



Research article

## Efficacy of workstation exercise and ergonomic exercise on nursing staff – a randomized clinical trial

**Renuka Dhole, Deepali Patil\*, Pratik Phansopkar**

Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Wardha, Maharashtra, India.

### ABSTRACT

The nurses' population comprises of almost majority of the health care staff in the hospitals and other clinical settings. This population was undermined in the past but in recent years, many studies have been focused on this group to increase efficacy along with analyzing and reducing adjoining risks. The illness most frequent for absenteeism and quality of work hampering is back pain. Hence, this study targets the interventions for low back pain in the nurses. The participants (n=120) will be selected from the hospital setting and divided into 3 random groups. Group A will perform work station exercises, group B will undergo ergonomic changes and advices and group C will be the control group. Each group will have 40 participants each and the participants will implement the interventions of the allotted protocol for 2 months. The initial and final changes will be noted as day 1 and day 60. The outcome measures used will be Visual Analog Scale for pain rating and WHO Quality of Life scale (BREF) for ratings in the standard and quality of living. In post intervention, the exercise modification group performed better than the ergonomic advice group. The VAS and the QOL grading showed a significant change. The control group had a non-significant change. This study concluded that both the workplace exercises and the ergonomic advices show a positive impact on low back pain in the nurses. The workplace exercises are although more efficient than the ergonomic advices.

**Keywords:** Physiotherapy, Work Station Exercises, Ergonomic Modifications, Nursing Population, Health Care System.

Received – 10-06-2021, Accepted- 26-06-2022

**Correspondence:** Deepali Patil\* ✉ [dvjphysio@gmail.com](mailto:dvjphysio@gmail.com) **Orcid Id:** <https://orcid.org/0000-0002-8547-3338>

Musculoskeletal Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Wardha, Maharashtra, India.

### INTRODUCTION

Musculoskeletal conditions are the utmost public wellness issue [1]. Those that requires medical condition attention, a difficult issue to tackle with many professional groups, such as the nursing staff. Even though the nurses are trained to administer to such health issues of others, they neglect their own well-being for the sake of reduction of taking leaves and better job caliber [2]. Historically, back pain has become a more common complaint, and most of the health care practitioners are at the greatest risk. Many researchers have become a witness to this condition in their trials [3].

Community of low back pain (LBP) is highly prevalent, and it has been explored in much research [4]. Findings put it on record that perhaps a multitude of factors relate toward low back pain globally. Some factors include age, genes, body mass index, comporment, style of living, vocational jeopardy, and many others or idiopathic in nature. However, the etiology has not yet been known. Thus, intervention as well as preventive strategies was found to lack of documented feasibility on the basis of etiology [5].

The ergonomic changes to counter act or reduce the pain from low back pain are prominent [6]. The hospital attendants are thoroughly well versed with these. Even though ergonomic modifications have been shown in certain research to also be moderately successful in reducing musculoskeletal disorders, they are very expensive which would be an important factor particularly in developing and undeveloped countries. In such times, the work place training comes in handy. It is relevantly cost effective and also helps to save time and money in recurrent process of modulating and refurbishing of the wards or clinics. It can be worked as it is, to build more support by cost efficiency. In other words, work place work outs save the time and money to start or initiate the treatment program to relieve low back ache [7].

When determining progression of the disease, the diagnosis, as well as the control of any of the musculoskeletal disorders, Q O L scales are now being used. As widely relevant Q O L is defined as a term that reflects individual responses to different effects of disease on

everyday life, affecting to what level real fulfillment should be attained. Measurement of QOL is detected in recent clinical trials as a significant add-on to achieving therapeutic effectiveness for the beneficial change. Low back discomfort is actually a major deterrent to QOL and the QOL scores co related with low back pain and other disabilities.

Visual Analog Scale is a validated and utmost used in all the musculoskeletal, neurological or other conditions. It does not diversify pain in various components and hence is reliable in pre-tests, post-tests and follow ups. Language barrier or educational intelligence and other factors do not hamper the outcomes of this pain rating scale [8]. Through this research, we aim at estimating and contrasting the influence of ergonomic alteration and work place exercises on low back pain in a crowd of nursing health care providers.

The group of ergonomic interventions will yield positive results wherein the mean of observations of the group of workstations exercises will be more inclined to the value of 1.00 levels. Control group will be inclined to 0.05 re 0.01 level of null hypothesis. The independent variables of this study will not have co relational analysis with the dependent variables. This will help the study to move forward to the rank order co relation in the specific statistical analysis.

