ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Dietary Fiber: Its Consumption Patterns and Role in Satiety and Weight Management.

Sneha Dnyaneshwar Unhale[1]*, and Renuka Sagar Gite[2].

[1]Assistant Professor, Department of Dietetics, Dr. D.Y Patil Arts, Commerce and Science College Pimpri Pune -411018, Maharashtra, India.
[2]MSC Student Department of Dietetics, Dr. D.Y Patil Arts, Commerce and Science College Pimpri Pune -411018, Maharashtra, India.

ABSTRACT

This research offers an investigation of trends in dietary fiber intake and its effect on satiation by Indian adults aged more than 21 years. Dietary fiber, a macronutrient found in plants, facilitates digestion and controls hunger. This research sought to assess the knowledge, attitudes, and practices (KAP) of fiber consumption and satiety, especially against the background of increased intake of low-fiber content processed foods. A cross-sectional study was conducted with a standardized questionnaire sent out through Google Forms among 147 participants. One-way ANOVA was used to explore the connection between fiber consumption and the time taken for satiety. The findings showed higher consumption of fiber, especially in combination with proteins and fats, enhancing satiety, hunger control, and positively affecting weight as well as gastrointestinal health. Of note, 68% of the subjects indicated that their health had improved as a result of higher fiber intake. Vegetables were the most commonly eaten high-fiber food. The study identifies the function of fiber in food as a way of inducing fullness and improving long-term health. The results recommend more intake of dietary fiber as a method for improved weight regulation and general health.

Keywords: Dietary fiber, Satiety, Hungry, Gut Health, Indian Adults.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Eben Hipsley [1] coined the term "dietary fiber" in 1953 when he observed that populations with diets high in foods high in fiber also tended to have reduced incidence of pregnancy toxicemia (Hipsley, 1953). The part of plant foods that escaped solvent, acid, and alkali extractions was previously referred to as "crude fiber" in analytical terminology (Trowell, 1976) (29). "Dietary fiber" was originally defined as unavailable plant material—that is, plant material that did not pass through the human upper GI tract and be absorbed (Knudsen, 2001) [13].

Like carbs, protein, and fat, dietary fiber is one of the macronutrients. We require a lot of these elements in our diet (Compaore-Sereme et al., 2022) [8]. Another name for it is complex carbs. Many nations throughout the world are adhering to this suggestion in an effort to lower the risk of diseases like some cancers, heart disease, and stroke. Micronutrients, phytochemicals, and most significantly, dietary fiber, are abundant in fruits and vegetables. The portion of plant material present in the diet that cannot be easily digested by the secretions of the gastrointestinal tract is referred to as dietary fiber (Dhingra et al., 2012) [9]. Its components include nonpolysaccharide lignin, cellulose, hemicellulose, pectins, gums, and mucilages (Yao & Komarek, 2017). Certain fiber releasing products can be broken down by certain bacteria in the large intestine and then absorbed by the body and utilised as a source of energy.

There are main two types of dietary fibers; Soluble fibers and Insoluble fibers (Chawla & Patil, 2010) [7].

The term "soluble" refers to a food fiber's capacity to dissolve in water. Dietary fibers that are soluble in water have a higher affinity than insoluble fibers. SDFs are made up of a variety of active ingredients with distinct structures, the two primary ones being viscous dietary fibers with a high molecular weight and resistant oligosaccharides (Surampudi et al., 2016) [23]. The outer skin of plants contains insoluble fibers, which are not soluble in water, less likely to ferment, and, for the most part, incapable of being fermented by bacteria in the colon (Guan et al., 2021) [11]. They consequently make up the majority of the feces and contribute in laxation (Mudgil, 2017) [16].

Only plant-based foods, such as fruits, vegetables, grains, and nuts, contain dietary fiber (Redgwell & Fischer, 2005). The amount of fiber in a food may or may not depend on its shape. The fiber content of the frozen and canned fruits and vegetables is the same as that of raw fruits and vegetables. Other processing techniques, however, might reduce the fiber content (Buttriss & Stokes, 2008) [6].

