IJIS: Vol.1, Issue 3, April 2025, Page: 56-64 ISSN 3049-3277

International Journal of Integrative Studies (IJIS)

Journal homepage:www.ijis.co.in

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

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Abstract

Knee OA is one of the most standard arthritic maladies that affect the lives of most patients suffering from this ailment. Pain management and functional limitation in patients with knee OA poses a significant problem. Although there are many treatments for osteoporosis, dietary intervention is very important for patients suffering from the disease. It was, therefore, conducted with the objective of establishing the impact of an improved nutrient balanced diet (NBD) and an alternate low carbohydrate (low-carb) diet on the functional disability and pain perception in patients with knee OA. The participants consisted of 20 individuals within the age range of 30-60 years with the diagnosis of knee OA who complained of knee pain for at least six months. The subjects were divided into two groups on a completely random basis. Group A was given a low carbohydrate diet in addition to conventional treatment; IFT, hot pack and resistance exercises while Group B was given a normal diet in addition to the treatment modalities mentioned above. The Numeric Pain Rating Scale (NPRS) was applied to measure the baseline and post-intervention pain. So, it is has been found that there have been lessening of pain and increase in the functional range in both the groups, but the group which followed the low carbohydrate diet were slightly more benefited in terms of pain relief. Analysis of t-tests showed that both types of interventions were beneficial, and intra-group comparisons revealed a decrease of pain after the treatment. Thus, it is possible to argue that dietary measures, with an emphasis on low-carb diets, can be useful as an adjunct treatment for patients with knee OA and impaired functional mobility.

Keywords: *OA Knee, Low Carbohydrate Diet, Low Glycemic Index Diet, Functional Performance, Pain relief, Nutritional Approach, Routine Approaches, Strengthening Exercises, Numerical Pain Rating Scale (NPRS), OA therapy*

DOI: 10.63856/ijis.v1i3.56-64

Introduction

A balanced diet is eating the right amount from various kinds of foods because it is impossible for one food to alone give out a body enough nutrient in its entirety that makes it healthy. When it comes to the cooking and serving of food following the set nutrition guidelines, the health promotion and disease prevention takes the spotlight with an emphasis utilized by various categories of the most vulnerable groups such as; the elderly, pregnant and lactating mothers, children and adolescents. Other necessities include availability of water, enough health facilities, exercise, and social as well as economical development because they also play an important role in enhancing the overall health standards of a country. It is easier to obtain locally available foods to be used in developing diets as such, locally produced foods should be used.

Some of the macronutrients include; lipids, proteins and carbohydrates which are believed to be in large abundance in the human body as compared to macronutrients. Micronutrient need is relatively low when compared with the macronutrients which include the carbohydrate, protein and fats. These were some of

the nutrients needed in the right proportions which were used in the body to ensure a healthy human being was produced so as to be protected from various diseases. Current recommendations from the American Heart Association are that calories from carbohydrate are at the range of 50-60%, calories from protein are 10-15% and visibly and invisibly fat are at 20-30%.

Therefore, in order to meet the daily protein needs today moderately active man in the example of grains, legumes, and dairy products should be 3:1:2.5 (RDA, 2020). For some time now, the focus shifted to so many things that we did not consider as a 'food', such as micronutrients, also referred to as the beneficial elements, phytochemicals, prebiotics, antioxidants and fibre among others. Hence for a balanced diet that will help in avoiding chronic diseases, the following amount of energy and foods should be taken. According to the nutritional concepts for a good diet, carbohydrate products should take between 55% and 65%, protein products should be between 7% and 20% and fat products should take between 15% and 30%. At the same time, the aged and the middle-aged, especially those who are above fifty years of age consume more carbohydrates than the required amount while the older persons particularly those above sixty-five years take less fats than recommended.

Low carb diets, better known as low carbohydrate diets have only been used as diets for losing weight from about the year 1850 and for a more specific usage from the year 1972. The same interest in low-carb techniques or the approach can be observed even today. All low carb diets reduce the daily carbohydrate intake; however, there is no agreement on what constitutes a low carb diet amount. Food has three macronutrients: Protein has 4 kcal/g, whereas fat and carbohydrates have 9 and 4 kcal/g respectively. Thus, in research, low carbohydrate has been described either as the percent of daily calories from carbohydrate or total percent daily macronutrient intake.

