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Nutritional Profile and Body Composition of Indian Inter-Collegiate and National Level Female Handball Players

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Abstract: Handball is a physically demanding sport that requires both aerobic and anaerobic energy systems. Female players need to consume adequate calories to fuel their training sessions and matches, as well as to support recovery. Other nutritional challenges faced by female athletes is micronutrient deficiency, which affects various playing capacities in women athletes. The present study was conducted to analyze the nutritional profile and body composition of female Handball players aged 17-25 years playing at intercollegiate and national level. The total number of subjects taken were thirty female handball players (15 National level female handball players and 15 Inter-collegiate level female Handball players) in the age range of 17-25 years. In anthropometric and body composition variables, weight was taken using weighing machine, height was measured with anthropometric rod and these values were used to compute Body mass index (BMI). Skin folds at biceps, triceps, supra-iliac and sub-scapular were taken with skinfold calipers to calculate body fat percent The nutritional profile was taken by recording 3-day's dietary record method and the nutrient intake was calculated using Indian Food Composition tables as given by NIN/ICMR (2017). The data obtained was analyzed by computing Mean (M), Standard deviation (SD). Independent t-test was used to evaluate the significant differences in various indices studied; between 15 National level female handball players and 15 Inter-collegiate level female Handball players and level of significance was taken at 0.05 levels. Analysis of data revealed that both intercollegiate and national level female handball players require nutrition education about adequate dietary practices to obtain desired body composition levels and to promote healthy dietary habits.

Keywords- Nutritional status, body composition, anthropometric measurements, female handball players.

Introduction

Competition in the sports is increasing day by day and so is the performance of athletes in different sports. Scientific selection of an athlete. keeping good nutritional status and a well-designed training program all contribute significantly in the success of an athlete. Playing handball involves a wide range of skills and movements. Some motor skills like sprinting, jumping, flexibility, shooting speed and agility have been identified as the components that contribute to the high performance of athletes. Anthropometric and body composition attributes, on the other hand, bestow supporting role to performance when player is in the competitive conditions. While height, Body mass index (BMI) and hand length are important in terms of

handball performance, body composition determines the economy of work performance. Bayios et.al (2009) conducted a study on the anthropometric, body composition and somatotype differences of Greek elite female basketball, volleyball and handball players. Handball athletes were the shortest of all ($P<0.01$), had the highest percentage of body fat ($P<0.001$) and their somatotype was mesomorph-endomorph (4.2-4.7-1.8).

To optimize desirable body composition handball athletes, need to follow sound nutrition principles, recover daily after training. In terms of energy requirements, handball player is a combination of a power and middle-distance athlete. Nutritional status affects the level of physical performance since physical fitness and training constituents are dependent upon the nutritional status of sports persons (Kreider et al. 2009). Various studies have emphasized that nutrition in athletes is often inadequate particularly in women (Diehl et al, 1986, Nuviala, 1996, Khanna et al., 2006). During periods of intensive training, the recommended intakes for energy and macronutrients must be met, especially for carbohydrates and proteins, to maintain appropriate body composition and post training recovery of muscle glycogen stores and wear and tear of the tissues. Fat intake should be adequate to meet the requirements for essential fatty acids, and micronutrient intakes should not be overlooked since exercise increases micronutrient requirements (Beals 2002). Athletes in power games have been reportedly consuming high amounts of fat considering fat as a major source of strength (Preeti and Siddhu, 1998; Sharma and Wasuja, 2008). Jain et al (2008) reported high fat intake of (> 25en %) even in team-games players (87%).

Female handball players particularly, may be at risk for various nutrition-related disorders due to the physical demands of training and competition, as well as the pressure to maintain a certain body composition. Some potential nutrition-related disorders that female handball players may face include disordered Eating and energy deficiency which in turn can impair performance, disrupt hormonal balance, and increase the risk of bone health issues such as stress fractures and osteoporosis. Iron Deficiency Anemia is also very common in female athletes. Intense training and menstrual blood loss can increase the risk of iron deficiency anemia in female athletes. leading to impaired performance. These disorders have serious physical and psychological consequences and require professional treatment.

