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Comparison of Diet With and Without Strengthening Exercises Impacting Non-Specific Chronic Low Back Pain Patients in Obesity

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Abstract

Background: Dietetic variations have long been taken as an imperative factor for managing obesity in low back pain patients. Thus, to evaluate diet with and without exercise to consider further the best regimen to counter this burning issue. Therefore, his study aimed to compare the effects of diet with and without strength training on non-specific low back pain in obese clients.

Methods: Fifty-two patients with sedentary lifestyles, aged between 25-40 years, were assigned to two groups according to their BMI (Grade I & II obesity) and were assessed for their weight, Body Mass index (BMI), Waist to hip ratio (WHR), Body Fat Percentage (BF %), Fat mass (FM), lean Mass (LM), Numeric Pain rating scale (NPRS), Oswestry Disability Index (ODI) and pushups for muscular endurance and strength were the outcome measures of interests. One group followed diet only (D), while the other followed diet plus strength (DS) training. After six weeks of intervention, patients were assessed again on the same parameters.

Results: DS group revealed positive changes in all parameters, i.e., weight (0.00), BMI (0.00), WHR (0.01), BF% (0.00), FM (0.00), LM (0.01), NPRS (0.00), OLBPD (0.00), pushups (0.00), while D group showed insignificant results in WHR (p-value- 0.736, before 0.88+0.1 after 0.88-+0.1), LM (p-value- 0.384, before 40.9+8.9 after 40.3+8.8) and Pushups (p-value 0.384, before 4.6+3.4 after 4.3+3.7).

Conclusion: Six weeks of diet and diet plus strength training resulted in positive changes in pain and ODI. Still, the diet-plus strength exercise group overweighed the diet-only group in all parameters.

Keywords

Diet, Exercise, Low Back Pain, Obesity.

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Introduction

Chronic low back pain (CLBP) is a devastating condition that affects a substantial ratio of the population, with approximations signifying that up to 50-80% of adults will experience CLBP at some point in their lives[1]. Obesity is a deep-rooted hazard for developing LBP[2], with studies showing that individuals with a body mass index (BMI) of 30 or higher are at an increased risk of developing this LBP[3]. Lack of physical activity and eating junk food also play a crucial role in developing obesity[4]. One interesting fact revealed in 2017 by researchers: a high fat percentage is a risk factor associated strongly with lower back pain[5]. Another noteworthy point is the vicious cycle of physical inactivity and obesity risk[6], which may lead to LBP.

In particular, obesity, which is targeted to the abdomen (abdominal obesity)[5-7]. With this, it is worth noting that, in turn, obesity will lead to physical inactivity and a sedentary lifestyle, which further will augment obesity, hence more low back pain[8,9]. The low back pain caused by obesity results in the disturbance of work efficiency, as WHO revealed that nearly 60% of work absence in Europe is due to musculoskeletal disorders[10]. The interrelationship between obesity, sedentary lifestyle and low back pain has previously been studied in a primary cohort or cross-sectional designs[11,12,13] as well as different modes of exercises[14,15] including weight training, aerobic training, High-intensity interval training, Moderate intensity continuous training[16] or combination of two or more[17]. Dietetic variations have long been taken as an imperative factor for managing obesity, with research suggesting that weightiness reduction through dietary changes can lead to improvements in CLBP[18,19]. In particular, diets that are low in calories and high in protein effectively reduce CLBP in obese individuals[20], while some studies have reported in opposition[21]. A systematic review and meta-analysis of randomized controlled trials (RCTs) published in 2018 found that low-calorie diets were associated with significant reductions in CLBP compared to control groups. The authors concluded that low-calorie diets could be an effective intervention for managing CLBP in obese individuals[22].

Now, there is a need to evaluate diet with and without strengthening training to consider further the best regimen to counter this burning issue, as currently limited research on the comparative effectiveness of these interventions is available to fully understand its effects and maximize its use for a larger population.

Methodology

This study is a Randomized Control Trial in which 52[23] subjects (26 males, 26 Females) aged between 25-40 years with Numeric pain rating scale (NPRS) between 2 to 5, BMI between 30 to 39.9 kg/m2 and Oswestry Disability Index scores less than 40% were recruited through non-probability convenience sampling. Subjects with Open injuries, Current dermatological or inflammatory illness, Recent fractures, Congenital lower extremity abnormalities, breathing difficulties, and Cardiovascular, pulmonary, hepatic, renal, and haematological disorders were excluded from this study.

Participants and Study Setting

This study was conducted at the Fitness and Sports Rehabilitation Center of Dow University of Health Sciences, Karachi. 26 clients each (13 males and 13 females) were divided into diet only (D) group and diet plus strength (DS) exercise group through Simple Random Sampling.