In the given review, low-carbo diets are defined in the following manner

1. The diet was considered as very low–carbohydrate diet, if carbohydrates were making less than 10% of total caloric intake or a moderate–low carbohydrate diet if carbohydrates were 20-50 g/d.
2. Low carbohydrate diet is defined as any meal that is equivalent to less than 26% of carbohydrates or 130 g of carbohydrates per day.
3. Moderate-carbohydrate (26%-44%)
4. High carbohydrate (45% or greater)

This is why some of the foods that are allowed within ketogenic diets should not consist of more than 20- 50 grams carbohydrate to effectively produce ketones. Restricting one's intake of carbohydrates to below 50 grams puts the body into a state whereby metabolism of fats in the adipose tissue results in the production of ketones. The three ketone bodies are acetoacetate, acetone and beta-hydroxybutyrate, and they can be tested for by serum or urine ketone. On the ketogenic diet, serum ketones typically range from 1mmol/L to 7mmol/L, however, it does not lead to the development of metabolic acidosis. By interpreting these definitions, it appears that hyperglycemia without a known etiology, metabolic acidosis, and serum ketones (more than 20 mmol/L) can all be indicative of DKA.

Osteoarthritis (OA) is one of the journal's cases of pathology, which affects a person's functioning, especially in the senior population. OA is the most frequent joint disease in the developed countries and a major cause of chronic morbidity due, in particular, to the hip and knee pathologies. Therefore, the Expansion side of the equation includes cost factor such as the cost of treatment, adaptation of cost by the home and the affected person and or family for certain changes in their working style, cost on working productivity.

Studies show that the patients with OA are at higher risk of death compared to the general populace. However, there are several factors that classify the patient as high-risk and they are; presence of difficulty in walking and previous history of diabetes, cancer or any cardiovascular disease. As goes to all those diseases that have identifiable patterns of mortality, they were diagnosed to have higher mortality rate but this is much worse with cardiovascular troubles. Knee OA is however a serious form of OA as it affects

more people than the other forms of OA and it comes in earlier than the other types of OA especially in women of a young but overweight category. However, longer live span, as well as currently rising mean body weight, result in this type of knee OA to become more common with age.

According to the current study, pain and all the other symptoms of OA have the potential to significantly impact the quality of life and the effects are often psychological and physical. Contrary to other knee diseases that affect specific localized region of the knee such as the articular cartilage, meniscal and ligament, knee OA is a diffused arthritis that affects the joint cartilage surfaces, menisci, collateral ligament as well as the peri-articular muscles. It has many pathophysiological conditions and could have multitude of etiology that refer to different diseases. One can safely assume that millions of individuals are struggling with this ard and limiting condition.

Knee osteoarthritis affects more women than men; this is due to various associated factors like obesity. Men of the specified age bracket had a lesser degree of knee OA as compared to women, as a cross-sex meta-analysis would show.

As mentioned earlier, genetics is a leading factor in the development of OA and is seen in 40%-80% of the cases of OA in hands and hips and much lower in knees. GWAS have so far identified 90 genetic loci associated with development of OA, but the majority of them have small effect sizes. Several studies have also shown that epigenetic factors play a crucial role in the progression and development of osteoarthritis (OA) apart from genetic risk factors. However, in diversity, it is important to note that the occurrence of OA is not uniform across and between the regions/ethnicities.

Significance of the study

Knee Osteoarthritis has now become one of the biggest issues in the present world. It has been seen that population of entire world is suffering as well as struggling against OA knee. One can attempt many more ways to lessen the pain on the knee joints. Though, there are various approaches to minimize pain and improve the functional capacity associated with OA knee but majority off them are palliative in nature and are therefore transient in their effects. Diet had its significant influence in the overall body functions of an individual. Different trends of diet are available in the market that includes sever different effects. In joint work-play, in order to differentiate the impact of diet, an ideal plan is needed so the comparison can be clearer. In this part, we need to make comparison between balance diet and low carbohydrate diet to find out the impact of functions performance in OA knee.

Objective

Essentially, the aim of the study will involve comparing the impact of a balance diet with that of low-carb diet with regard to enhancing functional exertion in the osteoarthritis knee.

2. Methodology

Participants: The study enrolled 20 subjects, male and female, aged between 30-60 years who had osteoarthritis for more than six months with knee joint pain in physiotherapy clinic. Patients who have previously received a diagnosis of OA knee by an orthopaedician. The patients with cardiovascular disease, any kind of psychological disorders, and reluctant patients were not included in this study. Voluntary participants' consent was sought from the subject. Demographic data was noted from patients' records of reply subject to the selection criteria of inclusion and exclusion criteria were randomly divided into two groups. Blinding was done in this case while the subjects were advised not to communicate on the treatment given to them. The study was conducted for a total of one month and there were no students who dropped out of the study.

