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NUTRITIONAL ANALYSIS OF ADOLESCENT COMBAT SPORTS ATHLETES

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A nutritional analysis was conducted on 27 adolescent combat sports athletes (15 males, 12 females) participating in karate, taekwondo, boxing, and wushu at the Sports Authority of India (SAI) Center, Naharlagun, Arunachal Pradesh. The study evaluated dietary patterns and nutritional status through detailed 24-hour dietary recall and analysis through Diet Cal.

Male participants age (year) (16.4 ± 1.84) had average height (cm) (159.96 ± 9.66) and weight (kg) (51.67 ± 7.29) with a BMI (kg/m^2) of (19.70 ± 2.12). Female participants age (year) (15.42 ± 1.88) averaged height (cm) (154.0 ± 5.89) and weight (kg) (53.42 ± 9.22) with a BMI of (22.85 ± 3.57).

Daily nutrient intake analysis revealed consumption of nutrients in male athletes as protein (gm) (114.76 ± 3), carbohydrates (gm) (268.28 ± 16), and fat (gm) (122.95 ± 5), with micronutrients including Calcium (mg) (721.31 ± 22) $p < 0.05$, Iron (mg) (17.68 ± 0.80) $p < 0.05$, and Zinc (mg) (14.16 ± 0.59) $p < 0.05$. Female athletes showed similar patterns: protein (gm) (111.23 ± 3), carbohydrates (gm) (262.83 ± 11), and fat (gm) (110.62 ± 6), with Calcium (gm) (714.2 ± 20) $p < 0.05$, Iron (mg) (22.27 ± 0.89) $p < 0.05$, and Zinc (mg) (12.62 ± 0.34). A significant difference in Calcium, Iron and Zinc uptake was observed in male and female athletes compared to recommended values. Magnesium and Sodium intake was found to be adequate with respect to recommended values from Recommended Dietary Allowance (RDA).

Key observations included the below-recommended Calcium intake and excessive fat consumption across both genders. While protein intake was high, Iron intake was lower than recommended, particularly among female participants. Recommendations include increasing Calcium-rich food sources, moderating fat intake, monitoring total caloric consumption, and improving Iron intake, especially for females. The findings emphasize the importance of a balanced diet and optimal nutrition in young combat sports athletes and suggest the need for targeted nutritional interventions in this population.

Keywords: Adolescent, Combat sports, Dietary deficiencies, Micronutrients, Nutritional status.

Introduction

Nutritional optimization is especially important for adolescent combat sports athletes with significant physiological and metabolic obstacles. Combat sports, which include martial arts, taekwondo, boxing, and wushu, require extraordinary levels of physical skill and have specific dietary plans to promote growth and performance[1]. Due to the rapid physical and physiological changes that occur during adolescence, the intricate relationship between nutrition, growth, and

athletic performance becomes even more crucial.

Specialized nutritional therapies have been shown to impact long-term health outcomes and athletic performance considerably. Due to the high metabolic needs of their developing bodies from their high-intensity exercise, adolescent athletes require a thorough approach to food management[2]. Combat sports pose additional difficulties because of weight category limitations, sporadic high-intensity training, and quick energy system activation demands during competition.

Deficits in nutrition can seriously impair general growth and sports performance. Many young athletes consume insufficient amounts of certain nutrients, especially micronutrients essential for immune system function, growth, and recuperation[3]. Combat sports players, in particular, frequently confront nutritional difficulties, such as controlling body composition, preserving ideal energy levels, and promoting quick muscle recovery while staying within weight category restrictions[4]. The metabolic needs of athletes participating in combat sports are very different from those of other sports. A well-balanced diet meeting macronutrient and micronutrient requirements is essential for intense training programs. Consuming protein is essential for muscle growth and repair, whereas high-intensity energy systems require carbohydrate intake[4]. Additionally, during intense training, micronutrient sufficiency is essential for promoting physiological responses, avoiding tiredness, and preserving general health.

