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Review Article

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Role of Aquatic Therapy in Knee Rehabilitation: A Narrative review

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Abstract

Background: Knee pain is a prevalent issue affecting adolescents and adults, with various causes ranging from acute injuries to chronic conditions like osteoarthritis. The knee is particularly susceptible to injury, especially among athletes. Aquatic therapy has gained attention as a promising approach to knee rehabilitation because of its unique properties, including buoyancy, hydrostatic pressure, and viscosity, which can aid in reducing pain and enhancing recovery. This narrative review explores the effectiveness of aquatic therapy in knee rehabilitation across different knee conditions and presents findings from several studies conducted between 2006 and 2022.

Methodology: A comprehensive search strategy was implemented using keywords in Google Scholar and PubMed. The search was limited to randomized controlled trials, systematic reviews, and pilot studies conducted between 2006 and 2022, published in English. Inclusion criteria encompassed original research with outcomes related to knee rehabilitation and aquatic therapy, while articles that did not focus on knee rehabilitation and aquatic therapy or were published prior to 2006 were excluded.

Results: Several studies were reviewed to assess the effectiveness of aquatic therapy in knee rehabilitation for different conditions. A total of 7 articles were selected that said the effectiveness of aquatic therapy in knee rehabilitation.

Conclusion: In this review, aquatic therapy is effective in all knee conditions.

Keywords: aquatic therapy, knee rehabilitation, ACL reconstruction, osteoarthritis, meniscal injury.

Introduction

Knee pain is a common adolescent and adult symptom. It is a frequent symptom beginning around the age of 10 and by the age of 15, 1 out of every 3 teenagers will report having some amount of knee discomfort [1]. Both acute and chronic are caused by functional limitation in individuals [2]. With an estimated of 2.5 million injuries associated with sports recorded each year, the knee is the most injured joint that young athlete's injury the most frequently. The types of major knee injuries, such as ruptures of the ACL or PCL or MCL that occur frequently are explained by the multidirectional loads applied to the complex knee joint during vigorous physical activity [2]. One of the common conditions in the knee is osteoarthritis for over 50 years. Knee problems in teenagers as well as catastrophic events such as ACL and meniscal injury, may raise the chance of developing osteoarthritis (OA) [1]. Obesity is a significant risk factor for knee pain, & both aging and obesity increase the likelihood of developing

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symptomatic knee osteoarthritis [3]. The knee is heavily loaded, and alterations in the biomechanics of the knee can cause pain and damage [1].

In sports, the knee is frequently hurt due to both direct as well as indirect trauma. Example: Meniscal tears, patellofemoral instability, ligament injury, patellar tendinitis, are common causes of knee pain in athletes, and osteochondral injury, arthritis in the elderly group common causes of knee pain. It's also important to keep in mind less prevalent issues including discoid meniscus, apophysitis (osteochondrosis), and plica syndrome, Hoffa's disease is an uncommon cause of anterior knee pain in athletes, medially knee pain causes are semimembranosus tendinitis, pes anserine bursitis, tibial collateral ligament bursitis, saphenous nerve entrapment, and laterally knee pain causes are popliteus tendinitis, iliotibial band syndrome, fabella syndrome, and proximal tibiofibular joint instability [4].knee pain also due to referred pain from hip or lumbar spine dysfunction [5].there are many effective treatment for knee pain. Treatment for knee pain is determined by the thorough diagnosis, the patient, and the available resources. The most common treatment choices are conservative treatment, exercise therapy, surgical, acupuncture, manual therapy etc[1]. preventing measures best option to from preventing knee pain. Such as controlling Obesity, lack of strength lower limb, stereotyped repetitive usage of the knee joint, severe external loads, awkward working conditions [6]. In recent studies says that aquatic therapy is highly effective in knee conditions. Aquatic therapy involves all therapeutic uses of a water-based setting during the Rehabilitation. Exercise in the water reduces joint loading, and being immersed has been linked to reduced pain symptoms due to improved sensory input and reduced joint compression. Basic hydrodynamic concepts are connected to the biological impacts of submersion in water. Understanding these effects, in addition to the physical characteristics of water, such as its density, specific gravity, hydrostatic pressure, viscosity, and buoyancy, may aid knee rehabilitation [7].

The need for studying aquatic therapy in knee rehabilitation arises from its potential to provide effective and safe rehabilitation for individuals with knee injuries or post-surgery recovery. Aquatic therapy takes advantage of buoyancy, reducing the impact on the knee joint during exercise. It can be crucial in early stages of rehabilitation and buoyancy allows for easier joint movement, aiding in regaining and enhancing range of motion. Hydrostatic pressure can alleviate pain reduce swelling in the knee, making it more conductive to rehabilitation, aquatic therapy challenges balance and stability which is essential for knee rehabilitation to prevent future injury .it can contribute to cardiovascular fitness and overall well-being [14].

Methodology

Search strategy: The search was conducted using specific keywords in databases such as Google Scholar and PubMed. Articles were selected based on predefined inclusion and exclusion criteria, and only full articles were considered for the literature review.

Database: Google Scholar, PubMed

Duration of the review: 1 month

Inclusion Criteria

1. Randomized control trials, systematic review and pilot studies between the years 2006 to 2022.
2. Original research encompasses a range of outcome measures related to knee rehabilitation and aquatic therapy.
3. Articles that have been published in English.

Exclusion Criteria

1. Articles published prior to 2006.
2. Articles that did not specifically center on knee rehabilitation and aquatic therapy were not considered.
3. Articles in language other than English.

Literature Review

- **Elie Hajouj et al (2021)** Conducted randomized controlled trial on "effects of innovative aquatic proprioception training on knee proprioception in athletes with ACL reconstruction". total 38 male athletes post (hamstring tendon graft) were randomly assigned into two groups. Experimental groups (n=19) received conventional therapy and controlled groups (n=19) received hydrotherapy with same convectional

therapy from after 6 weeks of post-surgery for 3 times per week. Controlled groups got additionally aquatic proprioception training 2 times weekly for 45-60 minutes. The result of the current study revealed that subjects who followed innovative aquatic proprioceptive training plus the conventional rehabilitation accelerated protocol had significantly reduced proprioception magnitude errors, signifying a reduction in proprioceptive deficit after the intervention [10].

- **Sirous Azizi et al (2019)** was guided single blind RCT with 32 men's with knee osteoarthritis aged <60 from university hospital Tehran. The aim of the study is to assess the efficacy of aquatic exercise for the management of knee osteoarthritis. 32 participants in the intervention group (n=16) followed an aquatic exercise program for three sessions for 8 weeks. In control group (n=16) was instructed to use only acetaminophen with lifestyle recommendation for 8 weeks. Results indicated that significantly improve in aquatic exercise for pain and static, dynamic balance. Aquatic exercise regarding static and dynamic balance, step length, stride length, and cadence [11].
- **Richard McAvoy et al (2006)** was conducted pilot randomized controlled trial about "Effectiveness of combining aquatic physical therapy with land-based therapy".30 participants which had unilateral TKR from Marsh book in Somersworth .15 person randomly assigned to integrated group (aquatic and land) received physical therapy in the water and on land two times a week for 6 weeks. Patients received 30 minutes land and 30 minutes aquatic exercises. Between sessions they got 15 minutes break to change dresses. Other groups received 60 minutes of physical therapy 2 times in 6 weeks. After exercise cessation (6 weeks), a significant improvement of knee functions was observed in the integrated group [12]
- **Qin LI et al (2022)** was aimed study about the "effectiveness of aquatic sports rehabilitation on functional recovery of knee joint injury". Due to epidemic period the recruitment for samples was done through WeChat social media application including 14 boys and 16 girls total 30 participants joined this study. 30 subjects were divided into water sports group, land sports group and control group by pairing method, with 10 people in each group. Study was conducted for 8 weeks. Results indicated that although both water sports rehabilitation and land sports rehabilitation can increase the knee joint function score of patients with knee ligament or meniscus injury [13]
- **Supriya Nikam et al (2022)** conducted double blinded RCT about "Efficacy of Aquatic Therapy and VMO Strengthening in Patellofemoral Arthritis". This Study was conducted with 30 subjects for 5 weeks 3 times a week. All 30 subjects were randomly assigned to 2 groups with 15 participants. Group A received VMO strengthening, and group B received aquatic therapy. Post-intervention results show significant improvement in aquatic therapy exercise [14].
- **Philip.M.Boozer et al (2016)** conducted a systematic review on "effectiveness of traditional land based versus aquatic therapy after ACL reconstruction". Systematic search on googles scholar and sports Discuss. Initial search included six articles.Only two publications concerning comparing aquatic and land-based therapy were discovered after each article's eligibility for inclusion had been evaluated; these two articles were the only ones that met the criterion. All articles were reviewed comparing land therapy and aquatic therapy after ACLR surgery.Only Two articles showed there was no difference in pain, effusion, ROM in land-based rehabilitation. While the aquatic rehabilitation did show improvement in all outcomes [15] .
- **Jae-Young Lim et al (2010)** RCT was focused about "Effectiveness of Aquatic Exercise for Obese Patients with Knee OA". 75 participants randomly assigned into Aquatic group (n= 26) and land exercise group (n=25) Other (n=24) participants in the control group. The intervention program for 40 minutes per session three times for 8 weeks. For control group home based provided.. Following an 8-week intervention, both the aquatic group and the land exercise group's BMI indicated some decrease. The improvement in functional performance

was almost equivalent between the two exercise treatments. The degree to which pain interferes with activities is lessened in aquatic groups. Patients with obesity who struggle to perform traditional workouts because of knee osteoarthritis may find success with aquatic exercise [16].

Table 1: Analysis of literature review

	Author	design	No. of subjects	Outcome measures	Study duration	Frequency of measurement	Results
1	Elie hajouj et al	RCT	n=38	IKDC questionnaire, VAS scale,	6 weeks	Pre and post intervention	Aquatic exercise has significantly improved VAS and IKDC
2	Sirous Azizi et al	RCT	n=32	VAS scale, ROM, balance error scoring system	8weeks	Pre and post intervention	Aquatic exercise significantly improve I pain, and static, dynamic balance
3	Richard McAvoy et al	Pilot RCT	n=30	NPRS, KOOS and WOMAC index	6 weeks	Baseline 6 months	Significant improve in aquatic exercise in pain and ROM AND knee functioning
4	Qin Li et al	RCT	n=30	VAS, KOOS index, ROM	8weeks	2,4,6,8 weeks	Patients with knee joint problems may recover rapidly with aquatic rehabilitation exercises.
5	Supriya Nikam et al	RCT	N=30	VAS, AKPS	5 weeks	Baseline 5 weeks	Aquatic therapy is more efficient than VMO strengthening, which demonstrated greater pain relief and increased functional capacity in PFA
6	Philip Boozer et al	Systematic review	6 articles	NA	Pain recovery, ROM, muscle strength	NA	Evidence supported that aquatic exercise helps to improve in pain, ROM, muscle strength
7	Jae-Young Lim et al	RCT	n=75	WOMAC, BPI	8 weeks	Pre and post intervention	For obese individuals who struggle with traditional exercise due to combination knee osteoarthritis and obesity, aquatic exercise may be a useful technique.

Discussion of Study

The knee joint is prone to damage since it is continually influenced by body weight loading from different angles[10]. The literature review presents a compelling case for the effectiveness of aquatic therapy in knee rehabilitation across various knee conditions. It consistently demonstrates positive outcomes, including pain reduction, improved range of motion, increased strength, enhanced balance, and better functional abilities. Reduce joint loading with aquatic activities, and water immersion has been linked to reduced pain sensations due to improved sensory input and reduced joint compression [10]. The biological effects of immersion in water are related to basic hydrodynamic principles. Understanding these impacts, as well as water's physical properties including density and specific gravity, hydrostatic pressure, viscosity, and buoyancy may help knee rehabilitation [14].

Elie Hajouj et al says that innovative aquatic proprioception training, when added to conventional therapy, significantly improved proprioception in athletes with ACL reconstruction. After the intervention, the proprioception assessments revealed substantial variations in the joint position sensation variables between the two groups. This study revealed that significantly reduced proprioception magnitude errors. Hydrostatic pressure helps by activating muscles to maintain the stability of body by role of external sensory stimuli. Not only improving proprioception this intervention it also improves efficiency of pain and knee function [10].

Sirous Azizi et al study focused on individuals with knee osteoarthritis. The findings suggest that aquatic exercise can significantly improve pain levels and static and dynamic balance in this group. This is crucial since managing pain and maintaining balance are key aspects of knee osteoarthritis management. Static and dynamic balance and gait parameters such as step length, stride length, cadence is significantly improved here[11]. Qin Li's study focused on patients with knee ligament injuries and meniscal injuries. It found that water sports rehabilitation led to better improvements in terms of benefits and range compared to land-based rehabilitation. This highlights the potential benefits of aquatic therapy for patients with complex knee injuries, including ligament and meniscal issues[13]. Effect of aquatic therapy accelerating rehabilitation in sports injury. Athletes with meniscal or ligament injury only participate in therapy after acute phase. In such case they have designed treatment according to individual condition,time,intensity and frequency.it help accelerate the rehabilitation.

The studies also suggest that aquatic therapy has unique advantages, such as early muscle activation, reduced pain interference during exercises, and the ability to cater to individuals. The literature review presents a compelling case for the effectiveness of aquatic therapy in knee rehabilitation across various knee conditions.

Limitations:

- Cost effectiveness for aquatic therapy is one of the basic limitations in our study. Using the community pool restricted for use all the time. It may only be available at certain times of the day; clinics can optimize their schedules to make the best use of pool hours. This ensures that therapy sessions are maximally productive. And community pools are also not able to maintain temperature as per need for treatment.
- Duration of exercise program was not likely enough to verify effects of treatments. Sessions and duration of exercises must increase to reliable results and validity of outcome measures.
- In post-surgical conditions such ACL reconstruction and meniscal and other ligament surgery will lead to becoming infected because of water based environment exercises.
- In some cases, sample size is not enough to reliable outcome measures and results.

Conclusion

The reviewed studies collectively emphasize the significant benefits of aquatic therapy in knee rehabilitation. These benefits encompass pain reduction, improved range of motion, increased strength, enhanced balance, and better functional abilities across a spectrum of knee conditions. This can accelerate knee rehabilitation in acute and chronic knee conditions.

In summary, aquatic therapy emerges as a promising and valuable tool in the realm of knee rehabilitation. However, ongoing research, protocol standardization, and continuous evaluation are essential steps to fully harness its benefits for individuals recovering from knee-related conditions and injuries.

Conflict of Interest: There is no conflict of interest.

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References

1. Afzali T, Fangel MV, Vestergaard AS, Rathleff MS, Ehlers LH, et al. Cost-effectiveness of treatments for non-osteoarthritic knee pain conditions: A systematic review. PLOS ONE. 2018;13(12):e0209240. DOI: 10.1371/journal.pone.0209240.
2. Gage BE, McIlvain NM, Collins CL, Fields SK, Comstock RD. Epidemiology of 6.6 million knee injuries presenting to United States emergency departments from 1999 through 2008. Acad Emerg Med. 2012;19(4):378-85. DOI: 10.1111/j.1553-2712.2012.01315.x.
3. Nguyen UST, Zhang Y, Zhu Y, et al. Increasing prevalence of knee pain and symptomatic knee osteoarthritis: Survey and cohort data. Ann Intern Med. 2011;155:725-732.
4. Safran MR, Fu FH. Uncommon causes of knee pain in the athlete. Orthopedic Clinics of North America. 1995;26(3):547-559. DOI: 10.1016/S0030-5898(20)32015-0.
5. Patel DR, Villalobos A. Evaluation and management of knee pain in young athletes: Overuse injuries of the knee. Transl Pediatr. 2017;6(3):190-198. DOI: 10.21037/tp.2017.04.05.
6. Miranda H, Viikari-Juntura E, Martikainen R, Riihimäki H. A prospective study on knee pain and its risk factors. Osteoarthritis Cartilage. 2002;10(8):623-630. DOI: 10.1053/joca.2002.0796.
7. Buckthorpe M, Pirotti E, Villa FD. Benefits and use of aquatic therapy during rehabilitation after ACL reconstruction: A clinical commentary. Int J Sports Phys Ther. 2019;14(6):978-993.
8. Kisner C, Colby LA. Textbook of Therapeutic Exercises. 5th edition.
9. Thein JM, Brody LT. Aquatic-based rehabilitation and training for the shoulder. J Athl Train. 2000;35(3):382-389.
10. Hajouj E, Hadian MR, Mir SM, Talebian S, Ghazi S. Effects of innovative aquatic proprioceptive training on knee proprioception in athletes with anterior cruciate ligament reconstruction: A randomized controlled trial. Arch Bone Jt Surg. 2021;9(5):519-526. DOI: 10.22038/abjs.2020.50106.2485.
11. Azizi S, Dadarkhah A, Rezasoltani Z, Raeissadat SA, Mofrad RK, Najafi S. Randomized controlled trial of aquatic exercise for treatment of knee osteoarthritis in elderly people. Interv Med Appl Sci. 2019;11(3):161-167. DOI: 10.1556/1646.11.2019.19.
12. McAvoy R. Research report: Aquatic and land-based therapy vs. land therapy on the outcome of total knee arthroplasty: A pilot randomized clinical trial. J Aquatic Phys Ther. 2009;17(1):8-15.
13. Li Q, et al. Aquatic sports rehabilitation on functional recovery of knee joint injury. Revista Brasileira de Medicina do Esporte. 2023;29. DOI: 10.1590/1517-8692202329012022_0807.
14. Nikam S, Yadav TS. Efficacy of aquatic therapy and VMO strengthening in patellofemoral arthritis. Int J Physiotherapy Res. 2022;10(6):4409-4416.
15. Boozer PM. Effectiveness of traditional land-based therapy vs aquatic-based therapy after ACL reconstruction. All Graduate Plan B and other Reports. 2016;797. Available at: https://digitalcommons.usu.edu/gradreports/797.
16. Lim JY, Tchai E, Jang SN. Effectiveness of aquatic exercise for obese patients with knee osteoarthritis: A randomized controlled trial. PM&R. 2010;2:723-731. DOI: 10.1016/j.pmrj.2010.04.004.

Cross-Sectional Research

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Musculoskeletal Pain Disorder Patients' Adherence to Physiotherapy Treatment: A Cross Sectional Study

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Abstract

Background & purpose: Musculoskeletal disorders (MSDs) are diseases or pain in the musculoskeletal system of the human body, which consists of the joints, ligaments, muscles, nerves, tendons, and structures that support the limbs, neck, and back. MSDs can be the result of a quick exertion (e.g., lifting a large object), repetitive strain, or constant exposure to force, vibration, or awkward posture. The study aimed to determine musculoskeletal pain disorder patients' adherence to home-based physiotherapy programs in the outpatient musculoskeletal department.

Methods: The cross-sectional study was chosen to carry out this study among 200 participants who were selected according to inclusion criteria. The Adherence in Chronic Diseases Scale (ACDS) was used to assess the adherence level to physiotherapy treatment. The study was conducted by using quantitative descriptive analysis.

Results: Most of the participants were medium adherent to physiotherapy treatment. Although this study found a significant association between different socio-demographic factors with adherence to physiotherapy treatment such as age, marital status, treatment sessions, and timely arrival for physiotherapy treatment.

Conclusion: This study concluded that most patients who are receiving treatment have moderate adherence to prescribed physiotherapy treatment at home.

Key Words: Musculoskeletal pain, Adherence, Physiotherapy treatment.

Introduction

Acute or chronic musculoskeletal pain is a medical and social issue that affects people worldwide. Pain from musculoskeletal illnesses is a major medical and economic problem.(1) About 35% of the general population suffers from chronic musculoskeletal pain, making it a serious public health concern in most developed countries. However, it is usually a clinical

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issue when pain continues past the expected time of recovery, and there are no identifiable pathological findings in bones, joints, or muscles as a result of a musculoskeletal disease process.[2]

Musculoskeletal pain is a difficult illness for both patients and doctors to treat. Regardless of age, gender, or socioeconomic situation, most persons suffer at least one episode of musculoskeletal pain. Approximately 47 percent of the overall population is affected. Approximately 39–45% of these individuals have persistent issues requiring medical advice. Musculoskeletal discomfort that is inadequately controlled can negatively impact the quality of life and cause substantial socioeconomic issues.[3]

In the case of musculoskeletal pain, it is believed that many recurrent or persistent instances may be prevented if patients adhere to their treatment regimens. Despite evidence supporting the efficacy of exercise and advice in the management of chronic musculoskeletal pain, high recurrence rates of musculoskeletal pain are well documented; therefore, it would appear that there are significant barriers to compliance and thus to the prevention of recurrence. [4]

Methodology

Source of Data: musculoskeletal pain disorders patient.

Study population: All the musculoskeletal pain patients attended in CRP musculoskeletal unit, Savar, Bangladesh

Inclusion Criteria:

- Age range between 20 to 60 years.
- Male and female both were included.
- Patient who has receiving physiotherapy treatment at least 6 sessions from CRP musculoskeletal unit.
- The patients who had shown willingness to participate were included.

Exclusion Criteria:

- Stop home exercise by physiotherapist's instruction
- Refusal to give informed consent.
- Unable to attend all sessions of physiotherapy
- People who were suffering from musculoskeletal pain with serious pathological diseases e.g., tumors, tuberculosis etc.

Method of Collection of Data

Sampling Method: Convenience sampling method

Sampling Size: 200 sample according to inclusion and exclusion criteria.

Duration of the Study: October 2021 to June 2022.

Procedure: The researcher stated at the beginning that participants had the option to decline answering any item on the questionnaire. Any moment they wanted; they were free to leave the study. The researcher also stated the purpose of the study to all participants. It was made clear to participants that any personal information they provided would not be released to the public. The researcher obtained written agreement from each volunteer participant using a consent form. Following participant permission, a standard questionnaire was utilized to detect complaints and collect demographic data. The researcher did a face-to-face interview and asked questions to conduct the interview. Physical environment was closely considered. To ensure the interviewee's undivided attention, distraction-causing stimuli were eliminated. As far as feasible, the interviewee was asked questions alone with their cooperation, as sometimes close relatives could influence their responses. During the interview, the researcher created rapport and clarified questions. Face-to-face interviews are the most effective technique to obtain the full cooperation of a survey participant. Face-to-face interviews are also effective for describing population characteristics. Face-to-face interviews were done to collect data that descriptively characterizes the population during the conversation. Following the participants' degree of comprehension, the questions were occasionally posed in the patients' native tongue so that they could comprehend them properly and respond accurately.

Results

Among the participants, the mean age was (36.03±11.678) years. 72.5% were male and 27.5% were female. 67.5% of participants were married, 31.5% participants were unmarried, 0.5% participants were divorced and 0.5% participants were widowed. Co-morbid diseases were absent in most of the participants. Most of the participants took physiotherapy treatments 6-10 times and mean treatment session were 11.72 (Table1).

Most of the participants who took physiotherapy treatment at CRP arrived on time for physiotherapy treatment (97%). This means participants are highly motivated to take treatment at CRP. Most of the patients continued physiotherapy treatment even though they were not well physically. They were coming for physiotherapy whatever he faced. 191 participants admitted that they did not forget about their treatment sessions. This is a huge number. Most of the participants admitted that physiotherapists from home who took treatment listened carefully to them. According to this study, most of the participants took physiotherapy treatment for less than 1 month (Table 2).

Among all the participants, most of the participants were medium adherent to physiotherapy treatment at 46.0%, high adherent was 39.0% and low adherent was 15.0% (Figure 1).

This study found a significant relationship between different socio-demographic indicators with adherence to physiotherapy treatment such as age, marital status, treatment sessions and timely arrival for physiotherapy treatment at $p<0.05$ by chi-square test (Table 3).

Table 1: Received of treatment sessions

Treatment sessions	Values
Mean	11.72
Median	10.00
Mode	7

Table 2: Information about treatment sessions

Variables		Frequency (Percentage)
1. Timely arrival for physiotherapy treatment	Yes	194 (97.0%)
	No	6 (3.0%)
2. Discontinued taking physiotherapy when feeling bad	Yes	9 (4.5%)
	No	191 (95.5%)
3. Forgotten to take treatment sessions	Yes	9 (4.5%)
	No	191 (95.5%)
4. Failed to take prescribed treatment sessions	1-2 times	8 (4.0%)
	3-5 times	1 (0.5%)
5. Healthcare providers (physiotherapists) listen carefully to patients	Yes, definitely	191 (95.5%)
	Yes, somewhat	9 (4.5%)
6. Receiving services from a current healthcare provider	<1 month	75 (37.5%)
	1-2 months	71 (35.5%)
	2-5 months	31 (15.5%)
	5 or more months	23 (11.5%)

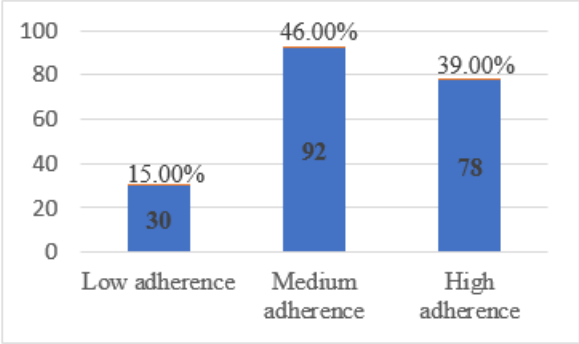

Figure 1: Adherence to prescribed home-advised physiotherapy treatment

Table 3: Association between socio-demographic indicators with adherence to physiotherapy treatment

Variables	Association with	P value
Age	Adherence to physiotherapy treatment	0.00
Marital status	Adherence to physiotherapy treatment	0.00
Education	Adherence to physiotherapy treatment	0.71
Family member	Adherence to physiotherapy treatment	0.25
Monthly income	Adherence to physiotherapy treatment	0.87
Treatment sessions	Adherence to physiotherapy treatment	0.01
Timely arrival for physiotherapy	Adherence to physiotherapy treatment	0.00

Discussion

The purpose of the study was to determine the adherence of patients with musculoskeletal pain disorders to home-based physiotherapy treatment at the outpatient department of CRP, Savar. In physiotherapy outpatient departments, the overall adherence to a home-based exercise program was moderate at 46% (n=92). In this study, those participants aged 20–30 years old, who were predominantly male, reported the highest levels of adherence. This may be because male and adult participants were more prevalent than female and older participants. Age, marital status, treatment sessions, and timely arrival for physiotherapy treatment were significant predictors of home-based exercise program adherence.

The outcomes of this study indicate that age is strongly connected with adherence, with a tendency for younger populations to adhere more than older populations. According to research conducted in Egypt,[5] regular physical activity/exercise declines with age. In a showed that male patients were nearly three times more likely than female patients to adhere to home-based exercise programs.[6] This is because, despite the lack of a specific explanation, the higher rate of adherence seen among men in this study may be attributable to the particular sociocultural concerns of Ethiopians.[7] Men in Nigeria,[8] the United States,[6] and Turkey[9] engage in more physical activity than women, suggesting that gender is significantly connected with exercise adherence. In contrast, there is no significant association between the research conducted in Spain[10] and northwest Nigeria.[11] This may include sample size, study location, study participants, sampling method, and data collector quality.

The findings revealed no significant correlation between educational attainment and home-based physiotherapy exercise programs. A study discovered in their study that education level is substantially connected with HBEP adherence, whereby HBEP adherence is higher among patients with higher educational standing, with 4.3 times more adherence than patients who are unable to write or read.[12] This was supported by a Nigerian study.[8] In contrast, a study conducted in the United States[6] found that education is not significantly related to exercise adherence. Another study indicated that housewives adhere to the HBEP at nearly five times the rate of others. This is because employed or self-employed individuals spend more time at work and may not have time for HBEP due to active travel.[13] But according to a second study conducted in Egypt, employment is more likely to comply with HBEP.[5] This mismatch may result from a distinct demographic, sample size, research design, or sampling process.

This study found a significant association between marital status and home-based physiotherapy exercise programs. A study conducted in Nigeria revealed that there was no association between the marital

status of the participants and their adherence to HEPs (p=0.120).[8] Another study revealed a marginally significant correlation between marital status and physiotherapy treatment adherence.[5] Furthermore, a study conducted in Panama revealed that there was no statistical correlation between marital status and adherence to physiotherapy treatment.

Regarding this study, timely physiotherapy treatment administration showed a substantial correlation with adherence to a home-based exercise regimen. A study also revealed that patients who receive prompt outpatient physiotherapy are more likely to stick to a home-based physiotherapy regimen.[14]

According to this study, there is a statistically significant correlation between therapy sessions and adherence to a home-based fitness regimen. A study revealed that the correlation between treatment sessions and adherence to a home-based fitness regimen is statistically significant.[15] Participants who received at least eight treatment sessions were reported to be more motivated to perform prescribed home exercises and more compliant. Another study has shown that treatment sessions are statistically associated with home exercise program adherence.[16] This assured them they were motivated to participate in their workout program.

Conclusion

Musculoskeletal (MSK) pain problems are the second most prevalent cause of disability globally, and their prevalence is growing daily. Numerous individuals are currently receiving physiotherapy treatment for their illnesses. Some of them are recovering quite quickly, but most are not recovering within the specified time frame. There may be problems, such as patients not adhering to physiotherapy directions. This study found moderate adherence to the home exercise program. Participants who are older, unmarried, uneducated, or arrive late for physiotherapy treatment have a greater probability of non-adherence and should be given additional concern.

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Conflict of interest: None.

References

1. Smith E, Hoy DG, Cross M, Vos T, Naghavi M, Buchbinder R, Woolf AD, March L. The global burden of other musculoskeletal disorders: estimates from the Global Burden of Disease 2010 study. Annals of the rheumatic diseases. 2014;73(8):1462-9.
2. Bergman S. Management of musculoskeletal pain. Best Pract Res Clin Rheumatol. 2007;21(1):153–66.
3. El-Tallawy SN, Nalamasu R, Salem GI, LeQuang JA, Pergolizzi JV, Christo PJ. Management of musculoskeletal pain: an update with emphasis on chronic musculoskeletal pain. Pain and therapy. 2021;10(1):181-209.
4. Kolt GS, McEvoy JF. Adherence to rehabilitation in patients with low back pain. Manual therapy. 2003;8(2):110-6.
5. El-Sakhy NM. Barriers of adherence to physiotherapy treatment among geriatric patients in Matrouh, Egypt. Int J Novel Res Healthcare Nurs. 2020;7(2):280-92.
6. Caspersen CJ, Pereira MA, Curran KM. Changes in physical activity patterns in the United States, by sex and cross-sectional age. Medicine & Science in Sports & Exercise. 2000;32(9):1601-9.
7. Zeleke Negera G, Charles Epiphanio D. Prevalence and predictors of nonadherence to diet and physical activity recommendations among type 2 diabetes patients in Southwest Ethiopia: a cross-sectional study. International journal of endocrinology. 2020;2020.
8. Okezue OC, Nwafor GC, Ezeukwu OA, John JN, Uchenwoke CI. Adherence to home exercise programmes and its associated factors among patients receiving physiotherapy. Clin Health Promot. 2019;9(1):7-14.
9. Chan D, Can F. Patients' adherence/compliance to physical therapy home exercises. Fizyoterapi rehabilitasyon. 2010;21(3):132-9.
10. Medina-Mirapeix F, Escolar-Reina P, Gascón-Cánovas JJ, Montilla-Herrador J, Jimeno-Serrano FJ, Collins SM. Predictive factors of adherence to frequency and duration components in home exercise programs for neck and low back pain: an observational study. BMC musculoskeletal disorders. 2009;10:1-9.
11. Ogwumike O, Badaru UM, Adeniyi AF. Factors

influencing adherence to home-based exercise by stroke survivors in North Western Nigeria. Int J Ther Rehabil Res. 2014;3(1):1.

12. Yalew ES, Melese AZ, Guadie YG, Gashaw M. Adherence to home-based exercise program and its predictors among patients treated in physiotherapy outpatient department in Amhara Region Hospitals in Ethiopia: A prospective cross-sectional study. Patient Preference and Adherence. 2022;561-72.
13. Barr AL, Partap U, Young EH, Agoudavi K, Balde N, Kagaruki GB, Mayige MT, Longo-Mbenza B, Mutungi G, Mwalim O, Wesseh CS. Sociodemographic inequities associated with participation in leisure-time physical activity in sub-Saharan Africa: an individual participant data meta-analysis. BMC public health. 2020;20(1):1-3.
14. Blom AW, Artz N, Beswick AD, Burston A, Dieppe P, Elvers KT, Gooberman-Hill R, Horwood J, Jepson P, Johnson E, Lenguerrand E. Improving patients' experience and outcome of total joint replacement: the RESTORE programme.
15. Hopewell S, Keene DJ, Heine P, Marian IR, Dritsaki M, Cureton L, Dutton SJ, Dakin H, Carr A, Hamilton W, Hansen Z. Progressive exercise compared with best-practice advice, with or without corticosteroid injection, for rotator cuff disorders: the GRASP factorial RCT. Health Technology Assessment. 2021;25(48):1-58.
16. Chetty V, Dunpath T, Meghnath S, Mothalal S, Sewmungal V, Kunene U, Ntshakala T. Satisfaction and adherence of patients with amputations to physiotherapy service at public hospitals in KwaZulu-Natal, South Africa. African health sciences. 2015;15(2):450-6.

Original Research Article

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An Experimental Study to Analyze the Efficacy of Backwards Gait Training on Balance and Weight Bearing Asymmetry on Sub-Acute Stroke Patient

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Abstract

Background: Stroke is the leading cause of long-term disability and death, and the second leading cause of death worldwide. The first month after a stroke is a vital period since the brain goes through major plastic changes during this time. Motor learning studies emphasize the significance of experience and learning in functional rehabilitation. Because training is a potent stimulator of neuroplasticity, the addition of a focused rehabilitation strategy can improve recovery by maximizing brain reconfiguration. Backward Walking Training (BWT) is an adjuvant therapeutic and rehabilitation method to improve proprioception, muscle strength, intra-limb coordination, and balance. Studies examining its effects on balance and weight bearing asymmetry are lacking.

Objective: To determine the effect of BWT on balance and weight bearing asymmetry in sub acute stroke subjects.

Results: The difference between the pre- and post-test results within the group for balance on Berg Balance Scale (BBS) as well as the weight on the affected and unaffected Lower Limb (LL) on the Body Weighing Machine (BWM) are both deemed to be significant for paired T-Test. According to conventional standards, when comparing pre- and post-test results for balance and the difference in weight between the two groups for the affected and unaffected Lower Limb (LL) on the BWM for the experimental and control groups using Unpaired T-Test, it can be inferred that the difference is statistically significant.

Conclusions: When combined with conventional physiotherapy as opposed to conventional physiotherapy alone, backwards gait training has a modestly greater impact on balance and weight bearing asymmetry. Berg balance score and weight bearing asymmetry can both be improved in stroke patients using BWT as an addition to standard care (moderate evidence).