Intervention to be implemented to the participants

1. The Numeric Pain Rating Scale or NPRS Scale will be taken pre-treatment to assess Osteoarthritis of the knee.
2. The changes will be observed gradually and throughout the course of the study, specifically during and at the end of each stage of the study.
3. GROUP A: will be assigned Low carb diet and Conventional therapy (IFT + Hot pack + Resistance Exercises of Quadriceps and Hamstrings).

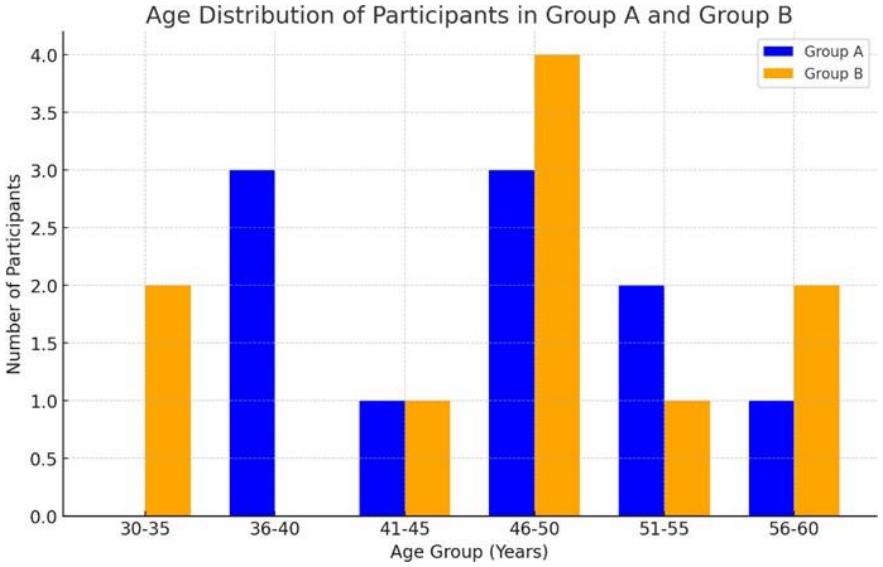
4. GROUP B: is a treatment plan that entails IFT, hot pack, and resistance exercises for the quadriceps and hamstrings.
5. The Physical therapists are distinguished to assess the sum of the NPRS Scale after treatment.

Results

Data collected of pain for of 20 subjects was analyzed using suitable statistical analysis tests using Graph Pad Prism 5 version (Graph Pad Software, Inc.7825 Fay Avenue, Suite 230La Jolla, CA 92037 USA).
In this study, the level of significance taken was 0.05, hence making any p-value of less than 0.05 statistically significant. As for the data analysis, frequencies and percentages were provided in tables and graphs. Chi-square test was also used in comparing functions in between groups. Independent T test was conducted to analyze the difference in ISO scores between the two groups after completion of the two diets. When comparing the groups within, the result suggested that there was a positive increase in the NPRS score achieved.