## METHODOLOGY

The study was set at Datta Meghe Institute of Medical Sciences, Sawangi (Meghe). The Study design is randomized clinical trial in an intervention group of nursing personnel. The sample size was 120 by randomized sampling method.

## Procedure

Sampling was allotted randomly. The division of the groups was on the basis of the time and number of subjects received. The first subject was allotted Group A, the second subject was allotted Group B, and the third subject was allotted Group C, the fourth with Group A and continued henceforth. The chronology of the patient list was solely dependent upon the time and date of assessment rather than the Alphabetical order or age or other criterions. The participants were categorized into three groups-

All participants of the three groups had an in-person physiotherapy session with proper consent and description of the session. The frequency of the sessions was 1-2 sessions per week which lasted between 15 and 45 minutes. They were handed out brochures with visual representation of the exercises and advices respectively. They were also asked to keep a journal of the exercise routine distributed for 3 to 5 sets a day in the clinical timings [9]. Group A was given a lumbar pelvic motor control exercise program. Its objective was to increase motor skill of transverse abdominus, multifidus, and pelvic floor muscles. This would in due course increase the performance during functional tasks [10]. Group B was given spinal ergonomic advice protocol. It comprised of information regarding

proper lifting, pushing and pulling, posture and the muscle work which help prevention and aggravation of back pain [11]. Group C was given lumbar corset belts for stability and immobilization of spine to avoid aggravation of pain and other symptoms [12].

Visual Analog Scale (VAS), for intensity of pain measurement, Visual Analog Scale has reliability of 90% and validity of 76%-84% [13]. WHO QOL BREF, for functional disability and quality of life assessment, WHOQOL BREF scale has reliability of 76%-80% and validity distributed domain-wise as physical domain-67%, Psychological domain 78%, Social domain- 74%, Environmental domain- 86% [14].

## Data collection

The evaluation data was obtained from a pre-established spreadsheet with variable baseline characteristics. Research data was placed in a secure database. Non-electronic records, such as hard copies of assessment forms, signed informed consent, etc., were stored safely in the study setting.

## Data management

Data collection and reporting was carried out under the supervision of the principal investigators. The research reports must be carefully checked for accuracy. The Excel spreadsheet was published at the conclusion of the study and given to the statistician for the required analysis.

## RESULTS

**Table 1:** Comparison of initial and final VAS score in three groups

	Group 1	Group 2	Control Group
Initial VAS	5.47±1.36	5.47±1.63	5.27±1.68
Final VAS	0.83±0.65	1.86±1.01	2.36±1.38
<b>Comparison between initial and final VAS Score(Student's paired t test)</b>			
t-value	25.93	17.58	14.81
p-value	0.0001,S	0.0001,S	0.0001,S
<b>Comparison of group 1 and 2 with control group(Student's unpaired t test)</b>			
<b>Initial VAS</b>			
t-value	0.54	0.50	-
p-value	0.58,NS	0.61,NS	-
<b>Final VAS</b>			
t-value	5.93	1.72	
p-value	0.0001,S	0.08,NS	

Table 1 shows the comparison of initial and final Visual Analog Scale scores in different groups. According to this, based on student's paired t test, the t value was compared in initial and final Visual Analogue Scale scoring. The p value was 0.0001 in all the groups: Group 1, Group 2 and the control group which was significant. Based on student's unpaired t test, the t value of both the Group 1 and Group 2 was compared with control group. p value of initial Visual Analogue Scale scores of these groups was 0.58 for Group 1 and 0.61 for Group 2 which was not significant. p value of final Visual Analogue Scale score of Group 1 was 0.0001 which was significant. p value of final Visual Analogue Scale score of Group 2 was 0.08 which was not significant.

Table 2 shows the comparison of initial and final Quality of Life scores in different groups. According to this, based on student's paired t test, the t value was compared in initial and final Quality of

Life scoring. The initial p value of all four domains was not significant initially when Group 1 and Group 2 were compared to control group,

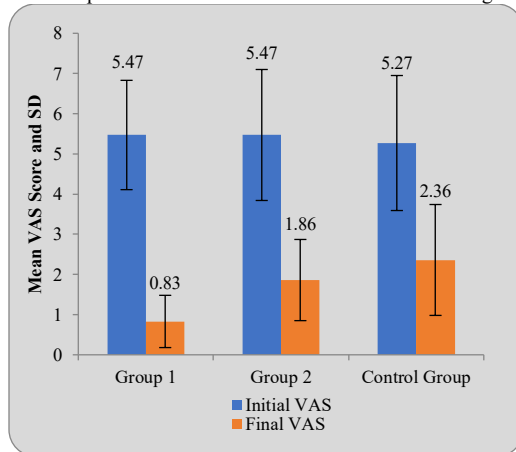
Group 3.

