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Association Between Plant-Based Dietary Intake and Anthropometric Measurements

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ABSTRACT

The benefits of plant-based diets in enhancing health and lowering the risk of chronic illnesses are becoming more widely acknowledged. **Objectives:** To establish a correlation between a plant-based dietary intake and anthropometric measurements among adults. **Methods:** This cross-sectional study was conducted on 200 adults (20–50 years old) from community centers in Lahore. The validated food frequency questionnaire was used to measure dietary intake of foods. Anthropometric Indicators were measured. Groups of participants were organized according to how much or how little they consume plant-based foods. SPSS version 26.0 was used to analyze the data, and independent t-tests were used for comparison. **Results:** Among 200 participants, 55% consumed legumes three or more times per week, 40% had three or more servings of whole grains daily, 70% consumed at least two servings of vegetables per day, and 65% had three or more servings of fruit daily. **Conclusions:** Individuals with higher intake of plant-based foods had significantly lower waist-to-hip ratio, body mass index, and lower waist circumference than those with lower intake.

INTRODUCTION

Plant diets have been noted to have the capacity to enhance health and prevent chronic illnesses [1, 2]. These diets contain large amounts of essential nutrients, fiber, and bioactive compounds, which help to achieve better nutritional status and decrease the risk of developing many health conditions [3, 4]. Diet is very important in preserving human health and in the prevention of chronic diseases. There is growing evidence that plant-based diets are a source of necessary nutrients, bioactive compounds, and antioxidants that promote metabolic health, weight control, and disease prevention [5, 6]. Studies have shown that dietary patterns that involve following vegan-based diets are linked to healthy results. To illustrate, it has been found that people who adhere to plant-based diets are likely to be less fat, experience lowered blood pressure, and have better lipid profiles [7-9]. Moreover, Plant-based diets have been linked to decreased levels of inflammation and oxidative stress, which has been attributed to the development of chronic diseases [10, 11]. Although these advantages exist, nutritional trends in most communities have been moving to high consumption of processed and animal-based food products, and many studies are needed regarding the impact of plant-based diets [12, 13]. To help guide dietary recommendations for the local population,

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this study examines the relationship between plant-based food intake and health indicators. There is currently little data on how plant-based diets affect nutritional and anthropometric indicators in Pakistani adults.

Despite growing global evidence supporting the health benefits of plant-based dietary patterns, limited empirical data are available regarding their association with anthropometric indicators in Pakistani adults. Most existing studies have been conducted in Western populations, and cultural dietary variations may influence outcomes in local settings. Furthermore, few community-based studies have quantitatively assessed plant-based intake using structured dietary tools alongside standardized anthropometric measurements. This gap underscores the need to evaluate the relationship between plant-based dietary consumption and body composition indicators within the local population. This study aims to establish a correlation between a plant-based dietary intake and anthropometric measurements among adults.

METHODS

This analytical cross-sectional study was conducted on 200 adults aged 20–50 years to analyze the association between plant-based dietary intake and anthropometric measurements. The study was conducted for 5 months from May 2024 to September 2024. Participants were recruited using a convenience sampling method from multiple community centers located in urban areas of Lahore, Pakistan. This non-probability sampling approach was chosen for practicality, though it may limit the generalizability of the findings. A sample size of 200 was used for this study. A post-hoc power analysis was conducted using G*Power software, which indicated that this sample size provided over 80% power to detect a medium effect size (d=0.4) in the independent t-test comparisons of anthropometric measures between the high and low plant-based diet groups, assuming a two-tailed alpha of 0.05. Participants were recruited from multiple community centers located in urban areas of Lahore, Pakistan. Participants were categorized into 'high' or 'low' plant-based diet intake groups based on a composite score derived from the food frequency questionnaire. The score was calculated from the sum of weekly servings of fruits, vegetables, whole grains, and legumes. A median split was used, with participants scoring above the median classified as 'high intake' and those at or below the median as 'low intake'. Participants included healthy individuals consuming either a mixed or plant-based diet who were willing to provide dietary information, while those with chronic diseases, pregnancy, or special dietary restrictions were excluded. Informed written consent was obtained from all participants. Dietary intake was assessed using a validated food frequency questionnaire with a 0–7 consumption scale [14]. The questionnaire was adapted for the local population by including region-specific foods and portion sizes. Its reliability was confirmed in a pilot study (n=30) with a two-week test-retest, showing good reproducibility (Cronbach's alpha = 0.78). Anthropometric measurements included BMI, waist circumference, hip circumference, and waist-to-hip ratio, measured using standard procedures [15]. Data were analyzed in SPSS version 26.0 using an independent t-test and descriptive statistics. For the independent t-tests used for inter-group comparisons, the assumption of homogeneity of variances was verified using Levene's Test. As the data met the assumptions of normality and homogeneity of variances, parametric tests were appropriately applied.

RESULTS

A total of 200 participants were recruited, with a mean age of 34.2 ± 8.5 years. The sample had a balanced gender distribution (51% male, 49% female). Dietary assessment showed that 40% of participants consumed three or more daily servings of whole grains, 55% consumed legumes at least three times per week, 70% consumed at least two daily servings of vegetables, and 65% reported three or more fruit servings daily (Table 1).

