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Effect of hemibridge exercise with and balloon on pain, disability and pefr in obese individuals with non-specific low back pain

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Abstract
Background and Purpose: low back pain is most prevalent cause if disability and obesity is related to poor physical functioning and limitation in daily living.
The purpose of study was to investigate the effect of hemibridge exercise with ball and balloon on pain, disability and PEFR in obese individuals with nonspecific low back pa
Methods: A total of 24 participants with nonspecific low back pain were recruited. BMI was calculated graded according to Asian Indian classification of BMI, low back pain on Numerical Pain Rating Scale (NPRS), Modified oswestry disability Questionnaire (MODQ) for disability due to low back pain, and Peak Flow Meter to check Peak expiratory flow rate and reassessed after 3 days.
Result: A statistical analysis was done Average values for various parameters were calculated. Data was tested for normality using shapiro wilk test. Level of significance was at 5% (i.e. $p<0.05$).
The Pre and Post values of Pain by NPRS were assed pre value 6.166, post value 4.291, Disability due to low back pain by MODQ pre value 34%, post value 31% and Forced expiratory flow rate by Peak flow meter pre value 303.33, post value 327.08.
Conclusion: The study concluded that there is decisive effect of hemibridge exercise with ball and balloon on Nonspecific low back pain in obese individuals.

Keywords: nonspecific low back pain, hemibridge exercise, zone of apposition, nociceptive factors

Introduction

Nonspecific low back pain is defined as symptoms of unknown cause (a symptom which is pathologically unidentified). However, there are many causes of pain identified or affects the development of low back pain subsequent causes. 84% is lifetime prevalence of low back pain and 23% of best prevalence in chronic low back pain of which 11-12% of population is disabled. Nociceptive factors play a major role in acute pain conditions. Various structures along with spine could contribute to origin of pain, but only clinical interpretation of abnormalities is not possible on anatomical data [1].

The annual prevalence of LBP is stated to be 15% to 45% with a point prevalence of approximately 30%. India has reported 23.09% incidences of low back pain. Low back pain poses an important problem in clinics and public health. It presents one of the significant problems with adults, since 70-80% of adults experienced it at least once in their lifetime.

Many Findings from a meta-analysis that included cross-sectional and longitudinal studies show that people who are overweight or obese have an increased risk of low back pain, with the strongest Cohort studies shows, there was increase in incidences of low back pain for a day or more in the previous 12 months is associated only with obesity. Low back pain is most prevalent cause of disability and obesity is related to poor physical functioning and limitation in daily life.

Researchers suggest that disuse and physical deconditioning are directly related with chronic low back pain, in either a causal or consequential manner, is scarce. There is detectable increase in prevalence between 1980 and 1994 confirms that population-wide increase in overweight and obesity may occur over a short period of time. The most recent data from the United States, derived from the third National Health and Nutrition Examination Survey (1988-94), shows ~20% of US men and ~25% of US women are obese [4].

Generalized primary prevention does not seem to be a realistic aim in low back pain because the symptom is highly prevalent, with the strongest risk factor for future low back pain which was previous low back pain and highly affected teenagers having already had low back pain Moreover, studies have not been able to identify many significant and altered risk factors for true first time low back pain. This situation is not startle, since the cause of the problem remains unclear in most patients.

Obesity is a disease in which excess body fat accumulate that may adversely affect. Conservative estimates of the economic costs of obesity in developed countries are between 2 and 7% of the total health costs, which represents a significant expenditure of national health-care budget. Increase in body fat is considered pathophysiology of predictable health consequences of obesity. Obesity is correlated with various diseases and conditions, particularly cardiovascular diseases and conditions, musculoskeletal conditions. High BMI is marker of risk, but no proven for direct cause. Obese individuals with excess fat in intra-

abdominal depots are at particular risk of negative health consequences, with certain ethnic populations carrying different levels of risk [2].

BMI is common index used to calculate height and weight ratio to classify obesity in individuals. BMI is defined as weight divided by height meter square. Use for both male and female.