Keywords: sub-acute stroke, backwards gait training, balance, weight bearing asymmetry

Introduction

According to World Health Organisation, Stroke is defined as "rapidly developing clinical signs of focal or global disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin". Ischemic stroke is the most

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common type, affecting about 80% of individuals with stroke, and results when a clot blocks or impairs blood flow, depriving the brain of essential oxygen and nutrients.[1]

Clinically, a variety of focal deficits are possible, including changes in the level of consciousness and impairments of sensory, motor, cognitive, perceptual, and language functions. To be classified as stroke, neurological deficits must persist for at least 24 hours. Motor deficits are characterized by paralysis (hemiplegia) or weakness (hemiparesis), typically on the side of the body opposite the side of the lesion.[2]

In 2016, 5.5 million deaths and 116.4 million Disability adjusted Life Years (DALYs) were caused by stroke, with an incidence of 13.7 million and 80.1 million prevalent cases globally. Survivors often have long term disability, reduced proprioception, balance impairment, gait alteration, coordination deterioration and high risk of falling.[3,4]

It was observed that 70% of the total body weight is borne by the unaffected leg while some researchers reported the difference between the proportions of the body weight borne by either leg (asymmetry) to be 27%. Falling is a very common complication after stroke, with as many as 50% to 70% of the people who return home from the hospital or rehabilitation center experiencing falls. These falls can have severe consequences such as hip fracture and decreased physical activity due to fear of falling. Improvement of postural stability is, therefore, an important goal in stroke rehabilitation.[5]

Backward walking (BW) is a simple and effective method for adjuvant treatment and rehabilitation. It can improve proprioception, muscle strength, intra-limb coordination and balance, assess the severity of impairment of coordination and motor ability, and predict falls in the elderly. BW helps reduce knee strain and improve gait and balance post stroke.

Different from forward walking (FW), the gait and lower extremity biodynamics of stroke patients will significantly change during BW.[6]

Backward walking is an intervention that may be valuable for enhancing balance and self-efficacy to improve mobility function after stroke. It has been used in orthopedic rehabilitation as it produces less mechanical strain on the knee joint while backward running is an effective means for increasing strength and power of the quadriceps.

Backward walking training challenges postural stability, which is essential for dynamic balance activities. Straube et al[6] reported improvements in dynamic balance after training individuals post stroke in variable stepping contexts.

Backward walking is an intervention that may be valuable for enhancing balance and self-efficacy to improve mobility function after stroke. It has been used in orthopedic rehabilitation as it produces less mechanical strain on the knee joint while backward running is an effective means for increasing strength and power of the quadriceps.

Backward walking to improve gait and dynamic balance post stroke is a more recent application and appears to offer a number of potential benefits.[7]

Materials and Methods

Source of Data

Neurology ward and Physiotherapy OPD, Mazumdar Shaw Medical Centre, Narayana Health City, Bangalore.

Methods of Data Collection

Population	:	Subjects with stroke, at least 30 days-6 months post onset
Sampling	:	Randomized Allocation
Sample size	:	60 Subjects

Study Duration: This study was completed in 9 months including Data collection and analysis from the month October' 2021 to June' 2022.

Inclusion Criteria:

1. First CVA diagnosed by neurologist and confirmed by CT Scan or MRI
2. Onset of stroke at least 30 days to 6 months-old
3. Age of 45-60 years
4. Able to maintain upright standing posture with moderate assistance
5. Hemiparesis causing problems with unilateral limb movement

6. Ability to follow commands (MMSE SCORE >/= 24)[8]
7. Stable medical condition
8. No sensory deficits

Exclusion Criteria:

1. Have any orthopedic and degenerative conditions
2. Have any neuropathies and myopathies
3. Have any neurological conditions causing movement disorders such as Parkinson's disease, Spinal Cord Injury, epilepsy etc.
4. Have other uncontrolled health conditions such as Diabetes etc.

The subjects who fulfilled the above-mentioned inclusion and exclusion criteria were selected for the study after obtaining a written informed consent. There were a total of 60 participants who were divided into 2 groups of 30 each.

Outcome Measures:

1. **Berg Balance Scale**: The BBS is valid, reliable, and sensitive to change in people with acute stroke. Studies of various elderly populations (N = 31–101, 60–90 + years of age) have shown high intrarater and interrater reliability (ICC =.98, 14, 15 ratio of variability among subjects to total = .96–1.0, 16 rs =.8817). Test-retest reliability in 22 people with hemiparesis is also high (ICC=.98).[8]
2. **Weighing Scale:** Two bathroom weighing scales were needed to check weight bearing asymmetry between two lower limbs.

Results

Data Analysis

The data collected on baseline characteristics and outcome measures of acute stroke subjects were carefully collected, recorded and analyzed through MS Excel. The level of significance was set at 5% level (0.05).

Following Statistical techniques were used:

- Range, mean and standard deviation was used to describe the pre and post test outcome measures.
- Paired t-test- To see the difference between pre and post measurements within the group.
- Unpaired t-test- To see the difference between pre and post measurements between the groups.
- MS-EXCEL and MS-WORD were used to generate the tables and graphs suitably.

Experimental Group

Table 1: Range, mean and SD of outcome measures of sub-acute stroke subjects in the experimental group

Si. No.	Outcome Measures	Experimental Group				Paired T-Test
		Pre Test		Post Test		
		Range	Mean±Sd	Range	Mean±Sd	
1.	BBS	30-42	36.8±4.24	36-52	44.6±4.95	13.16
2.	WEIGHT ON AFFECTED LL. ON BWM	17-34.2	25.94±5.29	20-39	28.93±5.25	5.34
3.	WEIGHT ON UNAFFECTED LL. ON BWM	29.2-55	36.53±5.43	26-47	34.24±4.29	5.75

Control Group

Table 2: Range, mean and SD of outcome measures of sub-acute stroke subjects in the control group

Si. No.	Outcome Measures	Control Group				Paired T-Test
		Pre Test		Post Test		
		Range	Mean±Sd	Range	Mean±Sd	
1.	BBS	32-48	39.21±3.97	40-52	43.71±4.56	1.44
2.	WEIGHT ON AFFECTED LL. ON BWT	17-30	26.2±4.23	25-32	29.15±3.87	8.43
3.	WEIGHT ON UNAFFECTED LL. ON BWT	29-55	35.76±5.98	26-45.5	33.14±5.04	7.67

Table 3: Comparison between difference of pre and post test outcome measures of sub-acute stroke subjects in between groups

Si. No.	Outcome Measures	Difference of Pre and Post-Test	
		Control	Experimental
		Mean±SD	Mean±SD
1.	BBS	6.25±2.82	7.25±3.26
2.	WEIGHT ON AFFECTED LL. ON BWT	2.15±2.9	2.44±1.85
3.	WEIGHT ON UNAFFECTED LL. ON BWT	1.88±2.09	2.28±1.89
BETWEEN GROUP COMPARISONS: Unpaired T-Test	• BBS: t = 1.27, P value = 0.21, S • Wt on Affected LL. On BWT: t=0.46, P value=0.64, NS • Wt. on Unaffected LL. On BWT: t=0.77, P value=0.44, NS		

NOTE: S- significant; NS-not significant

By conventional criteria, this difference between two groups for weight on affected and unaffected LL on BWT is considered to be not statistically significant.

Discussion

The present experimental study was conducted to analyze the efficacy of backwards gait Training on balance and weight bearing asymmetry on a sub-acute stroke patient. BWT's unique movement patterns [9] make it much more popular in sports and rehabilitation. To the best of our knowledge, BWT has been shown to a beneficial impact on the rehabilitation of post-stroke [10], knee osteoarthritis [11], diabetic foot syndrome [12], Parkinson's disease [13], cerebral palsy [14], low back pain [15], and anterior cruciate ligament reconstruction patient [16]. Furthermore, Thomas KS et al. [17] hypothesized that BW necessitated higher metabolic, neuromuscular, cardiovascular, and perceptual demands. It has also been demonstrated to be advantageous to optimize cardiopulmonary function [18].

For four weeks, the intervention was given five days a week for 35 to 45 minutes each time.

Employing the Berg Balance Scale and the bathroom weighing scale as outcome measures, pre- and post-assessments were performed.

Within the group results

The experimental group showed considerable improvement in balance and weight bearing asymmetry post-test, correlating with motor learning studies. The control group also showed improvement, as did the experimental group.

Between Group Results

This study found a significant improvement in balance and weight bearing asymmetry, with the mean difference between the experimental and control groups being statistically significant. The combined movement of the hip extensor, knee flexor, and ankle dorsiflexion was used to break the limb synergy pattern and gain neuromuscular control.

Also much improved is balance. The explanation might be that when walking backwards, visual cues are negated. The subject is under immense pressure in these conditions, and in order to meet the demand, various receptor systems such proprioception, kinesthetic sense, protective reflex, and neuromuscular control were all recruited. As a result, balance abilities are significantly improved. Therefore, this study shows that backward walking combined with conventional physiotherapy is a successful strategy.

Grobbelaar R et al.[20] hypothesized that backwards gait training could improve balance and weight bearing asymmetry in a patient with sub-acute stroke. BWT has been shown to be beneficial in various conditions, such as post-stroke, knee osteoarthritis, diabetic foot syndrome, Parkinson's disease, cerebral palsy, low back pain, and anterior cruciate ligament reconstruction. For four weeks, the intervention was given five days a week for 35 to 45

minutes each time. Outcome measures included the Berg Balance Scale and the bathroom weighing scale.

Although several researchers questioned the safety of subjects moving backward, none of the subjects in this study fell. The gradual deployment of a training programme for backward walking in a secure setting may be the cause.

Conclusion

The impact of BGT on sub-acute stroke patients was extensively examined and evaluated in this study.

It can be concluded that backward gait training combined with conventional physiotherapy is shown to be significantly more effective at improving balance and correcting weight bearing asymmetry than conventional therapy alone.

Ethical clearance: Taken from Narayana Health Academics Ethics committee

Source of funding: Self

Conflict of Interest: NO conflict of interest

References

1. Global Health Estimates 2016: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2016. Geneva, World Health Organization; 2018.
2. Rosamond W, Flegal K, Furie K, et al. Heart disease and stroke statistics–2008 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2008; 117:e25–e146.
3. American Heart Association/American Stroke Association: Stroke Warning Signs. American Heart Association, Dallas Texas, 2011. Retrieved February 6, 2012
4. Barthels D, Das H. Current advances in ischemic stroke research and therapies. Biochim Biophys Acta Mol Basis Dis. 2020 Apr 1; 1866(4):165260. Doi:10.1016/j. bbadis.2018.09.012. Epub 2018 Sep 15. PMID: 31699365; PMCID: PMC6981280.
5. Wnuk B, Walusiak M, Durma AJ, et al. Effects of physiotherapy including various forms of gait exercises on a treadmill on functional efficiency in the elderly at risk of falling. Physiotherapy 2010;18:3
6. Hawkins KA, Balasubramanian CK, Vistamehr A, Conroy C, Rose DK, Clark DJ, Fox EJ Top Assessment of backward walking unmasks mobility impairments in post-stroke community ambulators. Stroke Rehabil. 2019 Jul; 26(5):382-388
7. Straube DD, Holleran CL, Kinnaird CR, Leddy AL, Hennessy PW, Hornby TG. Effects of dynamic stepping training on non locomotor tasks in individuals poststroke: a clinical trial. Phys Ther. 2014; 94: 921–933.
8. DeMark L, Fox EJ, Spigel PM, and Osborne J, Rose DK Clinical application of backward walking training to improve walking function, balance, and fall-risk in acute stroke: a case series. Top Stroke Rehabil. 2019 Oct; 26(7):497-502.
9. Hoogkamer W, Meyns P, Duysens J. Steps forward in understanding backward gait: from basic circuits to rehabilitation. Exerc Sport Sci Rev 2014;42:23–9.
10. DeMark L, Fox EJ, Spigel PM, et al. Clinical application of backward walking training to improve walking function, balance, and fall-risk in acute stroke: a case series. Top Stroke Rehabil 2019;26:497–502.
11. Joshi S, Singh SK, Vij JS. Effect of retrowalking, a non-pharmacological treatment on pain, disability, balance and gait in knee osteoarthritis: a randomized controlled trial. Indian Journal of Public Health Research & Development 2019;10:214–9.
12. Zhang X, Zhang Y, Gao X, et al. Investigating the role of backward walking therapy in alleviating plantar pressure of patients with diabetic peripheral neuropathy. Arch Phys Med Rehabil 2014;95:832–9.
13. Grobbelaar R, Venter R, Welman KE. Backward compared to forward over ground gait retraining have additional benefits for gait in individuals with mild to moderate Parkinson's disease: a randomized controlled trial. Gait Posture 2017;58:294–9.
14. Cappellini G, Sylos-Labini F, MacLellan MJ, et al. Backward walking highlights gait asymmetries in children with cerebral palsy. J Neurophysiol 2018;119:1153–65.
15. Dufek J, House A, Mangus B, et al. Backward walking: a possible active exercise for low back pain reduction and enhanced function in athletes. J Exerc Physiol Online 2011;14:17–26.
16. Shen M, Che S, Ye D, et al. Effects of backward walking on knee proprioception after ACL reconstruction. Physiother Theory Pract 2019;21:1–8.

17. Shen M, Che S, Ye D, et al. Effects of backward walking on knee proprioception after ACL reconstruction. Physiother Theory Pract 2019;21:1–8.

18. Chaloupka EC, Kang J, Mastrangelo MA, et al. Cardiorespiratory and metabolic responses during forward and backward walking. J Orthop Sports Phys Ther 1997;25:302–6.

19. Weaver NA, Kancheva AK, Lim JS, Biesbroek JM, Wajer IMH, Kang Y, Kim BJ, Kuijf HJ, Lee BC, Lee KJ, Yu KH, Biessels GJ, Bae HJ. Post-stroke cognitive impairment on the Mini-Mental State Examination primarily relates to left middle cerebral artery infarcts. Int J Stroke. 2021 Oct;16(8):981-989. doi: 10.1177/1747493020984552. Epub 2021 Jan 20. PMID: 33472574; PMCID: PMC8554493.

20. Grobbelaar R, Venter R, Welman KE. Backward compared to forward overground gait retraining have additional benefits for gait in individuals with mild to moderate Parkinson's disease: a randomized controlled trial. Gait Posture 2017;58:294–9.

Descriptive Study

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Transient Menstrual Cycle changes Post Precautionary Dose Covid Vaccine in Indian Population

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Abstract

Introduction: Increased reporting of menstrual disturbances Post Precautionary dose Covid Vaccine among peer group and inadequate answers to questions pertaining to changes in menstruation after precautionary dose vaccine was the rationale for conducting this study. The aim was to assess the influence of COVID-19 precautionary vaccine on menstruation. **Methodology:** Study was performed using Menstruation -vac Questionnare. 198 participants of which 114 were included in the age group of 19-45 years. Participants with prior menstrual irregularities were excluded from the study. **Results:** The prevalence of changes in menstrual cycles post precautionary dose vaccination was in 30.70%. In our study the prevalence of changes in menstrual cycles post- precautionary dose vaccination was found to be 15.8%, 15.8%, 10.5%, 7.9%, 7% & 5.3% in 1st , 2nd, 3rd, 4th, 5th and 6th cycle respectively. **Conclusion:** Menstrual changes post-vaccination were insignificant; however a trend towards transient changes was observed returning to near normalcy after the 4th cycle post precautionary dose.

Keywords: Menstruation, Coronavirus disease 2019, Precautionary dose Covid – 19 vaccine.

Introduction

Over the past more than two years, the COVID-19 pandemic has taken the world by storm, affecting every aspect of human life.(1) The unprecedented development of the COVID-19 vaccine marks itself as a savior during the days of the COVID-19 pandemic. (4) As a response, numerous vaccines were developed and approved in less than a year from when the virus was first identified. Nevertheless, this rapid worldwide use of the vaccines led the Centres for Disease Control and Prevention (CDC) to utilize a real-time Vaccine Adverse Event Reporting System called V-Safe to track potential side effects of the vaccine. (1) In addition, many studies reported a variety of vaccine-related side effects, ranging from mild symptoms like fever, chills, headache, fatigue, and arm pain (1,2) to severe side effects such as thrombosis and anaphylaxis(1). However, the progression of vaccination rollouts accompanied feeds from various media articles and social media platforms that the COVID-19 vaccine was affecting the menstrual status in women, which included delay or early menstruation, heavier bleeding patterns, painful sessions, and breakthrough bleeding.(4) Changes to periods and unexpected vaginal bleeding are not listed, but primary care clinicians and those working in reproductive health are increasingly approached by people who have experienced

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these events shortly after vaccination.[2] A range of menstrual cycle changes after Covid-19 vaccination have been reported, including longer and shorter cycles, missed cycles, heavier and lighter menstrual flow, and intermenstrual spotting[3]. Many people began sharing that they experienced unexpected menstrual bleeding after SARS-CoV-2 inoculation. This emerging phenomenon was undeniable yet understudied.[5] While battling the life-threatening complications of COVID-19, its effect on the menstrual cycle and infertility has been somewhat ignored. [6] Emergency authorization for use of numerous vaccines for Covid – 19 were given considering the mortality benefit, however adverse effects especially (minor) could have been overlooked.

Menstrual cyclicity is an overt sign of health and fertility[8]. Menstrual outcomes were not included in COVID-19 vaccine trials, limiting the ability of the manufacturers, public health agencies and clinicians to respond to questions about the impact of the vaccine on menstrual health. [17]. Henceforth questions related to menstruation should be given due importance.

Covishield is a non-replicating adenovirus vaccine, while Covaxin is a viral inactivating vaccination. In preclinical investigations, both Covishield and Covaxin showed encouraging outcomes. [11]

Methodology

Descriptive study was performed on women in the menstruating age group, 19 to 45 years. The authors circulated an easy-to understand questionnaire titled "Menstruation – Vac Questionnaire" to women of reproductive age who had taken the Covid precautionary dose vaccine. The Questionnaire contained questions on demographic data, COVID-19 infection details (if infected), vaccination details, menstrual cycles changes post covid precautionary dose vaccine, past menstrual history, and a brief medical history. Prior approval by Institution Ethical Committee was taken as well as written consent from the participants. Mc Nemar statistical test was applied. A $p < 0.05$ was considered statistically significant.

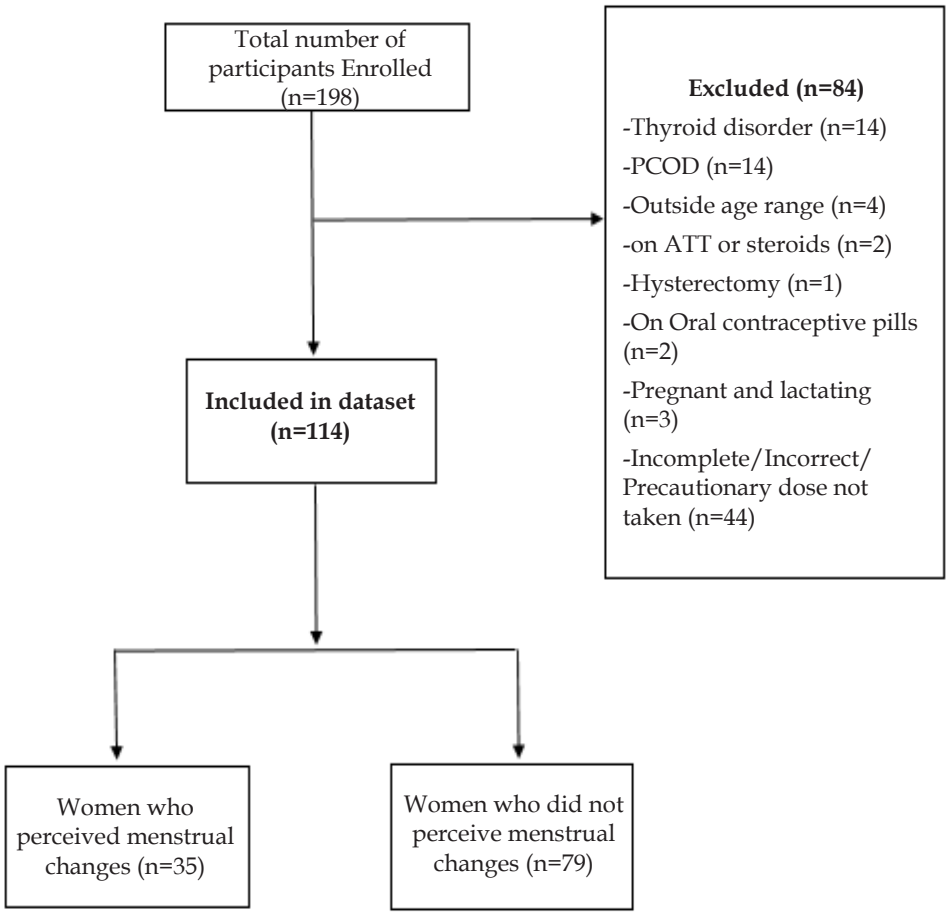

Figure 1: Flowchart

Results

Retrospective data was collected. A significant number of participants were physiotherapists, physiotherapy students and health care workers who maintained records of their menstrual data using mobile applications.

Table 1 summarizes the demographic data of the participants. A total of 198 subjects were taken and 114 subjects met the inclusion criteria. Subjects selected were of the age group 19 to 45 years, mean age- 27.1 years, BMI – 23.3. Of the selected subjects 10.5% reported to have tested positive for Covid infection twice, 35.1% reported to have tested positive once and 54.4% reported that they never tested positive for Covid infection.

Out of the 114 women who were selected for the study, 35 (30.7%) women complained of menstrual irregularities after the precautionary vaccination.

Table 1: Demographic Data

Age **19-45 YEARS (n=190)**	**MEAN±SD** **27.1±7**
BMI (n=190)	23.3 ± 4.2
Height (m) (n=190)	1.6 ± 0.1
Weight (kgs) (n=190)	59.2 ±11
Status of Infection	N (%)
Twice	12 (10.53)
Once	40 (35.08)
Never	62 (54.39)
Vaccine type	N (%)
COVISHIELD	107 (93.86)
COVAXIN	7 (6.14)

Changes in the menstrual cycle length and days of menstruation were taken into consideration. The percentage changes in menstrual cycle from 1st to 6th cycle post precautionary dose vaccine depicted in Table 2.

Table 2: Percentage of Change vs No Change in Menstrual Cycle from 1st to 6th cycle post precautionary dose vaccine

	1st cycle	**2nd cycle**	**3rd cycle**	**4th cycle**	**5th cycle**	**6th cycle**
No Changes Not Able to Recall (0)	84.20%	84.20%	89.50%	92.10%	93.00%	94.70%
Any Change (1)	15.80%	15.80%	10.50%	7.90%	7.00%	5.30%

Table 3: Depicting the percentage of menstrual changes reported 6 months post Covid-19 precautionary dose vaccine. (Changes of cycle length and/ or days of menstruation)

	FIRST CYCLE		**SECOND CYCLE**		**THIRD CYCLE**		**FOURTH CYCLE**		**FIFTH CYCLE**		**SIXTH CYCLE**	
	Change in Cycle Length	**Change in Days of Menstruation**	**Change in Cycle Length**	**Change in Days of Menstruation**	**Change in Cycle Length**	**Change in Days of Menstruation**	**Change in Cycle Length**	**Change in Days of Menstruation**	**Change in Cycle Length**	**Change in Days of Menstruation**	**Change in Cycle Length**	**Change in Days of Menstruation**
No change	72.8%	79.8%	72.8%	78.9%	74.6%	76.3%	78.9%	76.3%	79.8%	76.3%	78.1%	78.1%
Not able to recollect	6.1%	6.1%	8.8%	8.8%	9.6%	10.5%	10.5%	10.5%	10.5%	10.5%	11.4%	10.5%
Decrease	8.8%	7.9%	8.8%	5.3%	7.9%	6.1%	6.1%	7.9%	6.1%	7.9%	5.3%	7%
Increase	12.3%	6.1%	9.6%	7%	7.9%	7%	4.4%	5.3%	4.4%	5.3%	4.4%	4.4%

Table 4: Percentage changes after 1st and 2nd Dose after Covid Vaccine

% CHANGE AFTER 1ST VACCINE	12.3%
% CHANGE AFTER 2 ND VACCINE	11.4%

Table 5: Comparison between 1st cycle to 6th cycle after Precautionary dose

COMPARISON	BETWEEN CYCLES CHANGE	Mc Nemar Test
1ST Cycle – 2nd Cycle	21.9%	0.687
1ST Cycle – 3rd Cycle	18.4%	0.238
1ST Cycle - 4th Cycle	15.8%	0.049 *
1ST Cycle – 5th Cycle	14.9%	0.03 *
1ST Cycle - 6th Cycle	14%	0.019 *
* p – value < 0.05 (significant)		

Discussion

During the exhausting pandemic of COVID-19, the gynecological care has somewhat taken a backseat with reduced reporting of menstrual abnormalities. [6] Unfortunately, clinical trials of the current COVID-19 vaccines did not collect menstrual cycle outcomes post-vaccination. Vaccines that were manufactured during the pandemic had questionable inclusion of menstruation in efficacy. [12]

The present study was conducted to evaluate the effect of precautionary dose COVID-19 vaccine on menstrual health in women aged between 19–45 years. At the conception of the study there were limited studies to know the impact of Covid vaccine/ precautionary dose vaccine on the menstrual cycle. In our study the prevalence of changes in menstrual cycles post- precautionary dose vaccination was found to be 15.8%, 15.8%, 10.5%, 7.9%, 7% & 5.3% in 1st , 2nd, 3rd, 4th, 5th and 6th cycle respectively. In the women who reported changes - on comparing the menstrual discrepancies between cycles, i.e. 1st cycle with 2nd cycle, 1st to the 3rd cycle and so on till the 6th cycle, it was found that from 4th cycle onwards - increased number of women returned to their normal cycle, suggesting that changes observed were in a small percentage and transient. Any change in menstrual pattern does bring about anxiety, stress and concern in women. Edelman A et al in their study also stated that any change, even if small and not clinically relevant, is important to the public, and even more so in the context of a new vaccine. Although small changes in menstrual characteristics might not be meaningful to clinicians and scientists, any perceived effect to a routine bodily function linked to fertility can cause alarm for those experiencing it, and can contribute to vaccine hesitancy. Even small changes, when unanticipated, can have a large adverse impact on the quality of life of people who menstruate and who experience episodes of social embarrassment, anxiety related to uncontained bleeding or fertility planning or prevention, and worry about what bleeding changes mean for their overall health.[3] Moolamalla S, Bakshi K, Medarametla V in their study stated that the prevalence of unusual menstrual cycles post-vaccination/infection was 21.7%. However, the cycles returned to normal within three cycles in 61.9 and 53.8% post-vaccination and infection respectively, suggesting that the changes were transient.[12] Ata B et al have also documented a transient effect on the menstrual cycle.[10]. It emerged that symptoms such as delayed menstruation and abnormal uterine bleeding (metrorrhagia, menometrorrhagia, and menorrhagia) were generally reported within the first three weeks of vaccination, especially after the second dose, with a percentage of 23% and 77%, respectively. The COVID-19 vaccination originates an immune response and subsequen t inflammation may transitorily disturb the ovaric hormonal production over one or two cycles, with consequential anomalous menstrual bleeding.[13] Pourmasumi S et al states that the female reproductive system is an organ system affected by COVID-19 that has received less attention due to the lack of related deaths. The angiotensin-converting enzyme (ACE2) receptor has been reported to be the main receptor involved in the penetration of coronaviruses into cells. Postcell invasion, COVID-19 disrupts the renin-angiotensin system (RAS) by down-regulating ACE2 expression in host cells, leading to an exacerbated proinflammatory response by angiotensin-II. This receptor is present in the female reproductive system, particularly in the ovaries and uterus, where it affects

folliculogenesis, steroidogenesis, oocyte maturation, ovulation, and endometrial regeneration.[9]

Our research was only taking note of any changes observed in the menstrual cycles similar to research by Eldelman A which was also not designed to determine why these changes might happen; these changes are probably due to temporary vaccine-related activation of immune response, but more research is needed. [3] However, in clinical experience, following the administration of all COVID-19 vaccines, both mRNA and adenoviruses vectorized adenoviruses, some adverse drug reactions of the menstrual cycle have been recorded. COVID-19 vaccination gives rise to an immune response [14, 11], and the subsequent inflammation can transiently disrupt ovarian hormone production for one or two cycles, resulting in abnormal menstrual bleeding MHRA. [14]

Study by Lagana A S et al stated menstrual changes following vaccination are indeed not so unusual, given that such modifications were observed after vaccination for other microbes, like the Human Papilloma virus, or human hormones, such as human chorionic gonadotropin. Such disturbances could likely be ascribed to the inflammatory/ immunological reaction ensuing from adjuvants comprised in the vaccines, at least in some cases. Menstrual irregularities after both the first and second doses of the vaccine were found to self-resolve in approximately half the cases within two months.[16] Changes in menstruation were observed with HPV and flu vaccinations also.[15] Similar changes in menstruation such as decreased cycle length and dysmenorrhea were found in 53% of the population that got vaccinated for Typhoid, as reported by a medical doctor at the Presbyterian Hospital, New York in 1913. However, the cycles were regularized within six months post-vaccination.[12] Determining the scale of menstrual problems, their cause and the impact on those who menstruate and wider society will allow identification of new preventative and therapeutic strategies.[15]

Limitations: Our study has a few limitations. Small sample size. Recall bias may also be a problem since the study was self-reporting and questions asked required details of about six months. Our study does not cover aspects such as impact on quality of life, pain etc., which gives a future scope of study. The only vaccines used in our study was Covishield and Covaxin, so specific conclusion about any other vaccine could not be drawn.

Conflict of Interest: None

Any Sponsors: None, self- funded by the group.

Ethical Committee Approval: Institutional ethical committee approval was taken prior to commencing the study.

Conclusion

The number of women who reported change was small and the changes observed were transient but any number of changes in a women menstrual cycle does bring about anxiety, stress and discomfort in her quality of life.

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References

1. Muhaidat N, Alshrouf MA, Azzam MI, Karam AM, Al-Nazer MW, Al-Ani A; Menstrual Symptoms After COVID-19 Vaccine, A Cross-Sectional Investigation in the MENA Region;
2. Int J Womens Health, 2022 Mar 28;14:395-404.
3. Male V. Menstrual changes after covid-19 vaccination. BMJ. 2021 Sep 15;374:n2211.
4. Edelman A, Boniface ER, Male V, Cameron ST, Benhar E, Han L, Matteson KA, Van Lamsweerde A, Pearson JT, Darney BG. Association between menstrual cycle length and covid-19 vaccination: global, retrospective cohort study of prospectively collected data. BMJ Med. 2022; 1 (1):e000297.
5. Minakshi R, Rahman S, Ayaggari A, Dutta D and Shankar A; Understanding the Trauma of Menstrual Irregularity After COVID Vaccination: A Bird's-Eye View of Female Immunology, Front Immunol, 2022; 13: 906091.
6. Lee KMN, Junkins EJ, Luo C, Fatima UA, Cox ML, Clancy KBH. Investigating trends in those who experience menstrual bleeding changes after SARS-CoV-2 vaccination. Sci Adv. 2022 Jul 15; 8 (28): eabm7201.

7. Madaan S, Talwar D, Jaiswal A, et al Post-COVID-19 menstrual abnormalities and infertility: Repercussions of the pandemic. J Educ Health Promot, 2022, Jun 11, 11:170.

8. Kezhen Li, et al, Analysis of sex hormones and menstruation in COVID-19 women of child-bearing age, Reprod Biomed Online, 2021 Jan; 42(1): 260–267.

9. Edelman A, Boniface ER, Benhar E, Han L, Matteson KA, Favaro C, et al, Association Between Menstrual Cycle Length and Coronavirus Disease 2019 (COVID-19) Vaccination, A U.S. Cohort, Obstet Gynecol, 2022 Apr 1;139(4):481-489.

10. Pourmasumi S, Kounis NG, Naderi M, Hosseinisadat R, Khoradmehr A, Fagheirelahee N, Kouni SN et al; Effects of COVID-19 Infection and Vaccination on the Female Reproductive System: A Narrative Review. Balkan Med J. 2023 May 8; 40 (3):153-164.

11. Ata B, Vermeulen N, Mocanu E, Gianaroli L, Lundin K, Rautakallio-Hokkanen S, Tapanainen JS, Veiga A. SARS-CoV-2, fertility and assisted reproduction. Hum Reprod Update. 2023 Mar 1; 29 (2):177-196.

12. Manoj D H, Mounika DS, Possible menstrualcycle changes after COVID 19 Vaccination a questionnaire – based study among vaccinated women. Ann Geriatr Educ Med Sci 2022; 9 (2):58-63.

13. Moolamalla S, Bakshi K, Medarametla V, Menstrual Irregularities Post-COVID-19 Infection/Vaccination in Indian Population. J South Asian Feder Obst Gynae 2022;14(6):694–699.

14. Dellino M, Lamanna B, Vinciguerra M, Tafuri S, Stefanizzi P, Malvasi A, et al. SARS-CoV-2 Vaccines and Adverse Effects in Gynecology and Obstetrics: The First Italian Retrospective Study. Int J Environ Res Public Health, 2022 Oct 13; 19(20):13167.

15. Dellino M, Vimercati A, D'Amato A, Damiani GR, Laganà AS, Cicinelli E, et al. "GONE WITH THE WIND": The Transitory Effects of COVID-19 on the Gynecological System, J Pers Med, 2023 Feb 10;13(2):312.

16. Sharp GC, Fraser A, Sawyer G, Kountourides G, Easey KE, Ford G, Olszewska Z, et al. The COVID-19 pandemic and the menstrual cycle: research gaps and opportunities. Int J Epidemiol. 2022 Jun 13; 51(3):691-700.

17. Laganà AS, Veronesi G, Ghezzi F, Ferrario MM, Cromi A, Bizzarri M, et al. Evaluation of menstrual irregularities after COVID-19 vaccination: Results of the MECOVAC survey, Open Med (Wars), 2022 Mar 9;17(1):475-484.

18. Darney B G, Boniface ER et al, Impact of coronavirus disease 2019 (COVID-19) vaccination on menstrual bleeding quantity: An observational cohort study, BJOG, 2023; 130: 803-812.

Full-length Article

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Relation of Trunk Muscles Strength and Endurance to Severity of Forward Head Posturein Young Adults: An Observational Study

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Abstract

Background and Objective: Forward head posture is the common habitual poor posture seen in young adults. This study correlates Trunk muscles strength and endurance with severity of forward head posture in young adults.

Methods: A total of 70 individuals with Forward Head Posture and Craniovertebral Angle (CVA) less than 48^0 were enrolled in the study. The Trunk Muscle Strength was assessed using Hand Held Dynamometer. The Trunk flexor, extensor, side flexors and lower back extensors endurance was assessed using endurance tests. The trunk muscle strength and endurance were then correlated with severity of forward head posture.

Results: There was no correlation found between the trunk flexor strength and severity of FHP. But there was statistically significant correlation between the trunk extensor strength and severity of FHP. Also, no correlation was found between the trunk muscles endurance and severity of FHP.

Conclusions: Trunk Extensor muscles strength decreases with the decrease in CVA.

Keywords: Forward Head Posture, Trunk Muscles, Posture, trunk muscle strength, trunk muscle endurance.

Introduction

Forward Head Posture (FHP) is defined as the anterior positioning of the cervical spine. [1]It is many of the times associated with pain, fatigue, muscle imbalance and limited range of motion of the cervical spine[2]. It is worth noting that forward head posture not only affects the function of the head and neck musculoskeletal structures, but also affects the whole body postural control[3] Localized fatigue in the stabilizing spinal musculature may occur with repetitive activity or heavy exertion or when the musculature is not utilized effectively due to faulty posture. There is a greater chance of injury in the supporting structure of the spine when the stabilizing muscles fatigue.(4) The Craniovertebral Angle (CVA) is defined as the angle of the horizontal line running through the C7 spinous process and the line connecting the C7 spinous process to the tragus of the ear.(5) CVA is commonly used as an indicator of FHP which is due to muscle imbalance, related to pain, fatigue and limited motion of the cervical spine.(2) Yip et al(5) reported that participants with significantly smaller craniovertebral angles had FHP

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and tended to have increased levels of neck pain. FHP is one of the most commonly found abnormalities that is mostly present in the cervico-thoracic parts of the spine. [6] This spinal deviation is often related to prolonged poor sitting posture during driving, reading, or even texting on smart devices.[6,7] There have been studies that suggest that the abnormality or deviation of the normal posture in the cervical spine causes the deviation of the curves in other segments of the spine. This may lead to changes in the lengths of the trunk muscles i.e. abdominal and back extensors. And this in all may have an effect on the strength of the muscles which needs to be evaluated.[8] Therefore, the assessment of the lumbar strength can be used to avoid primary and secondary traumas.[9]

Objectives

This study was conducted with the aim of determining if the trunk muscle strength and endurance is correlated with the severity of forward head posture in young adults.