One has to ensure that athletes adopt good nutritional practice which would help them train hard, recover quickly and adapt more effectively with less risk of illness and injury. The present study was an endeavor to analyze the nutritional profile and body composition of female Handball players aged 17-25 years playing at intercollegiate and national level.

Methodology

Selection of Subjects

This investigation was conducted on a total of thirty female handball players (15 National level female handball players and 15 Inter-collegiate level female Handball players), between age of 17-25 years and only those National level female handball players were taken who were attending the National camp in Delhi or were practicing in Delhi Stadiums. Female Inter-collegiate level female handball players were taken from Indira Gandhi Institute of Physical Education and Sports sciences, University of Delhi and Janki Devi Memorial College, New Delhi. The subjects were selected using purposive sampling method.

Selection of Variables

In anthropometric and body composition variables, weight was taken using weighing machine, height was measured with anthropometric rod and these values were used to compute Body mass index (BMI). Body composition was measured by skinfold calipers taking Skin folds at biceps, triceps, supra-iliac and sub-scapular to calculate body fat percent using the Durin and Womersley (1974) formula. The formulas employed in the present study for calculating the body density are listed below:

Body density = 1.1620 – 0.630 log (Biceps + triceps + sub scapular + suprailliac)

After the calculation of body density with the help of the above formula, percent body fat was calculated by using the following formulas devised by Siri (1961)

Percent body fat = (4.95/body density - 4.50) x 100

For determining the nutritional profile, a questionnaire was developed and 3-day's dietary record method was used (Two working days and one holiday). The nutrient intake for energy, protein, fats and iron was calculated using nutritive values of different foods given by ICMR/NIN (2017).

Statistical Analysis

The data obtained was analyzed by computing Mean (M), Standard deviation (SD). Independent t-test was used to evaluate the significant differences in various indices studied; between15 National level female handball players and 15 Inter-collegiate level female Handball players and level of significance was taken at 0.05 levels.

Findings of the study

The data was collected and all measurements and readings were taken on 15 Intercollegiate and 15 National level female Handball players in Delhi and data was analyzed in terms of mean, standard deviation, range and percentage of responses.

Table 1- Sports Participation Of Intercollegiate Level Female Handball Players And National Level Female Handball Players

S.NO	Options	Inter-collegiate level Players (n=15)	National level Players (n=15)
1.	Players indulging in regular practice.		
	0-2 years	1 (6.66%)	0(0%)
	3-6 years	11 (73.33%)	6 (40%)
	7-12 years	3 (20%)	9 (60%)
2	No. of subjects participating in camps held before competition	12 (80%)	15 (100%)

Table 1 depicts the sports participation of Inter-Collegiate level female handball players and National level female handball players in competitive sports. Only 20 % of Inter-Collegiate level female players continued regular practice for 7-12 years; whereas in case of National level female handball players it was 60%. The table revealed that 80% of the Inter-Collegiate level and 100% of the national level female handball players participated in camps held before competition.

Table 2- Activity Profile Of The Inter Collegiate Level And National Level Female Handball Players

S.NO	Exercise performed by the subjects	Inter-college players (n=15)	National players (n=15)
1	Gym	1 (6.66%)	14 (93.33%)
2	Yoga	4 (26.66%)	Nil
3	Aerobics	Nil	Nil
4	Jogging	15 (100%)	15 (100%)
5	Fast walk	15 (100%)	15 (100%)
6	Slow walk	4 (26.66%)	12 (80%)
7	Skill exercises	15 (100%)	15 (100%)

Table 2 reveals the activity profile of Inter-Collegiate level and National level female Handball players. Only 6.66% of Inter-Collegiate level female handball players went to gym; whereas 93.33% of National level female handball players used gym for strength training. While 26.66% of Inter-College level players were doing yoga for flexibility and concentration, none of the players in both categories was doing aerobics. All Inter-Collegiate level female handball players and National level female handball players did jog as well as fast walk. 80% of National level female handball players went for slow walk; whereas only 26.66% of Inter-Collegiate level players went for slow walk. All the players from both groups did skill exercises.

