RESEARCH ARTICLE

EFFECT OF CORE MUSCLE STRENGTHENING AND BEHAVIORAL THERAPY IN THE MANAGEMENT OF CHRONIC NON SPECIFIC LOW BACK PAIN IN NURSING POPULATION

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ARTICLE INFO

ABSTRACT

Background and Introduction: Core muscle strengthening and behavioural therapy are the two main treatment strategies employed in the management of chronic non specific low back pain in nursing population. But there is very little evidence about the effect of a combined treatment protocol of core muscle strengthening and behavioural therapy in the management of chronic non specific low back pain.

Objectives : To determine the effect of core muscle strengthening and behavioral therapy separately and in combination on pain, disability and fear avoidance beliefs in nurses with chronic non specific low back pain.

Methods: According to the inclusion and exclusion criteria, 45 nurses who were evaluated for chronic non specific low back pain were enrolled in the study. 15 nurses each were allocated to core muscle strengthening group, behavioral therapy group and the combined group. Outcome measures used were Visual analogue scale, Rolland Morris Disability Questionnaire and Fear Avoidance and Belief Questionnaire. Base line data was collected initially and then post treatment data was taken after two weeks.

Results : Intra group comparison of all the outcome measures using paired sample statistics showed significant difference in the pre and post treatment evaluation (p<0.005). In overall inter group comparison using ANOVA significant differences for all three groups were evident (p<0.005). Multiple Scheffe test showed that the combined treatment group showed larger differences than others in most of the outcome measures.

Conclusion : These findings suggests that combined treatment protocol induced greater improvement in pain, disability and fear avoidance beliefs than when core muscle strengthening and behavioral therapy was administered alone.

INTRODUCTION

Pain is an unpleasant emotional state felt in the mind but identifiable as arising in a part of the body. In other words, it is a subjective sensation. Pain is a defense mechanism designed to make the subject protect an injured part from further damage (Sikiru and Hanifa 2010) The International Association for the Study of Pain (IASP) provided definitions for low back pain based on the anatomical tomography. These definitions explicitly locate the pain as perceived in the lumbar and/or sacral regions of the spine. Lumbar, sacral or lumbo-sacral spinal pain, or any combinations thereof, legitimately constitute what colloquially might be referred to as ''low back pain.'' The IASP recognizes chronic pain in general, as any pain that has persisted for longer than three months (Malliou 2006). Non-specific LBP is defined as symptoms without a clear or named cause ie: low back pain that is not attributable

to a recognizable known specific pathology. Non-specific LBP is thought to constitute approximately 90% of all Low back pain (Taylor *et al.,* 2011; Airaksinen *et al.,* 2006). Low back pain is a major public health problem throughout the world, and the prevalence of low back pain appears to be higher for nurses than for woman of similar age in the general population, a major cause of lost time and productivity for this occupational group. Several authors report annual prevalence of low back pain in nurses varying between 45%-58% (Rahmah *et al.,* 2008; Suzanne Denis *et al.,* 2007). In recent years a number of studies about LBP in nurses were carried out, revealing that this occupational group is especially at risk. This can be accounted for by the special nature of the nursing profession, which is a strenuous job involving frequent lifting, pushing and pulling in close contact to patients being in need of help. Furthermore, awkward working postures determined by the patients needs, as well as sudden, unexpected peak loads were observed in nursing aides. In addition, the nursing profession must be considered as a high stress job due to the

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frequent occurrence of unseen events, the need to work under time pressure and impossibility to have breaks when required. This is also reflected in the presence of moderate to severe burnout syndrome reported in the majority of nurses (Peter Schenk *et al.,* 2007; Smedley *et al.,* 1995). Core muscle strengthening and behavioural therapy are the two main treatment strategies employed in the management of chronic non specific low back pain in nursing population. But there is very little evidence about the effectiveness of a combined treatment protocol of core muscle strengthening and behavioural therapy in the management of chronic non specific low back pain. So there is a need for this study to compare the effectiveness of core muscle strengthening and behavioural therapy separately and in combination. A comprehensive strengthening or facilitation of these core muscles has been advocated as a way to prevent and rehabilitate various lumbar spine and musculoskeletal disorders and as a way to enhance athletic performance (Akuthota and Nadler 2004). Core muscle strengthening aims at improving strength of transverse abdominis, lumbar multifidus, internal and external obliques rectus abdominis and erector spinae (Franc *et al.,* 2010). Behavioural treatments include operant, cognitive, and respondent treatments or a combination of these treatments. Each of these focuses on the modification of one of the three response systems that characterize emotional experiences: behaviour, cognition, and physiological reactivity (Marienke *et al.,* 2011). The aim of this experimental study was to evaluate the effect of core muscle strengthening and behavioral therapy separately and in combination in nurses with chronic non specific low back pain.