Methods

The study was conducted on a total of 70 young adults with forward head posture (FHP). After the approval from Institutional Ethics Committee (Ethics committee Ref no. - PT/87/ECARP/2021/55, date: 10th June 2021), informed consent was obtained. The data collection was commenced in the OPD of P.T. School and Centre, T.N.M.C., Mumbai in 2021. The data collection was done for 6 months. The subjects were screened according to the inclusion and exclusion criteria mentioned in table 1 and informed consent was taken. Each participant participated in a single testing session. The forward head posture was confirmed by measuring the craniovertebral angle (CVA). The strength of trunk muscles were measured using the handheld dynamometer. The endurance of trunk muscles were measured using the tests for the respective group of muscles.

Craniovertebral Angle: The angle for forward head posture was measured using the photogrammetry method. [10] The angle was measured using the MB Ruler software. [11](Fig 1)

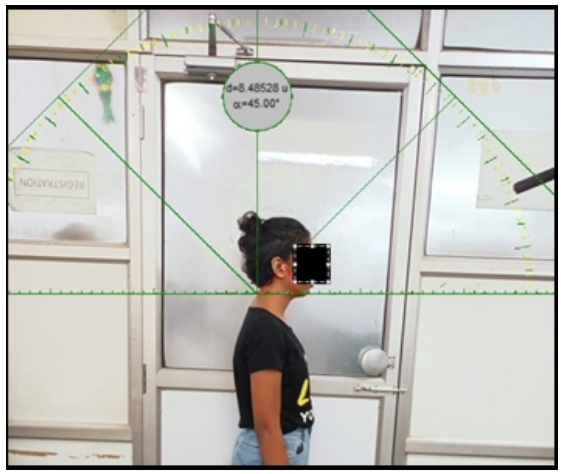

Figure 1: Assessment of craniovertebral angle (CVA) using the Photogrammatery technique and MB Ruler software.

Trunk muscles strength: The strength for trunk flexor muscles and extensor muscles was measured using the hand held dynamometer. The isometric strength of trunk flexors was assessed in supine position at thirty degree by placing the hand held dynamometer under the suprasternal notch. Subjects were asked to put their hands over the opposite acromion processes. A belt was wrapped just above the lateral malleolus and another belt over the anterior superior iliac spine (ASIS) to prevent lumbar motion. [10, 13] (Fig 2). The isometric strength of trunk extensors was assessed in prone position. The dynamometer was placed at the level of T4 and subjects were asked to put their hands on forehead. A belt was wrapped over the posterior superior iliac spine. Subjects were instructed to maximally contract the muscle for five seconds and the peak value was noted in kgs. [10, 13]. (Fig 3)

Figure 2: Assessment of trunk flexor muscle strength using the Hand Held Dynamometer.

Figure 3: Assessment of trunk extensor muscle strength using the Hand Held Dynamometer.

Trunk muscles endurance:

Trunk flexor: This was assessed using Trunk Flexor Endurance Test (TFET). The test was done with participant sitting on a table with his back supported at an angle of 60 degrees. Hips and knees were flexed to 90 degrees and feet were fixed to the table. The arms were crossed across the chest and the subjects were asked to maintain the position while the support was pulled back 10cm at the start of the test. This continued as long as the position was maintained and the duration was noted in seconds using the stop watch. [14](Fig 4)

Figure 4: Assessment of trunk flexor endurance using the Trunk Flexor Endurance Test (TFET)

Trunk extensors: Trunk extensor endurance was assessed using Biering-Sorenson test (BST). The subject was asked to lie prone with his lower body fixed to the table by straps. Upper body was out of the table and extended over a stool. The participant was asked to release the table while upper extremity was held in crossed position on chest. The participant was instructed to maintain the position horizontally as long as possible and the duration of hold was noted. [15] (Fig 5)

Figure 5: Assessment of trunk extensor endurance using the Biering-Sorenson test (BST)

Trunk lateral flexors: Lateral flexors endurance was assessed using side bridge test (SBT). The subject was asked to lie on one side with legs positioned at extension. The upper leg was placed in front of the lower leg. The participants were instructed to lift off their hips and maintain the full body in straight line. The test terminated when the hips returned to the table and the duration was noted in seconds using the stopwatch. Same procedure was done for the other side. [14] (Fig 6)

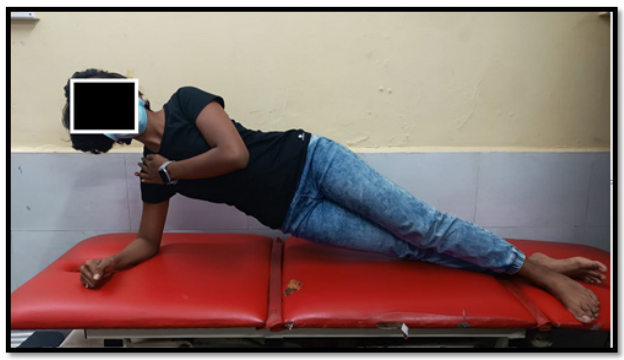

Figure 6: Assessment of the lateral Flexors using the Side Bridge Test (SBT)

Lower Back extensors: For the lower back endurance prone double straight leg raise test (PDSLRT) was used, the participants were asked to lie in a prone lying position with the hips extended. The hands were held underneath the forehead. The subjects were asked to lift off both legs until the knee clearance was achieved. The test continued as long as the position was maintained and the duration was noted in seconds using the stop watch. [16](Fig 7)

Figure 7: Assessment of lower back muscle endurance using the Prone Double Straight Leg Raise Test (PDSLRT)

OUTCOMES: The demographic data such as age, sex, height, weight, body mass index (BMI) was taken prior to the tests. (Table 2) Trunk muscle strength was measured using handheld dynamometer in kg. Trunk muscle endurance was measured using the various tests mentioned above. (Table 3)

Results and Discussion:

The study included 70 participants (48 females, 22 males) with a mean age of 21.97±2.53 years and a mean BMI of 21.32±2.22 kg/m2. The mean craniovertebral angle (CVA) was 45.91±2.37 degrees, with a range from 39.29 to 48 degrees. The mean trunk flexor strength was 8.68±2.37 kgs, with a range from 4kg to 15kg. The mean trunk extensor strength was 10.42±1.71 kgs, with a range from 8kg to 17kg. The mean Biering-Sorenson test time was 60.44±34.93 seconds, with a range from 8.46 to 162.19 seconds. The mean trunk flexor endurance time was 99.10±63.85 seconds, with a range from 21.76 to 300 seconds. The mean lateral flexor endurance time for right and left were 38.94±22.46 seconds and 39.16±24.74 seconds, respectively. The mean lower back endurance time using the prone double straight leg raise test was 47.11±30.01 seconds, with a range from 6.49 to 164.21 seconds. (Table 4).

The study examined the correlation between CVA and measures of core strength and endurance using Spearman's rho test. The correlation between CVA and trunk flexor strength was weak and not statistically significant (rs=0.2161, p=0.07238). The correlation between CVA and trunk extensor strength was weak but statistically significant (rs=0.36369, p=0.00197). The correlations between CVA and trunk extensor endurance, trunk flexor endurance, and lateral flexor endurance (right and left) were weak and not statistically significant (rs ranging from 0.01934 to 0.18095, p ranging from 0.13385 to 0.87376).

These findings suggest that CVA may play a role in lumbar extensor strength, but the relationship is not strong. Barczyk-Pawelec et al. evaluated the isokinetic strength of the trunk muscles in children with normal and abnormal posture and observed that among the children with poor postures, the abnormal anteroposterior spinal curvatures of the spine was associated with the lower values of isokinetic muscle strength.[17] This justifies the relation between CVA and lumbar extensor strength. The results vary from the previous studies and this might be because the present study measured isometric strength as compared to the previous studies that used isokinetic strength.

On the other hand, the lack of a significant correlation between CVA and trunk endurance is somewhat surprising, as previous research has suggested that decreased CVA is associated with decreased muscle endurance in the trunk musculature [18] and that the core muscles are important stabilizers of the spine and may be affected by changes in head and neck posture.

To the best of our knowledge this is the first study to focus on correlation between trunk muscle strength, endurance and the severity of forward head posture. Thus, this study in contrast to the previous studies showed that there was no relationship of trunk muscles endurance with severity of forward head posture. This might also be due to the variance in sample population which included more of females (69%, n= 48) than males (31%, n=22). Females as compared to males have shown to have lesser trunk muscle endurances. [19] The maximum samples in the present study were students. Also, only professional sports players were excluded from the study but the Physical activity as well as the occupation of the samples was not taken into considerations. These factors (physical activity and sedentary lifestyle) have shown to have an impact on back muscle endurance. [20]

It should be noted that the present study has some limitations that may have affected the results. For example, the sample size was relatively small, and the study only included young adults with normal BMI, so the findings may not be generalizable to other populations. In addition, the study only used static measures of trunk muscle strength and endurance, and did not assess dynamic movements or functional activities that may be more relevant to everyday activities.

Table 1: inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
• 18-30 years of age. Both genders. • Individuals having FHP. [CVA ≤ 48^0][12] • Patients with and without neck pain. • Individuals with normal BMI (18.5-24.9kg/m^2). • Individuals willing to participate.	• Past History of any neurological, orthopedic or cardiopulmonary disease. • Participating in any sport at professional level. • Individuals with spinal deformities. • Symptomatic low back pain. • Any recent Fractures. • Congenital or acquired chest wall deformity.

Table 2: Demographic data of subjects.

DEMOGRAPHICS	MEAN ± SD
Age	21.97 ± 2.53
Height	161.51 ± 7.88
Weight	55.72 ± 7.635
BMI	21.32 ± 2.22

Table 3: descriptive statistical analysis of outcome measures.

OUTCOME MEASURE	MEAN	S.D.	MINIMUM RANGE	MAXIMUM RANGE
CVA	45.91^0	2.37^0	39.29^0	48^0
TFS (kg)	8.68	2.37	4	15
TES (kg)	10.42	1.71	8	17
TFE (sec)	99.10	63.85	21.76	300
TEE (sec)	60.44	34.93	8.46	162.19
SFE (rt)(sec)	38.94	22.46	5.04	100.29
SFE (lt) (sec)	39.16	24.74	3.88	121.07
LBEE (sec)	47.11	30.01	6.49	164.21

Table 4: correlation of severity of forward head posture (CVA) with trunk muscle strength and endurance.

CVA Vs	r_s	p-value	correlation	Significance
TFS	0.223	0.063	Weak positive	Not significant
TES	0.3127	0.0084	Weak positive	significant
TFE	-0.1174	0.334	Weak negative	Not significant
TEE	0.0443	0.715	Weak positive	Not significant
SFE (rt)	0.102	0.400	Weak positive	Not significant
SFE (lt)	0.0933	0.442	Weak positive	Not significant
LBEE	0.1411	0.244	Weak positive	Not significant

Conclusion

In conclusion, the present study provides some evidence for a weak correlation between CVA and trunk extensor strength, but no significant correlation between CVA and trunk flexor strength or endurance. Future research is needed to further investigate the relationship between CVA and measures of core

strength and endurance, using larger and more diverse samples and a broader range of outcome measures.

Conflict of Interest: The authors declare that they have no conflict of interest.

List of Abbreviations:

FHP- forward head posture

BMI- body mass index

CVA- Craniovertebral angle

TFS- trunk flexor strength

TES- trunk extensor strength

TFE- trunk flexor endurance

TEE- trunk extensor endurance

SFE- side flexor endurance

LBEE- lower back extensor endurance

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References

1. Hanten WP, Lucio RM, Russell JL, et al.: assessment of total head excursion and resting head posture. Archives of Physical Medicine and Rehabilitation, (1991), 72: 877-880.
2. Baldry P, Yunus MB, Fatma Inanici. Myofascial pain and fibromyalgia syndromes: a clinical guide to diagnosis and management. Edinburgh; New York: Churchill Livingstone; (2001).
3. Kang J-H, Park R-Y, Lee S-J, Kim J-Y, Yoon S-R,Jung K-I. The effect of the forward head posture on postural balance in long timed computer based worker. Annals of Rehabilitation Medicine(2012); 36(1):98.
4. Kisner C, Colby L.A.: Therapeutic exercise – foundation and techniques. 5th edition. Philadelphia: F.A. Davis company, (2007)
5. Yip CH, Chiu TT, Poon AT: The relationship between head posture and severity and disability of patients with neck pain. Manual Therapy, (2008);13 (2) : 148-54
6. Patwardhan AG, Havey RM, Khayatzadeh S, Munuki MG, Voronov LI, Carandang G, et al. postural consequences of cervical sagittal imbalance: a novel laboratory model. Spine(2015); 40(11): 783-792.
7. Shaghayegh B, Ahmadi A, Sarrafzadeh J. Evaluation of forward head posture in sitting and standing positions. European Spine Journal(2016); 25(11) : 3577-3582.
8. Michael W. Darnell R.P.T. (1983) "A Proposed Chronology of Events for Forward Head Posture." Journal of Craniomandibular practice, 1:4, 49-54.
9. Mendonca LDM, Bittencourt NF, Ocarino JM, and Fonseca ST. P12: Good lumbopelvic stabilization is associated with patellar tendinopathy absence in athletes. Online Journal of Rural Nursing and health care.(2017);17: 11-18.
10. De Blaiser C, De Ridder R, Willems T, Danneels L, Roosen P. Reliability and validity of trunk flexor and trunk extensor strength measurements using handheld dynamometer in a healthy athletic population. Physical Therapyin Sports.(2018);34:180-186.
11. Hazar Z, et al. Reliability of photographic posture analysis of adolescents. Journal of Physical Therapy Science. (2015);27(10):3123–6.
12. Gadotti I, Magee D. Validity of surface measurements to assess craniocervical posture in the saggital plane: a critical review. Physical Therapy Reviews(2008); 13 (4): 258-68.
13. Dipti Kadu, et al. Reliability of "MB-Ruler software "t measure craniovertebral angleusing the photographic method. Journal of health and allied sciencesVol. 12 No. 3, (2022).
14. Biering Sorensen F. Physical measurements as risk indicators for low back trouble over a one year period. Spine. (1984);9(2):106-19.
15. McKay MJ, Baldwin JN, Ferreira P, Simic M, Vanicek N, Burns J, et al. normative reference values for strength and flexibility of 1000 children and adults. Neurology. (2017); 88:36-43.
16. Keller A, et al. Reliability of the Isokinetic Trunk Extensor Test, Biering-Sørensen Test, and □strand Bicycle Test. Spine. (2001 Apr); 26(7):771–7.
17. Barczyk-Pawelec K., Piechura J.R., et al. "Evaluation of isokinetic trunk muscle strength in adolescents with normal and abnormal postures. Journal of Manipulative Physiol. Ther.,(2015), 38(7), 484-492, DOI: 10.1016/j.jmpt.2015.06.101.
18. Salahzadeh Z, Rezaei M, et al. The Evaluation of Trunk Muscle Endurance in People with And Without forward Head Posture:a Cross Sectional Study. Muscle Ligaments and Tendons Journal. (2020 Dec); 10(04):752.
19. Greg McIntosh, Lynda Wilson, et al. "Trunk and Lower Extremity Muscle Endurance: Normative Data for Adults." J Rehabil Outcomes Meas, (1998), 2(4), 20-39.
20. Anne J. Smith, Peter B. O'Sullivan, et al. "The Relationship between Back Muscle Endurance and Physical, Lifestyle, and Psychological Factors in Adolescents." Journal of Orthopaedic and Sports Physical Therapy, Vol. 40, no.8, (Aug 2010), 517-523.

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Efficacy of Physiotherapy Rehabilitation Program In Post Operative Management of Femoroacetabular Impingement Syndrome: A systemic Review of Clinical Evidence

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Abstract

Background: Femoroacetabular impingement syndrome (FAIS) is a well-known cause of hip pain in adolescents and young adults. It is defined as the triad of symptoms, clinical signs and imaging findings in which structural morphology results in conflict between the femoral head and the acetabulum.

Aim: To summarize the effects of physiotherapy rehabilitation in post operative management of FAI syndrome

Method: A literature search was carried out on the PubMed, EMBASE, Scopus, Google Scholar ,Chocrane, Research Gate and PEDrodatabases, using the following keywords: "femoroacetabular impingement", "FAI", in associationwith "surgery", "arthroscopy", "surgical" and "physiotherapy", "physical therapy", "rehabilitation", "exercise". Studies meeting all inclusion and exclusion were reviewed and data were extracted.

Results: The above review includesa total of 10 studies. In the present review, data from 1281 patients were retrieved. Out of 1281 patients 820 were Male and 461were females. Furthermore, 117 cases were classified as a cam impingement , 40 as pincer impingement and 1124 as mixed FAI. The weighted mean age was 35.10 years, outcomes included iHOT-33, HOS ADL , HOS SPORTS, VAS, MHHS.

Conclusion: Rehabilitation protocols following hip arthroscopy for the management of FAI syndrome typically consist of four to five phase programs with set goals and progression criteria. The study found Clinically significant improvement in reported outcomes from baseline noted in majority of the studies reviewed that involved a structured rehabilitation program following arthroscopic management of FAI.

Keywords: "femoroacetabular impingement" "FAI"physiotherapy" "physical therapy""rehabilitation""surgery ", "arthroscopy"

Introduction

Femoroacetabular impingement syndrome (FAI) is a well-known cause of hip pain in adolescents and young adults, with an overall incidence of FAIS of 54.4 per 100,000 person-years[1]It is defined as the triad of symptoms, clinical signs and imaging findings

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in which structural morphology results in conflict between the femoral head and the acetabulum[2] Although FAI syndrome is one of the most studied conditions in sports medicine, its etiology still remains unknown[3] Mechanical conflict that results in the condition may be caused by abnormal sphericity of the femoral head, excessive protrusion of the acetabular edge or both.[4] Impingement can also in ballet dancers or gymnasts[5]

The morphological characteristics associated with FAI have helped define subtypes that include,

1. Cam impingement
2. Pincer impingement
3. Mixed-type hip impingement

Cam Impingement

Due to an abnormally formed femoral head that rotates into the acetabulum, particularly during strong flexion, cam-type morphology causes impingement[6]

Pincer Impingement

The foundation of morphology is an abnormally overextended component of the acetabulum, which can be localized (acetabular retroversion) or affect the entire acetabulum[6]

Repeated abutment of the femoral neck against the acetabular rim can result in injury to the labrum and adjacent cartilage[7] FAI is a common cause of early onset osteoarthritis of the hip. Over time this repetitive mechanical insult to the articular tissues leads to hip degeneration and development of hip OA[8]

Clinical examination reveals "C sign" hip discomfort, reduced range of motion, and positive results on provocative tests (FADDIR and FABER)[9]

The main focus of radiologic findings is the detection of retroversion for pincer type and cam-type[10] Either surgical or conservative approaches can be proposed for treating FAI morphologies[11]

Conservative treatment mainly consists of supervised physical therapy[12] Surgical treatment of FAI is aimed at correcting the anatomic abnormalities causing pathologic mechanics of the hip joint. Arthroscopic treatment adopted are acetabuloplasty, Femoroplasty,labral repair and debridment[13]

Several studies have reported the success of surgical intervention for patients with FAI syndrome[14,15] The postoperative rehabilitation program is vital for successful outcome following surgery16 Its details remain unclear[17,18]

The extent to which postoperative rehabilitation protocols are described and implemented in outcome studies is unclear. The aim of the present systemic review is to provide comprehensive analysis of physiotherapy for post operative rehabilitation programme for FAIS focusing on the all the clinical evidence.

Materials and Methods

The present systematic review was performed according to PRISMA guidelines [Preferred Reporting Items for Systematic Reviews and Meta-analyses] Two independent reviewers completed title, abstract, and full-text screening, assessing for study inclusion. Discrepancies were resolved by discussion or by a third reviewer A literaturesearch was carried out on the PubMed, EMBASE, Scopus, PEDRO, Google Scholar and Research Gate By two independent investigators using the following keywords "femoroacetabular Impingement" "FAI" "Arthroscopy" "Physiotherapy" "physical therapy" " rehabilitation" " surgery" "exercise"" Rehabilitation" "Post Operative Rehabilitation"

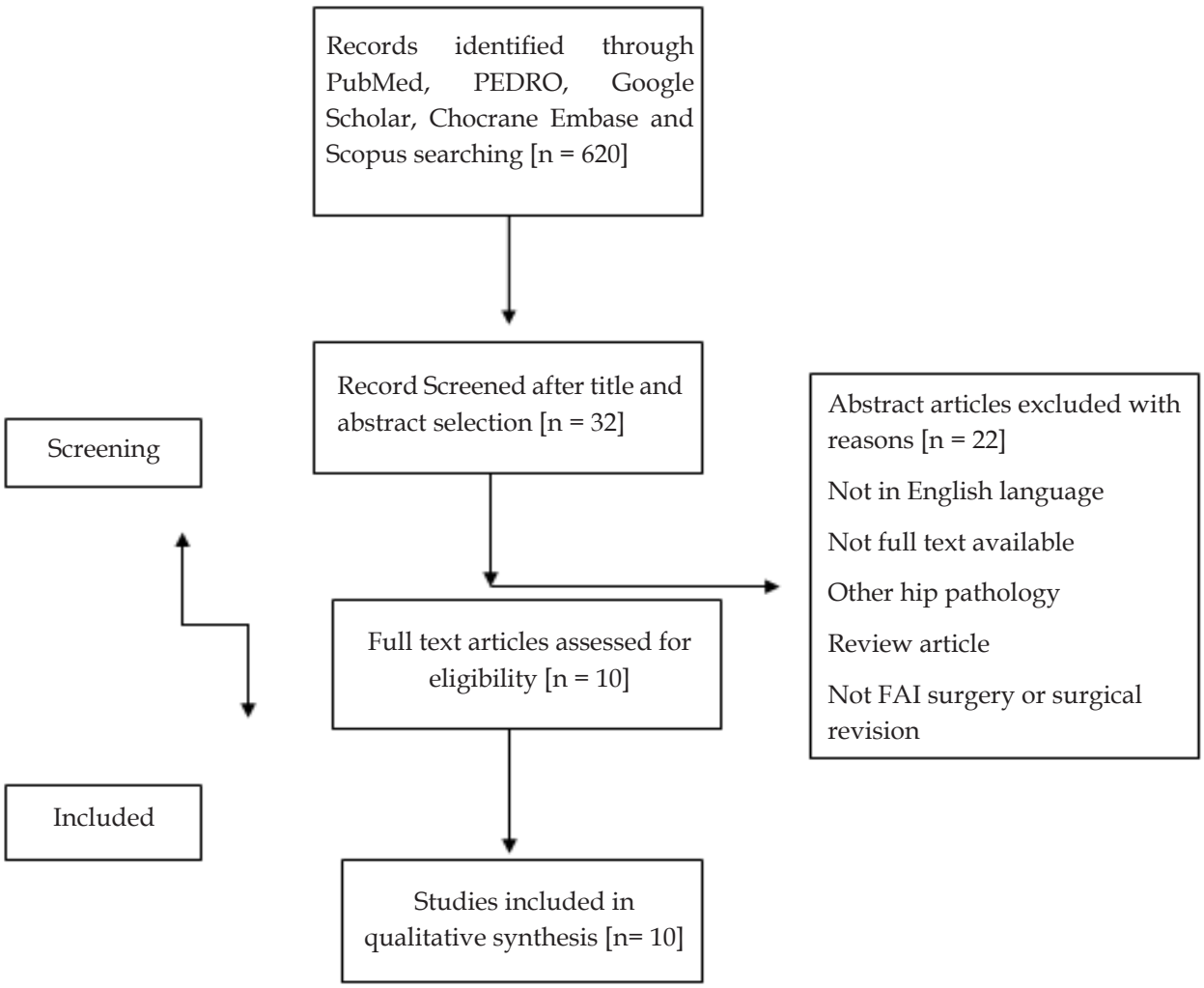

Figure 1. PRISMA Flowchart summarizing the selection process

First, all the retrieved articles were screened by title and abstract, using the following inclusion criteria for article selection.

Inclusion criteria

1. Prospective or retrospective intervention or observational and RCT dealing with the patients FAI syndrome and treated with either arthroscopy or an open surgical procedure.
2. Written in the English language
3. Published from 2000 to 2022
4. Dealing with the treatment of patients affected by FAI Syndrome.
5. Adults of both sexes, at least 16 years of age with clinically confirmed FAI

Exclusion criteria

1. Written in languages other than English
2. Not dealing with the treatment of FAI syndrome.
3. Systematic reviews, conference abstracts, case studies, narrative reviews, and non–peer-reviewed studies were excluded
4. Articles lacking access to the full text.
5. Studies reporting on hip surgery for a diagnosis other than FAI

Two independent reviewers extracted all the data. A third reviewer independently verified the data. The following data were extracted from each study.

Table 1. Showing Characteristics of Included Studies

Study	Study Design	Treatment Groups	Outcome Measures	Follow-Up	Rehabilitation Program	Main Results	Conclusion
1.Benjamin G. Domb et.al[19]	Clinical review.	–	Modified Harris Hip Score (mHHS) Hip Outcome Score– Activitis of Daily Living (HOS-ADL) Hip Outcome Score Sport-Specific Subscale (HOS-SSS) Non-Arthritic Hip Score (NAHS) Visual analog scale (VAS)	2-Year	A preoperative program was initiated 1 month prior to the patients surgery. Phase 1 lasts for 3 weeks Phase 2 spans from week 4 through 8 Phase 3 (Weeks 9-12) Phase 4 (>12 Weeks)	Showing improvement at 2-year follow-up of 61.29 to 82.02 for (mHHS), 62.79 to 83.04 for (HOS-ADL), 40.96 to 70.07 for Hip Outcome Score–	Following a structuredcriteria-based program, patients undergoing HA may achieve excellent outcomes
2.Kim L Bennell et.al[20]	RCT	14-Physiotherapy 16- control group	International Hip Outcome Tool (iHOT-33) sport subscale of the Hip Outcome Score (HOS)	14 week and 24 weeks	The PT group received seven PT sessions (one preoperative and six postoperative)	For the 14-week the PT group showed significantly greater improvements on the iHOT-33 and HOS	An individual PT treatment and rehabilitation programme may augment improvements in patientreported outcomes following arthroscopy for FAI syndrome
3.Kim L Bennell et.al[21]	RCT	100 people aged 16–35 years undergoing hip arthroscopy for symptomatic FAI randomly allocated to either a physiotherapy or control group.	International Hip Outcome Tool and the sports subscale of the Hip Outcome Score. Hip and Groin Outcome Score, HOS ADL	24 weeks.	The physiotherapy intervention will incorporate education and advice, manual techniques and prescription of a progressive rehabilitation program.	-	The findings will provide evidence for the efficacy of a specific physiotherapist-supervised rehabilitation program in improving outcomes following arthroscopicmanagement ofsymptomatic FAI.
4.Luke SpencerGardner et.al[22]	RCT	19-Males 33-Females	Modified Harris hip score MHHS Hip outcome score (HOS).	1- year	Phase I: day 1 to week 4 Phase II: weeks 4–8 Phase III: weeks 8–12 Phase IV: weeks 12–16	Mean MHHS, HOS-ADL, and HOS-sport scores at a mean 12.5 months were 80.1 ± 19. 83.6 ± 19.2 and 70.3 ± 27	This five-phase rehabilitation programme provides a framework where progression from surgery toincreasing post-operative activity level can take place in a predictable manner.

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5.Alexis Müller-Torrente et.al [23]	RCT	45- Control group 45- Experimental Group	Visual Analogue Scale (VAS) Goniometry (ROM) Harris Hip Score (mHHS).	14- Weeks	This protocol consists of an education program exercises focused on stabilization, proprioception, flexibility and strengthening 45 min each, once every two weeks for a total of 7 sessions	At 14 weeks the experimental group showed a, a greater improvement in mHHS	The rehabilitation program proposed in this study has been shown to achieve benefits in pain reduction and recovery of hip mobility in patients with FAIS undergoing HA
6.Melissa Saavedraet. al[24]	Retrospec-tive study	From a total of 684 hip surgeries, 103 subjects entered kinesiotherapy rehabilitation from which 48 subjects are eligible.	16- Weeks	Harris Hip Score (HHS) Vail Score	Phase 1 Tissue protection, mobility and motor control phase (1-4 weeks post-surgery) Phase 2 Neuromuscular control phase (4-8 weeks postsurgery) Phase 3 Strength, resistance and functional movement patterns (8-12 weeks) Phase 4 Return to sport activities.		This study found significant differences in the measurement of self-report scales (HHS and VHS) on the three occasions of evaluation during the kinesiotherapy rehabilitation process.
7. Danielle Lovett Carter and Norelee Kennedy[25]	Retrospec-tivestudy	Eight eligible participants were interviewed.		Ability to Participate in Sport. Perception of Hip and Rehabilita-tive Process	Personalised Hip Therapy (PHT), consists of four core components led by physiotherapists: detailed patient assessment, education and advice, help with pain relief and an exercise-based programme	A retrospective qualitative approach was adopted using semistructured interviews.	Overall, athletes were relatively satisfied with their outcome 1 y after hip arthroscopy, despite some having to adapt their sporting activities. protocol.
8.Kristian Thorborg et.al[26]	Cohort study	From September 2011 to March 2014, 97 consecutive patients	12- Months	Hip and Groin Outcome Score (HAGOS) Modified Harris Hip Score (mHHS).	97 consecutive pa-tients (mean age, 37 years; range, 19-59 years)] hip Standardizedpost-operative rehabili-tation instructions were provided	Improvements for all HAGOS subscales and mHHS results were seen at 3 months	Statistically and clinically relevant improvements in HAGOS and mHHS results after hip arthroscopy and rehabilitation can be seen at 3 months and up to 1 year.

Continue.....

9. A N Bennett et.al[27]	prospective	101 participants	12 months	Visual Analogue Scale (VAS) Non-Arthritic Hip Score (NAHS)	Initial postoperative rehabilitation included protecting the integrity of the repaired tissue, restoring range of motion, restoring normal gait pattern and weight-bearing status	Preoperative NAHS mean=62.9(SD 16.4), 12-month postoperative NAHS mean=78.8 (18.3), Preoperative VAS pain mean=51.3 (20.9), 12-month postoperative VAS pain=25.6 (24.5).	These data confirm that HA as part of a structured evidence-based multidisciplinary care pathway produces significant and continued symptomatic, functional and vocational improvements over a 12-month period in a military population exposed to high intensity, weight-bearing exercise
10.Michihisa Aoyama et.al[28]	RCT	10- Trunk stabilization 10- control group	8-weeks	Vail hip score Interna-tional hip outcome tool 12 (iHOT12)	20 female patients with symptom matic FAI comprising 2 groups (10 hips in trunk stabilization exercise group vs 10 hips in control group).	Vail hip score and iHOT12 were significantly increased at 8 weeks in the trunk training group	The addition of trunk stabilization-on exercise to a typical hip rehabilitation protocol improves short-term clinical outcomes

Results

In the present review, data from 1281 patients were retrieved. Out of 1281 patients 820[59.16%] are Male and 461[40.83] are females. Furthermore, 117[14.79%] cases are classified as a cam impingement ,40[5.05%]as pincer impingement and 1124[80.15] as mixed FAI. The mean age was 35.10 years. Out of 1281 patients 361 patients gone through Acetabuloplasty and Femoroplastytechniques, 150 gone through labral repair procedure and remaining 770 patients has gone through other arthroscopic procedures. Mean Duration of post operative rehabilitation is 18 weeks.

Table 2 Demographic Characteristics of Included Studies

Demographic Characteristics of Included Studies

- Population n= 1281
- Male n= 820
- Females n= 461

FAI morphology

- Cam impingement n= 117
- Pincer impingement n= 40
- Mixed n= 1124

Surgical Procedure

- Acetabuloplasty n= 361
- Femoroplasty n= 361
- Labral repair n= 150

Rehabilitation Duration n= 18 weeks

Reported clinical outcomes

International Hip Outcome Tool (iHOT-33) It is a questionnaire designed for self-administration and can be provided to young active patients with pathologies affecting the hip29

Kim L Bennell et.al reported a statistically significant improvement in iHTOT-33 from baseline to 14 – weeks between both the groups.

Hip Outcome Score of Daily Living (HOS-ADL) and Sports (HOS-Sports) This are self-reported outcomes with evidence of reliability and responsiveness for patients who are treated for HA.

Benjamin G. Domb et.al conducted a study to analyze the effect of physical therapy protocol after HA showing improvement from preoperative to 2-year follow-for(HOS-ADL), for (HOS-SSS). **Kim L Bennell et.al**[33] reported a statistically

significant improvement in HOS-Sports from baseline to 14 – weeks **Luke Spencer-Gardner**[32] et. al found significant difference in HOS – ADL after five phase rehabilitation programme.

Rom and Pain

Alexis Müller-[33] Torrente et.al reported significant improvement in hip ROM and VAS after 14- weeks of intervention. **Benjamin G. Domb 30** et.al showing improvement at 2-year follow-up in (VAS) scores from 5.86 to 2.94.**A N Bennett et.al** found significant at 12-month postoperative VAS

Modified Harris Hip Score (mHHS)

Alexis Müller-Torrente et.al conducted a study to analyze the Benefits of a Supervised post operative Rehabilitation Program in FAI Patients showedgreater improvement in mHHS($p<0.001$). **Melissa Saavedra et.al**[34] conducted a study to analyze the effect of kinesiotherapy after hip arthroscopy and found significant difference in HHS. **Kristian Thorborg et.al**[36] Improvements for mHHS at 3 months.

Post-operative rehabilitation protocols

Four out of the ten studies contained phase-based post-operative rehabilitation protocols for FAI syndrome. Benjamin G. Domb et.al include a pre operative phase and 4- phase post operative re rehabilitation protocol that last for more than 12 weeks.

Alexis Müller-Torrente et.al didn't use a phase-based approach, but instead included adequate pre- and postoperative care, including health education and an exercise plan. Luke Spencer-Gardner et.al include a pre operative phase and four phase post operativeprogramme for 16 weeks.

Melissa Saavedra et.al include four phase rehabilitation programmefor around 16 weeks. Kristian Thorborg et.al also include a four phase phases (mobility, stability,strength, and return to sport/competition) A N Bennett et.al [37] included rehabilitation initiallyfollowed the principles of postoperative rehabilitation and then progressed to a more individualized hip and groin programme.

Discussion

The present review highlighted the effectiveness of physiotherapy rehabilitation programme in post operative management of FAI syndrome. The above review includesa total of 10 RCT and four contained phase-based post-operative rehabilitation protocols for FAI syndrome.The studies included in this review have documented significant improvements in PROs following structured postoperativerehabilitation programs for patients with FAI.

Hari K. Ankem et.al conducted a review to determine the effect of Structured physical therapy protocols following hip arthroscopy and found clinically significant improvement in PROs[29]Similarlymichael p. reimanet.al conducted a scoping review to determine the effect of post operative rehabilitation for FAI syndrome and conclude thatSurgical outcome studies do not provide sufficient detail to replicate a postoperative rehabilitation protocol for FAI[30] Mark J. Holling et.alconducted Review of the Recent Literature for Athletes after HA of FAI syndrome and found that four-phase approach to rehabilitation following hip arthroscopy for FAI is widelyused with general uniformity[31]

Cheatham et al.'s systematic review suggested a 4-5 phase rehab programme[32]de SA et alemphasized the importance of an individualized rehabilitation strategy that emphasizes progressive development through various stages.[33]

The majority of the literature on physical therapy has been on non-surgical management of FAI which cannot be applied to a post-operative population[34,35] By using specific inclusion criteria, we were able to synthesize our review from a very uniform set of studies, with the same time frames, criteria, and objectives for progressing through various phases of rehabilitation.

