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Dietary assessment of Protein intake in adults of village Behkri, Chakwal, Pakistan

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Abstract: Optimal protein intake is essential for supporting muscle strength, mass, and general health. The differences in intake are primarily impacted by gender, age, occupation, and body composition. The low intake of proteins in Pakistan, especially in rural areas, is due to cultural and economic factors. The present study aims to assess the dietary protein intake in adults of Village Behkri, Chakwal, and evaluate it with the Recommended Dietary Allowances (RDAs). A cross-sectional study was performed among 100 adults (≥20 years), enrolled randomly according to set criteria. The participants provided data related to anthropometrics (height, weight, BMI), demographics (age, occupation, etc.), and 3-day dietary records. The protein intake was measured employing the Pakistan Food Composition Table (2001) and supplemented with the USDA Food Composition Database. Data were grouped and analyzed by age, gender, occupation, and BMI, comparing them with the RDA of 0.8g/kg/BW. The males' protein intake was found to be consistently more than that of females across all age groups included in the study. The highest protein intake was found in the adults aged ≥56 years (54 g/day), followed by those aged 20–35 years (53 g/day), while the lowest intake was in the 36–55 years' group (49 g/day). Protein intake was found to be positively linked with BMI, as underweight adults consumed 55 g/day as compared to obese adults with 45 g/day. Protein intake differed notably by age, BMI, and gender, with males overall consuming more than females. However, older and younger adults exceeded or approached their RDAs, while overweight or obese and middle-aged adults fell below the recommendations. The results call for the need for specific dietary interventions among the rural populations of Pakistan.

Keywords: Body Mass Index, Consumption Pattern, Protein Intake, Recommended Dietary Allowance, Rural Pakistan, Nutritional Assessment, Dietary Patterns, Chakwal

1. Introduction

Protein is a crucial macronutrient for maintaining body structure and function, muscle synthesis, tissue repair, metabolic regulation, and immune function. The RDA for a healthy adult is typically set at 0.8g/kg/day, although some research findings suggest that appropriate and safe levels may range between 0.93 - 1.2 g/kg/day, especially when procedural limitations of past research are taken into consideration (Elango et al., 2010). The significance of meeting RDAs is highly emphasized in global-level dietary guidelines; however, the actual intake patterns differ significantly due to diversity in economic, agricultural, and cultural factors across different geographical regions (Trumbo et al., 2002). Chronic malnutrition remains a constant concern in Pakistan. Recent studies have found a huge gap between the protein requirements and consistent protein consumption, especially in rural areas, where there is limited dietary diversity and economic constraints limit its intake. One national research finding suggested that the median protein intake in a household every month (6,381 g) lies way below the recommended standards, revealing a universal scarcity in protein consumption across the whole population.

Another cross-sectional study revealed that cereals and wheat make up approximately half (50%) of this total protein intake, whereas animal-based sources, which are rich in essential amino acids, barely have a share of about 6.4g/person/day (Shabnam et al., 2021), despite existing overall national-level data. Regional/local assessments remain limited. The majority of the research studies either encompass metropolitan or diversified nation-wide samples, or focuses on specific groups or children, e.g., a study that involved Pakistani school-children (aged 6-16 years) through 24-hr dietary recall suggested that the protein consumption levels were

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qualitatively less as compare to carbohydrates intake, strengthening the earlier results of variations in macronutrient distribution (Aziz & Hosain, 2014). In older men, protein consumption also remained well below the recommended levels, and even further declined with an increase in age, which suggests many age-related susceptibilities to insufficient nutrition (Alam et al., 2011).

Adequate protein consumption is a serious challenge in rural areas that include lesser dietary diversity, low financial status, seasonal insecurity of food, etc. Despite this, literature focusing on rural populations regarding this remains scarce. The present study addresses an important evidence research gap by focusing on a rural community in Chakwal (Behkri), providing essential understanding for specifically targeted nutrition programs and large-scale rural health policies in Pakistan (Hameed et al., 2021).

2. Research Methodology

2.1. Study Design and Subject Selection

A cross-sectional study was conducted in Village Behkri, District Chakwal, Punjab, Pakistan. Adults aged ≥20 years of both sexes were included. Individuals younger than 20 years or unwilling to participate were excluded. Informed consent was also obtained from all participants individually before enrolling them in the study. The study protocol was approved by the Institutional Review Board of the University of Lahore – Islamabad campus.

