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RESEARCH ARTICLE

GYNECOLOGICAL AND PSYCHOSOCIAL RISK FACTORS ASSOCIATED WITH OBESITY IN ADOLESCENT GIRLS

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ABSTRACT

Background: There has been an increase in childhood and adolescent obesity worldwide, which affects the girls resulting low self-esteem and depression and diminishes health-related quality of life. The overweight and obese teenage girls are more likely to have gynaecologic and obstetric complications during adolescence and later in life. **Objective:** To determine gynaecological and psychosocial risk factors associated with obesity in adolescent girls. **Methods:** A cross sectional study conducted at schools and colleges of Islamabad and Rawalpindi with a sample size of n=99. The participants were divided into two groups of which n=25 were obese adolescents (cases) and n=74 were non-obese adolescents (controls). The Data collection was done based on self-structured questionnaire from adolescent females aged 10 to 19 years in cases with BMI >27.5kg/m2 in controls 18.5 to 23kg/m2. The study duration was 6 months from (October- 2020 to March- 2021). Study was conducted in various school and colleges of Islamabad and Rawalpindi. To determine the association odds ratio (OR) was calculated. **Results:** The mean age of the cases was 16.2±2.10 years and 14.78±1.82 years for controls. The BMI of cases was 29.38±1.97 kg/m^2 and a control was 18.06±2.88 kg/m^2. In gynaecological risk factors cases are more at risk to have excessive acne/pimple on face (Odds ratio: 3.484, p= 0.008), more likely to experience amenorrhea (OR: 4.504, p=0.007) and more likely to have excessive facial/abdominal hair growth (OR: 3.600, p=0.014). For psychosocial risk factors the cases presented with a greater need/referral of a psychological evaluation (OR: 4.063, p=0.008) and feel social limitation or emotional disturbance (OR: 2.561, p=0.044). **Conclusion:** It was concluded that certain gynaecological and psychosocial determinants could be influenced by adolescent obesity leading to many complications and negative consequences on present and future health outcomes.

Key words: adolescents, females, gynaecologic, obesity, overweight, quality of life

INTRODUCTION

The obesity is the condition in which excessive accumulation of triglyceride occur in adipose tissue which later on leads to increase in fat mass which ultimately effects health[1]. The Obesity is chronic disease just like hypertension and atherosclerosis[2]. the Obesity is the condition in which the weight of the body is more than normal. It is connected with low educational performance and a lower personal satisfaction accomplishes by the youngsters[3].

About 20% of the world's population is obese; thus, obesity is classified among the diseases of civilization. In certain developed countries, 50% to 65% of the total population are overweight or obese, which means that only 1/3 of the people have normal body weight[4]. The prevalence of obesity in children is the reason for affecting the body fitness, social and psychological welfare and the self-respect which profoundly influence their living a normal life[5]. The latest data from the National Health and Nutrition Examination Survey show that the prevalence of obesity among US children and adolescents was 18.5% in 2015-2016[6]. The Childhood and adolescent obesity has greatly increased in the United States. In 2016, Pakistan female obesity prevalence was 11.3 %, the percentage is alarming because most of the obese adolescents will turn to obese adults[7].

In 2018, the research was conducted in Karachi among the schoolgirls, in which the prevalence of obesity in total of n=362 adolescent girls was 40.8%. The overweight was found in 169 (19.1%) children, whereas the obese were total of 96 (10.8%). Thus, from the recorded estimation the epidemic of obesity is growing with high speed, mostly in Karachi[8].

The Psychosocial issues that are associated with obesity are mental and social difficulties, specifically involving their habits or behaviour and academic issues. The issues also include depression, anxiety, family problems, substance abuse, body image dissatisfaction, stigma and discrimination. Anxiety and depression was linked to higher BMI, particularly in female adolescents with increased waist circumference and higher body fat[9].

The outcomes of overweight youth encompass sexual development disorders, dysmenorrhea, unsafe sexual conduct, infertility, cartilage

thickness deformity, macromastia and an exponential danger of uterine tumor[10].

Obesity also associated with early onset of puberty, infertility, irregular menstruation, polycystic ovary syndrome (PCOS) and hormonal alterations which leads to impaired ovulatory function and reproductive health[11].

Obesity is a common nuisance affecting many around the world, particularly large number of young adults and adolescents due to sedentary lifestyles and poor eating habits. Complains of gynecological issues and the prevalence of anxiety and depression among teenage girls has arisen gradually and is oft linked to being overweight or obese. The available literature lack about the association between obesity and above mentioned factors. So the current study was conducted to determine the gynecological and psychological factors with Obesity in adolescent girls.

METHODOLOGY

It was a cross sectional study, conducted at school and colleges of Islamabad and Rawalpindi including Allied School 6th road Rawalpindi campus, Kainat School System (Both Islamabad and Rawalpindi Campus), and Allied School I-10/4, Islamabad Campus. The Research was carried over a period of 6 months (Oct-20 to Mar-21) after getting approval from Research Ethical Committee (REC) of Riphah International University with Ref # Riphah/RCRS/REC/00839. A Sample size of n=99 was calculated by OpenEpi tool. and divided into n=25 cases and n=74 controls on the basis of 1:3 of cases: control ratio[12].

The adolescent girls with age between 10 – 19 years were included in the study. A Nonprobability Purposive Sampling technique was used for sample collection. The data of gynecological and psychological risk factors assessed through self-developed questionnaire from the literature[13,14]. The data collection questionnaires are having total of 25 questions relating to gynecological and psychological aspects. The screening tool used for cases and control was BMI score (kg/m$^{2)}$ for Asian population. The first phase of data collection was obtaining permission and approval from various schools and colleges of Islamabad. A meeting was held with the management of the respective institutes to explain the questionnaire and duration of study. In the second phase, in-person meeting with participants was carried out in which explanation was done for the questionnaire and its terminologies to them, and consent was taken from them to participate in the study. The female adolescents who were willing and were allowed by their parents in case of minors were included in the study.

The data was analysed through SPSS Version 21. The descriptive analysis was done to present the frequencies, percentages, mean and standard deviation of variables (age, weight, height, BMI). The Odds ratio was calculated for risk estimation and likelihood among cases as compared to controls. The level of significance was set at $p<0.05$.

RESULTS

The mean age of the adolescent girls recruited in the study was 16.2±2.10 years and 14.78±1.82 years in cases and control group respectively. The Asian BMI scale was used as a reference, in which participants with BMI >27.5 kg/m^2 are falls under case group (29.38±1.97 kg/m^2) and participants less than this BMI falls under control group (18.06±2.88 kg/m^2).

The odds ratio (OR) was calculated using Pearson Chi-square test which depicted that gynecological risk factors in cases like excessive acne/pimple on face (OR=3.484, p=0.008), experience of amenorrhea (OR=4.504, p=0.007) and excessive facial/abdominal hair growth (OR=3.600, p=0.014) have greater risk and are significantly associated with obesity. While the psychological risk factors like need a psychological evaluation (OR=4.063, p=0.008) and feeling of social limitation or emotional disturbance (OR=2.561, p=0.004) were also significantly associated with obesity in adolescent girls. The remaining gynecological and psychological risk factors did not show any significant association with obesity in adolescent girls. (Table 1)

Table 1: Gynaecological and Psychological Risk Factors Associated With Obesity (Odds Ratio)

KEY TERMS	Obesity N(%) Yes	Obesity N(%) No	X^2	OR	CI 95% Lower	CI 95% Upper	p-value
Gynecological Risk Factors							
Need of gynecological consultation	7 (28%)	18 (72%)	2.757	2.489	0.830	7.465	0.097
Disturbed menstrual cycle	10 (40%)	15 (60%)	0.699	1.478	0.578	3.782	0.413
Diagnosed gynecological dysfunction	5 (20%)	20 (80%)	1.949	2.393	0.684	8.365	0.163
Passing of blood clots	8 (32%)	17 (68%)	1.222	0.585	0.224	1.523	0.269
Breast tenderness/pain on touch	11 (44%)	14 (56%)	0.297	1.291	0.515	3.235	0.586
Family history of Breast/endometrial cancer	4 (16%)	21 (84%)	0.019	1.091	0.314	3.794	0.891
Excessive acne/pimple on face	16 (64%)	9 (36%)	7.032	3.484	1.350	8.993	0.008**
History of fracture	4 (16%)	21 (84%)	0.749	0.593	0.180	1.955	0.387
Early onset of menstruation	8 (32%)	17 (68%)	0.413	0.730	0.279	1.909	0.521
Excessive menstrual pain	11 (44%)	14 (56%)	0.004	1.031	0.414	2.572	0.947
Experience of Amenorrhea	8 (32)	17 (68%)	7.385	4.504	1.433	14.162	0.007**
Excessive facial/abdominal hair growth	9 (36%)	16 (64%)	6.093	3.600	1.255	10.330	0.014*
Psychological Risk Factors							
Experienced heart burn/chest congestion	10 (40%)	14 (60%)	0.669	1.478	0.578	3.782	0.413
Shortness of breath	9 (36%)	16 (64%)	0.207	1.247	0.481	3.237	0.649
Need a psychological evaluation	9 (36%)	16 (64%)	7.138	4.063	1.388	11.888	0.008**
Satisfied with your appearance	20 (80%)	5 (20%)	0.364	0.698	0.217	2.252	0.546
Felt of anxiety or depression	15 (60%)	10 (40%)	1.206	1.671	0.665	4.199	0.272
Feeling of social limitation or emotional disturbance	13 (52%)	12 (48%)	4.055	2.561	1.011	6.487	0.044*
Body Shamming by peers	7 (28%)	18 (72%)	2.757	2.489	0.830	7.465	0.097
Lack of Confidence due to weight	7 (28%)	18 (72%)	2.167	2.227	0.754	6.577	0.141
Difficulty buying cloths	9 (36%)	16 (64%)	2.047	2.039	0.780	5.469	0.153
Difficulty making friends	8 (32%)	17 (68%)	3.538	2.695	0.937	7.753	0.060
Disease awareness due to obesity	8 (32%)	17 (68%)	2.098	0.497	0.191	1.292	0.148
Weight loss strategies	22 (88%)	3 (12%)	0.133	0.766	0.182	3.220	0.716
Tested for hyperglycaemia	4 (16%)	21 (84%)	0.472	1.571	0.430	5.748	0.429

Significance Level: p<0.05, p<0.01**, p<0.001****

DISCUSSION

The objective of this study was to evaluate gynecological and psychosocial effect of obesity on adolescents' girls. This study was carried out based on self-structured questionnaires with having questions related to gynecological and psychosocial risk factors caused because of obesity and screening tool used is Asian BMI chart.

Overweight and obese teenagers are at an increased risk of gynaecologic and obstetric dysfunctions in the period of adolescence and continued to be so in later years which encompass sexual maturation and reproductive disorders, menstrual variations, dysmenorrhea, questionable sexual behaviour, improper or inadequate usage of contraception, polycystic ovary syndrome (PCOS), bone density abnormalities, macromastia, and a peaking risk of cancer of the breast or endometrium[13]. The current study is in line with these facts such that obese participants reported having excessive acne and facial hair which are signs of PCOS and amenorrhea that depicts variation in menstrual cycle.

PCOS affectees, majority being obese, go through fluctuating and multifactorial levels of menstrual disturbances. PCOS may not even be present, even so, obesity has been associated with longer and irregular cycles. Women with a BMI of 35 have a five times greater likelihood of long cycles in contrast to women who have BMI between 22 and 23[15].This study shows that obesity causes gynecological issues with problem in menstruation and occurrence of signs of PCOS.

A cross-sectional research conducted on Australian females between 26 to 36 years presented the outcome that the probability of experiencing disturbed cycles was 2.61 for women with a BMI greater than 30 when observed parallel to women with a BMI between 20 and 24.9. This goes on to evidentiate an association between visceral adiposity and menstrual disruptions[16] which have been depicted via the results of the current study.

Childhood and adolescent obesity have long lasting negative consequences for health outcomes. In particular, the onset of psychiatric and psychological symptoms and disorders is more prevalent in the stated age group[14]. Anderson et al. quantified the health-related quality of life and psychological wellness of children and adolescents who were obese, noting poor mental health and insisting on the need of psychotherapeutic mediation to ameliorate the subject population's mental health[17]. Thus the important factor relating to the need of a psychological evaluation that showed significance in this study's outcomes will have great impact on identifying risks for future

problems.

Owing to the objectifying view of the society for obesity, obese people have low self-esteem. The worst most outcomes of obesity in the age of adolescence probably end up in long-term disorders and issues until older ages. Lack of confidence in self is also linked with behavioural disorders, sceptical and grim moods, and pessimistic and unchecked emotions[18].Obese adolescents might be subjected to derision from peers, friends, and classmates and also persistently shamed for their eating habits by their parents[17]. Similar aspects have been observed in the study as obese adolescent females reported a higher likelihood of having social limitations owed to their physical presentation and body imaging.

In some studies, the mostly occurred disorders seen in the adolescent girls due to obesity were anxiety or depression problems, lack of confidence, and they were mostly isolated and having low self-esteem[19]. Current study depicts similar outcomes and depicts the obese adolescents to be more likely to have emotional disturbances.

Obesity in adolescence may lead to grave outcomes for the adolescents suffering from the condition and even for society. Obese adolescents usually have continued obesity into adulthood, which causes many medical and psychological problems. Furthermore, obesity in adolescents is linked to a wide variety of social issues[20]. This has been depicted from outcomes of present study revealing the impact of obesity upon an adolescent's gynecological and psychosocial health. The self-structured questionnaire had lack objectivity, so the understanding of subjective statement may impact the current results. As the purposive sampling technique was used for sample collection, so the results may not be generalized. In current study dietary and nutritional factors were not controlled, which may affect the results.

CONCLUSION

It was concluded that certain gynecological and psychosocial determinants could be influenced by adolescent obesity leading to many complications and negative consequences on present and future health outcomes. Future research should focus on detail list of risk factor the underlying mechanism in this special group to obtain a better understanding that could lead to focus on a comprehensive management of obese adolescent girls.

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RESEARCH ARTICLE

COMPARE THE EFFECTS OF STRENGTHENING EXERCISES WITH AND WITHOUT SOFT TISSUE MOBILIZATION FOR THE MANAGEMENT OF TENSION NECK SYNDROME IN FEMALES: A RANDOMIZED CONTROLLED

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Wardah Hussain Malick[1]: Analysis & interpretation of data, revised and accountable for all aspects

ABSTRACT

Background: Tension neck syndrome (TNS) is a prevalent condition worldwide. Soft tissue mobilization and strengthening exercises are used in physiotherapeutic rehabilitation of the musculoskeletal disorders. **Objective:** To compare the effects of strengthening exercises with and without soft tissue mobilization (STM) for pain and disability reduction in females with TNS. **Methods:** A single-blinded, parallel-group randomized controlled trial was conducted at the National Institute of Rehabilitation Medicine, Pakistan, from April to July 2016. A total of n=30 females, aged 30-70 years, were recruited through non-probability convenient sampling technique, and randomly allocated to the experimental and control group. The experimental group received STM and neck isometric strengthening exercises (NISE), whereas the control group received neck isometric strengthening exercises only. The Numeric Pain Rating Scale (NPRS) was used to assess the pain intensity, while Neck Disability Index (NDI) was used for the neck-related disability. The data was collected at the baseline, after the 4th session and after the 8th session. The repeated measure analysis of variance (RM ANOVA) was used to analyse within the group changes, while the independent t-test was used to analyse the differences between the groups. The data was analysed by using SPSS version 21. **Results:** The mean age of the study participants was 47.9 ± 8.95 years. Within groups' changes showed that pain intensity, individual items of NDI and its total score showed significant improvement in both the groups from the baseline to the 8th session ($p \leq 0.05$). After the 8th session, the experimental group showed more significant reduction ($p \leq 0.05$) in pain intensity and neck disability as compared to the control group. **Conclusions:** Soft tissue mobilization when combined with neck isometric strengthening exercises was more effective than exercises alone for reducing the pain intensity and disability in females with tension neck syndrome.

Keywords: Management, neck pain, physical therapy, soft tissue mobilization, strength training

INTRODUCTION

Tension neck syndrome (TNS) can be defined as localized myofascial pain in the neck and shoulder region[1,2] without any past medical history of degenerative disorders, herniated cervical disc, or trauma. Individuals with TNS usually complain of pain, stiffness, tenderness, fatigue, muscle spasm, and tender spots in the neck muscles, especially palpable on the trapezius or sternocleidomastoid muscles, which reduce the neck ranges of motion and functional ability of the neck and shoulder musculature[1,3]. TNS frequently presents as chronic neck pain[4] which is a common condition with a yearly prevalence of 16.7% to 75.1% of the general population[5], and it is the leading cause of disability worldwide[6].