Comparing age distribution of patients

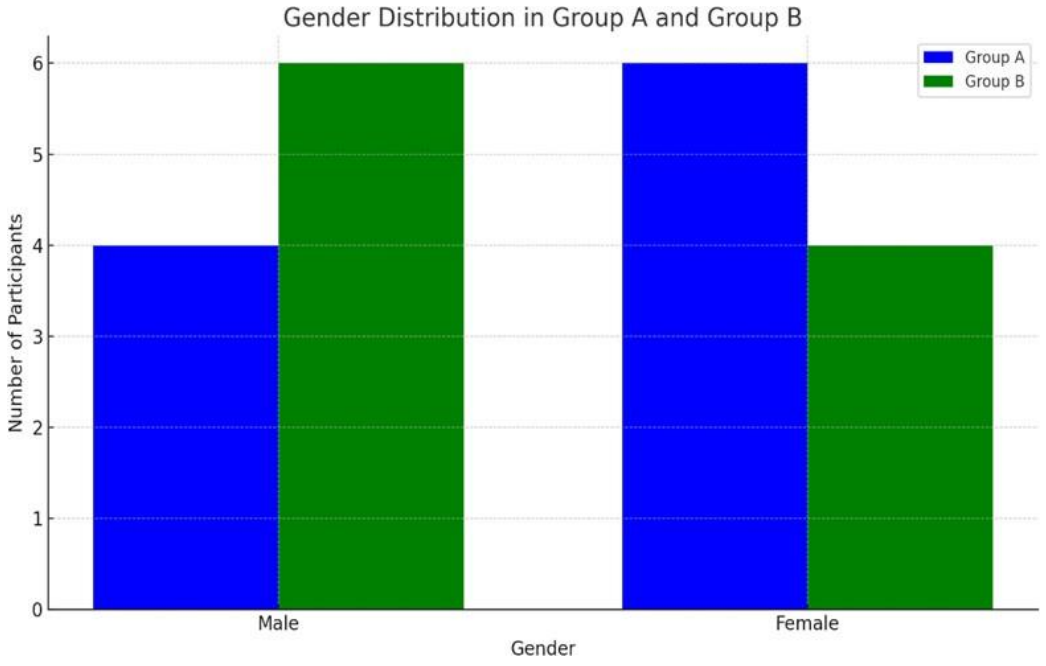
Age in years	Group A	Group B		
	No.	%	No.	%
30-35	0	0	2	20
36-40	3	30	0	0
41-45	1	10	1	10
46-50	3	30	4	40
51-55	2	20	1	10
56-60	1	10	2	20
Total	10	100	10	100
Mean ± SD	1.78 ± 1.00	1.68 ± 1.22		



Here is the bar graph showing the age distribution of participants in Group A and Group B. The x-axis represents the age groups, and the y-axis shows the number of participants in each group.

Graph Bar 1
Sex distribution

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

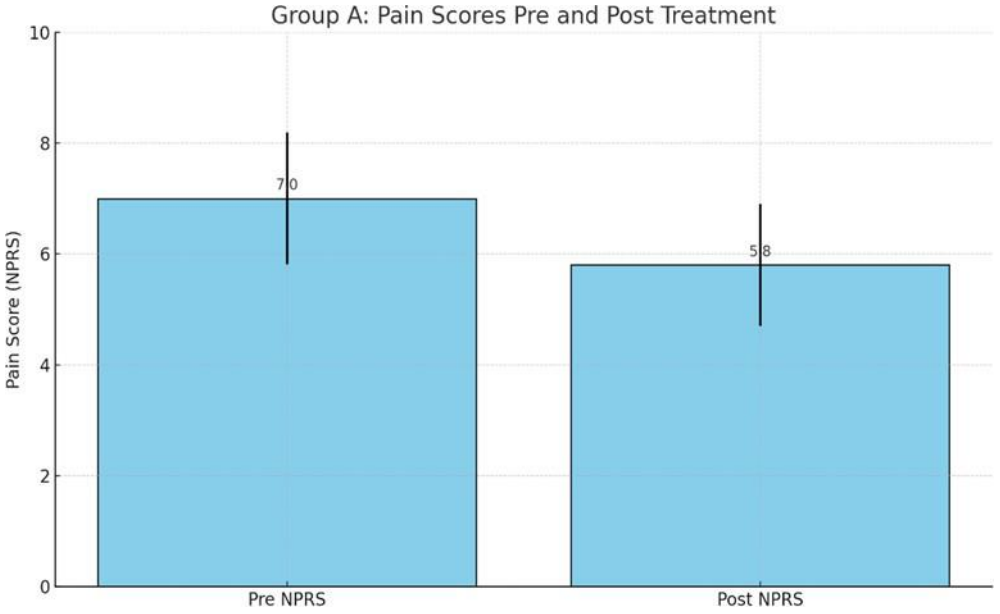


Here is the bar graph showing the gender distribution for both Group A and Group B. It visualizes the number of male and female participants in each group.