2.2. Sampling and Data Collection

A simple random sampling technique was employed. From local health records, a list was obtained of residents in Behkri village, and using a computer-generated random number table, the participants were selected. A total sample size of 100 participants was measured with a power of 80% and a significance level of 5%. Data collection included demographic details (age, gender, occupation), anthropometric measurements (height, weight, BMI), and 3-day dietary records. The height of participants was measured using a stadiometer up to the nearest 0.1 cm, and the weight was calculated using a calibrated digital scale. BMI was calculated by dividing weight (kg) by height (m2). WHO standards were applied for defining BMI categories: underweight (<18.5), normal weight (18.5–24.9), overweight (25–29.9), and obese (≥30). No ethnic-specific cut-offs were applied (Who, 2007).

2.3. Dietary Assessment

The participants were asked to note down their consumption of all beverages and foods over 3 non-consecutive days, including a weekend day. They were also guided about portion sizes and measuring tools commonly practiced/used at home. The researcher thoroughly reviewed the records for completeness and any ambiguity in them during the records submission. Dietary protein intake was estimated using the Pakistan Food Composition Table and the USDA Food Composition Database. The USDA Food Composition Table was used for any food item/s does not present in the Pakistan Food Composition Table (2001). However, limitations in regional food representation may affect the accuracy of protein estimates for traditional dishes.

2.4. Data Analysis

Data were categorized by gender, age (20–35, 36–55, ≥56 years), BMI categories (underweight, normal weight, overweight, obese), and occupation. Intake values were compared against RDIs (0.8 g/kg/day for adults).

3. Results and Discussion

3.1. Demographic Characteristics

The gender wise distribution showed that there were 53% females and 47% males in the study population. 39% (n=39) fell in the age group of 20-35 years, 41% individuals (n=41) in the 36-55 years age group, and 20% (n=20) in the 56+ years age group. 17% of participants (n=17) were students, 30% (n=30) were employed, 40% (n=40) were housewives, and 13% (n=13) were retired. 10% of participants (n=10) were underweight, 57% (n=57) were normal weight, 27% (n=27) were overweight, and only 6% of participants (n=6) were obese.

3.2. Protein Intake by Gender

Males consistently consumed more protein than females, irrespective of age categories. Like, in the age group of 36-55 years, females consumed 44g of protein per day compared to 56g by males daily. This finding is consistent with both national and international research that indicates that females mostly consume less protein than their counterparts, males, for several reasons, including lesser energy needs and many socio-cultural factors like dietary restrictions and intra-household distribution of food, etc (Park, 2018). Lower diet quality was observed in females in Pakistan, especially living in rural areas where there is limited dietary diversity

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(Shabnam et al., 2021). According to a recent study, most Pakistani households spend only 20% of their food budget on protein-containing foods, with inflation and affordability considered two important barriers. In rural areas of Pakistan, inadequate intake of proteins is combined with different micronutrient deficiencies like iron deficiency anemia, which is greatly prevalent in women, especially during reproductive age. Studies have observed that about 60% of these affected females are those with low protein intake. This disparity leads to higher chances of anemia, osteoporosis, and other nutritional deficiencies in rural females, especially during their youth. These results show that this gender-based difference in protein intake, especially in rural Pakistan, has a huge impact on females' health across the whole life course (Tariq et al., 2019).

