



## **A Comparative Study on the Nutritional Profile of Male and Female Sportspersons**

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### **Abstract**

To study the impact of dietary pattern on nutritional status of sportspersons, a sample of 120 sportspersons including 60 vegetarian and 60 non-vegetarian in the age group of 16-25 years were selected from Punjab Agricultural University and Guru Nanak Stadium, Ludhiana. The data regarding general profile, anthropometric measurements, hemoglobin levels, dietary and nutrient intake of the sportspersons was collected. It was revealed that percent adequacy of all the food groups including cereals, pulses, vegetables and sugar was inadequate. However, intake of fruits and milk and milk products was found to be higher. Among nutrient intake, the percent adequacy of energy, protein, fat and iron was found to be inadequate among vegetarian and non-vegetarian category of both the genders, however, that of calcium, folic acid was found to be more than adequate. Among vegetarian males 6.7 percent and 3.4 percent among non-vegetarian males were found to have a Body Mass Index (BMI) less than 18.5, whereas 40 and 30 percent vegetarian and non-vegetarian females were underweight respectively. The potential health benefits of a vegetarian diet have been reported among non athletes. However, it was considered relevant to consider the benefits of a vegetarian diet among athletes and whether their nutritional status can be improved or compromised in any ways. Therefore, in the present study a comparison was made with regard to various parameters of nutritional status of the vegetarian and non- vegetarian male and female sportspersons.



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### **Introduction**

The importance of proper nutrition and diet to the overall fitness and health of the individual throughout the life span is well recognized. Health and sports are closely related. Any dietary deficiency that

adversely affects the health of the individual is likely to impair his or her physical performance capacity. Thus, nutrition and wellbeing plays a vital role in the field of sports and overall performance of an athlete. Different sports involve different levels of exercise

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sessions and a balanced diet to have an overall good fitness status. It has been supported by various researches that good nutrition has a very important role in maintaining good health and fitness of the sportsperson so that they can train and compete well. Dietary habits of Indian population have a large variation due to various social, economic and religious beliefs. An optimal eating methodology may be described as one in which the supply of needed supplements is satisfactory to blanket vigor use, and for tissue support, repair and development. The wholesome needs vary from individual to individual depending upon age, sex, form measure and arrangement, occupation, physiological condition and so forth. A typical vegetarian diet tends to contain fruits, vegetables, nuts, whole grains and legumes excluding all types of meat and fish<sup>1</sup>. Non-vegetarian athletes tend to consume lesser fruits and vegetables as compared to vegetarians as reported<sup>2</sup>. Female athletes are estimated to meet at least 12 percent body fat to meet general health requirements, so they are more likely to follow vegetarian diet as a measure to achieve an optimal body weight<sup>3</sup>. An extreme calorie restriction among female athletes may lead to have a negative impact on vitamins and minerals status leading to greater risk of amenorrhea and disordered menstrual cycles<sup>4</sup>. Studies have shown that poor performance and early fatigue are due to deficiencies in major nutrients, whereas excessive intake can impair performance resulting in undesirable increase in body's adipose tissue. The potential health benefits of a vegetarian diet have been reported with regard to non-athletes. However, it might be relevant to consider the benefits of a vegetarian diet with regards to the athlete and weather performance can be improved or compromised in any ways.

## **Materials And Methods**

### **Selection of subjects**

One hundred and twenty subjects, including 60 vegetarians and 60 non-vegetarians belonging to 16-25 years of age group were selected from Punjab Agricultural University and Guru Nanak Stadium, Ludhiana.

### **Development of interview schedule**

The required data collected through personal interview technique using the especially structured

schedule pertaining to various aspects as general, socio-economic status, family composition of the subjects were collected.

### **Dietary Survey**

Dietary survey was carried out to obtain the information regarding the dietary pattern and food habits. Detailed information on the food intake was obtained using 24 hour recall method for three consecutive days. The nutrient intake was calculated by using Indian Nutritive Software Diet Cal-A<sup>5</sup> for dietary assessment and planning.

