



# **Effectiveness of Body Mechanics Training (BMT) on the Management of Low Back Pain, Functional Disability and Physical Fatigue among Women Working in Health Profession: A Study Protocol**

**Nutan Prakash Makasare<sup>a\*</sup> and Seema Singh<sup>b≡</sup>**

<sup>a</sup> *Department of Medical Surgical Nursing, College of Nursing, Government Medical College and Hospital, Nagpur, Maharashtra, India.*

<sup>b</sup> *Department of Medical Surgical Nursing, Shrimati Radhikabai Meghe Memorial College of Nursing, Wardha, Maharashtra, India.*

## **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

## **Article Information**

DOI: 10.9734/JPRI/2021/v33i54B33765

Editor(s):

(1) Dr. Ana Cláudia Coelho, University of Trás-os-Montes and Alto Douro, Portugal.

Reviewers:

(1) Amal Ali Mukhtad, University of Benghazi, Libya.

(2) Ayatallah Farouk Ahmad Hussein, Cairo University, Egypt.

Complete Peer review History, details of the editor(s), Reviewers and additional Reviewers are available here:

<https://www.sdiarticle5.com/review-history/76678>

**Received 02 October 2021**

**Accepted 06 December 2021**

**Published 11 December 2021**

**Study Protocol**

## **ABSTRACT**

**Background:** The most prevalent musculoskeletal problem among healthcare workers is low back pain (LBP). It's a type of pain between the costal margins and the inferior gluteal folds, and a painful restriction of movement frequently accompanies it. In high-risk health care professionals such as nurses, the prevalence of LBP is higher (64.07%). Clients with chronic LBP had a high level of functional impairment and weariness.

**Objectives:** 1.To evaluate the effectiveness of Body Mechanics Training (BMT) on managing low back pain, functional disability, and physical fatigue among women working in the health profession on the 7th day and at the first, third, and sixth-month interval. 2.To identify the inter-relationship between LBP, functional disability, and physical fatigue.

**Study Design:** It is a two-arm trial, interventional hospital-based Study.

<sup>≡</sup> Principal;

\*Corresponding author: E-mail: [nutanmakasare@gmail.com](mailto:nutanmakasare@gmail.com);

**Place and Duration of The Study:** This Study will be conducted in selected hospitals of Wardha district, Maharashtra, India. The duration of the Study will be six months.

**Methodology:** The participants will be 330 women in the nursing profession with nonspecific chronic LBP aged 21 to 50. With purposive sampling technique, participants will be allocated to 1 of 2 treatment groups: 1) Experimental Group will receive BMT including McKenzie and Yoga exercises, through a licensed physiotherapist and certified yoga trainer. 2) Control Group will receive written instructions regarding body mechanics in a booklet form and follow exercises at home. The experimental group will receive 24 sessions of 60 minutes (6 sessions per week over the first four weeks or a month) and then a supervised session once a week for the next five months. The outcome will be obtained during intervention on the 7th day and after completion at 1, 3, and 6 months. After therapy, the primary outcome will be pain intensity as determined by the Numeric Pain Rating Scale (NPRS). The secondary outcome, i.e. pain intensity, functional disability (measured with Modified Oswestry LBP Disability Questionnaire), and physical fatigue (measured with Chalder Fatigue Scale), will be measured after treatment.

**Expected Results:** LBP, functional disability, and physical fatigue will be reduced.

**Limitations:** Only Nursing personnel will be included in this Study.

**Conclusion:** This Study's results will contribute to developing BM Training Program for Nursing personnel to manage work-related nonspecific LBP.