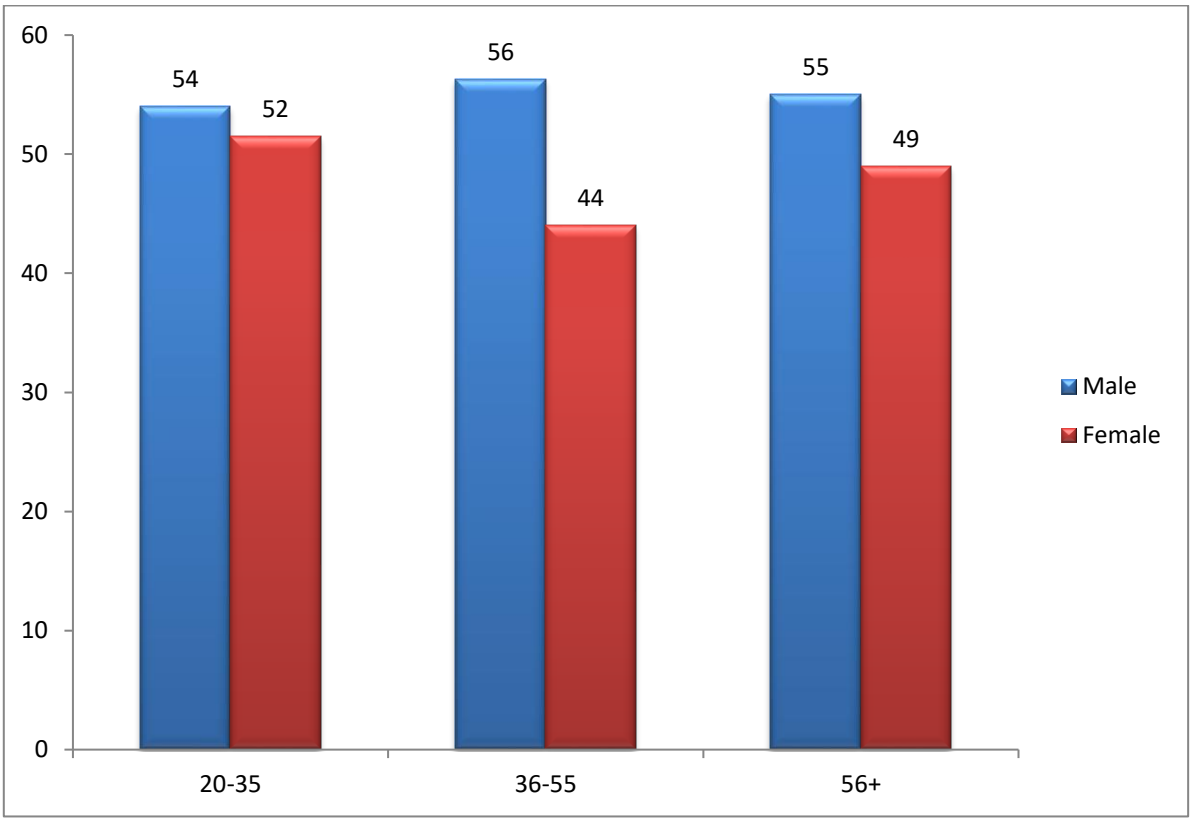

Figure 1: Protein Intake Comparison with Recommendations (Gender-Wise)

3.3. Protein Intake by Age

In the first age group (20-35 years), the average protein intake of individuals was 53g, while the average recommendation for them was 48g, meaning individuals of this age group were consuming more than their recommended amounts. Coming to the second age group (36-55 years), the average protein intake of individuals here was 49g, while their recommendation was 54g, meaning they were consuming less protein than their standard recommendations. The average protein intake of individuals of the third age-group (56+ years) was 54g compared to their recommendations of 55g, implying they were consuming approximately close to their average recommendations.

This finding is consistent with research conducted by Alam et al. (2011), which also found a decrease in dietary quality among Pakistani adults, mainly because of negligence, occupational demands, and financial pressures. Also, the lower protein consumption in adult females was reported in the Korea National Health and Nutrition Examination Survey, indicating the worldwide pattern of malnutrition during this stage of life (Park, 2018). Previous research also reinforces these results. A study conducted in the USA suggested that middle-aged adults having lower protein consumption are less susceptible to muscle weakness and lean mass Jun et al. (2021), suggesting that being unable to meet protein requirements can increase the risk of sarcopenia (muscle loss related to age) that begins around 40 years of age (Roubenoff, 2000).

