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Effect of balance diet versus low carb diet in improving pain in knee Osteoarthritis

Manisha Nayyar[1], Dhruv Taneja[2], Ranjeeta Waribam[3], Maliram Sharma[4], Swati Dubey[5], Kapila Jain[6]

[1]Raja Park, India, Manisha.phyisio89@gmail.com
[2]Jagatpura, Jaipur, dhruv.taneja@mvgu.ac.in
[3]Jagatpura, Jaipur, waribam.ranjeeta@mvgu.ac.in
[4]Bhagwati Nagar, India, sharma.maliram@gmail.com
[5]Bhagwati Nagar, India, rusty.khush@gmail.com
[6]Vaishali Nagar, India, jainkapila1012@gmail.com

Abstract

Study Design: Pre to post-test design- experimental study

Background: There is a lack of clinical research regarding effectiveness of low carb diet for improvement of pain in Knee Osteoarthritis. To our knowledge there are no prospective, randomized studies in the literature investigating the low carb diet in improving pain in osteoarthritis knee.

Purpose of the study: To determine which dietary program either balance or low carb is more effective in reducing pain in Osteoarthritis of knee.

Method: 20 subjects having osteoarthritis with grade 2 or 3 were randomly assigned to either control group or experimental group. Readings were taken for National Pain Rating scale (NPRS) on 1st day and last day of 4th week.

Results: The results of the study revealed that Group B dietary protocol is better than group A in reducing pain. There was a significant improvement in NPRS score in group B in the end of 4th week ($p<0.001$) compared to that in group A.

Conclusion: The results of the study revealed that low carb diet is more effective in decreasing pain in knee osteoarthritis patients.

Keywords: *Osteoarthritis (OA), Low carb diet (LCD), Pain, NPRS scale*

1. Introduction

A balanced diet consists of consuming the appropriate quantity of nutrients from a range of foods to preserve our health, as no single food can supply the precise quantity of every vital ingredient our bodies require to function. The nutritional standards for creating a balanced diet place a strong emphasis on illness prevention and health promotion for individuals of all ages, with a focus on vulnerable groups like the elderly, pregnant and lactating women, and children and adolescents. A secure water supply, health care, physical exercise, and socioeconomic development are all important factors to consider because they have a significant impact on nutrition and overall well-being. Foods that are readily available locally should be chosen to create balanced diets.

Micronutrients such as protein, fat, and carbohydrates are usually required in high concentrations. Less is needed in the way of micronutrients like vitamins and minerals. These essential nutrients were required by our body in the right amounts for it to be used effectively to preserve our health and guard against various illnesses. A healthy, well-balanced diet should consist of 50–60% total calories from carbohydrates, primarily from complex carbs, 10-15% from proteins, and 20–30% from both visible and unseen fat.

To achieve daily protein requirements, a moderately active man's diet must consist of grains, legumes, and dairy products in the ratio 3:1:2.5 (RDA, 2020). Micronutrients, functional foods with benefits to one's health, such as phytochemicals, prebiotics, antioxidants, and fibre, should also be a part of a well-balanced diet. A balanced diet that adheres to the suggested range of energy and food consumption is ideal for managing and preventing chronic diseases. A healthy diet should consist of 55%–65% carbohydrates, 7%–20% protein, and 15%–30% fat. The middle-aged and elderly, especially those over 50, consume too many carbohydrates, and people over 65 consume too little fat.

Low-carb, or low-carbohydrate, diets have been used as a weight-loss method since 1860 and more recently, in 1972. The interest in low-carb methods is still there today. Although all low-carb methods lower total carbohydrate intake, there isn't a clear agreement on what constitutes a low-carb diet. Food has three macronutrients: protein (4 kcal/g), fat (9 kcal/g), and carbs (4 kcal/g). Thus, low carbohydrate has been characterized in research as a percentage of total daily carbohydrate load or daily macronutrient consumption.

This review defines low-carbo diets as follows:

1. Very low-carbohydrate (<10% carbohydrates) or 20 to 50 g/d
2. Low-carbohydrate (<26% carbohydrates) or less than 130 g/d
3. Moderate-carbohydrate (26%-44%)
4. High carbohydrate (45% or greater)

To achieve nutritional ketosis, keto diets often restrict carbohydrate intake to 20 to 50 grams per day. Limiting carbohydrates to 50 grams or less causes the body to produce ketone bodies by burning fat that has been stored in adipose tissue. Acetoacetate, acetone, and beta-hydroxybutyrate are the ketone bodies produced during nutritional ketosis, which can be measured by serum or urine ketones. Serum ketones typically rise from 1 mmol/L to 7 mmol/L during nutritional ketosis, but metabolic acidosis is not the result. By definition, metabolic acidosis, hyperglycemia, and serum ketones (usually greater than 20 mmol/L) are all signs of diabetic ketoacidosis.