Neck pain is the most common musculoskeletal disorder among intensive computer users, for example, software professionals[7]. School teachers have also been commonly seen to have neck pain at some point during their lives[8]. Chronic neck pain can occur due to various reasons, including abnormalities in the neck muscles, synovial joints, and intervertebral discs together with cervical dura mater, vertebral artery, and infections[9]. Repetitive overloaded activities, bad ergonomics, psychosocial factors, and forward head posture are common contributing factors[10,11]. Forward head posture puts excessive load on the neck musculature, which results in the shortening of sternocleidomastoid, scalenus anterior and upper trapezius, and weakness of levator scapulae and semispinalis capitis muscles[12,13]. In the upper quadrant, postural muscles in general and the upper trapezius muscle in particular, are most affected by soft tissue problems in the form of myofascial trigger points. However, in most cases of neck pain, it is difficult to identify a specific cause and is simply classified as soft tissue rheumatism or muscular, mechanical, or postural neck pain[14].

As compared to males, females are more prone to have the condition, with the highest prevalence reported in middle-aged women[15,16]. Various reasons have been determined for the higher prevalence of chronic neck pain in females than

males, including lower muscular strength, pressure pain threshold, sleep quality, and higher levels of psychological issues such as anxiety and depression in women as compared to men[17]. Physiotherapy, spinal manipulation, massage, yoga, acupuncture, muscle relaxants, and non-steroidal anti-inflammatory drugs are the common treatment options available for neck pain[6]. Physiotherapy includes a variety of approaches including soft tissue mobilization (STM) and therapeutic exercises which are commonly used for the management of TNS[18].STM, also known as muscle mobilization or fascial mobilization, is a commonly used technique for managing tight muscles and cervical radiculopathy[19,20].It consists of two methods, i.e. manual and instrumental, both of which have been determined to be equally effective for pain reduction, improvement in the range of motion, and function[21].Strengthening exercises have also shown effectiveness for neck pain reduction[22].

Although many studies have been conducted on patients with neck pain, there is a paucity of evidence on the comparative effectiveness of neck strengthening exercises with and without STM for females with nonspecific chronic local neck pain. Therefore, the purpose of this pragmatic clinical trial was to compare the effects of neck isometric exercises when given with and without the STM for pain and disability in females with TNS.

METHODOLOGY

A single-blinded, parallel-group randomized controlled trial, registered with clinicaltrials.gov (CTR #: NCT05227963) was conducted at the National Institute of Rehabilitation Medicine (NIRM), Islamabad, Pakistan, from April 2016 to December 2016. The study was initiated after the ethical approval from the institutional review board (IRB), Isra University, Islamabad (ID: 1309-PDPT-012). A written informed consent was taken from the participants, and they were assured about the confidentiality of the data before the study as a statement of ethical principles for medical research involving human subjects as given in the Declaration of Helsinki.

A total of n=47 females with chronic neck pain were assessed for eligibility, who visited NIRM during the recruitment period. However, n=30 participants fulfilled the inclusion criteria and showed a willingness to participate in the study and were thus recruited through a non-probability convenient sampling technique. The participants were randomly allocated to the experimental (n= 15) and control (n=15) group through the lottery method (figure 1).

The inclusion criteria were females, aged 30-70 years with chronic (more than three months) localized mechanical neck pain and a negative Spurling test (assessed by a physiotherapist), while individuals were excluded if they reported having any neurological condition, radicular pain, fracture, or trauma in the neck region, spinal deformity, malignancy, tumours, or any inflammatory condition.

Both the groups received 8 interventional sessions i.e., 4 sessions per week for two weeks. Each session lasted 45 minutes. The experimental group received STM of the sternocleidomastoid, upper trapezius, scalene, and the prevertebral muscles. The STM technique included sustained pressure, unlocking spiral, direct oscillation, perpendicular mobilization, parallel mobilization, perpendicular drumming, and friction massage for a minute followed by a release for 30 seconds in the sitting position[20]. Each technique was repeated three times in each session for 25 minutes. Additionally, neck isometric strengthening exercises (NISE) were performed in flexion, extension, side bending, and rotation for the sternocleidomastoid, upper trapezius, scalene, and the prevertebral muscles were also performed in the sitting position. The duration of the neck isometric exercises was 20 minutes, and each isometric exercise was held for 10 seconds followed by rest for the same time duration. Every muscle group was isometrically contracted 8 times in each session within the available ROM. The control group received neck isometrics strengthening exercises (NISE) only for the same muscles and with the same protocol as the experimental group for 20 minutes.

The general demographic data and past medical history were collected from the participants through a self-structured questionnaire. Spurling test was used for the evaluation of non-radiculopathy cases, which is a valid and reliable tool to assess the anatomical integration of the cervical spine[23].Numeric Pain Rating Scale (NPRS) was used to assess the pain intensity,[24] while Neck

Disability Index (NDI) was used to assess the neck-related disability[25].The data was collected at the baseline, after the 4th session, and after the 8th session by the physiotherapist.

The descriptive statistics, including age and body mass index (BMI), were presented as mean and standard deviation. As the data met the assumption of the parametric test, the repeated measure analysis of variance (RM ANOVA) with pairwise comparison was used to analyse within the group changes. The independent t-test was used to analyse the statistical differences between the two study groups. The data was analysed by using SPSS version 21 and the level of significance was set at 95% (*p≤0.05).*

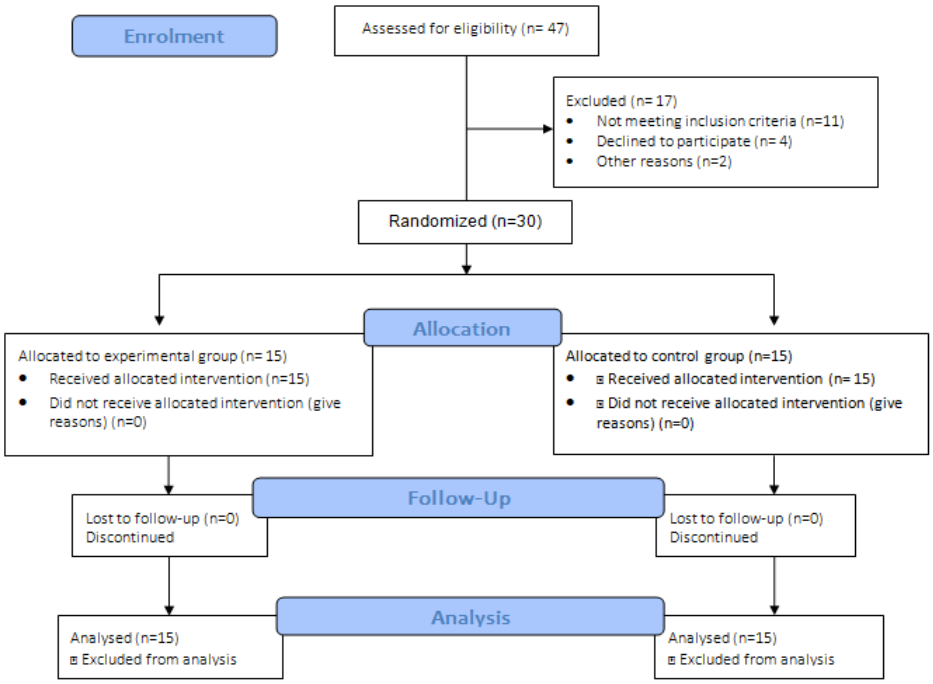

Figure: 1 Consort Diagram

RESULTS

A total of n=30 females, aged 30 to 70 years, participated in the study. The mean age of the study participants was 47.9 ± 8.95 years. Most of the participants were overweight (n=16) and obese (n=7), while n=7 was normal and n=1 was underweight. The mean BMI of n=30 participants was 27.27±5.22 kg/m^2. In the STM group, 3 (10%) patients had their symptoms for more than 3 months, 4 (13.33 %) had since the last 5-8 months, 1 (3.33 %) had since the last 9-12 months, and 7 (23.33 %) patients had symptoms for more than a year. In the control group, 3 (10%) patients had their symptoms for more than 3 months, 2 (6.66 %) had since the last 5-8 months, 3 (10%) had since the last 9-12 months, and 7 (23.33 %) patients had symptoms for more than a year.

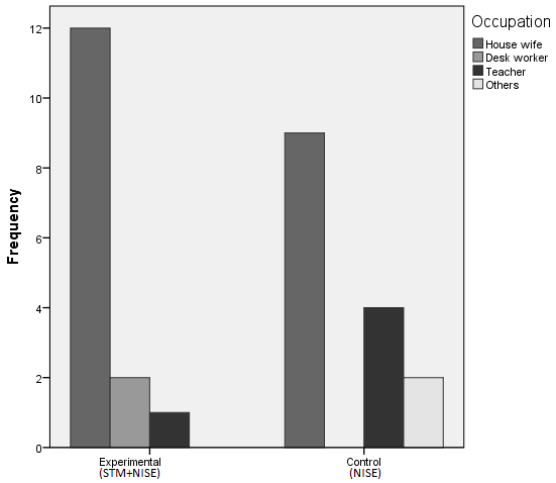

Figure 2: Frequency of the Participants Based on Their Profession

Within groups' changes showed that the pain intensity, individual items of NDI and its total score showed a significant improvement (p ≤ 0.05) in both the groups from the baseline to the 8th session (Table 2)

Table 2: Within-group Changes in NPRS and NDI

NDI Items	No. of Sessions	Experimental Group Mean ± Std	Experimental Group MD/F(df)	Experimental Group p-value	Control Group Mean ± Std.	Control Group MD/F(df)	Control Group p-value
NPRS	Baseline	7.20+ 1.32	3.40	0.00[a***]	7.47+1.64	2.33	0.00[a***]
	4th session	3.80+1.70	2.93	0.00[b***]	5.13+1.30	1.93	0.00[b***]
	8th session	0.87+1.19	226.6(1.9)	0.00[c***]	3.20+1.61	76.48(1.48)	0.00[c***]
Pain intensity	Baseline	3.20±0.77	1.4	0.00[a***]	3.33±0.82	0.80	0.00[a***]
	4th session	1.80±0.68	1.26	0.00[b***]	2.53±0.10	0.87	0.01[b*]
	8th session	0.53±0.64	161.7(1.8)	0.00[c***]	1.67±0.82	23.37(1.78)	0.00[c***]
Personal care	Baseline	2.53±1.06	1.13	0.00[a***]	2.80±0.68	0.67	0.00[a***]
	4th session	1.40±0.99	0.80	0.03[b*]	2.13±0.64	0.60	0.10[b]
	8th session	0.60±0.74	35.96(1.6)	0.00[c***]	1.53±0.74	16.94(1.61)	0.00[c***]
Lifting	Baseline	3.27±0.88	0.80	0.00[a***]	3.53±0.74	0.73	0.00[a***]
	4th session	2.47±0.99	1.27	0.00[b***]	2.80±0.68	0.73	0.00[b***]
	8th session	1.20±1.21	26.18(1.3)	0.00[c***]	2.07±0.88	26.47(1.75)	0.00[c***]
Reading	Baseline	2.93±1.03	0.93	0.00[a***]	2.93±0.80	0.80	0.02[a*]
	4th session	2.00±0.85	1.33	0.00[b***]	2.13±0.99	1.07	0.00[b***]
	8th session	0.67±0.62	43.96(1.7)	0.00[c***]	1.07±0.70	31.51(1.94)	0.00[c***]
Headache	Baseline	2.33±1.54	0.80	0.02[a*]	2.60±1.40	0.53	0.22[a]
	4th session	1.53±1.51	0.33	0.52[b]	2.07±1.03	0.33	0.41[b]
	8th session	1.20±1.15	9.40(1.68)	0.01[c*]	1.73±1.16	5.38(1.71)	0.04[c*]
Concentration	Baseline	2.40±0.91	0.60	0.10[a]	2.60±1.06	0.73	0.00[a***]
	4th session	1.80±0.77	1.20	0.00[b***]	1.87±0.83	0.67	0.01[b*]
	8th session	0.60±0.74	24.96(1.8)	0.00[c***]	1.20±0.87	23.89(1.79)	0.00[c***]
Work	0 session	2.87±0.92	1.13	0.00[a***]	2.67±1.05	0.87	0.00[a***]
	4th session	1.73±1.03	0.80	0.01[b*]	1.80±1.08	0.47	0.01[b*]
	8th session	0.93±0.96	38.3(1.84)	0.00[c***]	1.33±0.82	27.73(1.72)	0.00[c***]
Driving	Baseline	3.40±1.18	1.07	0.00[a***]	2.60±1.12	0.60	0.00[a***]
	4th session	2.33±0.90	0.93	0.00[b***]	2.00±1.31	0.47	0.04[b*]
	8th session	1.40±0.83	31.65(1.58)	0.00[c***]	1.53±1.19	25.25(1.89)	0.00[c***]
Sleeping	Baseline	2.60±0.74	0.467	0.09[a]	2.73±0.96	0.60	0.04[a*]
	4th session	2.13±0.99	1.27	0.00[b***]	2.13±0.83	0.47	0.21[b]
	8 session	0.87±0.92	30.167(1.83)	0.00[c***]	1.67±0.98	9.42(1.79)	0.01[c*]
Recreation	Baseline	3.00±0.93	1.27	0.00[a***]	3.13±0.74	1.07	0.00[a***]
	4th session	1.73±0.88	0.93	0.00[b***]	2.07±0.80	0.53	0.08[b]
	8th session	0.80±0.77	68.99(1.97)	0.00[c***]	1.53±1.13	24.41(1.52)	0.00[c***]
NDI Total score	Baseline	28.66±5.67	9.80	0.00[a***]	28.93±5.48	7.53	0.00[a***]
	4th session	18.87±4.78	10.06	0.00[b***]	21.40±4.64	6.07	0.00[b***]
	8th session	8.80±2.78	228.10(1.52)	0.00[c***]	15.33±3.90	153.0(1.54)	0.00[c***]

[a] Baselines to 4th session, [b] 4th session to 8th session, [c] Baseline to 8th session
*Level of significance: p<0.001***, p<0.0.1**, p<0.05**
MD: Mean Difference

After two weeks intervention, at the end of 8th session the experimental group showed more significant improvement (p<0.05) in pain on NPRS (0.87±1.19 ver. 3.20±1.61, p<0.001) and domains of NDI including pain intensity (0.53±0.64 ver. 1.67±0.82, p=0.03), personal care (0.60±0.74 ver. 1.67±0.82, p<0.001), lifting ability (1.20±1.21 ver. 2.07±0.88, p=0.03), sleeping (0.87±0.92 ver. 1.67±0.98, p=0.03) and total score NDI (8.80±2.78 ver. 15.33±3.90, p<0.001) was significantly improved in experimental group as compared to control group. While no significant difference between group was observed regarding reading (p=0.11), headache (p=0.22), concentration (p=0.05), work (p=0.23), driving (p=0.72), and recreation (p=0.05) after two weeks of intervention (Table 3)

DISCUSSION

This study determined the comparative effectiveness of strengthening exercises when combined with STM and when strengthening exercises are used alone for the management of TNS in females. According to the results of this study, neck isometric strengthening exercises in combination with STM as well as exercises alone were effective for managing neck pain and functional disability when a comparison was made within the groups. The participants in both the groups showed significant reduction in the pain intensity and improvement in their personal care activities, lifting activities, reading, work, and driving during and post-intervention. This might be because STM helps in reducing the pain intensity and increasing functional ability,[26] and exercises play an important role in the prevention of recurrent episodes of pain and the rehabilitation of impaired structures and physiological functions[4]. However, a few components of NDI, including headache, concentration, sleeping, and recreation

showed insignificant differences between some scores in the experimental and control groups. This might be attributed to some unidentified factors and small sample size which should be determined and addressed in the future studies.