Table 3- Anthropometric Status Of The Intercollege Level Female Handball Players And National Level Female Handball Players

Parameter	Inter-collegiate players (n=15) Mean ± S.D **(Range)**	National players (n=15) Mean ± S.D **(Range)**
Weight (Kg)	51.00 ± 7.578 (40-67)	57.20±6.109 (47-68)
Height (Cm)	156.93±6.475 (145-170)	161.87±5.866 (154-169)
BMI	20.75±3.223 (16.8-26.7)	21.81± 1.770 (18.1-24.1)
Body fat (%)	25.82±2.521 (21.79-31.26)	25.52±2.043 (21.79-30.59)

The analysis of data in Table 3 reveals anthropometric parameters of the subjects. For Inter-Collegiate level female handball players; mean body weight 51.00 ± 7.578 kg whereas for National level female handball player's weight had mean value of 57.20 ± 6.109 kg. In case of height, Inter-Collegiate level female handball players had mean value and standard deviation of 156.93 ± 6.475 cm; whereas National level female handball players had mean value and standard deviation of 161.87 ± 5.866 cm. Mean BMI was 20.75 ± 3.223 for Inter-Collegiate level female handball players; whereas for National level female handball players, BMI had mean value and standard deviation of 21.81 ± 1.770. Mean Body fat percentage was 21.82 ± 2.521 for Inter-Collegiate level female handball players and for National level female handball players, Body fat percentage had mean value and standard deviation of 25.52 ± 2.043. Further distribution of subjects according to BMI classification of Inter-Collegiate and National level female handball players placed 40% of the Inter-College handball players in ideal BMI category and 60% of the National players in ideal BMI category. Almost 13.33% of Inter-

Collegiate level female handball players and 33.33% of National level female handball players were falling in overweight category.

Table 4 – Nutrient Intake Of Inter-Collegiate Level And National Level Female Handball Players

Nutrients	Inter-college level players (n=15) Mean ± S.D (range)	National level players (n=15) Mean ± SD (range)
Energy intake (kcal)	2262±848.96 (1414-4824)	2430±406.29 (1548-3223)
Protein intake (gm)	109.00±47.10 (56-243)	115.47±25.08 (56-155)
Fat intake (gm)	105.00±46.72 (55-232)	115.54±26.73 (52-154)
Iron intake (mg)	14.94±3.16 (11-22)	12.00±20 (15.36-28.11)

The analysis of Table 4 reveals that total energy (kcal) for Inter-Collegiate level female handball players was 2262.22 ± 848.96 kcal whereas for National level female handball players total energy (kcal) had mean value and standard deviation of 2429.79 ± 406.29 kcal. Protein (gm) intake for Inter-Collegiate level female handball players was 108.66 ± 47.10 gm and for National level female handball players it was 115.47 ± 25.08 gm. Fat (gm) intake for Inter-Collegiate level female handball players was 104.70 ± 46.72 while National level players it was 115.54 ± 26.73. Iron intake (mg) for Inter-Collegiate level female handball was 14.94 ± 3.16 and for National level female handball players it was 12 ± 20.

Discussion

In this study, more than half (73.33%) numbers of National players were non-vegetarian and were consuming eggs 2-3 times a week and other meat products at least once a week. The intercollegiate players had only 47% consuming non-vegetarian foods. This is reflected in their protein intake as well. National players had higher protein intake as compared to intercollegiate players.