### **Anthropometric Measurements**

Various anthropometric measurements viz. height, weight, waist & hip circumference and triceps skinfold thickness were collected using standard methods<sup>6</sup>. Based on the measurements, Body Mass Index (BMI) and Waist/Hip ratio was calculated.

### **Estimation of hemoglobin (Hb)**

Blood samples of all the sportspersons were collected and hemoglobin was got analyzed from Punjab Agricultural University Hospital Laboratory by using cyanmethemoglobin method<sup>7</sup>.

### **Statistical analysis**

Collected data was statistically analyzed by calculation of means, standard deviation and percentage distribution.

## **Results And Discussion**

### **General profile**

Majority of the subjects i.e. males as well as females belonged to the nuclear family, which is further evident from the number of family members also i.e. majority of the subjects belonged to families having less than 4 members (Table 1). It was revealed that 58.4 percent males and 63.4 percent females belonged to the high income group. Junk food was being consumed by 48.4 percent of males and 70 percent of females. It was further observed that skipping of meals was more prevalent among females as compared to that among males i.e. 51.6 percent of females used to skip their meals as compared to 38.4 percent of males which might be due to the reason that female athletes are more conscious about their body looks.

**Table 1: General Profile of the subjects (N=120)**

Characteristics	Males (n=60)	Females (n=60)
<b>Family size</b>		
Nuclear	48(80)	43(71.6)
Joint	12(20)	17(28.3)
<b>Family Composition</b>		
Small(<4)	44(73.3)	22(36.6)
Medium (4 to 8)	16(26.7)	37(61.6)
Large(>8)	0	1(3.3)
<b>Family income (Rs/Annum)</b>		
Low (upto 50,000/-)	1(3.3)	0
Medium (50,000-2,50,000/-)	24(40)	22(36.6)
High (>2,50,000/-)	35(58.4)	38(63.4)
<b>Junk Food</b>		
Yes	29(48.4)	42(70)
No	31(51.6)	18(30)
<b>Skipping Meals</b>		
Yes	23(38.4)	31(51.6)
No	37(61.6)	29(48.4)

**Anthropometric Measurements**

The anthropometrical characteristics are one of most influential factors in determining good athletic performance besides other physiological characteristics<sup>8</sup>.

Data regarding anthropometric measurements of the subjects has been presented in Table 2, which revealed that there was not any significant difference

in the height, weight and body mass index (BMI) of vegetarian and non-vegetarian subjects of both the genders. Similarly, no significant differences in height, weight and lean body mass in vegetarian and non-vegetarian subjects has been reported<sup>9</sup>.

However, a statistically non-significant difference was observed in the waist and hip circumference of vegetarian and non-vegetarian males as well as females.

**Classification According To Body Mass Index (BMI)**

The Body Mass Index (BMI) defined as weight (kg) / height (m<sup>2</sup>) is used to assess the nutritional status of adults. The classification of subjects based on Body Mass Index has been presented in and Fig. 1. The findings revealed that only 6.7 percent and 3.4 percent of vegetarian and non-vegetarian males were underweight having BMI less than 18.5 Kg/m<sup>2</sup>, whereas 40 percent and 30 percent of vegetarian and non-vegetarian females were in the category of being underweight.