Patients were also asked to fill out the Physical Activity readiness questionnaire at the start of this trial, followed by recording baseline values such as Pain, Disability, height, weight, BMI, waist & hip circumference, waist-to-hip ratio (WHR), Body fat percentage and push-ups. The push-up procedure was that the subject assumed the standard push-up position (hands shoulder width apart, back straight, head up, using the toes as a pivotal point). The issue was to lower the body until the chin touched the mat but not the stomach. The maximum number of push-ups performed consecutively without rest was counted as the score[24].

Both the groups were assessed by a nutritionist and provided 500 kcal daily deficit diet plans from their daily caloric intake for six weeks. First, the basal metabolic rates were calculated and multiplied by the lifestyle (1.2 for sedentary lifestyle) to get the daily caloric requirement, and from DCR 500 kcal were reduced.

Interventions

The Diet plus Strength group was given supervised training by the Physiotherapist who, a Physical Fitness Trainer in the gym. To set the intensity of weight training subjects were asked to perform 15 repetitions of every exercise of muscle (Including Pectoralis Major, Latissimus Dorsii, Deltoid, Trapezius, Biceps, Triceps, Quadriceps, Hamstring, Rectus Abdominus, Erector Spinae, Multifidus, Gastrocnemius) on minimum load then were asked if he/sh they do more reps or not. Accordingly, load/weight was adjusted on which subject can perform 12-15 repetitions maximum. After two weeks with the same procedure, the intensity of weight training was increased to 10-12 repetitions.

A whole body workout plan for all major muscle groups, including Pectoralis major (Peck Deck), Latissimus Dorsi (Lat pull down), Deltoid (Front Raises), Trapezius (Shoulder Shrugs), Biceps (Preacher Curls), Triceps (Tricep Press Down), Quadriceps (Leg Extension Machine), Hamstrings (Leg Curls Machine), Rectus Abdominus (Sit-Ups), Erector spinae and Multifidus (Bird Dog) and Gastrocnemius soleus (Heel Raises Device) was followed by the subjects under supervision for six weeks, five sessions per week (30 sessions)[24].

Results

SPSS 21 software was used to analyze the data statistically. Male and female distribution was equal in both the groups [D & DS; 26 clients (13 male and females) each group]. The average age group of participants for both the groups was 31.1 years.

In this study the difference in Weight, BMI, WHR, BF%, FM, LM (BF% x body weight =Fat mass; Body weight – fat mass= lean mass), NPRS, OLBPD and pushups was seen in D and DS group. Consequently, both the groups showed significant difference in majority of variables (P value 0.00 to 0.004), however, DS group showed significant change in all variables as shown in Table-1. weight (<0.05), BMI (<0.05), WHR (<0.05), BF% (<0.05), FM (<0.05), LM(<0.05), NPRS (<0.05), OLBPD (<0.05), pushups (<0.05), while D group showed insignicant results in WHR (p value- 0.736, before 0.88+0.1 after 0.88¬+0.1), LM (p-value- 0.384, before 40.9+8.9 after 40.3+8.8) and Pushups (p value 0.384, before 4.6+3.4 after 4.3+3.7).

Another fact which should not be left unnoticed that in both groups, hip and waist ratio have decreased, on the contrary, diet group showed WHR insignificant while diet plus strength exercise group showed significant result.

Table-1 Paired t-test on all study parameter

	Diet			Diet+ Strength		
	pre	Post	p-value	pre	post	p-value
Weight(kg)	89.2±13.1	88±12.9	0.00	91.6±14.0	89.8±13.7	0.00
BMI(kg/m2)	35.0±2.7	34±2.8	0.00	33..7±3.1	33.1±3.0	0.00
Waist(inch)	40.3±7.1	39.5±6.8	0.004	39.1±5.5	37.1±5.7	0.004
HIP(inch)	45.5±4.2	44.6±4.3	0.003	44.6±3.9	43.5±3.8	0.003
WHR (inch)	0.88±0.1	0.88±0.1	0.736	0.88±0.1	0.85±0.1	0.001
BF (%)	54.4±6.3	53.5±6.4	0.00	54.4±8.6	52.8±8.6	0.00
FM (kg)	48.3±8.2	47.3±8.2	0.00	50.2±12.4	47.8±13.3	0.00
LM (kg)	40.9±8.9	40.3±8.8	0.384	41.4±8.3	41.9±8.3	0.001
NPRS	3.8±0.8	2.3±0.7	0.00	3.7±1.1	1.9±0.7	0.00
OLBPD (%)	13.2±4.2	10.5±3.8	0.00	13.4±5.2	7.9±2.9	0.00
Push up(repetition)	4.6±3.4	4.3±3.7	0.42	5.1±3.7	11.6±5.2	0.001

**** p-value<0.05 considered significant***

It is important to note that DS group brought positive changes in LM and Pushups. Conversely, in diet group, LM declined with declination in Pushups as shown in Table-1 and Figure-1.

