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A comparative study on dietary intake among different lifestyles

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Abstract
Background: Adequate dietary intake in alignment with the Recommended Dietary Allowances (RDA) is a fundamental prerequisite for sustaining physiological health, work capacity, and long-term well-being across diverse population groups.
Objective: The present study aimed to assess and compare macronutrient intake specifically energy, protein, and fat with ICMR-NIN RDA benchmarks among individuals following sedentary, moderate, and heavy physical activity lifestyles in Hyderabad, Telangana.
Methodology: A community-based cross-sectional study design was employed, with a total of 150 participants aged 18–55 years, equally stratified into three groups of 50 individuals each, based on self-reported and occupation-linked physical activity levels. Dietary assessment was conducted using the 24-hour dietary recall method, supplemented by anthropometric measurements including height, weight, and Body Mass Index (BMI). Statistical analysis was performed using descriptive statistics, paired t-tests, and one-way Analysis of Variance (ANOVA) to evaluate differences between actual nutrient intake and RDA requirements across lifestyle categories
Results: The findings revealed that energy and protein intakes were consistently below RDA across all three lifestyle groups, with the most severe deficit observed among heavily active individuals where mean energy intake represented less than 40% of the recommended level. Fat intake, conversely, exceeded RDA thresholds in all groups, irrespective of activity level. Overweight was the most prevalent BMI category across all three groups. ANOVA confirmed statistically significant inter-group differences in energy ($F = 15.56$, $p < 0.001$), protein ($F = 18.49$, $p < 0.001$), and fat intake ($F = 10.37$, $p = 0.019$).
Conclusion: The study concludes that lifestyle-specific dietary non-compliance is widespread and necessitates targeted, evidence-based nutritional interventions tailored to each activity level.

Keywords: Dietary intake, RDA compliance, sedentary lifestyle, moderate lifestyle, heavy lifestyle, macronutrients, BMI, ANOVA, nutritional assessment, ICMR-NIN.

Introduction
Globally, two of the most important modifiable risk factors for chronic illness and early mortality are physical inactivity and poor eating habits. A significant portion of avoidable deaths globally are caused by the combination of poor nutrition and sedentary lifestyles. However, research suggests that these detrimental trends could be significantly reversed by simultaneously improving diet and physical activity. Acknowledging the urgency of these issues, the World Health Assembly adopted the Global Strategy on Diet, Physical Activity, and Health in 2004, highlighting the ways in which these lifestyle choices influence public health outcomes in a synergistic or additive way [1]. Sedentary lifestyles are associated with up to 3.2 million deaths per year, according to data from the World Health Organization. High levels of sedentary behaviour (SB) in adults are strongly associated with serious health risks, such as an increased risk of type 2 diabetes, cardiovascular disease, cancer-related deaths, and all-cause mortality. A sedentary lifestyle is structurally defined as spending at least 1.5 Metabolic Equivalents of Task (MET) of energy each day while sitting or lying down. The great majority of modern adults' days are spent doing sedentary activities like driving, watching television, using computers, or engaging in screen-based recreation. On the other hand, not meeting recommended levels of physical activity (PA) is specifically referred to as physical inactivity (PI). Therefore, sedentary behaviour falls under the more general category of physical inactivity. Ultimately, a sedentary lifestyle paired with poor dietary habits routinely causes individuals to fall short of meeting their Recommended Dietary Allowances [2].
Activity levels — Sedentary, Moderate, very active: A sedentary person does minimal movement and very low energy expenditure, spending most of the day seated or lying down with under 30 minutes of intentional daily exercise. Example: An office employee who commutes by car, spends over 8 hours working at a computer, and watches television in the evening without any planned exercise. Moderate activity involves 3–4 hours of weekly exercise (e.g., 30–45-minute brisk walks most days) and frequent standing or stair use. Very active individuals perform ≥5 hours of strenuous weekly activity (or have physically demanding jobs), with vigorous movements ≥6.0 METs (e.g., running, high-intensity aerobics) [3].
RDA: Definition and derivation: The ICMR–NIN (2020) updated India’s nutrient benchmarks because changing diets and lifestyles have intensified the country’s dual burden of malnutrition. Nutrient needs depend on age, sex, weight, activity, and physiological status (e.g., pregnancy, growth, ageing). The Expert Group set requirements using the Estimated Average Requirement (EAR) the median need for a healthy population measured experimentally and adjusted for absorption. The Recommended Dietary Allowance (RDA) is then derived from the EAR by adding two