*Keywords: Low Back Pain (LBP); functional disability; physical fatigue; body mechanics; mckenzie exercises; Yoga.*

## 1. INTRODUCTION

LBP is described as pain that lasts at least one day in the posterior portion of the body, from the lower margin of the twelfth ribs to the lower gluteal folds, with or without pain directed into one or both lower limbs [1]. The most common location of LBP is in the 4th and 5th lumbar segments. In terms of onset duration, it might be acute, sub acute, or chronic. LBP is the most prevalent reason for medical consultation, as it interferes with quality of life and work performance, and it affects people of all cultures in equal proportions. Furthermore, LBP is one of the most common musculoskeletal illness in both developed and developing countries [2]. LBP results from individual characteristics, lifestyle factors, psychological factors, working conditions such as heavy physical work, manual handling and lifting, and ward static and dynamic working postures. Epidemiological studies reveal that, in addition to the usual degenerative ageing process, poor ergonomic workplace conditions contribute to low back diseases. The load or pressure on the back increases, owing to poor ergonomic work factors in a healthy back or accelerates existing alterations in an already damaged back [3]. Using the most efficient and safest methods to lift and move heavy items or patients, refer to good Body Mechanics (BM). Strength is less significant than efficiency. It is critical to bend the knees while bending or lifting something, taking close attention to the position of the spine. Care must be taken to avoid poor

BM and maintain the neutral spine when lifting something to avoid injury. When viewed from the outside, the back seems straight, with a depression in the low back. Experience of exercising good BM will help reduce back and neck injuries and minimize these stresses. Good BM are not just for the worksite but should be used at all times [4]. Researchers who conducted Study in Egypt among 50 staff nurses concluded that BM and ergonomics training programs positively affected nurses' knowledge and practices regarding LBP, quality of nursing work life, and disability level after program implementation. Safe patient handling and mobility training programmes, as well as no-lift policies and nurse benefit programmes, should be developed by hospital administration. Staff Nurses should adhere to safety guidelines and no lift policy [5]. In a study conducted in Turkey, working postures were analyzed among nurses, physiotherapists, dentists, and dieticians; work-related musculoskeletal system diseases are commonly observed. In 70.09% of healthcare professionals, LBP was observed. 57.2% of individuals were working with a difficult posture, suffering from LBP. Individuals without LBP used difficult working postures in 40.63 % of cases. Dentists and nurses had a higher prevalence of LBP than the other groups (p 0.05) [6]. In a study conducted in Tunisia among 300 health workers, 41.6% thought their physical workload was heavy. According to the work ability index, 2/3 of healthcare professionals experienced severe LBP during the investigation period, with 54.4%

experiencing extremely severe LBP. Higher LBP prevalence among females was statistically correlated, i.e.  $p = 0.01$ , and impaired work capacity  $p < 10^{-3}$ . LBP is still a health issue for caretakers, with significant professional and social impacts. Workplace improvements and interdisciplinary management, including coordination between rehabilitation and occupational physicians, may lower the prevalence and effect of LBP [7].

A study conducted by Mrs. L. Shanthi in Madurai among 60 perimenopausal women revealed that the percentage of pretest scores on LBP disability in the control group was 55.1% and in the experimental group was 56.7%. The post-test score was 36.6% in the experimental group and 52.7% in the control group, which emphasizes video-assisted teaching of spinal exercises BM on LBP disability [8]. These factors can provide the direction for preparing strategies for preventing and controlling fatigue in CLBP patients. The Study conducted in Brazil by Marina de Góes Salvetti et al. investigated the incidence of fatigue and its associated variables in patients with chronic LBP. The data revealed that fatigue is a serious issue in CLBP patients. The prevalence of fatigue in CLBP patients was very similar to the prevalence of fatigue among nursing professionals (25.7%) and slightly higher (18% - 22%) than the prevalence in the general population [9].

McKenzie exercises are beneficial for patients and showed a significant reduction in pain and functional disability. The nucleus pulposus is kept anteriorly by maintaining lumbar lordosis and a full range of lumbar spine extension [10]. McKenzie and stability exercises reduced functional impairments better than standard exercise programs in people with persistent nonspecific LBP [11]. Chronic low back pain (CLBP) is entirely cured by using NSAIDs, epidural steroids injection, or surgical intervention in all patients. Nevertheless, the condition can be managed by adopting various alternative and complementary therapy modalities and providing a better quality of life for the patient. Yoga is one of the effective treatment therapies reported to help manage chronic LBP. CLBP can be treated in a number of ways, but no one treatment stands out as particularly effective. To treat musculoskeletal-related disease, Yoga was the most commonly used treatment therapy. Patients who suffer from chronic LBP without significant causes get some relief if they properly practice specific yoga posture [12]. Yoga