With in group analysis of NPRS-Group A

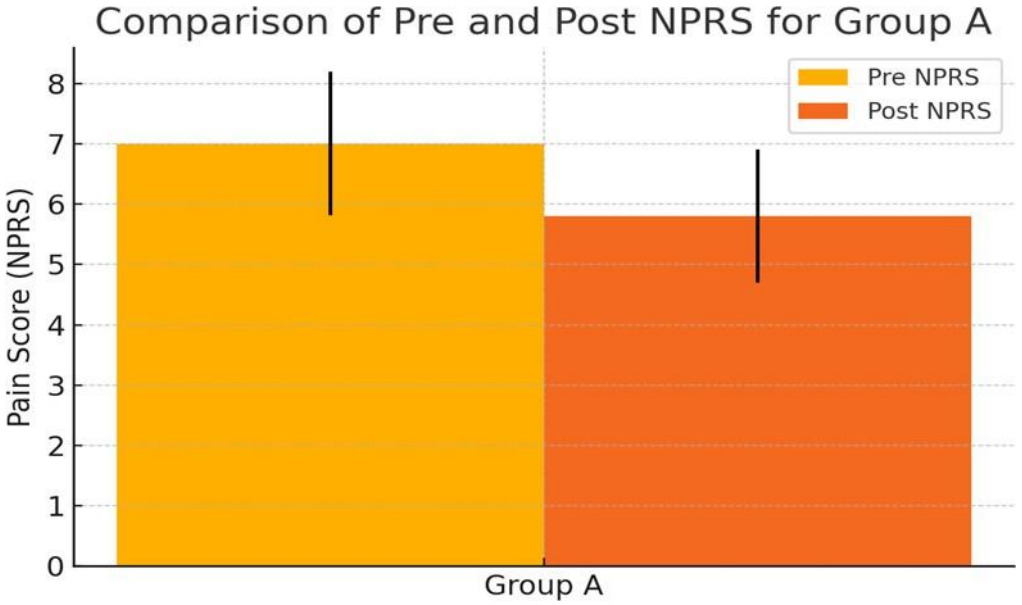
Variables	Group A Mean ± SD	Mean Difference	t	p

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

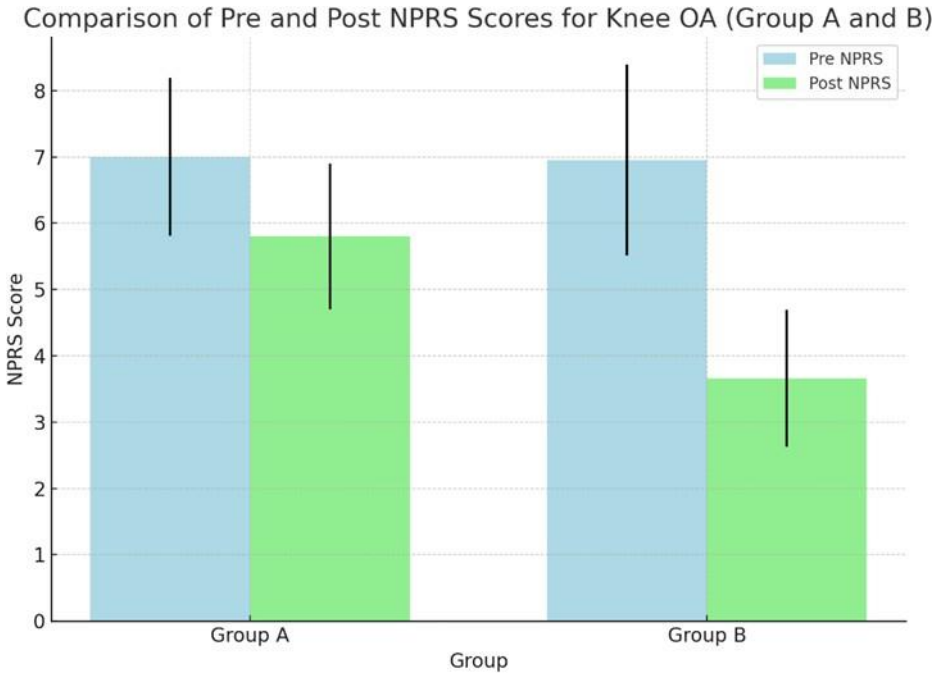
Variables	Group A Mean ± SD	Mean Difference	t	p
Mean Pre NPRS	7.00 ± 1.19	-1.19	4.45	p<0.002
Mean Post NPRS	5.80 ± 1.10			



Here is the bar graph comparing the pre and post NPRS scores for Group A, showing the pain score changes over time with their respective error bars.

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		



Here is the bar graph showing the comparison of pre and post NPRS scores for knee osteoarthritis in Group A and Group B. The graph includes error bars representing the standard deviation for each group.

