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Nutritional Evaluation of Taekwondo Athletes

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Abstract:- This study aims to evaluate the dietary intake of elite Indian Taekwondo athletes to determine their nutritional adequacy and compare it with other combat sports. Five male athletes participated, with an average age of 24.5 ± 2.5 years, weight 64.5 ± 5.5 kg, height 170 ± 5.5 cm, BMI 22.5 ± 0.5 kg/m², and body fat percentage 9.5 ± 4.0%. The analysis was based on a three-day dietary record. The findings revealed nutritional inadequacies in protein and fiber intake, despite generally adequate intake of most macro- and micronutrients. Further studies during different training and competition phases could provide more insight into the nutritional risks associated with weight-category sports and the strategies used for competitive advantage.

Keywords:- *Taekwondo; Nutrition; Athlete; Dietary Intake; Sports Performance Diet.*

I. INTRODUCTION

Taekwondo, a martial art from Korea, is distinguished by its rapid striking techniques, leaping and twisting kicks, and head-height strikes. The Korean term "tae" denotes the concept of "foot" or "in order to strike using one's foot," "kwon" signifies the notion of "fist" or "to hit with a hand," and "do" refers to the idea of "way" or "art." The word "Taekwondo" derives from these three concepts. The sport's competitive nature focuses on techniques to throw, takedown, immobilize, or subdue opponents using grappling maneuvers or submission holds. Weight cycling, which entails rapid weight loss through restricted food consumption or depletion, is prevalent in weight-classified sports such as judo, Taekwondo, grappling, rowing, and boxing. Research on the effects of these techniques on Taekwondo practitioners' diets is limited in comparison to other martial arts (Achten et al., 2004).

The development and maintenance of effective dietary programmes are contingent upon nutritional evaluation. Detailed food history analysis helps establish strategies for necessary dietary modifications, which should be flexible to transform food habits. The sport played, the current training phase, when the competition will be, performance objectives, basal metabolic rate data, energy needs, changes in body composition, and major clinical variables are all important considerations (Gilbert, 2009). The consumption of carbohydrate-rich foods is advised for restocking hepatic and muscular glycogen, particularly after training or competitions, as low-carbohydrate diets can have a detrimental effect on physical performance in combat sports. Carbohydrate intake may also mitigate immune system alterations caused by excessive exercise stress, benefiting both performance and athlete mood (Kerksick et al., 2008).

Given these considerations, this study aims to evaluate the nutrient intake of elite Indian Taekwondo athletes, comparing it with other combat sports and providing future nutritional recommendations to enhance performance.

II. MATERIALS AND METHOD

- *Participants:*

The study involved five elite Indian male Taekwondo athletes who voluntarily participated. The requirements for participation included being a black belt, being at least twenty years old, and following training plans created specifically for competitions. The body fat percentage of 9.5 ± 4.0%, weight of 64.5 ± 5.5 kg, height of 170 ± 5.5 cm, and BMI of 22.5 ± 0.5 kg/m² were the characteristics of the participants. The average age was 24.5 ± 2.5 years. The equation established was utilized for determining body density, and to determine fat percentage (Jackson & Pollock, 1978).

- *Dietary Information:*

Athletes recorded their food intake over three non-consecutive days, ensuring not to alter their eating habits during this period. The recording was done voluntarily by the athletes following standardized instructions provided by a nutritionist. The collected data were statistically analyzed for significance using Microsoft Office Excel 2007.

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III. RESULTS

The hydration status values of Taekwondo athletes, assessed through BIA, indicated an average total body water of 22.5 ± 0.5, representing 39.5 ± 3.3% of body weight, and 70.7 ± 0.45% in lean mass.

Table 1 Nutrient Intake by Taekwondo Athletes Recorded during Three Non-Consecutive Days.