Table 3: Between the Group Comparison of NPRS and NDI

NDI Items	No. of Sessions	Experimental Group Mean ± Std	Control Group Mean ± Std.	MD	p-value
NPRS	Baseline	7.20+ 1.32	7.47+1.64	-0.27	0.63
	4th session	3.80+1.70	5.13+1.30	-1.33	0.02*
	8th session	0.87+1.19	3.20+1.61	-2.33	0.00***
Pain intensity	Baseline	3.20±0.77	3.33±0.82	-0.13	0.65
	4th session	1.80±0.68	2.53±0.10	-0.73	0.03*
	8th session	0.53±0.64	1.67±0.82	-.1.13	0.00***
Personal care	Baseline	2.53±1.06	2.80±0.68	-0.27	0.42
	4th session	1.40±0.99	2.13±0.64	-.073	0.02*
	8th session	0.60±0.74	1.53±0.74	-0.93	0.00***
Lifting	Baseline	3.27±0.88	3.53±0.74	-0.27	0.38
	4th session	2.47±0.99	2.80±0.68	-0.73	0.29
	8th session	1.20±1.21	2.07±0.88	-0.93	0.03*
Reading	Baseline	2.93±1.03	2.93±0.80	0.00	1.00
	4th session	2.00±0.85	2.13±0.99	-0.13	0.70
	8th session	0.67±0.62	1.07±0.70	-0.40	0.11
Headache	Baseline	2.33±1.54	2.60±1.40	-0.27	0.62
	4th session	1.53±1.51	2.07±1.03	-0.53	0.27
	8th session	1.20±1.15	1.73±1.16	-0.53	0.22
Concentration	Baseline	2.40±0.91	2.60±1.06	-0.20	0.58
	4th session	1.80±0.77	1.87±0.83	-0.07	0.82
	8th session	0.60±0.74	1.20±0.87	-0.60	0.05
Work	Baseline	2.87±0.92	2.67±1.05	-0.20	0.58
	4th session	1.73±1.03	1.80±1.08	-0.07	0.86
	8th session	0.93±0.96	1.33±0.82	-0.40	0.23
Driving	Baseline	3.40±1.18	2.60±1.12	0.20	0.07
	4th session	2.33±0.90	2.00±1.31	0.13	0.42
	8th session	1.40±0.83	1.53±1.19	0.40	0.72
Sleeping	Baseline	2.60±0.74	2.73±0.96	-0.13	0.67
	4th session	2.13±0.99	2.13±0.83	-0.00	1.00
	8th session	0.87±0.92	1.67±0.98	-0.80	0.03*
Recreation	Baseline	3.00±0.93	3.13±0.74	-0.13	0.67
	4th session	1.73±0.88	2.07±0.80	-0.33	0.29
	8th session	0.80±0.77	1.53±1.13	-0.73	0.05
NDI Total score	Baseline	28.66±5.67	28.93±5.48	-0.27	0.90
	4thsession	18.87±4.78	21.40±4.64	-2.53	0.15
	8thsession	8.80±2.78	15.33±3.90	-6.53	0.00***

*Level of significance: p<0.001***, p<0.0.1**, p<0.05**

Between the groups comparison showed that the NPRS scores during and post-intervention, and at the baseline and post-intervention showed more reduction in the experimental group as compared to the control group. Furthermore, the total NDI scores at the baseline and post-intervention showed more reduction in the experimental group as compared to the control group. This might be because a combination of both interventions would have helped in reducing the alteration in the neuromuscular and sensorimotor system due to chronic neck pain which causes functional disability[4].

In a study conducted in the past, massage therapy was determined to be more effective than exercises for pain relief[27]. Though the findings of this study are like those of the current study, however instrumental STM instead of manual STM was used in the previous study, and the effects of exercises and STM combined were not seen. Similarly, another study has reported considerable improvement in patients who received STM, in terms of pain intensity; however, the comparison was made with therapeutic ultrasound[28].

While manual therapy techniques such as STM allow therapists to identify and treat soft tissue dysfunctions, therapeutic exercises increase muscle and ligament strength, improve the mobility of structures, and prevent tendon injuries. It may be that both treatments combined would have helped in the myofascial release, which would have formed the basis for the realignment of the impaired structures and creating appropriate postural adjustments, [29] thus more improvement in the experimental group as compared to the control group in the current study.

In a systematic review conducted by Hidalgo, Banjamin et al., on the efficacy of manual therapy and exercise for treating non-specific neck pain, it was concluded that combining different forms of manual therapy with exercise is better than manual therapy or exercise alone[30].The results of this study are like the current study except that in the current study the effects of manual therapy alone were not determined.

Furthermore, there are certain factors that have shown to be associated with the higher prevalence of pain in females as compared to males in the previous studies, including a higher prevalence of psychological issues such as anxiety and depression, lower muscular strength, and pain threshold, as well as poor sleep quality[17]. This provides important evidence for the clinicians in determining the causes of NP typically associated with the female gender.

The limitations of the study are that it was conducted for short time duration, on a small sample size, and the female participants who belonged to a broad age range.

CONCLUSION

Neck isometric strengthening exercises when combined with soft tissue mobilization were more effective than neck isometric exercises alone for reducing the pain intensity and disability in females with tension neck syndrome. Future studies should be conducted for a longer duration to see the long-term retention effects of the combined therapy approach, and gender-based study with larger sample size and a more specific age range to draw more generalized conclusions.

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RESEARCH ARTICLE

COMPARISON OF PERCEIVED BENEFITS AND BARRIERS TO EXERCISE AMONG MEDICAL AND NON-MEDICAL STUDENTS

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ABSTRACT

Background: Perceptions of exercise benefits and barriers in medical and non- medical students needs to be explored as it is expected that medical students have more awareness regarding physical activities. **Objective:** To compare the perception of exercise benefits and barriers among medical and non-medical students. **Methodology:** This comparative cross-sectional study was conducted in 6 months from November 2020 to April 2020, on sample of n=289 regular male and female students in the age range of 19-27 years. The data of final year medical students was collected from Azra Naheed Medical College and nonmedical students from Superior University, Lahore Through on probability convenient sampling technique. The perception of exercise benefits and barriers was assessed using the exercise benefit/barrier scale (EBBS). The data was carried out by an online Google form due to the pandemic situation. The independent sample t-test was used to estimate of difference among both groups. **Results:** The mean age of the participants was 23.75±2.11 years. A total of n=164(56.74%) were males and n=125 (43.25%) were females. The result of independent t-test showed no significant difference between medical and non-medical students regarding exercise benefit (91.2±11.66 ver. 91.09±12.83, p=0.93) and barriers (34.97±7.22 ver. 35.27±7.62, p=0.72) as well in total score of EBBS (126.23±14.450 ver. 125.81±16.390, p=0.810).**Conclusion:** It is concluded that medical and non-medical final year students are equally aware about exercise benefits and barriers.

Keywords: Benefits, Barriers, Exercise, Medical students, non-medical students, Physical activity, Perception

INTRODUCTION

Physical activity (PA) is the combination of voluntary movements along with consumption of the body energy[1].PA increases the bone density, muscular mass and neuromuscular activation, therefore showing quick and long-term benefits for the physical, social and psychological wellbeing of an individual[2]. On other hand, prevalence of obesity has increased substantially over the past 40 years, from less than 1% in 1975, to 6-8% in 2016 as more obesity demands more physical activity[3]. High cholesterol level is contributing in high level of heart diseases in adulthood[4]. Physical inactivity is considered the 4th leading risk factor accounting for 6% of the global mortality rate[5].Physical inactivity, poor diet; poor cardiorespiratory fitness[6] and high content of body fat are the risk factors for CVD[7].

The recommended guidelines from the WHO indicate that adults ranging from 18-64 years old should engage in the exercises of moderate-intensity five days per week for at least 30 minutes to enhance their muscular strength and cardiopulmonary fitness to lower the risk of all the non-communicable diseases[8].Many authors have reported positive relationship between academic performance and physical fitness [9,10].

It is an ethical duty of medical students to tell their clients about suitable exercises and their attitude toward exercise because there is an assumption that medical students being health care professionals have a greater knowledge of exercise and its advantages compared to non-medical[11].It is stated that there is vast difference of knowledge and understanding in medical students about the application and advantages of PA in their life[12].The students had different perceptions about exercise benefits and barriers faced by them. The reported barriers were less free time and a high workload of studies resulting in reduced PA levels in medical students[13].Levels of physical activity were found quite higher in American medical students following PA recommendations in guidelines Physical therapy students have high physical activity compared to medical students because they followed the ACSM guidelines for PA. The reason is their university modules offered sports and leisure time activities[14]. But contrary findings were seen in another study that PA levels were lower in PT students when compared the physical education students[15]. Another study also stated

that physiotherapy students have good perception about their BMI[16]. but students from the rural background were fit compared to urban[17,18].

The perception of medical students in the promotion of PA is still unknown and PA levels of medical students are different because they took their classes differently accordingly to their syllabus[19]. So, PA levels and the perceptions about exercise benefits and barriers in medical and non-medical students need to be explored. The objective of the study was to compare the perception of medical and non-medical students regarding exercise benefits and barriers.

METHODOLOGY

It was a comparative cross-sectional study conducted on n=289 (Male 164 and female 125) medical and non-medical students 51.56% were medical and 48.44% non-medical students. Azra Naheed Medical College and Superior University Lahore respectively after Ethical permission from Research Ethical Committee (REC) of Azra Naheed Center of Research and Development (ANCRD) SU/ANCRD/IERC/57. The Sample n=289 calculated based on the formula, z1-α/22 P/(1-P) /d2, where , Z1-α/2= 1.96 (Standard normal variants at 5% type I error (p<0.05) ,P= 0.79 (Expected proportion in population and d= 0.05 (absolute error[20].

The undergraduate students in the age range of 19-27 years both genders and final professional year regular students studying full time at the university campus were included. The students with any serious illness, musculoskeletal disorders, injury in the last 06 months, physical disability, and hereditary disease along with any physical activity or exercise contraindicated were excluded. The participants were selected using a non-probability convenient sampling technique in two categories: one was the medical undergraduate students of DPT MBBS, BDS, MLT, and MIT from Azra Naheed Medical College and nonmedical students from Engineering, Aviation, BBA, Architecture, Mass Com, BS-CS) from Superior University, Lahore.

The data was collected from the study participants through online google forms. The outcome was measured using the 43 items Exercise benefit and barrier scale (EBBS). The beneficial components comprised of 29 questions and the barrier component has 14 questions. It has a validity coefficient of 0.879 as a whole and 0.95 for benefit and 0.80 for the barrier section. The scale responses were on 4 point Likert scale ranging from 4 (strongly agree) to 1 (strongly disagreed. The scoring of barrier scale is reversed. The total score of scale is ranged from 43 to 172. If Benefits Scale is used alone, the score range is between 29 and 116. While Barriers Scale is used alone, scores range from 14 to 56 and does not need reverse scoring. The higher the score on scale, the more positively the individual perceives exercise [21].

Before data collection each participant submitted written informed consent. The researcher the adhered to ethical and legal norms and standards according to Declaration of Helsinki as a statement of ethical principles

The data was presented in the form of mean±Sd and n(%). As the data was normally distributed, the independent t test was applied to compare the medical and non-medical students. The SPSS 22 Version was used for the statistical analysis and level of significance was set at p<0.05.

RESULTS

The mean age of the participants was 23.75±2.11 years. A total of n=149 (51.56%) were medical and n=140 (48.44%) non-medical students. (Table 1) The frequency of gender was n=164(56.74%) were males and n=125(43.25%) were females. The frequency distribution of BMI can be seen in Figure 1.

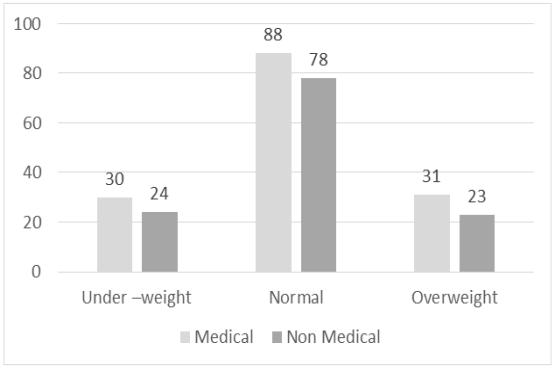

Figure 1: BMI frequency distribution

The result of independent t-test showed no significant difference between medical and non-medical students regarding exercise benefit (91.2±11.66 ver. 91.09±12.83, p=0.93) and barriers (34.97±7.22 ver. 35.27±7.62, p=0.72) as well in total score of EBBS (126.23±14.450 ver. 125.81±16.390, p=0.810). (Figure 1)

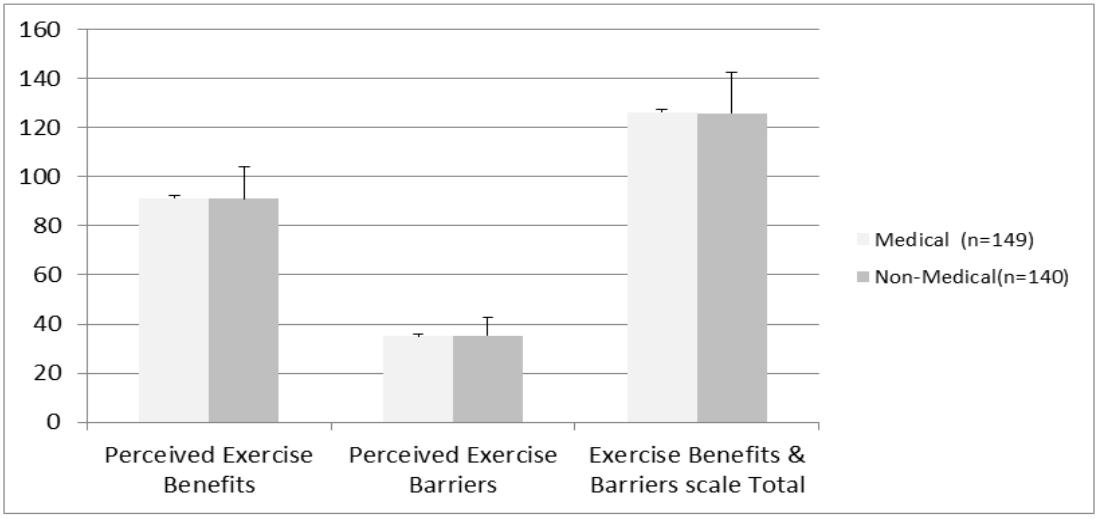

Figure 2: Comparison between Medical and Non-Medical Regarding Perceived Exercise Benefits and Barriers

DISCUSSION

The objective of study was to compare the medical and non-medical undergraduate student regarding the perception of exercises benefit and barriers. The results indicated that both have the same perception about the exercises benefit and barriers. This cross-sectional study was conducted in Lahore using the exercise benefit/barrier scale (EBBS) as an outcome measure. Medical students have a slightly higher score on the exercise benefits scale than non-medical students but with no significant difference at p=0.93. This study indicates that medical students have positive attitude about exercise than non-medical students. The Physical inactivity is the leading risk factor and has long-term effects on the physical, social, and psychological well-being of an individual[22].As per knowing this fact, the above study result was compared with the current study and revealed that many medical students had faced a barrier to exercise due to their busy routines. However, according to literature, more than half of medical students are physically inactive due busy academic schedule and lack of proper facilities. This result can be compared 41.1 % Saudi medical students were physically inactive but only 15.4% of Egyptian medical students were inactive[23].When these results were compared with a current study,, exhibited that many medical students show a positive trend towards exercise they were not as inactive as the data of sudia medical student was reported. Similarly, Fourth-year medical students at the University of British Columbia participate in more strenuous physical exercise than the average age-matched Canadian students , which impacts their expectations of potential of clinical practices[24].This study finding had consistency with the current study because medical students had potential benefits and a positive attitude towards exercise.

The exercise was perceived to benefits on their health, with medical students finding additional stress-relieving benefits. The most significant obstacles to exercise were lack of time, facilities with inconvenient schedules and exercise not integrating into research or placement schedules. In this current study non -medical students considered lack of exercise place, exercise work out, lack of support from family and peers, exercise fatigue and sparing time were considered as barrier to exercise more than medical students. But these findings are inconsistent with Saudi students because they had good perception benefits of exercise but cultural differences, lack of facilities and time were also barriers for them[25].

Nursing students were less involved than medical students, citing fewer advantages and more obstacles to exercise, as well as a lack of social support for physical activity, Current study lack the analysis regarding program wise perception of exercise benefits and barriers. Self-efficacy and social reinforcement were the best predictors of physical activity in nursing and medicine students, accounting for 35% of the variance[11].The students considered tiredness, fatigue, and time spent

keeping away from their families as exercise barriers. The mostly reported barriers are pain, musculoskeletal disorders, physical exertion, and fatigue, but there was no association between barriers and a sedentary lifestyle[26].