Altered mechanical muscular activity due to adiposity, altered airway caliber and increases respiratory resistance may be responsible for the reduced lung functioning and lower PEFR in obese individuals. During sleep respiratory functions are more affected in obese individuals. In obese individual's normal respiratory biomechanics is altered. Excess body fat lines on chest and occupies the abdominal limits the action of respiratory muscles these structure changes in the thoracic -abdominal area restricts the diaphragmatic mobility and ribs movement, which promotes changes in dynamics of the respiratory system and reduce its compliance, leading to mechanical impairment of respiratory muscle [3].

Primarily affecting PEFR is the strength of expiratory muscles that generates force of contraction, elastic recoiling pressure of lungs and airway pressure. In obese women these factors are compromise because of fat deposition and hyper responsiveness of airway. Obesity was linked with wide range of respiratory conditions like chronic obstructive pulmonary disease (COPD), obstructive sleep apnea (OSA) and asthma. Obese women without any respiratory illness, has increase in risk of dyspnea during exercise or during any physical activity. This happens due to rise in oxygen cost of breathing as the total energy needed by the respiratory muscles to overcome respiratory mechanical factors, such as airway resistance, fat deposition increases lung compliance and chest wall resistance. Dyspnea can cause slight oxygen cost of breathing increase and increase ventilation from resting levels. In women with sedentary lifestyle may lead to early or easy fatigability.

An increased amount of fat in the chest wall and abdomen has an expected effect on the mechanical properties of the chest and the diaphragm and leads to difference in respiratory excursions during inspiration and expiration, decreases lung volume and changes the pattern of ventilation to each region. In addition, there is decrease in lung compliance due to increase in fat mass. There is exaggeration in changes when on obese person lies flat. With increase in fat deposition, static lung volumes- expiratory reserve volume (ERV), functional residual capacity (FRC) and total lung capacity (TLC) reduces. Rise in intra-abdominal pressure due to fat deposition is transfer to the chest which significantly reduces the FRC and ERV. Reductions in ERV and FRC may lead to abnormalities in ventilation distribution, with closure of airway in dependent zone. This can lead to mismatch of ventilation perfusion ratio. Thus, requires obese individual to breathe in a less efficient part of their pressure-volume curve, which in turn rises the effort of breathing. Consequently, change in mechanical muscular activity due to adiposity, alteration in airway caliber and raised respiratory resistance may be responsible for the decrease in lung functioning and reduced PEFR in obese individuals.

Findings from systematic reviews of trials into the prevention of low back pain show that only exercise interventions and other interventions-such as modalities, stress management, shoe inserts or insoles, back supports, ergonomics or back education, and reduced lifting programmes seem to be effective. Hemi bridge exercise with ball and balloon also practiced to promote optimal posture by correcting the lumbar spine position so that joint and muscle can work effectively and efficient manner and reduces low back pain [5].

Methodology

The data was collected in and around Pune targeted population were obese individuals with nonspecific low back pain. Convenience sampling method was used. The subject included Patients with age group of 20 to 45 year. Both males and females with BMI> 25 kg/m2.Non-specific LBP with Twelve weeks from the first onset of pain (chronic pain). Excluded subject Central nervous system dysfunction (hemiparesis, myelopathy, cerebellar ataxia) LBP due to any other pathology (Lumbar radiculopathy, lumbar canal stenosis, etc.) Amputation of lower limb, angina, and other cardiac conditions. Subjects suffering from cardiac and pulmonary diseases with chest or spinal deformities. Alcoholics, smokers and tobacco consumers. Pregnant women.

Outcome measures

Numerical pain rating scale is segmental numeric version of visual analog scale (VAS) in which a whole number is selected (0-10) that reflects the pain. The common format is horizontal bar or line. The 11-point scale ranges from o representing no pain to 10 representing extreme pain

Modified Oswestry Disability Questionnaire (MODQ) gives a subjective percentage score of level of function (disability) in 10 daily activities of daily living scored from 0-5. 0% -20% is minimal pain 81% -100% is extreme pain.