The subjective scores considered by the authors included iHOT-33, SF-12, EQ-5D-5L and HOS. iHOT-33 is considered one of the main questionnaires to quantitatively evaluate patients symptoms[36]

Conclusion

Rehabilitation protocols following hip arthroscopy for the management of FAI syndrome typically consist of four to five phase programs with set goals and progression criteria.study found Clinically

significant improvement in reported outcomes from baseline noted in majority of the studies reviewed that involved a structured rehabilitation program following arthroscopic management of FAI.

Limitations

There is limited available evidence surrounding the specific post-operative Rehabilitation for FAI syndrome. Second, there were significant differences in the mean follow-up timepoints for PROs Therefore, it wasn't possible to draw meaningful conclusionsas to which PT protocol was ideal.Meta Analysis of these studies could not be done due to quantitative difference in patient's properties , duration of intervention, outcome measures and treatment therapies.

Future Directions

Further high-quality comparison studies are required because it is impossible to determine which protocol is the most successful due to the variety in patient-specific features among the included researches.

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References

1. Hale RF, Melugin HP, Zhou J, LaPrade MD, Bernard C, Leland D, Incidence of femoroacetabular impingement and surgical management trends over time. The American journal of sports medicine. 2021 Jan;49(1):35-41.
2. Griffin DR, Dickenson EJ, O'donnell J, Awan T, Beck M, ClohisyJC, The Warwick Agreement on femoroacetabular impingement syndrome (FAI syndrome): an international consensus statement. British journal of sports medicine. 2016 Oct 1;50(19):1169-76.
3. Zadpoor AA. Etiology of femoroacetabular impingement in athletes: a review of recent findings. Sports Medicine. 2015 Aug;45(8):1097-106.
4. Dimmick S, Stevens KJ, Brazier D, Anderson SE. Femoroacetabular impingement. Radiologic Clinics. 2013 May 1;51(3):337-52.
5. Thomas GE, Palmer AJ, Andrade AJ, Pollard TC, Fary C, Diagnosis and management of femoroacetabular impingement. British Journal of General Practice. 2013 Jul 1;63(612):e513-5.
6. Anzillotti, G.; Iacomella, A.; Grancagnolo, M.; Bertolino, Sconza,Conservative vs. Surgical Management for Femoro-Acetabular Impingement: A Systematic Review of Clinical Evidence. J. Clin. Med. 2022, 11, 5852
7. Leunig M, Beaulé PE, Ganz R. The concept of femoroacetabular impingement: current status and future perspectives. Clinical orthopaedics and related research. 2009 Mar;467:616-22.
8. Yuan BJ, Trousdale RT. Femoroacetabular impingement. The Young Adult Hip in Sport. 2013 Oct 21:59-61.
9. Dooley, P.J. Femoroacetabular impingement syndrome: Nonarthritic hip pain in young adults. Can. Fam. Physician 2008, 54, 42–47
10. Laborie LB, Lehmann TG, Engesæter, Sera F, Engesæter LB, Rosendahl K. The alpha angle in cam-type femoroacetabular impingement: new reference intervals based on 2038 healthy young adults. The bone & joint journal. 2014 Apr 1;96(4):449-54.
11. Fioruzzi A, Acerbi A, Jannelli E, Ivone A, Fontana A. Interobserver and intraobserver reliability of a new radiological classification for femoroacetabular impingement syndrome. Musculoskeletal surgery. 2020 Dec;104:279-84.
12. Mansell NS, Rhon DI, Meyer J, Slevin JM, Marchant BG. Arthroscopic surgery or physical therapy for patients with femoroacetabular impingement syndrome: a randomized controlled trial with 2-year follow-up. The American journal of sports medicine. 2018 May;46(6):1306-14.
13. Mansell NS, Rhon DI, Marchant BG, Slevin JM, Meyer JL. Two-year outcomes after arthroscopic surgery compared to physical therapy for femoracetabular impingement: a protocol for a randomized clinical trial. BMC musculoskeletal disorders. 2016 Dec;17(1):1-9.
14. Hartwell MJ, Morgan AM, Nelson PA, Fernandez CE, Nicolay RW,Isolatedacetabuloplasty for femoroacetabular impingement: favorable patient-reported outcomes and sustained survivorship at minimum 5-year follow-up. Arthroscopy: The Journal of Arthroscopic & Related Surgery. 2021 Nov 1;37(11):3288-94.
15. Casartelli NC, Leunig M, Maffiuletti NA, Bizzini M. Return to sport after hip surgery for femoroacetabular impingement: a systematic review. Br J Sports Med. 2015;49:819-824.
16. Hetaimish BM, Khan M, Crouch S, et al. Consistency of reported outcomes after arthroscopic management of femoroacetabular impingement. Arthroscopy. 2013;29:780-787
17. Kierkegaard S, Langeskov-Christensen M, Lund B, et al. Pain, activities of daily living and sport function at different time points after hip arthroscopy in patients with femoroacetabular impingement: a

systematic review with meta-analysis. Br J Sports Med. 2017;51:572-579.

18. Lodhia P, Slobogean GP, Noonan VK, Gilbart MK. Patient-reported outcome instruments for femoroacetabular impingement and hip labral pathology: a systematic review of the clinimetric evidence. Arthroscopy. 2011;27:279-286..
19. Domb BG, Sgroi TA, VanDevender JC. Physical therapy protocol after hip arthroscopy: clinical guidelines supported by 2-year outcomes. Sports Health. 2016 Jul;8(4):347-54
20. Bennell KL, O'Donnell JM, Takla A, et al. Efficacy of a physiotherapy rehabilitation program for individuals undergoing arthroscopic management of femoroacetabular impingement – the FAIR trial: a randomized controlled trial protocol. BMC MusculoskeletDisord. 2014;15:58.
21. Bennell KL, Spiers L, Takla A, O'Donnell J, Kasza J, Hunter DJ. Efficacy of adding a physiotherapy rehabilitation programme to arthroscopic management of femoroacetabular impingement syndrome: a randomised controlled trial (FAIR). BMJ open. 2017 Jun 1;7(6):e014658
22. Spencer-Gardner L, Eischen JJ, Levy BA, Sierra RJ, Engasser WM, comprehensive five-phase rehabilitation programme after hip arthroscopy for femoroacetabular impingement. Knee Surgery, Sports Traumatology, Arthroscopy. 2014 Apr;22:848-59
23. Müller-Torrente A, Puig-Torregrosa J, Montero-Navarro S, Sanz-Reig J, Morera-Balaguer J,Benefits of a specific and supervised rehabilitation program in femoroacetabular impingement patients undergoing hip arthroscopy: A randomized control trial. Journal of Clinical Medicine. 2021 Jul 15;10(14):3125.
24. Saavedra M, Moraga R, Diaz P, Camacho D, Mardones R. Comparative analysis of kinesiotherapy rehabilitation after hip arthroscopy, quantified by Harris and Vail hip scores: a retrospective study. Muscles, Ligaments and Tendons Journal. 2016 Jul;6(3):420.
25. Lovett Carter D, Kennedy N. What are athletes' perceptions of rehabilitation outcome 1 year after hip arthroscopy?. Journal of Sport Rehabilitation. 2014 Nov 1;23(4).
26. Thorborg K, Kraemer O, Madsen AD, Hölmich P. Patient-reported outcomes within the first year after hip arthroscopy and rehabilitation for femoroacetabular impingement and/or labral injury: the difference between getting better and getting back to normal. The American Journal of Sports Medicine. 2018 Sep;46(11):2607-14.
27. Bennett AN, Nixon J, Roberts A, Barker-Davies R, Villar R, Houghton JM. Prospective 12-month functional and vocational outcomes of hip arthroscopy for femoroacetabular impingement as part of an evidence-based hip pain rehabilitation pathway in an active military population. BMJ Open Sport & Exercise Medicine. 2016 Aug 1;2(1):e000144.
28. Aoyama M, Ohnishi Y, Utsunomiya H, Kanezaki S, Takeuchi H, Watanuki M, Matsuda DK, A prospective, randomized, controlled trial comparing conservative treatment with trunk stabilization exercise to standard hip muscle exercise for treating femoroacetabular impingement: a pilot study. Clinical Journal of Sport Medicine. 2019 Jul;29(4):267.
29. Ankem HK, Yelton MJ, Lall AC, Bendersky AM, Rosinsky PJ, Structured physical therapy protocols following hip arthroscopy and their effect on patient-reported outcomes—a systematic review of the literature. Journal of Hip Preservation Surgery. 2020 Aug 1;7(3):357-77
30. Reiman MP, Boyd J, Ingel N, Reichert A, Westhoven M, Peters S. There is limited and inconsistent reporting of postoperative rehabilitation for femoroacetabular impingement syndrome: A scoping review of 169 studies. Journal of Orthopaedic& Sports Physical Therapy. 2020 May;50(5):252-8
31. Holling MJ, Miller ST, Geeslin AG. Rehabilitation and return to sport after arthroscopic treatment of femoroacetabular impingement: a review of the recent literature and discussion of advanced rehabilitation techniques for athletes. Arthroscopy, Sports Medicine, and Rehabilitation. 2022 Jan 1;4(1):e125-32
32. Anzillotti, G.; Iacomella, A.; Grancagnolo, M.; Bertolino, E.M.;Marcacci, Conservative vs. Surgical Management for Femoro-Acetabular Impingement: A Systematic Review of Clinical Evidence. J. Clin. Med. 2022
33. de SA D, Lian J, Sheean AJ, Inman K, Drain N, Ayeni O, Mauro C. A systematic summary of systematic reviews on the topic of hip arthroscopic surgery. Orthopaedic Journal of Sports Medicine. 2018 Sep 19;6(9):2325967118796222.
34. Orbell S, Smith TO. The physiotherapeutic treatment of acetabular labral tears. A systematic review. Advances in Physiotherapy. 2011 Dec 1;13(4):153-61.
35. Kemp JL, Risberg MA. Significant knowledge gaps between clinical practice and research on femoroacetabular impingement: are we on the same path?. Journal of Orthopaedic& Sports Physical Therapy. 2018 Apr;48(4):228-9.
36. Mohtadi NG, Griffin DR, Pedersen ME, Chan D, Safran MR, Parsons N, Sekiya JK, Kelly BT, Werle JR, Leunig M, McCarthy JC. The development and validation of a self-administered quality-of-life outcome measure for young, active patients with symptomatic hip disease: the International Hip Outcome Tool (iHOT-33). Arthroscopy: The Journal of Arthroscopic & Related Surgery. 2012 May 1;28(5):595-610

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A Study to Correlate Smart Phone Addiction and Adult Hypertension Among Students of KPGU University: A Pilot Study

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Abstract

Background: The prevalence of hypertension is rising globally due to unhealthy lifestyle. Smartphones are vital instrument as a result of the rising use of technology in education. Anxiety, sadness, and sleep difficulties are all linked to smartphone addiction. These mental illnesses also have an impact on blood pressure. The purpose of this study was to investigate the prevalence of hypertension and its association with smartphone addiction among adults.

Methods: An university-based cross-sectional study was conducted on 74 young adults, aged 17-24 years (18.47±0.51for males and 19.27±0.97 for females) by random cluster sampling method after getting consent. Systolic and Diastolic blood pressure were measured according to normative data of ACSM guidelines. BMI was calculated to identify the prevalence of obesity and its association with an increase in blood pressure. The Smartphone Addiction Scale - a short version was used to assess level of smartphone addiction.

Results: The prevalence of risk of developing hypertension in those who are having smartphone addiction was 9.45% ((OR=0.53, 95% CI: 0.155-1.762). And the association between smartphone addiction and obesity was 6.75%.

Conclusion: Among college-going students surveyed at KPGU University Vadodara, there is a risk of developing hypertension due to excessive smartphone addiction as it shows borderline or elevated blood pressure and obesity. This can affect their physical as well as mental health. Therefore it is essential to arrange educational seminars to make students aware of reducing the use of social media by engaging them in various recreational activities.

Keywords: Smartphone addiction, young adults, hypertension, University students

Introduction

Nowadays one of the most popular forms of information and communications technology is the mobile phone, which is also likely the one that has demonstrated the most amazing development in recent years about technological advancements, social effects, and widespread use by the vast majority of people[1]. However, there are drawbacks. Technology addiction is an impulse control disease characterised by obsessive usage of mobile devices, the internet, or video games, regardless of negative effects to the user. The condition is also known as digital addiction or online addiction. Smartphones, which are portable devices with various functionalities, are increasingly becoming a must for students and improving their educational experiences.[2] Some students also

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use their smartphones as leisure devices, such as watching movies, playing games, and talking online[3]. Problematic smartphone use is defined as "an inability to control one's smartphone use, which eventually has detrimental effects on daily life"[4]. Young people depend on their smartphones, and their unintentional use makes them prone to many adverse effects[5]. 1.2 billion adolescents cover up about 20% of the world population, where as in India, it has 600 million adolescents. In 2017, worldwide, mobile phone users were 4.77 billion. There is an increase in mobile phone users in India from 2013 to 2019 that is accounted for 730.7 million users in 2017, which includes 340 million smartphone users.[6]

The age range of 18 to 34 is reported to have the highest rate of smartphone usage, at 62%. 43% of Apple i-Phone users and 50% of Android Smartphone users are people who are under 34 years old. A little over 53% of men and 47% of women use smartphones. [7]. These negative health effects could emerge physically, such as an increased risk of type 2 diabetes mellitus due to sedentary lifestyle, hypertension, cardiac diseases, ophthalmic or auditory difficulties, and musculoskeletal problems. disorders or psychological difficulties including nutritional or sleep issues. Risk, habits, addictive behaviour, and low self-esteem behaviours are all factors to consider.[8-10]

The major cause of CVD death and disease burden worldwide is hypertension, which is also a significant risk factor for ischemic heart disease, dementia, stroke, and chronic renal disease.[11] According to contemporary estimates, 7.7 to 10.4 million deaths per year are directly related to high blood pressure, which affects 1.4 billion people globally.[12] In 2018, it was observed that the amount of time spent on a mobile phone increased the risk of acquiring hypertension. Furthermore, those who had used mobile phones for at least eight years had a six-fold increase in this risk, as did those who used them for more than 60 minutes every day.[13] Smartphone addiction has been categorised as a disorder in the 10th edition of the International Classification of Diseases under the criteria for Dependence in Mental and Behavioural Disorders syndrome.[11] To assess smartphone addiction, Kwon et al. created and validated the SAS (Smartphone Addiction Scale), which has 33 questions and 6 points. The Smartphone addiction Scale-Short version (SAS-SV) is a validated scale.[14] SAS-SV is internally consistent (Cronbach's α= 0.844). There is very few studies have been done yet on the University students to find out the relationship between mobile phone usage and its association with hypertension. Thus there was a need to identify the relationship between them among university students.

The aim of this study was to investigate the prevalence of hypertension and its association with smart phone addiction among adults of KPGU university of Vadodara.

Methodology

Participants and Procedure

Between the months of December 2022 and January 2023, a cross-sectional survey was conducted. By random cluster sampling, 74 university students (19 boys and 55 girls) aged 17-24 years (19.06±0.94 years) were enrolled in this study. The university's ethical council authorised the study's design and procedure, and informed Google form-based consent was obtained from all participants prior to the survey.

Measurements

All of the individuals were in good health, had no kidney or cardiovascular disease, and were not using any mental, sleep, or cardiovascular medications. Body Mass Index (BMI) was used to define weight status (weight in kilogrammes divided by height in metres squared). BMI was assessed to indicate obesity caused by prolonged inactive hours. Demographic information such as age, height, and weight, as well as SAS-SV rating, were collected using a Google form.

After each subject had rested for at least 5 minutes, systolic and diastolic blood pressure measurements were collected in the sitting position with a mercury sphygmomanometer and the appropriate cuff in a quiet surroundings. The reference values in this study were derived from the ACSM 10th edition recommendations.[15]

Data Analysis

Frequency(%) and mean standard deviation (SD) were used to characterise categorical results

and continuous results, respectively. The t test for continuous variables, was used to assess group differences. p values of <0.05 were considered statistically significant. All data were analyzed using the SPSS version 20.0.

Results

Participants Characteristics

Out of 74 participants 25.67% were male with a mean age of 18.47 years (SD=0.51) and 74.33% were female with a mean age of 19.27 years (SD=0.97) **(Table 1).** The mean prevalence of smart phone addiction was 41±9.89 (39.16±6.62 for female and 41.67±5.68 for male). There was no statistically significant difference between gender and smart phone addiction. Compared to the females, the males had a significantly higher height, weight and DBP. Whereas females had higher age and BMI. But there was no difference in SBP.

Analysis of Factors Associated with Smart Phone Addiction in Adults

18 participants(24.32%) who are having overweight were showing great amount of smart phone addiction. Out of 30 participants (40.54%) with elevated blood pressure, 7 (9.46%) participants had positive smart phone addiction **(Table 2).** Among 9.46% obese participants 1.35% showed smartphone addiction positive.

Analysis of Factors Associated with Adult Hypertension

The overall prevalence of hypertension among adults was 40.54%. Out of them 9.45% adults were addicted to smart phone**.(Table 2)**

Discussion

According to this survey, smart phone addiction can cause a variety of issues, including increased blood pressure and weight gain as a result of prolonged inactive hours while using a smartphone. The primary finding of this study was that smart phone addiction may be a substantial and independent predictor of hypertension in persons aged 17 to 24.This study showed that overall prevalence of elevated blood pressure was 30 (9.45%) out of which 7 (9.45%) showed peak of smart phone addiction. Numerous studies have shown in recent years that excessive smart phone use is associated to a variety of health risks, ranging from potentially fatal injuries from car accidents to psychological disorders such as anxiety and sleep issues. [16,17]

Table 1: Participants characteristics

	TOTAL(N=74)	FEMALE (N=55)	MALE (N=19)	P value
Age	19.06±0.94	19.27±0.97	18.47±0.51	0.0010
Height	1.57±0.042	1.54±0.13	1.64±0.059	0.0019
Weight	55.47±4.94	54.09±10.25	59.47±14.41	0.081
BMI	24.98±2.23	23.52±5.46	21.78±4.36	0.21
SBP	124.3±2.80	124.07±2.82	124±4.24	0.93
DBP	80.10±4.24	78.50±4.13	84.2±4.24	0.312
Smartphone Addiction:- Negative Positive	21.46±4.69 41±9.89	22.39±4.68 39.16±6.62	20.43±5.21 41.67±5.68	0.151 0.116

The results of many scales also revealed that smart phone addiction is becoming a public health issue that cannot be ignored.[18,19] Interestingly, 22 individuals (29.72%) with borderline or increased blood pressure also showed smartphone addiction. This suggests that adults with high blood pressure are more likely to be drawn to smart phones, but additional research is needed to determine the precise mechanism.

Table 2: Analysis of factors associated with smart phone addiction

	Total (N=74)	Smartphone Addiction positive(N=22)	Smartphone Addiction Negative(N=52)	P value
Gender:				
Female	55(74.32%)	19(25.6%)	55(74.33%)	0.11
male	19(25.68%)	3(4.05%)	16(21.63%)	
BMI(%)				
Under-weight Normal	14(18.92%)	6(8.10%)	8(10.82%)	
Over-weight	35(47.3%) 18(24.32%)	11(14.8%) 4(5.40%)	23(31.02%) 11(14.87%)	0.022
obesity	7(9.46%)	1(1.35%)	10(13.52%)	
Blood pressure:				
Normal	44(59.45%)	15(20.2%)	30(40.54%)	<0.0001
Elevated	30(40.54%)	7(9.46%)	32(43.24%)	

Out of 55(74.32%) females 19(25.68%) and among 19(25.68%) males total 3(4.05%) reached to peak of smart phone addiction. The results of this study also showed that the risk of hypertension was higher among those with smart phone addiction (OR=0.53, 95% CI:0.155-1.762). According to a study done by Long J and Liu et al;(2016) Phone, camera, multimedia player, internet browser, navigation system, e-mail service, social networking, and gaming are all examples of smart phone functions. Because of these powerful and attractive benefits, many youngsters overuse their mobile devices, resulting in comparable addiction symptoms. Taking of BP measurements in only one visit was limitation of this study. The another limitation was, we did not examine potential confounding variables that could have an impact on our results, such as daily dietary practices (especially salt intake), physical activity, genetics, the use of stimulants to treat attention deficit hyperactivity disorder and depression in adults. As this study was a pilot study, there was very small sample size so in future this study can be done with larger number of participants.

Conclusion

Among college-going students surveyed at KPGU University Vadodara, there is a risk of developing hypertension due to excessive smartphone addiction as it showed borderline or elevated blood pressure and obesity. This can affect their physical as well as mental health. Therefore it is essential to arrange educational seminars to make students aware of reducing the use of social media by engaging them in various recreational activities.

Authors Contribution

All three authors contributed to the study's idea and design, data analysis and interpretation, and paper preparation. In addition, the first author helped with data collection and analysis.

Conflicts of Interest: None

Source of funding: Self

Abbreviations

ACSM : American College of Sports Medicine

BMI : Body Mass Index

CVD : Cardio Vascular Disease

SBP : Systolic Blood Pressure

DBP : Diastolic Blood Pressure

BP : Blood Pressure

SAS-SV : Smartphone Addiction Scale- Short Version

References

1. Thomee, S., H arenstam, A., & Hagberg, M. Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults-a prospective cohort study. BMC public health, 2011,11(1), 66.
2. Kuss DJ, Griffiths MD. Online social networking and addiction-a review of the psychological literature. Inter J Environ Res Pub Health, 2011;8(9):3528-52.
3. Lepp A, Li J, Barlkey J. Exploring the relationships between college students' cell phone use, personality and leisure. Comput Human Behav 2015;43:210-9.
4. Lopez-Fernandez O. Short version of the smartphone addiction scale adapted to Spanish and French: Towards a cross-cultural research in problematic mobile phone use. Addict Behav 2017;64:275-80.
5. Alshahwan H, Alosaimi FD, Alyahya H, Al Mahyijari N, Shaik SA. Arabic validation of Problematic use of Mobile Phone scale among university students in Saudi Arabia. J Nat Sci Med 2020;3:101-6.
6. Davey S, Davey A. Assessment of smartphone addiction in Indian adolescents. Int J Prevent Med 2014; 5:1500-11.
7. Alkhateeb A, Alboali R, Alharbi W, Saleh O. Smartphone addiction and its complications related to health and daily activities among university students in Saudi Arabia: A multi-center study. J Fam Med Prim Care 2020;9:3220-4.
8. Shoukat S. Cell phone addiction and psychological and physiological health in adolescents. EXCLI J 2019;18:47-50.
9. Tamura H, Nishida T, Tsuji A, Sakakibara H. Association between excessive use of mobile phone and insomnia and depression among Japanese adolescents. Int J Environ Res Public Health 2017;14:701.
10. Zou, Y., Xia, N., Zou, Y., Chen, Z., & Wen, Y. Smartphone addiction may be associated with adolescent hypertension: a cross-sectional study among junior school students in China. BMC pediatrics,2019 19(1), 310.
11. Martín-Fernández, J., Alonso-Safont, T., Polentinos-Castro, E., Esteban-Vasallo, M. D., Ariza-Cardiel, G., González-Anglada, M. I., Sánchez-Perruca, L., Rodríguez-Martínez, G., Rotaeche-Del-Campo, R., & Bilbao-González, A.Impact of hypertension diagnosis on morbidity and mortality: a retrospective cohort study in primary care. BMC primary care,2023,24(1),79.
12. Lin YH, Chiang CL, Lin PH, Chang LR, Ko CH, Lee YH, Lin SH.Proposed diagnostic criteria for Smartphone addiction. PLoS ONE 2016, 11:e163010.
13. Kwon M, Kim DJ, Cho H, Yang S. The smart phone addiction scale: development and validation of a short version for adolescents. PLoS One. 2013;8(12):e83558.
14. Deborah Riebe, Jonathan K., Gary L., Meir M. ACSM's Guidelines for Exercise Testing and Prescription. 10th ed. Philadelphia: Wolters Kluwer; 2018.
15. Amra B, Shahsavari A, Shayan-Moghadam R, Mirheli O, Moradi-Khaniabadi B, Bazukar M, Yadollahi-Farsani A, Kelishadi R. The association of sleep and late-night cell phone use among adolescents.J Pediatr. 2017;93(6):560–7.
16. Wu AM, Cheung VI, Ku L, Hung EP. Psychological risk factors of addiction to social networking sites among Chinese smartphone users. J Behav Addict.2013;2(3):160–6.
17. Lee JE, Jang SI, Ju YJ, Kim W, Lee HJ, Park EC. Relationship between Mobile phone addiction and the incidence of poor and short sleep among Korean adolescents: a longitudinal study of the Korean Children & Youth Panel Survey. J Korean Med Sci. 2017;32(7):1166–72.
18. Kim HJ, Min JY, Kim HJ, Min KB. Accident risk associated with smartphone addiction: a study on university students in Korea. J Behav Addict.2017;6(4):699–707.
19. Long J, Liu TQ. Prevalence and correlates of problematic smartphone use in a large random sample of Chinese undergraduates. BMC Psychiatry.2016;16(1):408.

Original Article

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Validity of Arch Height Measuring Tool in Comparison with Chippaux-Smirak Index and Staheli's Arch Index: A Pilot Study

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Abstract

Background: Flat foot is a postural deformity also known as pes planus is a condition where the arches of the foot collapse and the entire sole comes into contact with the ground when standing. Various tools are available to measure the extent of flatfoot which involves the usage of inks, dyes, expensive instrumentation, etc., which may be harmful and not available at all times. The arch height measuring tool is portable, easy to use, inexpensive and quick. However, the validity of this tool for flat foot is unknown and hence the objective of the study was to identify the same.

Objective: To determine the validity of the 'Arch Height Measuring Tool' designed by E-Soles Custom Footbeds as compared to Chippaux-Smirak Index and Staheli's Arch Index.

Methods: The medial longitudinal arches of the feet of 30 children with neurodevelopmental delay were assessed with static footprints evaluated using Staheli's Arch Index, Chippaux-Smirak Index and also using The Arch Height Measuring Tool. The footprints were classified into flatfoot and non-flatfoot and further subjected to data analysis.

Results: The tool when compared with the Chippaux-Smirak Index and Staheli's Arch Index was found to have a sensitivity of 30% and 28.3% respectively, specificity of 41.6% and 25% respectively and an accuracy of 72% and 75% in detecting flat feet in children with neurodevelopmental delay (NDD).

Conclusion: The study concludes that the Arch Height Measuring Tool with its current classifications is not suitable for diagnosing mild flatfeet due to the higher false negative results.

Keywords: Flatfoot; Deformity; Footprint Analysis; The Arch Measuring Tool; Chippaux-Smirak Index; Staheli's Arch Index.

Introduction

The ankle and foot complex consists of 26 bones, >100 muscles, ligaments and tendons, 23 joints, and a network of nerves, skin, blood vessels, and soft tissues. Based on the structure of the medial longitudinal arch, 3 types of the foot have been classified: [1] Normal foot [2] Low arched or pronated or pes planus [3] High arched or supinated or pes cavus.[1]

Flatfoot is a postural deformity characterized by the medial longitudinal arch of the foot being in a

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collapsed position or is less developed where the sole comes into complete or near-complete contact with the ground.[2-3]

It can be caused by various factors including genetics, injury, or certain medical conditions such as rheumatoid arthritis, cerebral palsy, muscular dystrophy, congenital vertical talus, etc.[3]

Radiographs can be the direct method for assessing medial longitudinal arch, which is reliable too but is less applicable in larger scale studies due to the cost and risk of radiation exposure. Indirect methods of assessment such as the use of non-toxic coloured footprints which can be simple, fast, reliable, non-invasive, and inexpensive, have been linked to the radiographic method. Several reports suggest that footprint analysis can be used for qualification, categorization, and surveillance of pes planus or flat feet. The other methods of assessing flat feet include ultrasound which provides dynamic images of soft tissues in the foot; whereas CT scans provide detailed 3D x-ray images of the foot and MRIs also provide detailed information regarding soft tissue abnormalities in the ankle foot complex.[1]

The medial longitudinal arch can be measured from the footprints by using various standard tools like the Chippaux-Smirak index and Staheli's arch index. During the search for various tools for arch height measurement, a new tool called 'Arch Height Measuring Tool' was found, however, the validity of the same was not found. The tool may be highly accurate, and consistent, reducing the chance of human error, which may occur while using footprints. It would be safer as compared to the use of various colours, dyes and hence decreasing the risk of toxicities and allergic reactions. It will not only provide objective data but also provide faster assessment saving both time and energy. It is more portable and can be used in different locations making them more accessible for arch-related assessment. Overall, it may provide more precise and consistent data. Hence, the study aimed at finding the validity of this new tool as compared to gold standard footprint assessment methods.[1]

Objective

To determine the validityof the 'Arch Height Measuring Tool' designed by E-soles Custom Footbeds as compared to CHIPPAUX-SMIRAK INDEX and STAHELI'S ARCH INDEX.

Materials and Methods

Inclusion criteria

Childrenfrom 2-16 years of age of either gender diagnosed with neurodevelopmental delay that could stand or walk with or without assistance.

Exclusion criteria

Children with typical development were excluded from the study. Children with NDD who had a history of lower limb injury or trauma, and a history of botox administration for the lower limbs 6 months prior to data collection. Children with congenital lower limb amelia were also excluded from the study.

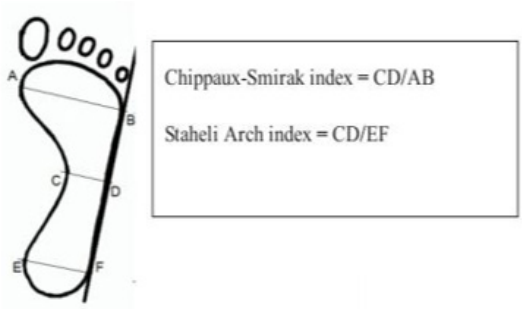

Figure 1: Foot Print Analysis[1]

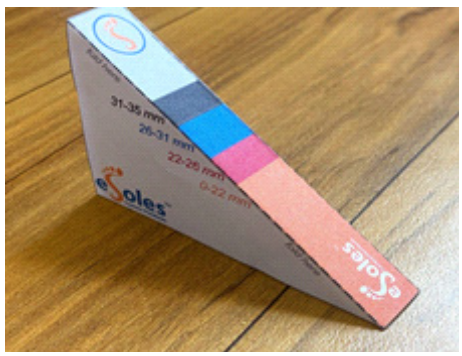

Figure 2: Arch Height Measuring Tool

Methodology

The Institutional Ethical Committee examined and approved the study's protocol. The data was collected in the out-patient department of paediatric physiotherapy on the premises of the tertiary hospital, from March 2023 to June 2023. Using G.

Power Software (Version 3.1.9.2) the total sample size for the Exact test for a set a-error probability of 5%, power of the statistical test (1-β error probability) 95% and an effect size of 0.8 (α =0.5, power=0.95%, r>0.7)was calculated to be 59 feet with the parameters set at 2 tails.

Considering that 10% of parents would not consent to the child's participation an additional 6 feet were added. Therefore, the sample size was 65 which were rounded off to 66 (thus the sample size of 33 children was taken).

33 children between 2 and 16 years of age with neuro developmental delay were chosen for participation in the study. The study's methodology and goals were explained to the parents of these children. Parents of 2 children did not consent to their child's participation during the preliminary demographic data collection. As a result, 31 children whose parents consented to their child's participation and also met the inclusion and exclusion requirements were chosento participate in the data collection.

The parents of the children who were a part of the study provided their written approval. Static footprints of these children were taken using non-toxic colour and subsequently subjected to the Staheli's Arch Index and Chippaux-Smirak Index for assessment of the medial longitudinal arch.

Chippaux-Smirak Index and Staheli's Arch Index were employed to measure the flatness of the footprint. The two indices were determined by drawing three lines: one at the minimal distance of the midfoot region, one at the maximal distance of the forefoot area, and one at the maximal distance of the rear-foot region. (Figure 1)

The Staheli's Arch Index (Figure 1) is the ratio of the minimal distance in the midfoot region (mid-foot width CD) to the maximal distance in the rear-foot region (heel width EF).

The Chippaux-Smirak Index is the ratio of the minimal distance between the midfoot regions(mid-foot width CD) divided by the maximal distance in the forefoot area (metatarsal width AB).

Figure 3: Footprints Of A Child With Ndd

Results

Footprints of 2 feet which were not found to be appropriate for analysis with Staheli's Arch Index and Chippaux-Smirak Index were excluded and the data of 60 feet was thus subjected to data analysis.

The data of 60 feet was statistically analysed using Statistical Package for the Social Sciences (SPSS) version 23.0. The descriptive statistics were first evaluated using Mean and Standard deviation for the baseline characteristics.

All calculations were done with a p-value ≤0.05.

Table no. 1 shows all the demographic details of the participants included in the study.

The sample included 30 children which consisted of 9 (30%) girls and 21 (70%) boys with mean ages 5.2 (±2.7) and 5.3(±4.2) respectively.

The Z score for population proportion showed that the number of boys was significantly higher as compared to that of girls at a Z value of -3.0984 at a p-value of 0.002.

The ages of boys and girls when subjected to a t-test for independent means, showed that the ages were not significantly different with a t-value of 0.25049 and the p value of 0.8.

The number of flatfeet [36(60%)] was found to be significantly higher than the number of non-flatfoot [24(40%)] at a z score of 2.19 and p-value of 0.03.

The tool when compared with the Chippaux-Smirak Index and Staheli's Arch Index was found to have a sensitivity of 30% and 28.3% respectively.The specificity when compared with the CSI and SAI was found to be 41.6% and 25% respectively.The accuracy with which the tool gave the true positives and true negatives was 72% and 75% when compared with CSI and SAI respectively.The false negative results as compared to CSI and SAI were 28.3% and 25% respectively.

Table 1: Demographic details of the participants

	BOYS	GIRLS	TOTAL
NUMBER (%)	21 (70%)	9 (30%)	30 (100%)
MEAN AGE YEARS (SD)	5.3(±4.2)	5.2(±2.7)	10.5(±6.9)
FLAT FOOT	36(60%)		z = 2.19
NON-FLAT FOOT	24(40%)		p = 0.03*
* p < 0.05 was statistically significant			

Table 2: Comparison of the Arch Height Measuring Tool with CSI and SAI

ARCH HEIGHT MEASURING TOOL	CSI	SAI
SENSITIVITY %	30	28.3
SPECIFICITY %	41.6	25
POSITIVE PREDICTIVE VALUE %	41.80	37.7
NEGATIVE PREDICTIVE VALUE %	29.9	36.3
FALSE NEGATIVE %	28.3	25
ACCURACY% (TRUE POSITIVE+TRUE NEGATIVE)	72	75

Discussion

The data obtained from 30 children's 60 feet were subjected to data analysis.

The number of boys in the study were significantly higher. This result is supported by other articles which also report the same.[4-6]

The results also show that children with NDD have a greater predisposition to develop flat feet.The number of feet with extreme flatfoot (where the total medial arch was in contact with the surface and the tool could not be inserted below the foot) were the only ones which were diagnosed as flatfoot by the arch height measuring tool. Whereas, mild flatfeet could not be identified by the tool as the lowest category identifiable was a medium arch. This could have been the reason for a large number of false-negative results of flatfeet. Thus, decreasing the validity of the tool in identifying mild flatfeet.