standard deviations, yielding an intake that covers nearly all individuals in a specific sex and life-stage group. EARs are calculated separately for different life stages to reflect growth or ageing and guide public-health targets and supervised supplementation for deficiencies [4]. Securing adequate nutrition is essential for health, work capacity, and economic productivity, especially for physically demanding jobs. Industrial and manual workers have much higher energy and nutrient needs, yet studies in developing countries show their intakes often fall below RDA. When energy expenditure exceeds intake, workers develop negative energy balance, leading to undernutrition, weight loss, weakened immunity, and reduced capacity. Many workers expend a large share of daily calories on labour (up to ~41%) and nearly double the energy per minute versus light-duty workers, but diets based on cheap cereals and staples lack protective foods (eggs, meat, milk, fruits, vegetables) needed to meet those demands [5]. This thesis questions whether current RDAs overstate energy needs for low-activity populations. Despite rising noncommunicable diseases (stroke, heart disease, diabetes) and high obesity prevalence (female obesity 32.9%), national surveys report mean intakes below RDA (for example, women 19–55: 1607 kcal/day vs. 2000 kcal RDA). Field observations complicate this picture: homemakers often prioritize family nutrition over their own, and many individuals consume near-RDA calories yet remain overweight because diets are high in fried/fatty foods and low in fibre and vegetables. We hypothesize that modern low-activity lifestyles reduce actual energy requirements, so existing RDA energy recommendations may be excessive [6].

This study compares dietary intakes across lifestyle groups against RDA benchmarks to identify nutrient deficits and assess overall nutritional status. Findings will inform targeted dietary interventions and workplace nutrition policies for physically demanding occupations. The analysis focuses on energy, protein, and fat determining if sedentary individuals consume imbalanced energy and protein-to-fat ratios and if active individuals meet their elevated energy and protein requirements.

Methodology

1. Selection of Population

A community-based cross-sectional study was conducted among different lifestyle workers in Hyderabad, Telangana, to compare actual dietary intake with Recommended Dietary Allowances. Individuals were recruited from workplaces, offices and organised sectors comprising sedentary professionals, moderately active workers and heavy manual labourers, after obtaining informed consent.

2. Selection of Samples

A simple random sampling method was used to select participants from each lifestyle category, with stratified random sampling employed to select equal numbers from each lifestyle (sedentary, moderate, heavy-work) based on occupation and self-reported activity level, after screening for chronic illness, pregnancy or special diets. This study included a total of 150 individuals aged between 18 and 55 years, divided equally into three groups of 50 each.

3. Data Collection

A pre-designed questionnaire administered through Google Forms and personal interview was used to collect demographic information, dietary practices and lifestyle data. Anthropometric measurements (height, weight and BMI) were taken and compared with WHO standards. A 24-hour dietary recall method was used to assess actual nutrient intake, and total energy, protein and fat intake for each participant were calculated using a standard food-composition database, expressed as total intake per day and per kilogram body weight. Data such as demographic information, anthropometric measurements and dietary patterns were processed, tabulated and analysed using descriptive statistics (percentage, frequency, mean, standard deviation), paired t-test and one-way ANOVA to compare actual intake against RDA-calculated requirements across lifestyle groups.

Result and Discussion

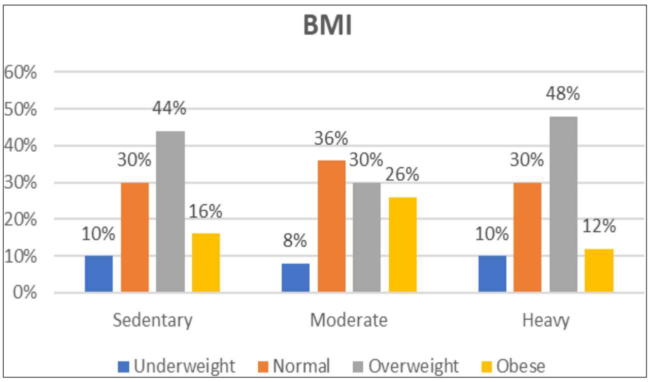
The study was conducted on 150 individuals aged 18-55 years, divided into three equal groups of 50 each: sedentary, moderately active and heavily active lifestyles.

Table 1: Demographic information of data collected among sedentary and active individuals

Characteristics	Categories	Sedentary n = 50	Moderate n = 50	Heavy n = 50
Age	18 -35 years	74%	52%	58%
	36 – 55 years	26%	48%	42%
Gender	Male 18 – 55years	42%	24%	70%
	Female 18-55years	58%	76%	10%
BMI	Underweight < 18.5	10%	8%	10%
	Normal 18.5 – 24.9	30%	36%	30%
	Overweight 25- 29.9	44%	30%	48%
	Obese >30	16%	26%	12%
Religion	Hindu	0%	4%	22%
	Muslim	100%	94%	74%
	Christian	0%	0%	4%
	Other	0%	2%	0%
Qualification	Illiterate	14%	8%	26%
	Higher studies [12th]	20%	22%	34%
	Graduation and above	66%	70%	40%
Occupation	Private employed	14%	30%	60%
	Government employed	0%	0%	0%
	Unemployed	18%	10%	14%
	Housewife	10%	50%	10%
	other	40%	10%	16%
Lifestyle	Sedentary	100%	100%	100%

The demographic data shows that sedentary individuals were predominantly young (74% aged 18–35), female (58%), unemployed or in "other" occupations (40%), and entirely Muslim (100%), while the moderate-activity group was similarly female-dominated (76%), largely housewives (50%), and had the highest obesity rate (26%) despite being more active; in contrast, the heavy-activity group was mostly male (70%), predominantly privately employed (60%), more religiously diverse (74% Muslim, 22% Hindu, 4% Christian), and had the highest illiteracy rate (26%), with overweight status common in both the sedentary (44%) and heavy (48%) groups, and graduation-level education fairly consistent across all three groups (66–70%).