Peak Flow Meter PEFR was measured by using Cipla peak flow meter. Subjects were taught to blow fast and hard through the disposable mouth piece by making tight seal around it. Subject were asked to take a deep breath, and breathed out as hard and fast can with the nose clip on. Position of the head in a neutral position.

Procedure

Ethical clearance was obtained from the institutional ethical committee; the purpose of the study was explained. All subjects were screened for inclusion and exclusion criteria before recruitment in study. A written informed consent was obtained from the study subjects. After finding the suitability as per the inclusion criteria, they were requested to participate in the study and 3 days intervention was given. A total of 24 patients were recruited in the study and were given hemibridge exercise with ball and balloon which was demonstrated before.

Intervention

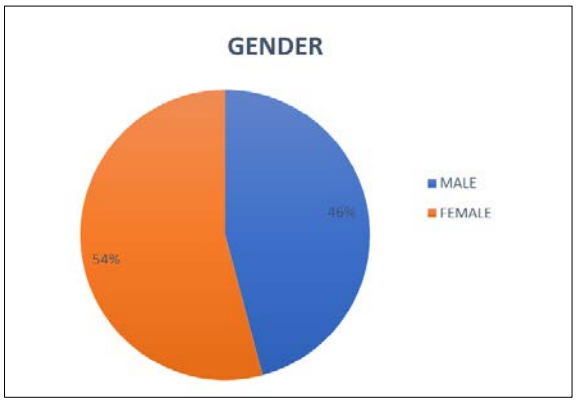
1. Participants were given exercise called as hemi bridge with ball and balloon exercise for 3 sessions over 3 days with feet on a wall and Instructions - Lie on back knee and hips bent at 90°
2. Place a 4-6" ball between knees
3. Place right arm above head and a balloon in left hand
4. Inhale through nose and as exhale through mouth perform a pelvic tilt so that tailbone is raised slightly off the mat. Keep low back flat on the mat. Do not press feet flat in the wall; instead dig down with heels
5. Shift left knee down so that it is below the level of right without moving feet. should feel left inner thigh engage. With left knee shifted down, take right foot off the fall should feel the back Now inhale through nose and slowly blow out into the balloon.

6. Pause 3 seconds with tongue on the roof of mouth to prevent airflow out of the balloon.

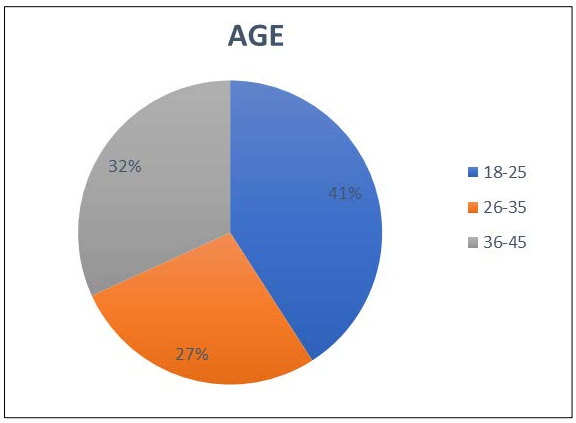
Data analysis

Microsoft excel office 2007 and Instat software version 3.0 used for statistical analysis. Average values for various parameters were calculated. Microsoft office excel 2007 and instat software version 3.0 was used for statistical analysis. Average values for various para meters were calculated. Level of significance was at 5% (i.e. $p<0.05$). Data did not pass normality hence non parametric test was done for comparison of pre and post intervention.