**Table 2:** Comparison of initial and final QOL score in three groups

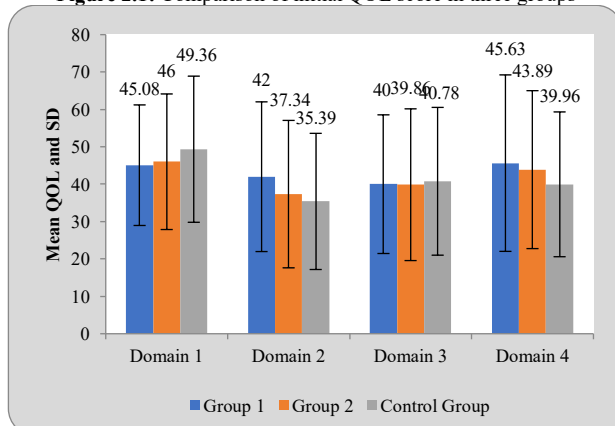
	Group 1	Group 2	Control Group	Comparison with control group (Student's unpaired t test)	
				Group 1 Vs Control Group	Group 2 Vs Control Group
<b>Initial QOL</b>					
Domain 1	45.08±16.62	46±18.13	49.36±19.55	0.98,p=0.33,NS	0.75,p=0.45,NS
Domain 2	42±20.03	37.34±19.72	35.39±18.21	1.42,p=0.15,NS	0.43,p=0.66,NS
Domain 3	40±18.54	39.86±20.29	40.78±19.76	0.17,p=0.86,NS	0.19,p=0.84,NS
Domain 4	45.63±23.60	43.89±21.12	39.96±19.36	1.08,p=0.28,NS	0.81,p=0.42,NS
<b>Final QOL</b>					
Domain 1	88.30±9.23	84.34±9.44	81.78±16.09	2.08,p=0.041,S	0.82,p=0.41,NS
Domain 2	89.80±6.40	83.15±8.43	65.66±17.43	7.76,p=0.0001,S	5.49,p=0.0001,S
Domain 3	64.58±19.46	56.55±19.39	52.33±19.55	2.60,p=0.011,S	0.91,p=0.36,NS
Domain 4	52.72±25.83	49.44±25.73	42.15±24.10	1.75,p=0.084,NS	1.22,p=0.22,NS
<b>Comparison between initial QOL and final QOL (Student's paired t-test)</b>					
Domain 1	18.63,p=0.0001,S	14.92,p=0.0001,S	12.19,p=0.0001,S		
Domain 2	14.11,p=0.0001,S	14.67,p=0.0001,S	6.91,p=0.0001,S		
Domain 3	5.90,p=0.0001,S	3.58,p=0.001,S	2.83,p=0.008,S		
Domain 4	1.27,p=0.21,NS	1.18,p=0.28,NS	0.63,p=0.53,NS		

The final assessment p value was significant in domains 1, 2, 3 and non-significant in domain 4 for Group 1. For Group 2, the final p value was only significant in domain 2 and non-significant in domains 1, 3 and 4. In paired t test, the Groups 1, 2 and control group 3 were compared between each other. The p value of initial and final Quality of Life scores of Groups 1 and Group 2 are significant in domain 1, 2, and 3 ( $p < 0.05$ ). Only the domain 4 showed no significant changes in both the groups, Group 1 and Group 2.