Conclusion

The study concludes that the Arch Height Measuring Tool with its current classifications is not suitable for diagnosing mild flatfeet. Hence future studies with some additional classifications may make the tool valid for diagnosing all levels of flatfeet.

Conflict of interest: No conflicts of interest exist between the authors, which they have disclosed.

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References

1. Jeevannavar JS, Kulkarni S, Ankolekar B, Nadgauda KP, Shilesh K, Bachgoudar RH. Intra-rater and inter-rater reliability of Foot Print Analysis Tool. Indian Journal of Physiotherapy and Occupational Therapy - An International Journal. 2018;12(4):171.
2. Chaurasia BD, Garg K. Lower limb. In: Human anatomy: Regional and AppliedDissection and clinical. 7th ed. New Delhi, India: CBS Publishers & Distributors;2010. p. 174–5.
3. Maheshwari J, Mhaskar V. Essential orthopaedics: Including clinical methods. 6th ed. New Delhi, India: Jaypee Brothers Medical Publishers; 2019.
4. May T., Adesina I., McGillivray J., Rinehart NJ. Sex differences in neuro-developmental disorders. Current opinion in neurology. 2019 Aug 1; 32(4):622-6.
5. Van Naarden Braun K, Christensen D, Doernberg N, Schieve L, Rice C, Wiggins L, et al. Trends in the prevalence of autism spectrum disorder, cerebral palsy, hearing loss, intellectual disability, and Vision Impairment, Metropolitan Atlanta, 1991–2010. PLOS ONE. 2015;10(4).
6. Jeevannavar J, Madinkar A, Jeevannavar S. Parental stress and compliance with Home Exercise Program of children with developmental delay-a Correlation. Indian Journal of Physiotherapy and Occupational Therapy - An International Journal. 2018;12(4):91.

Original Research Work

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Recent Trends in Occupational Therapy Practice amongst the Budding Therapists Across India

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Abstract

Backround: Occupational Therapy is increasingly becoming popular. The objective of the present study is to develop an insight to the current trends in practice of occupational therapy in India. The target group chosen for the study are budding occupational therapists who have completed their graduation within the last 5 years.

Objectives: The study aims to investigate the trends in location of work setups, nature of organization of work, nature of place of employment, current work profile, nature of cases these budding therapists are dealing with currently, the work setup they are employed in and remuneration they are receiving. The trends emerging from the present study would be helpful to understand the current work dynamics and thus prepare the young workforce for future possible opportunities.

Study Design: The present study was a survey-based research design. Data was gathered through a questionnaire.

Methods: This questionnaire was distributed on an online platform to 695 therapists practicing across India. Care was taken to include only the therapists who had completed their graduation within the last five years i.e., between 2018-22. Data collection was carried out for a period of 8 months from October 2021 to May 2022.

RESULTS: The analyses revealed that the profession of Occupational Therapy in the country is dominated by female therapists. The age of the workforce that have responded are in their mid-twenties. Most of them are working in urban or metropolitan setups primarily in Paediatric setups in clinics which are mostly privately owned rehabilitation centres.

Conclusion: The present analyses pointed out that there may be a lack of diversification of practice in Occupational Therapy in the country. It also indicated that the freshly graduated out professionals feel that there are a limited remuneration and lack of opportunities in the Government sector, and as a result the current scenario suggests that most of them after being trained turn their head to foreign land for a better opportunity with respect to employment. However, new setups and areas of practice are slowly emerging and opportunities for young budding therapists are increasing back home.

Key Words: Occupational Therapy (OT), American Occupational Therapy Association **(**AOTA), Mental Health and Geriatric Care, Neurorehabilitation, Hand Rehabilitation, Oncological Rehabilitation.

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Introduction

With an increase in average life expectancy and awareness in India, the opportunities of an occupational therapist have increased substantially. Awareness about disability and accessibility is increasing. Government policies that support inclusion of people with disabilities in India have increased. This, resulted in growth of occupational therapy as a profession in India.[1-2-3] According to data obtained in 2019-20 from All India Survey on Higher Education by the Government of India, a total 4102 students get enrolled in Bachelors of Occupational Therapy and a total of 362 students get enrolled in Masters of Occupational Therapy in India.[4].It is a common experience, in this field, that most of the students drop out of the course or change their stream post completion of graduation. Of those who continue, more than 25-30% of occupational therapists in India migrate to overseas countries owing to inadequate lucrative opportunities in both government and private sectors [5].There are approximately 5000 occupational therapists in India mostly employed in the private hospitals, special schools, rehabilitation clinics, home health systems, non-governmental and non-profit organisations. [3]

Recent trends amongst young and budding occupational therapists in the country show an alarming and criticalsituation may arise regarding future of this profession. The present study, thus, gathers information which may provide a basic layout of the choices made by the budding therapists with respect to the aspects as mentioned above. This outcome of the present would also be informative for the freshly graduated professionals for it could provide valuable information to a spectrum of opportunities that may lie in front of these upcoming students and budding professionals helping them to plan a way ahead, giving them an insight of the current situation too.

Materials and Methods

A questionnaire consisting of 12 questions related to demographics and information regarding current nature of work of the budding therapists across the country was formed. The questionnaire was administered in the form of 'Google Forms', as the survey was to reach professionals far and wide. It was administered to the professionals who had completed their graduations and had passed out within five years and were working presently. Informed consent regarding willingness to participate in the study was taken from the participants and confidentiality of information was assured. The questionnaire was shared online to about 695 budding therapists, out of which 402 responded. The study focused on getting responses from therapists who completed their graduation within last 5 years so as to capture the essence of the voice of the young budding therapists of the country. The data collection was carried out for a period of 8 months from October 2021 to May 2022. The study was carried out for a period of one year from October 2021 to October 2022. The raw data was transferred to the Excel sheet in Microsoft Office software. Data was interpreted as percentages and aggregate numbers for comparative purposes.

Findings

3.1 Data pertaining to male to female ratio of the respondents:

The Data constituted 63.18% females and 36.81% of males (Fig 1)

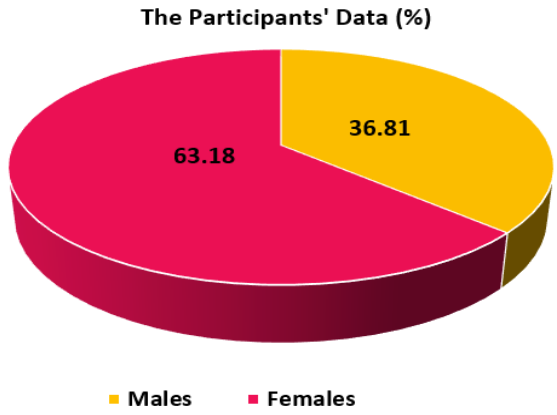

Figure 1. Percentage of male and female participants

3.2 Data pertaining to age group of the participants:

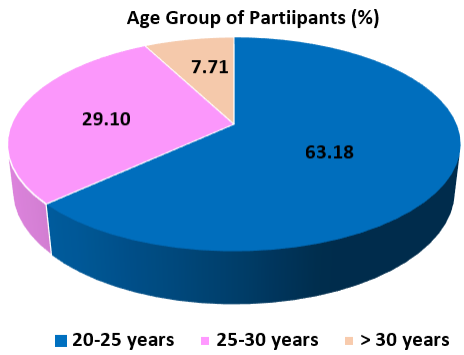

Figure 2. Age group of the participants

3.3 Data pertaining to Work Set-uplocations of the participants:

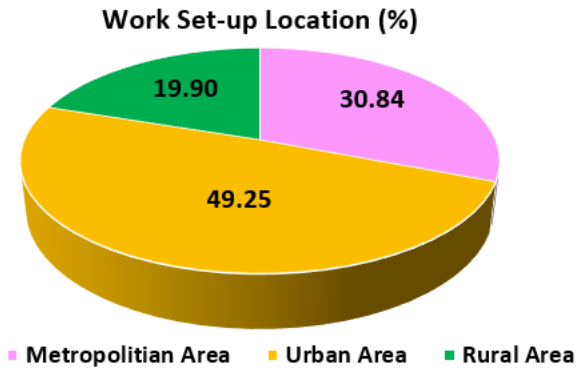

Figure 3. Work Set-up locations of the participants

3.4 Data pertaining to Nature of Organizational which the participants work.

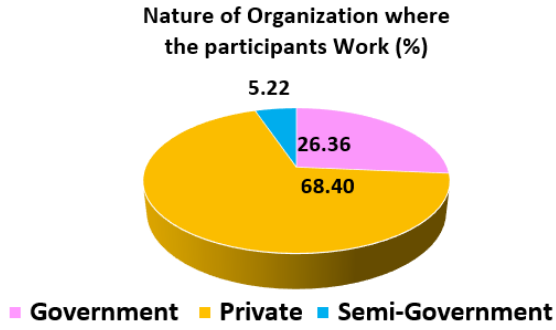

Figure 4. Nature of Organization in which the participants work

3.5 Data pertaining to the place of employment of the participants.

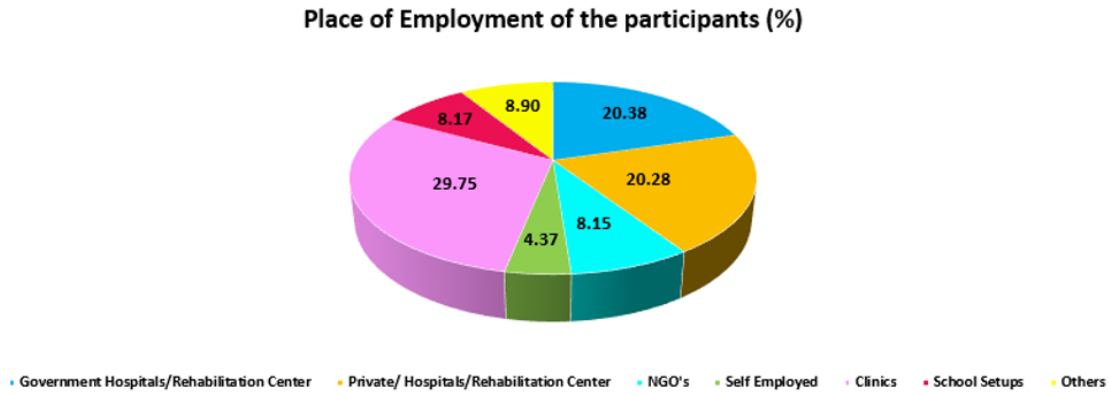

Figure 5. Place of employment of the participants.

3.6 Data pertaining to the Nature of work set up of the participants.

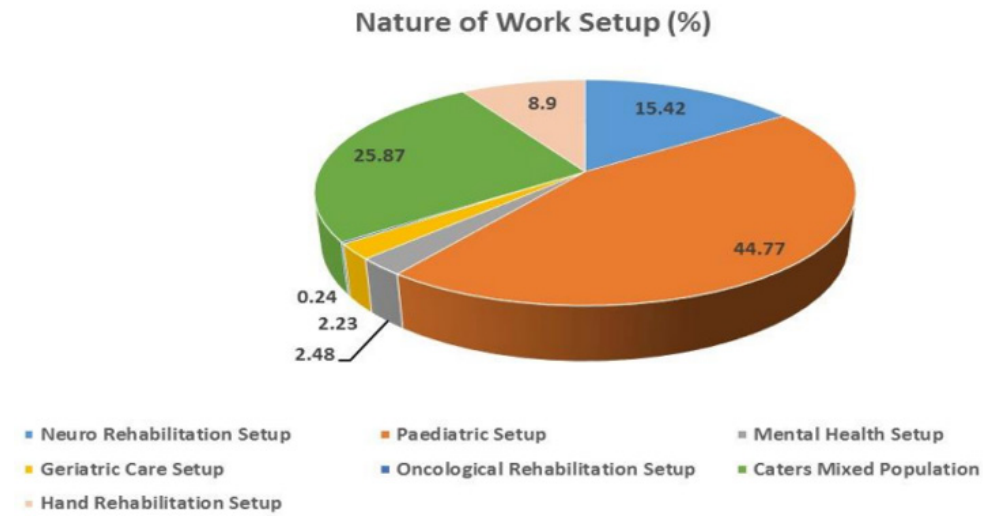

Figure 6: Nature of work set up.

3.7 Data pertaining to Annual Income of the participants.

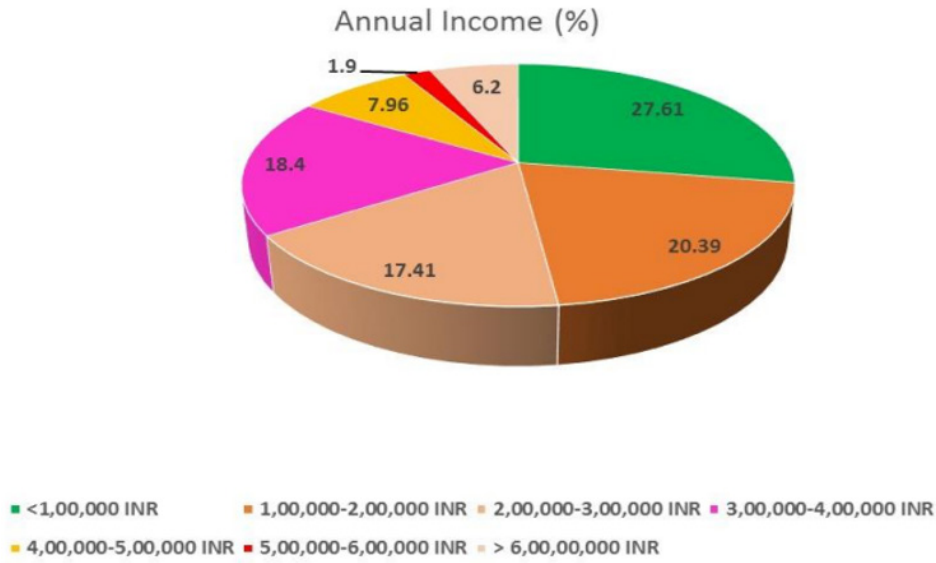

Figure 7. Percentage wise Annual income of the respondents.

Discussions

There were 402 respondents out of whom 254 were females i.e., 63% and 148 males i.e., 37 % of the entire data set. It was found that the number of female therapists were 26% more than the males. According to data released by AOTA, in 2012 females dominate the occupational therapy field and a majority of 91% of the therapists are females. [6] According to a 2020 report of popular website Data USA 88% of the occupational therapists are females worldwide attributing to better emotional understanding and empathetic stand point. Following the same trend 63% of the budding occupational therapy workforce are women in India. However, it appears that India produces more male OTs in comparison to other parts of the world. [7-8-9]

Maximum therapists, i.e., 63% who have completed their graduation in last 5 years are in the age group of 20-25 years. Only 7.7% are of the age group 30 and above.

Almost 80% of the young occupational therapy workforce is either working in a metropolitan or urban type of work setup. A minority of 9.9% of the budding therapists work in the rural setup. There could be multiple causes for the same. Either there is a lack of awareness amongst rural population and rural areas in this sector or the concerned administration in the rural areas has yet to equip the therapists by setting up the required infrastructure for this sector, resulting in so few atherapist working in rural areas. This could be further investigated.

Majority of the budding therapists are working in a Clinic (29.85%). The percentage of therapists working in a Private Hospital/Rehabilitation Setup and Government Hospital/ Rehabilitation Setup is nearly the same, being 22.88% and 22.38% respectively. However only a small population of therapists work in Non-Government Organizations (NGO) and School Setups (8.20% and 8.95% respectively).

Only 26.4% are employed in the government setup indicating lack of enough government posts and less interest of the candidates due to less remuneration. Setups in Urban and Metropolitan areas on the other hand provide better remuneration, working facilities and opportunities for recognition for the therapists. Similar reasons may account for the majority of the therapists working in Clinics and Private Rehabilitation Centres. The concept of therapists working in Special Schools and NGO's is a concept which has still not gained much popularity in India, but may gain momentum in the coming years.

As per the present study, majority of therapists are currently engaged in a Paediatric setup that is about 44.77% of the respondents, setups that caters

mixed populations, is the next in list of setups, in which young therapists are engaged in, the percentage being 25.87% followed by Neurorehabilitation i.e., 15.42%. 8.9% of the therapists are working in a Hand Rehabilitation setup. However, domains of Mental Health and Oncological Rehabilitation are concepts that are still in budding stage in the country and only 2.48% and 0.24% of the therapists are engaged in these setups. 2.23% of the therapists work in a Geriatric Care setup, which is also a growing trend in India.

In the present sample it is observed that a small percentage of therapists, i.e.,16.06% have an annual income of more than 4,00,000 INR. About 27.61% of therapists are working at an amount of less than 1,00,000 INR per year. 20.9% have a range of 1,00,000 to 2,00,000 INR. 17.41% are have their salary as 2,00,000 to 3,00,000 INR, 18.4% have their annual income as 3,00,000 to 4,00,000 INR. A minority of therapists work for incomes between 4,00,000 to 5,00,000 INR; 5,00,000 to 6,00,000 INR; more than 6,00,000 INR that is 7.96%, 1.9%, 6.2% respectively.

There are 45,000 qualified occupational therapists in India and around 2.5 lakh patients are handled by OTs in India per day.[4] Despite this fact, the average annual compensation range of occupational therapists in India was 2, 40,000 to 3, 60,000 INR [3,10] (2015),which falls way below than that of general physicians, which is 5, 39,488 INR [11] (2015). According to the website Pay-scale average annual salary of an occupational therapist is 4,09,349 INR [11] whereas annual salary of a general physician 6, 97,141 INR[7] as of the year 2021, clearly the gap seems to be widening.

Conclusion

The recent trends amongst budding occupational therapists in the country suggest that a young task force, majority in the mid-twenties mostly work in the urban and metropolitan areas of the country. Private setups and clinics, especially of Paediatrics, dominate as primary areas of practice in the country. The annual salary for majority does not increase more than 4 lakhs per annum. Lack of a regulatory body, limited government policies, limited job opportunities and overlapping professional boundaries could be factors contributing to limited practice areas and work setups of occupational therapy within the country. Encouraging more of adult based services setups, encouraging induction of OTs in School Setups, NGOs, Oncological Rehabilitation/ Mental Health and Geriatric Care units; awareness driven rural campaigns and reaching out to the administration regarding proper framework and regulatory body for the profession could be the possible solutions.

Limitations of the Study

The data collection was limited to an online mode only. A future scope of the study would explore a detailed statistical analysis to establish associations within different aspects of the questionnaire.

Source of Funding: The study was carried with the financial support provided to the corresponding author under the aegis of the International Chapter: All India Occupational Therapists' Association.

Conflicts of Interest: The authors have no conflict of interest.

Ethical Clearance: Not applicable in the present study

Declaration

The authors declare the following:

- that this manuscript is the original work of ours and entire information in it is accurate.
- that all research is conducted ethically. The data collected was survey based via a questionnaire which was administered Pan India, both online and offline. Before the data was collected, the authors informed the subjects that the identity of the participants will be confidential and if they (the participants) agreed, then they could proceed with the survey.
- that the content in the manuscript has not been previously published and is not being concur-rently submitted elsewhere.

Refrences

1. Murthi KM, "Evolution of Occupational Therapy Practice in India: An Overview of the Historical Foundation and Current Practice". Annals of Int. Occupational Therapy. 2019;2(3): 141-148. doi:10.3928/24761222-20190314-0.

2. All India Occupational Therapists' Association. "All India Occupational Therapists'

3. Association in the news" Available from http://aiota.org/temp/site/vision/vison_mission.pdf [Accessed 14th May 2018].

4. 3. Mani K, Provident IM" Compensation received by occupational therapists in India: A national survey". Indian Journal of Physiotherapy & Occupational Therapy, 2019;49(1), 22–28.

5. Government of India, "All India Survey on Higher Education (AISHE), 2019-20" Ministry of Higher Education, New Delhi, Table Number 11. pp 113/290 [Accessed 10th June 2021]

6. ANI, "Inclusion of Occupational therapy in health policies among other demands of AIOTA", Business Standard. 2019 Nov 9. Available from:https://www.google.com/amp/s/wap.business-standard.com/article-amp/news-ani/inclusion-of-occupational-therapy-in-health-policies-among-other-demands-of-aiota-119110900877_1.html.

7. Collins J , "A Female's Profession: Gender Disparity in Occupational Therapy" [PhD thesis on internet]. Eastern Kentucky University, 2019. Available from:https://encompass.eku.edu/honors_theses/671

8. Mani K, Sundar S,"Occupational therapy workforce in India: A National survey". Indian Journal of Occupational Therapy; 2019; 51(2):45-51. Available from: http://www.ijotonweb.org/text.asp?2019/51/2/45/259172

9. Maxim AJM, Rice MS, "Men in occupational therapy: Issues, factors, and perceptions". American Journal of Occupational Therapy. 201972:7201205050p1-7201205050p7. Available from:https://pubmed.ncbi.nlm.nih.gov/29280725/

10. American Occupational Therapy Association, "Surveying the profession. OT Practice". 2015;20 (7-11)

11. PayScale. Physician/ Doctor, General Practice Salary (India) [Internet]. 2015 [cited 2015 Oct 21]. Available from http://www.payscale.com/research/IN/Job=Physician_%2F_Doctor,_General_Practice/Salary

12. PayScale, Occupational Therapist (India) [Internet]. 2021 [cited 2021 June 21] Available from https://www.payscale.com/research/IN/Job=Occupational_Therapist_(OT)/Salary

Original

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Effect of Motor Relearning Program with Obstacle Walking on Dynamic Gait Performance and Functional Mobility in Subacute Stroke Subjects

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Abstract

Background: Gait difficulties are common post-stroke due to muscle weakness and postural imbalance. Motor relearning program is known to improve motor skills through task oriented practice, appropriate feedback and active participation of subjects. Obstacle walking helps in improving gait parameters, stepping over objects, walking endurance and reduces fall risk.

Objectives: To determine effect of Motor Relearning Program with obstacle walking on dynamic gait performance and functional mobility in sub-acute stroke subjects.

Materials and Methods: 30 sub-acute stroke subjects were assigned to one of the two groups. Group-A received Motor Relearning Program and Group-B received Motor Relearning Program with obstacle walking for 30 minutes, 5 days a week for 4 weeks. Both groups received 15 minutes of conventional exercises for upper limb. Dynamic gait performance and functional mobility were assessed pre- and post-intervention at 4 weeks using Dynamic Gait Index and Motor Assessment Scale.

Results: Pre-test scores of DGI and MAS were 11.53±3.53 and 3.83±0.48 in Group-A, 12.43±4.12 and 3.67±0.81 in Group-B which improved to 15.80±3.82 and 4.07±0.59 in Group-A, 18.67±4.86 and 4.73±0.96 in Group-B, post-intervention. Within group comparison of pre to post-test scores of DGI and MAS was found to be statistically significant in both groups. When post-test scores of DGI and MAS were compared in between groups, Group-B was found to be statistically significant than Group-A ($p<0.05$).

Conclusion: Both interventions were individually effective but Motor Relearning Program with obstacle walking was better than Motor Relearning Program alone to improve dynamic gait performance and functional mobility in sub-acute stroke subjects.

Keywords: Stroke, Motor Relearning Program, Obstacle Walking, Dynamic gait performance, Functional Mobility, Dynamic Gait Index, Motor Assessment Scale.

Introduction

Stroke is an acute, irreversible cerebrovascular accident caused due to interruption of blood flow in the brain[1] leading to motor impairment,[2] loss of voluntary control and walking speed affecting balance and mobility.[3] Deficits in gait, posture and

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walking speed require more energy consumption during walking. Asymmetric body alignment leads to imbalance and increases fall risk.[4, 5] Living with these post-stroke deficits increase the burden on the individual's family and community.[6] The recovery of mobility, especially walking is an important goal in both neurologic and geriatric population and therefore is an essential part of rehabilitation.

Motor Relearning Program (MRP) can train muscle activity and function preventing compensatory activity. Learning and mastering a motor skill depends on correcting unwanted muscle activity, feedback, practicing individual components of movement, understanding the relationship between postural adjustment and movement, progression of the activity and skill transfer.[7, 1] MRP helps in regaining control over motor activity in post-stroke individuals. An obstacle training program helps in balance and walking endurance thereby improving gait parameters, paretic side foot clearance, spatial temporal symmetry and better stride length.[8,5,9] It places a high demand on both the limbs and requires well-coordinated joint movements, helping individuals to understand motor deficits while crossing over objects.[10] Post-stroke, patients and their families face challenges that greatly alter their life style as a result of the sudden loss of functional independence.[9] MRP helps in achieving motor skills with task oriented approach and appropriate feedback.[1] Literature evidence suggests the importance of MRP in gaining functional recovery in post-stroke subjects than those who were in the conventional therapy in terms of balance function, performance on self-care and activities of daily living and integration into the community.[6] There is a dearth of literature on the effect of MRP in the lower limb and a previous study suggested the use of MRP in improving dynamic gait performance and functional mobility.[11] Similarly, the combined effect of MRP and obstacle walking on gait was not studied extensively. So this study aims to determine the effect of MRP along with obstacle walking on dynamic gait performance and functional mobility in sub-acute stroke subjects.

Methods and Methodology

30 male and female subjects between 40-65 years of age with sub-acute stroke (4 weeks to 6 months post-stroke)[12] were recruited and randomly assigned to one of the two groups. Subjects who could walk independently or by using an assistive device, having good cognition with Mini Mental State Examination score of 23 or greater and a score of 4 or greater on the Brunnstrom voluntary control grade were included in the study. Individuals with unstable cardiovascular, musculoskeletal or medical conditions, visual disturbances or any other neurological co-morbidities were excluded. Ethical clearance was obtained from the Institutional Ethical Committee and informed consent was taken from all the subjects. Demographic variables such as age, gender, type and duration of stroke were documented. Pre and post-intervention, dynamic gait performance and functional mobility were assessed using Dynamic Gait Index (DGI) and the walking component of Motor Assessment Scale (MAS) respectively. DGI and MAS were widely studied for their reliability and validity to assess gait and functional mobility.[13, 14, 15, 16, 17, 18]

Intervention conducted on the subjects

Subjects in Group A received MRP training which varied for each subject based on the missing components and difficulty they experienced while walking. Analysis of function, practice of the missing components and the activity, its progression and transference of learning were considered while training. The essential gait components were trained for during the stance and swing phases.[19] Subjects in Group B received MRP along with obstacle walking training on a 10 meter way on which obstacles were placed and the participants were asked to step over the obstacles while walking.[5] All subjects were given training for 30 minutes per session, 5 times a week, for 4 weeks. The frequency of exercise was based on the individual's physical performance and subjects were given rest whenever required while training. Both groups received another 15 minutes of conventional exercises for upper limbs which included stretching, range of motion and strengthening exercises.[20, 21]

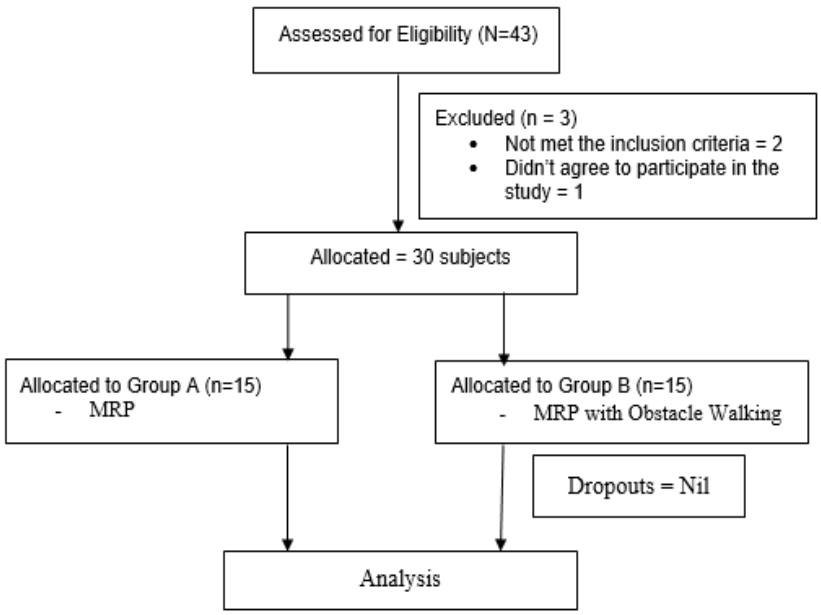

Fig 1: Consort Flow Diagram

Results

Table 1: Range, mean and SD of age and gender of subjects with subacute stroke in both the groups

S. No.	Variable	Group A	Group B
1	Age in Years	50.80±6.71	48.33±6.70
2	Male / Female	9(60%) / 6(40%)	10(66.7%) / 5(33.3%)

Table 2: Range, mean and SD of outcome measures of subjects with subacute stroke in Group A

S. No.	Outcome measures	Group-A				Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	DGI	5-17	11.53±3.53	8-21	15.80± 3.82	$z=4.800^{S}$	p<0.001
2	MAS	3-4	3.83±0.48	3-5	4.07±0.59	$z=4.833^{S}$	p<0.001

Note; S-Significant(p<0.05)

Table-3: Range, mean and SD of outcome measures of subjects with subacute stroke in Group B

S.No.	Outcome measures	Group-B				Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	DGI	3-17	12.43±4.12	7-24	18.67± 4.86	$z=3.820^{S}$	p<0.001
2	MAS	2-5	3.67±0.81	3-6	4.73±0.96	$z=3.557^{S}$	p<0.001

Note; S-Significant (p<0.05)

Table 4: Range, mean and SD of outcome measures of subjects with sub-acute stroke in between the groups

S. No.	Outcome measures	Pre test		Post test	
		Group-A	Group-B	Group-A	Group-B
		Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
1	DGI	11.53±3.53	12.43±4.12	15.80± 3.82	18.67± 4.86
2	MAS	3.83±0.48	3.67±0.81	4.07±0.59	4.73±0.96
Between groupcomparisons: Mann-Whitney U test		• DGI: Z=0.814, p>0.05, NS • MAS: Z=1.821, p>0.05, NS		• DGI: Z=2.019: p<0.05, S • MAS: Z=2.029, p<0.05, S	

S- Significant (p<0.05); NS – Not Significant (p>0.05)

Discussion

The present study aimed to determine the effect of MRP with obstacle walking on dynamic gait performance and functional mobility in sub-acute stroke subjects. Subjects in both groups were homogenous in terms of their age and gender. 15 subjects in Group-A were treated with Motor Relearning Program and the pre- to post-intervention results showed improvement in both DGI and MAS scores (p<0.001). The results are in line with previous literature where the authors observed that motor relearning was effective for improving functional recovery post-stroke. Motor learning takes place through observation and practice. It helps regain normal motor skills using task-oriented practice, appropriate feedback, self-reliance and active participation of subjects.[6, 22] Introducing normal daily routine, early intervention and task specific training during the initial phase of rehabilitation must have helped in motor control.[23] MRP concentrates on training real life activities adding specificity and variability to the tasks practiced.[24] In the present study, it was observed that the missing components of gait were different in each individual. It was seen that if foot dorsiflexion was weak in some participants, a few other participants had difficulty doing knee flexion. In MRP, the whole task was broken down into discrete parts, and then, individual components were practiced separately. MRP can help improving attention and inhibitory control, flexibility and updating memory which could have a direct relation with improvements in functional skills and mobility.[11] In Group-B, subjects were treated with MRP and Obstacle walking and significant improvement was observed between the pre- to post-intervention scores (p<0.001). The results of the present study are in line with Tung-Wu Lu et al., who observed improvement in gait with obstacle training by a specific symmetric kinematic strategy which primarily consisted of increased posterior pelvic tilt, a kinematically efficient way to elevate swing toe. During obstacle walking, post-stroke individuals seemed to adopt a strategy involving swing hip and knee flexion to maintain constant toe clearance. Pelvic control was more efficient than the distal hip or knee control and posterior pelvic tilt offered a more efficient approach to elevate the swing toe.[10] In another study, authors observed that obstacle walking helped foot clearance of the paretic limb during swing phase, also increasing knee flexion and ankle dorsiflexion which improved gait in community dwelling stroke survivors.[8]

While comparing the pre-test scores of DGI and MAS among the subjects in between the groups, it was observed that the scores were not statistically significant (p>0.05) and the subjects in both the groups were homogenous. When the post-test scores of DGI and MAS were compared in between the groups, though both groups improved individually post-intervention, Group B showed more significant improvement than Group A (p<0.05). It could be because of the combined effect of MRP and obstacle walking training. MRP involved assessment and training of various activities of daily living. This practice could have led to relatively permanent changes in skilled behavior.[25] On other hand, Obstacle walking helped gait parameters by improving the ability to step over objects, balance and walking endurance and speed.[8, 9, 20] Due to time restrictions, long term follow up and changes in functional mobility could not be assessed. In the present study, subjects who were able to walk independently were

included. It is recommended to apply MRP with obstacle walking in subjects who need assistance.

Conclusion

Based on the results of the study, it can be observed that though MRP and MRP with obstacle walking are individually effective, MRP with obstacle walking was more effective in improving the dynamic gait performance and functional mobility in sub-acute stroke subjects and it can be considered as an integral part of gait rehabilitation.

Source of Funding: Self-Funded

Conflict of Interest: NIL

Ethical Clearance: Obtained from the Institutional Ethical Committee of Padmashree Institute of Physiotherapy.

References

1. Pandian S, Arya KN, Davidson ER. Comparison of Brunnstrom movement therapy and Motor Relearning Program in rehabilitation of post-stroke hemiparetic hand: a randomized trial. Journal of bodywork and movement therapies. 2012;16(3):330-7.
2. Brewer L, Horgan F, Hickey A, Williams D. Stroke rehabilitation: recent advances and future therapies. QJM: An International Journal of Medicine. 2013;106(1):11-25.
3. Kim BH, Lee SM, Bae YH, Yu JH, Kim TH. The effect of a task-oriented training on trunk control ability, balance and gait of stroke patients. Journal of Physical Therapy Science. 2012;24(6):519-22.
4. Weerdesteijn VG, Niet MD, Van Duijnhoven HJ, Geurts AC. Falls in individuals with stroke.Journal of Rehabilitation Research and Development. 2008;45(8):1195-1214.
5. Park KT, Kim HJ. Effect of the a circuit training program using obstacles on the walking and balance abilities of stroke patients. Journal of physical therapy science. 2016;28(4):1194-8.
6. Chan DY, Chan CC, Au DK. Motor relearning programme for stroke patients: a randomized controlled trial. Clinical rehabilitation. 2006;20(3):191-200.
7. Charulatha R. Comparison of Upper Limb Functional Outcomes in Stroke patients receiving Motor Relearning Programme (MRP) Vs. Proprioceptive Neuromuscular Facilitation (PNF) (Doctoral dissertation, College of Occupational Therapy, JKK Muniraja Medical Research Foundation, Komarapalayam). 2011.
8. Bassile CC, Dean C, Boden-Albala B, Sacco R. Obstacle training programme for individuals post stroke: feasibility study. Clinical rehabilitation. 2003;17(2):130-6.
9. Jaffe DL, Brown DA, Pierson-Carey CD, Buckley EL, Lew HL. Stepping over obstacles to improve walking in individuals with poststroke hemiplegia. Journal of Rehabilitation Research & Development. 2004;1;41.
10. Lu TW, Yen HC, Chen HL, Hsu WC, Chen SC, Hong SW, Jeng JS. Symmetrical kinematic changes in highly functioning older patients post-stroke during obstacle-crossing. Gait & posture. 2010;31(4):511-6.
11. Mainak Patra, Sudheera Kunduru. Effect of Motor Relearning Program on Dynamic Gait Performance and Functional Mobility in Sub-acute Stroke patients: A Pilot Quasi-Experimental Study. Istanbul International Modern Scientific Research Congress-III. 2022; pg 750-754.
12. Lim YH, Choi EH, Lim JY. Comparison of effects of botulinum toxin injection between subacute and chronic stroke patients: a pilot study. Medicine. 2016;95(7).
13. Matsuda PN, Taylor CS, Shumway-Cook A. Evidence for the validity of the modified dynamic gait index across diagnostic groups. Physical therapy. 2014;94(7):996-1004.
14. Marchetti GF, Lin CC, Alghadir A, Whitney SL. Responsiveness and minimal detectable change of the dynamic gait index and functional gait index in persons with balance and vestibular disorders. Journal of neurologic physical therapy. 2014;38(2):119-24.
15. Dye DC, Eakman AM, Bolton KM. Assessing the validity of the dynamic gait index in a balance disorders clinic: an application of Rasch analysis. Physical therapy. 2013;93(6):809-18.
16. Dean C, Mackey F. Motor assessment scale scores as a measure of rehabilitation outcome following stroke. Australian Journal of Physiotherapy. 1992;38(1):31-5.
17. Sabari JS, Lim AL, Velozo CA, Lehman L, Kieran O, Lai JS. Assessing arm and hand function after stroke: a validity test of the hierarchical scoring system used in the motor assessment scale for stroke. Archives of physical medicine and rehabilitation. 2005;86(8):1609-15.
18. Carr JH, Shepherd RB, Nordholm L, Lynne D. Investigation of a new motor assessment scale for stroke patients. Physical therapy. 1985;65(2):175-80.