The objective of the study is also to study the dietary fiber is also linked to a number of health problems, including depression, obesity, food allergies and intolerances, type 2 diabetes, hyperlipidemia, colon cancer, gut motility, weight loss, energy balance and food management (Swann et al., 2020) [24]; (Barber et al., 2020) [4]. Dietary fiber also primarily helps with metabolic effects such as increased excretion of bile acids from the feces, decreased enzyme performance, and delayed gastric emptying, and water holding capacity and viscosity (Lattimer & Haub, 2010) [14]; (Lefranc-Millot et al., 2012) [15]. The state that follows eating and is known as satiety is the suppression of additional eating, which includes the connection between dietary fiber and satiety. Dietary fiber is a vital component of a healthy diet and is well known for its capacity to promote satiety (Freeland et al., 2009) [10]; (Akhlaghi, 2024) [1]. For these purposes, dietary fiber could seem to be the best option.

MATERIAL AND METHODS

For analysing the contribution of dietary fiber to satiety and public opinion, a survey was carried out using an online survey tool google forms and distributed to individuals belonging to different age groups. Microsoft Excel was used to help analyze the data that was gathered.

KAP Survey

The study, which assessed people's knowledge of dietary fiber, attitudes towards its health benefits, and actual consumption rates, was based on the Knowledge, Attitude, and Practice (KAP) paradigm. The questionnaire asked about knowledge of foods high in fiber, opinions regarding the health

and satiety benefits of fiber, and habits related to fiber consumption. This paradigm significantly increased our understanding of the relationship between eating patterns, feelings of fullness, and weight control.

Study Population and Sample:

The target population for the study was individuals 21 years and older, who were selected by convenience sampling from the Indian adults. Participants who were 21 years and above, willing to participate voluntarily, and able to read and reply on their own were included.

Study Participants and Tools

With the aid of an online survey conducted with Google Forms and distributed through digital media, a cross-sectional study was done. The aim, consent, and succinct summary of the study were provided to the participants. Data was gathered from March 2024 to January 2025, with 147 responses.

Measurements

A formal five-part questionnaire—about informed consent, demographics, fiber consumption (form, how often, supplements, portions), awareness of satiety and appetite suppression, and perception of health—was administered to measure respondents understanding of dietary fiber. Consumption of fibre was rated daily, 3–5 times a week, 1–2 times a week, or rare.

Data Analysis

Data from the poll was cleaned and analyzed using Microsoft Excel. Satiety levels and patterns of fiber consumption were treated as dependent variables and age and occupation as independent variables in the study. The consumption of fibre differed considerably ($p < 0.05$) by age and occupation, as per one-way ANOVA.

RESULT AND DISCUSSION

A total of 147 Indian adults participated in the study, consisting of 89 female (60.5%) and 58 male (39.5%).The mean age of adults was 21 years above. The results of the present study evolved as a result of an extensive analysis of the gathered data, followed by a systematic exploration of the data through proper statistical methods. Through this rigorous research process, the researcher could obtain relevant information from the study. These findings along with their respective dimensions make up the content of the Results and Discussion section.

Information on dietary fiber intake patterns and the impact on satiety was carefully collected and examined for the current research. The findings in the study were more precise and reliable because the diversified responses were systematically recorded and analyzed with advanced statistical techniques.

The (fig: 2.2.2) indicated that, as perceived by 28.8% (N=42) of the respondents, vegetables (like broccoli and carrots) were the most frequently eaten food group among the high-fiber foods. 24% (N=35) of the respondents choose whole grains (like oats and brown rice), while 23.3% (N=34) choose fruits (like apples and berries). 14.4% (N=21) of the participants selected legumes (i.e., beans, lentils), while 9.5% (N=14) of individuals reported other foods that are rich in fiber.

The breakdown of participants by frequency of intake of foods rich in fiber is presented in (table 2.3.1) Most of the 147 participants exhibited a moderate to high frequency of intake of foods rich in fiber. Over one-third of the participants have foods rich in fiber in their diets on a regular basis, as shown by the 53 participants (36.1%) with daily consumption. The highest percentage of participants (57, or 38.8%) reported eating foods high in fiber three to four times a week, which is a fairly regular but non-daily practice. 25 participants (17%) reported taking meals high in fiber only 1-2 times a week, reflecting an irregular intake of dietary fiber. Twelve participants (8.2%) reported rarely consuming foods high in fiber, which could reflect ignorance, unavailability, or willingness for such foods.