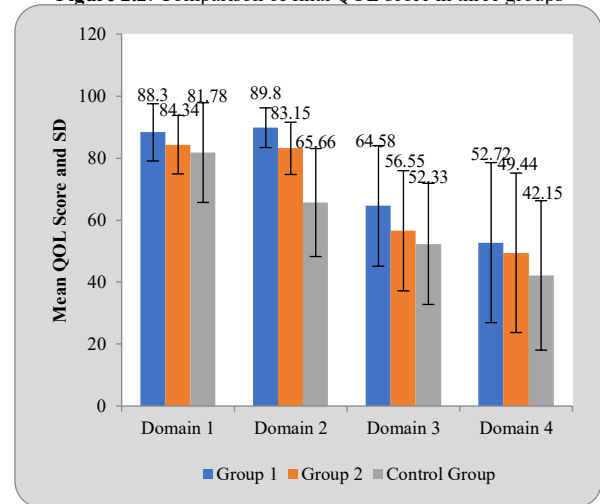
**Figure 1:** Comparison of initial and final VAS score in three groups



**Figure 2.1:** Comparison of initial QOL score in three groups



**Figure 2.2:** Comparison of final QOL score in three groups



Statistical analysis was done by using descriptive and inferential statistics using student's paired and unpaired t test and software used in the analysis was SPSS 27.0 version and  $p < 0.05$  is considered as level of significance.

## DISCUSSION

This study aimed at gaining insights of the various interventions used on low back ache and their effects on the pain and quality of life. The nursing population has most problems of sick leaves and poor health care of self and the patients due to low back ache. This study focuses on curtailing these medical issues [15] [16]. Exercise regimen was the prominent focus as a study explained its psychological, physiological and pathological effects and benefits [17]. Another study described the procedure, the results and the limitations faced while applying the ergonomic interventions in work settings [18] This study also analyzed these aspects. The age and gender distribution was not equal and it could bias the ultimate results and hence both paired and unpaired t tests were conducted [19]. After thorough analysis, the work station exercise routine showed the best results and the control group showed the least results. The ergonomic advices

worked well but could not set a benchmark in decreasing the pain and increasing efficacy.

When comparing initial and final pain via Visual Analog Scale in Group A, the mean difference was 4.64 in positive prospect. In Group B, the mean difference was also good, i.e. 3.61. Even though the initial score of control group was lower than groups A and B, the mean difference was only 2.91

Initial scorings of Quality of Life had mean scorings ranging from 39.96 to 49.96 inclusive of all the groups and their individual domains. The domain 2 of psychological and domain 3 of socio-economic aspects were severely affected. The domains 1 and 4 of physical and environmental aspects were also affected but not as severely.

In the final scoring of Quality of Life, the mean scorings ranged from 89.8 to 42.15 including the domains of all the three groups. The most recovery was seen in domain 1 and domain 2. Domain 3 showed mild recoveries and domain 4 had the lowest to least significant average of recovery in all of the domains.

Individually, Group 1 had the most significant recovery closer to the Group 2. The control group was seen showing 10 to 30% of increased changes when Group 1 was showing 7 to 47% and Group 2 were showing 5 to 38% of increased change.

The reason that the psychological, the socio-economic and the environmental domains did not show changes similar to the physical change could be the ongoing covid crisis in the health care department and the overburden on the nurses. The results of the groups would have been more improved if the study settings and participants would have not been under a pandemic induced medical emergency [20][21][22].

## CONCLUSION

This study concluded that both the workstation exercises and ergonomic training result in reduction of low back pain. Both these interventions can be implemented in the health care settings for the nursing population. Although workstation exercises proving more effective.

### Ethical approval and dissemination

Ethical Clearance was obtained from the Institutional Ethical Committee of Datta Meghe Institute of Medical Sciences.

### Patient consent

Principal Investigator obtained the informed consent from the subject and the employer on a printed form with signature and given the proof of confidentiality.

### Conflict of interest

The author declares no conflicting interest.

## REFERENCES

1. Purushe D, Phansopkar P, 2019. A Research Protocol - Musculoskeletal screening using pGALS in girls and boys aged between 5 and 12 years. *Journal of Critical Review*. 6(6), 4.