19. Janet H. Carr, Roberta B. Shepherd. A motor relearning programme for stroke. London; An Aspen Publication;1983.

20. Jung J, Lee J, Chung E, Kim K. The effect of obstacle training in water on static balance of chronic stroke patients. Journal of physical therapy science. 2014;26(3):437-40.

21. Jeong YG, Koo JW. The effects of treadmill walking combined with obstacle-crossing on walking ability in ambulatory patients after stroke: a pilot randomized controlled trial. Topics in stroke rehabilitation. 2016;23(6):406-12.

22. Anandan D, PK TN, Arun B, Priya V. Effect of task specific training with proprioceptive neuromuscular facilitation on stroke survivors. Biomedicine. 2020;40(3):363-6.

23. Bhalerao G, Kulkarni V, Doshi C, Rairikar S, Shyam A, Sancheti P. Comparison of Motor Relearning Program versus Bobath approach at every two weeks interval for improving activities of daily living and ambulation in acute stroke rehabilitation. International Journal of Basic and Applied Medical Science. 2013;3:70-7.

24. Kanase SB. Effect of motor relearning programme and conventional training on functional mobility in post stroke patients. Indian Journal of Public Health Research & Development. 2020;11(5):496-501.

25. Kannabiran B, Cathrine S, Nagarani R, Senthil R, Sahayaraj S. A study on efficacy of Bobath technique and motor relearning programme on functional activities in hemiplegic patients. Int J Neurorehabilitation. 2016;3(235):2376-0281.

Original Research

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Comparative analyses of the effects of Glucosamine and Chondroitin Sulphate Iontophoresis on Cartilage Thickening, Interleukine-6 and Uric Acid in patients with Knee Osteoarthritis

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Abstract

This study compared the chondroprotective actions of glucosamine and chondroitin sulphate iontophoresis for cartilage remodeling using Interleukine-6 and Uric Acid as biomarkers. 78 participants with grade II knee OA were randomly assigned to 3 groups. Group one participants received 1g of glucosamine sulphate (GS) while group two received 1g of chondroitin sulphate (CS) through iontophoresis (40mA- min as dosage). Group three participants served as control. The serum concentrations of IL–6 and uric acid were determined while the cartilage thickness was measured using a 7- to 12-MHz linear probe. Descriptive statistics and ANOVA were used to analyze the data. There were significant reductions in the concentrations of interleukin-6 and uric acid at 12th week compared to baseline for the 3 groups ($p = 0.01$). The IL–6 in the CS group was significantly lower compared to that of the GS group ($p = 0.01$). After 12 weeks, across the 3 groups, no significant changes were observed in uric acid concentrations and sonographic features (JSW and ICT). The administration of both drugs significantly reduced inflammatory reactions. However, CS significantly lowered IL–6 compared to GS but there was no significant effect on uric acid concentration. Also, there was no significant change in cartilage thickening after 12 weeks.

Keywords: Osteoarthritis, Glucosamine, Chondroitin Sulphate, Iontophoresis, Interleukine-6, Uric Acid

Introduction

It is increasingly imperative to understand the biochemical and molecular changes involved in the pathogenesis of osteoarthritis (OA), as this may give an insight to providing effective treatment options, and monitoring disease progression or prognosis. Osteoarthritis was considered to be a non-inflammatory joint disease but there are emerging evidences that inflammatory mediators are produced by articular tissues that are implicated in the pathogenesis[12,3,4].

Morphological changes in OA include cartilage

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erosion and synovial inflammation and these have been attributed to changes in series of biochemical factors, including proteolytic enzymes resulting in cartilage breakdown[5]. Although, there is still doubt about biomarkers in relation to stages of osteoarthritis in patients but biomarkers such as interlukin-6 and uric acid have been reported to compromise cartilage degeneration and synovitis leading to greater risk of cartilage loss in patients with OA[6,7]. Increased plasma biomarkers have been considered to be the hallmark of increasing joint inflammatory reactions[4, 8]. Few studies reported that the level of different biomarkers were more in synovial fluid than sera due to their origin from joint cartilages[1,2,3,4].

Amongst drugs which have been speculated to be disease-modifying are glucosamine and chondroitin, but the magnitude of their effects remain unclear and controversial[9]. Both drugs are two molecular building blocks found in articular cartilage, and most clinical research suggested that they have potentiality to retard progression or regenerate damaged cartilage[10]. Most of these trials adopted either the use of oral or intramuscular injections in the administration of glucosamine and chondroitin sulfate whereas there are alternative methods involving the use of electromotive forces in medical rehabilitation field[10,11,12,13].

Biomarkers such as interleukin – 6 and uric acid are known for quantifying joint remodeling and disease progression[12,13]. Specifically, interleukin-6 and uric acid have been reported to be important in monitoring the efficacy and safety of disease modifying OA drugs[14]. The use of electromotive force, especially iontophoresis is becoming a trend in the management of degenerative OA [15]. Electromotive Drug Administration of glucosamine sulphate had been reported to reduce pain, improve physical function and enhance cartilage thickening in patients with knee OA[16]. However, it is unknown if iontophoretic application of glucosamine cream will be more effective than chondroitin sulphate in lowering inflammatory reactions and increasing cartilage regeneration in patients with knee osteoarthritis.

Materials and Methods

78 patients with OA of the knee joint were recruited from the Physiotherapy Departments of Osun State University Teaching Hospital, Osogbo, Osun State, Nigeria. The study period was (June 2020 to July 2021)..

Instruments

The major test instruments and reagents are Glucosamine sulphate cream (glucosamine 8% w/w), (Urah), Chondroitin sulphate cream (Vitabiotics), Ultrasound scanning machine (Model; Landwind Mirror 5China), Electrical stimulator (Model: Endomed 582, India), Elisa plate reader (Model: URIT 660, China) was used for reading optical density (OD) micro plate, Elisa plate washer and incubator (Model: URIT 660, China), Microwell (Model: Accubing, USA) - It is the template with which sample, control and reagent are dispensed, Pipette (Model: 5ml, China), Plasma transfer bottle (Model: 5ml plain) and Chromogen (Model: Accubing, USA).

Methods: Inclusion and Exclusion Criteria

Included were patients with grade II knee osteoarthritis, being 30 years and older, and duration of onset not less than three months. Excluded were patients with history of cardiac disorder with pacemaker, knee surgery, diabetes and nutritional disorder, neuromuscular and other musculoskeletal diseases; and intra articular therapy within two months before the commencement of the study.

Sampling Techniques

107 patients were recruited and purposive sampling technique was used to select 87 participants who met the inclusion criteria. 78 participants completed the study.

Research Design

A randomized controlled trial involving random allocation into 3 groups using Fish-bowl technique.

Procedure for Data Collection

Ethical approval was obtained for the study (UTH/EC/2021/11/549). Informed consent was

obtained from participants. Group 1 participants received 2 FTU (an equivalence of 1g) of GS while group 2 also received 1g of CS, both through iontophoresis. The control group had quadriceps muscle strengthening using resisted exercise (1RM, 10 repetitions and 3 sets); a baseline treatment for the groups. The quantity of weight required for strengthening was determined for each participant by determining 1RM[17]. Each patient flexed and extended the knee joint against the weight for 12 weeks using Standardized procedures[18].

Galvanic current mode was used to deliver the cream through the skin. One gram of GS was placed on positive electrode (being positively charged using Trans-arthral electrode placement technique) for administration of Iontophoresis [40mA-min (2mA x 20minutes)][9,19,20]. The active electrode was placed on the knee side where the participants experienced higher pain intensity. The skin areas where electrodes were fastened were cleansed with methylated spirit (70% alcohol) to minimize the risk of burns[21]. The electrodes were soaked in 3ml of tap water prior to application and held in place by adhesive straps. Interventions were twice a week for 12 weeks.

One gram of Chondroitin Sulphate (CS) cream was placed on the positive electrode of the Electrical stimulator for participants in group 2. Other procedures adopted were as for participants in the GS group. The concentrations of IL–6 in plasma was determined by Enzyme-linked immune sorbent assay (ELISA), involving phases of incubation, washing, dispensing and optical density determination[22]. The concentrations of uric acid in plasma of the participants with knee OA was also determined using ELISA[22]. Cartilage thickness was measured as the distance between the thin hyperechoic line at the synovial space or cartilage interface and the sharp hyperechoic line at the cartilage-bone interface[23]. The cartilage thickness was determined by measuring the lateral and medial joint space width; and intercondylar thickening using Ultrasound machine.

Data Analysis

Descriptive statistics and ANOVA were used to analyze data obtained. Post Hoc Analysis (LSD) was used to determine trend of differences in the groups. The Alpha level was set at $p \leq 0.05$.

Results

The physical characteristics and duration of onset of knee OA are presented in table 1. The radiographic parameters are presented in table 2. There were no significant differences in LJSW, MJSW and ICT of the knee joint within the control, and across the groups (Table 3). The mean and ICT for participants are presented in Table 4.

Table 1: Across- group Comparison of Physical Characteristics

	Glucosamine sulphate		Chondroitin sulphate		Control			
	Mean	**±SD**	**Mean**	**±SD**	**Mean**	**±SD**	**F-ratio**	**p-value**
Age (Years)	59.576	12.423	55.962	9.154	63.654	11.171	3.041	0.005
Weight (Kg)	70.346	7.536	75.500	11.208	76.308	9.711	2.613	0.008
Height (m)	1.585	0.093	1.570	0.946	7.294	29.107	1.042	0.361
BMI (kg/m^2)	28.092	3.116	30.635	4.776	30.644	4.218	3.333	0.042

The serum concentration of interleukin-6 for participants in the GS, CS and control groups are presented in table 4. There were significant differences in interleukin-6 concentrations within the GS, CS and control groups (F= 6.638, P= 0.001, F= 11.936, P= 0.001 and F= 15.666, P= 0.001). The Post hoc analysis showed that there was significant reduction in serum concentration of interleukin-6 at 12th week compared to baseline (p = 0.001) in the groups (Table 5). Table 4, 5, 6 and 7 also presents serum concentrations of uric acid within and across.

Table 2: Within-groups Comparison of Sonographic Parameters

		Baseline		4th week		8th week		12th week			
	SP(mm)	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	F-ratio	p-value
GS	LJSW	2.655	0.715	2.660	0.723	2.671	0.717	2.720	0.705	0.114	0.736
	MJSW	2.555	0.594	2.561	0.593	2.577	0.589	2.587	0.566	0.047	0.828
	ICT	2.847	0.612	2.860	0.601	2.892	0.597	2.937	0.587	0.340	0.561
CS	LJSW	2.722	0.741	2.717	0.750	2.766	0.754	2.782	0.754	0.126	0.724
	MJSW	2.447	0.652	2.473	0.649	2.497	0.644	2.524	0.641	0.204	0.653
	ICT	2.779	0.707	2.785	0.705	3.598	3.856	2.892	0.701	0.396	0.531
Control	LJSW	3.035	0.857	2.920	0.878	3.064	0.854	3.083	0.857	0.173	0.679
	MJSW	2.802	0.788	2.809	0.773	2.830	0.789	2.885	0.874	0.146	0.703
	ICT	3.034	0.869	3.037	0.851	3.063	0.864	3.082	0.861	0.051	0.823

GS: Glucosamine Sulphate CS: Chondroitin Sulphate SP: Sonographic Parameters

Table 3: Across-Groups Comparison of Sonographic Parameters

		Glucosamine Sulphate		Chondroitin Sulphate		Control			
Sonographic Parameters (mm)	Week	Mean	±SD	Mean	±SD	Mean	±SD	F-ratio	p-value
LJSW	Baseline	2.655	0.715	2.722	0.741	3.035	0.857	3.057	0.083
	4^{th}	2.660	0.723	2.774	0.827	2.920	0.878	1.334	0.252
	8^{th}	2.671	0.717	2.766	0.754	3.064	0.854	3.267	0.075
	12^{th}	2.720	0.705	2.782	0.754	3.083	0.857	2.803	0.104
MJSW	Baseline	2.555	0.594	2.447	0.652	2.802	0.788	1.676	0.200
	4^{th}	2.561	0.593	2.508	0.701	2.809	0.773	1.133	0.291
	8^{th}	2.577	0.589	2.497	0.644	2.830	0.789	1.778	0.186
	12^{th}	2.587	0.566	2.524	0.641	2.885	0.874	2.294	0.134
ICT	Baseline	2.847	0.612	2.779	0.707	3.034	0.869	0.807	0.372
	4^{th}	2.86	0.60	2.84	0.78	3.03	0.85	0.357	0.55
	8^{th}	2.892	0.597	3.598	3.857	3.063	0.864	0.070	0.792
	12^{th}	2.937	0.587	2.892	3.701	3.082	0.861	0.512	0.483

Table 4: Within-Groups Comparisons of concentrations of Biomarkers

		Baseline		4th week		8th week		12th week			
	Biomarkers	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F-ratio	p-value
Glucosamine Sulphate	IL-6 (pg/ml)	21.274	3.183	20.727	3.187	20.360	3.321	18.977	3.271	6.638	0.011
	UA(mg/dl)	6.589	1.401	6.104	1.221	5.545	1.134	5.106	1.075	22.010	0.001
Chondroitin Sulphate	IL-6 (pg/ml)	19.611	3.007	18.457	2.839	17.901	2.771	16.984	2.384	11.936	0.001
	UA(mg/dl)	7.062	1.158	6.248	1.049	5.632	1.043	5.121	1.012	46.495	0.00 1
Control	IL-6 (pg/ml)	19.434	2.854	18.840	2.678	17.820	2.524	16.724	2.335	15.666	0.001
	UA(mg/dl)	6.910	1.654	6.270	1.597	5.910	1.537	5.494	1.460	10.628	0.002

Table 5: Within-Group Mean Changes in the Concentrations of Biomarkers

	Biomarkers	I	j	Mean Changes (i-j)	p-value
Glucosamine Sulphate	IL-6 (pg/ml)	1	4	2.297	0.001
	UA (mg/dl)	1	3	1.045	0.001
			4	1.483	0.001
Chondroitin Sulphate	IL-6 (pg/ml)	1	3	1.710	0.028
			4	2.627	0.001
	UA (mg/dl)	1	2	0.814	0.001
			3	1.430	0.001
			4	1.940	0.001
Control	IL-6 (pg/ml)	1	3	1.614	0.031
			4	2.710	0.001
	UA (mg/dl)	1	3	1.000	0.026
			4	1.417	0.002

Significant at $p < 0.05$

***Key**, IL-6; Interleukin-6, UA; Uric Acid. 1: Baseline, 2: 4th week, 3: 8th week, 4: 12th week.*

Table 6: Across-groups Comparisons of concentrations of biomarkers

		Glucosamine		Chondroitin		Control			
	Week	Mean	±SD	Mean	±SD	Mean	±SD	F-ratio	p-value
IL-6 (pg/ml)	Baseline	21.274	3.183	19.611	3.007	19.434	2.854	4.730	0.001
	4th	20.727	3.187	18.332	2.803	18.806	2.646	5.014	0.009
	8th	20.360	3.321	17.901	2.771	17.820	2.524	9.799	0.002
	12th	18.976	3.271	16.984	2.384	16.724	2.335	8.851	0.004
UA (mg/dl)	Baseline	6.589	1.401	7.062	1.158	6.910	1.654	0.656	0.420
	4th	6.104	1.221	6.141	1.123	6.253	1.588	0.156	0.687
	8th	5.545	1.134	5.632	1.043	5.910	1.537	1.085	0.301
	12th	5.106	1.075	5.121	1.012	5.494	1.193	1.324	0.254

Table 7: **Across-Groups Mean Changes in the Concentrations of Biomarkers**

	Biomarkers	I	J	Mean Changes (i-j)	p-value
Baseline	IL-6 (pg/ml)	1	3	1.840	0.033
8th	IL-6 (pg/ml)	1	2	2.459	0.003
			3	2.539	0.002
12th	IL-6 (pg/ml)	1	2	1.993	0.010
			3	2.252	0.004

Discussion

The assessment of changes in Joint Space Width is currently the gold standard to monitor the effects of disease modifying drugs in Osteoarthritis (OA), and reports have also shown cartilage deterioration [24,25.] The current report showed no significant differences in lateral and medial JSW; and ICT following administration of glucosamine and chondroitin sulphate for 12 weeks. These findings contradicted the report of Onigbinde et al, Reginster *et al*. and Dahmers[9,26,27]. This might be due to manual

radiographic assessment adopted in previous studies, that are susceptible to errors[28]. The clinical implication of this current finding is that there was no significant progression in the degeneration of the knee joint of patients with OA after 12 weeks. Also, none of the interventions showed supremacy over the other in slowing down degenerative changes in the articular surfaces.

The current result showed significant reduction in the concentration of interleukin-6 at 12th week compared to that of baseline following administration of glucosamine and chondroitin sulphate iontophoresis. Significant changes were only observed in the interleukin-6 after 4th and 8th week administration of chondroitin and glucosamine sulphate iontophoresis. Generally, there was a significant reduction in IL-6 concentration within each group. Most previous studies documented decrease in serum concentration to be associated with decreasing degeneration[29-32]. Stannus et al and Mukundan et al reported that IL-6 was elevated in knee osteoarthritis in older adults[28,33]. Fraenkel et al., Robinson et al and Rubenhagen et al also reported associations of IL-1β production[34,35,37]. Contrarily, Vlad et al. reported no association between markers of inflammation and osteoarthritis[36]. The significantly lower concentration of serum IL-6 found in this study, implied reduced inflammatory reactions, and this could only be attributed to the effects of the interventions. The uric acid concentrations are also significantly lowered within each group but none of the interventions had supremacy over the other. Kim et al. had earlier reported that serum and urine uric acid was not a risk factor for knee OA progression[38].

Conclusion

Chondroitin sulphate significantly lowered interleukin-6 compared to Glucosamine but both reduced knee joint inflammatory reactions. There was no significant effect on uric acid concentration. Also, there was no progression in the degenerative changes after 12 weeks.

Conflicts of Interest: The authors declared that there is no conflict of interest regarding the publication of this article.

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Ethical Clearance: Ethical approval was obtained for the study from Osun State University Teaching Hospital (UTH/EC/2021/11/549).

References

1. Pelletier, J. P, Martel-Pelletier, J., Abramson, S. B. Osteoarthritis, an inflammatory disease: potential implication for the selection of new therapeutic targets. Arthritis Rheumatology, 2001, 44:1237-47. https://pubmed.ncbi.nlm.nih .gov /11407681.
2. Abramson, S. B., Attur, M., Yazici, Y. Prospects for disease modification in osteoarthritis. National Clinical Practice Rheumatology, 2006, 2: 304–312.
3. Sohn, D. H., Sokolove, J., Sharpe, O., Erhart, J.C., Chandra, P.E., Lahey, L. J. Plasma proteins present in osteoarthritic synovial fluid can stimulate cytokine production via toll-like receptor 4. Arthritis Resource Therapy, 2012, 14: 7. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3392793/
4. Berenbaum, F. "Osteoarthritis as an inflammatory disease" Osteoarthritis and Cartilage, 2013, 21 (1): 16–21.
5. Troeberg, L.; Nagase, H. Proteases involved in cartilage matrix degradation in osteoarthritis. Biochim. Et Biophys. Acta, 2012, 1824, 133–14
6. Krasnokutsky, S., Belitskaya-Levy, I., Bencardino, J., Samuels, J., Attur, M., Regatte, R. Quantitative magnetic resonance imaging evidence of synovial proliferation is associated with radiographic severity of knee osteoarthritis. Arthritis Rheumatology, 2011, 63: 2983–2991. https://www.ncbi.nlm.nih. gov/pmc/articles/PMC3183134/
7. Radojcic R Maja, Christian S Thudium, Kim Henriksen, Keith Tan, Rolf Karlsten, Amanda Dudley, Iain Chessell, Morten A Karsdal, Anne-Christine Bay-Jensen, Michel D Crema, Ali Guermazi. Biomarker of extracellular matrix remodelling C1M and proinflammatory cytokine interleukin 6 are related to synovitis and pain in end-stage knee osteoarthritis patients. Pain, 2017 Jul; 158 (7):1254-1263.
8. Hunter, D. J., Guermazi, A. Imaging techniques in osteoarthritis. PM&R, 2012, 4S68– 74.
9. Onigbinde, A. T., Owolabi, A.R., Lasisi, K., Sarah, O.I., Ibikunle, A. F. Symptoms-modifying effects of electromotive administration of glucosamine sulphate amongpatients with knee osteoarthritis Hong Kong Physiotherapy Journal, 2018, 38, No. 1: 1–13.

10. Dhote, V., Bhatnagar, P., Mishra, P. K., Mahajan, S. C., Mishra, D. K. "Intophoresis a Potential Emergence of a Transdermal Drug Delivery Sysytem". Scientia Pharmaceutica, 2012, 80 (1): 1–28.
11. Onigbinde, A.T., Olukola, A. F., Adenike,F. A., Oniyangi, S., Olaitan, O. L. An assessment of hamstring flexibility of subjects with knee osteoarthritis and their age matched control. Clinical Medicine Research, 2013, 2, (issue 6): 121-125.
12. Kraus, V. B. Osteoarthritis year 2010 in review: biochemical markers. Osteoarthritis Cartilage, 2011, 19:346–53.
13. Bijlsma, J.W., Berenbaum, F., Lafeber, F.P. Osteoarthritis: an update with relevance for clinical practice. Lancet, 2011, 377: 2115–26.
14. Onigbinde, A. T., Adesina, O. D., Tarimo, N., Ojoawo. Comparative Effects of a Single Treatment Session Using Glucosamine Sulphate and Methyl Salicylate on Pain and Hamstring Flexibility of Patients with Knee Osteoarthritis. Special Issue: Supplementary Prescribing in Nigeria: A Needy Concept to Promote Clinical Physiotherapy Practice. American Journal of Health Research, 2014Vol. 2, No. 5-1
15. Onigbinde, A.T., Owolabi, A. R., Lasisi, K., Sarah, O. I. Symptoms-modifying Effects of Electromotive Administration of Glucosamine Sulphate among Patients with Knee Osteoarthritis. Hong Kong Physiotherapy Journal. 2017, Vol. 38, No. 1 (2018) 1–13. DOI: 10.1142/S1013702518500075
16. Mabey, T., Honsawek, S. Cytokines as biochemical markers for knee osteoarthritis. World Journal Orthopeadics, 2015, 6(1): 95-105.
17. Kisner, C., Colby,L.A. Therapeutic exercise: foundations and techniques. 5th edition, F.A. Davis Company. 1915 Arch Street, Philadelphia, PA 19103, 2007, www.fadavis.com.
18. Onigbinde, A.T, Olaoye, A.O, Lasisi, K. Clinical and Radiographic Indices as Correlates and Predictors of Self-Reported Physical Functions in Patients with Chronic Knee Osteoarthritis. Rehabilitation Sciences, 2016, 1(1): 9-15.
19. U.S. Patent 530,4380 Glucosamine derivative and liposome containing the same as membrane constituent., 1994, http://www.patentstorm.us/patents/5304380-description.html.
20. Tiziano M. Iontophoresis in pain management. Pract Pain Manage 2014. Available at: www. Practical Pain Management.com.
21. Gazelius, B. Iontophoresis theory htpp//www.perimed.se. 2001. Available at: http//www.perimed.se.
22. Shohichi, K., Toshihiko, S., Junji, C., Chaoying, J., Kazuhiko, I., Jun, K. Interleukin–6 and interleukin–8 levels in serum and synovial fluid of patients with osteoarthritis. Arthritis Resource Therapy, 2009, Pages 71-79
23. Roman-Blas, C. L., Herrero, B. Glucosamine sulfate for knee osteoarthritis: science and evidence-based use Journal of Physical Therapy Science, 2016, (8): 2249–2252.
24. Graig, W. Glucosamine and chondrition for osteoarthritis. Work Safe BC Evidence Based Practise Group, 2003, 1(6):700–3.
25. Carrillon, Y. Imaging knee osteoarthritis. In: Bonnin M, Chambat P, eds. Osteoarthritis of the Knee. Paris: Springer Verlag, 2008, 3–14.
26. Reginster, J., Bruyere, O., Lecart, M., Henroitin. Naturocetic (glucosamine and chondroitin sulphate) compounds as structure-modifying drugs in the treatment of Osteoarthritis. Current Opinion Rheumatology, 2003, 15(5):651–5.
27. Dahmers, S., Schiller, R.M. Glucosamine. America Family Physician, 2008, 1578(4):471–6
28. Mukundan, A., Svetlana, K, Jonathan, S., Steven, B.A. Prognostic biomarkers in osteoarthritis. Current Opinion Rheumatololoy, 2013, 25(1): 136–144.
29. Vilim V, Olejarova M, Machacek S, et al. Serum levels of cartilage oligomeric matrix protein (COMP) correlate with radiographic progression of knee osteoarthritis. Osteoarthritis Cartilage. 2002;10:707–713. https://pubmed.ncbi. nlm.nih.gov/12202123/
30. Sharif M, Kirwan JR, Elson CJ, et al. Suggestion of nonlinear or phasic progression of knee osteoarthritis based on measurements of serum cartilage oligomeric matrix protein levels over five years. Arthritis Rheum, 2004, 50:2479–2488. https://pubmed.ncbi.nlm.nih.gov/15334461/
31. Pelletier, J.P., Raynauld, J.P., Beaulieu, A. DChondrointin sulfate efficacy versus celecoxib on knee osteoarthritis structural changes using magnetic resonance imaging: a 2-year multicentre exploratory study. Arthritis Res Therapy, 2016, 18(1):256.27809891. https://pubmed.ncbi. nlm.nih. gov/20570834/
32. Hoch JM, Mattacola CG, Medina McKeon JM, et al. Serum cartilage oligomeric matrix protein (sCOMP) is elevated in patients with knee osteoarthritis: a systematic review and meta-analysis. Osteoarthritis

Cartilage, 2011;19:1396–1404. Important meta-analysis, which showed that serum COMP is elevated in patients with knee osteoarthritis and is sensitive to osteoarthritis disease severity. https://www.ncbi.nlm.nih.gov/pmc/articles/ PMC3962955/

33. Stannus OP, Jones G, Blizzard L, et al. Associations between serum levels of inflammatory markers and change in knee pain over 5 years in older adults: a prospective cohort study. Ann Rheum Dis, 2012 (Epub ahead of print) Serum hsCRP, TNF-α, and IL-6 associated with different measures of worsening knee pain. https://pubmed.ncbi.nlm.nih.gov/22580582/
34. Fraenkel L, Roubenoff R, LaValley M, et al. The association of peripheral monocyte derived interleukin 1beta (IL-1beta), IL-1 receptor antagonist, and tumor necrosis factor-alpha with osteoarthritis in the elderly. J Rheumato, 1998, 25:1820–1826.
35. Rubenhagen R, Schuttrumpf JP, Sturmer KM, Frosch KH. Interleukin-7 levels in synovial fluid increase with age and MMP-1 levels decrease with progression of osteoarthritis. Acta Orthop. 2012, 83:59–64. https://www.ncbi.nlm.nih.gov/pmc /articles/ PMC3278659/
36. Vlad SC, Neogi T, Aliabadi P, et al. No association between markers of inflammation and osteoarthritis of the hands and knees. J Rheumatol. 2011, 38:1665–1670. https://www.ncbi.nlm.nih.gov/pmc/articles/ PMC3193179/
37. Robinson, W.H., Lepus, C.M., Wang, Q. Low-grade inflammation as a key mediator of the pathogenesis of osteoarthritis. National Reviewed Rheumatology, 2016, 12(10):580–59.
38. Go Dong Jin , Dong Hyun Kim, Jie Young Kim, Ali Guermazi, Michel Daoud Crema, David J Hunter, Hyun Ah Kim. Serum uric acid and knee osteoarthritis in community residents without gout: a longitudinal study. Rheumatology, October 2021, Volume 60, Issue 10, Pages 4581–4590, https://doi.org/10.1093/ rheumatology/keab048

Original Study

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Prevalence of Patello Femoral Pain Syndrome in Competitive Swimmers: A Cross Sectional Study

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Abstract

Objectives: To find out and know the prevalence of patello-femoral pain syndrome in competitive swimmers.

Study Design: A cross sectional study.

Study Setting: various swimming clubs around India

Participants: Competitive swimmers

Methodology: Firstly, various sports clubs and recreational clubs and university sports clubs in and around India was approached. After getting permission from the clubs, informed consent was obtained from the athletes. Then, questionnaire was distributed to the athletes. Then, based on the information collected from questionnaire, the athletes were chosen for screening of inclusion and exclusion criteria.

Results: only 10% prevalence found out of 100 competitive swimmers. Of them breast stroke and butterfly swimmers found 0% prevalence And in back stroke 6% prevalence and in free style 4% prevalence has been found. CONCLUSION: The study concluded that swimmers who uses back stroke and free style, have 10% chances of PFPS. Therefore, PFPS is very less prevalent in swimmers.

Key words: PFPS, runner's knee, Competitive swimmers, Flutter kick.

Introduction

Competitive swimmers are predisposed to musculoskeletal injuries of the upper limb, knee, and spine. This study highlights the epidemiology of injuries to competitive swimmers and provides prevention strategies for the sports health professional. Swimming is a unique sport that combines upper and lower extremity strengthening exercises with cardiovascular training in a non-weight bearing environment. A 5 year survey from National College Athletic Association revealed that overall elite swimmer injury rates were 4.00 injuries per 1000 hours of training.[1]

Four strokes are recognized in competitive swimming: (1) Freestyle (Front crawl stroke) (2) Butterfly (3) Backstroke (4) Breaststroke. The prevalence of musculoskeletal injuries in competitive swimmers is – shoulder - 37%, knee - 28%, spine -

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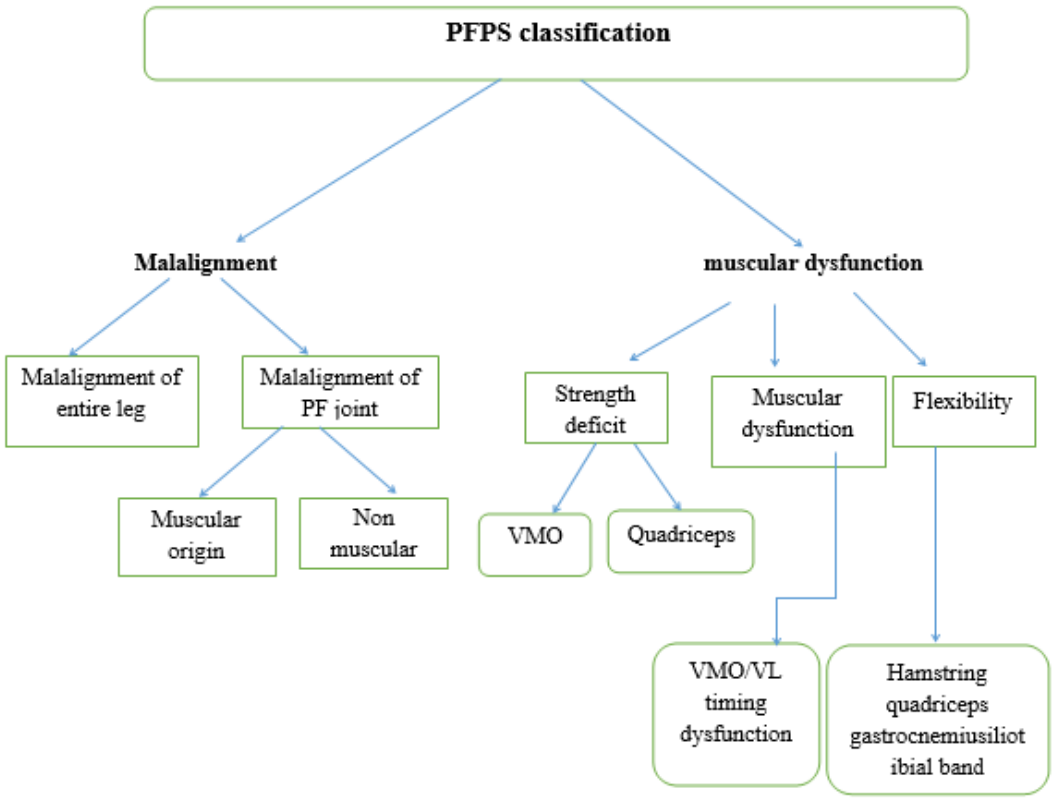
22.2% and the foot and ankle - 19%. Knee is second most reported source of pain in competitive swimmers.[1, 2, 3]

Swimming injuries primarily arise from Activity exposure in terms of distance covered range from 9 km/week at club level to 110 km/week at international level. Knee is second most reported source of pain in competitive swimmer. The kicking action of legs serves as a secondary propulsive force in back stroke, free style and butterfly. In flutter kick, there is repetitive quadriceps contraction which may lead to knee pain because of cumulative patello-femoral over load. High patello-femoral contact stress is also generated during push off from the wall because of forceful quadriceps contraction. This results in increasing patellofemoral contact stresses leading to anterior knee pain.[4,5]

Anterior knee pain is also known as patellofemoral pain syndrome (PFPS).PFPS is a common musculoskeletal condition characterised by anterior knee pain in activities that load the patellofemoral joint. The common signs and symptoms are – 1) Anterior or peri-patellar or retro patellar knee pain.2) Pain on Squatting, ascending or descending stairs.3) Pain on Prolonged sitting with knee flexion (movie or cinema sign).Majority of the scientific literature describing injuries in swimmers concentrates on swimmer's shoulder, hip abductor injury, MCL knee injury and lumbar disc injuries. The literature describing other injuries particularly PFPS is spars.

Malalignment



Abbreviation for PFPS classification

PFPS: Patello Femoral Pain Syndrome

PF: Patello Femoral

VMO: Vastus Medialis obliquus

VL: Vastus Lateralis

Aim and Objective

To find out and know the prevalence of Patello-femoral pain syndrome in competitive swimmers.

HYPOTHESIS

Research hypothesis: Patellofemoral pain syndrome will be prevalent among professional swimmers in India.

Null hypothesis: Patello femoral pain syndrome is not prevalent in competitive swimmers.

Review of Literature

1. **Scoring of Patellofemoral Disorders.[16](1993),**

   A study conducted on new questionnaire was used to evaluate subjective symptoms and functional limitations in Patellofemoral disorders. They concluded that a tendency to lateral patellar tilt during quadriceps contraction causes anterior knee pain and can be imaged in knee extension when the patella is not fully supported by femoral condyles.