Adolescent combat sports athletes have several important nutritional issues recognized in previous research. Poor Calcium intake can hinder the formation of bones, while low Iron levels might affect oxygen transport and general performance, especially in female athletes[5]. Weight-category sports need athletes to carefully control their body composition while sustaining growth and performance demands, making the delicate balance between energy intake and expenditure even more challenging. The paucity of current research on dietary tactics for teenage combat sports athletes highlights the need for thorough nutritional analysis[6]. There is a substantial knowledge gap regarding the unique dietary needs of juvenile combat sports players because most current research focuses on adult athletes or general athletic groups [7].

By offering a thorough nutritional evaluation that can guide focused intervention tactics, our study seeks to close this important gap. This study aims to advance a more sophisticated understanding of food trends among adolescent combat sports athletes by performing a thorough nutritional analysis.

Material and Methods

The study involved 27 adolescent combat sports athletes aged 13 to 19 years participating in karate, taekwondo, boxing, and wushu at SAI Center Naharlagun, Arunachal Pradesh. Participants meeting the criteria for inclusion in this study were identified as active combat sports players engaging in a minimum of 4-5 hours of intense training in a day. A written consent form outlining general information and signed by participants stipulated the utilization of their data for research purposes and their voluntary participation agreement. The document elucidated the study's objectives and the potential benefits of participant involvement.

A validated food frequency questionnaire and a 24-hour diet recall were used to collect thorough data for assessing participants' dietary habits and nutritional intake due to the quantitative nature of the investigation. The data collected were then

examined using the Diet Cal program since the survey was the main methodological approach. Diet Cal is software for effective nutrition management that is simple and intuitive. With its help, users may easily monitor and assess the calories, macronutrients, and vital vitamins they consume each day. Participants answer questions regarding the foods they typically eat, giving researchers studying dietary patterns and nutritional analysis important information.

A 24-hour diet recall is a technique used to evaluate nutrition that involves asking athletes to recall everything they have eaten and drunk over the previous 24 hours during a structured interview. This procedure aims to determine an athlete's energy and macronutrient levels. To better evaluate changes in energy consumption over time, athletes were also told to keep a meal journal for future evaluations.

The Statistical Package for the Social Sciences (SPSS) program was used for statistical analyses. The Shapiro-Wilk test was used to evaluate the data's normality. For every variable, descriptive statistics were displayed as mean (± SEM). The mean value, standard deviation, standard error of the mean, and independent 't' test were used for data analysis in this study's context. For every test, the significance level was set at $p < 0.05$.

Results and Discussion

The nutritional status and dietary intake of 27 adolescents (15 males and 12 females) with mean ages of 16.4 ± 1.8 and 15.4 ± 1.9 years, respectively. The anthropometric data revealed several notable patterns. Males had a greater mean height (cm) (160.0 ± 9.7) than females (154.0 ± 5.9), consistent with typical adolescent growth patterns where males generally experience greater height gains during puberty. However, females had a slightly higher average weight (kg) (53.4 ± 9.2 vs. 51.7 ± 7.3) and consequently a higher BMI ($kg/m^{2)}$ (22.9 ± 3.6 vs. 19.7 ± 2.1) (Table- 1).

The Body Mass Index (BMI) values for both groups fall within the normal weight range according to World Health Organization (WHO) standards for adolescents, though females trended toward the upper end of the normal range[8]. This gender difference in BMI aligns with expected physiological differences, as females typically develop greater adipose tissue during adolescence[9]. The calculated

Table 1. Anthropometric Comparison of adolescent combat sports athletes.

Parameter	Males (n=15)	Females (n=12)
Age (in years)	16.4 ± 1.8	15.4 ± 1.9
Height (in cm)	160.0 ± 9.7	154.0 ± 5.9
Weight (in kg)	51.7 ± 7.3	53.4 ± 9.2
BMI (in $kg/m^{2)}$	19.7 ± 2.1	22.9 ± 3.6
BMR (kcal)	1307.6 ± 141.4	1252.1 ± 88.0

Table 2. Energy Requirements and Intake of adolescent combat sports athletes.