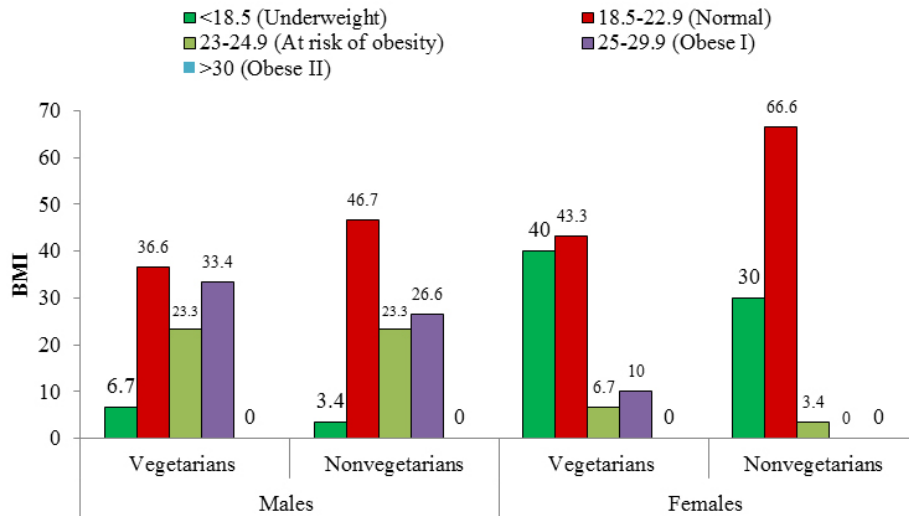
Among vegetarian males 36.6 percent and 46.7 percent of non-vegetarian males were in the normal category (18.5-22.9) while 43.3 percent of vegetarian and 66.6percent of non-vegetarian females was in the normal category of Body Mass Index. Among females subjects of vegetarian and non-vegetarian category, the prevalence of risk of obesity and obesity of grade I was very less when compared to the male counterparts, which might be due to the

**Table 2: Anthropometric measurements of the subjects (N=120)**

Parameters	Males			Females		
	Veg (n=30)	Non-veg (n=30)	t-value	Veg (n=30)	Non-veg (n=30)	t-value
Height (mts)	1.7±0.05	1.7±0.07	1.6NS	1.6±0.04	1.6±0.06	0.9NS
Weight (kg)	69.8±11.3	73.2±9.4	1.2NS	50.2±4.7	52.7±6.6	1.6*
BMI	22.7±3.3	23.1±2.8	0.5NS	19.6±1.7	20.2±2.8	0.9NS
Waist (inch)	32.6±2.4	33.6±2.3	1.7*	28.1±2.1	29.3±2.7	1.9*
Hip (inch)	36.2±2.9	37.9±2.9	2.1*	32.2±2.5	33.9±2.8	2.5*
W/H ratio	0.9±0.02	0.9±0.03	0.6NS	0.9±0.04	0.9±0.02	0.4NS
Triceps skinfold	7.5±2.7	8.8±3.1	1.6NS	9.8±1.8	9.8±2.0	0.1NS

Values are Mean ± SD

\*Significant at 5percent level NS – Non-significant



**Fig. 1: Classification of subjects according to BMI (N=120)**

reason that the females are more figure conscious. The BMI of the athletes with good fitness was found to be closer to normal levels but higher than the ones with average or poor status, as higher weight among the athletes with good fitness indicates more lean muscle mass and not necessarily body fat<sup>10</sup>. Observational studies indicate that the weight or body mass index of prevalence of obesity ranged from 0-6 percent of vegetarian and from 5.45 percent in non-vegetarians<sup>11</sup>.

**Biochemical picture**

Among the biochemical parameters, haemoglobin levels of the selected subjects were determined to assess the difference between that of vegetarian and non vegetarian sportspersons.

**Hemoglobin level of the subjects**

As depicted in Table 4.3, haemoglobin level of non-vegetarian category of both the genders was

higher as compared to vegetarians. However, the difference was statistically non significant. It has also been reported<sup>9</sup> that haemoglobin concentration of non-vegetarian was higher than vegetarian sportspersons. Higher the concentrations of hemoglobin in blood, greater will be the capacity of the system to carry oxygen to cells and tissues.

**Food Intake Of The Subjects**

As evident from the Table 4, intake of cereals grains & products was found to be higher among vegetarian males as well as females, as compared to their non-vegetarian counterparts and differences were statistically significant (p<0.05). However, the percent adequacy of cereals, grains and products was very less as compared to Suggested Dietary Intakes given by NIN<sup>12</sup>. Similarly, study have also reported that intake of cereals was ten percent deficit among female athletes of 18-23 years of age. Intake of pulses & legumes was comparatively

**Table 4.3: Hemoglobin level of the subjects (N=120)**

Parameters	Males			Females		
	Veg (n=30)	Non-veg (n=30)	t-value	Veg (n=30)	Non-veg (n=30)	t-value
Hemoglobin(mg/100 ml)	13.2±1.5	13.7±1.5	1.3 NS	11.2±1.3	11.2±1.3	0.9NS

Values are Mean ± SD  
NS-Non-significant

higher among vegetarian males and females as compared to their non-vegetarian counterpart<sup>13</sup>. Similar results regarding a significantly higher daily intake of pulses and legumes by male and female vegetarians than their non-vegetarian counterparts have been reported<sup>14</sup>.