MATERIALS AND METHODOLOGY

This experimental study was done at K.S Hegde medical college hospital using purposive sampling and random allocation of subjects into various groups.

Methods of Data Collection

45 nurses evaluated and diagnosed with chronic non specific low back pain was randomly assigned to any of the three treatment groups of equal size. The base line scores of all outcome measures were documented for all the subjects in each group in the pre interventional period. The subjects were treated six times a week for two weeks following which post interventional scores were measured.

GROUP 1:- Core muscle strengthening

Abdominal hollowing manure was taught to the patient using pressure biofeedback unit (P.B.U). The participants were instructed to draw the lower stomach gently off the pressure sensor without moving the back or the hips and to sustain it for 10 seconds, measured by a stop watch. Three sets of 15 repetitions were done for each exercise. All the exercises were demonstrated to the patient before administering them.
- Exercises for the transverse abdominis in 4 point kneeling
- Exercises for the transverse abdominis in dorsal decubitus with flexed knees
- Exercises for the lumbar multifidus in ventral decubitus
- Co-contraction of the transverse abdominis and lumbar multifidus in upright position

- Exercises for the rectus abdominis in dorsal decubitus with flexed knees: trunk flexion
- Exercises for the rectus abdominis, internal obliques and external obliques in dorsal decubitus and flexed knees: trunk flexion and rotation
- Exercises for the rectus abdominis in dorsal decubitus and semi-flexed knees: hip flexion
- Exercises for the erector spinae in ventral decubitus: trunk extension

GROUP 2:- Behavioural therapy

Cognitive behavioural therapy (CBT) has six distinct phases:
- Assessment
- Re-conceptualization
- Skills acquisition
- Skills consolidation and application training
- Generalization and maintenance
- Post treatment assessment

The assessment phase involved a conversation with the patient to identify the degree of psychosocial impairment and determine the most appropriate course of action. The re-conceptualization phase intended to help patients challenge and question the rationality of their maladaptive thoughts. In the skills acquisition phase, patients were taught how to deal with obstacles in their day to day lives and how to avoid falling into the patterns of automatic maladaptive thoughts. In the skills consolidation and application training phase patients were given homework to reinforce the skills they have acquired. In the generalization and maintenance phase, the patient discussed the future, and how the patients are going to cope once they had left the treatment. Finally the patients participated in the post treatment assessment.

GROUP 3:- Combination of Core muscle strengthening and Behavioural therapy

Both core muscle strengthening and behavioural therapy was given for the patients in this group.

Subject Selection Criteria

Inclusion Criteria

- Female nurses with chronic non specific low back pain.
- Age group 18- 40 years of age.

Exclusion criteria

- History of back surgery.
- Rheumatologic disorders.
- Vertebral infections.
- Spinal abnormalities.
- Renal and urological disorders.
- Back pain due to gynecologic and obstetric conditions.
- Spine exercise within 3 months of the onset of the study.

Materials Used

- Pressure biofeedback unit
- Straps

OUTCOME MEASURES

Three outcome measures, Visual Analogue Scale, Rolland Morris Disability Questionnaire, and Fear Avoidance and Belief Questionnaire were used to assess pain, disability and fear avoidance beliefs respectively.

RESULTS

Data analysis

Pre – Post comparisons within the groups were done using Independent t-test.
ANOVA was done to check if there was any significant difference between the three groups.
Multiple Scheffe was done to compare between the three groups.

Intra group comparisons

The result of group 1 which was the core muscle strengthening group, had an initial mean value of V.A.S 3.96±1.47 which reduced to 1.88±1.13 post treatment. The initial mean value of the R.M.D.Q in this group was 8.00±2.42 which reduced to 4.2± 2.39 post-treatment. The initial pre-treatment mean value of the F.A.B.Qw was 28.13±6.62 which reduced to 24.60±6.63 post treatment.

The initial pretreatment mean value of F.A.B.Qpa was 14.73±4.93 which was reduced to 11.40±5.02 post treatment. (Annexure, Table: 1,2,3,4). The result of group 2 which was the behavioural therapy group, had an initial pre treatment mean value of V.A.S 4.32±1.41 which reduced to 3.2867±1.19 post treatment. The initial mean value of the R.M.D.Q in this group was 8.4667±3.35 which reduced to 6.80±2.67 post treatment. The initial pretreatment mean value of the F.A.B.Qw was 28.60±6.55 which reduced to 22.00±5.80 post treatment.