exercises are beneficial for patients and show a significant reduction in pain and functional disability [13]. McKenzie and stability exercises were found to be more effective than traditional exercise regimens in lowering functional impairment in patients with persistent nonspecific LBP in a systematic study [14]. McKenzie and yoga interventions both significantly improved pain and functional disability in patients with nonspecific chronic LBP, according to a study done by Sai Sanjay Shinde, Dr. Asmita C Moharkar, and Dr. Sucheta Golhar. However, when compared to each other, no statistically significant difference was observed post-intervention [15]. The researchers suggested that health care workers, particularly nurses, physiotherapists, and dentists, be required to participate in awareness, education, and training programmes on musculoskeletal disorders prevention and coping methods. A model of integrated health promotion for health care professionals in the workplace should be developed [16].

## 2. MATERIALS AND METHODS

**Study Design:** This will be a two-arm trial, interventional hospital-based Study.

**Study Setting:** The Study will be conducted in selected hospitals of Wardha district, Maharashtra, India.

**Participants:** The participants will be 330 women working in the Nursing profession (165 in Experimental & 165 in the Control group) with nonspecific chronic LBP.

**Sample Size Calculation:** The sample size is determined considering the difference in proportions of LBP in 2 groups as the primary outcome measure. Following assumptions are made from the Study of Sandul Yasobant and Paramasivan Rajkumar year 2014 [16].

### Assumptions:

1. Proportion of LBP in group I (control group) is 45.7%
2. Proportion of LBP in group II (BMT/experimental group) is 30 %
2. Effect Size = 15.7% (1/3 reduction)
3. Confidence Interval = 95% ( $\alpha = 5\%$ )
4. Power = 80%
5. Alpha error = 5%

SAMPLE SIZE required is  $n = 149/\text{group}$ . (150/group)

Assuming 10% loss to follow up in 6 months, the effective sample size will be n= 165/group  
Total 330 female health professionals will be included in this study

Sample size formula for testing difference in proportions of 2 groups:

$$n = \frac{\{Z_{1-\alpha}[\sqrt{2p(1-p)}] + Z_{1-\beta} [\sqrt{p_1(1-p_1) + p_2(1-p_2)}]\}^2}{(p_1-p_2)^2}$$

Where P<sub>1</sub> = Proportion in gp I = 45.7%  
P<sub>2</sub> = Proportion in gp II = 30%

$$P = \text{mean of proportion} = \frac{P_1 + P_2}{2} = \frac{45.7 + 30}{2} = 37.85$$

Z<sub>1-α</sub>=1.96 (Standardized score for α error)  
Z<sub>1-β</sub>= 0.84 (Standardized score for β error)

$$n = \frac{\{1.96 [\sqrt{2 \times 37.85 (1-37.85)}] + 0.84 [\sqrt{45.7 \times (1-45.7) + 30 (1-30)}]\}^2}{(45.7 - 30)^2}$$

n = 149

**Sampling procedure:** Purposive Sampling

**Inclusion criteria:**

- 1) Nonspecific chronic LBP with the intensity of at least one on the 0-10 Numerical Pain Rating Scale (NPRS).
- 2) Women with the age group of 21 to 50 years.
- 3) Has worked at her current job for at least 12 months.
- 4) Women who are willing to participate and present at the time of the Study.

**Exclusion criteria:**

- 1) Spinal disorder, former severe back injury due to fracture, surgery, or disc protrusion.
- 2) Severe other diseases or symptoms that limit participation in moderate-intensity exercises.
- 3) Engagement in neuromuscular type exercise more than once a week.
- 4) Pregnant or recently delivered (< 12 months).