Consumption of milk and milk products was significantly ( $p \leq 0.05$ ) higher among vegetarian males as compared to non-vegetarian males. Similarly, it was higher among vegetarian females as compared to non-vegetarian females but the difference was statistically non-significant. The reason for such higher intake of milk and milk products is consumption of 2-4 glasses of milk per day by the selected athletes.

As evident from the data, consumption of fats and edible oils was found to be higher among non-vegetarian category. Overall consumption of fats and oils was higher in males as compared to females. The higher amount of fats and oils was contributed by the daily consumption of paranthas and additional butter in the diets of majority of female subjects as reported<sup>15</sup>. Also, the non-vegetarian food items add to the excess fat intake in case of non-vegetarian subjects. Further, the data was collected in winters, which is the time to consume more fats traditionally in the Indian sub-continent, especially in Punjab state. The percent adequacy of consumption of fruits was found to be higher among vegetarian category as compared to non-vegetarians (Table 4). Similarly, a study found a higher intake

of fruits and vegetables in both male and female vegetarians compared with omnivorous<sup>16</sup>. Overall consumption of vegetables including that of leafy, other vegetables and roots & tubers was higher among vegetarian males and females as compared to non-vegetarian category. Although, consumption of sugars was found to be higher among non-vegetarian subjects but the differences were statistically non-significant. Similarly, authors have also reported non-significant difference in consumption of sugars and sweets between vegetarians and non-vegetarians<sup>17</sup>. Often sportsperson consume more table sugar in milk and more of energy drinks which have good quantity of sugar so as to increase the glucose level during their workout.

#### Nutrient Intake Of The Subjects

The average daily energy consumption of non-vegetarian males and females was found to be higher as compared to vegetarian sportsperson. Furthermore, the percent adequacy in both the categories was not meeting the RDAs (Table 6). Similarly, a study also reported a lower energy intake of vegetarians than that by non-vegetarians, confirming the fact that generally, energy intake by vegetarians ranged from 5-22 percent lower than that of non-vegetarians<sup>18</sup>. The percent adequacy of protein intake was higher in non-vegetarian as compared to vegetarian sportspersons. However, the protein intake was lesser as compared to the RDAs in all the categories of sportspersons and the differences

**Table 4: Daily average food intake (g) by the subjects (N=120)**

Food groups	SDI# (g)	MALES			FEMALES		
		Veg (n=30)	Non-veg (n=30)	t-value	Veg (n=30)	Non-veg (n=30)	t-value
Cereals grains & products	550	339.5±87.1	281.1±54.8	3.1*	272.3±40.4	243.9±41.3	2.7*
Pulses & legumes	80	65.8±30.2	34.9±26.1	1.4NS	65.5±21.2	27.6±12.9	1.4NS
Milk & milk products	750	1327.8±530	1077.3±147.1	2.5*	944.8±162.5	879±325.3	0.9NS
Fats & edible oils	75	43.1±5.7	45.3±7.4	1.2NS	33.3±9.7	36.4±7.2	2.3*
Fruits	150	288.8±201.7	169±149.3	2.6*	326.3±125.3	293±126.1	1.0NS
Leafy vegetables	150	72.4±37.7	51.9±33.8	1.4NS	65.7±7.0	48.4±0	2.3*

