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Bioscience Research

Print ISSN: 1811-9506 Online ISSN: 2218-3973

Journal by Innovative Scientific Information & Services Network

RESEARCH ARTICLE BIOSCIENCE RESEARCH, 2023 20(3):800-805. **OPEN ACCESS**

Deep breathing and stretching exercises effect on Chronic Mechanical Low Back Pain in university students after the COVID-19 Pandemic

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Reduced physical activity was evident worldwide, besides the restricted health care during the COVID-19 pandemic. As well, reduced utilizing the non-pharmacological therapies, anti-inflammatory drugs, and analgesics by patients suffering from chronic mechanical low back pain (CMLBP). Lower back pain (LBP) is known as one of the greatest widespread conditions. Objectives: The study aim was to find the relationship between sitting posture during classes and CMLBP and the impact of stretching and deep breathing exercises on CMLBP. Method: Quantitative cross-sectional study included thousand male students, aging between 19-25 years from five medical science colleges at KAU was conducted during the academic year 2020–2021. As well, an experimental study was applied to sixty male medical students with CMLBP, almost the same intensity of pain was chosen from the sample and divided into two equal groups [experimental (A)& control (B)]. The control group received advice on the correct way of sitting, sleeping, and lifting heavy objects, using cushions in class with an application as a reminder. The experimental group learned deep breathing and stretching exercises in addition to the advice as the previous one. Both groups were re-assessed after a month. Results: Pain intensity was greatly decreased in the experimental group with improvement in ADL and life quality, while there were no significant variations in most of the investigated variables of the controls ($p<0.05$). Conclusion: Stretching & deep breathing exercises were effective in reducing CMLBP among students.

Keywords: breathing exercise, chronic mechanical low back pain, COVID-19, sitting, stretching exercise, students

INTRODUCTION

LBP is one of the most widespread disorders in all ages (Nordin, et al. 2014). At least 90% of subjects suffered from LBP previously in their lifespan (Hafeez et al. 2013, Falavigna et al. 2010). While it is uncommon for adult people to call doctors due to LBP, the ratio of adult people with LBP was calculated as 13.5 and 39.8% in people aged18 to 24 years (Anand et al. 2013, Kennedy et al. 2008), 80-90% is of mechanical origin (Deyo and Weinstein 2001), manifested as a pain in the spine or its supporting structures (Cohen et al. 2008). Consequently, university students complain great incidence of LBP (Fahad and Munir 2017), according to a recent study, what makes them the susceptible majority to back pain is sitting for a prolonged time for learning and the tension they face, as an incorrect sitting position for prolonged time cause back pain (Power et al. 2001).

Deep and slow breathing (DSB) technique is commonly applied in diverse syndromes, regarding long-lasting pain syndromes, as a part of many physical, mental, and spiritual disciplines combined into multimodal treatment approaches (Pratscher, S. D., 2023. Chalaye et al. 2009). Deep breathing was found operational in reducing pains in a diversity of patients. Most patients have used these techniques well as the typical medication-based pain therapy (Miller and Perry 1990). Relaxing techniques, as deep breathing or muscle relaxation including stretching, were proved to be effective in treatment of pain symptoms in patients with long-lasting pains (Kwekkeboom and Gretarsdottir 2006).

LBP is a common musculoskeletal complaint, with nearly 70% -90% of adults' facing LBP incident during their lives, 50% have frequent episodes, and 5-10% are emerging long-lasting and possibly incapacitating LBP (Thiruganasamb and amoorthy et al. 2014, Johnson and Thomas 2010). MLBP is recognized by incidence or no symptoms and signs with dissimilar positions or motions (Pincus et al. 2006).

LBP is considered chronic (CLBP) if it lasts for three months or more (Rozenberg 2008). The causes of CLBP are complicated, some are unknown. One chief origin includes weak superficial trunk as well as abdominal muscles (Lee et al. 2014, Chang et al. 2013). Researchers confirmed an association between reduced core steadiness and LBP, as well as reductions of core muscular tone and spinal stability in subjects with acute as

well along-lasting disorders (D'Hooge et al. 2013, Hayden et al. 2005). Core stability depends on the power, coordination, as well as flexibility of these musculature (McGill et al. 1995, McGill 1997). Maintaining the spine integrity requires three systems to work together: (nervous, skeletal, and muscular). Any dysfunction of one of them will affect stability and possibly cause back pain according to the Panjabi model (Panjabi 1992).

Lee, G. T., et al (2023) reported that home-based workout protocols must be prescribed for subjects with CMLBP.

Varela, A. R., et al 2021 reported that a significant reduction in persons description or accurately measured physical activity, besides augmented inactivity (sitting), for all ages, fitness state, or geographical locality, while matching pre-COVID-19 times.

While records are limited, developments are evolving through clinical management suggest that diaphragmatic breathing might be helpful in core stability, posture, thoracic tone (Calhay et al. 2015), as well as reducing BP prevalence (Lippincott and Wilkins 2007, Kolar et al.2012). Relaxation might have a dynamic part in converting breathing techniques into operative techniques for managing pain and stress-associated conditions (Pal et al. 2004).