Distribution of BMI among Sedentary and Active Lifestyles Individual



Among the 150 individuals surveyed, divided equally into three activity groups of 50 each, the BMI distribution varied across activity levels. In the sedentary group, 10% were underweight, 30% had a normal BMI, 44% were overweight, and 16% were obese. In the moderate activity group, 8% were underweight, 36% had a normal BMI, 30% were overweight, and 26% were obese. In the heavy activity group, 10% were underweight, 30% had a normal BMI, 48% were overweight, and 12% were obese. Notably, overweight was the most prevalent BMI category across all groups largely driven by excessive consumption of unhealthy, calorie-dense foods beyond the RDA while underweight individuals, likely facing nutrient deficiencies, remained consistently low, and notably, even high physical activity failed to prevent overweight outcomes without proper dietary habits. Obesity was most prevalent in the moderate activity group suggesting that mid-level exercise without proper dietary control does little to prevent excessive weight gain from consuming calorie-dense foods beyond the RDA. Normal BMI individuals were highest in the moderate activity group, indicating that a balanced combination of regular movement and adequate nutrient intake aligned with RDA recommendations is key to maintaining a healthy weight.

Table 2: Association of nutrients with different lifestyles

Anova Test	Sedentary	Moderate	Heavy	F – Test	P-Value
Energy	3515±599	2947±301	3035±389	15.56	< 0.001
Protein	105.64±21.96	84.56±10.23	114.69±24.95	18.49	< 0.001
Fat	148.1±30.03	118.61±16.29	114.8±17.7	10.37	< 0.019

(*p =0.05)

The present study demonstrated a statistically significant difference in the actual intake of energy, protein, and fat among individuals with varying lifestyle patterns ($p < 0.05$). Specifically, significant differences were observed for energy intake ($F = 15.56$, $p < 0.001$), protein intake ($F = 18.49$, $p < 0.001$), and fat intake ($F = 10.37$, $p < 0.019$), all of which were below the established significance threshold of 0.05. These findings suggest that lifestyle activity level whether sedentary, moderate, or heavy is a significant determinant of macronutrient consumption patterns.

This study similarly reported significant differences in energy and macronutrient intake across groups with differing physical activity levels, consistent with the ANOVA findings presented in **Table 4**.7. [1]

Table 3: Comparison of macronutrient intake by gender across lifestyles

T – Test MALES	Sedentary	Moderate	Heavy	T - Test	P-Value
Energy	2025±726	1593±322	1329±424	17.60	< 0.001
Protein	60.34±26.81	47.25±9.76	40.44±17.55	18.70	< 0.001
Fat	86.97±39.12	65.4±16.43	52.27±20.81	16.59	< 0.001

(*p =0.05)

The present study revealed a statistically significant difference in actual nutrient intake among males across different lifestyle categories. Mean energy, protein, and fat intake were notably higher in sedentary males compared to those with moderate and heavy physical activity levels, with all differences reaching statistical significance ($p < 0.001$). These findings indicate that sedentary males consumed considerably greater quantities of energy and macronutrients than their more physically active counterparts, underscoring the inverse relationship between physical activity level and dietary energy intake.

The study findings were similar to a study demonstrated that active males had significantly higher mean energy intake compared to sedentary males ($p < 0.001$), while simultaneously exhibiting lower proportional protein consumption findings that highlight the complex interplay between physical activity patterns and macronutrient regulation among males. [1]

T – Test FEMALES	Sedentary	Moderate	Heavy	T - Test	P-Value
Energy	1490±472	1354±280	1706±355	13.52	< 0.001
Protein	45.30±17.11	37.31±10.7	74.24±32.33	18.29	< 0.001
Fat	61.13±20.9	53.21±16.43	62.53±14.68	4.15	< 0.019

(*p =0.05)

The present study demonstrated a statistically significant difference in macronutrient intake among females across varying lifestyle groups. Specifically, the actual intake of energy, protein, and fat differed significantly among females of distinct lifestyle categories, with a p-value of $p < 0.001$ for energy and protein, and $p = 0.019$ for fat — both of which fall below the conventional significance threshold of $p \leq 0.05$.

The study findings were similar to a study demonstrated that active females had significantly higher mean energy intake compared to sedentary males ($p < 0.001$), while simultaneously exhibiting lower proportional protein consumption findings that highlight the complex interplay between physical activity patterns and macronutrient regulation among females. [1]

Conclusion

The study concludes that dietary intake across sedentary, moderate, and heavy lifestyle groups fails to meet ICMR-NIN RDA marked by excessive fat intake from fried and processed foods alongside energy and protein deficits (most severe in heavily active men) and recommends lifestyle-specific dietary guidelines and targeted nutrition education to restore macronutrient balance, improve energy–protein adequacy, reduce fat and portion sizes, promote substitution of processed snacks with protein- and fibre-rich foods, and thereby curb overweight and related chronic disease risk, since physical activity alone is insufficient to prevent weight gain.

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