One of the most common conditions that causes impairment, especially in the senior population, is osteoarthritis (OA). The most prevalent articular disease in the industrialized world, osteoarthritis (OA) is a major contributor to chronic disability, primarily due to hip and/or knee OA (1). The financial burden of OA is significant and includes treatment costs, home and life adaptation costs for affected persons and their families, and decreased productivity at work.

Patients with OA had a greater death risk than the general population. Major risk factors include the presence of walking difficulty and a history of diabetes, cancer, or cardiovascular disease. All diseases with distinct causes of death show excess mortality, but cardiovascular problems show this more clearly. In addition to having a higher prevalence rate than other forms of OA, knee OA is more significant since it typically

manifests at an earlier age, especially in obese women who are younger in age. Age-related increases in the incidence of knee OA are followed by improvements in lifespan expectancy and population average weight.

A person's quality of life may be significantly impacted by pain and other OA symptoms, which can impact psychological and physical aspects of functioning. As a chronic illness affecting the entire joint, including the articular cartilage, meniscus, ligaments, and peri-articular muscle, knee OA is not limited to a single area of damaged cartilage. It can be caused by a variety of pathophysiological processes. Millions of individuals are afflicted with this debilitating and agonizing illness.

Men are less likely than women to have osteoarthritis in the knee. Males over the age of 55 had a lower incidence of knee OA than females, according to a meta-analysis comparing the two sexes.

As seen in 40–80% of cases of OA in the hands or hips, but much less in knee OA, genetics is a major factor in the pathophysiology of OA. Genome-wide association studies (GWAS) have identified 90 genetic risk loci for the development of OA to date, however most of those have small effect sizes. Research has demonstrated that epigenetic mechanisms, in addition to genetic risk loci, significantly influence the pathogenesis and development of osteoarthritis (OA). Moreover, the prevalence of OA varies by region and ethnicity.

Significance of the study:

Knee Osteoarthritis is one of the major problems now a days. Population of all around world is suffering and fighting against OA knee. A person tries many more way to reduce pain in knee joint. There are different methods to reduce pain and increase functional performance in OA knee but most of them are symptomatic and does not last long. Diet play an important role in body physiology. There are many types of diet in market that shows various results. To see effect of diet in joint work play. Here, we care comparing balance diet and low carbohydrate diet to see the effect of functions performance in OA knee.

Objective:

To compare the effect of balance diet with low carb diet on improving functional performance in osteoarthritis knee.

2. Methodology

Participants: Study included 20 participants, both male and female age group 30-60 years who were screened for Osteoarthritis for greater than 6 months and reported pain in knee joint in physiotherapy clinic. Subjects already diagnosed with OA knee by orthopaedician. The participants were excluded if they had any cardiovascular disease or psychological disorder or uncooperative patients. Informed consents were taken from subject. Subjects who fulfilled the inclusion and exclusion criteria were assigned into two groups by simple random sampling technique. The randomization was blinded, and the participants were also told not to discuss among themselves regarding the treatment they receive. The total duration of study was 1 month and there was no drop out in the study.

Intervention to be conducted on the participants:

1. A pre-treatment NPRS Scale (The Numeric Pain Rating Scale), will be noted to evaluate Osteoarthritis knee.
2. Immediate effects of the treatment will be seen during the entire study.
3. GROUP A: will receive Low carb diet and Conventional therapy (IFT + Hot pack + Resistance Exercises of Quadriceps and Hamstrings)
4. GROUP B: will receive Balance diet and Conventional therapy (IFT + Hot pack + Resistance Exercises of Quadriceps and Hamstrings)
5. Post treatment NPRS Scale will be evaluated.