In this study 51 (34.22%) medical and 61 (43.57%), non-medical students considered cost as a barrier to their exercise. Interestingly among Jordanian teenagers, more than half of medical and non-medical students were taking fatigue as a barrier while Lack of physical activity skills, easy availability and low cost of fast food, and a lack of peers and friends were all highlighted as social and personal barriers to exercise[27].The current study found that medical students of had a good attitude toward exercise as compared to non-medical professionals but not significantly different. The health-promoting behaviors did not affect their physical activity and female students of medical were found less active at this institute inconsistent with the findings of undergraduate Saudi students[28].The limitation of this study was the population, which was selected from only one university due to pandemic lockdown and it does not represent the whole country. The second limitation was online data collection because the university was closed due to the pandemics.

CONCLUSION

The perception about exercise benefits and barriers were high in both medical and non-medical students without any significant difference. The medical and non-medical students both positively perceived the exercise benefits and barriers equally. The reasons may be easily accessible information regarding the exercise benefits that could lead to focus on a comprehensive management of obese adolescent girls.

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RESEARCH ARTICLE

ASSOCIATION OF COMMON TYPES OF HEADACHES WITH VESTIBULAR IMPAIRMENT AND NECK PAIN IN ELDERLY

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ABSTRACT

Headache(TTH). The headache is associated with vestibular impairment (VI) and neck pain, but this association has not been studied in elder population. **Objective:** To determine the association of common types of headaches with vestibular impairment and neck pain in elderly. **Methods**: A cross sectional study was conducted from February 2021 to June 2021 at District Headquarters Hospital Narowal using a non-probability convenience sampling technique on n=140 participants. The inclusion criteria include age above 50 years, able to ambulate independently, complaint history of common type of headache. Headache was assessed clinically based on diagnostic criteria. The head impulse test was used to assess the vestibular function. The neck pain presence was asked through close ended question with binary response. The chi-square (x^2) test used for association between the variables. **Results:** The mean age of the participants was 58.17 ± 7.14 years. The tension type headache was seen in n=76 (54.2%), migraine in n=33 (23.5%) and cervicogenic headache in n=31 (22.1%) patients. Vertigo was seen in n=52 (37%) patients and neck pain in n=82 (58%) patients. A significant association of vestibular impairment with migraine (Chi square value= 7.79, p=0.02) and cervicogenic headache (Chi square value= 6.12, p=0.04). While no significant association with tension type headache (Chi square value= 0.97, p=0.04). All type of headache were significantly associated (p<0.05) with neck pain. **Conclusion**: The vestibular impairment and neck pain are associated with all type of headache, except tension type headache where vestibular impairments are not associated. There was an association between types of headaches and neck pain.

Keywords: Cervicogenic headache, migraine, neck pain, tension type headache, vestibular impairment.

INTRODUCTION

A painful sensation in the head region is called headache that originates in a specified portion, sometimes at the posterior of the head, on each side of the head, in the region of forehead, or it may be in the eye region. In generalized headache pain occupy the whole head region[1]. According to the WHO, ten top disabling conditions include headache as one of the disabling diseases. Globally 46% of the population is affected with active headache[2].Headache is classified into two main subdivisions, primary headaches, i.e., patients having no underlying cause of having this pain. Another type is secondary headaches, in which patients have specific etiology in reference to the International Classification of Headache Disorders (ICHD-3)[3].

Vestibular Impairment (VI) is a non-specific complaint that primary health care providers frequently encounter, with prevalence estimates ranging from 11.1 to 28.9 percent[4].It manifests as dizziness, unsteadiness, spinning sensations, and disorientation[4].According to new research, headache sufferers with dizziness have varying degrees of peripheral and central VI. Some mechanisms responsible for this impairment are vestibule-cerebellar loss of inhibition, central vestibular network misfiring, and peripheral disease exacerbating central hypersensitization[5].

Dizziness and imbalance are two of the most prevalent symptoms of VI among the elderly, and due to accidental falls these are considered public health concerns[6].VI and falls are most prevalent and morbid in the elderly[7].

In headache sufferers, head and neck pain is common finding[8].Different aspects of Neck pain, including as pericrania muscular discomfort, myofascial transferred pain from neck muscles, and upper cervical spine joint dysfunction, have been linked to headache in adults. Although migraine pain is most commonly felt in the trigeminal nerve's ocular distribution, a significant number of migraines have reported discomfort in the neck and occiput during their episodes[9]. Psychiatric comorbidities, sleep difficulties, abuse of headache abortive drugs, and obesity are all modifiable risk factors that lead to transformation from episodic to chronic forms[10].

There are many people who suffer from headaches and had symptoms of VI and neck pain. So it is

critical to understand the association between types of headache and vestibular impairment as well as neck pain. This study was conducted to determine the association of types of headaches with VI and neck pain in elderly population.

METHODOLOGY

A cross sectional study was conducted from October 2020 to August 2021. The study was carried out at the District Headquarters Hospital Narowal. The study's protocol was approved by ethical review committee of Riphah College of rehabilitation & allied health sciences Islamabad with a Reference RIPAH/RCRS/REC/00815. Each patient participant signed a written informed consent form.

The Nonprobability convenience sampling was used for sample collection. A total of n=140 individuals were included in the study. The inclusion criteria include age above 50 years, both genders, able to ambulate independently, complaint/ history of common type of headache. The subject having any systematic illness, cognitive impairment, hypoglycemia, neurodegenerative disease, viral infection (meningitis, encephalitis), disorder of stance and gait, psychiatric disorder, drug intoxication were excluded from the study.

Before data collection each participant signed a written informed consent. Afterword a questionnaire containing demographics was filled by each patient. The type of headache was assessed clinically based on symptoms, location, origin, associated and exacerbating factors. Aside from the more uncommon and optional symptoms like autonomic disturbances, dizziness, phono photophobia, monocular visual blurring, and difficulty swallowing, diagnostic criteria for the headache include unilateral head pain, symptoms and signs of neck involvement, non-clustering episodic moderate pain originating in the neck then spreading to the head, and response to root or nerve blockade[11].

In Tension-type headache (TTH) was diagnosed on following characteristics low to moderate diffused Pain, pulsation, or exacerbation by physical activity. The aura or neurological signs are not discernible. Light, noise, and odor sensitivities are usually absent or mild. In the chronic form, nausea may be present, but vomiting is never noticed[12]. While in migraine, headache aura may be present with different severity level. There may be both photophobia and phono-phobia, which may cause nausea and vomiting. The cervicogenic headache (CGH) can be unilateral or bilateral with restricted range of motion (ROM) in the neck, ipsilateral shoulder and arm discomfort may be aggravated by neck positioning or posture and the positive cervical flexion test is the diagnostic criteria of CGH.

The head impulse test was performed on each patient to assess the vestibular impairment (VI). The presence of neck pain was asked through close ended question " Do you suffer from neck pain?" with the answer of YES for presence and NO The assessment of the neck pain was made with the question that" Do you suffer from neck pain?" with the answer of YES for presence and NO for the absence. The demographic data was presented with n(%), mean±SD. To find the association between the types of headache with VI and neck pain in the elderly, the Chi-square (x^2) test was used. The data was analyzed using SPSS version 23 and the level of significance was set at $p<0.05$.

RESULTS

The mean age of the participants was 58.17 ± 7.14 years range from 50 to 80 years. In the sample gender distribution is equal, n=70 male and n=70 female respectively. Among n=140 participants, n=76 (54.28%) were diagnosed with tension-type headache, n=33 (23.5%) were diagnosed with migraine, and n=31(22.1%) with Cervicogenic headache and vertigo was seen in n=52 (37.1%) patients. Association of types of headaches with vestibular impairment was determined by using chi-square. Analysis shows that there is an association common type of headache with VI.

A significant association of vestibular impairment with migraine (Chi square value= 7.79, p=0.02) and cervicogenic headache (Chi square value = 6.12, p=0.04). While no significant association with tension type headache (Chi square value= 0.97, p=0.04). All type of headache were significantly associated ($p<0.05$) with neck pain.

Table 1: Association of common types of headaches with vestibular impairment and neck pain

Type of Headache	Total	Vertigo				Neck pain			
		Present	Absent	X^2	p-value	Present	Absent	X^2	p-value
Migraine	33 (23%)	18 (13%)	15 (10%)	7.79	0.02*	18 (13%)	15 (10%)	7.79	0.02*
Tension Type Headache	76 (54%)	22 (16%)	54 (38%)	.97	0.62	35 (25%)	41 (29%)	6.12	0.04*
Cervicogenic Headache	31 (22%)	12 (9%)	19 (14%)	.12	0.04*	29 (21%)	2 (1%)	13.47	0.001**

*Level of significance: p<0.001***, p<0.01**, p<0.05**

DISCUSSION

The purpose of this study was to find the association of types of headaches with VI and neck pain in the elderly. The data analyses show there is an association of cervicogenic headache (CGH) and migraine with VI, while no association was seen with tension type headache (TTH). There is an association of neck pain with cervicogenic headache, tension type headache, and migraine which is statistically significant. When comparing current results to those of the older studies, it must be pointed out that the association was more evident in the migraine patient, which is supported by the study of lamp et al., which states that there is an association between migraine and vertigo[13]. The migraine and vestibular problems coexist which sometimes is referred as vestibular migraine[14].

An association of these two variables is well reported by the study of G.Akdal et al. and concluded that dizziness exists in more than half of the headache patients; however, the relation was strong with migraine than TTH and CGH[15].This research supported the current study results in this respect that the headache with dizziness is more common in females and with migraine than other types of headache. Migraine has an association with vertigo, and its prevalence increases with age; Anne studied this. H et al. and this point supported the present study[16].

In this study head impulse test (HIT) was used to assess the vestibular impairment (VI). This test was done in all the participants, but more positivity was seen in patients with vertigo. In the present study, the association though is analyzed with types of headaches and showed the association was more evident in the migraine because migraine often coexists with vertigo, so indirectly, the association was found between the VI and HIT. KP weber researched the Vestibulo-ocular reflex (VOR) deficits evaluation with HIT and concluded that HIT with high velocity revealed VOR deficits better. Hence in the light of this study, the HIT could be a test for evaluating VI[17].

S. Ashina et.al also found that neck pain is a common complaint in the general population but more prevalent with the TTH and migraine. These findings support the results of the present study[18]. A.H. Calhoun study had the same finding relating to the relation of migraine with neck pain[19]. A review article stated that the neck is the origin of pain and causes pain in a headache known as cervicogenic headache. This article proves that neck pain has a relation with cervicogenic headache as in the present study[20]. In 2018 Sunil.p et al. conducted a study to find the association of neck pain with migraine and found that neck pain is the common feature of migraine and there is an association between these two conditions[21].

Due to covid-19 pandemic patient were reluctant to perform the physical test. It was hard to perform the maneuvers on the patient with proper SOPs .Further studies should be performed on elderly because headache has more prevalence in elderly population and VI is also common so more risk factors should be studied. Association of headaches with VI should be studied with large sample size.

CONCLUSION

The vestibular impairment and neck pain are associated with all type of headache, except tension type headache where vestibular impairments are not associated. There was an association between types of headaches and neck pain. Future study large sample size while controlling some confounding variable may provide more detail about association between types of headaches with vestibular impairment and neck pain.

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RESEARCH ARTICLE

EFFECTS OF DOSE-RESPONSE OF NORDIC HAMSTRING EXERCISE ON MUSCLE PERFORMANCE IN ATHLETES, A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: The Nordic Hamstring muscle training is effective for eccentric strengthening of the hamstring in a sports population. Due to its high volume, its compliance is low and researchers are working to find out its lowest effective dose. **Objectives:** To determine the effects of dose-response of Nordic hamstring exercise on hamstring muscle performance. **Methods:** A randomized controlled trial was conducted from August to November 2020 and comprised of athletes of both genders who were randomized into high (3 times/week, 4 weeks) and low volume (1 time/week, 4weeks) Nordic hamstring exercise groups. The Outcome measures were taken using the single leg hamstring bridge test for hamstring strength, 30-m speed test, agility T-test, anthropometric measurement at 5cm, 10cm, 15cm above the patella. The assessments were taken at baseline, 2nd and 4th weeks. The data were analysed using SPSS 23. **Results:** There were 30(88.2%) males and 4(11.8%) females with a mean age of 23.41±3.67years and a mean BMI of 18.6±3.16. A significant difference ($p<0.001$) was observed between both groups for all outcome variables post-exercise protocol at 2nd and 4th week. **Conclusion:** The Nordic hamstring exercise was effective in improving hamstring muscle performance. The higher dose of Nordic Hamstring Exercise was more effective than the lower dose in improvement in muscle size, strength, speed and agility of the participants after 4 weeks of training.

Keywords: Agility, athletes, hamstring injuries, muscle strength, nordic hamstring exercises, speed

INTRODUCTION

Hamstring muscle injuries are most commonly occurring in sports-related injuries[1]. These career-threatening injuries have a high rate of recurrence ranging from 14-63%[2]. The engaging every fifth player per season leads to a high cost of treatment. The modifiable risk factors are inadequate eccentric hamstring strength, poor balance, high speed running with a quick change in directions, inadequate hamstrings/quadriceps ratio, inadequate warm-up, poor flexibility prpredisposinghe hamstring injury[3]. About 60-80% of hamstring injuries happen in the late swing phase, the position the muscle works eccentrically[4]. So the treatment options that focus on the eccentric strengthening of the muscle are more promising in the prevention of hamstring strain injuries[5].

Hamstring Muscle Strength and architecture are both improved with training[5]. The Nordic hamstring exercise(NHE) was first introduced by Mjølsnes et al with 700 repetitions across 10-weeks eccentric Nordic hamstring exercise (NHE) protocol with better results in hamstring strength as compared to concentric group (hamstring curl)[6].But this high volume exercise is probably the reason of low compliance and high Delayed Onset Muscle Soreness[7]. According to a meta-analysis, Nordic hamstring exercises can reduce the risk of hamstring strain injuries by 51%[1]. several studies suggest that Nordic hamstring exercise(NHE) can reduce hamstring injuries recurrence by 85% in previously injured athletes[8]. Performing 6 sets of 5 repetitions Nordic hamstring exercise (NHE) per week the strength of the hamstring was incredibly increased[9] Preventive effects of (Nordic hamstring exercise) NHE are seen with the threshold of 4-6 weeks dose[6]. The Volume of training is the number of repetitions multiplied by the number of sets. Studies showed that both the high and low volume protocols are effective in increasing strength and reducing injuries[1].3 sets of 3 repetitions, 3 times per week is considered the lowest nordic hamstring protocol[6]. Researches are being done to find out the minimum dose of exercise protocol that produce the desirable effects of hamstring strength[1, 4, 6, 10].

Hamstring strengthening results in improvement of athlete's performance by producing the desired effects. The important performance indicators are speed and agility in almost all the sports. Speed is the ability of the athlete to move in the fastest possible way[11]. The NHE has proven effects on

enhancing the speed of many sports players[12]. Agility is the ability to cross the hurdles and change directions in the fastest possible way[13]. The effects of NHE on agility are yet to be found according to previous literature[6].

Even in the face of promising NHE preventive effect shown by previous studies, adoption and compliance of the NHE programs are still low[6]. Evidence suggests that lowest dose of NHE required to enhance athletes' performance is yet to be found. So the current study was planned to determine the lowest dose-response of Nordic hamstring exercise on strength, muscle size, speed as well as agility.

METHODOLOGY

This single-blinded randomized control trial was conducted at JKD (Jeet Ker Dikhao) cricket academy and Sports center Peshawar, Pakistan from July 2020 to January 2021. The study protocol is registered at national library of medicine (NCT04668105) and ethically approved from Riphah ethical committee REC/00789. The sample size was calculated through Open Epi tool.