The initial pretreatment mean value of F.A.B.Qpa was 12.53±5.04 which was reduced to 7.80±3.85 post treatment. (Annexure, Table : 1,2,3,4). The result of group 3 which was the combined group, had an initial pre treatment mean value of V.A.S 4.4867±1.37 which reduced to 1.84±1.04 post treatment. The initial mean value of the R.M.D.Q in this group was 8.40±2.72 which reduced to 3.2667±1.86 post treatment. The initial pretreatment mean value of the F.A.B.Qw was 25.133±6.50 which reduced to 14.133±5.15 post treatment. The initial pretreatment mean value of F.A.B.Qpa was 13.133±5.68 which was reduced to 6.60±3.73. (Annexure, Table : 1,2,3,4)

Inter group comparisons

In the inter group comparison for V.A.S, it was found out that there was overall significance, p-value 0.000(p<0.05) between the three groups. And was found that group 1 and group 3 as having equal reduction in pain but both of them were better

ANNEXURE : (TABLES)

Table 1. Paired sample statistics of V.A.S

		Mean	N	Std. Deviation	Std. Error Mean
Group 1	preVAS1	3.9600	15	1.47105	.37982
	postVAS1	1.8800	15	1.13402	.29280
Group 2	preVAS2	4.3200	15	1.41330	.36491
	postVAS2	3.2867	15	1.19455	.30843
Group 3	preVAS3	4.4867	15	1.37366	.35468
	postVAS3	1.8400	15	1.04458	.26971

Table 2. Paired sample statistics of R.M.D.Q

		Mean	N	Std. Deviation	Std. Error Mean
Group 1	preRMDQ1	8.0000	15	2.42015	.62488
	postRMDQ1	4.2000	15	2.39643	.61875
Group 2	preRMDQ2	8.4667	15	3.35659	.86667
	postRMDQ2	6.8000	15	2.67795	.69144
Group 3	preRMDQ3	8.4000	15	2.72029	.70238
	postRMDQ3	3.2667	15	1.86956	.48272

Table 3. Paired sample statistics of F.A.B.Qw

		Mean	N	Std. Deviation	Std. Error Mean
Group 1	preFABQw1	28.1333	15	6.62103	1.70954
	postFABQw1	24.6000	15	6.63110	1.71214
Group 2	preFABQw2	28.6000	15	6.55526	1.69256
	postFABQw2	22.0000	15	5.80640	1.49921
Group 3	preFABQw3	25.1333	15	6.50128	1.67862
	postFABQw3	14.1333	15	5.15290	1.33047

Table 4. Paired sample statistics of F.A.B.Qpa

		Mean	N	Std. Deviation	Std. Error Mean
Group 1	preFABQpa1	14.7333	15	4.93481	1.27416
	postFABQpa1	11.4000	15	5.02565	1.29762
Group 2	preFABQpa2	12.5333	15	5.04079	1.30153
	postFABQpa2	7.8000	15	3.85820	.99618
Group 3	preFABQpa3	13.1333	15	5.68038	1.46667
	postFABQpa3	6.6000	15	3.73784	.96511

than group 2 using Multiple Scheffe test which proves that both core muscle strengthening group and combined group were equally effective and both of them were better than the behavioural therapy group in the reduction of pain. (Annexure, Table: 5). In the inter group comparison for R.M.D.Q, it was found out that there was overall significance, p-value 0.000(p<0.05) between the three groups. Using Multiple Scheffe test it was found out that group 3 showed most reduction in disability followed by group 1 and group 2 which proves that disability was reduced the most in the combined group followed by core muscle strengthening group and behavioural therapy group respectively.(Annexure, Table :5). In the inter group comparison for F.A.B.Qw, it was found out that there was overall significance, p-value 0.000(p<0.05) between the three groups. Using Multiple Scheffe test it was found out that group 3 showed most reduction in fear avoidance beliefs during work followed by group 2 and group 1which proves that fear avoidance beliefs during work was reduced the most in the combined group followed by behavioural therapy group and core muscle strengthening group respectively. (Annexure, Table: 5)

There was significant improvement in all the outcome measures in the core muscle strengthening group which was in accordance to the study conducted by Sherry Rish *et al.* in which they concluded that exercises resulted in reduction of pain and improvement of the physical and psychological functioning in chronic low back pain patients. The mechanism of action is currently not known but may be related to improvement in the neurophysiologic functioning of the lumbar muscles, increase in lumbar stability, conditioning of the lumbar musculature and increase in the disc metabolism. In patients with chronic low back pain, psychological co-morbidities such as anxiety depression, maladaptive illness behaviour may get established. This type of behaviour may manifest itself as fear of engaging in any activity or movement that had been previously associated with symptoms of chronic low back pain. As time passes virtually all activities gain this association, leading to generalized fear of movement in an attempt to minimize exacerbations. Engaging in supervised exercise therapy can help to break this cycle and demonstrates that not all movements or activities need to be painful. There was significant improvement in all outcome measure in the