**Interventions:**

**Data collection tools**

- 1) Demographic sheet

- 2) 11- point Numbered Pain Rating Scale (NPRS)
- 3) Modified Oswestry LBP Disability Questionnaire
- 4) Chalder fatigue scale

**Procedure**

**Section I:** The Study shall be conducted only after the approval of the IEC. Permission to conduct the Study shall be taken from relevant stakeholders. Written informed consent shall be taken from the participants. Women who fulfill inclusion criteria shall then be assigned to the experimental and control group. The baseline parameters of each participant shall be assessed i.e., Sociodemographic variables, pain intensity with 11- point pain numbered rating scale, functional disability with Modified Oswestry LBP Disability Questionnaire, and physical fatigue with Chalder Fatigue Scale. Information & Discussion on LBP, the meaning of BM and its purposes, McKenzie exercises, and Yoga techniques.

**Section II:** The participants from the experimental group shall then be given Training (videos and live demonstration) regarding BM, McKenzie exercises, and Yoga through a licensed physiotherapist and certified Yoga trainer. The experimental group will receive 24 sessions of 60 minutes (6 sessions per week over the first four weeks or a month). Then the

supervised session will be conducted once a week for the next five months. Control Group will receive written instructions regarding BM in a booklet form and follow exercises at home. A daily diary will be maintained to monitor participants' adherence to exercise at home. Follow-up will be done at regular intervals. Whatsapp messages will be sent to the group regularly for motivation.

**Body Mechanics:** Demonstration regarding how to maintain the neutral spine by following the BM during standing, sitting, bending, lying, lifting, and exercising, etc.

**McKenzie exercises:** Demonstration of static back, static abdominals, active prone extension, hamstring stretching, dorsolumbar stretching, rectus femoris stretching, SLR, standing back extension, oblique abdominals, supine crunches, and oblique back extension.

**Yoga techniques:** Supine position exercises (Upper and lower extremities), Shavasana, Knee exercises, Tadagasana, Breathing exercises: Omkar and Bhramary.

Each participant will be instructed to carry out demonstration of all exercises. All their queries regarding the BMT shall be cleared during one-to-one interaction. The participants in the experimental group will be provided with Whatsapp messages, images, information videos regarding LBP, BM, McKenzie exercises, and Yoga. Whatsapp messages will be regularly sent to the experimental group to motivate them to do the above exercises twice a day at home.

**Section III:** Practice sessions for four weeks followed by repeat supervised sessions once a week for five months. Participants will be instructed to carry out all exercises twice a day and maintain BM at work and home. All participants shall then be reinvestigated for the given parameters, i.e. LBP, functional disability, and physical fatigue on 7th day, at the end of 1 month, three months, and six months on an individual basis. Online supervised sessions also will be conducted.

#### **Outcome Measures:**

1. Primary outcome: Effectiveness of BMT on managing LBP, functional disability, and physical fatigue among women working in the health profession.

2. Secondary outcome: Inter-relationship between LBP, functional disability, and physical fatigue.

**Statistical Analysis:** Descriptive (Mean, mean percentage, Standard deviation), Inferential, Comparative Statistics (Student's t-test), and co-relational statistics are planned for data analysis.

### **3. RESULTS**

1. Reduction in LBP, Functional Disability, and Physical fatigue.
2. Positive or negative correlation between LBP, Functional Disability, and Physical fatigue before and after the intervention.

### **4. DISCUSSION**

A descriptive cross-sectional study will support the present study finding. 285 (74.2 %) of 384 staff nurses had LBP, with 162 (42.2 %) experiencing pain in the lumbar region. The outcomes of the study revealed that LBP was related to age, BMI, exercise pattern, qualification, number of children, type of birth, number of lifts, stressful work environment, overall standing time, area of posting, and nurse-patient ratio. With a mean score of 15.02, approximately half of the study participants had good knowledge of BM. Even though nurses had a strong understanding of BM, the authors found that they rarely applied it. LBP can be reduced if appropriate measures are made early on. As a result, nurses' quality of life can be improved [17].

The conclusions of this study will be reinforced by another study in which authors determined that most nurses do not employ BM when turning, moving, lifting, and transferring patients, and 88% of them reported lumbar pain. Low back discomfort is mostly caused by exposure to a variety of risk factors, including a lack of awareness about proper BM and obesity. Educational programmes for nurses on BM when handling and lifting patients are critical in reducing LBP exposure [18]. The results of one systematic review indicated that both McKenzie and stabilization exercises effectively reduce pain and functional disability scores among individuals suffering from chronic nonspecific LBP [11], which will support the present Study.