Based on the graph (2.4.2), 59% (N=85) of the participants responded that consuming foods rich in fiber assists in controlling appetite, 7.6% (N=11) disagreed, and 33.3% (N=48) were not sure. The majority of the participants believe that consuming foods rich in fiber assists in controlling appetite.

Average participants' satiety duration after a fiber meal is illustrated in graph (2.5.2).The significant satiety effect of fibre was indicated by the observation that 54 participants (37.2%) indicated feeling hungry after two to three hours, while the same number (37.2%) felt full for over three hours. But only 6.9% reported hunger in under an hour, and 18.5% reported hunger in one to two hours. Our data lend further support for the role of dietary fiber in the control of appetite and satisfaction of meal timing, suggesting that meals containing fibre significantly prolong satiety in most individuals.

Participants' answers about changes in body weight after increasing dietary fiber intake are shown in Table 2. 6.1. 98 out of 147 participants (68.5%) reported a positive improvement in body weight, indicating that fiber had a good effect on weight management. Despite increasing their intake of fibre, only one participant (0.7%) reported a negative change, while eleven participants (7.7%) saw no change at all. In addition, 33 participants (23.1%) indicated that they did not increase their consumption of fibre, indicating the need to encourage this group to take more fibre in. These findings add support for the notion that dietary fibre is an effective weight-management strategy. The highly positive response underscores the way fibre can assist in maintaining satiety, managing digestion, and enable individuals to achieve or maintain a healthy weight.

The graph (2.7.2) revealed that 52.9% (N=74) of respondents reported that consuming foods rich in fiber with protein or fats greatly impacted their degree of fullness. Nevertheless, 39.3% (N=55) reported they have not yet experimented with it, and 7.9% (N=11) responded that their combination does not make a difference. As the findings show, the majority of participants feel fuller after combining foods rich in fiber with either proteins or fats, suggesting that such a combination can be effective in enhancing fullness and control over appetite.

One-way ANOVA (3.1) was carried out to determine if there is a significant relationship between the quantity of fibre-containing food eaten and how long the respondents feel hungry again after a fibre-containing meal.

Statistical Inference

F-value = 97.64 is higher than F critical = 3.87

P-value = 4.9×10^{-20} is far less than 0.05, indicating the strongest statistical significance

Since F > F crit and P < 0.05, the null hypothesis is rejected. This is a large association between intake of fiber and satiety duration (how long it is before people become hungry again), which verifies that there is a statistically significant difference between the two groups.

The intake of fibrous foods and the time taken for individuals to feel hungry once more are inversely related, as shown in the ANOVA analysis. The hypothesis that fibre intake positively contributes to appetite control is affirmed by the longer time period for satiety experienced by subjects who consume foods rich in fiber on a regular basis. This finding is in line with previous research in this study that identified that numerous participants were in agreement that high fiber diets help regulate appetite. Therefore, the two factors are dependent on each other and closely related, highlighting the role of dietary fibre in managing appetite and inducing satiety.

One-way ANOVA (4.1) test was applied to determine whether there was a statistically significant relationship between the eating frequency of foods rich in fiber and the noticeable change in body weight. Inference from Statistics: The critical value (F crit = 3.87) is considerably lower than that of the F-value (17.78). The common significance level of 0.05 is far above the P-value (0.0000332). We deny the null hypothesis because F > F crit and P < 0.05, which means that the groups are statistically significantly different.

Based on the findings of the ANOVA research, individuals who ingest greater amounts of fiber-rich food are much more likely to experience positive changes in their body weight compared to

ISSN: 0975-8585

individuals who ingest less fiber. This confirms that dietary fiber consumption and weight regulation are clearly connected. Foods high in fiber most likely assist with the digestion process, feeling full, and calorie consumption reduction, all contributing to weight regulation. Accordingly, the test gives statistical evidence that the relationship between changes in body weight and fiber intake is related and dependent.