Other vegetables	200	83.6± 48	59.8± 19.2	2.5*	62.9± 25.4	60.7± 25.3	0.3NS
Roots & tubers	150	84.5± 18.9	75.7± 12.2	2.07*	71.7± 56.04	64.9± 19.9	0.6NS
Sugars	80	45.3± 5.4	46.8± 8.7	0.8NS	37.6± 9.1	38.1± 7.1	1.06NS
Fish, meat & poultry	-	0	213.9± 131.5	-	0	154.02± 73.02	

Values are Mean ± SD

SDI#: Suggested Dietary Intakes by NIN (2007)

\*Significant at 5percent level

NS-Non-significant

**Table 5: Percent adequacy of food intake by the subjects (N=120)**

Food groups	MALES		FEMALES	
	Veg (n=30)	Non-veg (n=30)	Veg (n=30)	Non-veg (n=30)
Cereals grains & products	60.5	52	49.4	44.2
Pulses & legumes	81.2	42.5	81.2	34.5
Fats & edible oils	57.3	60.4	44.4	48.5
Fruits	192	112.7	217.5	195.3
Leafy vegetables	48.7	34.6	43.8	32.3
Milk & milk products	176.9	143.6	126	117.2
Other vegetables	41.8	29.9	31.4	30.3
Roots & tubers	56.4	50.5	47.8	43.3
Sugars	56.6	58.5	47	47.6

were statistically significant ( $p \leq 0.05$ ) between vegetarian and non-vegetarian category. The protein intake was also found to be higher in non-vegetarians as compared to vegetarians and lacto vegetarians<sup>9</sup>. However, it has been suggested that because of the lower digestion of plant proteins, the protein requirement of vegetarian should be significantly higher than those of non-vegetarians<sup>19</sup>.

Fat is the most concentrated source of energy. The percent adequacy of fat intake ranged between 71 to 82.1 which was quiet good as compared to the RDAs. Similarly, a study have also reported that percent adequacy of fat intake was more than 150 percent among vegetarian and non-vegetarian boys and girls<sup>15</sup>.

There was a statistically significant difference ( $p \leq 0.05$ ) between vegetarian and non-vegetarian females regarding iron intake but it was non-significant among vegetarian and non-vegetarian males, the values being 28.8 and 38.5mg for

vegetarian and non-vegetarian males and 26.1 and 29.1mg for vegetarian and non-vegetarian females, respectively. Similar results i.e. higher intake of iron by non-vegetarian sportspersons have been reported<sup>9</sup>. The authors have also reported that iron deficiency anemia appears to be uncommon among non-vegetarian than vegetarian sportspersons<sup>20</sup>.

Average daily consumption of calcium was higher in vegetarian males and female sportspersons as compared to the non-vegetarian ones. But, the differences were statistically non-significant. Such high calcium intake might be due to more consumption of milk and milk products in the daily diet by the subjects under study. A study have also reported higher intake of calcium among lacto-vegetarians ( $p \leq 0.01$ ) than vegetarians and non-vegetarians<sup>9</sup>.

Average daily intake of  $\beta$ -Carotene was higher in vegetarian males and females as compared to the non-vegetarian counterparts of both the sexes.