3. Results

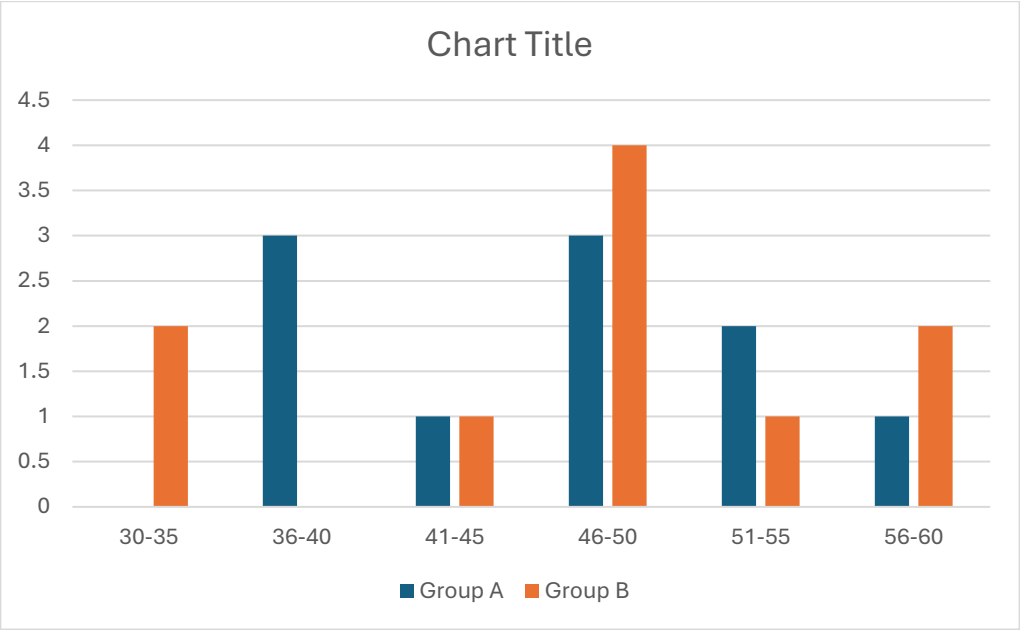
Analysis of the data collected of pain for of 20 subjects was done by suitable statistical analysis tests by using Graph Pad Prism 5 version (Graph Pad Software, Inc.7825 Fay Avenue, Suite 230La Jolla, CA 92037 USA).

The results were considered statistically significant if the p-value < 0.05. The characteristics of the data were presented through tables and graphs. T-test was used to analyze inter-group differences in function. Paired sample t-test was used to compare the intra-group differences in pain scale readings before and after both diets. Within group analysis revealed that there was a significant improvement in NPRS score.

Comparing age distribution of patients

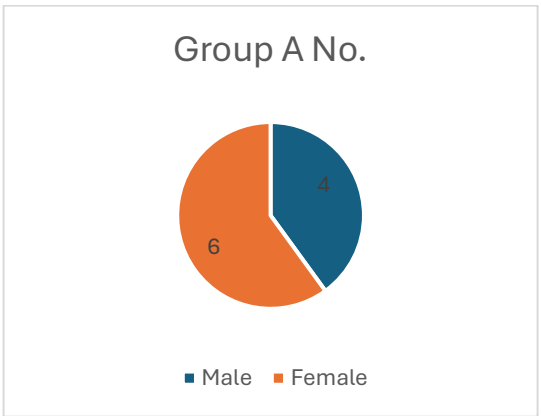
Age in years	Group A		Group B	
	No.	%	No.	%
30-35	0	0	2	20
36-40	3	30	0	0
41-45	1	10	1	10
46-50	3	30	4	40
51-55	2	20	1	10
56-60	1	10	2	20
Total	10	100	10	100
Mean ± SD	1.78 ± 1.00		1.68 ± 1.22	

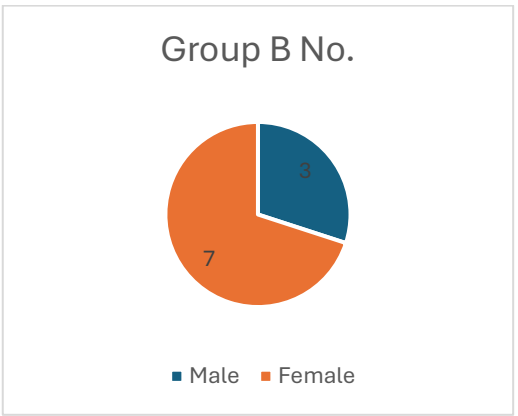
Graph Bar 1



Sex distribution

Gender	Group A		Group B	
	No.	%	No.	%
Male	4	40	6	60
Female	6	60	4	40
Total	10	100	10	100





