

## Study Protocol

# 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

### ABSTRACT

**Background:** Low Back Pain (LBP) is the most frequent musculoskeletal disorder in hospital employee. It is the pain between the costal margins and inferior gluteal folds and usually accompanied by painful limitation of movement. Prevalence of low back pain is higher (64.07%) in high risk health care professionals like Nurses. Functional disability and fatigue was prevalent in chronic low back pain clients.

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

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

**Place and Duration of The Study:** This study will be conducted in selected hospitals of Wardha district, Maharashtra, India. Duration of Study will be 6 months.

**Methodology:** The participants will be 330 women in nursing profession with non-specific chronic low back pain of age group 21 to 50. With purposive sampling technique, participants will be allocated to 1 of 2 treatment groups:1) Experimental Group will receive training of Body mechanics including McKenzie and Yoga exercises through licensed physiotherapist and certified yoga trainer. 2) Control Group will receive written instructions regarding body mechanics in the form of booklet and instructed to follow exercises at home. The experimental group will receive 24 sessions of 60 minutes (6 sessions per week over first 4 weeks or a month) and then supervised session once in the week for next 5 months. The outcomes will be obtained during intervention on 7th day and after completion of intervention at 1, 3 and 6 months. The primary outcome will be pain intensity that will be measured with the Numeric Pain Rating Scale (NPRS) at the completion of treatment. The secondary outcome i.e. pain intensity; functional disability (measured with Modified Oswestry Low Back Pain Disability Questionnaire) and physical fatigue (measured with Chalder Fatigue Scale) will be measured at the completion of treatment.

**Expected Results:** Reduction in Low back Pain, Functional disability and Physical fatigue.

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

**Conclusion:** The results of this study will contribute to develop Body Mechanics Training Program for Nursing personnel to manage work related nonspecific LBP.

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**KEY WORDS:** *Low back pain, Functional disability, Physical fatigue, Body Mechanics, McKenzie exercises, Yoga.*

### 1. INTRODUCTION

As per Global Burden of Disease studies, Low Back Pain (LBP) refers to the pain in the area on the posterior aspect of the body from the lower margin of the twelfth ribs to the lower gluteal folds with or

without pain referred into one or both lower limbs that lasts for at least one day [1]. The 4th and 5th lumbar segment is the most frequent site of low back pain. It can be either acute, sub acute or chronic in onset duration. LBP is the most common reason for medical consultation which interferes with quality of life and work performance, and occurs in similar proportions in all cultures. Moreover, low back pain is said to be among the leading musculoskeletal disorders that predominantly affect the working population in developed as well as in developing countries [2]. LBP results from many factors including individual characteristics, lifestyle factors and psychological factors, working conditions such as heavy physical work, manual handling and lifting and ward static and dynamic working postures. Epidemiological studies reveal that along with the normal degenerative aging process, poor ergonomic factors in the workplace contribute to low back disorders in a healthy back or accelerate existing changes in an already damaged back. The load or strain on the back increases due to poor ergonomic work factors. In almost all, majority of health care professionals are at the risk of musculoskeletal system disorders. 18.7% of the Health Care Workers (HCW's) with chronic LBP were using analgesic and or pain relief drugs as LBP is considered one of the most important causes of morbidity that affects their work. In a study conducted at Sweden authors revealed that health care workers showed a higher prevalence (77%) of low back pain as compared to other occupational groups. Similarly, in Taiwan, a study showed that 72% of HCWs had LBP. Cross sectional study done by Emmanuel et. al. in Christian Medical College, Vellore, India, found 53.4% prevalence of LBP among 1284 Nurses [3].

Using the most efficient and safest methods to lift and move heavy items or patients refer good body mechanics. Efficiency is more important than strength. While bending or lifting something it is important to bend the knees, with attention to the position of spine. Care must be taken to avoid poor body mechanics, maintain the neutral spine at the moment of lifting something, to avoid injury. The three normal curves-at the neck, middle and lower back-are maintained in neutral spine. The back looks straight with a hollow in the low back, when viewed from the outside. Day to day activities can place much stress on the spine. Knowledge of practicing good body mechanics will help to decrease the incidence of back and neck injuries and minimize these stresses. Good body mechanics are not just for the work site but should be used at all times [4]. Researchers who conducted Study in Egypt among 50 staff nurses concluded that body mechanics and ergonomics training program had positive effect on nurses' knowledge and practices, in terms of low back pain, quality of nursing work life and disability level after program implementation. Hospital administrators should develop policies for safe patient's transfer and handling (no lift policy); as well as nurse benefit programs and safe patient handling and mobility training programs. Staff Nurses should adhere to safety guidelines and no lift policy [5]. 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% individuals were working with a risky posture, suffering from LBP. 40.63% of individuals without LBP were using risky working postures. LBP prevalence of dentists and nurses were higher compared to other groups ( $p < 0.05$ ) [6]. A study conducted in Tunisia among 300 health workers, perceived physical workload was considered heavy by 41.6%. As per the work ability index, during 12 months of investigation, 2/3 of healthcare workers complained of severe LBP and in 54.4% of cases LBP was extremely severe. Among females, Higher low back pain prevalence was statistically correlated i.e.  $p = 0.01$  and impaired work capacity  $p < 10^{-3}$ . Among caregivers, LBP is still a health problem with heavy professional and social impact. Improvement of working conditions, multidisciplinary management including collaboration between rehabilitation and occupational physician, may ensure the reduction of the prevalence and the impact of LBP [7].