**Table 6: Daily average nutrient intake of the subjects (N=120)**

Nutrients	Males			Females		
	Veg (n=30)	Non-veg (n=30)	t-value	Veg (n=30)	Non-veg (n=30)	t-value
Energy (Kcal)	3271.7±747.2	3450.2±519.8	1.0 <sup>NS</sup>	2950.9±438.9	3011±274	0.6 <sup>NS</sup>
Protein (g)	95.4±25.4	112.7±20.7	2.8*	72.5±8.2	83.8±15.8	3.0*
Carbohydrates (g)	389.9±85.6	379.9±69.8	0.5 <sup>NS</sup>	346.4±36.6	320.9±50.6	2.2*
Fat (g)	86.2±34.4	98.5±23.3	1.6 <sup>NS</sup>	85.1±21.4	86.5±13.8	0.3 <sup>NS</sup>
Iron (mg)	28.8±5.2	32.5±5	0.5 <sup>NS</sup>	26.1±3	29.1±2.8	3.09*
Calcium (mg)	2321.8±903.7	2060.5±403.7	1.4 <sup>NS</sup>	1681.4±330.2	1546.5±638.1	1.02 <sup>NS</sup>
Phosphorous (mg)	2386±726.9	2271.1±401.7	0.7 <sup>NS</sup>	1702.8±243.5	1717.6±402.4	0.1 <sup>NS</sup>
Beta - Carotene (µg)	2688.1±466.9	2279.3±480.7	4.8*	2216.8±662.6	1913.9±880.8	1.5 <sup>NS</sup>
Vitamin A (µg)	545±279.9	570.8±156.1	0.4 <sup>NS</sup>	388.4±142.1	412.1±116.5	0.7 <sup>NS</sup>
Folic Acid - Total (µg)	190.9±72.9	177.2±45.7	0.9 <sup>NS</sup>	143.4±39.9	134±38.8	0.9 <sup>NS</sup>
Vitamin C (mg)	95.7±43.2	81.6±30.9	1.4 <sup>NS</sup>	123±60.4	97.6±56.3	1.7*
Total Dietary Fibre (g)	21.7±4.1	23.6±5.7	1.3 <sup>NS</sup>	26.7±3.5	27±3.32	5.1*

Values are Mean ± SD

\*Significant at 5percent level

NS-Non-significant

**Table 7: Percent adequacy of nutrient intake by subjects (N=120)**

NUTRIENTS	RDA#	Males		Females	
		Veg (n=30)	Non-veg (n=30)	Veg (n=30)	Non-veg (n=30)
Energy (Kcal)	4500	72.7	76.7	65.5	67
Protein (g)	160	59.6	70.4	45.3	52.4
Fat (g)	120	71.8	82.1	71	72.1
Iron (mg)	60	48	54.2	43.5	48.5
Calcium (mg)	2000	116.1	102	84.1	77.3
Beta - Carotene (µg)	4800	56	47.9	46.9	39.9
Vitamin A (µg)	600	90.8	95.1	64.7	68.7
Folic Acid - Total (µg)	200	95.4	88.6	71.7	67
Vitamin C (mgs)	40	239.2	204	307.5	244

# Recommended Dietary Allowances for Indians by NIN (2007)

However, intake of  $\beta$ -Carotene was quiet less as compared to the RDAs of 4800  $\mu$ g per day. Such lower intake of  $\beta$ -Carotene might be due to very low consumption of green leafy and other vegetables in their diets. However, higher adequacy of  $\beta$ -Carotene intake ranging from 104 to 153 percent for vegetarian and non-vegetarian boys and girls

has been reported<sup>15</sup>.

A statistically non-significant difference was observed regarding average daily intake of Vitamin A among vegetarian and non-vegetarian categories of both the sexes. However, percent adequacy (Table 7) was found to be higher among non-vegetarian males and females as compared to their

vegetarian counterparts.

Percent adequacy of folic acid intake was found to be higher among vegetarian subjects as compared to the non-vegetarian ones. A study has also reported that vegetarians normally consume more folic acid than meat eaters<sup>21</sup>. Adequacy of Vitamin C was found to be quite high i.e. ranging from 204 to 307.5 percent among all the categories. However, consumption was higher among vegetarian subjects as compared to the non-vegetarian counterparts. Such high consumption of Vitamin C might be due to more consumption of lemon, lemon water, coconut water and various seasonal fruits in their daily diet.

### Conclusion

In present study, the vegetarian and non-vegetarian sportspersons (males as well as females) were found to consume a very low amount of various food groups and nutrients as compared to the Suggested Dietary Intake and Recommended Dietary Allowances given by NIN<sup>12</sup>. However, a non-significant difference

regarding their anthropometric profile was observed with relation to the dietary pattern i.e. whether vegetarian or non-vegetarian.

Through a well balanced diet concentrating on nutrient dense and protein rich foods, vegetarians can consume all required nutrients in sufficient amounts, leading to optimal health and athletic performance. Hence, it can be concluded that vegetarianism can be an equally healthy alternative for sportspersons.

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