Table 5. Multiple Scheffe test

Dependent Variable	(I) group	(J) group	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
						Lower Bound	Upper Bound
VAS	group1	group2	1.04667[*]	.28848	.003sig	.3146	1.7787
		group3	-.56667	.28848	.158not sig	-1.2987	.1654
	group2	group1	-1.04667[*]	.28848	.003sig	-1.7787	-.3146
		group3	-1.61333[*]	.28848	.000sig	-2.3454	-.8813
RMDQ	group1	group2	2.13333[*]	.52089	.001sig	.8115	3.4552
		group3	-1.33333[*]	.52089	.048sig	-2.6552	-.0115
	group2	group1	-2.13333[*]	.52089	.001sig	-3.4552	-.8115
		group3	-3.46667[*]	.52089	.000sig	-4.7885	-2.1448
FABQw	group1	group2	-3.06667[*]	.79947	.002ig	-5.0955	-1.0379
		group3	-7.46667[*]	.79947	.000sig	-9.4955	-5.4379
	group2	group1	3.06667[*]	.79947	.002ig	1.0379	5.0955
		group3	-4.40000[*]	.79947	.000ig	-6.4288	-2.3712
FABQpa	group1	group2	-1.40000	.76842	.202not sig	-3.3500	.5500
		group3	-3.20000[*]	.76842	.001sig	-5.1500	-1.2500
	group2	group1	1.40000	.76842	.202notsig	-.5500	3.3500
		group3	-1.80000	.76842	.076not sig	-3.7500	.1500

In the inter group comparison for F.A.B.Q.pa, it was found out that there was overall significance, p-value 0.001(p<0.05) between the three groups. Using Multiple Scheffe test it was found out that group 1 and 2 showed similar reduction in fear avoidance beliefs group 2 and 3 also showed similar reduction in fear avoidance beliefs, but group 3 showed better reduction in fear avoidance beliefs during physical activity which proves that fear avoidance beliefs during physical activity was reduced in all the three groups while the combined group showed greater reductions than others.(Annexure, Table : 5). This study proved that there were significant reductions in pain, disability and fear avoidance beliefs within all the three treatment groups (core muscle strengthening, behavioural therapy and combined) indicating that both core muscle strengthening and behavioural therapy was effective in treating chronic non specific low back pain. But the greatest improvement was shown when the two treatment strategies were administered together.

DISCUSSION

The purpose of this study was to compare the effects of core muscle strengthening and behavioural therapy separately and in combination in nurses with chronic non specific low back pain.

behavioural therapy group, thus this study supports the study of Anne Keller in which she highlights the importance of planning future rehabilitation programs for patients with chronic low back pain, according to cognitive behavioural principles, and not only according to principles of exercise physiology. Cognitive behavioural therapy attempts to improve how symptoms of chronic low back pain may be perceived and what impact they may have on a patient's life. By reframing maladaptive thoughts and coping strategies, cognitive behavioural therapy can decrease distress and promote appropriate self care, which may in turn reduce the patient's pain experience. By improving maladaptive behaviours with respect to chronic low back pain, cognitive behavioural therapy may affect the degree of emotional and physical disability associated with that condition, if not the underlying symptoms themselves. This study proved that core muscle strengthening and behavioural therapy reduced pain, disability and fear avoidance beliefs when given in isolation and when administered together. But greatest improvements in all the three outcome measures score was showed by the combined group indicating that treatment of chronic non specific low back pain should include combinations of various treatment strategies and should not stress only on a single mode of

treatment. Limitations of this study was the small sample size, inclusion of only female nurses, the duration of the study was less and prolonged follow ups was not conducted.

Conclusion

This study proves that both core muscle strengthening and behavioural therapy is effective in reducing pain, disability and fear avoidance beliefs in nurses with chronic non specific low back pain. This study proves that combination of treatment strategies is more effective in the management of chronic non specific low back pain. The effectiveness of core muscle strengthening and behavioural therapy can be examined in the future with other treatment strategies used for the management of chronic non specific low back pain. Various other forms of exercises and different other combinations of treatment strategies on the basis of evidence based guidelines can be examined in the future with longer interventional duration and prolonged follow ups.

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