S.No	Nutrients	Mean (SD)	Recommendation 20 – 30 years	% ADQ
1	Energy (kcal)	2889.(586.8)		-
2	Energy (kcal* kg^{-1})	50.4 (12.4)	37-41#	-
3	Carbohydrate (g)	783(255.2)		-
4	Carbohydrate (g* kg^{-1})	8.0(2.8)	6-10#	-
5	Protein (g)	185.2(76.3)		-
6	Protein (g* kg^{-1})	3.2 (0.8)	1.6-1.7#	-
7	Fat (g)	118.5(78.7)		-
8	Fat (g* kg^{-1})	1.8(0.8)	1-0#	-
9	Calcium (mg)	1583.5(615.3)	1000.00**	-
10	Iron (mg)	25.5(10.5)	8.0	306.2
11	Vitamin A (mcg)	708.5(312.5)	900.0*	67.7
12	Vitamin C (mg)	280.2(147.3)	90.0*	266.7
13	Vitamin E (mg)	18.0(10.6)	15.0*	100.00
14	Fiber (g)	19.6(4.5)	38.0*	-
15	Water (mL)	168.9(810.4)	3700.00***	-
16	%E: carbohydrates	60.9(8.2)	60-70#	-
17	%E: proteins	18.5(4.6)	15-20#	-
18	%E: fats	22.7(4.2)	20-25#	-

Note: Note: % ADQ = Percentage of adequacy; E = percentage of energy intake. #ADA (1993); ***IOM (2004); Lukaski (2004); ***IOM (1998); Lukaski (2004).

Among the studied parameters, the athletes' energy intake was 2889 kcal per day, which corresponds to the recommended values of energy intake for active people (American Dietetic Association, 2003). The energy intake per kilogram of body weight was also sufficient and was 50.4 kcal/kg, which can be considered appropriate for combat sportsmen (Fogelholm, 1994).

It was also observed that carbohydrate intake was within the suggested level for the athletic population; 783 grams daily, 8 grams per kg of body weight. This is beneficial for the Taekwondo athlete, as their sport entails a power endurance type of training that is characterized by short bouts of high-intensity exercise that is fueled by the glycogen stores. Carb intake is vital as it helps in restocking glycogen post-training, which in turn is vital in enhancing performance (Degoutte et al., 2006).

The only perceived limitation was that the portions were large especially on the protein aspect. The athletes in the given study consumed an average of 185.2 grams/day or 3.1200 calories per day and 2 grams per kilogram of body weight of carbohydrates. This is quite far above the recommended daily allowance of 1.6-1.7g/kg. Therefore, protein intake in a normal diet should not exceed 2. Thus, protein intake of 4g/kg may be related to the oxidation of amino acids and not muscle synthesis because a protein intake does not contribute to muscle mass gain beyond 2.4 g/kg (Rossi & Tirapegui, 2001).

The athletes' fat intake was also sufficient as they took an average of 118.5 grams per day, or 1.8 grams per kilogram of their body weight. This stands within the normal limit of 1 gram per kilogram and above. It is recommended that an individual should take moderate amounts of lipids to ensure a steady source of energy during the periods of physical activity (Bouhlel et al., 2006).

The nutrient intake was moderate; calcium, iron, and vitamins A, C and E were sufficient but fiber intake was insufficient. The athletes were taking an average of 19.6 grams of fiber per day, while the recommended amount of fiber intake per day is 38 grams, thus, the athletes should be encouraged to take more fiber for improved digestive system and health wise (Teshima et al., 2002).

IV. DISCUSSION

Taekwondo, with its origins deeply rooted in history, is a combative sport typically dominated by male athletes, which aligns with findings from collaborators (2003) who noted the gender prevalence in martial arts as a reinforcement of masculinity. Previous studies indicate that the nutritional and energy demands of combative athletes are often inadequately met, highlighting the need for comprehensive nutritional education. Various factors, such as the nature of the sport, training schedules, and body image requirements, influence athletes' dietary habits. It was observed that 83% of male and female athletes engaged in fasting before competitions, with some not consuming any liquids or food (Gilbert, 2009).

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Bioelectrical Impedance Analysis (BIA) is a non-invasive, dependable method for assessing hydration status, provided that the hydration conditions are maintained prior to the evaluation (Shirreffs, 2003). Alderman et al. (2004) reported that frequent fasting-related symptoms among wrestlers included migraines (47%), vertigo, nausea (48%), heat flashes, nosebleeds, febrile sensations, disorientation, and an elevated heart rate. The B-complex vitamins, calcium, magnesium, iron, and zinc are often severely depleted in the diets of wrestlers and Taekwondo practitioners (Fogelholm et al., 1993).