Discussion

The study compared the effectiveness of balance diet and low carb diet regarding the reduction of pain in OA knee. The time 0 values of the different dependent variables are equivalent showing that all the groups had a standard set of patients. Knee O.A. is one of the most common joint diseases that appears to have a huge impact on functionality and disability. Several studies reveal that the secondary gait change pattern of O.A. is attributed to pain, low muscle strength, stability and stiffness.

Therefore, the findings of the study also show that Low carb diet is more effective in improving pain rather than the balance diet. The group of the patients that was on low carb diet (Group B) recorded greater improvement of 29.57% in mean NPRS scores compared to the group of patients who consumed balanced diet (Group A) who recorded an improvement of 7.33%. For subjects in the group A, the mean NPRS score was 7.00 ± 1.19 on day 1 and 5.80 ± 1.10 on the 4th week. Group B: The subjects were having mean NPRS score of 6.95 ± 1.44 on day one and 4.14 ± 1.25 on 4th week.

In the present work, authors have explored the role of pain in knee OA. As postulated by Arata statistically significant change is evident in the two groups as well as between the groups for pain. Nonetheless, the level of enhancement observed for Group B is higher than in Group A.

Oxidative stress has been established to be caused by carbohydrates, so it was expected that overconsumption of carbohydrates would lead to oxidative stress, pain, and inflammation. Therefore, these effects would reduce if carbohydrates intake was also minimized in patients with KOA. We also found significant differences in the pain score among the diet groups and thus, we think that the improvement is not due to weight loss, but is due to the quality of the diet. This has been supported in the literature in the arthritis consummatory process research.

This indicates that KOA pain is not necessarily a result of inflammatory pain from some peripheral structure in the knee. Nonetheless, our results suggest that this antioxidant susceptibility could be associated with functional KOA pain as the hiobarbituric acid reactive substance alteration correlated to the alteration in the pain intensity ratings after temporal summation tests as well as to repeated chair stand tests.

Limitation

Due to the improvement in the hiobarbituric acid reactive substances in the low carb group most of which was attributed to the women, more research can be done to discover the sex differences that may result

from diet on hiobarbituric acid reactive substances.

Sample size was small

If the study is to be carried out for few more months the following amendments are likely to be made and identified as follows:

Future Research

For the future work, research can be taken to a larger population. It can be done on different topics of any subject as well as different ages of children that are involved. More research can be done for other months with changes in the blood test result.

Conclusion

The outcome of the analysis of the findings showed that low carb diet has a better impact in reducing pain in the KOA patients.