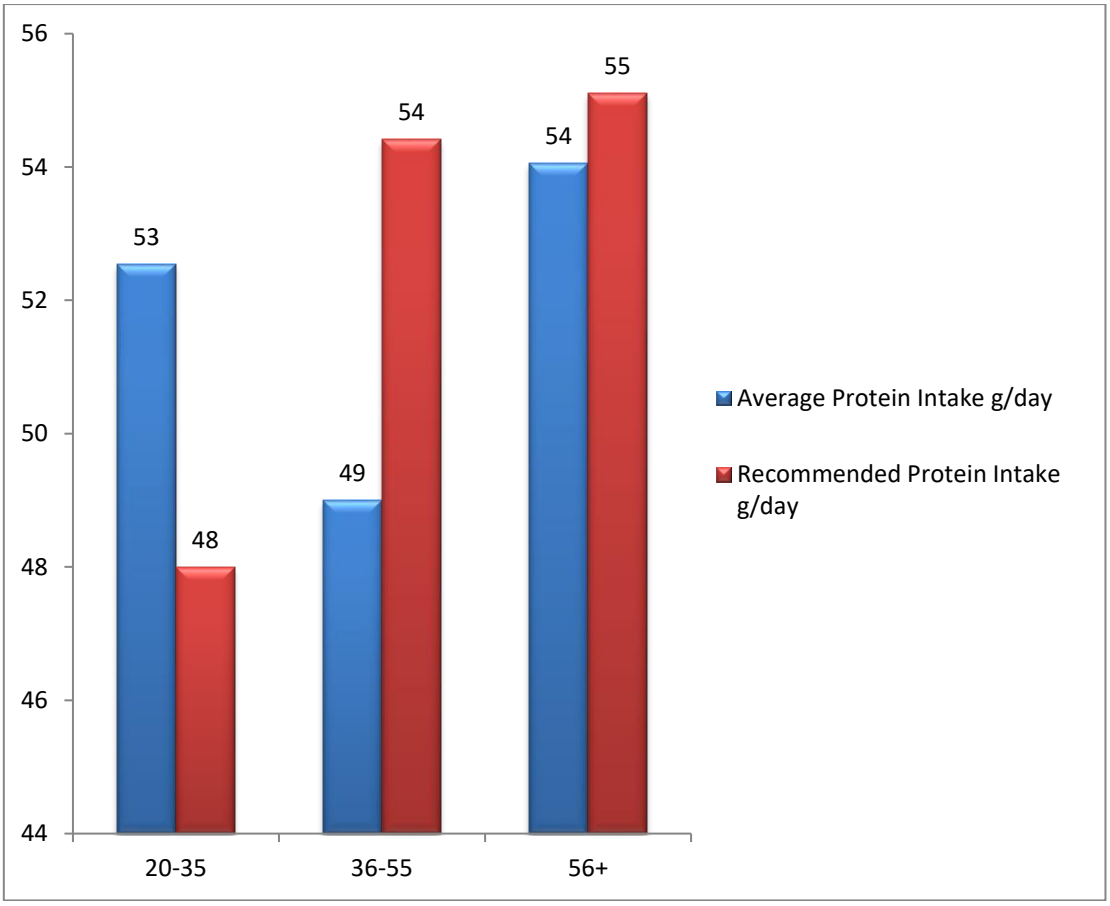

Figure 2: Protein Intake Comparison with Recommendations (Age-Wise)

3.4. Protein Intake by BMI

(Figure 3) shows that underweight individuals consume 35g of protein daily, while their average recommendation was 37g, meaning they were consuming protein close to their recommendations. Coming to normal weight individuals, their average intake was 45g, compared to recommendations of 49g, meaning they were also consuming protein just below their needs. The average protein intake of overweight individuals was 57g, compared to the average recommendations of 60g, which means their intake was slightly less than their average recommendations. Obese individuals had an average protein intake of 63g, while their recommendations were 72g, implying a low protein intake. Despite the obese individuals consuming more protein, their intake did not match the higher needs linked to their body weight. This odd match can result in sarcopenic obesity, in which muscle mass is less compared to body fat, increasing the risk of physical disability and metabolic disorders (Trichopoulou et al., 2002). South Asian populations have also shown these types of trends, where the higher BMI is not always linked to improved diet quality (Elango et al., 2010).