2. **Evaluate subjective symptoms and functional limitations in Patellofemoral disorders.(1993)**

   A study was conducted on evaluation of symptoms and functional limitations. They have concluded that Kujala Scoring can be used as a standardized tool to diagose anterior knee pain patient.

3. **Prevalent knee pain and sport.[12] (1998),**

   A study was conducted on knee pain in active athletes. 339 athletes gave information about occupation sports activity and different features of knee pain based on self-filled questionnaire. The study concluded Constant or recurrent knee pain was positively associated with swimming. The prevalence. is associated with the type, amount and duration of sports participation.

4. **Knee pain in competitive swimming.[5](1999),**

   A study was conducted on knee pain in competitive swimmers. They found that 75% of swimmers reported at least three episodes of knee pain per season, and 47% of these swimmers reported weekly episodes of knee pain; the incidence of bilateral symptoms was equal to the incidence of unilateral symptoms. The data indicated knee pain is quite common in swimmers

5. **Clinical classification of patellofemoral pain syndrome.[9](2005),**

   A study was conducted on clinical classification of patellofemoral pain syndrome. In this study they introduced a classification system, which reflects a consents reached by the European Rehabilitation Panel. This classification system helped the clinicians to identify the causes of patellofemoral pain, and consequently help to select the most appropriate non-operative treatment. This study, therefore offers a classification system that provides the clinician with guidelines to classify and treat PFPS patients.

6. **Diagnostic value of five clinical tests in patello femoral painsyndrome.[13] (2006),**

   A study was conducted on validity of five clinical patellofemoral tests used in the diagnosis of PFPS. An investigator performed the vastusmedialis coordination test, patellar apprehension test, Waldron's test, Clarke's test, and the eccentric step test. In this study they concluded that the vastusmedialis coordination test, patellarapprehension test, Clarke's test, and the eccentric step test are more sensitive to diagnose PFPS.

7. **Short-Term Effects of Hip Abductors and Lateral Rotators Strengthening in Females With Patellofemoral Pain Syndrome: A Randomized Controlled Clinical Trial.[18](2010),**

   A study conducted on to investigate the influence of strengthening the hip abductor and lateral rotator musculature on pain and function of females with Patellofemoral pain syndrome. Seventy females, with a diagnosis of unilateral PFPS, were distributed randomly into 3 groups: 22 females in the knee exercise group, who received a conventional treatment that emphasized stretching and strengthening of the knee musculature; 23 females in the knee and hip exercise group, who performed exercises to strengthen the hip abductors and external rotators in addition to the same exercises performed by those in the knee exercise group; and of the 25 females who did not

receive any treatment. They concluded that Rehabilitation programs focusing on knee strengthening exercises and knee strengthening exercises supplemented by hip strengthening exercises were both effective in improving function and reducing pain in sedentary women with PFPS. Improvements of pain and function were greater for the group that performed the hip strengthening exercises, but the difference was significant only for pain rating while descending stairs.

8. **Epidemiology of injuries and prevention strategies in competitive swimmers.[1] (2012),**

   A systemic review was conducted on prevalence of musculoskeletal injuries in swimmers. A literature search was performed by a review of Google Scholar, OVID, and PubMed. The study included Articles published from 1972 to 2011. They concluded that the epidemiology of the upper limb, knee and spine injuries in competitive swimmers and provided prevention strategies for sports health profession.

9. **Persian translation and validation of the Kujala Patellof femoral Scale in patients with Patellofemoral pain syndrome.[6](2012),**

   A study was conducted to culturally translate and validate the kujala Patellofemoral scale and to find test-retest reliability, internal consistency, construct validity with 100 PFPS patients. They found test retest reliability=64.4, ICC=0.96. The study concluded that kujala Patellofemoral scale is a reliable and valid outcome measure.

10. **The relationship of breaststroke training on knee pain and q angle of breaststroke and crawl swimmers.[19](2014),**

    A study was conducted to determine the biomechanical and anatomical factors which predispose subjects to injury. This study included 60 breaststroke and crawl swimmers (16 ±3.2 years old) who participated in 3–6-year-long swimming training in Tabriz city. The knee pain was evaluated with McGill's pain questionnaire, and Q angle was measured with universal goniometry by knee radiography in standing position. The medial pain of knee joint increased significantly and the knee was only symptomatic when the swimmers performed the whip kick. Breaststroke swimmers were hardly able to complete training because of the knee pain. It is concluded that competitive training of breaststroke swimming for 6 months can cause exclusive injury and pain in swimmer's knee. On the other hand, the result showed that there is a direct relationship between the swimmer's Q angle amount and chance of the knee injury. This emphasizes a scrious consideration of Q angle states in breaststroke swimmers.

Methodology

Study design: A cross sectional study

Study population: competitive swimmers

Study sample size: As per the availability of competitive swimmers

Study setting: various swimming clubs in India

Study Duration: April 2017 to March 2018

Criteria for Selection:

Inclusion criteria

1. Age between 18 to 35
2. Competitive Swimmers
3. Anterior Pain in one or both knee on daily basis for at least previous 3 months History of insidious onset
4. Pain with at least 3 of the following tests:
   a. compression of patella against femur at rest – Patella grinding test
   b. quadriceps contraction with knee extended
   c. palpation of posteromedial and posterolateral border of the patella
   d. resisted isometric quadriceps muscle contraction at 60 degrees of flexion, squatting, stair climbing, kneeling or prolonged sitting
   e. Subjects who can read and write English

Exclusion criteria

- Subject will be excluded if they have a history of
  a. Patellar dislocation
  b. Knee surgery in past 1 year
  c. Concomitant diagnosis of bursitis, internal knee derangement, systemic arthritis, ligamentous knee injury or laxity, peripatellar tendonitis, plica syndrome, infection of the knee or cancer
  d. Concomitant musculoskeletal or neurological impairment in the involved lower extremity that influenced their gait
  e. Pregnancy

Materials Used:

a. Height measurement scale
b. Weighing machine

Data collection procedure:

The study was conducted in the year April 2017 to March 2018, in & around different cities of India. Competitive Swimmers attending Swimming classes were invited to complete a survey. Proper evaluation was done and the subjects were included and excluded based on the eligibility criteria. A written consent was taken from the participants for their voluntary participation, before filling the self-administered questionnaire. Participants were supposed to fill the consent form (Annexure-I).Validated questionnaires were printed and were made available to Participants through personal visits. The questions were asked in English. Participants were given a brief explanation about the type of study, its need significance and the benefits. They were explained about how to fill the questionnaires. The completed copies of the questionnaire were collected through personal visits in the respective Swimming classess in due time frame. The study procedures were approved by Ethical Review Board of Srinivas College of Physiotherapy and Research Centre, Pandeshwar, Mangalore, Dakshina Kannada District under Rajiv Gandhi University of Health Sciences, Bangalore, India.

Results

Total 100 competitive swimmers male and female using different style, were screened among Indian population. 10 competitive swimmers out of 100 were found to be suffering from PFPS; making overall prevalence 10% among them highest prevalence was found in freestyle and backstroke users.

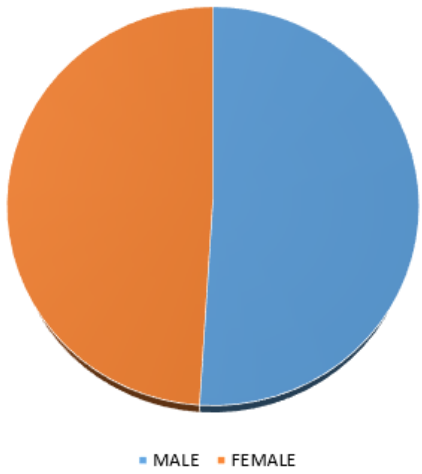


Fig 1 showing male female ratio

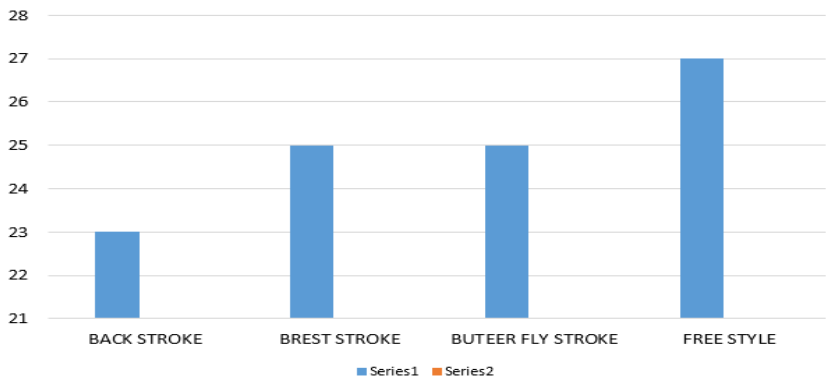


Fig 2 showing number of swimmers in each style

Table 1 showing prevalence of PFPS in different styles of swimming

STYLES OF SWIMMING	yes(%)	No(%)
BACK STROKE	6	94
BREAST STROKE	0	100
BUTTERFLY STROKE	0	100
FREE STYLE STROKE	4	96

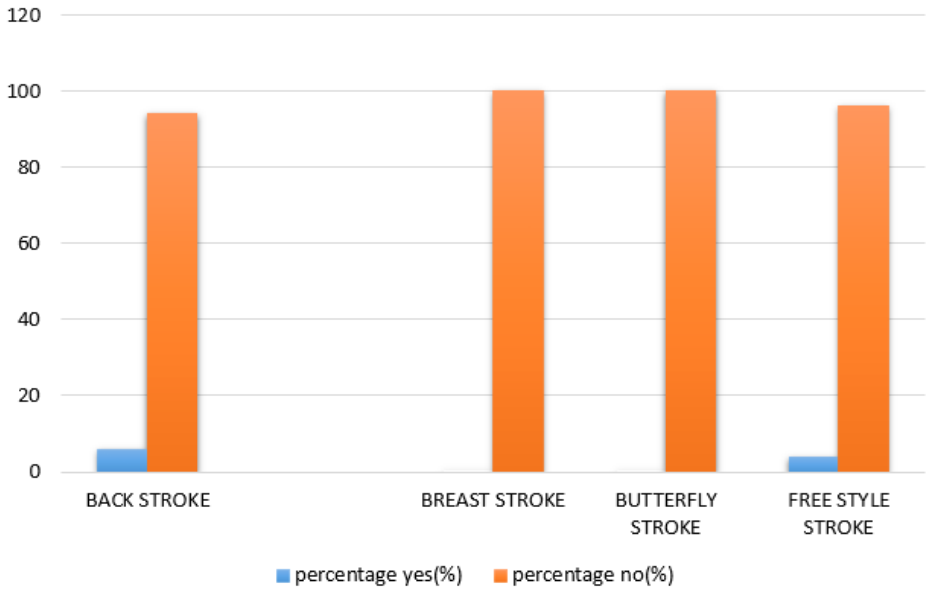


Fig 3 showing prevalence of PFPS in different styles of swimming

Discussion

As PFPS is multi-factorial condition. In swimmers there are chances of occurrence of PFPS because of few faulty techniques. In present study, results were computed based on the information of competitive swimmers, who participated in state and national level competition.

This is the 1st study intended to know the prevalence of PFPS among competitive swimmers in Indian population. Based on information gathered the overall prevalence is 10%. It is prevalent only in free style and back stroke swimmers, which proves that there is less chances of occurrence of anterior knee pain in competitive swimmer. None of the swimmers having PFPS who swim the butterfly and breast stroke.

This study showed that swimmers who swim backstroke and free style were having low prevalence rate (10%) as compare who swim other style. because in backstroke and freestyle, flutter kicking action of legs serves as secondary propulsive force.[5]

Previous literatures have given the hypothetical reason that due to repetitive quadriceps contraction leads to an overload on PFJ and leads to an anterior knee pain.[5]

The diagnosis of PFPS was done on the basis of information gathered from screening questionnaire which comprise a knee pain map, clinical examinations including patellar grinding test, stepdown test and pain on palpation among 10 swimmers suffering from PFPS.

Limitations of this study were we have not used MRI for the further confirmation of diagnosis of PFPS, as MRI increase the likelihood of clinical diagnosis.

We have found that none of the swimmers discontinued from the competition despite suffering from PFPS, further studies can be done on finding the risk factors of PFPS in Indian competitive swimmers. On larger scale across country furthermore this study will be helpful in educating therapists, coaches, competitive swimmers also it will be helpful in developing preventive measures for PFPS.

Conclusion

➢ The major findings of this study were;

- There is a low prevalence of Patellofemoral pain syndrome.
- Chances of PFPS only in, who swim back stroke and free style.
- PFPS is not prevalent in swimmers who swim breast stroke and butterfly stroke.

Conflict of Interest: There is no conflict of interest declared in this study

Source of Funding: This Self funded

Ethical Clearance: Ethical Committee of Srinivas Group of College

References

1. Florian wanivenhaus, alicen Fox J.S., slma Chaudhury, Scott A Rodeo. Epidemiology of injuries and prevention strategies in competitive swimmers. Sports Health. 2012may; 4(3):246-251.
2. Barbara Oliveira Venancio, Pascale MuttiTacani, Paulo Cesar Porto Deliberato. pain prevalence in swimming athletes. Rev bras med esporte. 2012 nov ;18(6):394-399.
3. Marilyn M. pink, George T, Edelman, Russell Mark, and Scott A.Rodeo.Applied biomechanics of swimming. 2016 ; 4(3): 57-73.
4. Trevor Gaunt ,Nicola Maffulli . Soothing suffering swimmers : a systematic review of the epidemiology, diagnosis, treatment and rehabilitation of musculoskeletal .injuries in competitive swimmers. 2011 September 4; 103:45-88.
5. Scott A, Rodeo . Knee pain in competitive swimming. Clin Sports Med. 1999; 18(2):379-387.
6. Negahban H, Pouretezad M, Yazdi MJS, et al. Persian translation and validation of the Kujala Patellofemoral Scale in patients with patellofemoral pain syndrome. DisabilRehabil. 2012; 34(26):2259-2263.
7. Guy Hains, fracoishains. Patellofemoral pain syndrome managed by ischemic compression to the trigger points located in the peri-patellar and retro-patellar areas: A randomized clinical trial. 2010; 13:201-209.
8. Josh cleland, Meghann McRae. Ptellofemoral pain syndrome: A Critial Analysis of Current Concepts. Phys Ther Rev.2013july; 7:153-161.
9. Erik witrouw, S.Werner ,C. Mikkelsen et al . Clinical classification of patellofemoral pain syndrome : guidelines for non-operative treatment. KneeSurg Sports TraumatolArthrosc. 2005;13:122-130.
10. Sara R. Piva, Edward, John D. Strength Around the Hip and Flexibility of Soft Tissues in Individuals With and Without Patellofemoral Pain Syndrome. JOrthop Sports PhysTher . 2005; 35(12):793-801.
11. Kurt Grote, Todd L, Lincoln, James G. Gamble. Hip Adductor Injury in Competitive Swimmers.:Orthop J Sports Med.2004; 32(1):104-108.
12. T. Hahn, A. Foldspang. Prevalent knee pain and sport. Scand J Soc Med.1998; 26(1):42-52
13. J. Nijs et al. diagnostic value of five clinical tests in Patellofemoral pain syndrome. Manual Therapy2006;11: 69–7770
14. Christian Swann, Aidan Moran, David Piggott. Defining elite athletes: Issues in the study of expert performance in sport psychology. Psychol Sport Exerc; 2014:1-12.
15. Jo Nijsa,b, Catherine Van Geela, Cindy Van der auweraa, Bart Van de Veldea.manual therapy.2006;11:69-77.
16. Urho M. Kujala et al. Scoring of Patellofemoral Disorders. The Journal of Arthroscopic and Related Surgery.1993;9(2):15-163.
17. Matheus Oliveira de Almeida, Luiz Carlos Hespanhol, Alexandre Dias Lopes. Prevalence of musculoskeletal pain among swimmers in an elite national tournament. IJSPT. 2015;7:1026-1037.
18. Thiago Yukio Fukuda, Flavio Marcondesrossetto, Eduardo Magalhães, Flavio Fernandes Bryk, Paulo roBertogarcialucareli, nilzaaParecida de al Meidacarvalho, Short-Term Effects of Hip Abductors and Lateral Rotators Strengthening in Females With Patellofemoral Pain Syndrome: A Randomized Controlled Clinical Trial. 2010;40:736-741.
19. Mehrdad Hefzollesan, C Asghar Tofighi, 2, BahramJamali Qarakhanlou, 3, ohrab Ghalehgir1. The relationship of breaststroke training on knee pain and q angle of breaststroke and crawl swimmers. 2014;7(3):29-36.

Original Article

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Correlation Between the Simple Reaction Time and Cervical Proprioception in Asymptomatic Young Adults with Forward Head Posture (FHP): A Cross Sectional Study

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Abstract

Background: This study was designed to find the Correlation between the Simple Reaction Time and Cervical Proprioception in asymptomatic young adults with Forward Head Posture (FHP).

Purpose: To find the correlation between the Simple Reaction Time and Cervical Proprioception in asymptomatic young adults with Forward Head Posture (FHP).

Materials and Methods: Materials required for this study were Body markers, Tripod stand, Laptop, ON Protractor mobile application, Headband with laser beam device, Target with concentric circles, Deary-Liewald reaction time software. It was a cross-sectional observational study design. The sampling method used was Purposive sampling. One Sixty subjects with Forward head posture (CVA= $<49^0$) were included in this study. The written informed consent was taken. Informed consent document was signed, retained by the principal investigator and a copy was given to the participant. Deary-Liewald Time task and Cervicocephalic Relocation test was used to study the Simple Reaction Time and Cervical Proprioception respectively. All the data obtained was statistically analysed using proper tests.

Results: The results showed no significant (p value > 0.05) correlation of SRT with Cervical Rotation Proprioception, as the participants in our study were asymptomatic young adults with mean of 22.24±1.783years, had mild FHP and their scores on both the Simple Reaction Time and Cervical Proprioception tests were slightly above the normal range.

Conclusion: Our study concluded that there is no significant correlation of Cervical Proprioception with Simple Reaction Time in Asymptomatic Young Adults with Forward Head Posture.

Key Word: Forward Head Posture (FHP), Simple Reaction Time (SRT), Cervicocephalic Relocation Test (CRT), Craniovertebral Angle (CVA).

Introduction

Posture is defined as a musculoskeletal balance, resulting in minimal amount of stress and strain on the body. Forward head posture (FHP) is one of the most common type of poor head postures in the sagittal plane. Peterson-Kendall et al. defined FHP

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as 'a state in which the external auditory meatus is positioned anterior to the plumb line through the shoulder joint'.[1] Forward head posture (FHP) is commonly referred to as "text neck", "scholar's neck, "wearies neck", "hunch" or "reading neck".[2]It is caused by several factors which includes sleeping with the head elevated too high, extended use of computers, laptops & cell phones, lack of developed back muscle strength and nutritional deficiency such as calcium. Prolonged use of smart phones exposes individuals to cumulative trauma disorder caused by maintaining the same posture for long periods of time.

It is found that there is 73% prevalence of forward head posture in the age group of 18-30 years.[3]Craniovertebral Angle (CVA) is defined as the angle between the line passing through the C7 and the midpoint of the ear tragus with the horizontal line.[4] A young healthy adult exhibits an average Craniovertebral angle (CVA) within a 10° range from 49° to 59°. Therefore, subjects encountering angles less than 49° are considered as FHP.[5] FHP can be classified into: • mild CVA = 46.9-49.1 and • moderate to severe CVA = 40.7-43.2.[6] In FHP, the lower cervical spine goes into hyper flexion with the lordosis curve flattening out and the upper cervical spine goes into hyperextension with the lordosis curve becoming more pronounced. This causes the anterior shearing forces to increase than normal causing muscular imbalance, joint cervical position sense dysfunction and sensorimotor disturbance. As the head is held further forward the spinal canal lengthens through the neck, leading to an increased stretching and tension on the spinal cord and adjacent nerve roots. Common muscles that elongate and weaken due to forward head posture include: • Deep cervical flexors: such as longuscapitus and longuscolli, Erector spinae, middle trapezius and rhomboid muscles. Common muscles that shorten and tighten due to long-term forward head posture include •Sub occipital muscles, Levator scapulae muscle. The cervical spine plays a important role in providing proprioceptive input, which is evident through the abundance of cervical mechanoreceptors and their central and reflex connections to the vestibular, visual and central nervous systems.[7] It is known that altered sagittal cervical spine alignment potentially lead to altered sensorimotor integration through a modified afferent input from altered cervical spine kinematics.[5] Cervical proprioception plays a significant role in maintaining head on body stabilization, and there has been observed a close relationship between anatomical structures of the cervical spine in maintenance of this position sense and interaction with CNS. Reaction time can be described as the time taken between the application of a stimuli to the time taken to conduct an appropriate and timely response to it. Our Reaction requires intact sensory skills, cognitive processing and motor performance. Delay in appropriate and quick response can lead to injuries and fatality.[8]

AIM

To correlate the Simple Reaction Time and Cervical Proprioception in asymptomatic young adults with Forward Head Posture.

Material and Method

Materials required for this study were Body markers, Tripod stand, Laptop, ON Protractor mobile application, Headband with laser beam device, Target with concentric circles, Deary-Liewald reaction time software.It was a cross sectional observational study conducted on 160 subjects with Forward head postureUpper Trapezius Trigger Point, age between 18-30 years,was taken from Out patients department tertiary hospital and care centre. The method used in this study for sampling was Purposive sampling.

Inclusion criteria:

- Young adults: 18-30 years[3]
- Forward head posture (CVA= $<49^0$)[5]
- Both gender
- Normal corrected vision

Exclusion criteria:

History of any Musculoskeletal, Neurological and Cardiopulmonary conditions

- Cervical spine instability
- Trauma to cervical spine
- Cervical spine surgery
- Congenital spinal deformities
- Patients with impaired cognition
- Vertigo

- Impaired vision
- Individuals with neck pain

Outcome measures:

1. **Deary-Liewald Time Task:**

This software was designed by IJD and programmed by DL The software is used to assess the Simple Reaction time and Choice Reaction time. The programme is designed to run on all laptop and desktop computers and requires no special software. Participants are seated comfortably on a chair with a backrest in front of a laptop with the screen at—or slightly below—eye level, at least 20 inches (51 cm) from your eyes—about an arm's length distance. One white square is positioned in the centre of a laptop screen, set against a blue background which is shown to the participant. The stimulus refers to the appearance of a diagonal cross within the square. Each time a cross appears, participant responds by pressing a key with the index /middle finger with their preferred hand as quickly as possible after which it disappears and another cross appears shortly after. Twenty trials are performed. The Deary-Liewald reaction time task is a reliable and valid method for obtaining measurements. There are also instructions for downloading and using the new reaction time programme, and they encourage other researchers to use it. Its reliability is observed to be 0.94.[9]

Figure 1: Simple Reaction Time Task

2. **Cervicocephalic Relocation Test:**

Cervicocephalic relocation test (CRT) to the neutral head position (NHP),'' originally described by Revel, Andre´- Deshays, and Minguet (1991). Participants were blindfolded and had to sit as far back in the chair as possible with their arms hanging by their sides, keep the shoulders against the backrest, and place the rear of their heels on the floor facing a white, plain wall 90 cm apart, with their heads in a neutral position, a laser pointer was attached to the head and a button was given to the subject to turn the laser light on/off when necessary. Once the neutral head position was achieved and memorized, the subjects pressed the hand held button so that the laser light turned on and the mark left on the wall could be recorded. Then after actively rotating the head on the horizontal axis to both right and left sides in the comfortable end range of movement, the participants relocated their heads on the trunk to the beginning neutral position that they had memorized. After each relocation, the subject pressed the button once more. No feedbacks were given during the procedure. Six trials were carried out for each right and left head rotation.[4,10] If the mean value was higher than a threshold value of 7.1 cm or 4.5 degrees, the subject were considered as inaccurate. Target used to determine laser values (in degrees) of JPE based on the formula: Angle = tan -1 [error distance] [90 cm] its reliability is observed to be 0.81.[10]

Procedure

Approval from the Ethics Committee and MUHS was sought. Subjects were screened according to inclusion and exclusion criteria and only those eligible were included in the study (n=160). Asymptomatic young adults with forward head posture (CVA = $<49^0$). and age group of 18-30years were selected. Cervical proprioception and Simple Reaction time was recorded for each participant. The written informed consent was taken. Informed consent document was signed, retained by the principal investigator and a copy was given to the participant. Each participant participated in a single testing session and was given an information sheet to know the details of the study. The entire procedure was orally explained to the participant. Simple Reaction timeusing Deary-Liewald Time Task and Cervical proprioception using Cervicocephalic Relocation Test was recorded for each participant. The entire procedure took approximately 25-30 minutes. The Simple Reaction Time using Deary –Liewald time task was correlated with the Cervical Proprioception using Cervicocephalic Relocation Test scores. Data was analysed using Shapiro-wilk test. As data was not normally distributed, Spearman's correlation coefficient was used for correlation analysis of cervical rotation of left and right side with SRT.

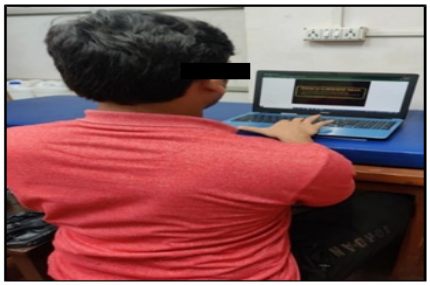

Figure 2: Participant performing SRT

Figure 3: Participant performing CRT

Data Analysis

- Data was analyse dusing Graph Pad Prism (Version9.4.0)

Table 1: Test for Normality

Test for Normality distribution	SHAPIRO-WILKTEST		
W	0.8772	0.9727	0.9869
P value	<0.0001	0.0029	0.1408
Passed normality Test (alpha=0.05)?	No	No	Yes
P value summary	****	**	Ns
Number of values	160	160	160

Table 2: Correlation analysis of simple reaction time with right cervicalrotation joint position sense

	S pearmanr
	SRT with Right side
R	0.1192
95% confidence interval	-0.04122 to 0.2737
P value	
P(two-tailed)	0.1332
P value summary	Ns
Exact or approximate P value?	Approximate
Significant?(alpha=0.05)	No
Number of XY Pairs	160

Table 3: Correlation analysis of simple reaction time with left cervical proprioception

	Spearmanr
	SRT with left side
R	0.06212
95% confidence interval	-0.09853 to 0.2196
P value	
P (two-tailed)	0.4352
P value summary	Ns
Exactor approximate P value?	Approximate
Significant? (alpha=0.05)	No
Number of XY Pairs	160

Result

- **Table 1,** shows, Shapiro-Wilk test for the normality of data with results.
- The data was tested for normality using Shapiro-wilk test considering the sample size (N=160). Simple Reaction Time and right side cervical rotation proprioception data did not pass the normality test while the left side cervical rotation proprioception data passed the normality test.
- Therefore, correlation was measured using non-parametric test, i.e., Spearman's correlation coefficient to find the relationship of Simple Reaction Time with right Cervical proprioception scores and Simple Reaction Time with left cervical proprioception scores.
- **Table 2:** Correlation of SRT with Right cervical rotation proprioception showing Spearman's correlation coefficient on the data, **(r=0.1192, N=160)** the results were found to be not significant **(p value>0.05).**
- This indicates that the rewash no correlation between SRT with Right cervical rotation proprioception.
- **Table 3:** Correlation of SRT with Left cervical rotation proprioception showing Spearman's correlation coefficient on the data, **(r=0.06212, N=160)** the results were found to be not significant **(p value>0.05).**
- This indicates that there was no correlation between SRT with Left cervical rotation proprioception.

Discussion

The prevalence of FHP is 73 percent amongst students, which may be a result of their habit of studying with their necks flexed, or from using laptops and cell phones more frequently, or from adopting specific positions or adopting improper posture for an extended period of time, which may result in muscular imbalance and be one of the causes of forward head posture.[3] Numerous research have shown that FHP can cause various abnormalities such as my of a scialtrigger points, cervicogenic headaches, neck pain, and are duction in lung capacity. Asa result, it's critical for the rapists to conduct a valid evaluation of FHP in order to gauge the effectiveness of the irtherapeutic interventions.[6]

This study was conducted on 160 asymptomatic young adults with forward head posture measuring CVA = $<49^0$ between the age of 18 to 30 years with a meanage of 22.24±1.783 Years. Participants in our study were screened for FHP by measuring Craniovertebral ANGLE using on protractor mobile application for assessing Forward head posture ICC=0.81[11]

Forward head posture can be classified based on the CVA scores as:

Slight FHP = 48.7±2.5

Moderate to severe FHP =41.9±3.9.[6]

In our study the Mean CVA score was 46.49±2.759 which corresponds to slight FHP with mean of 48.7±2.5, as the participants were asymptomatic and young (mean=22.24 years).

In their study, Zahra Salahzadeh et al. found that the Craniovertebral angle method is widely used to assess forward head posture (FHP) and involves evaluating the position of the head in relation to the seventh cervical vertebrae.

CORRELATION OFSRT WITH CERVICAL ROTATION PROPRIOCEPTION OF RIGHT AND LEFT SIDE:

The objective of our study was to find the relationship between Simple Reaction Time and Cervical Rotation Proprioception in Asymptomatic Young Adults with Forward Head Posture. The results showed no significant correlation of SRT with Cervical Rotation Proprioception for right and left side, as the participants in our study were asymptomatic young adults with mean of 22.24±1.783 years, had mild FHP and slightly higher Cervical Proprioception and Simple Reaction Time than normal.

It suggests that FHP along with degenerative changes due to aging or any musculoskeletal condition such as cervical spondylos is; trauma can be a risk factor affecting Cervical Proprioception and Simple Reaction Time.

In a study, Piotr Kocur et al. discovered that Age was negatively correlated with CVA values, which indicates a more anteriorly positioned head i.e., severity of FHP increases with age. Additionally, between the third and ninth decade of life, the SCM and UT muscles lose 1.5 percent of their elasticity each year and become stiffer.[12] numerous factors relating to the composition and operation of the connective tissue influence myotonometric assessments of the biomechanical characteristics of muscle. This tissue develops the deep and superficial fascial layer that envelops and penetrates muscle tissue. In reaction to external pressures, my of ascialt issue's structure and morphologyalter continuously and dynamically. Extracellular matrix morphology, or the amount of collagen and elastin 42, and especially collagen cross-linking 43, is known to have an impact on stiffness and elasticity. Therefore, we assume that the infiltration and degeneration of muscle connective tissue is the most likely

Cause of an increase in stiffness and loss inelasticity. The quantity of non-twitching connective or adipose tissue in skin and myofascial tissues rises with age, which affects both faster rates of ageing and higher rates of pain.

Conclusion

Our study concluded that there is no significant correlation of Cervical Proprioception with Simple Reaction Time in Asymptomatic Young Adults with Forward Head Posture.

Limitations

This study was conducted in a tertiary care hospital i.e., it was a unicentric study. Therefore, the results cannot be generalized to a larger population.

Ethical Clearance: Institutional ethical Committee, TNMC & BYL Nair College, Mumbai.

Conflict of Interest: Nil

Source of Funding: Self

References

1. Lee, Mi-Young; Lee, Hae-Yong; Yong, Min-Sik. Characteristics of Cervical Position Sense in Subjects with Forward Head Posture. Journal of Physical Therapy Science 2014;26(11):1741–1743.
2. ApurvaNitin Worlikar, Dr. Mayuri Rajesh Shah. Incidence of Forward Head Posture and Associated Problems in Desktop Users. International Journal of Health Sciences and Research.Feb 2019; 9(2): 96-100.
3. Sutantar Singh, KavitaKaushalet al. Prevalence of forward head posture and its impact on the activity of daily living among students of Adesh University – A cross-sectional study. Adesh University Journal of Medical Sciences &Research. Jul-Dec 2020; 2(2): 99-102
4. Leila Rahnama, IrajAbdollahiet al. Cervical Position Sense in Forward Head Posture versus Chronic Neck Pain: A Comparative Study. Journal of Clinical Physiotherapy Research; Jan 2017; 2(1): 39-42.
5. ElahehSajjadi, Gholam Reza Olyaei et al. The effect of forward head posture on cervical joint position sense. Journal of Paramedical Sciences (JPS).2014; 5(4): 27-31
6. Zahra Salahzadeh, Nader Maroufiet al. Assessment of forward head posture in females: observational and photogrammetry methods. Journal of Back and Musculoskeletal Rehabilitation.2014; 27(1): 131-139.
7. Ibrahim M. Moustafa, Ahmed Youssef et al: Is forward head posture relevant to autonomic nervous system function and cervical sensorimotor control? Cross sectional study. Gait and Posture.2020; 77(1): 29-35.
8. Pooja Shankar, Manali S. Desai, et al. Determination of simple reaction time in individuals with cervical spondylosis: International Journal of Physiotherapy and Research. 2018; 6(3):2701-04.
9. Ian J. Deary, David Liewald et al. A free, easy-to-use, computer-based simple and four-choice reaction time progamme: The Deary-Liewald reaction time task. BehavRes. 2011; 43: 258-268.
10. Gavin Morrison, PT. Forward Head Posture's Effect on the Cervical Spine. Spine-Health. 2018.
11. Jinal A. Mamania Deepak B. AnapDhanashree Tanksale. Validity and reliability of 'on protractor' smartphone application for measurement of craniovertebral and cranio- horizontal angle. Int J Physiotherapy: Aug 2017; 4(4): 207-211.
12. PiotrKucor, MaciejTomczak et al. Relationship between age, BMI, head posture and superficial neck muscle stiffness and elasticity in adult women: Scientific Reports. 2019: 1-10.

Original Research Article

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Prevalence of State Trait Anxiety and Binge Eating Disorder in Overweight Individuals: A Cross Sectional Study

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Abstract

Background: Overweight is a growing public health global epidemic that affects over 600 million people worldwide and leads to the development of multiple metabolic, mechanical, and mental health disorders associated with fatality. Binge eating disorder (BED) is a kind of eating entity associated with excessive weight. Nearly, 80% of those with BED have higher risk of psychopathology, including mood, anxiety, and sleep problems. Anxiety has repeatedly been associated with overweight and eating disorders. So, the aim of this study was to find the prevalence rate of state trait anxiety and binge eating disorder in overweight individuals.

Method: A self-administered questionnaire was prepared which consisted of survey related questions from State Trait Anxiety Inventory and Binge Eating Scale. Total 51 individuals were selected on the basis of selection criteria and the questionnaire was distributed amongst them. Data analysis using scientific calculation showed that there was high prevalence rate of high level of state anxiety, moderate level of trait anxiety with moderate level of binge eating in overweight individuals.

Conclusion: The study supported the alternative hypothesis and indicated that there was significant prevalence of state anxiety, trait anxiety as well as binge eating disorder in overweight individuals.

Keywords: State Trait Anxiety Inventory, Binge Eating Scale

Introduction

Overweight is defined by the World Health Organization (WHO) as an abnormal or excessive accumulation of fat in the body that can cause various changes in body functions and even behavior.[1] By 2025, it is envisaged that 2.3 billion adults around the world will be overweight, with 700 million individuals at risk for obesity.

The dominant pathogenesis is the imbalance in the processes involved in energy homeostasis, with an energy intake greater than energy expenditure, leading to energy storage.[2] Numerous problematic eating behaviors (viz. binge eating episodes, loss of control over eating) and mood (viz. anxiety or stress) have shown an association with increased weight.[3] Overweight is a major public health concern worldwide, with rates having nearly tripled since 1975. Worldwide, 37.4% of the adult population is overweight, while 23.7% of adults suffer from obesity.[4]

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Binge-eating disorder (BED) is defined by several criterias. Individuals must report consuming an unusually large quantity of food in a short span of time (compared to what others may consume in a similar situation) in addition to experiencing a loss of control over one's eating behavior during this period. In addition, at least three of the following features must also be present: consuming food much more rapidly than normal, eating food until uncomfortably full, consuming large quantity of food when not hungry, eating food alone to avoid embarrassment, or feeling frustrated, depressed, or guilty after eating.