2. Sikiru L, Shmaila H, 2009. Prevalence and risk factors of low back pain among nurses in Africa: Nigerian and Ethiopian specialized hospitals survey study. *East African Journal of Public Health*. 6(1), Page 22-5.
3. Alexandre NMC, Moraes MAA de, CorrêaFilho HR, et al., 2001. Evaluation of a program to reduce back pain in nursing personnel. *Revista de Saúde Pública*. 35(4), Page 356-61.
4. Ribeiro T, Serranheira F, Loureiro H, 2017. Work related musculoskeletal disorders in primary health care nurses. *Applied Nursing Research*. 33, Page 72-7.
5. Maul I, Läubli T, Oliveri M, et al., 2005. Long-term effects of supervised physical training in secondary prevention of low back pain. *European Spine Journal*. 14(6), Page 599-611.
6. Mehrparvar AH, Heydari M, Mirmohammadi SJ, et al. 2014. Ergonomic intervention, workplace exercises and musculoskeletal complaints: a comparative study. *Medical Journal of Islam Republic Iran*. 28, Page 69.
7. Dhole R, Patil D, Kapoor A, 2021. Impact of Workstation Exercise and Ergonomic Exercise on Nursing Population—A Randomized Clinical Trial Research Protocol. *Indian Journal of Forensic Medicine & Toxicology*. 15(1).
8. Burns SA, Cleland JA, Rivett DA, et al., 2018. Effectiveness of physical therapy interventions for low back pain targeting the low back only or low back plus hips: a randomized controlled trial protocol. *Brazilian Journal of Physical Therapy*. 22(5), Page 424-430.
9. Kendall KD, Emery CA, Wiley JP, et al., 2015. The effect of the addition of hip strengthening exercises to a lumbopelvic exercise program for the treatment of non-specific low back pain: A randomized controlled trial. *Journal of Science and Medicine in Sport*. 18(6), Page 626-31.
10. Vrushali H Talmale, Rahul H Kasliwal, Yogesh N Gholve, 2021. Current Updates On Herbal Oil Vs Synthetic Antibiotics Use For Topical Application. *Journal of Medical Pharmaceutical and Allied Sciences*, 10(2), Page 2688- 2697.
11. Pope MH, Goh KL, Magnusson ML, 2002. Spine ergonomics. *Annual Review of Biomedical Engineering*. 4, Page 49-68.
12. Pope MH, Phillips RB, Haugh LD, et al., 1994. A prospective randomized three-week trial of spinal manipulation, transcutaneous muscle stimulation, massage and corset in the treatment of subacute low back pain. *Spine (Phila Pa 1976)*. 19(22), Page 2571-7.
13. Gholami A, Jahromi LM, Zarei E, et al., 2013. Application of WHOQOL-BREF in Measuring Quality of Life in Health-Care Staff. *International Journal of Preventive Medicine*. 4(7), Page 809-17.

14. Conagin, Armando, Barbin, et al., 2008. Modifications for the tukey test procedure and evaluation of the power and efficiency of multiple comparison procedures. *Scientia Agricola*. 65(4), Page 428-432.
15. H. Acquah, 2010. Comparison of Akaike information criterion (AIC) and Bayesian information criterion (BIC) in selection of an asymmetric price relationship. *Journal of Development and Agricultural Economics*. 2, Page 1-6.
16. Shariat A, Cleland JA, Danaee M, et al., 2018. Effects of stretching exercise training and ergonomic modifications on musculoskeletal discomforts of office workers: a randomized controlled trial. *Brazilian Journal of Physical Therapy*. 22(2), Page 144–53.
17. Maher CG, 2000. A systematic review of workplace interventions to prevent low back pain. *Australian Journal of Physiotherapy*. 46(4), Page 259–69.
18. Sahu A, Naqvi WM, 2020. Quarantine Exercises in the Time of Covid-19- A Review. *Journal of Evolution of Medical and Dental Science*. 9(26), Page 1922–7.
19. Whysall ZJ, Haslam RA, Haslam C, 2004. Processes, barriers, and outcomes described by ergonomics consultants in preventing work-related musculoskeletal disorders. *Applied Ergonomics*. 35(4), Page 343-51.
20. Raudenská J, Steinerová V, Javůrková A, et al., 2019. Occupational burnout syndrome and post-traumatic stress among healthcare professionals during the novel coronavirus disease 2019 (COVID-19) pandemic. *Best Practice and Research and Clinical Anaesthesiology*. 34(3), Page 553-560.
21. Athawale V, Phansopkar P, Darda P, et al., 2021. Impact of Physical Therapy on Pain and Function in a Patient with Scoliosis. *Cureus*. 13(5).
22. Bais A, Phansopkar P, 2021. Impact of Pilates Training versus Progressive Muscle Relaxation Technique on Quality of Life in Menopausal Women-A Comparative Study. *Indian Journal of Forensic Medicine & Toxicology*. 15(1).

**How to cite this article**

Renuka D, Deepali P, Pratik P, 2022. Efficacy of Workstation Exercise and Ergonomic Exercise on Nursing Staff – A Randomized Clinical Trial. *Journal of Medical Pharmaceutical and Allied Sciences*, V 11 - I 4, Pages: 5026 - 5030 Doi: 10.55522/jmpas.V11I4.1265.