Figure 1.1: Sources of Fiber

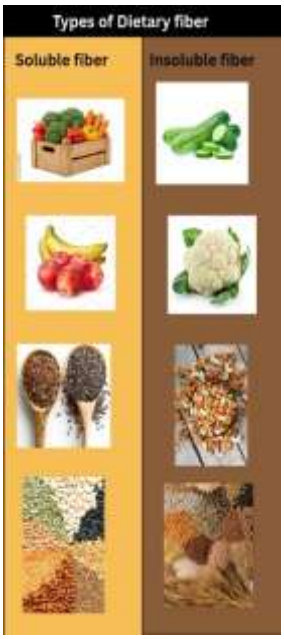


Figure 1.2: Effects of Dietary Fibers

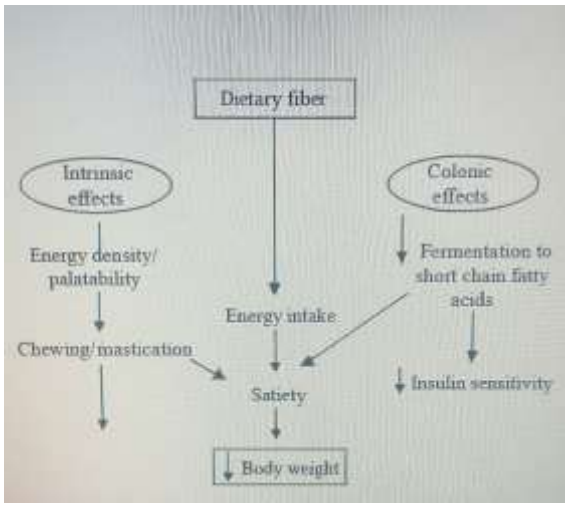


Table 2.1.2: Demographics Characteristics Of Participants

	Categories	Frequency(N=147)	Percentage (%)
Age	21-30	99	67.3%
	31-40	18	12.2%
	41-50	13	8.8%
	51-60	6	4.1%
	Above 60	11	7.5%
Gender	Male	58	39.5%
	Female	89	60.5%

ISSN: 0975-8585

Graph: 2.1.2

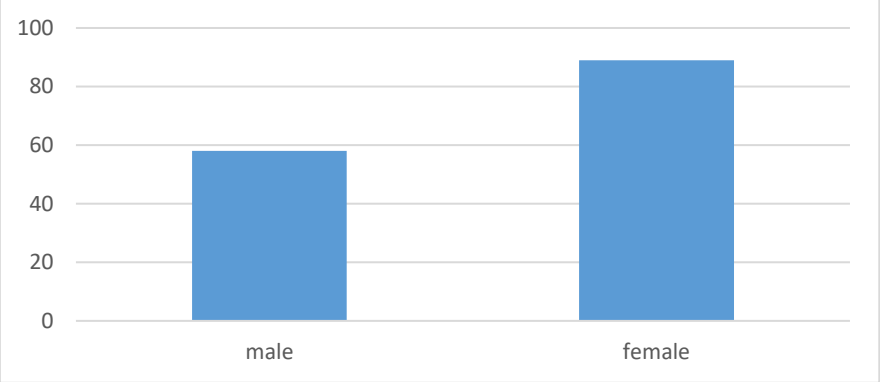


Table: 2.2.1: Knowledge About Types Of Dietary Fiber Rich Food

Knowledge about types of dietary fiber rich food	Frequency(N=147)	Percentage (%)
Whole grains (e.g., Oats,brown rice)	35	24%
Fruits (e.g., apples,berries)	34	23.3%
Vegetables(e.g., broccoli,carrots)	42	28.8%
Legumes (e.g., beans, lentils)	21	14.4%
Others	14	9.5%