The current study's findings will also be validated by an RCT, the investigators found a significant difference in pain and general health between

the control and experimental groups. The pre- and post-test results showed that the exercise training (both Pilates and McKenzie) reduced pain and improved overall health, whereas in the control group, pain rose and general health deteriorated [19]. In their RCT, Bali Y, Ebnezar J, and John R concluded that an adjunctive program of the Integrated Approach to Yoga Therapy (IAYT) for CLBP improves spine flexibility and reduces pain and disability, and offers better relief [20]. These findings will support the present Study.

## 5. CONCLUSION

After the completion of data collection, the conclusion will be drawn from the statistical analysis. The researcher expects participants who intervened with BM Training to benefit more than those who intervened with written instructions. The findings of this study will help to improve the management of LBP.

## CONSENT AND ETHICAL APPROVAL

The Institutional Ethics Committee approved the present Study of DMIMS, Wardha (DMIMS (DU)/IEC/2018-19/7750 dated 31.12.18). written consent will be taken from the participant for participation in the study. Nurses will be instructed that their participation in this study is entirely voluntary, and they may opt out at any moment. Throughout the Study, confidentiality will be maintained. The study's findings will be disseminated to participants and published in a peer-reviewed journal.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Hoy D, March L, Brooks P, Blyth F, Woolf A, Bain C, Williams G, Smith E, Vos T, Barendregt J, Murray C, Burstein R, Buchbinder R. The global burden of low back pain: Estimates from the Global Burden of Disease 2010 study. *Ann Rheum Dis.* 2014;73:968–974.
2. Gautam GJ1, Gurung L2, Shrestha N3, Shrestha PS4, Neupane S5 ; Prevalence And Contributing Factors Of Low Back Pain Among Nurses In Tertiary Level Hospital; *J-GMC-N*;Volume12; Issue 02; July-December 2019;46-52.
3. Karahan A, Kav S, Abbasoglu A, DoganN. Low back pain: Prevalence and associated risk factors among hospital staff; *Journal of Advanced Nursing.* 2008 Oct;65(3):516-524.
4. Jafar N, Ahmad Nizal Mohd Gazali, Knowledge and Practice of Body Mechanics Techniques Among Nurses in Hospital Kluang, Johor, Malaysia; Thesis for: Nursing; June 2013. Available:<https://www.researchgate.net/publication/236982573>
5. ZiziFikry Mohamed Abd El-Rasol , Reem Mabrouk Abd El Rahman; Effect Of Implementing Body Mechanics And Ergonomics Training Program On Nurses' Low Back Pain And Quality Of Nursing Work Life; *IOSR Journal of Nursing and Health Science (IOSR-JNHS)* e- ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 7, Issue 3 Ver. X (May-June .2018), PP 20-35 Available:[www.iosrjournals.org/iosr-jnhs/papers/vol7-issue3/Version-10/C0703102035.pdf](http://www.iosrjournals.org/iosr-jnhs/papers/vol7-issue3/Version-10/C0703102035.pdf)
6. Cinar-Medeni, Ozge, ElbasanBulent, DuzgunIrem; Low back pain prevalence in healthcare professionals and identification of factors affecting low back pain; *Journal of Back and Musculoskeletal Rehabilitation.* 2017 ;30(3):451-459, Available:<https://www.ncbi.nlm.nih.gov/pubmed/27858698>
7. S. Kamoun Dr et al; Low back pain in healthcare: Study among 300 health care workers of two University Hospitals in the center of Tunisia; *Annals of Physical and Rehabilitation Medicine.* 2015;Volume 58, Supplement 1:e90. Available:<https://www.sciencedirect.com/science/article/pii/S1877065715003036>
8. Mrs. L. Shanthi, To assess the effectiveness of video assisted teaching of spinal exercises and body mechanics on low back pain disability among perimenopausal women at selected urban areas in Madurai; 2012; Dr. M.G.R. Medical University, Chennai-32, Unpubilshed Masters' Dissertation; <http://repository-tnmgrmu.ac.in/4344/1/3004275shanthil.pdf>
9. Marina de Góes Salvetti Cibele Andrucio de Mattos Pimenta, Patrícia Emília Braga, Michael McGillion; Prevalence of fatigue and associated factors in chronic low back pain patients; *Rev. Latino-Am.*