Table 1: Participant Characteristics and Dietary Intake by Gender

Variables	Total (n=200)	Male (n=102)	Female (n=98)
Age (Years)	34.2 ± 8.5	35.1 ± 8.2	33.3 ± 8.7
Fruit Intake ≥3 Servings/Day	130 (65%)	60 (59%)	70 (71%)
Vegetable Intake ≥2 Servings/Day	140 (70%)	68 (67%)	72 (73%)
Legume Intake ≥3 Times/Week	110 (55%)	56 (55%)	54 (55%)
Whole Grain Intake ≥3 Servings/Day	80 (40%)	38 (37%)	42 (43%)

Participants with higher plant-based diet intake exhibited significantly better anthropometric outcomes. Specifically, their mean BMI and waist-to-hip ratio were lower compared to those with lower plant-based intake (Table 2).

Table 2: Anthropometric Outcomes by Plant-Based Diet Score and Gender

Plant-Based Diet Score	Gender	BMI (kg/m^2)	Waist Circumference (cm)	Waist-to-Hip Ratio
High Intake	Male	23.5 ± 2.4	80.2 ± 7.0	0.86 ± 0.05
	Female	22.7 ± 2.6	76.9 ± 7.3	0.84 ± 0.04
Low Intake	Male	26.8 ± 3.3	90.1 ± 8.4	0.93 ± 0.06
	Female	26.0 ± 3.1	86.4 ± 7.9	0.91 ± 0.05
p-Value	—	<0.01	<0.01	—

Although both groups had anthropometric measurements within WHO-recommended ranges, participants with higher plant-based diet scores exhibited significantly lower BMI, waist circumference, and waist-to-hip ratio

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compared to those with lower scores ($p<0.05$), indicating a trend toward improved body composition among plant-based diet consumers.

DISCUSSION

Plant-based diets are linked to better fat distribution, a lower risk of obesity, and an improved nutritional status [16, 17]. According to the current study, eating more plant-based meals is associated with having a healthier body composition. Although the anthropometric indicators of all participants were within the WHO-recommended normal ranges, individuals with higher plant-based diet scores exhibited significantly lower BMI, waist circumference, and waist-to-hip ratio compared to those with lower scores. These findings indicate an association between plant-based dietary intake and more favorable fat distribution, rather than a direct causal relationship. Our results align with the findings of Rahbar *et al.* who reported that individuals adhering to plant-based diets exhibited lower BMI and waist-to-hip ratios compared with those consuming predominantly animal-based foods [18]. Similarly, Ferguson et al. observed that female participants following plant-based dietary patterns demonstrated significantly reduced BMI and waist circumference compared to their counterparts [19]. These studies support the idea that high plant food intake contributes to reduced overall adiposity and less fat accumulation around the abdomen, which is especially important given the role of central obesity as a risk factor for cardiometabolic diseases. A strong association between treatment allocation and positive outcome, regardless of the technique used. This is evidenced by the consistent, strong within-group improvements (all $p<0.01$) and the absence of a statistically significant or clinically meaningful association between the specific technique (holding vs. pistoning) and the degree of improvement (all between-group $p > 0.05$, with small effect sizes). Mechanistically, plant-based diets are typically high in dietary fiber, lower in energy density, and often lead to greater satiety and lower overall caloric intake, which could help explain the anthropometric differences observed. The correlation with waist measures indicates effects not just on overall weight, but primarily on central fat deposition. Given our cross-sectional design, causality cannot be assumed; however, when taken together with longitudinal cohort studies (e.g., fruit intake being inversely associated with weight gain and waist circumference over time), the evidence suggests that promoting higher intake of fruits, vegetables, legumes, and whole grains might be a fruitful strategy to prevent obesity and central adiposity in our population [20]. While associations between plant-based diets and positive health metrics highlight their potential benefits, cross-sectional studies cannot prove cause and effect. The results suggest that promoting greater intake of plant-based foods could be an affordable and practical approach to improve body composition and reduce chronic disease risk. These findings can inform dietary guidelines, community health programs, and policy initiatives encouraging plant-based nutrition.

This study is limited by its cross-sectional design, which restricts causal inferences between plant-based dietary intake and anthropometric outcomes. The use of convenience sampling and self-reported dietary data may also introduce selection and recall bias, limiting generalizability. Future research should employ longitudinal or interventional designs with larger, more diverse samples to confirm causality and explore metabolic biomarkers. Additionally, detailed analysis of specific plant-based dietary components and their long-term impact on cardiometabolic health would further strengthen the evidence base for dietary recommendations in Pakistan.

CONCLUSIONS

Dietary factors derived from plant-based foods significantly influence nutritional status and health outcomes. Promoting regular inclusion of fruits, vegetables, legumes, and whole grains in the daily diet offers an affordable way to strengthen community health and lower the likelihood of chronic disorders. Future longitudinal studies are recommended to establish causality and explore specific plant-based components.

Authors' Contribution

Conceptualization: TB, RN
Methodology: TB, AM, RN
Formal analysis: AM, RN
Writing and Drafting: TB, AM, RN
Review and Editing: TB, AM, RN

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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