involve polymerization reaction. Evidence suggests some proven benefits of PFCs to be used as artificial blood substitute as they do not allow the oxygen to react with the other gases and also allows smooth gaseous exchange between cells and tissues.(11) Biomaterials are also being used in the development of mechanical and biological cardiovascular valves and also in cardiovascular stents.(12, 13) Devices used as extracorporeal artificial organs like bio artificial livers, are used to assist the patients with acute hepatic failure.(14) In case of hollow fiber system, Synthetic or natural polymers like collagen are used to design such kind of devices.(15)

In case of skeletal muscle repair, electro spun chitosan microfibers are used as biomaterials.(16) These three dimensional scaffolds help the muscles to regain their normal function that are otherwise subjected to scar tissue formation as a result of normal healing process.(17) Tissue engineering is another area of regenerative medicine that utilizes combination of cells within biomaterials with the overall goal to generate viable and long lasting tissues with fast neovascularization. Several natural and synthetic polymers are used in cartilage tissue engineering such as silk, col and col etc.(18) Both synthetic and naturally occurring polymers can be used in regenerative medicine, and scaffold fabrication from natural polymers such as alginate, collagen, agarose, hyaluranon, fibrin etc. as well as synthetic polymers include polyglycolic acid, poly hydroxy ester, polylactic acid (PLA) and their copolymers is used.(19) Studies have shown significant regenerative results of corneal implants composed of methacryloyloxyethyl phosphorylcholine (MPC) cross linked collagen in corneal tissue regeneration as well.(20) Furthermore, substantial role of biomaterials can also be seen in nerve regeneration for axonal growth,(21, 22) hepatocytes regeneration,(23) bone and vascular regeneration, stem cell differentiation, and soft tissue regeneration.(24)

Carbohydrate polymers in regenerative medicine:

Tissue engineering is one of the most prominent tools and an active field of research in regenerative medicine.(25) Moreover, polymers are the most popular biomaterial used for the purpose of regeneration of the damaged tissues. Evidence suggests that carbohydrate polymers not only play an active role in drug delivery and hydrogels but also in tissue engineering.(26) Linear glycosaminoglycan hyaluronic acid has a significant role in extracellular matrix formation as well as in tissue morphogenesis.(27) Studies have shown that hyaluronic acid is effective for the prophylactic treatment of knee pain and also for surgical adhesions.(28) Several modifications in the structures of relatively simple carbohydrate polymers can enhance their activity to promote efficient migration, spreading and multiplication of cells.(25, 29)

Future Challenges:

Numerous issues are imperative for consideration regarding the progression of regenerative medicine as a field. Creation of big engineered replacement tissues will necessitate equipment and technology that allows fully vascularized grafts to be anastomosed with the host vasculature at the instance of transplantation, permitting optimum graft survival.(30) Furthermore, enhanced knowledge of the role of the host immune system is integral for the success of regenerative medicine. An improved knowledge of the role of age and state of disease state of the host is also important in terms of progressing in the field of regenerative medicine.(31-33) Lastly, the use of three dimensional human tissue culture models are very integral as they would allow experimentation with polymers and other biomaterials in a human biological environment in contrast to animal models that are commonly used, but the two environments may have important differences.(34)

Conclusion:

It is evident from the above mentioned examples that the role of biomaterials in regenerative medicine is immense. However, for the success of the use of biomaterials in regenerative medicine, the focus should not only be on the physical, mechanical and chemical properties of the materials but also the fundamental principles of biological interactions and biocompatibility.