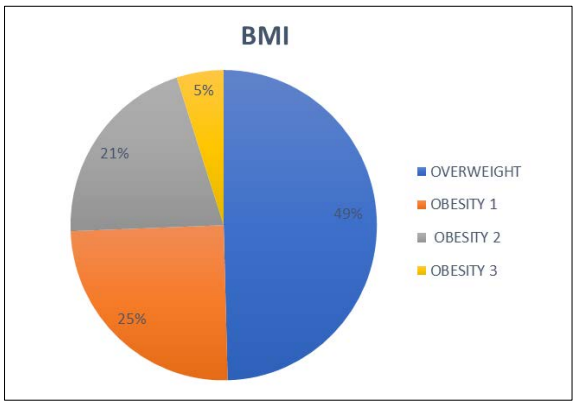
Results



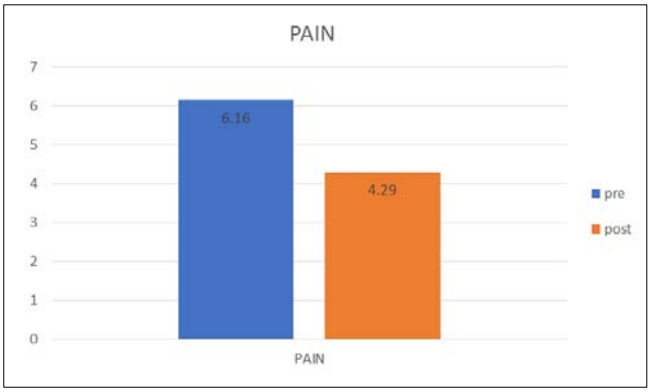
Graph 1: Gender distribution.



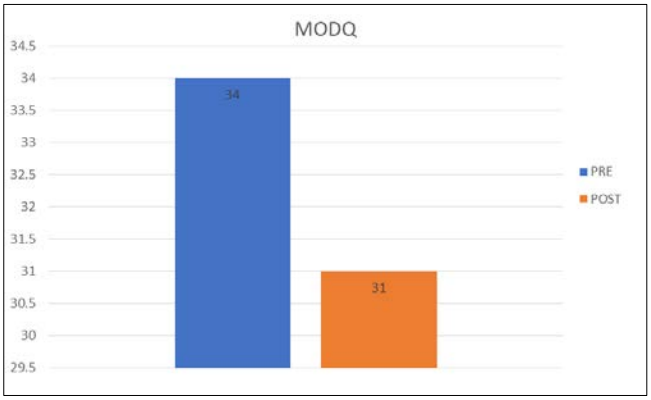
Graph 2: Age distribution.



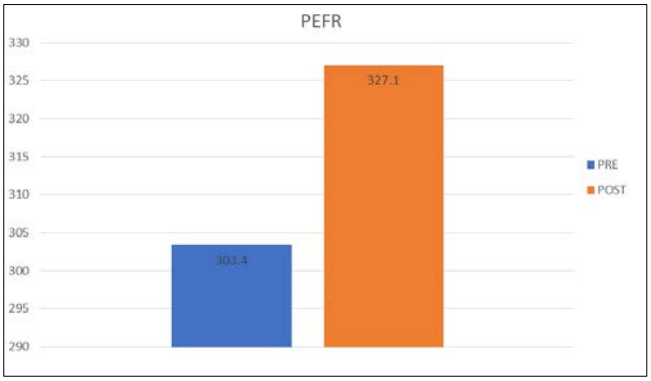
Graph 3: BMI distribution.



Graph 4: Comparison Pre and post intervention pain distribution.



Graph 5: Comparison Pre and post intervention modified oswestry disability questionnaire scores.



Graph 6: Comparison of pre and post intervention of PEFR.

Discussion

The term Non-specific low back pain is, by definition, a symptom of unknown cause (a symptom for which we are currently unable to reliably identify the pathology). However, there are many causes of pain identified or affects the development of low back pain subsequent causes.

The study sample comprised 24 subjects all the subjects underwent Performa. The subjects were given hemibridge ball and balloon exercise. The Pre and Post values of Pain by NPRS were assed pre value 6.166, post value 4.291, Disability due to low back pain by MODQ pre value 34%, post value 31% and Forced expiratory flow rate by Peak flow meter pre value 303.33, post value 327.08.