Graph: 2.2.2

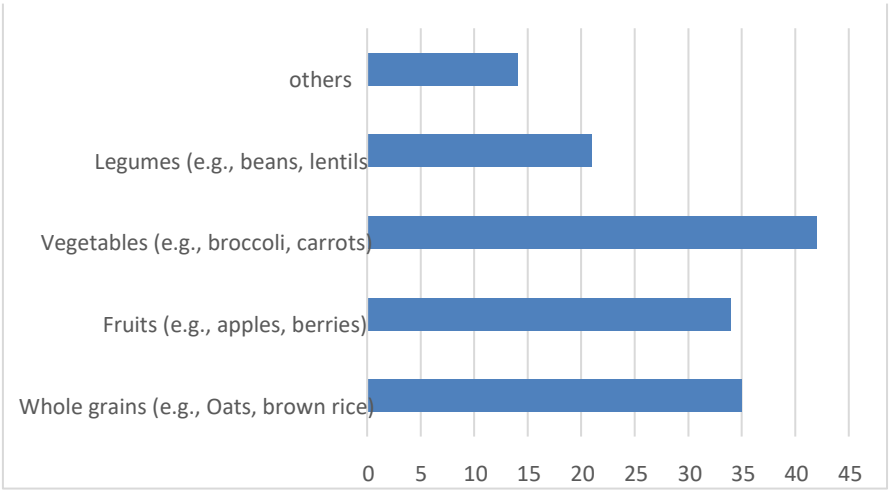


Table: 2.3.1: Frequency Of Consumption Of Fiber Rich Food

Often consumption of fiber rich foods by Indian adults	Frequency (N=147)	Percentage (%)
Daily	53	36.1%
3-4 times a week	57	38.8%
1-2 times a week	25	17%
Rarely	12	8.2%

ISSN: 0975-8585

Graph: 2.3.2

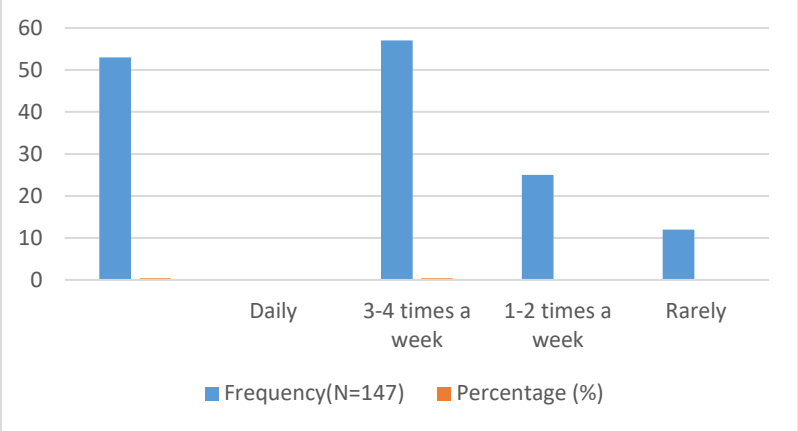


Table: 2.4.1: Dietary Fiber In Controlling Appetite

Fiber rich food helps in controlling appetite	Frequency (N=147)	Percentage (%)
Yes	85	59%
No	11	7.6%
Maybe	48	33.3%

Graph: 2.4.2

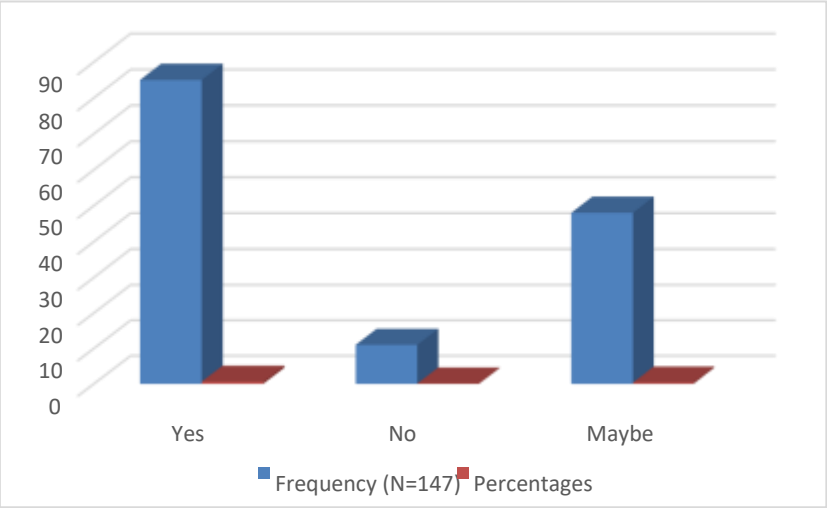


Table: 2.5.1: Frequency Of Hunger After Fiber Rich Food

Pattern	Frequency (N=147)	Percentage (%)
Less than 1 hour	10	6.9%
1-2 hours	27	18.6%
2-3 hours	54	37.2%
More than 3 hours	54	37.2%