Parameter	Males (n=15)	Females (n=12)
Calculated TEE (kcal/day)	3070.0 ± 311.2	2534.5 ± 190.5
Actual Energy Intake (kcal/day)	3341.2 ± 185.0	3025.0 ± 437.0

Basal Metabolic Rate (BMR) (kcal/day) was higher in males (1307.6 ± 141.4) than in females (1252.1 ± 88.0), reflecting the generally higher metabolic demands associated with greater lean body mass in males (Table- 1).

A striking finding was the substantial excess energy intake relative to calculated requirements in both groups. Males consumed approximately 108.8 % of their calculated energy requirements (3341.2 ± 185.0 vs 3070.0 ± 311.2 required), while females consumed an even higher percentage at 119.4 % of their requirements (3025.0 ± 437.0 vs 2534.5 ± 190.5 required).

This excessive energy consumption is worrisome because if physical activity levels don't offset the extra calories, it could eventually make these teenagers more likely to gain weight[10]. According to the statistics, males consumed 3341.2 ± 185.0 kcal per day, 271.2 kcal more than the calculated Total Energy Expenditure (TEE) of 3070.0 ± 311.2 kcal per day (Table- 2). Compared to a calculated TEE of 2534.5 ± 190.5 kcal/day, females consumed 3025.0 ± 437.0 kcal/day, an excess of 490.5 kcal/day.

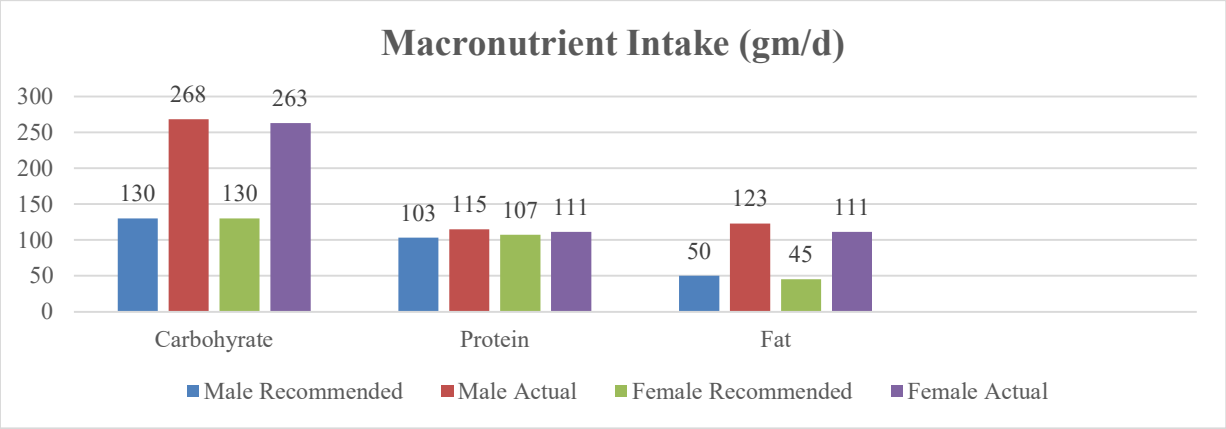

Fig.- 1: Macronutrient Intake of combat sports athletes: Recommended vs. Actual Intake