24 participants were (female =13, male =11) with age group of 18-45 years were chosen for the study. All participants were assessed for their pain on NPRS, Disability on MODQ, and peak expiratory flow rate on peak flow meter, BMI was calculated. This study showed the effect of hemibridge exercise with ball and balloon on pain, disability and PEFR in obese individuals with nonspecific low back pain. Table and graph 1 shows gender distribution in which out of 24 participants 13 were females (54%) and 11 were males (46%). Above study findings are supported by a study done by Rodrigo Dalke Meucci *et al*: estimated worldwide prevalence of chronic low back pain according to age and gender. Females are more likely have low back pain than males. This is due to low economic status, uneducated, changes in hormonal levels, such as menopause and obesity is also related to lifestyle and is also a known risk factor of CLBP [6].

sof 18-45 which shows 40% of participants are in age group of 18-25,32% participants are in age group of 25-35,28% in 35-45 age group. So, majority of population falls in 18-25 age group. A systemic review on prevalence chronic low back pain Rodrigo Dalke Meucci *et, al*: which showed prevalence of Low back pain in lower in younger individuals (aged 20 to 30), increasing from the third decade of life, reaching highest at age group of 50-60 of age. They have done their study on healthy individuals. In our study obesity is the risk factor for low back pain as it promotes overloading of articular structures of spine [6].

Table and Graph 3 shows distribution of participants according to BMI which showed 50% of population was overweight, 25% of population was under grade 1 obesity, 21% of population was under grade 2 obesity, 4% of population was under grade 3 obesity. So, in our study majority of population falls under overweight category. A study by Mirtz *et al*: by reviewing the literature in Medline. They concluded that there is significant uncertainly in the theory of effect of obesity on low back pain. Risk factor for low back pain may be loss of muscle mass of trunk and muscles of lower extremity and central obesity. Degenerative changes which occur low back pain may be due obesity [7].

Table and Graph 4 shows distribution of participants according to pain pre and post intervention on NPRS which showed that pain before the intervention was (6.16±1.43) and post intervention was (4.29±1.51) post intervention. Table and Graph 5 shows distribution of participants according to Modified Oswestry Disability Index showed disability pre intervention (34±8.19) and post intervention (31±7.44).

Which concluded that there was reduction in pain post treatment hence the p value was considered extremely significant. Extensive research is done by Boyle, Kyndall *et, al*: which showed effect of hemibridge exercise with ball and balloon in athlete population with low back pain. Hemibridge exercise with ball and balloon showed reduction in pain due to BBE is a conservative exercise intended to assist a patient/athlete in obtaining optimal posture and respiration i.e. diaphragm (ZOA) and spinal position and neuro motor control (lumbar-pelvic stability) [8]. Hemibridge exercise targets on ZOA (Zone of apposition) of diaphragm. ZOA refers to a vertical area of diaphragms that begins at the insertion point on the lower ribs and extends to the top of diaphragm. ZOA maintains proper shape of diaphragm and proper diaphragmatic breathing will occur without use of accessory muscles. ZOA is dependent on position of ribcage. When the rib cage in neutral position Zone of apposition occurs in proper position.

So hemibridge exercise with ball and balloon position targets on ZOA and spine to proper position, so that the diaphragm can function effectively to respiration and maintain posture. This study used hemibridge with ball and balloon, to correct the postural instability which causes pain. These exercise causes slow breathing and is considered further to relax neuromuscular system and decrease the resting muscles. In many correlation studies indicates that chronic low back pain is associated with restrictions of movements in thoracic spine and association may affects respiratory function.