Those with BED have a high prevalence of physical and psychological comorbidities. Nearly 80% of those with lifetime BED have suffered from disorders such as mood, anxiety, substance use, and eating disorders.[5,6] In addition to psychiatric concerns, BED is independently associated with increased risk of physical comorbidities including chronic diabetes, hypertension, back/neck pain, chronic headaches, and other types of chronic pain.[5]

Anxiety has repeatedly been associated with overweight and eating disorders. It has a complex impact on food consumption and can increase [6-9] or decrease food intake.[10] Emotional eating is an inclination to eat in response to positive or negative emotions, with the foods chosen predominantly being energy-dense and appealing.[11] This type of eating can result from numerous causes, such as using food to deal with negative feelings or confusing internal appetite and satiety with physiological changes connected with feelings.

Kehan Bao et al. in 2022 found that the greater food addiction symptoms were more strongly associated with greater objective binge eating and with higher levels of anxiety in youth.[12] There was also a small and significant positive correlation between food addiction symptoms and greater BMI in youth. So, excess weight with greater BMI is an important contributing factor for non-communicable chronic diseases (NCCD), as well as cardiovascular diseases (mainly coronary artery disease and cerebrovascular disease). From physiotherapy management point of view, it is necessary to know the prevalence and alleviate the levels of anxiety and binge eating by psychotherapeutic education, counseling and treatment to prevent complex clinical entities.

State Trait Anxiety Inventory (STAI): Anxiety is evaluated by the State-Trait Anxiety Inventory[13], which consists of two scales, one of trait anxiety, which requires subjects to describe how they generally feel, and a scale of state anxiety, for which the subjects are instructed to indicate how they feel at that moment. These scales are independent, have different connotations, and can be calculated as indicators of a single type of anxiety.

Binge Eating Scale (BES): This tool is used to raise data about binge eating, evaluates the severity of binge eating in overweight people, being considered a valid tracking device. The BES is a 16-item questionnaire assessing the presence of certain binge eating behaviors which may be indicative of an eating disorder.[14]

Materials and Method

Study Design: A Cross-Sectional study

Study Population: Overweight individuals

Study Setting: Fitness centres in Vadodara city

Study Duration: One time (longitudinal) study

Study Period: 6 months (November 2022 – April 2023)

Sampling Design: Convenience sampling method

Sample size: 51 individuals

Inclusion criteria:

- Age group - 20 to 59 years
- Gender - both male and female
- Individuals having BMI 25 to 29.9 kg/m^2
- Individuals who were able to comprehend commands
- Willingness to participate in the study

Exclusion criteria:

- Individuals on medication that may have altered gastrointestinal motility, appetite or absorption within the last 6 months including anti-anxiety drugs.
- Individuals undergoing psychological or psychiatrist treatment and not participating in any systematic weight loss programs.
- Disorder or condition that may affect appetite or weight viz. Type II diabetes mellitus, hyperthyroidism etc.

Materials used:

- Stadiometer
- Weighing machine
- State trait anxiety inventory (STAI)
- Binge eating scale (BES)

Outcome Measures:

1. State Trait Anxiety Inventory (STAI):

Spielberger, Gorsuch, Lushene, Vagg & Jacobs stated that it is a commonly used measure of state and trait anxiety. It is used in clinical settings to assess anxiety and to differentiate from depressive syndromes. It is also often used in research as an indicator of caregiver distress as mentioned by Ugalde et al. in 2014 and Greene et al. in 2017.

Anxiety Form Y, the most popular version, has 20 items for diagnosing state anxiety and 20 items for trait anxiety.[10]

State anxiety items comprise of: "I am tense; I am worried" and "I feel calm; I feel secure." Trait anxiety items consists of: "I worry too much over something that really doesn't matter" and "I am content; I am a steady person." All items are rated according to 4-point scale (e.g., from "Almost Never" to "Almost Always"). Higher scores indicate greater anxiety.

Scoring:

a) 20-34: Low Anxiety

b) 35-49: Moderate Anxiety

c) 50-64: High Anxiety

d) 65-80: Very High Anxiety

2. Binge eating scale (BES):

The BES comprises of 16 items measuring key behavioral (e.g., rapid eating, eating large amounts of food), and affective/cognitive symptoms (e.g., guilt, feeling out of control or unable to stop eating) that precede or follow a binge. Each item contains 3 to 4 statements that are weighted response options, which reflect a range of severity for each measured characteristics.[11]

The scale's possible total scores range between 0 to 46, with higher scores indicating symptoms of severe binge eating. Marcus, Wing, & Lamparski stated that individuals may be categorized into three groups as defined by established cut scores of binge eating severity: no or minimal binge eating (score ≤ 17), mild to moderate binge eating (score 18-26) and severe binge eating (score >27).

A self-administered questionnaire was prepared which consisted of survey related questions from State trait anxiety inventory (STAI) and Binge eating scale (BES).Total 51 individuals (aged between 20-59 years) were selected (convenience sampling) on the basis of inclusion and exclusion criteria from various fitness centres in Vadodara. Proper knowledge & education regarding the study was provided to the participants prior to the commencement of the study. After taking consent from the participants, study was executed. The questionnaire was distributed amongst the participants selected for this study and the responses were recorded for further data analysis.

Results and Discussion

- Data was analyzed by Microsoft Excel 2019. Prior to the statistical test, data was screened for normal distribution by Shapiro-Wilk test. After normal distribution of the data, scientific calculation was applied for data analysis.

Table 1: Frequency of different age groups (in years)

Age (Years)	Frequency	Percent	Cumulative Percent
20-24	37	72.5	72.5
25-29	1	2	74.5
30-34	5	9.8	84.3
35-39	2	3.9	88.2
40-44	1	2	90.2
45-49	2	3.9	94.1
50-54	2	3.9	98
55-59	1	2	100
Total	51	100	

Table 2: Mean Age (in years)

N	51
Mean	39.5
Std. Deviation	12.24

Interpretation: The above table shows that mean age of participants was 39.5 ± 12.24 years taken for this study.

Table 3: Prevalence rate of State Trait Anxiety (STAI-S) in overweight individuals

	State Trait Anxiety (STAI-S)			
	Low	**Moderate**	**High**	**Very High**
Male	0	2	5	0
Female	1	21	21	1
Total	1	23	26	1

Table 4: Prevalence rate of State Trait Anxiety (STAI-T) in overweight individuals

	State Trait Anxiety (STAI-T)			
	Low	**Moderate**	**High**	**Very High**
Male	0	5	2	0
Female	1	21	20	2
Total	1	26	22	2

Table 5: Prevalence rate of Binge Eating (BES) in overweight individuals

	Binge Eating (BES)		
	Non-binging	**Moderate Binging**	**High Binging**
Male	1	2	4
Female	2	25	17
Total	3	27	21

The need of the hour is to explore the psychological outlook of individuals living with overweight by taking into account multiple psychological correlates of overweight such as self-esteem, eating self-efficacy, perceived stress, physical hunger and body satisfaction and to compare their anxious symptomatology and levels of binge eating. Therefore, the need arises to quantify the existence of psychological profiles and eating disorders specific to male and female with overweight, as well as to investigate differences in the age, BMI, symptoms of anxiety and binge eating disorders. Thereby, we can know their prevalence and with the help of physiotherapy, we can provide adequate knowledge, counseling and treatment to prevent the occurrence of non-communicable disease and cardiovascular disease.

A British study which aimed at examining the association between sleep disorders, quality of life, anxiety and depression found out that these variables were highly prevalent among excessive weight individuals and more than two thirds of them reported poor sleep quality.[15]

With these evidence based results, a Canadian study compared insomnia symptoms in individuals with BED and in those with no record of eating disorders. The results of this study provided evidence of sleeping difficulties in the presence of BED. Moreover, anxiety and depressive symptoms mediated the relation between the insomnia symptoms and binge eating, showing the significance of mood, anxiety and sleeping difficulties for the comprehension and treatment of binge eating.[16]

Suzimar de Fatima in 2020 found that the prevalence of minimally moderate levels of state anxiety in overweight individuals was 96%. When a comparison was done for anxiety with sleep patterns and binge eating, a positive correlation was found among the overall population and in young adults as well as an inverse relation between age and anxiety in adults who were 45 or older i.e. the higher the age for this category, the lower the anxiety score. No differences were found between sexes regarding scale scores; however 80.8% of the study sample was female and the highest rates of moderate anxiety and poor sleep quality were seen in middle-aged groups whose age coincides with the climacteric period.

Lizeth Cifuentes et al. in 2022 found associations between symptoms of anxiety, eating behaviours, and self-efficacy for eating. Patients with excess weight with symptoms of anxiety showed higher mean scores for emotional eating and uncontrolled eating and low self-efficacy for resisting eating in challenging situations.

In this current study, the dependent variable, Strait Trait Anxiety Inventory was used in the study which measured two types of anxiety; state anxiety and trait anxiety. The other dependent variable used was Binge Eating Scale which assessed the presence of binge eating severity in overweight individuals.

The results of this study (using scientific calculation) showed that there was high prevalence rate of high level (51%) of state anxiety, moderate level (51%) of trait anxiety with moderate level (53%) of binge eating in overweight individuals.

Conclusion

The results of this current study supported the alternative hypothesis and indicated that there was significant prevalence of state anxiety as well as trait anxiety in overweight individuals. Moreover, the findings also showed the significant prevalence of binge eating disorder in overweight individuals. So, it was concluded that there was high prevalence rate of high level of state anxiety, moderate level of trait anxiety with moderate level of binge eating in overweight individuals.

Limitations

- The present study only examined a total of 51 overweight individuals using a convenience sampling method and this sample size is not sufficient for identifying a significant prevalence rate of state trait anxiety and binge eating disorder in overweight individuals.
- This was a one time (observational) study, so no follow-up with the participants was taken.
- Gender distribution was unequal.

Ethical clearance: Ethical clearance was obtained from The Institutional Review Board from Pioneer Physiotherapy College, Vadodara.

Source of funding: Self

Conflict of interest: Nil

References

1. Boutari, C.; Mantzoros, C.S. An update on the epidemiology of obesity and a call to action: As its twin COVID-19 pandemic appears to be receding, the obesity and dysmetabolism pandemic continues to rage on. Metabolism 2022, 133, 155-217.
2. Amin T, Mercer JG. Hunger and satiety mechanisms and their potential exploitation in the regulation of food intake. Curr. Obes. Rep. 2016;5(1):106–112.
3. Clark MM, et al. Psychological assessment and motivational interviewing of patients seeking bariatric and metabolic endoscopic therapies. Innovat. Tech. Gastrointest. Endosc. 2020;22(3):120–125.
4. Ng, M.; Fleming, T.; Robinson, M.; Thomson, B.; Graetz, N.; Margono, C.; Mullany, E.C.; Biryukov, S.; Abbafati, C.; Abera, S.F.; et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: A systematic analysis for the Global Burden of Disease Study 2013. Lancet 2014, 384, 766–781.
5. Kessler RC, Berglund PA, Chiu WT, et al. The prevalence and correlates of binge eating disorder in the WHO World Mental Health Surveys. Biol Psychiatry. 2013; 73:904–914.
6. Roehrig M, Masheb RM, White MA, et al. The metabolic syndrome and behavioral correlates in obese patients with binge eating disorder. Obesity. 2009; 17:481–486.
7. Nittari, G.; Scuri, S.; Petrelli, F.; Pirillo, I.; di Luca, N.M.; Grappasonni, I. Fighting obesity in children from European World Health Organization member states. Epidemiological data, medical-social aspects, and prevention programs. Clin. Ter. 2019, 170, 223–230.
8. Lash, M.M.; Armstrong, A. Impact of obesity on women's health. Fertil. Steril. 2009, 91, 1712–1716.
9. Tomiyama, A.J. Weight stigma is stressful. A review of evidence for the Cyclic Obesity/Weight-Based Stigma model. Appetite 2014, 82, 8–15.
10. Cuijpers, P.; Auerbach, R.P.; Benjet, C.; Bruffaerts, R.; Ebert, D.; Karyotaki, E.; Kessler, R.C. The World Health Organization World Mental Health International College Student initiative: An overview. Int. J. Methods Psychiatr. Res. 2019, 28, 1761.
11. Kuehner, C. Why is depression more common among women than among men? Lancet Psychiatry 2017, 4, 146–158.
12. Kehan Bao., Elan French., Brooke Schleyer., ShelynKhaikin., Eunice Y. Chen. Food addiction is associated with greater objective binge eating and eating disorder psychopathology and higher body mass index in youth:A meta-analysis. Psychiatry Research Communications. 2022, 2(3), 100067.
13. Biaggio AMB, Natalício L. Manual for the state-trait anxiety inventory (STAI). Rio de Janeiro: CEPA, 1979, 15.
14. Gormally, J., Black, S., Daston, S., &Rardin, D. The assessment of binge eating severity among obese persons. Addictive behaviors, 1982, 7(1), 47-55.
15. Hinz A, Glaesmer H, Brähler E, Löffler M, Engel C, Enzenbach C, et al. Sleep quality in the general population: psychometric properties of the Pittsburgh Sleep Quality Index, derived from a German community sample of 9284 people. Sleep Med. 2017; 30:57-63.
16. Kenny TE, Van Wijk M, Singleton C, Carter JC. An examination of the relationship between binge eating disorder and insomnia symptoms. Eur Eat Disord Rev. 2018;26(3):186-196.

Original Research Article

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A Comparative Study - Effectiveness of Instrument Assisted Soft Tissue Mobilization Versus Ischemic Compression on Pain and Range of Motion in College Going Students with Upper Trapezius Trigger Points

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Abstract

Background: Trapezitis is one of the common inflammatory conditions seen among college going students due to prolonged faulty posture, overuse, stressful neck movement, etc. Students with trapezitis frequently report pain, restricted range of motion, and trouble doing regular tasks. The majority of college-bound youngsters have trigger points over their trapezius muscles.

Need of study: There Is few Literatures or Research Work Available on This and No Comparison Is Done on Above Techniques.so this study was done to compare both the techniques.

Objective: To compare the effectiveness of IASTM and ischemic compression in trapezius trigger points in college going students.

Methodology: In this study, 45 participants were recruited based on inclusion and exclusion criteria. They were divided in 2 groups. group-A(n=23) (IASTM) and group-B(n=22) (IC). Each intervention was administered to them for a period of 2 weeks, 3 sessions per week in respective groups. Pre and post assessment was taken using following outcome measures VAS, NDI and cervical range of motion.

Result: Data was analysed by SPSS21, t-test was applied. Statistically significant improvements observed in both groups but more pronounced in group A(IASTM). VAS (3.0504) P (0.0042), NDI (6.20) P<0.0001.

Conclusion: The results suggested that IASTM gives better result than ischemic compression in relieving trapezius trigger points in college going students.

Keywords: trapezius, trigger points, students, Instrument Assisted Soft Tissue Mobilization (IASTM), ischemic compression.

Introduction

The most frequent musculoskeletal pain, both traumatic and non-traumatic, is neck pain. Most of them complain of "non-specific neck pain" brought

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on by poor postural habits or mechanical issues. [1] The dorsal side of the neck and trunk is where the trapezius, a sizable muscle, inserts into the thorax. It receives supply from cervical nerves (C3 and C4) and the motor spinal root of the accessory nerve (CN XI). [2]

Smartphones are one of the most used technical devices by people of all ages. According to a recent study, 79% of people between the ages of 18 and 44 use cell phones with their hands bent, leaving them with only a few hours of the day without their smartphones. [3] Common causes of trigger point triggering include lack of exercise, prolonged poor posture, emotional stress, armrests that are too high, sitting without a firm backrest. head tilt, any position where the shoulder is held for long periods of time can maintain trigger points in this muscle. [4]

Trapezitis is inflammation of the trapezius muscle leading to pain, present even at rest and aggravated with activity, inflammation in the muscle causing spasms and tension of the trapezius muscle. [5] Pain occurs even at rest and worsens with activity; it can be transferred to another area from the site of primary inflammation. [6]

The IASTM includes a number of rigid materials (plastic or steel) instruments of various morphologies that can be manually used by the clinician depending on the depth of pressure applied or the clinical picture. These devices are designed to apply longitudinal pressure along the path of the muscle and/or connective fibres. [7]

The IASTM technique contains a protocol for treatment that contains several components: examination, warm-up, IASTM treatment Currently, benefits derived from IASTM include releasing skin constraints, breaking collagen cross-links, increasing blood flow and possibly increasing cell regenerative activity. [8] IASTM also improve muscle strength and joint range of motion. Despite extensive use of IASTM techniques research regarding its effect on myofascial pain reduction, is limited. [9]

The idea of using an instrument is said to offer a mechanical advantage to the clinician by allowing deeper penetration and more specific treatment, while reducing stress on the hand. [10]

The ischemic compression technique uses the application of sustained pressure with sufficient force and for long enough to slow blood flow and release muscle tension. Once the pressure is removed, blood flows to the area that caused the trigger to stop working. [11]

Therefore, the present study has been undertaken to compare the effect of IASTM and IC onupper trapezius trigger points in college going students.

There is a dearth of literature present on Upper Trapezius Trigger Points in College Going Students so this study is aimed to determine the effect of IASTM and IC technique in college going student.

Aim and objectives

Aim:

To compare the effect of Instrument assisted soft tissue mobilization and Ischemic compression on upper trapezius trigger point in college going students.

Objectives:

1. To determine the effect of IASTM on pain intensity and neck disability index in upper trapezius trigger point in college going students.
2. To determine the effect of IC on pain intensity and neck disability index in upper trapezius trigger point in college going students.
3. To compare the IASTM and IC on pain intensity and neck disability index in upper trapezius trigger point in college going students.

Hypothesis:

- Null hypothesis: There is no significant difference in neck disability and pain in college going student treated with IASTM and IC.
- Alternate hypothesis: There is significant difference in neck disability and pain in college going student treated with IASTM and IC.

Materials and methodology

- **Source of data**: collage going students
- **Study design**: comparative study

- **Study duration**: 6 months
- **Study population**: students with trepezitis
- **Proposed sample size**:45
- **Sampling method**: Convenient sampling method

Inclusion criteria

- Participants within the age group of 18-26 years
- male and female both were included.
- VAS value between 4 to 7 out of 10,
- Participants with unilateral or bilateral trapezius tender point, duration of the pain from 7 days to 1 month,
- participants willing to sign the written inform consent form

Exclusion criteria

- Recent history of trauma or fracture in cervical spine, recent cervical spine surgery, fracture of upper limb and cervical.
- Participants taking any anti-inflammatory drugs, brachial neuralgia.
- Prolapse intervertebral disc, neck deformities like scoliosis or torticollis.
- Any type of skin infection, Open wounds in upper back area, Hypersensitive skin.

Procedure

A comparative prospective study was conducted at MatrusriDavalba hospital, Varnama, Vadodara. It was conducted for duration of six months. Total of 58 participants had participated in the study.

Total 58 participants were included and written informed consent was taken then baseline data and pre and post intervention assessment was done. After that the randomization within the groups was done by even and odd numbers Group A (n=23) (IASTM) and Group B (n=22) (IC).

The effectiveness of intervention was assessed using the outcome measure visual analogue scale (VAS), cervical range of motion by universal Goniometer and Neck Disability Index Questionnaire (NDI).

Group A (IASTM)

- Subjects received six sessions given in two weeks treatment of instrument assist soft tissue mobilization.
- Position of patient – sitting on chair hand supported on table and head resting on hand.
- Position of therapist- behind the patient towards involved side.
- Technique: hot pack was given 15 min prior to treatment, treatment area exposed properly then gel was used for lubrication then instrument used at angle of 45 applied slow strokes on the muscle from origin to insertion (sweeping technique) for 3 min.

Group B (IC)

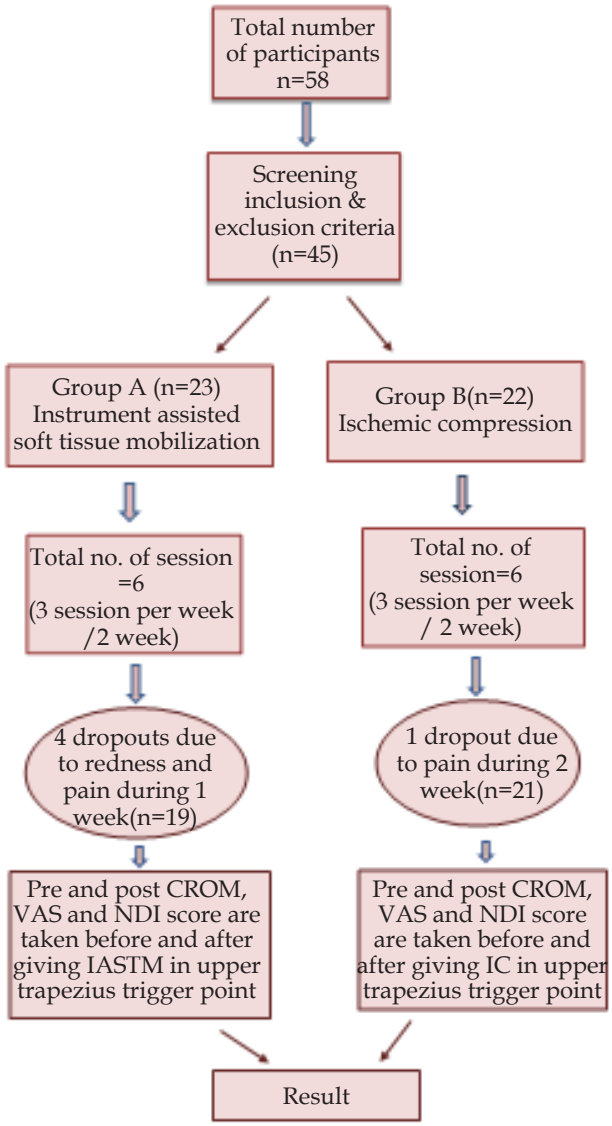


Fig 1: Flow Chart representing the procedure of selection of participants

- Subjects received six sessions given in two weeks treatment of ischaemic compression and trigger point pressure release.
- Ischaemic compression consisted of sustained deep pressure with the thumb on the upper trapezius trigger points for 30secs-1min.
- Pressure was released when there was decreased tension in the trigger point or when the trigger point was no longer tender or 1 min had elapsed whichever occurred first.
- Trigger point pressure release is non-painful slowly increasing pressure with the thumb was applied over the trigger point until a tissue resistance barrier is felt
- This level of pressure was maintained until release of the tissue barrier is felt, at which time pressure is increased until a new barrier is reached.
- This process was repeated until there is no trigger point tension/ tenderness or 90 sec has elapsed, whichever occurred first

Outcome Variables:

VAS: It is a measurement instrument that tries to measure the characteristics or attitude that is believed to range across a continuum of values. A straight horizontal line of fixed 10 cm length with the ends defined as the extreme limits of the pain to be measured, oriented from left (no pain) to right (severe). (ICC=0.97).[12]

Cervical Range of Motion:

All the motions were assessed by using Universal Goniometer. This test has satisfactory psychometric properties with ICC measurements for intra and inter examiner reliability that ranges from 0.80 to 0.93.[12]

Neck Disability Index:

It is a patient - completed condition specific functional status questionnaire with 10 items. It has sufficient support and usefulness to retain its current status as the most commonly used self – report measure for neck pain. Each section is scored on a 0 to 5 rating scale, in which zero means 'No pain and 5 means 'Worst imaginable pain'. [12]

Statistical Analysis

Descriptive statistical analysis obtained using frequency, percentage, mean, SD, CI, median and IQR. Paired t-test was used for the comparison of

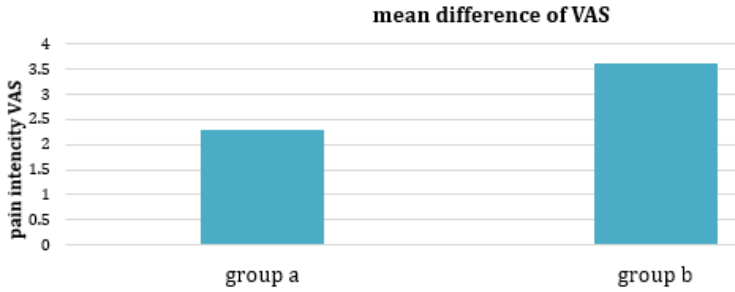
Pre and post data within the group. Unpaired t-test was used for the comparison of data between group A and Group B. All the statistical analysis was performed by using IBM SPSS version 29.0.0.

Result

- Table 1 depicts Comparison of mean of VAS score between Group A and B Group. The mean value of VAS score in group A 2.30±1.26(P value <0.0001) and group B 3.60±1.43(P value <0.0001).
- Graph 1 depicts Comparison of mean in post intervention between Group A and Group B using VAS where t value is 3.0504 and (p value >0.0042).
- Table 2 depicts Comparison of Post treatment mean difference values between Group A and Group B of cervical ROM between both the groups.
- Graph 2 depicts Comparison of mean cervical range of motion between Group A and Group B.
- Table 3 depicts Comparison of mean in post intervention between Group A and Group B using NDI questionnaire and these table suggested that group A NDI score is less than 22% and group B NDI score is more than 22%.
- graph 3 depicts Comparison of mean difference between Post NDI values between both the groups.

Table 1: Comparison of mean of VAS score between Group A and B Group

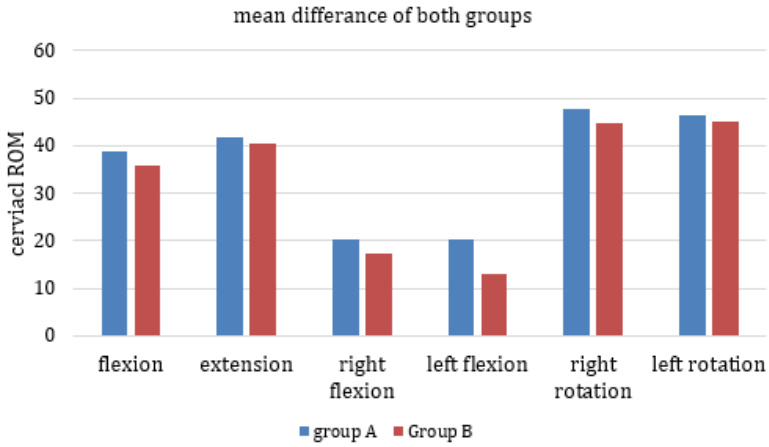
VAS	Mean ±SD	Mean ÷SD	't value'	'p value'	Result
	pre	post			
Group A	5.50±1.15	2.30±1.26	13.5	<0.0001	Extremely significant
Group B	5.70±0.98	3.60±1.43	4.97	<0.0001	Extremely significant
Group A V/S Group B	Group A post 2.30±1.26	Group B post 3.60±1.43	3.0504	0.0042	Very significant



Graph 1: Comparison of mean in post intervention between Group A and Group B using VAS where t value is 3.0504 and p value >0.0042 which is statistically significant, whereas within the group it was significant

Table 2: Comparison of Post treatment mean difference values between Group. cervical ROM between both the groups are as follow: Flexion: 38.85±3.42and 35.80±1.79 (p -Value: <0.0011), Extension:41.92±4.32 and 40.44±5.01(p-Value:0.269), Left Flexion: 20.16±1.40and 12.85±2.65 (p – Value:<0.0001), Right Flexion: 20.25±1.52 and 17.35±1.73 (p -Value: <0.0001), Left Rotation: 46.40±2.44 and 45.15±1.69(p -Value: 0.0673), Right Rotation: 47.80±2.24and 44.80±1.47 (p -Value :<0.0001).

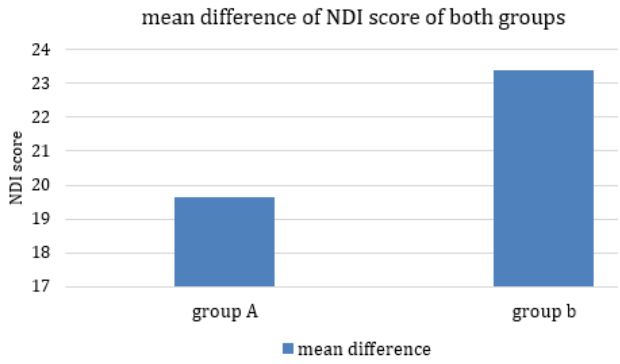
CROM	GROUP	Mean (difference)	SD	SEM	'p' value	't' value	Significance
Flexion	A	38.8500	3.42	0.76	<0.0011	3.53	Very significant
	B	35.8000	1.79	0.40			
Extension	A	41.9200	4.32	0.86	0.269	1.11	Not significant
	B	40.4400	5.01	1.00			
Left Flexion	A	20.1600	1.40	0.28	<0.0001	10.76	Extremely significant
	B	12.8500	2.65	0.54			
Right Flexion	A	20.2500	1.52	0.33	<0.0001	5.63	Extremely significant
	B	17.3500	1.73	0.38			
Left Rotation	A	46.4000	2.44	0.54	0.0673	1.88	Quite significant
	B	45.1500	1.69	0.37			
Right Rotation	A	47.8000	2.24	0.50	<0.0001	5.00	Extremely significant
	B	44.8000	1.47	0.32			



Graph 2: Comparison of mean cervical range of motion between Group.

Table 3: Comparison of mean in post intervention between Group.using NDI questionnaire where t value is 6.20 and p value which is 0.0001 statistically significant, whereas within the groups it was significant

NDI	Mean ±SD		't' value'	'p' value	Result
	pre	post			
Group A	45.90±2.97	19.65±1.81	26.25	<0.0001	Extremely significant
Group B	46.15±2.70	23.40±2.01	22.75	<0.0001	Extremely significant
Group A v/s Group B	Group A Post	Group B Post	6.20	<0.0001	Extremely significant
	19.65±1.81	23.40±2.01			



Graph 3: Comparison of mean difference between Post NDI values between groups.

Discussion

The present study aimed at finding out the effects of instrument assisted soft tissue mobilization and ischemic compression in reducing pain on VAS scale and improving the cervical range of motion and NDI score in students with trapezitis. The results of the present study showed that both techniques effective for reducing pain and disability but IASTM produced better results with respect to pain, cervical range of motion and NDI.

Clinicians claim that IASTM is a type of soft tissue mobilization technique that can more effectively reach tissues deeper in the body than the hands can, relieving myofascial adhesions, borders, tightness, fibrous nodules, crystalline deposits, and scar tissue. (13)

IASTM causes a localized minor injury to soft tissue that results in haemorrhagic changes in capillaries and other small blood vessels, which in turn triggers the body's inflammatory response and launches the body's reparative system. (14)

These results were in line with a study conducted by Dr. Basavaraj Motimath et al. In their study they found the immediate effect of Instrument Assisted Soft Tissue Mobilization (IASTM) With M2T blade technique in trapezitis.(15)

Conclusion

In the current study, application of IASTM once in 3 days for 2 weeks to trigger points in upper trapezius muscle produced significant increase in flexion,both lateral flexion and rotation of cervical spine. It also reducing pain measured by VAS.These findings were more Statistically and clinically significant when compared with ICOur study concludes that IASTM is more effective with trapezitis than IC.so here our alternat hypothesis is accepted and our null hypothesis is rejected.

Clinical implication

IASTM is feasible, safe, fast and effective method for patients with trapezitis.

Limitation of the study

Small sample size and short period of intervention.

Future scope

Future research with more sample size and long period of intervention and cupping therapy could be compare with other techniques

Acknowledgement

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Conflict of Interest: none

Source of Funding: none

Ethical Clearance

Approval was taken by ethical committee.

References

1. VK PD, Abraham J. Effect of muscle energy technique versus middle and lower trapezius strengthening exercises on pain and neck functions in subjects with upper trapezitis. International Journal of Physical Education, Sports and Health 2019; 6(4): 85-89.
2. Cheatham SW, Baker RT, Larkins LW, Baker JG, Casanova MP. Clinical practice patterns among health care professionals for instrument-assisted soft tissue mobilization. Journal of Athletic Training. 2021 Oct 1;56(10):1100-11.
3. Gayathri K, Senthil P, Swathi S, Nainar M, Haribabu L. Effectiveness of Myofascial Release Technique and Muscle Energy Technique on Pain and Physical Function among Smartphone Users with Trapezitis. Chettinad Health City Medical Journal (E-2278-2044 & P-2277-8845). 2022 Dec 31;11(4):37-41.
4. Shinde K, Karpe M. Effect of Integrated Neuromuscular Inhibition Technique versus Ischaemic Compression and Trigger Point Pressure Release on Upper Trapezius and Non-Specific Neck Pain. International Journal of Physical Education, Sports and Health 2019; 6(4): 85-89.
5. Ajmera MA, Patil M. Effect of dry needing and IASTM in chronic upper trapezitis: A Randomised controlled trial. Indian Journal of physiotherapy and rehabilitation science 2022 Oct-Nov-Dec; 1(2); 1-11.
6. Mahmood T, Afzal W, Ahmad U, Arif MA, Ahmad A. Instrument soft tissue mobilization integrated with exercise for musculoskeletal disorders. Rawal Medical Journal. 2021 Jul;46(3):749-.
7. Pianese L, Bordoni B. The Use of Instrument-Assisted Soft-Tissue Mobilization for Manual Medicine: Aiding Hand Health in Clinical Practice. Cureus. 2022 Aug 31;14(8).
8. Cheatham SW, Lee M, Cain M, Baker R. The efficacy of instrument assisted soft tissue mobilization: a systematic review. The Journal of the Canadian Chiropractic Association. 2016 Sep;60(3):200.
9. Fousekis K, Kounavi E, Doriadis S, Mylonas K, Kallistratos E. The effectiveness of instrument-assisted soft tissue mobilization technique (ergonš technique), cupping and ischaemic pressure techniques in the treatment of amateur athletes' myofascial trigger points. J Nov Physiother S. 2016;3(2):1-7.
10. Katariya P, Anap D, Kuttan V. IMMEDIATE EFFECT OF INSTRUMENT ASSISTED SOFT TISSUE MOBILIZATION ON HAMSTRING MUSCLE EXTENSIBILITY–PRE AND POST TEST DESIGN: Immediate effect of instrument assisted muscle release technique on hamstring extensibility. VIMS JOURNAL OF PHYSICAL THERAPY. 2019;1(1):49-54.
11. Saadat Z, Hemmati L, Pirouzi S, Ataollahi M, Ali-Mohammadi F. Effects of integrated neuromuscular Sinhibition technique on pain threshold and pain intensity in patients with upper trapezius trigger points. Journal of bodywork and movement therapies. 2018 Oct 1;22(4):937-40.
12. Vispute S, Kumar N. A Comparative Study of Immediate Effects of Myofascial Release Technique and Positional Release Technique on Trapezitis among the College Student. Int J Physiother Res. 2022;10(3):4243-9.
13. Carey MT, Hammer WI, Vincent RE. Graston technique instruction manual. TherapyCare Resources, Incorporated; 2001.
14. Melham TJ, Sevier TL, Malnofski MJ, Wilson JK, Helfst Jr RH. Chronic ankle pain and fibrosis successfully treated with a new noninvasive augmented soft tissue mobilization technique (ASTM): a case report. Medicine and science in sports and exercise. 1998 Jun 1;30(6):801-4.
15. Terry Loghmani M, Bayliss AJ, Clayton G, Gundeck E. Successful treatment of a guitarist with a finger joint injury using instrument-assisted soft tissue mobilization: a case report. Journal of Manual & Manipulative Therapy. 2015 Oct 20;23(5):246-53.

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