Athletes were consuming enough calories per day, with an average of 50.4 ± 8.64 kcal/kg. According to Fogelholm (1994), combat athletes should adhere to a moderate energy restriction of 25 to 33 kcal/kg/day. Individuals who engage in intensive physical activity necessitate between 2000 and 6000 kcal/day, which is consistent with the 2889.0 ± 475.0 kcal/day determined in this study, according to American Dietetic Association (2003) recommendations. Despite the possibility of nutritional depletion, some studies have shown that performance efficiency is unaffected by keeping an energy intake that is consistent with the demands of the sport (Fogelholm et al., 1993). When energy restrictions are implemented, taekwondo athletes exhibit diminished efficiency and mood fluctuations (Degoutte et al., 2006).

The American Dietetic Association (2003) reported that the intake of macronutrients was adequate for carbohydrates and lipids, but protein was excessive. Martial arts demand lactic anaerobic energy generation during brief, intense bursts of movement, thus it's important to stay within the suggested carbohydrate intake levels. There is no set carbohydrate recommendation for Taekwondo, however anything below 500 g per day won't be enough to restore glycogen stores after training (Degoutte et al., 2006).

An excess was observed in the protein intake of athletes, which ranged from 4.0 to 6.0 g/kg/day. The general population experiences a high protein intake when it exceeds 1.6 g/kg/day, and an exceptionally high protein intake when it exceeds 2.4 g/kg/day. Strength athletes should consume protein at a rate of 1.4 to 1.8 g/kg/day, with the potential to consume up to 2.0 g/kg/day. At doses over 2.4 g/kg/day, the oxidation of amino acids rises independently of any further increase in lean body mass (Rossi & Tirapegui, 2001). The limited consumption of red meat and dairy among Japanese karate athletes resulted in a protein intake of 89.8 ± 24.5 g/day or 1.38 ± 0.46 g/kg/day (Teshima et al., 2002).

Lipids play a larger role as an energy source in Taekwondo as competition levels rise, necessitating both aerobic and anaerobic metabolism (Bouhlel et al., 2006). The American Dietetic Association (1993) recommends limiting lipid consumption to no more than 30 percent of total daily calories or 1 gramme per kilogramme of body weight. Of all fats, 10% should be essential fatty acids. The researchers in this study determined that a daily lipid consumption of 1.8 ± 0.2 g/kg, which is equivalent to 22.7 ± 3.2% of TCV, was sufficient. Degoutte et al. (2006) and Teshima et al. (2002) have, however, discovered that martial artists consume an inordinate amount of nutrients.

According to the results of this investigation (Teshima et al., 2002), Japanese karate athletes exhibited inadequate fibre intake from dietary sources. But there isn't a lot of data on how much fibre athletes consume. Micronutrients are very necessary for many bodily functions, including producing energy, making hemoglobin, maintaining strong bones, immune system function, and protecting tissues from oxidative damage. Additionally, they facilitate the reconstruction and repair of muscle tissue following physical activity American Dietetic Association (2003). Although athletes can usually get away with using the Dietary Reference Intake (DRI) values, those who are trying to maintain a certain weight and are thus at danger of falling short need special attention (Manore, 2000; Lukaski, 2004). Risks are associated with harmful behaviors, including the exclusion of food groups, severe energy restriction, and the consumption of high-glycemic-index carbohydrates (Bonci et al., 2008). As a result of these practices, taekwondo athletes may experience deficiencies in vitamins B-complex, calcium, magnesium, zinc, and iron (Kazemi et al., 2006). Hydrosoluble vitamins are essential for metabolism, despite not being direct energy sources (Woolf & Manore, 2006; Lukaski, 2004). The diversity of athletes' nutrition implies a low likelihood of micronutrient inadequacy.

V. CONCLUSION

Overall, unless we exclude protein and fibre consumption, there was no discernible danger of nutritional deficiency when we looked at what Taekwondo athletes ate. Additionally, additional research should investigate the optimal timing of meals and the optimal combinations of nutrients to optimize the efficacy and performance of Taekwondo training. Furthermore, the efficacy of athletes in this expanding Olympic sport can be enhanced through the implementation of comprehensive and diverse dietary plans, which are backed by tailored training and computational projections, both internationally and in India.

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