The change in FVC could be attribution to component of blowing balloon exercise. During the activity, co-ordination activity of transverse abdominis and diaphragm is required to maintain respiration and stability. During inhalation, there is concentric contraction of diaphragm and eccentric contraction of transverses abdominis and during exhalation there is concentric contraction of transverses abdominis and eccentric contraction of diaphragm [9]. Blowing the balloon requires deep inhalation followed by forceful exhalation. The eccentric contraction of both diaphragm and transverses abdominis during exhalation and inhalation may have developed strength and optimize ZOA and therefore improve the respiratory function. The hemi bridge with ball and balloon exercise is designed to promote optimal posture by utilizing the diaphragm in the most efficient way and correcting the lumbar spine position. It also concentrates on neuromuscular control of the deep core muscles [10]. Activation of these muscles may have contributed to correction of lumbar lordosis, there by correcting faulty posture causing pain. Blowing the balloon during exhalation helps in the activation of the abdominal muscles and inhibition of the paraspinal muscles. This also contributes in the correction of the lumbar lordosis there by increasing the functional ability of the participant [8].

Table and Graph 6 shows distribution of participants according to PEFR which showed PEFR pre intervention (303.4±78.9) and post intervention was (327.1±47.7) which showed improvement with extremely significant p value of 0.001. A study conducted by Saylee R Patil conducted study on comparison on peak expiratory flow rate in obese and nonobese individuals. Adipose tissue acts an endocrine and energy storage organ. which is composed of adipocytes, fibroblasts, endothelial cells, and immune cells. These cells secrete hormones and cytokines (adipokines) that exert endocrine, paracrine, and autocrine functions. Under physiological and pathological conditions, adipokines induce the production of reactive oxygen species, which trigger oxidative stress. During this process, immune cells produce free oxygen radicals that promote a systemic proinflammatory state. These effects favors the development of bronchial hyper responsiveness even in non- asthmatic individuals. This hyper responsiveness of the airway due to its underlying inflammatory nature can compromises the size of the airway leading to alter lung functioning Hence, altered mechanical muscular activity due to adiposity, altered airway caliber and increases respiratory resistance may be responsible for the reduced lung functioning and lower PEFR in obese women [3].

Table 1: Demographic characteristics of subjects.

Characteristics	Mean ± SD
Age	29.62±7.60
Weight (kg)	70.83±10.56
Height(m)	1.49±0.13
BMI (kg/m^2)	32.02±4.86

BMI= Body Mass Index, SD= Standard Deviation

Table 2: Comparison of pre and post of outcome measures.

	Pre Mean ±SD	Post Mean ±SD	P value
Pain	6.16±1.43	4.29±1.51	0.0001*
MODQ	33.66±8.49	31.66±7.96	0.0001*
PEFR	303.33±78.99	321.008±77.76	0.0001*

*P<0.05, MODQ= Modified Oswestry Disability Questionnaire, PEFR= Peak Expiratory Flow Rate.

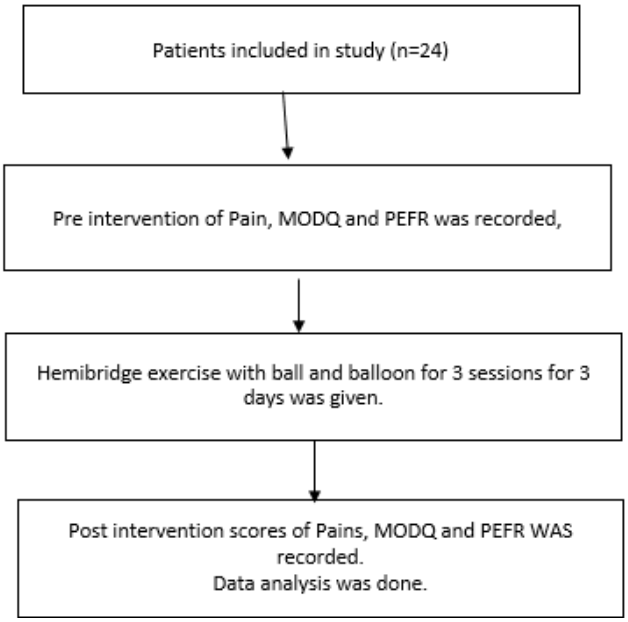


Fig 1

Conclusion

The study concluded that there is significant effect of hemibridge exercise with ball and balloon on Nonspecific low back pain in obese individuals.

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