The sample was collected using the non-probability convenience sampling technique. The athletes of both gender, aged between 18 and 30 years, BMI between optimum range 18.5-24.5 kg/m^2, belonging to cricket, football, sprinters and badminton participating at least 6 months in relevant sports and COVID-19 negative and free from symptoms. The athletes having history of knee injury < 6 months, had knee or hip, spine surgery, the ruptured knee or ankle ligaments torn and those that withdraw from training were excluded from the study. A total of n=50 athletes were evaluated for eligibility criteria, out of which n=16 were excluded for not meeting the criteria. So the Sample size of n=34 athletes were randomly allocated to Group A (n=17) received the High volume Nordic hamstring exercise (HV-NHE) training and group B (n=17) received low volume Nordic Hamstring Exercise (LV-NHE). (Figure 1)

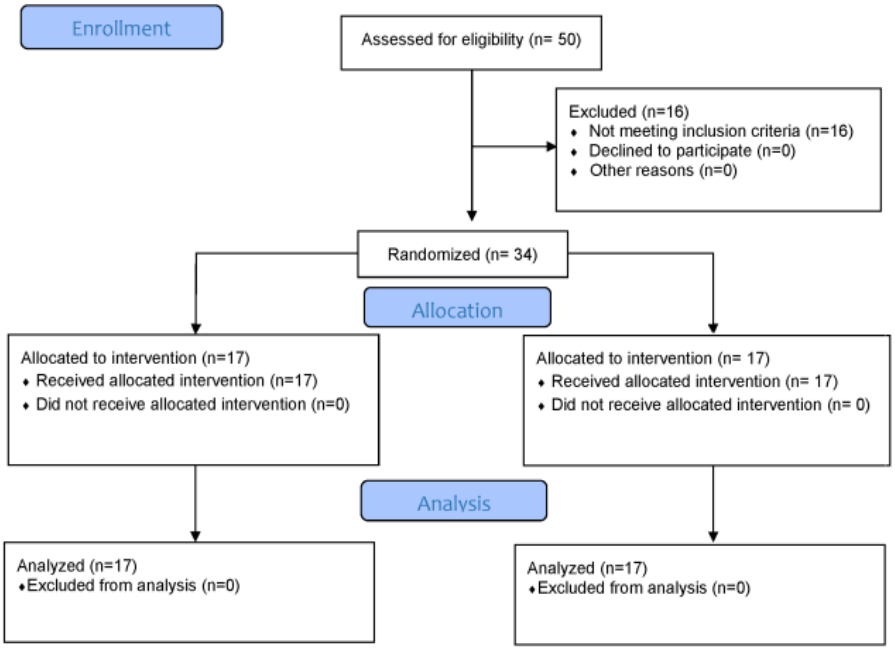

Figure 1: CONSORT diagram

After taking the informed written consent, the baseline data for strength was obtained using the Single Leg Hamstring Bridge which is a valid and reliable clinical test of hamstrings muscle strength for athletes[15,16]. The agility was measured through a T-test which is a reliable and valid tool to measure the agility of athletes[17] with cut-off values of 12.5 and 10.5. The speed was assessed through the 30-m speed test with validity and reliability of the 30-m speed test is 0.94 to 0.98 respectively[18]. The size of the hamstring was measured through an anthropometric measuring tape around the thigh circumference. The tape is placed 5, 10, and 15 cm proximal to the upper pole of the patella.

The intervention given to the group A, High volume Nordic hamstring exercise (HV-NHE) group was Nordic hamstring exercise for the eccentric hamstring strength. The athlete kneeled on the ground to stabilize his ankles and hold them in place with the help of a partner. The athlete lean forward from his knees, not his hips and the movement must be controlled and kept slow while the participant moved forward / low as much as possible without the help of hands or arms. He was allowed to put his hands in front only when he cannot rely on his feet and pushing himself back to return to their original position and repeat the procedure[5]. Athletes performed the high-volume Nordic hamstring exercise with protocol of 3 repetition× 3sets× 3 times for 4 weeks. the total dose was 27 repetitions per week with 108 repetitions in 4 weeks[10]. It is the otherwise lowest according to previous literature[6]. The intervention given to group B, low volume Nordic hamstring exercise (LV-NHE) group was the same Nordic hamstring exercise for the eccentric hamstring strength. But the athletes received low volume Nordic hamstring exercise with the protocol of 3 repetition × 3 sets × 1 time for 4 weeks even lower than the previous one. It was 9 repetitions per week with 36 repetitions in total.

Both the groups were assessed for outcome at baseline, after 2nd weeks and 4th week of intervention. The assumptions of parametric tests were not met for hamstring strength speed and agility and the muscle size measurements. So the Mann Whitney u-test was used for between the group analysis and Friedman test with Wilcoxon sign rank test was used for intra group changes of hamstring strength, speed and agility. The data was analysed using IBM SPSS version 21.0.

RESULTS

The mean age of the HV-NHE group was 23.71±3.601 years and 23.12±3.822 years in LV-NHE group was 23.12±3.822 years. There were n=30(88.2%) males and n=4(11.8%) females in the study. The mean BMI in the HV-NHE groups was 19.87.05±3.69 and 17.32±3.93 in the LV-NHE group.

The intragroup analysis showed significant improvement (p<0.001) in both group observed from baseline to at the end of 4th week, as well as at all levels from baseline to end of 2nd week, 2nd week to end of 4th week in strength, agility, speed and hamstring muscle size of the athletes. (table 1)

The intergroup analysis showed that all variable were comparable at the baseline. After that significant improvement (p<0.001) observed in group A (HV-NHE) as compare to group B (LV-NHE) in all variables at 2nd and 4th week, except at 2nd week speed improvement was not significantly different (p=0.218), but after 4th week HV-NHE showed significant improvement (p=0.02) as compare to LV-NHE. (table 2)

Table 1: Intra-group changes in HV-NHE and LV-NHE groups

Variable	Assessments	Group A (HV_NHE) Median(IQR)	Mean Rank	Z/X^2(df)	p-value	Group B (LV-NHE) Median(IQR)	Mean Rank	Z/X^2(df)	p- value
	Baseline	10.5(2.7)	3	3.62	0.00***	14(3)	3	3.62	0.00***
Agility	After 2nd week	7(0)	2	3.94	0.00***	9(0)	2	3.94	0.00***
	After 4th week	5(0)	1	34 (2)	0.00***	9(1)	1	34 (2)	0.00***
	Baseline	13(4)	1.15	3.06	0.00***	14(3)	1.15	3.23	0.00***
SLHB	After 2nd week	17(1)	1.94	3.58	0.00***	16(1)	2.09	2.89	0.00***
	After 4th week	19(1)	2.91	27.3 (2)	0.00***	17(1)	2.76	25.9 (2)	0.00***
	Baseline	4.5(0.35)	3	3.62	0.00***	4.3(0.2)	3	3.63	0.00***
30m speed	After 2nd week	2(1.4)	1.71	2.73	0.00***	2.5(0.5)	1.76	2.70	0.00***
	After 4th week	2(0.35)	1.29	31.1 (2)	0.00***	2.5(1)	1.24	29.6(2)	0.00***
	Baseline	39(5)	1.09	3.43	0.00***	37(2)	1.03	3.60	0.00***
MSM 5cm	After 2nd week	42(4)	1.94	3.52	0.00***	39(1)	2.06	3.42	0.00***
	After 4th week	46(.2)	2.94	31.5 (2)	0.00***	42(3)	2.91	31.1 (2)	0.00***
	Baseline	45(4)	1.21	2.76	0.00***	41(4)	1.15	3.14	0.00***
MSM 10cm	After 2nd week	45(4)	1.91	3.31	0.00***	42(2)	1.85	3.64	0.00***
	After 4th week	45(1)	2.88	27.8 (2)	0.00***	45(1)	3	32.1(2)	0.00***
	Baseline	44(6)	1.18	3.13	0.00***	44(4)	1.35	2.84	0.00***
MSM 15cm	After 2nd week	46(2)	1.82	3.64	0.00***	45(1)	2.6	2.35	0.00***
	After 4th week	48(1)	3	29.9 (2)	0.00***	46(1)	2.59	18.9	0.00***

[a]Baseline to after 2nd week, [b]2nd week to after 4th week, [c]baseline to after 4th week
*Level of significance: p<0.001***, p<0.01**, p<0.05**

Table 2: Inter-group comparison at baseline, 2nd week and 4th week

Variable	Assessments	Group A (HV-NHE)		Group B (LV-NHE)		p- value
		Median(IQR)	Mean Rank	Median(IQR)	Mean Rank	
Agility	Baseline	10.5(2.7)	19.47	14(3)	15.53	0.248
	After 2nd week	7(0)	9.50	9(0)	25.50	0.00***
	After 4th week	5(0)	9.50	9(1)	25.5	0.00***
SLHB	Baseline	13(4)	15.5	14(3)	19.50	0.23
	After 2nd week	17(1)	21.9	16(1)	13.09	0.005**
	After 4th week	19(1)	25.06	17(1)	9.94	0.00***
30m speed	Baseline	4.5(0.35)	19.47	4.3(0.2)	15.53	0.241
	After 2nd week	2(1.4)	15.44	2.5(0.5)	19.56	0.218
	After 4th week	2(0.35)	13.79	2.5(1)	21.21	0.02*
MSM 5cm	Baseline	39(5)	20.56	37(2)	14.44	.070
	After 2nd week	42(4)	23.38	39(1)	11.62	0.00***
	After 4th week	46(.2)	25.85	42(3)	9.15	0.00***
MSM 10cm	Baseline	45(4)	19.18	41(4)	15.82	.322
	After 2nd week	45(4)	22.21	42(2)	12.79	0.005**
	After 4th week	45(1)	24.59	45(1)	10.41	0.00***
MSM 15cm	Baseline	44(6)	18.0	44(4)	17.0	.768
	After 2nd week	46(2)	24.88	45(1)	10.12	0.00***
	After 4th week	48(1)	26.0	46(1)	9.0	0.00***

*Level of significance: p<0.001***, p<0.01**, p<0.05**

DISCUSSION

The results indicated that higher volume of Nordic hamstring exercise (HV-NHE) was more effective for improvement in strength, speed, agility compared to low volume of Nordic hamstring exercise (LV-NHE) at both 2nd and 4th week. In addition, both groups had significant improvement in performance across all parameters.

The Nordic hamstring exercise has previously proven its efficacy on improve of the various parameters of hamstring muscle performance[1, 4, 6]. Systematic review suggests the significant effects with the dose of the NHE ranges between 21- 73 repetitions.[6] The risk of the hamstring injuries increases due to lack of muscle strength. The recommended dose of volume to increase muscle strength is ≤6 with 80%1RM [19]. So the fewer repetitions are performed to produce the strength gain effects. Previously 27 per week and 108 for 4 weeks are considered to be lowest effective dose that have significant improvement for hamstring strength.[10]

Systematic review is being done to find the lowest volume to gain hamstring strength[6]. Presland et al (high volume 440 reps, low volume 128 reps) found that both the high and low volume results in the significant effects on hamstring muscle strength.[20]This evidence somehow support the current study in which both the high and low volume produced the significant effects. But the high volume produces better results. The reason to this is that the 108 repetitions are proven in evidence to increase the biceps femorus architectural length[20]. The dosage less than this probably will not be able to produce the same effects. High volume (108 reps) used in this study was the one that was used as lowest volume in literature [6] and suggestions were to find still lowest volume. So probably the repetitions are to be improved a little in future studies to get equal gain in strength. The current study showed that the 36 repetitions volume produce positive effects in the hamstring strength but these results are not comparable with the higher volume Nordic hamstring curl.

In addition, improvement in hamstring size, which is specific to hamstring muscle performance taken at three levels, was found to increase in both groups over 2nd and 4th weeks. Contemporary evidence support this finding[20,21]. Whereas Nordic hamstring exercise increases both the volume and physiological cross sectional area of hamstring muscle. Hence it is used as an effective training method for muscle hypertrophy[21]. In the current study, both the groups show increase in the size of the muscle at 3 different levels. But high volume produces the better results particularly from 2nd to 4th week the reason to this is the hypertrophy mechanics explained in the literature [21].

The Nordic hamstring exercise increases the sprint performance by improving the hamstring strength and size. [12] The data of the current study is in line with the data where the Nordic hamstring exercise increases the speed performance in 5m and 10m sprint and in jump height of the athletes without

compromising their other performance measures[12]. Further findings indicated improvement in agility in both the high and low volume groups. The agility was marked as limitation in the previous systematic review on the dosage of Nordic hamstring exercise[6] which was fulfilled in the current study.

The current study has some limitations, including lack of follow up to look for the injuries in the future and to see the sustainability effects of the training. The compliance and the DOMS effects were not observed.

CONCLUSION

Higher and lower dose Nordic hamstring exercises (NHE) were effective in improving hamstring strength, size, speed and agility. However, the high dose of NHE was more effective than low dose after 4 weeks of training in improvement in strength, size, speed and agility of hamstring than speed. Further studies should be conducted on individual games separately as each game has its own techniques and performance parameters.

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RESEARCH ARTICLE

VIRTUAL REALITY VERSUS CONVENTIONAL PHYSICAL THERAPY FOR STROKE MANAGEMENT IN IMPROVING ACTIVITY OF DAILY LIVING AND BALANCE: A RANDOMIZED CONTROL

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ABSTRACT

Background: Loss of balance and Activity of daily living commonly compromised in stroke patients. Conventional physical therapy CPT) showed promising result in the rehabilitation of stroke, but these effects are very slow. Virtual reality (VR) technology is an adjunctive therapy that could be applied in neurorehabilitation in conjunction with conventional physical therapy. **Objective:** The aim of the study was to determine the effectiveness of virtual reality and conventional physical therapy (CPT) for stroke management in improving activities of daily living and balance. **Methodology:** A total of n=30 participants with sub-acute ischemic stroke, aged between 45-65 years, were divided into group A and group B. The group A received virtual reality training (VRT) with conventional physical therapy (CPT) for stroke management, while Group B received conventional physical therapy (CPT). The activities of daily living (ADLs) were assessed through Barthel index and balance was assessed through Balance Berg Scale (BBS). The data was collected at baseline, 2nd week, 4th week and after 6th week of intervention. The mixed ANOVA and One way MANCOVA was applied to see the interaction and main effects. The data was analyzed using SPSS 21. **Results:** The mean age of study participants of Group A was 51.533±4.82 years and Group B was 52.53±5.01 years. There is significant interaction effect between interventions and level of assessment in Balance score {F=11.705(1.683, 47.134), p<.001, ηp^2=.295} as well as activity of daily living {F=4.782(2.209, 61.841), p=.010, ηp^2=.146} after 6 week intervention. **Conclusion:** Both groups were effective in improving ADLs and balance but VR was more effective as compared to traditional balance exercises.

Keywords: activities of daily living, acute stroke, balance, physical therapy, virtual reality.

INTRODUCTION

Stroke is defined as a neurological shortage accredited to an acute focal injury of the central nervous system due to a vessel related issue, which includes cerebral infarction, intra-cerebral haemorrhage, and subarachnoid haemorrhage in subarachnoid matter. It is a chief source of disability and death throughout the world[1]. The burden of the disease is more in developing countries, which reported 75.2% of all stroke-related deaths and 81.0% of the associated disabilities after stroke[2]. Prevalence of stroke in males & female population was 1.3% (n=137/10944) & 1.2% (n=134/11556) respectively[3].

Limitation in mobility is a major deficit occurred due to stroke. It affects control of movement on one side of the body, which is present in 80% of stroke patients. Loss of balance during walking is common after stroke and 70% of stroke survivors reported fall and injury. Also, psychological issues including confusion, depression, anxiety is also noted as post-stroke complications[4]. The factors that contribute to reduced walking speed are muscle weakness and loss of voluntary movements which leads to impaired standing balance after stroke. Thus, a key rehabilitation goal is to improve walking and balance in order to enhance activities of daily living[4,5]. The Activities of daily living (ADLs) is majorly compromised in stroke patients. A previous study reported that age, caregivers, history of past illnesses and smoking, and muscle strength may influence the ADLs of stroke patient. The stroke survivors always feel isolated, and over-whelmed due to dependency. Therefore, maintenance of ADLs is important for quality of life of stroke survivors. The primary goal of health care workers is restoration of ADLs such as dressing, bathing and toilet using, moving in and out of bed, mobility, and feeding[6].

Multidisciplinary team is required to deal with the complications and issues after stroke[7]. The rehabilitation team includes physicians, nurses, physical therapists, occupational therapists, speech language pathologists, vocational therapists, and vocational health professionals {Knecht, 2011 #318}. Physical therapy consists of interventional strategies that focus on development, maintenance, restoration of movements, and

functional abilities. Task oriented functional training concomitant to musculoskeletal, cardiopulmonary and sensory interventions appear to be very effective in improving balance and postural stability[9].