Study conducted by Mrs. L. Shanthi in Madurai among 60 perimenopausal women revealed that percentage of pretest score on low back pain disability in control group was 55.1% and in experimental group was 56.7% and post test score was 36.6% in experimental group and 52.7% in control group which emphasizes the effectiveness of video assisted teaching of spinal exercises body mechanics on LBP disability [8]. In chronic low back pain patients, fatigue was prevalent and associated with depression and self-efficacy. These factors can provide the direction for preparing strategies for prevention and control of fatigue in CLBP patients. In the study conducted in Brazil by Marina de Góes Salvetti et al, explored the prevalence of fatigue and its associated factors among chronic LBP patients. The findings revealed that fatigue is a significant problem CLBP patients. The prevalence of fatigue 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 exercise are beneficial for patients and showed significant reduction in pain and functional disability. It emphasises the maintenance of the lumbar lordosis and a full range of lumbar spine

extension to keep nucleus pulposus anteriorly [10]. Both McKenzie and stabilization exercises was better than conventional exercise programs in reducing functional disability in patients with chronic nonspecific low back pain [11]. Chronic low back pain (CLBP) is a disease which cannot be cured completely by using NSAIDs, epidural steroids injection or through surgical intervention in all the patients. Nevertheless, the condition can be managed by adopting various modalities of alternative and complementary therapy and provide better quality of life for the patient. Yoga is one of the effective treatment therapies which have been reported to be useful in the management of chronic low back pain. There are various treatment options for CLBP, but no single therapy stands out as being the most effective. To treat musculoskeletal related disease, yoga was the most commonly used treatment therapy. Patients who suffered from chronic low back pain without major causes definitely got some relief if he or she practices specific yoga posture in a proper way [12]. Yoga exercise are beneficial for patients and showed significant reduction in pain and functional disability. The practice of Yoga places as much emphasize on mental focus as on physical movement and consider the breath which links the mind and body [13]. In a systematic review authors concluded that in reducing functional disability in patients with chronic nonspecific low back pain, both McKenzie and stabilization exercises was better than conventional exercises programmes [14]. In a study conducted by Sai Sanjay Shinde, Dr. Asmita C Moharkar and Dr. Sucheta Golhar, concluded that both McKenzie and yoga intervention showed significant effect on improvement of pain and functional disability with patients having nonspecific chronic low back pain. But when compared with each other no significant difference was seen post intervention statistically [15]. The researchers recommended that awareness, education, and training programs on prevention and coping strategies for musculoskeletal disorders be made mandatory for health care professionals especially for the high-risk groups such as nurses, physiotherapists and dentists. An integrated health promotion model should be planned for health care professionals in workplace [16].

## 2. MATERIAL 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 Nursing profession (165 in Experimental & 165 in Control group) with nonspecific chronic low back pain.

### Sample Size Calculation:

Sample size is determined considering difference in proportions of low back pain in 2 groups as the main outcome measure. Following assumptions are made from the study of Sandul Yasobant and Paramasivan rajkumar year 2014 <sup>16</sup>

#### Assumptions:

1. Proportion of low back pain in group I (control group) is 45.7%
2. Proportion of low back pain 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  $n = 165/\text{group}$

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  $P_1 =$  Proportion in gp I = 45.7%

$P_2 =$  Proportion in gp II = 30%

$$P = \text{mean of proportion} = \frac{P_1 + P_2}{2} = \frac{75.7}{2} = 37.85$$

$Z_{1-\alpha} = 1.96$  (Standardized score for  $\alpha$  error)

$Z_{1-\beta} = 0.84$  (Standardized score for  $\beta$  error)

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

$$(45.7 - 30)^2$$

n =149

**Sampling procedure:** Purposive Sampling

**Inclusion criteria:**

- 1) Nonspecific chronic low back pain with intensity of at least 1 on 0-10 Numerical Pain Rating Scale (NPRS).
- 2) Women with 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 study.