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Author Contribution:

Malik RJ: Conception of the idea, literature search and manuscript writing

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Narrative Review

Role of Physical Therapy in COVID-19 Pandemic

Sameera Gul[1], Hafiza Noor-ul-huda[1], Misha Raza Sherazi[1]

ABSTRACT

Coronavirus disease 2019 (COVID-19), a pandemic, is an infectious condition caused by severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) , which has caused an increased number of hospitalizations worldwide. People infected with COVID-19 experience a variation in symptoms including cough, fever, muscle pain, fatigue, tiredness, and shortness of breath. Approximately 14% of patients experience a severe form of COVID-19 and thus requiring hospitalization, and 5% of patients require admission to an ICU. Effective screening of infected patients is necessary for early detection and the proper treatment and care of the patient. Polymerase Chain Reaction (PCR) and antigen-antibody tests are the screening methods for virus detection. The sample is taken either from the nasopharynx or the throat. Since the vaccine for the treatment of coronavirus is under production, supportive management is recommended for minimizing symptoms. Social distancing, hand hygiene, and wearing face masks are the preventive measures against this virus. Rehabilitative and physical therapy interventions have a significant impact on patients in resolving problems associated with breathing and for active mobilization to improve quality of life. This literature review sought to determine the effects of COVID-19 and to discuss what is known regarding the role of Physical Therapy on COVID-19 patients.

Keywords: Breathing exercises, COVID-19, Physical therapy, Respiratory therapy, World Health Organization

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Introduction:

According to the World Health Organization (WHO), Coronavirus disease 2019 (COVID-19) is an infectious condition caused by a newly discovered coronavirus. The first case of the novel coronavirus 2019 (COVID-19) was reported and confirmed in Wuhan, Hubei Province, China in December 2019. On March 11, 2020, WHO declared COVID-19 a pandemic. Afterward, the World Health Organization reported 69,808,588 cases of COVID-19, including 1,588,854 deaths (as of December 12, 2020). A Beta coronavirus named SARS-Cov-2 is the cause of COVID-19 that has drastic consequences on the lower respiratory tract which results in pneumonia.(1) Coronavirus also affects different organs such as heart, liver, kidneys, gastrointestinal tract, brain, and organ systems such as blood and immune system.(2) Most people affected with COVID-19 experience mild to moderate symptoms such as fever, continuous cough, myalgia, and dyspnea; while elderly people and those with underlying health conditions such as cardiovascular conditions, diabetes, and chronic respiratory diseases have symptoms varying from person to person and are at greater risk of having severe symptoms and thus require hospitalization.(3, 4) Also, multiorgan failure, shock, acute respiratory distress syndrome, cardiac failure, arrhythmias, and renal failure occur in different people and ultimately cause the death of the person.(5, 6) Moreover, some articles state that the survival of COVID-19 patients is lower when associated with Acute Respiratory Distress Syndrome (ARDS) as compared to when associated with other etiologies. In other cases, it may also be associated with acute kidney injuries.(7, 8)

The spread of the COVID-19 occurs through the respiratory droplets produced whenever the infected person coughs, sneezes, talks, or breathes. (4, 9) Further research confirm airborne transmission to be the main cause of the spread in indoor places because the composition of the virus is such that it contains water, salt, and organic material. Whenever, the water evaporates, the virus becomes so lightweight that it suspends in the air, multiplying the risk of infection.(10, 11)

So, the early detection of the virus is necessary for controlling the spread and transmission. The virus is detected by Polymerase Chain Reaction (PCR) and antigen-antibody test.(12) The sample is taken from the nasopharynx and throat and via laboratory testing. A high C-reactive protein, erythrocyte sedimentation rate, lactate dehydrogenase, creatinine, and prolonged prothrombin time may be present in patients with COVID-19.(4, 8) The other method for detecting COVID-19 is by the radiological examination of the chest which includes a chest X-ray and CT scan showing ground-glass opacities and consolidation

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in the lung periphery, while the normal lung does not have these characteristics.(13)

The first and foremost thing to protect against COVID-19 is to take proper measures. Fundamental hand sanitization including regular hand washing after every five minutes for at least 20-30 seconds and the wearing of face masks will help against the spread of the virus. Maintaining a safe distance of at least 6 feet, avoidance of crowded places, and disinfecting the most touched places are all defensive techniques against COVID-19.(9)

The primary objective of this study was to determine the effect of physical therapy in patients infected with COVID-19 as this pandemic has placed an enormous amount of stress on health care professionals. So, a proper response is needed to decrease the severity of symptoms. The management of symptoms is a multidisciplinary approach comprising of health care professionals from different fields working effortlessly throughout the day and night ensuring that patients receive effective rehabilitative and physical therapy services.(7, 14)

Methods & Results:

Search strategy:

An online search was carried out using different search engines including Google Scholar, Pubmed, and Cochrane from October 2020 to December 2020 to look for the role of physical therapy and its effects on COVID-19 patients.