ISSN: 0975-8585

Graph: 2.5.2

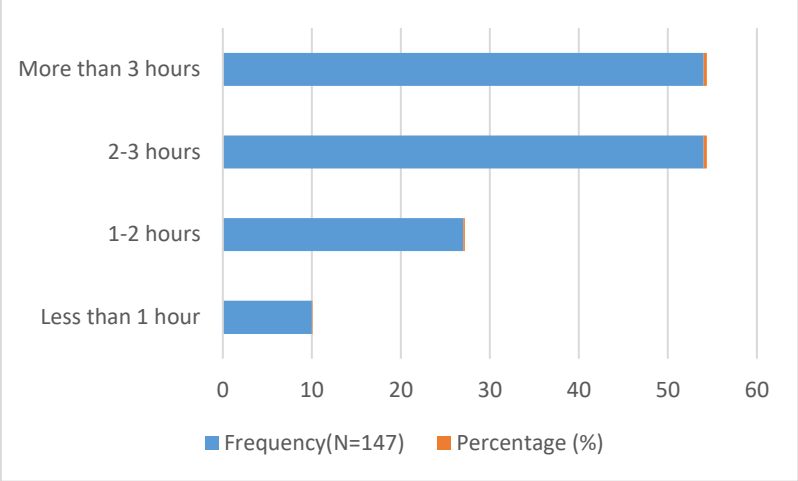


Table: 2.6.1: Effect Of Dietary Fiber On Body Weight

Notice any changes in body weight since increasing in fiber intake	Frequency (N=147)	Percentage (%)
Yes, Positive change	98	68.5%
Yes, negative change	1	0.7%
No change	11	7.7%
I haven't increased my fiber intake	33	23.1%

Graph: 2.6.2

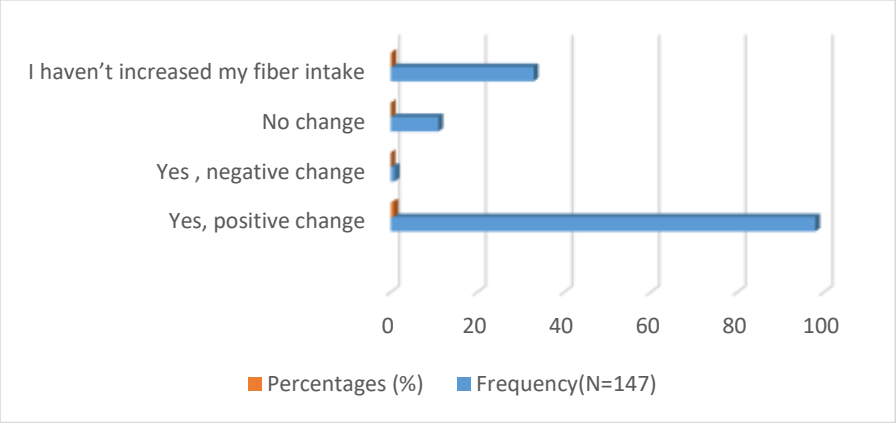
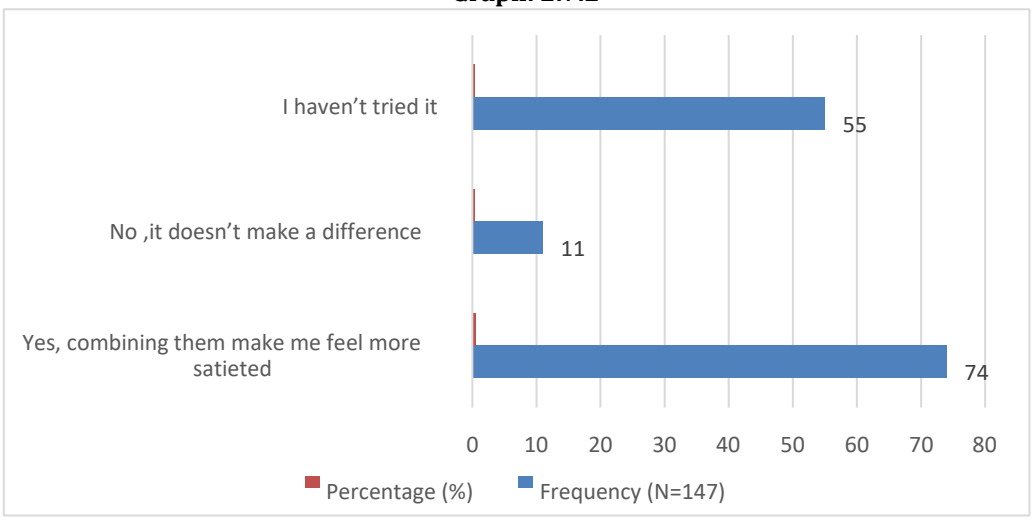