It is interesting to witness that lean mass and pushups have strong connection as in diet group both are insignificant while in other group both are significant as shown in Figure 1. Here, it is attention-grabbing that both the groups showed waning in fat mass but the great transformation can be seen in DS group (50.2±12.4 to 47.8±13.3).

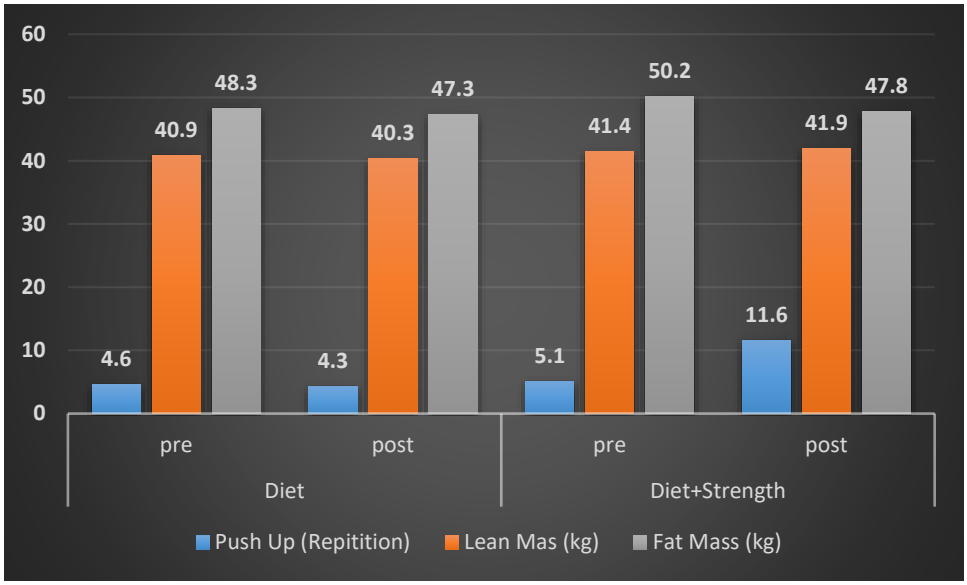

Figure-1 Comparison of study parameters

Discussion

This study was designed to investigate the D versus DS groups in obese people having NSCLBP in both genders. There was meaningful reduction of weight, BMI, Waist and Hip circumference in both groups. Interestingly, LM and pushups showed significant improvement, in DS group whereas, in D group; lean mass, pushups and WHR were found to be insignificant.

A study conducted in 2021 by Uçar et al[25] explained the relationship between muscle size, obesity, body fat ratio, pain and disability in individuals with and without nonspecific low back pain by investigating 54 participants with and without NSLBP. A direct relationship between large BMI values and NSLBP was found; suggesting that increased disability and fat infiltration do influence pain severity. Approximately the same has been found in our study that fat mass reduction leads to substantial pain and disability declination.

Similar to our study, Svein O. Tjøsvoll[26] conducted a supervised heavy resistance training in which participants were trained a whole-body program with compound exercises two times per week for 16 weeks. The study concluded meaningful fall in pain intensity, pain-related disability, pain self-efficacy and improvement in strength. This is compatible with our results in which strength

training group reduced pain, disability while incased lean mass and pushups (which shows the muscular endurance and strength improvement[27]. Our study results are also in line with what Jung seok lee et al.[28] revealed in their study in 2016. The study was conducted to see the beneficial effects of strength exercise program vs combined exercise program showing evident reduction in weight, back pain, disability and fat mass. Comparable study16 was conducted in 2022 which analyzed the strategies for weight reduction and changes in anthropometric measures including BMI, waist, hip, waist to hip ratio and fat mass revealing the group which had high intensity training showed better results. This is similar to our study in which we found that resistance training group showed better results. This study has provided strong basis for inferring causality. Moreover, as hormonal influence plays an important role in weight/fat reduction so testosterone & cortisol levels should be undertaken in future researches. Despite, for fat mass loss, limb circumference could have been a better way for proper estimation.

Conclusion

This study revealed 6 weeks of diet and diet plus strength training resulted in bringing about the positive changes in pain and Oswestry disability index but in all parameters diet plus strengthening exercise group overweighed the diet only group.

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Conflict of Interest

None.

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None.

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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

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Acquisition, Analysis or Interpretation of Data: Sarfaraz M, Ahmed J, Bhutto MA

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All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.