- Enfermagem. 2013 Jan-Feb;21(Spec):12-9;  
Available:<https://www.ncbi.nlm.nih.gov/pubmed/23459886>
10. David Joseph Ponte, Gail J Jensen, Barbara E Kent. MASPT A Preliminary Report on the Use of the McKenzie Protocol versus Williams Protocol in the Treatment of Low Back Pain; Journal of Orthopaedic & Sports Physical Therapy. 1984, Volume6 Issue2 Pages130-139.  
Available:<https://pubmed.ncbi.nlm.nih.gov/18806375/>
  11. Anas Mohammed Alhakami, Sally Davis, Mohammed Qasheesh, Abu Shaphe, and Aksh Chahal; Effects of McKenzie and stabilization exercises in reducing pain intensity and functional disability in individuals with nonspecific chronic low back pain: A systematic review; Journal of Physical Therapy Science;.2019 Jul;31(7):590–597.  
Available:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6642883/>
  12. Hari Khanal, Jyoti Koirala; Usefulness of Yoga Posture in the Management of Chronic Low Back Pain; Journal of Natural and Ayurvedic Medicine. 2020;4(4).  
Available:<https://medwinpublishers.com/JONAM/>
  13. Sherman KJ, Cherkin DC, Erro J, Miglioretti DL, Deyo RA. Comparing Yoga, exercise, and a self-care book for chronic low back pain: A randomized, controlled trial. Ann Intern Med. 2005; 143(12):849.
  14. Anas Mohammed Alhakami et al; Effects of McKenzie and stabilization exercises in reducing pain intensity and functional disability in individuals with nonspecific chronic low back pain: A systematic review; July Journal of Physical Therapy Science. 2019;31(7):590-597.  
Available:<https://www.researchgate.net/publication/334314189>
  15. Sai Sanjay Shinde, Dr. Asmita C Moharkar and Dr. Sucheta Golhar; Effectiveness of mckenzie and yoga on chronic non specific low back pain and functional disability: A comparative study; International Journal of Applied Research. 2020;6(4):263-268.  
Available:<https://www.allresearchjournal.com/archives/2020/vol6issue4/PartD/6-4-30-910.pdf>
  16. Sandul Yasobant and Paramasivan Rajkumar; Work-related musculoskeletal disorders among health care professionals: A cross-sectional assessment of risk factors in a tertiary hospital,India; Indian Journal of Occupational and Environmental Medicine. 2014 May-Aug; 18(2):75–81.  
Available:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4280781/>
  17. Sandhya RV, Kumari MJ, Gopisankar, Angeline Mary Sheela. Prevalence of low back pain and knowledge on body mechanics among the staff nurses in a tertiary care hospital. Int. J. of Adv. Res. 2015;3(Sep)928-934] (ISSN 2320-5407)
  18. Yossria EL-Sayed Hossein,Hend Elham Mohammed,Amal Mohammed; Relation between body mechanics performance and nurses' exposure of work place risk factors on the low back pain prevalence; November. Journal of Nursing Education and Practice. 2018;9(3):25.  
Available:<https://www.researchgate.net/publication/328889543>
  19. Ali Hasanpour-Dehkordi, Arman Dehghani and Kamal Solati; A Comparison of the Effects of Pilates and McKenzie Training on Pain and General Health in Men with Chronic Low Back Pain: A Randomized Trial; Indian J Palliat Care. 2017 Jan-Mar; 23(1): 36–40.  
Available:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5294435/>
  20. Bali Y, Ebnezar J, John R. Role of Yoga Therapy In Chronic Low Back Ache - A Randomized Control Trial, Ann Yoga Phys Ther. 2016;1(2):1008.

© 2021 Makasare and Singh; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:  
<https://www.sdiarticle5.com/review-history/76678>