Conventional physical therapy is aiming towards high-intensity, repetitive, and task-specific procedures. This practice is an effective therapy throughout stroke recovery. However conventional physiotherapy is labor and resource-intensive, tiresome and results are often delayed. Along with this, frequency and intensity of the physiotherapy sessions are not sufficient in clinics for maximum recovery of the patients[10,11].

Virtual reality comprises of a simulation of the real environment which is generated by computer software. It is experienced via a human-machine interface. The concept behind using this technology is functional re-arrangement of the damaged motor area of brain that can be stimulated with the facilitation of mirror neurons or through the patient's motor imagery[12]. Virtual reality has provided new visions into the activity of brain areas involved in spatial cognition and navigation, multisensory integration of perceptual stimulation, and societal interaction[13]. It is getting well-known substitute to traditional upper and lower extremity rehabilitation after stroke[14].

Therefore the aim of the study was to determine the effectiveness of VR and traditional stroke management in improving ADLS and balance of acute and sub-acute ischemic stroke patients. VR is an emerging rehabilitation program in Pakistan, thus this study may add little knowledge to scientific literature regarding effective management of stroke cases.

METHODOLOGY

A single-centered, double blinded, randomized control trial was conducted at Haleema Siraj hospital Saidpur road Rawalpindi Pakistan from July 2021-March 2022. The study was initiated after taking approval from Medical Director (Ref #: HSH/2022-06-12/04). The participants with sub-acute ischemic stroke, aged between 45-65 years, who were independent or ambulant classified as level 1 or 2 on Gross Motor Functional Classification System, sufficient cognitive capacity measured through Mini-Mental State Examination (MMSE) score greater than 22-30, and adequate vision and hearing were included in the study. However, exclusion criteria included patients with severe osteoarthritis, asthma, structural deformities, poor cognition level, visual and hearing impairments, neuropathies, hemorrhagic stroke, and Pusher syndrome.

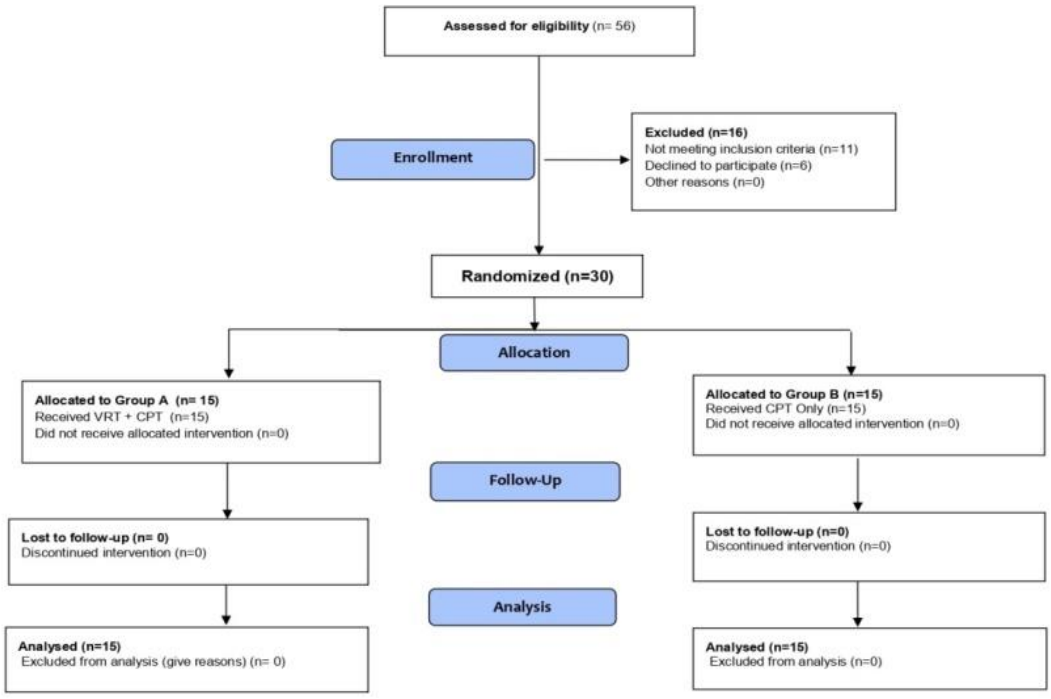

Figure 1: CONSORT diagram

The written informed consent, according to the Deceleration of Helsinki, was obtained from all the study participants prior to the study. A total of n=56 stroke subjects were evaluated for eligibility criteria, n=11 subjects did not fulfil the inclusion criteria and n=6 subjects decline to participate in the study due to accessibility issue. A total of n=30 participants were randomly allocated into two study groups, n=15 participants in each group through the computer generated numbers, and were written on the cards and placed in thick and sealed envelopes. When the patient came, physiotherapist opened the envelope and gave the assigned treatment. Each patient was given an allocated treatment written on the envelope. Group A (n=15) received virtual reality intervention while Group B (n=15) received traditional stroke management. (Figure 1)

The virtual reality games included bucket ball, balance it, and reflex ridge. While playing games patient has to move forward/backward, right/left side, and also move the upper the upper extremity to complete the tasks of the game. The games have different activities, including balance the object on virtual bar or collect the balls using bilateral arms and then move to the opposite direction to put in a bucket, and moving in different directions to avoid obstacle and using upper limb to collect bonus points. The participants were encouraged by providing feedback to complete the task. The game became more challenging with each passing level, which actively involves the patients. Before starting intervention, the trial session was given to each participant for better understanding of the game. The VR session was conducted in a separate room to avoid distractions and held under the supervision of physiotherapist. The duration of intervention was 40 minutes; 15 minutes VR games and 25 minutes of traditional stroke management.

The traditional management included exercises for balance with strengthening included stretching, range of motion, weight bearing, bed side activities, turning from affected to sound side, sitting, bed to chair transferring, sitting to standing, and parallel bar activities, and strengthening activities. The duration of intervention was 40 minutes.

The frequency of traditional protocol is 10 repetitions of each exercise depending on the endurance of patients. Each exercise was performed after 5 seconds of relaxation with 10 seconds of holding. A total of 18 sessions were given to the study participants for 6 weeks - 3 sessions in a week.

The outcome measures were Barthel Index and Balance Berg Scale (BBS). Barthel index has established validity and reliability and was used to determine the activities of daily living[15]. Balance Berg Scale was used to determine balance and is a valid and reliable tool[16]. The demographic data in terms of age, gender, BMI, gender, occupation, sitting and standing duration was obtained at baseline. The data of outcome measures was collected at baseline, 2nd week, 4th week and 6th week. The Mixed ANOVA was applied to determine the interaction effects between the intervention and level of assessments. After significant interaction effects main effects were measured through RM-ANOVA for within group analysis test was used. The MACOVA was applied to compare the groups while controlling the baseline differences. The level of significance was set at $p<0.05$ and the data were analyzed through SPSS version 21.

RESULTS

The mean age of Group A was 51.533±4.82 years and Group B was 52.53±5.01 years. The mean of mini mental status examination score of Group A was 25.33±2.22 and Group B was 24.86±1.68 which depicts no significant cognitive impairments in subjects. The detail of other demographic characteristics of study participants is shown in table 1.

Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated, the Greenhouse-Geisser values showed that there is significant interaction effect between interventions and level of assessment in Balance score {$F=11.705(1.683, 47.134)$, $p<.001$, $\eta p^2=.295$} as well as activity of daily living {$F=4.782(2.209, 61.841)$, $p=.010$, $\eta p^2=.146$} after 6 week intervention. (Figure 2) The main effects also showed significant within group improvement ($p<0.05$) in both Group A (VRT) and Group B (CPT) regarding activity of daily living and balance. (Table 2)

Table 1: Distribution of demographic features in Group A and Group B group

	Categories	Group A n (%)	Group B n (%)	Total
Age (Cat)	20-40 years	10(33.33 %)	12(40%)	22(73.3%)
	41-60 years	5(16.66%)	3(15%)	8(26.7%)
Gender	Male	6(40%)	6(40%)	12(40%)
	Female	9(60%)	9(60%)	18(60%)
BMI (Cat)	Normal	5(33.3%)	5(33.3%)	10(33.3%)
	Over weight	5(33.3%)	6(40%)	11(36.7%)
	Obese	5(33.3%)	4(26.7%)	9(30%)
Sitting duration (hr/day)	<4	4(26.7%)	6(40%)	10(33.3%)
	4 - 6	2(13.3%)	4(26.7%)	6(20%)
	6 - 8	9(60%)	5(33.3%)	14(46.7%)
Standing duration (hr/day)	<4	10(66.7%)	9(60%)	19(63.3%)
	4 - 6	-	4(26.7%)	4(13.3%)
	6 - 8	5(33.3%)	2(13.3%)	7(23.3%)

Significance Level: p<0.05, p<0.01**, p<0.001****

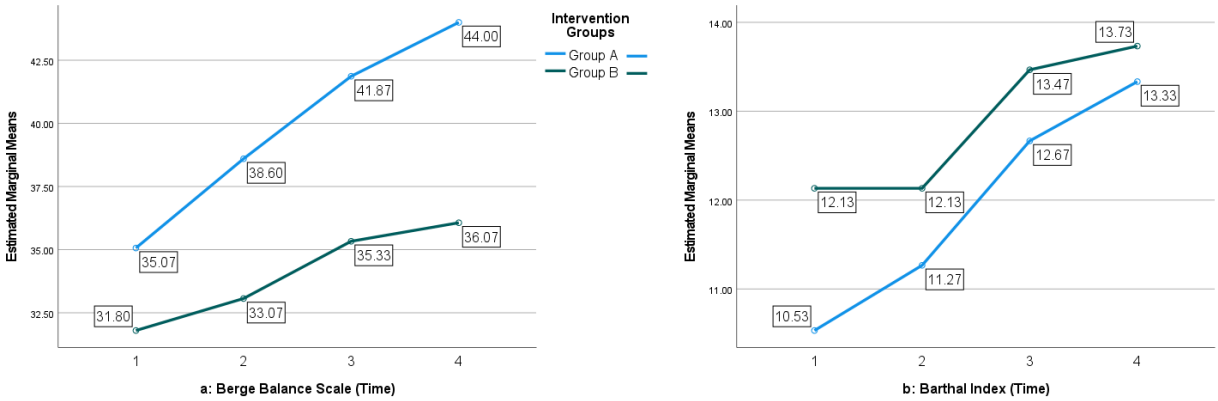

Figure 2: Interaction effect between intervention and level of assessment

Table 2: Within the Group Changes in Both Groups

		Group A (VRT)				Group B (CPT)			
		Mean	SD	MD/F(df)	p-value	Mean	SD	MD/F(df)	p-value
Barthal Index	Baseline	10.53	.83	-.733*	.01[a]*	12.13	.51	.000	.
	2nd Week	11.26	.96	-1.400*	0.00[b]***	12.13	.51	-1.333*	.001**
	4th Week	12.66	1.29	-.667	.074[c]	13.46	1.24	-.267	.986
	6th Week	13.33	1.17	58.06(3,42)	0.00[d]***	13.73	1.09	30.21(3,42)	0.00[d]***
Berg Balance Scale	Baseline	35.26	2.40	-3.533	.002**	31.80	2.88	-1.267*	.020*
	2nd Week	38.73	2.25	-3.267	<.001***	33.13	2.13	-2.267*	0.00***
	4th Week	41.86	2.94	-2.133	.009**	35.13	2.03	-.733*	.037
	6th Week	44.06	2.15	66.30(1.55,21.82)	0.00[d]***	35.93	2.05	39.22(1.46,20.54)	0.00[d]***

[a]baseline to 2nd week, [b] 2nd week to 4th week, [c]4th week to 6th week, [d]baseline to 6th week
Significance level: p<0.05, p<0.01**, p<0.001****

The MANCOVA test was applied to compare both groups for controlling the baseline differences, the result indicated that group A was significantly improved as compared to group B {13.33±1. ver. 13.73±1.09, F=5.251(1.26), p=.030, ηp^2=.168} regarding activity of daily living after 6th week.

While no significant difference (p≥0.05) found at 2nd and 4th week. The balance was significantly improved (p<0.05) in group A as compared to group B at 2nd week, 4th week and 6th week with large effect size. (Table 3)

Table 3: Between the Group Comparison (Group A & Group B)

		Group A (VRT)		Group B (CPT)		F(I,26)	p-value	ηp^2
		Mean	SD	Mean	SD			
Barthal Index	Baseline	10.53	.83	12.13	.51	-	-	-
	2nd Week	11.26	.96	12.13	.51	1.089	.306	.040
	4th Week	12.66	1.29	13.46	1.24	1.456	.238	.053
	6th Week	13.33	1.17	13.73	1.09	5.251	.030*	.168
Berg Balance Scale	Baseline	35.26	2.40	31.80	2.88	-	-	-
	2nd Week	38.73	2.25	33.13	2.13	14.318	0.00***	.355
	4th Week	41.86	2.94	35.13	2.03	12.069	.002**	.317
	6th Week	44.06	2.15	35.93	2.05	43.648	0.00***	.627

Significance level: p<0.05, p<0.01**, p<0.001****

DISCUSSION

The purpose of the study was to determine the effectiveness of balance exercises in ischemic stroke patients. It was hypothesized that virtual reality is more effective in improving balance and ADLs. The results of the study showed significant improvement in both groups but Group A showed more significant improvement.

According to the results of the study, VR games showed significant improvement in ADLs. The result supported previous study in which VR significantly improve daily life activities of stroke patients[17]. Previous studies reported that stroke patients have reduced ADLs due to stress, anxiety, dependency, sense of self-deprivation, and avoidance of using affected side[18], however VR games improves performance, satisfaction, and sense of achievement that leads to the improvement in daily activities[17]. Similarly, it was observed in a recent study that patients of VR group are more self-motivated to complete the tasks, which may also leads to the improvement in performance of ADLs.

The results of the recent study showed significant improvement in balance after VR intervention which corresponded with the previous study. A previous literature found VR games significantly improve balance of stroke patients[19,20]. It may be due to the improvement in spatial orientation capacity of patients through cerebral cortex activation in VR training, which improves balance and motor function[21]. The other possible reasons of improvement are repetitive task practice, which is supported by literature that repetitive task training improves motor function[22]. VR facilitates neural plasticity through incorporation of motor learning principles such as implicit learning, real-time feedback and focus of attention[23]. These factors may contribute to the improvement in balance.

Furthermore, traditional balancing exercises along with strengthening significantly improved activities of daily living and balance, which is supported by the previous literature balance along muscle strength is important for performing ADLs[24]. A previous literature suggests that functional training such as balancing exercises along strengthening significantly improve balance and thus function and daily life activities[25].

Between the groups analysis showed significant difference between Group A and Group B group. According to the results of this study, Group A showed significant improvement in ADLs and balance. The results of this study is in coherence with the previous study in which VR training is more effective as compared to the traditional therapy[26]. The possible reason of improvement in VR could be the neuroplasticity (which is at peak during acute and sub-acute stage), repetitive movement, task-oriented approach, feedback, implicit and explicit learning, which in return self-motivates the patient and leads to improvement in ADLs and balance. Brain-derived neurotrophic factor (BDNF) has appeared as a key facilitator of neuro-plasticity involved in motor re-learning. Firstly, learning-related plasticity encompasses the strengthening of current, in addition to the formation of new, neuronal networks that support learned actions. It is followed by focusing of neural connections as skill and preferential pathways[27]. However in traditional physical therapy, outcomes mostly rely on the ability and prior training of physical therapist. Moreover, the repetitions and intensity of traditional physical therapy is not sufficient to reach the plasticity-based optimal motor recover[26]. Therefore, the VR training augments the effects of traditional stroke management.

The limitation of the study was small sample size and short duration of intervention. The data was collected from single clinical setting. Only short term efficacy of intervention was investigated. These factors limit the generalizability of the results.

CONCLUSION

In this study both groups showed statistically significant results but clinically the group treated with VR showed more marked improvement in balance and ADLs. Future studies should be incorporated on a larger sample size, and multicentre. The study duration should be large to determine the long-terms effects of VR.