**Exclusion criteria:**

- 1) Spinal disorder, serious former back injury due to fracture, surgery or disc protrusion.
- 2) Other serious disease 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 Low Back Pain 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. A written informed consent shall be taken from the participants. Women who fulfill inclusion criteria shall then be assigned to 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 Low Back Pain Disability Questionnaire and physical fatigue with Chalder Fatigue Scale. Information & Discussion on Low back pain, meaning of Body mechanics and its purposes, McKenzie exercises and Yoga techniques.

**Section II:** The participants from experimental group shall then be given training (videos and live demonstration) regarding body mechanics, McKenzie exercises and yoga through licensed physiotherapist and certified Yoga trainer. The experimental group will receive 24 sessions of 60 minutes (6 sessions per week over first 4 weeks or a month). Then supervised session will be conducted once in the week for next 5 months. Control Group will receive written instructions regarding body mechanics in the form of booklet and instructed to follow exercises at home. Adherence to exercise will be monitored by daily diary that participants will maintained at home. Follow up will be done at regular interval. Whatsapp messages will be sent to the group regularly for motivation.

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

**McKenzie exercises:** Demonstration of static back, static abdominals, active prone extension, hamstring stretching, dorso lubar 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 redemonstration of all exercises. All their queries regarding the BMT shall be cleared during one to one interaction. The participants in experimental group will be provided with Whatsapp messages, images, information videos regarding low back pain, body mechanics, McKenzie exercises and yoga. Whatsapp messages will be sent to the experimental group regularly to motivate them to do above exercises twice a day at home.

**Section III:** Practice sessions for 4 weeks followed by repeat supervised sessions once in the week for next 5 months. Participants will be instructed to carry out all exercises twice a day and maintain body mechanics at working place and while at home. All participants shall then be reinvestigated for the given

parameters i.e. low back pain, functional disability and physical fatigue at 7th day, and at the end of 1 month, 3 months and 6 months on individual basis. Online supervised sessions also will be conducted .

#### **Outcome Measures:**

1. Primary outcome: Effectiveness of Body Mechanics Training (BMT) on the management of low back pain, functional disability and physical fatigue among women working in health profession.
2. Secondary outcome: Inter-relationship between low back pain, functional disability and physical fatigue.

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

### **3. RESULTS**

1. Reduction in Low back Pain, Functional disability and Physical fatigue.
2. Positive or negative correlation between Low back Pain, Functional disability and Physical fatigue before and after intervention.

### **4. DISCUSSION**

Present study finding will be supported by a descriptive cross sectional study in which among 384 staff nurses 285 (74.2%) nurses had low back pain among which 162 (42.2%), experienced pain on lumbar region. The study findings showed that low back pain was associated with age, BMI, exercise pattern, qualification, number of children, type of delivery, number of lift, stressful work environment, over all standing time, area of posting and nurse patient ratio. Regarding body mechanics, about 50% of the study participants had good knowledge with a mean score of 15.02. Authors concluded that even though nurses had good knowledge on body mechanics they rarely follow it. Appropriate interventions at initial stages can reduce the incidence of low back pain. Hence can improve the quality of life of nurses [17].

Findings of this study will be supported with another study where authors concluded that the majority of nurses don't use body mechanics when turning, moving, lifting, and transferring the patients and 88% of them had pain in lumber region. The low back pain is mainly related to the exposure of many risk factors such as lack of knowledge regarding practicing good body mechanics and obesity. Educational programs among nurses about body mechanics when handling and lifting the patient have important role in decrease exposure to LBP [18]. The results of one systematic review indicated that both McKenzie and stabilization exercises are effective in reducing pain and functional disability scores among individuals suffering from chronic non-specific low back pain [19], which will support the present study.

Present study findings will also supported by RCT, where authors observed significant difference in pain and general health between the control and the two experimental groups at the pre- and post-test, so that the exercise training (both Pilates and McKenzie) resulted in reduced pain and promoted general health; while in the control group, pain increased and general health declined [20]. Bali Y, Ebnezar J and John R in their RCT concluded that an adjunctive programme of the Integrated Approach to Yoga Therapy (IAYT) for CLBP improves spine flexibility and reduces pain and disability and offers better relief [21]. These findings will support the present study.

### **5. CONCLUSION**

After completion of data collection, conclusion will be drawn from the statistical analysis. Researcher expect that participants intervened with Body mechanics Training will benefit more than the participants intervened with written instructions. The results of this study will contribute to the better management of low back pain.

#### **CONSENT AND ETHICAL APPROVAL**

The present study was approved by the Institutional Ethics Committee of DMIMS, Wardha (DMIMS (DU)/IEC/2018-19/7750 dated 31.12.18). All participants of this study will be asked to read and sign the written informed consent form. Result of the study will disseminate to the participants and will published in peer reviewed journal.

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