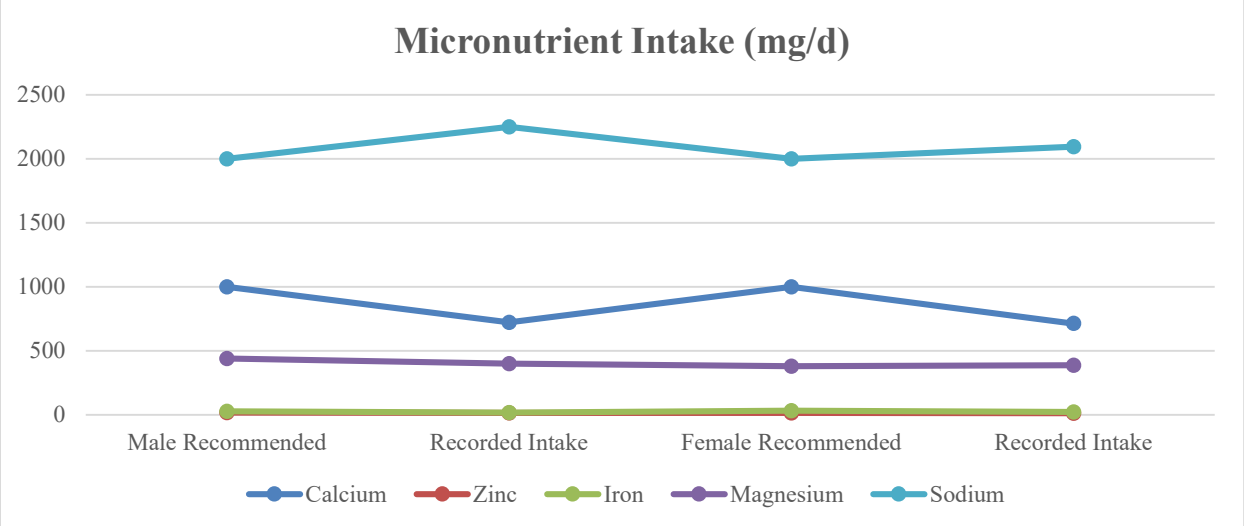

Fig.- 2: Micronutrient Intake of combat sports athletes: Recommended vs. Actual Intake

Despite their shorter height, girls' significantly larger absolute overconsumption (490.5 kcal/day excess) than males' (271.2 kcal/day excess) may contribute to the explanation of their higher BMI values. This trend raises the possibility of gender-based variations in energy control, levels of physical activity, or reporting accuracy[11].

Both genders' macronutrient analyses revealed notable departures from suggested levels. Excess energy intake was partly caused by a much higher than recommended intake of carbohydrates (268 g vs. 130 g for males and 263 g vs. 130 g for females) (Fig.-1). Protein consumption was somewhat higher than recommended (115 g versus 103 g for males and 111 g versus 107 g for females), which probably supported the growth of adolescents. The most concerning result was that fat intake was more than double the recommended amounts (111 g vs. 45 g for females and 123 g vs. 50 g for males) (Fig.- 1), which could have long-term effects on cardiometabolic health. This unequal distribution of macronutrients, especially too much fat, raises the possibility that dietary intervention may be required to bring intake into compliance with dietary recommendations and promote healthier growth[12].

During adolescence, Calcium (mg) intake is concerningly low for males and females, who consume just 714 and 721, respectively, compared to the recommended 1000 (mg) daily requirement (Fig.-2). This is especially concerning because bone growth is crucial during adolescence[13]. Additionally, Iron (mg) intake was below recommended levels, with ladies ingesting 22 of Iron versus their greater requirement of 32 and males consuming 18 versus the required 26 (Fig.-2). Because of the demands associated with menstruation, this Iron shortage is particularly concerning for females[14]. While Magnesium (mg) intake was somewhat below the suggested levels for males (400 vs 440), it was sufficient for females (386 vs 380). Zinc (mg) intake was below recommended in both groups (males: 14 vs 17.6; females: 13 vs 14.2), which may affect immunity and growth. Nonetheless, both groups' sodium intake was higher than advised; males consumed 2250 mg, and females consumed 2094 mg, more than the daily allowance of 2000 mg. Sodium consumption was higher than what is advised for both sexes, which is consistent with worldwide patterns and poses a risk to the heart. Despite increased calorie and fat intake, numerous micronutrient deficits were noted, particularly in females, indicating low nutritional quality[15]. The main goals of interventions should be to increase nutrient-dense diets, decrease saturated fat, and improve portion management. To fill these gaps, Calcium, Iron and Zinc supplements should be considered, as well as continuous monitoring, especially for menstruating women.

Conclusion

According to this report, teenagers' nutritional profiles portray high caloric and fat intake and low intake of vital minerals, including Calcium, Iron and Zinc. These results underline the necessity of focused nutrition education and possible supplementation techniques to address the insufficient intake of micronutrients and the excessive consumption of macronutrients. A greater understanding of the nutritional status of this population and the development of more targeted therapies would be possible with bigger sample numbers and more thorough evaluations of body composition and physical activity.

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