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RESEARCH ARTICLE

EFFECTS OF ELDOA TECHNIQUE VERSUS MCKENZIE EXTENSION EXERCISES ON NON-SPECIFIC LOW BACK PAIN PATIENTS: A RANDOMIZED CLINICAL TRIAL

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ABSTRACT

Background: Low back pain may lead cause disability in the patients. There are several physical therapy protocols used to manage the low back pain including McKenzie exercises. The Elongation Longitudinaux Avec Decoaption Osteo Articulaire (ELDOVA) is novel techniques could help to reduce the pain and disability related to lower back problems. **Objective:** to determine the effects and compare the McKenzie extension exercise and ELDOA stretch in non-specific low back pain patients. **Methodology:** A randomized clinical trial was conducted at Railway General Hospital, Rawalpindi and Irada Rehabilitation Center, Buchal Kalan from October 2021 - December 2021. The female participants with the age range of 40-69 years and had chronic non-specific low back pain for more than 3 months were included in the study. The participants were randomly divided into group A which received McKenzie extension exercises while group B received ELDOA stretch. The patient's outcome measures were assessed through Numeric Pain Rating Scale (NPRS), inclinometer for measuring ROM of lumbar flexion and extension, flexi curve ruler for lordships angle, and Oswestry Disability Index (ODI) for disability. MANCOVA test was used for controlling the covariates at baseline. Friedman with post hoc Wilcoxon test (non-parametric-within group analysis) for ODI variables RMANOVA was applied to observe pairwise changes with-in the groups for ODI total score, lordosis angle at baseline, and end of second, and fourth week of the treatment. NPRS and range of motion (extension, flexion) at pre and post treatment session. **Results:** The mean age of study participant was 44.29±3.08. Within group analysis showed that significant improvement ($p<0.05$) was observed in both groups regarding ODI total score, NPRS, Lordosis angle and range of motion (flexion, extension) from baseline to the end of 4th week and at each level of assessment. The group A (McKenzie extension exercises) was a significantly improved on the combined dependent variables as compared to group B (ELDOA stretch) after controlling for baseline values of BMI, NPRS, lordosis angle and ROMs, $F(7, 34) = 55.12$, $p<0.001$, Wilks' $\Lambda=0.018$, $\eta p^2=0.49$.**Conclusion:** McKenzie extension exercise showed better result in improving pain, range of motion, angle of lordosis and disability than ELDOA technique.

Keywords: disability, low back pain, physical therapy, stretching exercises. ROM

INTRODUCTION

Low back pain is referred to an unpleasant feeling or discomfort in lumbar area that may or may not include buttocks[1]. The muscles which are involved in forward bending (40°-60°) of spine included iliopsoas major, minor and abdominal, while erector spinae and multifidus muscle group are involved in backward bending (20°-35°)[2]. Non-specific low back pain has unknown cause and it does not include any radicular symptoms[3]. 85% of population of low back pain have non-specific type of pain,[4] and is more common in older population but most frequently effect in age of 40-69 years. Females are more prone to low back pain than males[5].

The factors which contribute to low back pain is poor biomechanics for longer duration encouraged loading on the spinal structures, improper sitting with the flexed spine. Due to prolong slouch posture, muscle imbalance occurs i.e. weak lumbar extensor, strong abdominals and tight hamstrings, which disturb the normal inward curvature of lumbar region and leads to the straightening of curve thus moves the pelvis posteriorly. Therefore, lordosis further goes towards hypo lordosis[6].

Different physical therapy interventions including thermotherapy, soft tissue release stimulation for muscles activation are used to treat the tighten structures[7]. Electric modalities such as interferential current (IFC) and transcutaneous electrical nerve stimulation (TENS) are used to treat chronic pain. IFC is more widely used than TENS because it is deeply impale and does not irritate skin[8]. Also, short wave diathermy is also used to treat chronic low back pain[9]. Furthermore, various exercise regimes includes for low back pain is William flexion,[10] strengthening exercises of core muscles,[11] and stabilization exercises[12]. ELDOA and McKenzie extension exercises are also used to treat low back pain.

ELDOA stands for Elongation Longitudinaux avec Decoaptation Osteo-Articulaire. This technique is

given in Europe by Gay Voyeur. ELDOA stretches are used to correct the postural imbalance by improving the motion of muscle and fascia. Fascial stretching is carried out by adopting the special postures that target their respective vertebral segment. It reverse the narrowing of short structures by making pivot point to lower vertebra and move the upper vertebrae[2]. McKenzie extension exercises are effective in the treatment of chronic mechanical LBP[13]. Robin Anthony McKenzie gave the concept of extension exercises. The McKenzie method focuses on the centralization phenomenon for assessing and treating spinal pain, in which pain which originates from the spine refers distally, and with targeted repetiting movements, this pain will migrate toward the spine[14].

In previous studies no comparison was done between McKenzie extension and ELDOA stretch. Also, ELDOA stretch was not used for hypo lordosis. Therefore in this study the effects of McKenzie extension exercise and ELDOA stretch in pain, range of motion, posture and disability was discussed, which wasn't discussed previously.

METHODOLOGY

A single-blinded, randomized clinical trial (NCT05239247) was initiated after taking approval from Research Ethics Committee of Riphah University, Islamabad. The study was conducted at Railway General Hospital, Rawalpindi and Irada Rehabilitation Center, Buchal Kalan for a time period of six month from March 2020 - September 2020.

The female participants were included with the age range of 40-69 years, who had chronic non-specific low back pain more than 3 months-pain of grade <3 measured on Numeric Pain Rating Sale, restricted ROM and lumbar straightening. However participants who had any other orthopaedic or neurological condition of hip and lumbar spine, sign and symptoms of lower motor neuron disease, using medication prescribed for pain, had radiculopathy, fracture, malignancy, lumbar trauma, and disc pathology were excluded from the study.

A total of n=55 participants were assessed for eligibility, out of which n=8 participants didn't fulfil the inclusion criteria and showed unwillingness to participate in the study. Thus, n=48 participants were recruited through non-probability purposive sampling technique. The randomization was done by the person who wasn't directly involved in the study. The flip a coin method was used for randomization and participants were divided into group A (n=24) which receive McKenzie extension exercises, and group B (n=24) received ELDOA exercises in addition to and conventional physical therapy. The patients were blinded to the allocated treatment while treating physiotherapist was unaware of the assessment and assessing physiotherapist was unaware of the treatment given.

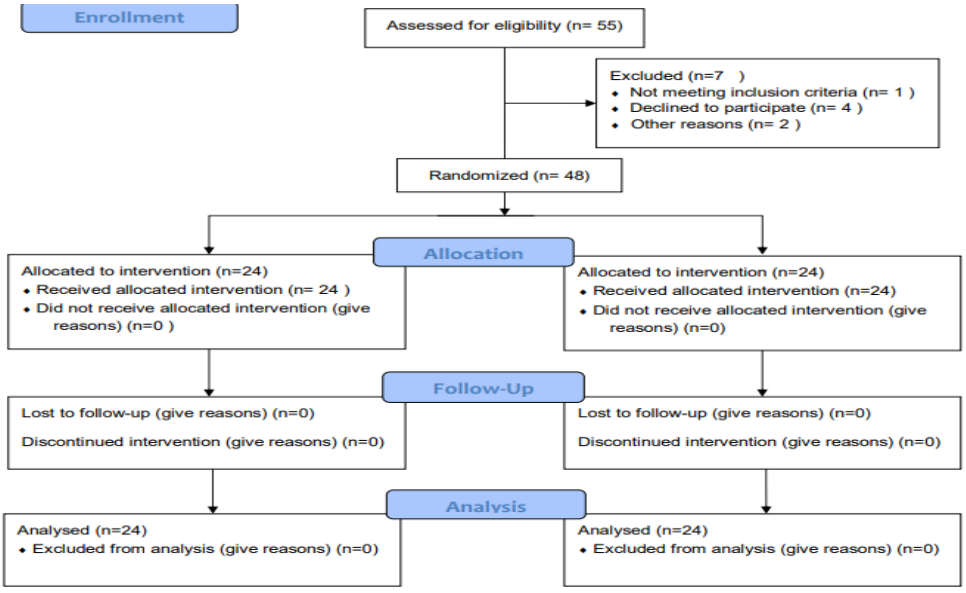

Figure 1: Consort Diagram

In group A (McKenzie extension), patient were asked to laid in prone position with both arms by the sides of the body and lifted the head and trunk off the plinth from neutral to extension. A total two sets of five repetitions with 45 seconds hold and 15 seconds rest between each set was performed in McKenzie extension.

Group-B received ELDOA stretch for L4- L5 levels. The patients were asked to sit down on a floor in upright position and keep your legs apart and knees semi-flexed, feet in outward and upward position, knees constantly pushing downwards, straight lower back, raise arms with palms facing upward, and chin should be pulled back. For L5-S1, patients were asked to lay on floor and flatten, bring your legs up and straight with the support of wall, straight knees and keep distance between them, connect your toes, raise arm and externally rotated with wrist extension now press your heels and palms out. ELDOA stretch was performed 2 sets of 5 repetitions with 45 second hold and 15 sec rest between each set once a day.

Conventional therapy was given in both groups, which included 10 minutes hot pack and 10 minutes Transcutaneous Electrical Nerve Stimulation (TENS) on lumbar region. Each session was given under the supervision of physiotherapist.

The duration of intervention was 4 weeks, 3 sessions a week, a total of 12 sessions were given to the study participants. Each session lasted for 40 minutes.

The demographic data in terms of age, BMI, sitting and standing duration was obtained at baseline. The pain, ROM of lumbar extension and flexion, angle of lordosis and functional disability was assessed at baseline, after 2nd week and 4th week. The NPRS scale was sued to determine the intensity of pain and is a valid and reliable tool[15]. The inclinometer was used to measure the ROM of lumbar flexion and extension. The inclinometer has constructed validity and reliability[16]. The flexi curve ruler was used to evaluate the spinal curve (angle of lordosis) to conclude the changes occurred in patient spinal angle and is a valid and reliable tool[17]. The functional disability was measured through total score of Oswestry Disability Index (ODI), which is a valid and reliable tool[18]. Prior to the data collection written informed consent was taken according to Deceleration of Helsinki.

As the baseline data of all outcome measure were not comparable, So the MANCOVA test was applied to compare the groups while controlling the baseline score of ODI, BMI, NPRS, Extension range of motion as a covariate. For with-in group analysis RM-ANOVA with Bonferroni correction for pairwise comparison was applied.

The data was presented as a frequency, mean, standard deviation, mean difference, degree of freedom, partial eta^2, and p-value. The level of significance was at $p<0.05$. Data was statistically analysed using SPSS version 21.

RESULTS

The mean age and BMI of study participant was 44.29±3.08 years and 23.80±4.40 kg/m^2 respectively. The mean of sitting was 5.85±1.01 hours and standing duration was 4.04±0.58 hours in the participants.

Table 1: With-in Groups Pairwise Changes.

		Group A				Group B			
		Mean	SD	MD/F(df)	p-value	Mean	SD	MD/F(df)	p-value
ODI	baseline	20.54[a]	9.98	11.62	0.00***	18.41[a]	9.20	9.197	0.00***
	after 2nd week	8.91[b]	7.25	8.91	0.00***	8.50[b]	7.51	6.375	0.00***
	after 4th week	.00[c]	.00	91.05(1.137,26.15)	0.00***	2.12[c]	2.75	114.56(1.38,31.74)	0.00***
Lordosis Angle	baseline	18.58[a]	3.82	-8.54	0.00***	24.50[a]	3.85	-3.95	0.00***
	after 2nd week	27.12[b]	4.04	-9.29	0.00***	28.45[b]	3.75	6.37	0.00***
	after 4th week	36.41[c]	4.38	289.46(1.55,35.70)	0.00***	34.58[c]	4.12	339.9(1.39,32.17)	0.00***
NPRS	baseline	6.91[a]	1.28	4.41	0.00***	6.66[a]	1.00	2.58	0.00***
	after 2nd week	2.50[b]	1.10	2.50	0.00***	4.08[b]	.82	4.08	0.00***
	after 4th week	.00[c]	.00	443.18(1.89,43.46)	0.00***	.00[c]	.00	733.74(1.72,39.75)	0.00***
Flexion	baseline	29.41[a]	4.33	-6.00	0.00***	31.16[a]	6.40	-15.66	0.00***
	after 2nd week	35.41[b]	3.80	-7.41	0.00***	46.83[b]	5.08	-11.04	0.00***
	after 4th week	42.83[c]	2.79	448.35(1.49,34.40)	0.00***	57.87[c]	2.62	474.48(1.72,39.55)	0.00***
Extension	baseline	10.79[a]	5.32	-9.75	0.00***	9.00[a]	4.29	-6.33	0.00***
	after 2nd week	20.54[b]	6.76	-11.37	0.00***	15.33[b]	4.35	6.66	0.00***
	after 4th week	31.91[c]	4.31	506.6(1.54,35.54)	0.00***	22.00[c]	3.93	532.85(1.37,31.50)	0.00***

[a]baseline to 2nd week, [b]2nd week to 4th week & [c]baseline to 4th week
Significance Level: p<0.05*, p<0.01**, p<0.001***

Within group analysis showed that significant improvement ($p<0.05$) was observed in both groups regarding ODI total score, NPRS, Lordosis angle and range of motion (flexion, extension) from baseline to the end of 4th week and at each level of assessment. (Table 1)

As the groups were not comparable at the baseline for all dependent variables, the MANCOVA test was applied. The results showed that there was a statistically significant difference between the intervention groups on the combined dependent variables after controlling for baseline values of BMI, NPRS, lordosis angle and ROMs, $F(7, 34) = 55.12$, $p<0.001$, Wilks' $\Lambda=0.018$, $\eta p^2=0.49$.

Between the group univariate analysis after controlling the covariates, it was observed that after 2nd week no significant difference between the groups ($p\geq0.05$), while after 4th week group A (McKenzie exercises) showed more improvement as compared to group B (ELDOA). The lordosis angle was also significantly improved after 2nd ($p=0.03$) and 4th ($p=0.005$) week in groups A as compared to group B. The group A showed that pain on numeric pain rating scale (NPRS) was significantly improved as compared to group B after 2nd week. But after 4th week pain level was zero in both groups ($p=1$). The ROMs (flexion and extension) was also improved in group A more significantly ($p<0.05$) than group B after 2nd and 4th week of intervention. (Table 2)

Table 2: Univariate Comparison between the groups while controlling the Covariates

		Group A (McKenzie)		Group B (ELDOA)		F(1,40)	p-vlue	partial η2
		Mean	SD	Mean	SD			
ODI	Baseline	20.54	9.98	18.41	9.20	-	-	-
	After 2nd week	8.91	7.25	8.50	7.51	.822	.370	.020
	After 4th week	.00	.00	2.12	2.75	20.517	0.00***	.339
Lordosis angle	Baseline	18.58	3.82	24.50	3.85	-	-	-
	After 2nd week	27.12	4.04	28.45	3.75	5.094	.030*	.113
	After 4th week	36.41	4.38	34.58	4.12	8.878	.005**	.182
NPRS	Baseline	6.91	1.28	6.66	1.00	-	-	-
	After 2nd week	2.50	1.10	4.08	.82	17.270	0.00***	.302
	After 4th week	.00	.00	.00	.00		1	
Flexion	Baseline	29.41	4.33	31.16	6.40	-	-	-
	After 2nd week	35.41	3.80	46.83	5.08	55.581	0.00***	.582
	After 4th week	42.83	2.79	57.87	2.62	214.854	0.00***	.843
Extension	Baseline	10.79	5.32	9.00	4.29	-	-	-
	After 2nd week	20.54	6.76	15.33	4.35	5.428	.025*	.119
	After 4th week	31.91	4.31	22.00	3.93	31.278	0.00***	.439

Significance Level: p<0.05, p<0.01**, p<0.001***.*

DISCUSSION

The purpose of study was to determine the effectiveness of McKenzie extension exercise and ELDOA stretch in improving pain, posture, range of motion and functional disability in non-specific low back pain patients. The results suggested that the study participants in both groups showed significant improvement throughout the treatment duration.

According to the results of the study, McKenzie extension exercises significantly improved non-specific low back pain and lumbar extension ROM. Similarly, a previous experimental study was conducted by Chopade P, revealed that McKenzie extension is an effective treatment to manage the non-specific low back pain and ROM[19]. Another study showed similar results conducted by Waqar S. et. in patients with chronic low back pain, that also reported significant improvement in pain, mobility and quality of life by the McKenzie extension exercise protocol[13]. The factor of reduction in pain after McKenzie extension may be due to the correction and maintenance of posture that reduces stress and relax the muscles[19-21], which also improves lumbar extension.