References

1. Cena H, Calder PC. Defining a Healthy Diet: Evidence for The Role of Contemporary Dietary Patterns in Health and Disease. Nutrients. 2020 Jan 27;12(2):334. doi: 10.3390/nu12020334. PMID: 32012681; PMCID: PMC7071223.
2. Karmaveer Bhaurao Patil Mahavidyalaya, Tal. Pandharpur Dist STUDY ON AWARENESS OF NUTRITIONAL BALANCED DIET AND EATING PRACTICE'S AMONG COLLEGE STUDENTS. INTERNATIONAL JOURNAL OF RESEARCH CULTURE SOCIETY. 2020 Apr 5.245. doi: 2456-6683
3. Lim S. Eating a Balanced Diet: A Healthy Life through a Balanced Diet in the Age of Longevity. J Obes Metab Syndr. 2018 Mar 30;27(1):39-45. doi: 10.7570/jomes.2018.27.1.39. PMID: 31089539; PMCID: PMC6489487.
4. Clark JE. A small switch in perspective: Comparing weight loss by nutrient balance versus caloric balance. Biol Sport. 2024 Jul;41(3):177-189. doi: 10.5114/biolsport.2024.133666. Epub 2024 Jan 30. PMID: 38952898; PMCID: PMC11167477.
5. Osugi K, Kusunoki Y, Ohigashi M, Kusunoki K, Inoue C, Inoue M, Takagi A, Tsunoda T, Kadoya M, Konishi K, Katsuno T, Koyama H; Hyogo Diabetes Hypoglycemia Cognition Complications (HDHCC) study group. Association between low-carbohydrate diets and continuous glucose monitoring-derived time in ranges. J Diabetes Investig. 2023 May;14(5):659-668. doi: 10.1111/jdi.13999. Epub 2023 Feb 28. PMID: 38078864; PMCID: PMC10119912.
6. Oh R, Gilani B, Uppaluri KR. Low-Carbohydrate Diet. [Updated 2023 Aug 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK537084/
7. Naude CE, Brand A, Schoonees A, Nguyen KA, Chaplin M, Volmink J. Low-carbohydrate versus balanced-carbohydrate diets for reducing weight and cardiovascular risk. Cochrane Database Syst Rev. 2022 Jan 28;1(1):CD013334. doi: 10.1002/14651858.CD013334.pub2. PMID: 35088407; PMCID: PMC8795871.
8. Heidari B. Knee osteoarthritis prevalence, risk factors, pathogenesis and features: Part I. Caspian J Intern Med. 2011 Spring;2(2):205-12. PMID: 24024017; PMCID: PMC3766936.
9. Primorac, D.; Molnar, V.; Rod, E.; Jeleč, Ž.; Čukelj, F.; Matišić, V.; Vrdoljak, T.; Hudetz, D.; Hajsok, H.; Borić, I. Knee Osteoarthritis: A Review of Pathogenesis and State-Of-The-Art Non-Operative Therapeutic Considerations. Genes 2020, 11, 854. https://doi.org/10.3390/genes1108085
10. Strath LJ, Jones CD, Philip George A, Lukens SL, Morrison SA, Soleymani T, Locher JL, Gower BA, Sorge RE. The Effect of Low-Carbohydrate and Low-Fat Diets on Pain in Individuals with Knee Osteoarthritis. Pain Med. 2020 Jan 1;21(1):150-160. doi: 10.1093/pm/pnz022. PMID: 30865775; PMCID: PMC7999621.
11. Strath LJ, Jones CD, Philip George A, Lukens SL, Morrison SA, Soleymani T, Locher JL, Gower BA, Sorge RE. The Effect of Low-Carbohydrate and Low-Fat Diets on Pain in Individuals with Knee Osteoarthritis. Pain Med. 2020 Jan 1;21(1):150-160. doi: 10.1093/pm/pnz022. PMID: 30865775; PMCID: PMC7999621.
12. Haider MZ, Bhuiyan R, Ahmed S, Zahid-Al-Quadir A, Choudhury MR, Haq SA, Zaman MM. Risk factors of knee osteoarthritis in Bangladeshi adults: a national survey. BMC Musculoskelet Disord. 2022 Apr 8;23(1):333. doi: 10.1186/s12891-022-05253-5. PMID: 35395747; PMCID: PMC8991964.
13. Messier SP. Diet and exercise for obese adults with knee osteoarthritis. Clin Geriatr Med. 2010 Aug;26(3):461-77. doi: 10.1016/j.cger.2010.05.001. Erratum in: Clin Geriatr Med. 2013 May;29(2):ix. PMID: 20699166; PMCID: PMC3444812.
14. Stephen P. Messier, Leigh F.etc.A randomized controlled trial of diet and exercise to prevent Knee Osteoarthritis: Design and rationale,Osteoarthritis and Cartilage Open,Volume 6, Issue 1,2024,100418,ISSN 2665-9131, doi.org/10.1016/j.ocarto.2023.100418
15. Strath LJ, Jones CD, Philip George A, Lukens SL, Morrison SA, Soleymani T, Locher JL, Gower BA, Sorge RE. The Effect of Low-Carbohydrate and Low-Fat Diets on Pain in Individuals with Knee Osteoarthritis. Pain Med. 2020 Jan 1;21(1):150-160. doi: 10.1093/pm/pnz022. PMID: 30865775; PMCID: PMC7999621.
16. Haider MZ, Bhuiyan R, Ahmed S, Zahid-Al-Quadir A, Choudhury MR, Haq SA, Zaman MM. Risk factors of knee osteoarthritis in Bangladeshi adults: a national survey. BMC Musculoskelet Disord. 2022 Apr 8;23(1):333. doi: 10.1186/s12891-022-05253-5. PMID: 35395747; PMCID: PMC8991964.
17. Messier SP. Diet and exercise for obese adults with knee osteoarthritis. Clin Geriatr Med. 2010 Aug;26(3):461-77. doi:

10.1016/j.cger.2010.05.001. Erratum in: Clin Geriatr Med. 2013 May;29(2):ix. PMID: 20699166; PMCID: PMC3444812.
18. Stephen P. Messier, Leigh F.etc.A randomized controlled trial of diet and exercise to prevent Knee Osteoarthritis: Design and rationale,Osteoarthritis and Cartilage Open,Volume 6, Issue 1,2024,100418,ISSN 2665-9131, doi.org/10.1016/j.ocarto.2023.100418.