Anthropometric status of the respondents in the present study revealed that National level players were heavier and taller as compared to intercollegiate players (Table 3). For a modern model of a handball player, the pronounced longitudinal dimensions such as stature, arm span, hand spread and length are necessary. Such an anthropometric profile plays a supportive role in helping athletes perform under actual competitive conditions.

The BMI was slightly higher for national players (Table 3). Mean BMI values of the present study were comparable to a study conducted on 40 female handball players in Maharashtra (Anju and Warker, 2013). This could be due to more number of overweight subjects (5) in national player category as compared to the intercollegiate player category. There is inherent limitation of BMI that it measures fat mass as well as LBM and persons with higher lean body mass or muscle mass are also categorized as overweight or obese particularly in case of sportspersons. Anju and Warker (2013) also studied BF% values which were reported to be 14.86%. In the present study BF% values (25.8% intercollegiate players and 25.5% national players) were much higher than

the mentioned study. Although for handball players BF% on the upper limit of the normal range is desirable, higher than the normal body fat per cent values may have long term detrimental health effects.

The adequacy in dietary intake was assessed by keeping dietary record for three consecutive days. The data underwent appropriate statistical techniques. According to Table 4, the mean of total energy intake of intercollegiate handball players was found to be 2262 kcal which was slightly higher than the energy requirements moderate worker category according to the recommended dietary allowance (RDA) of Indians (2130 kcal, ICMR 2020). Although there was no significant difference in the energy intake of players of both groups, the National level players had comparatively higher energy intake (around 2430 Kcal). It is important to note that the energy requirements increase during competition season and are placed at 60-70 kcal/kg body weight (ICMR, 1985). The energy intake of both the groups of players studied in the present study was only around 40 kcal/kg body weight. The present study was conducted during camps where players were practicing for 3 hours intensely. Hence, the energy requirement should be adjusted during practice period and off-season. Jain et al (2008) conducted a study on Delhi based sportswomen (n=100; 18-25 years) and found mean energy intake as 1471 $\pm$ 479 Kcal (range 629-3429 kcal) and most of the subjects were in negative energy balance. Adequate energy intake is the foundation stone of the handball athlete's diet to support optimal body function. Availability of energy dense and low-cost snacks and drinks probably can fill in the energy gap.

The ACSM sets daily recommendations of 6–10 g CHO/kg body weight for handball, and daily protein recommendations range from 1.2 to 2.0 g PRO/kg/day and 14 g dietary fiber per 1000 kcal (Mora-Fernandez et al, 2022). The protein intake for athletes has been recommended at 1-1.5 g/kg body weight for team players, not exceeding 100g per day. The total protein intake of female handball players in the present study was slightly higher than 100g/day for both the groups. None were consuming protein supplements and protein was coming purely from natural food sources. Protein intake is directly associated with lean body mass and strength in players. In the present study also protein intake was found to be positively correlated with Lean body mass for national players although correlation was not significant. This recommends and encourages high quality protein intake from natural sources, as the subjects of the present study were not taking any protein supplements. Jonnalagadda, et al (2001) conducted a study the purpose of which was to determine the dietary practices, attitudes, and physiological status of freshman collegiate football players and suggested that these athletes may require education about healthy dietary practices and on the proper use of dietary supplements. This is not only important to help improve performance but to also promote healthy dietary practices in the long term.

As far as fat intake was concerned, the total intake was 105 gm and 115 gm respectively for intercollegiate and national level players. The fat intake from visible sources for both the groups was higher than the RDI up to 30g per day (ICMR 2020). Their diet analysis also revealed higher intake of saturated fats. A right proportion of saturated fat intake and unsaturated fats should be recommended in order to attain long term health benefits. Lower than required iron intake (table 4) is also of concern in the athletes of both the groups.

Thus, the nutritional data analysis of both intercollegiate and national level female handball players suggested that these athletes require nutrition education about adequate dietary practices not only to adjust their body composition levels but also to promote healthy dietary habits.

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