The influence of stretching exercises on flexibility was examined (Halbertsma et al. 1999). Amplified range of motion is straight related to diminished pain intensity, improved tedious viscoelasticity (Taylor et al. 1997, Ferreira et al. 2007), and increased sarcomeres in muscle fiber (Chan and Hong 2001, Coutinho et al. 2004).

MATERIALS AND METHODS

A cross-sectional study using a mailed questionnaire was conducted to students at King Abdul-Aziz University, Jeddah, Saudi Arabia, during the academic year 2020–2021. One thousand male students participated in the study. Five hundred ninety-nine students suffered from CMLBP and four hundred and one were chronic. In addition to an experimental study was done to sixty male medical students with CMLBP.

Inclusion Criteria:

Male students, age ranged between 19-25 years old, having CMLBP, normal BMI.

Exclusion Criteria:

scoliosis or any structural deformity or congenital anomalies, back surgery, malignancy, factures, spinal or orthopedic surgery, osteoporosis, tuberculosis, injury due to carrying heavy object, sedatives & pain killers, any inflammatory or pathological abdominal & back conditions.

Self-administered questionnaire was distributed in forms of (paper based and online survey). It contained twenty-three questions: Demographic data such as age, weight, height, and college. Pain characteristics such as location, intensity, recall period and treatment received for pain. Risk factors included usual sitting position in class, handedness, class condition (temperature - light), knowledge of correct sitting and lifting heavy object. The questionnaire was sent by the researchers, answered by participants, and finally data were analyzed.

Procedure :

A general medical examination was done and revealed that all participants were free from any pathological causes rather than CMLBP. At that time, sixty male medical students with normal BMI, and almost the same intensity of pain were chosen from the sample and divided into two equal groups (control and experimental). Pain intensity and disability of all participants were measured by VAS and classified based on Oswestry disability index (ODI) (Tonosu, J., et al. 2012).

The control group received advice of correct way of sitting, sleeping and lifting heavy objects, using cushions in class with an application as a reminder. The experimental group learned deep breathing (1) and stretching exercises (2) in addition to the advice as the controls. Both groups were reassessed after one month.

Statistical Data Analysis:

Data analysis was done via the *SPSS* (statistical package for social sciences) version 21.0 software package. Data was presented as percentages and P-value was ($P<0.05$).

RESULTS

The data obtained from the research indicated that, pain intensity was greatly decreased in the experimental group with improvement in activity of daily living and quality of life, while non-significant differences were seen in most of the investigated variables of the controls ($p<0.05$).

Demographic Data of the Participants:

In the present study 60 male students were participating; they were allocated in random into two groups, 30students in every group.

Experimental group(A)

Thirty male students were randomly assigned, with mean age of (22.100±1.135) years, mean weight (54.066±7.254) kg, mean height (163.068±4.550) m, and mean BMI (21.604±2.781) kg/m^2 as presented in table 1.

Control group (B)

Thirty male students were randomly assigned, with mean age of (22.400±1.465) years, mean weight (53.801±5.641) kg, mean height (161.000±4.930) m, and mean BMI (21.765±2.081) kg/m^{2}as presented (table 1).

Assessment of Pain:

Pain level in visual analogue scale pre- and post-treatment was presented (table 2). A high statistically

significant difference was seen in the paired t-test in pain intensity post-treatment for group (A) and group (B) as the mean for group (A) was (3.533± 2.391), t-value (7.671) and p-value (0.000). While for group (B), the mean was (3.733±1.711), t-value (9.541), and p-value was (0.000). Also, non-significant change was seen in the unpaired t-test between groups as the mean difference post-treatment was (0.3), t-value (0.265), and p-value (0.795), (table 3).

Functional Ability:

Functional ability was displayed (table 4)pre- and post-treatment. A high statistically significant change was noted in the paired t-test in group (A) and a significant change in group (B). Group (A) mean was (0.934±1.669), t-value (5.398), and p-value (0.000). The mean for group (B) was (1.468± 0.916), t-value (3.414), and p-value (0.004). Whereas non-significant change was seen in the unpaired t-test post-treatment between groups as the mean difference was (0.543), t-value (1.087), and p-value (0.288), (table 5).

Table 1: Demographic Data of the subjects (n=60)

Variable	Experimental Group (A)	Control Group (B)	Comparison	
	Mean ±SD	Mean ±SD	t-value	P-value
Age (year)	22.100±1.135	22.400±1.465	-0.561	0.580
Height	163.068±4.550	161.000±4.930	0.622	0.551
Weight	54.066±7.254	53.801±5.641	0.111	0.910
BMI(Kg/m^2)	21.604±2.781	21.765±2.081	-0.181	0.861

SD: standard deviation, T-test statics, p: probability, p0.01

Table 2: Pain Paired t-test in both groups (n=60)

Pain level (VAS) paired t-test					Significance
	Pre-treatment	Post-treatment	Comparison		
Group	Mean ±SD	Mean ±SD	t-value	P-value	
Experimental (A)	7.000±2.043	3.533±2.391	7.671	0.000	HS
Control (B)	7.333±1.842	3.733±1.711	9.541	0.000	HS