Several studies have supported this trend. A prospective Korean cohort study (KoGES) conducted for 12 years showed that increased protein consumption is positively linked with lean mass, especially in adults with a normal weight. Different meta-analyses and systematic reviews have shown that protein-rich diets (>1.3g/kg/day) help in preserving lean body mass, especially in obese/overweight adults, as compared to low-protein diets (<1g/kg/day), which result in muscle loss (Elfadil et al., 2024). RCTs in older obese adults have also proven that the combination of a protein-rich diet (~1.3g/kg/day) and resistance exercise is highly effective in the maintenance of fat-free mass as compared to protein alone (Verreijen et al., 2017). Talking about the protein sources, Australian research showed that the intake of animal protein is positively linked to BMI, as compared to plant protein, which is negatively or inversely associated, which suggests that the quality and origin of proteins also play a very important role (Tapsell et al., 2016). Locally, research conducted among Lahore's elderly females suggested that slightly higher intake of proteins (1.2g/kg/day) improved muscle strength, mass, and composition compared to the standard consumption (Ishaq et al., 2025). Combined, these

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findings suggest that despite consuming more protein overall by obese individuals, their consumption remains low compared to their high muscular and metabolic needs.

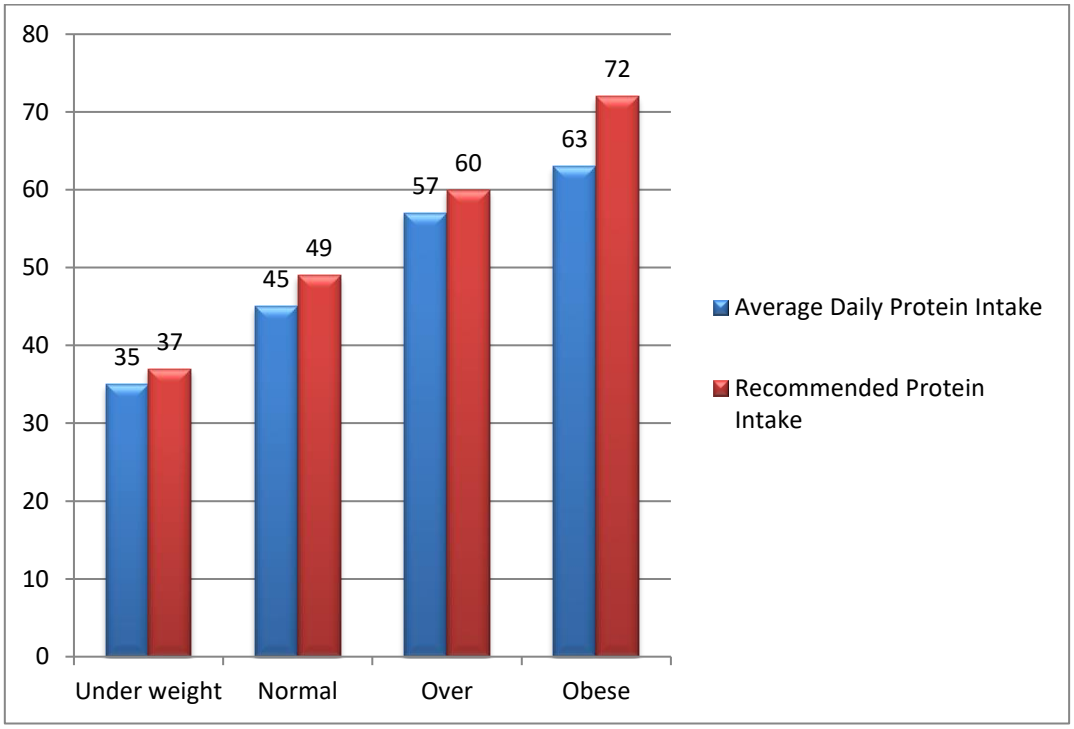

Figure 3: Protein Intake Comparison with Recommendation (BMI-Wise)

4. Conclusion

Protein consumption among individuals of the target population in this study differed across demographics. While older and younger adults consumed protein close to their recommendations, obese and middle-aged adults had inadequate consumption. Individualized nutrition interventions and education are required to improve the protein adequacy, especially within the vulnerable groups of rural Pakistan.

CRediT authorship contribution statement

Danial Ejaz Maqbool conceptualized and wrote the manuscript, drafted and revised the manuscript.

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Declaration of Competing Interest

The author declared no conflict of interest.

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