With in group analysis of NPRS-Group A

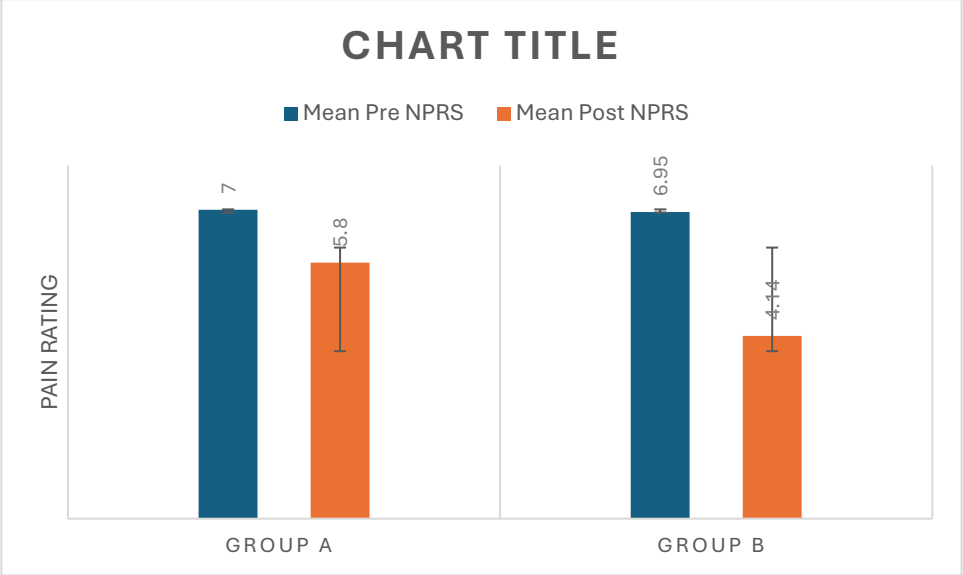
Variables	Group A Mean ± SD	Mean Difference	t	p
Mean Pre NPRS	7.00 ± 1.19	-1.19	4.45	p<0.002
Mean Post NPRS	5.80 ± 1.10			

With in group analysis of NPRS-Group B

Variables	Group A Mean ± SD	Mean Difference	t	p
Mean Pre NPRS	6.95 ± 1.44	-2.81	4.68	p<0.1
Mean Post NPRS	4.14 ± 1.25			

Comparison of NPRS between Group A and Group B

Variables	Group	Mean ± SD	t	p
Pre NPRS Day 1	A	7.00 ± 1.19	2.06	p<0.04
	B	6.95 ± 1.44		
Post NPRS End of 4 Weeks	A	5.80 ± 1.10	3.05	p<0.02
	B	3.66 ± 1.03		



4. Discussion

The research evaluated how well balance diet and low carb diet performed in terms of reducing pain in OA knee. The study's participants have comparable starting values for each dependent variable implying that every group had a uniform group of patients. Knee O.A. is a prevalent condition contributing significantly to functional limitation and disability. Numerous studies show secondary gait change pattern of O.A. is due to pain, decreased muscle strength, instability and stiffness.

The result of the study reveals that the Low carb diet is more effective in improving pain than the balance diet. The low carb group (Group B) showed a significant improvement in NPRS scores of 29.57% than the balance diet group (Group A) who showed an increase of 7.33%. The mean value ± standard deviation of NPRS scores for subjects in group A was 7.00 ± 1.19 on day 1 and on 4th week was 5.80 ± 1.10. The mean value ± standard deviation of NPRS scores for subjects in group B was 6.95 ± 1.44 on day 1 and on 4th week was 4.14 ± 1.25.

In this study, we have investigated the effects of pain on knee OA. According to Arata statistically, significant improvement in pain is seen in both the groups and between the groups. However, the improvement in Group B is greater than that of Group A.

Based on the role that carbohydrates play in oxidative stress, we hypothesized that excess carbohydrates in the diet would result in oxidative stress, pain, and inflammation. Consequently, these effects would decrease if consumption of carbohydrates was also reduced in patients with KOA. Because there were no significant differences in weight loss between the diet groups, we believe that the differences in pain scores between the groups are unrelated to weight loss but are an effect of the quality of the diet. This belief has been reinforced in the literature in studies of arthritis.

This suggests that KOA pain may not be directly related to peripheral inflammation. However, our data indicate that oxidative stress may be linked to functional KOA pain as the change in hiobarbituric acid reactive substances was related to the change in pain intensity ratings following temporal summation and, possibly, repeated chair stands.

Limitation

The reduction of hiobarbituric acid reactive substances in the low carb group was primarily driven by women, so further investigation into the sex-specific effects of diet on hiobarbituric acid reactive substances may be done.

Sample size was small

Study can be extended foe few more months

Future Research

In future studies, research can be done on the wider sample. It can be done on different subjects and different age groups. Further research can be done for more months with changes in blood reports.

5. Conclusion

The results of the study revealed that low carb diet is more effective in decreasing pain in knee osteoarthritis patients.

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