SD: standard deviation, T: test statics, p: probability, p ⩽0.01, HS: highly significant

Table 3: Pain Intensity Unpaired t-test between groups(n=60)

(VAS) unpaired t-test				Significance
Pain	Mean Differences	Comparison		
		t-value	P-value	
Pre-treatment	0.4	0.472	0.643	NS
Post-treatment	0.3	0.265	0.795	NS

T: test statics, p: probability, p ⩽0.01, NS: non-significant

Table 4: Functional Ability in both groups (n=60)

Oswestry questionnaire paired t-test					Significance
	Pre-treatment	Post-treatment	Comparison		
Group	Mean ±SD	Mean ±SD	t-value	P-value	
Experimental (A)	5.201±1.860	0.934±1.669	5.398	0.000	HS
Control (B)	4.268 ±1.870	1.468± 0.916	3.414	0.004	S

SD: standard deviation, T: test statics, p: probability, p> 0.01, S: Significant, HS: Highly significant

Table 5: Functional Ability t-test between groups (n=60)

Oswestry unpaired t-test				
Functional Ability	Mean Differences	Comparison		Significant
		t-value	P-value	
Oswestry Pre-treatment	-0.940	-1.372	0.182	NS
Oswestry Post-treatment	0.543	1.087	0.288	NS

T: test statics, p: probability, p> 0.01, NS: non-significant

DISCUSSION

CMLBP is one of the most common conditions that students complain of mechanical pain comes from bad habits, such as poor posture, seats with poor design, bad sleeping position and wrong bending and lifting movements. Mechanical back pain can be treated by many methods of physical therapy including massage, ROM, strengthening, hot packs, and different types of interventions (Page, 2012). Stretching and deep breathing technique are one of the complementary methods approved to be effective with different types of disorders; and in the present study the aim was determining the influence on pain, ADL, in male medical students complaining of CMLBP.

The results indicated that the group who received exercises showed positive findings, and a significant difference was found among groups after a month of treatment. We found that stretching and deep breathing exercises significantly improved quality of life (QoL) and ADL in middle-aged female medical students.

Agreeing with our results, Sherman et al. (2011) found that stretching had good results, while Smith et al. (2011) mentioned that treatment of both lumbar spine and the hips through manual therapy and exercise produce better results than treating lumbar spine alone. Conversely, David et al. (2012) reported that pain level didn't decrease with stretching (Gisla and Izaguirre 2015), while a study done by Busch et al. (2012) using deep breathing suggested that this breathing affected autonomic and pain pathway (Babina et al.2016) showed improvement in respiratory parameter and reduction in disability (Licciardone 2021).

Questionnaire Group Analysis:

This survey included 1000 students from different medical faculties. Group sizes from all faculties were equal.

Sitting posture during lecture and pain or discomfort & Pain location in different specialties:

Regarding both questions, there were statically significant results.

Knowledge about standing and sitting correctly & Intensity of pain:

Regarding this question, there was no correlation between knowledge about standing and sitting correctly & Intensity of pain. Results showed that participants who had knowledge recorded high pain intensity. Pain intensity does not interfere with students' knowledge, in comparison to participants answered no. The explanation maybe they did not apply the right knowledge. This showed that both medical and non- medical students must get awareness regarding correct sitting posture during lecture.

Intervention Group analysis:

Both groups had the same characteristics regarding ODI and pain intensity before intervention.

Regarding the Intensity of pain and ADL before and after the intervention program, the experimental group showed lesser pain intensity and better ADL performance than control group. p=.002 and .028 respectively.

The experimental group had lesser pain intensity and better ADL after the intervention (4.10± 1.43) as opposed to before the intervention program (4.20±1.398), while no statistically significant decrease was noted in the controls, p=.253.

It is important to consider the efforts made to help subjects in being physically active during and after COVID-19. American College of Sports Medicine (ACSM) has reported evidence on ways to stay dynamical through COVID-19. Several fitness centers provided posts on free online exercise practices for helping persons stay physically dynamic at their homes (Hall et al. 2020, WHO, 2020). Muscle action proves circulation, as well as neuronal incorporation and cognitive abilities (Fernandes et al. 2018). Developing a novel worldwide active strategy must be greeted by physical activities (PA) supporters, specialists, officials, and researchers universally (Foster et al. 2018).

CONCLUSION

We can conclude that stretching and deep breathing exercises were effective in reducing CMLBP among students.

CONFLICT OF INTEREST

The author declared that the present study was performed in absence of any conflict of interest.

ACKNOWLEDGEMENT

I deeply appreciate and have exceptional recognition to all students who participated in this experiment. The results of the present experiment considered the following

recommendation, future research to be done for studying post awareness improvement in CMLBP.

AUTHOR CONTRIBUTIONS

SR designed and performed the experiment and wrote the manuscript. SR performed treatments, and data analysis. SR designed experiment and reviewed the manuscript. The author read and approved the final version.

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