Table: 2.7.1: Combination Of Dietary Fiber With Protein Or Fats

Feels a difference in satiety when you combine fiber rich foods with protein or fats	Frequency (N=147)	Percentage (%)
Yes, combining them make me feels more satiated	74	52.9%
No, it doesn't make a difference	11	7.9%
I haven't tried it	55	39.3%

ISSN: 0975-8585

Graph: 2.7.2



ANOVA Single Factor Test

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	147	291	1.97959184	0.869444
Column 2	145	442	3.04827586	0.837931

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	83.368334	1	83.3683336	97.64432	4.9E-20	3.873724
Within Groups	247.60084	290	0.85379602			
Total	330.96918	291				

ANOVA Single Factor Test

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	147	291	1.979592	0.869444
Column 2	143	220	1.538462	0.71506

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	14.10552	1	14.10552	17.78028	3.32344E-05	3.87395
Within Groups	228.4772	288	0.793324			
Total	242.5828	289				

CONCLUSION

Daily intake of fiber is significantly connected with long-term satiety, as this study clearly illustrates—individuals who regularly ate dietary fiber felt they were full for significantly longer periods after meals. Consistent with fiber's role in controlling hunger and weight, greater intake of fiber-rich foods was strongly linked with positive body weight changes. These statistically significant findings validate that providing fiber as a daily supplement is an efficient method of supporting Indian adults with maintaining a normal body weight and enhancing satiety.

REFERENCES

[1] Akhlaghi, M. (2024). The role of dietary fibers in regulating appetite, an overview of mechanisms and weight consequences. Critical Reviews in Food Science and Nutrition, 64(10),3139-3150.

[2] Anderson, J. W., Deakins, D. A., Floore, T. L., Smith, B. M., & Whitis, S. E. (1990). Dietary fiber and coronary heart disease. Critical Reviews in Food Science and Nutrition, 29(2), 95– 147.

[3] Armet, A., Deehan, E., Hewko, S., Thoene, V., & Walter, J. (2019). The effect of isolated dietary fiber supplements on markers of metabolic diseases in human intervention studies: a systematic review (P08-077-19). Current Developments in Nutrition, 3, nzz044-P08.

[4] Barber, T. M., Kabisch, S., Pfeiffer, A. F., & Weickert, M. O. (2020). The health benefits of dietary fiber. Nutrients, 12(10), 3209.

[5] Bunck, M. C., Diamant, M., CORNer, A. N. J. A., Eliasson, B., Malloy, J. L., Shaginian, R. M.... & Heine, R. J. (2009). One-year treatment with exenatide improves β-cell function, compared with insulin glargine, in metformin-treated type 2 diabetic patients: a randomized, controlled trial. Diabetes care, 32(5), 762-768.

[6] Buttriss, J. L., & Stokes, C. S. (2008). Dietary fiber and health: an overview. Nutrition Bulletin, 33(3), 186-200.

[7] Chawla, R. P. G. R., & Patil, G. R. (2010). Soluble dietary fiber. Comprehensive reviews in food science and food safety, 9(2), 178-196.

[8] Compaore-Sereme, D., Tapsoba, F. W. B., Zoénabo, D., Compaoré, C. S., Dicko, M. H., & Sawadogo-Lingani, H. (2022). A review on dietary fiber: definitions, classification, importance and advantages for human diet and guidelines to promote consumption. International Journal of Biological and Chemical Sciences, 16(6), 2916-2929.