The results of the recent study also reported significant improvement in lumbar lordosis after extension exercises and literature also supported McKenzie extension exercises to improve lumbar lordosis. Improper posture leads to the mechanical deformation of soft tissues, which increased lumbar flexion. Thus McKenzie extension restore and maintain lumbar lordosis by relaxing the structures and thus correct the posture[14]. McKenzie extension exercises showed significant improvement in disability or functional limitation throughout the treatment duration which is in coherence with the previous study in which

statistically significant improvement was observed in disability or functional limitation measured through ODI[22]. The improvement might be attributed to decrease in pain, lumbar lordosis and increase in lumbar extension.

Furthermore, within group analysis showed significant improvement in pain, ROM, lordosis angle, functional disability. Previous literature also supported ELDOA techniques to improve, ROM, posture, and functional status[23]. The results of a recent study is in accordance with the previous literature in which significant improvement was observed in pain, and functional status[24]. The improvement occurred may be due to reduced stress[22] which be a reason of improved posture, ROM and function disability.

Between groups analysis showed lumbar extension was significantly improved in McKenzie extension exercises group while lumbar flexion was significantly improved in ELDOA exercises group. The reason of improving extension could be the mechanism of McKenzie extension i.e. during extension, the anterior structures of the spine are stretched, which are in stress due to the abnormal slouch sitting or standing with flexion, while the posterior structure that overworked and became more susceptible to injury are relaxed and helped in reducing pain[19], and may improves lumbar extension. Also, continuous repetitions of McKenzie extension stretch the structures and according to then literature, relaxation after maximum stretch improves the range[25]. The reason of improving flexion range in ELDOA is may be due to hamstring stretching occurred during L4-L5 ELDOA pose. Hamstring tightness play a role in forward bending of spine and increase the risk of low back pain [26]. However, when hamstring tightness facilitates it will bring positive impact on lumbar range of flexion.

The limitations of the study included smaller sample size, which compromise the generalizability. Also, side bending and rotation of lumbar spine was not addressed.

CONCLUSION

It is concluded that both techniques were effective in improving pain, range of motion, posture, and functional disability. But the McKenzie extension was more effective as compared to the ELDOA technique.

Future studies should incorporated larger sample size. Follow up consultations should be administered to determine the long term effects should be done after completion of study. Determine the effectives of McKenzie extension and ELDOA stretch with specific low back pain patients. There was too little evidence available on ELDOA so more studies should be performed to find out its effectiveness. Future studies should be conducted on comparing the effects of ELDOA with other techniques of manual therapy.

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RESEARCH ARTICLE

EFFECTS OF PROLONGATION OF SPEECH AND SYLLABLE TIME SPEECH ON SEVERITY OF STUTTERING IN STUTTERING PATIENTS

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ABSTRACT

Background: Stuttering is an organic process utterance condition. This utterance condition is broken by prolongation of sounds and repetitions of part words and phrases. Speech constitution strategies facilitate the client to use a new way of oral communication in stutters. **Objective:** to determine the effects of prolongation of speech and syllable time speech on severity of stuttering in stuttering patients. **Methods:** This Randomized clinical trial study design was conducted in National Institute of Rehabilitation bSP) and Group B received syllable time speech protocol. The data was collected using the Scale of rating severity of stuttering (SRSS) at baseline, after 6th weeks and after 12th weeks of training. The data was analyzed through SPSS-21. **Results** The mean age of the study participants was 22±2.05 years. The median number of sibling was 4(2), birth order 2.5(2) and age of onset was 4(1) years. With-in group analysis showed that the group received prolong speech protocol {F=25.24(2), p<0.001} and syllable time speech protocol {F=29.52(2), p<0.001}, both were significantly improved from the baseline to the end of 12th week of intervention as well as at each level of assessment. While comparing the groups, there was significantly large mean difference (MD) of SRSS in group received syllable time speech protocol (2.53±.83 ver 1.73±.59, p=0.005, Cohen's d=0.72) as compared to group received prolong speech protocol. **Conclusion** It is concluded that Syllable time speech was effective in reducing severity of stuttering and improving fluency in stutterers. .

Key words: Stuttering, stammering, fluency shaping therapy, speech therapy.

INTRODUCTION

Stuttering is condition characterized by prolongation of sounds and repetitions of part words and broken phrases mostly occurs between 2 and 4 years during the preschool time of life[1].The prevalence of stuttering in young children is approximately 5% and 0.5% to 1% in adults respectively. Approximately 75% children recover from stuttering even without any treatment. It depends on family history and physiological factors of natural recovery. The female child seems more natural recovery as compare to male child children with a family history of natural recovery from stuttering[2, 3].

Stuttering is multi-modality, and its features are readily observable during communication, but some are not that include affective and personal aspects of stuttering. Consequently, a person who stutters frequently creates many strategies to cope the stuttering. These strategies include avoiding stressful speaking situation, difficult words and avoiding talking situation where unnecessary communication pressure presents[4]. The person who stutter (PWD) feel communication pressure while he communicate on telephone, introducing them and specially when talking to dominant personalities[5]. Several factors contribute in the development of stuttering and influence the speech i.e. brain structure and function, genetics factors, language development and environment. Working together, these factors can of a person who stutters[5,6,7].

Speech constitution strategies facilitate the client to use a new way of oral communication. These approaches are also called prolonged speech or fluency shaping management. Prolonged speech is typically the essential element of new way of oral communication. These approaches involves like light articulatory pressure gentle initiation of speech. Stuttering patients use speech production strategies in daily life that are not the part of their motor control ability. The successful prolong speech depends on patients willingness to apply a new plan of action in conversation of daily life[6, 7].

Stutters have since been taught many methods for adding rhythm to their speech. Syllble time speech involves saying each syllable in time to a rhythmic beat including foot tapping, finger tapping, and arm swinging. In syllable time speech (STS) group, each syllable has been spoken exactly on downbeat. It starts by relatively slow speech i.e. 60 beats per minute, and then gradually speed up to 80 beats, and then as high as 120 beats per minute in in

talking with expert, reading loudly, free spoken language in reading and conversation context.[4,6]

There is paucity in the literature regarding the stammering management with prolongation of speech and syllable time speech. The objective of this study was to determine the effects of prolongation of speech and syllable time speech on reduction of severity of stuttering in stuttering patients.

METHODOLOGY

This study was designed as a randomized clinical trial with n=30 participants were recruited through non-probability, purposive sampling and randomly assigned to Group A (n=1%) received prolonged speech protocol (PSP) and Group B (n=15) received syllable time speech protocol (Figure 1).

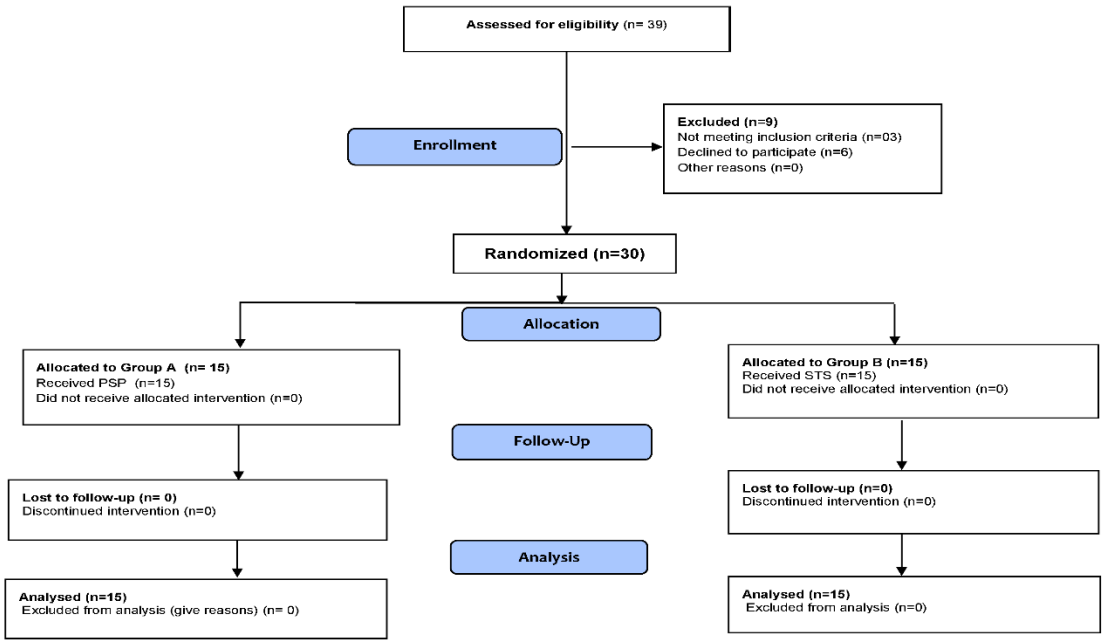

Figure 1: CONSORT diagram

Participants of both genders having developmental stuttering with age between 20-30 years were included in the study. While those with neurological stuttering, cluttering and language disorders were excluded. The study was conducted in National Institute of Rehabilitation Medicine Islamabad Pakistan after approval from the ethics review committee (ERC). All participants provided written, signed consent before participation in the study which was conducted according to ethical guidelines of Pakistan medical and research council as well as Declaration of Helsinki

Prolonged speech protocol (PSP) group received light articulatory pressure, gentle initiation of speech, continuous phonation and light articulatory contact during talking with expert, reading aloud and free spoken language in reading and conversation context.

In syllable time speech (STS) group, each syllable has been spoken exactly on downbeat. It starts by relatively slow speech i.e. 60 beats per minute, and then gradually speed up to 80 beats, and then as high as 120 beats per minute in talking with expert, reading loudly, free spoken language in reading and conversation context.

Each participant in both groups therapy session twice week for 12 weeks. Each session was last for 30 minutes. In every session the reading task was performed with 80 short sentences, free spoken language for 5 minutes and talking with expert by using protocol for 5 minutes. At the end for 5 minute each participant gave the review of the session.

The data was collected using the Scale of rating severity of stuttering (SRSS)at baseline, after 6th weeks and after 12th weeks of training. . The SRSS score range from 0 to 7, 0 score means absence of stuttering and 7 means very severe stuttering. The demographic data was obtained as age, gender birth order, number of siblings and age of onset of

stuttering. The Friedman and Wilcoxon sign rank test was used for with-in group analysis. Mann Whitney U-test was applied for between the group comparisons. As the data was not comparable ($p \geq 0.05$) at the baseline, so the mean difference (MD) of both groups was compared through independent t test. The significance level was set at $p<0.05$ and SPSS ver 21 was used for data analysis.

RESULTS

The mean age of the study participants was 22±2.05 years. The median number of sibling was 4(2), birth order 2.5(2) and age of onset was 4(1) years.

With-in group analysis showed that the group received prolong speech protocol {F=25.24(2), p<0.001} and syllable time speech protocol {F=29.52(2), p<0.001}, both were significantly improved from the baseline to the end of 12th week of intervention as well as at each level of assessment. (Table 1)

It was observed that, groups were not comparable at the baseline, so the mean difference (MD) was calculated in the both groups and compared with independent t-test. (Table 2) The result showed that there was significantly large mean difference (MD) of SRSS in group received syllable time speech protocol (2.53±.83 ver 1.73±.59, p=0.005, Cohen's d=0.72) as compared to group received prolong speech protocol. (Figure 2

Table 1: With-in group Analysis

	Assessment	Prolonged Speech Protocol				Syllable Time Speech Protocol			
		Median (IQR)	MR	Z/F(2)	p-value	Median (IQR)	MR	Z/F(2)	p-value
Severity Rating scale of Stuttering	Baseline	5(1)	2.93	-3.35	0.00***	5(1)	3.00[a]	-3.54 [a]	0.00***
	After 6th Week	4(1)	1.83	-2.48	.013*	4(1)	1.97[b]	-3.44 [b]	0.00***
	After 12th Week	3(1)	1.23	25.24	0.00***	3(1)	1.03[c]	29.52 [c]	0.00***

[a]baseline to 6th week, [b]6th week to 12th week & [c]baseline to 12th week
*Significance level: p<0.001***, p<0.01**, p<0.05**

Table 2: Comparison between the Groups on Severity Of Stuttering

	Assessment	Prolonged Speech Treatment Protocol		Syllable Time Speech Protocol		U-test	p-value
		Median (IQR)	MR	Median (IQR)	MR		
Severity Rating scale of Stuttering	Baseline	5(1)	12.50	5(1)	18.50	67.5	0.045
	After 6th Week	4(1)	13.67	4(1)	17.33	85.0	0.202
	After 12th Week	3(1)	16.03	3(1)	14.97	104.5	0.724

*significance level: p<0.001***, p<0.01**, p<0.05**

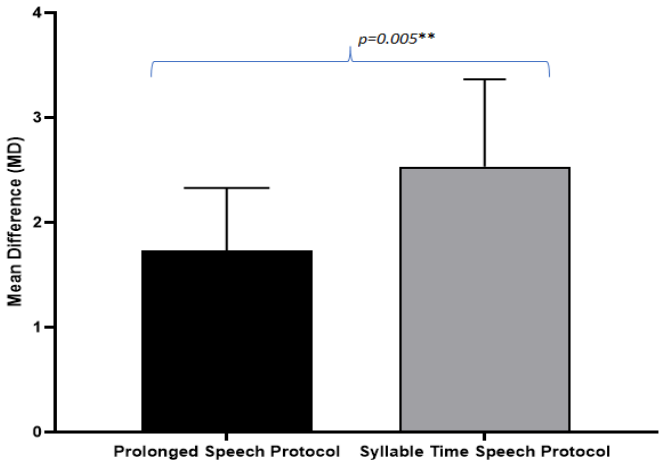

Figure 2: Comparison of mean difference of the both groups

DISCUSSION

The study was conducted to find out the effect of prolongation of speech and syllable time speech for management of stuttering. Significant improvement was noted within both groups from zero weeks to 12th weeks of training regarding severity of stuttering but syllable time speech proved to be more effective as compared to prolonged speech, in reduction of severity of stuttering and improving fluency in stuttering patients.

Current study demonstrated that there was significant improvement in prolonged speech group from week 0 to week 12 of training regarding scale for rating the severity of stuttering. The prolonged speech resulted in control over the articulatory movements of speech and effective in reducing severity of stuttering and in enhancing confidence and improving quality of life of clients with stuttering[8]. Another study conducted by sanjeev Kumar Gupta also supports the results of our study in which significant improvement was observed on both pre- and post-intervention score in stutters[9]. Zamani P et al, also reported that prolong speech is an effective in reducing the severity of stuttering and improve the fluency in stuttering patients[10].

The current study also demonstrated that syllable time speech was significantly better than prolonged speech regarding in reduction of severity of stuttering and improving fluency from baseline to 12 weeks of training regarding SRSS. A previous study also concluded that SRSS was improved significantly in syllable time speech which is in line with current result. Nineteen stuttering patients were involved under two conditions in speech communication activity. One using STS and other in their native talking manner. The talkers' speech rhythmicity and percentage syllables stuttered (%SS) were ranked. The rhythmicity ranks evaluated in syllable time speech to approximation the level to which native talkers were using STS. Results discovered that syllable time speech was significantly reducing severity of stuttering on %SS; but reduction in severity of stuttering[11].

Prolonged speech improves the fluency but syllable time speech showed more improvement in the severity of stuttering. The underlying mechanism of improvement in fluency involves speaking with minimal stress across syllable or words in time to a regular beat.one of the reasons for better results in STS group is that STS has an advantage of engaging in hand tapping activities which ultimately lead to the patient to talk in strict time to rhythm and each syllable have to be spoken exactly on downbeat. exactly on downbeat. This syllable time speech allowed and individual to change their spoken language production. The syllable time speech method resulted in decreased the power of articulatory motion and improves fluency[12,13].

Andrews et al., examined the Syllable time speech to reduce the stuttering severity in 10 preliminary school-age children with stuttering. They trained the children with stuttering and their parents to practice a treatment protocol of the syllable time speech at relaxed level of talking. The results showed that nine children with stuttering exhibited a substantial reduction in severity of stuttering. Researchers have firmly proposed that more studies are desirable to explore the effectiveness of syllable time speech in the reduction of severity of stuttering in other languages[14].

One of the limitations of the current study was designed without controlled group. The study was conducted only one institute. The reason was that the ethical committee of NIRM did not approve the controlled group. This study was conducted without counseling.

CONCLUSION

Syllable time speech was significantly better than prolonged speech regarding in reduction of severity of stuttering and improving fluency from baseline to 12 weeks of training regarding SRSS. It is recommended that study should be conducted with large sample size. This study was conducted in only one institute; therefore, it is recommended further study should be conducted in multiple institutes.

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