Treatment strategies:

Since the vaccines are under production and there is no effective vaccine available for the treatment of a many patients yet, social distancing is the primary tool to stop the transmission of the virus.(1) Furthermore, supportive therapies including oxygen therapy, pharmacological therapy, and physical therapy such as active range of motion, cycle ergometry, pre-gait exercises, and ambulation help reduce the severity of symptoms. (8)

Physical therapy Role:

In assisting hospitalized patients through respiratory support and mobilization, the physical therapist plays a significant role. The management of physical therapy intervention should be customized to the need of the patient according to their level of severity of the disease so that appropriate time and treatment should be given to the patient to improve their quality of life. Physical therapy management comprises of two components: Respiratory training and active mobilization. Respiratory training can be done for airway opening, to improve the vital capacity of the lungs, mobilize secretions, and to strengthen the muscles of respiration. Breathing exercises such as diaphragmatic breathing, active cycle of breathing techniques (ACBTs), thoracic expansion exercises, and inspiratory and expiratory muscle training are different techniques of respiratory support. Less affected patients should be encouraged to perform breathing exercises independently. Moreover, prone positioning for at least 12-16 hours a day enhances ventilation in adult patients affected with severe ARDS.(15)

On the other hand, active mobilization comprising of bed mobility, pelvic rolling exercises, bridging, ankle pumps, all can be

Table 1: The role of Physical Therapy in patients infected with the coronavirus. (4)

RESPIRATORY SUPPORT	ACTIVE MOBILIZATION	DISCOURAGE PERIOD OF INACTIVITY
Vital monitoring	Avoid muscle contractures and atrophy (positioning, ROMs, PROMs)	Prolong bed rest
Positioning	Encourage remodeling of the patient (pre gait exercises, ambulation, gait training, isometrics, balance training)	Immobility
Postural drainage		Positioning after every 2 hours to prevent pressure sores
Respiratory muscles strengthening		
Training of respiratory muscles via different breathing techniques (active cycle of breathing techniques, diaphragmatic breathing, segmental breathing technique, percussions, vibrations)		

performed to overcome the problems, restricting activities of daily living and for the improvement of physical function as shown in the table (Table 1). (3, 4) Patients should be encouraged to perform light intensity training to improve muscle strength and functional outcome. Interventions to improve endurance and balance should be progressed gradually and gait training should be started using different walking aids, for example, parallel bars and walkers.(16) All these early rehabilitative interventions have a significant impact on patient outcome thus minimizing severity of symptoms and therefore, reducing the duration of the hospital stay. (17)

The physical therapist must take proper measures to ensure their own safety as they are at risk of getting infected due to close contact with patients of COVID-19. So, unnecessary contact with COVID-19 patients should be avoided. In cases where direct delivery of exercise programs is not required, the physical therapist must use telehealth, which is absolute management for communicable diseases, to deliver care while minimizing their contact with infected people.(18)

Conclusion:

COVID-19 is an infectious condition that spreads from person to person by respiratory droplets and has caused many deaths worldwide. Protective strategies including the use of face masks, good hand hygiene, and social distancing should be practiced minimizing the spread of the virus. The physical therapist plays a significant role in managing symptoms of respiration and improving the overall quality of life. Early rehabilitative care has a positive effect on critically ill patients and it gives more benefit to the patient and reduces the length of the hospital stay.

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Gul S: Conception, design, drafting the work and agreement to be accountable for all aspects of the work.
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