[9] Dhingra. D.. Michael. M.. Rajput. H.. Patil. R. T. (2012). Dietary fiber in foods: a review. Journal of Food Science and Technology. 49(3), 255-266.

[10] Freeland, K. R., Anderson, G. H., & Wolever, T. M. (2009). Acute effects of dietary fiber and glycaemic carbohydrate on appetite and food intake in healthy males. Appetite, 52(1), 58-64.

[11] Guan, Z. W., Yu, E. Z., & Feng, Q. (2021). Soluble dietary fiber, one of the most important nutrients for the gut microbiota, 26(22), 6802.

[12] Ibrahim, O., & Menkovska, M. (2022). Dietary fibers-classification, properties, analysis and function: A Review. Advances in Bioscience and Biotechnology, 13(12), 527-544. https://www.scirp.org/journal/paperinformation?paperid=121937

[13] Knudsen, K. B. (2001). The nutritional significance of "dietary fiber" analysis. Animal feed science and technology, 90(1-2), 3-20.

[14] Lattimer, J. M., & Haub, M. D. (2010). Effects of Dietary Fiber and Its Components on Metabolic Health. Nutrients, 2(12), 1266-1289.

[15] Lefranc-Millot, C., Macioce, V., Guérin-Deremaux, L., Lee, A. W., & Cho, S. S. (2012). Fiber and Satiety. Dietary Fiber and Health, 83.

[16] Mudgil, D. (2017). The interaction between insoluble and soluble fiber. In Dietary fiber for the prevention of cardiovascular disease (pp. 35-59). Academic Press.

[17] Myhrstad, M. C., Tunsjø, H., Charnock, C., & Telle-Hansen, V. H. (2020). Dietary fiber, gut microbiota, and metabolic regulation—Current status in human randomized trials. Nutrients, 12(3), 859. https://www.mdpi.com/2072-6643/12/3/859

[18] Redgwell, R. J., & Fischer, M. (2005). Dietary fiber as a versatile food component: an industrial perspective. Molecular nutrition & food research, 49(6), 521-535.

[19] Reddy, B. S. (1999). Role of dietary fiber in colon cancer: an overview. The American journal of medicine, 106(1), 16-19.

[20] Singh, N., Benjamin, S., Lakdawala, M., & Nawathe, V. Fiber Gap in the Daily Diet of Indian Population: A Narrative. https://ijmpr.in/uploads/article/IJMPR43225-13-18.pdf

[21] Slavin, J. (2013). Fiber and prebiotics: mechanisms and health benefits. Nutrients, 5(4), 14171435.
[22] Slavin, J. L. (2005). Dietary fiber and body weight. Nutrition, 21(3), 411-418.
[23] Surampudi, P., Enkhmaa, B., Anuurad, E., & Berglund, L. (2016). Lipid lowering with soluble dietary fiber. Current atherosclerosis reports, 18, 1-13.
[24] Swann, O. G., Kilpatrick, M., Breslin, M., & Oddy, W. H. (2020). Dietary fiber and its associations with depression and inflammation. Nutrition Reviews, 78(5), 394-411.
[25] Thilagavathi, T., Pandiyan, M., Suganyadevi, M., Sivaji, M., Yuvaraj, M., & Sasmitha, R. (2020). Dietary fiber-health benefits. Biotica Research Today, 2(6), 519-522. Article:RT0205
[26] Ullrich, I. H. (1987). Evaluation of a high-fiber diet in hyperlipidemia: a review. Journal of the American College of Nutrition, 6(1), 19-25. http://dx.doi.org/10.1080/07315724.1987.10720161
[27] Yao Olive Li, Andrew R Komarek, Dietary fiber basics: Health, nutrition, analysis, and applications, Food Quality and Safety, Volume 1, Issue 1, 1 March 2017, Pages 47–59,
[28] Yusuf, K., Saha, S., & Umar, S. (2022). Health benefits of dietary fiber for the management of inflammatory bowel disease. Biomedicines, 10(6), 1242. https://www.mdpi.com/2227-9059/10/6/1242
[29] Trowell H. Definition of dietary fiber and hypotheses that it is a protective factor in certain diseases. Am J Clin Nutr. 1976 Apr;29(4):417-27.