



Comparative Study of Dietary Nutrition Index of Players of Sports Authority of India (SAI) and Tribal Schools of Kanker Chhattisgarh India

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Abstract

Nutritional assessment of the adolescent is very important, as it provides the status of health. Calculating Dietary Nutrition Index (DNI) is an ideal method to the study nutritional status of any population. In the present study dietary index of the players who are studying in tribal schools of Chhattisgarh and players who are residing in urban area and training under Sports Authority of India was assessed. Total of 200 subjects aged between 14 to 17 years participated in this study. Descriptive statistics and ANOVA were used to compare the nutritional status of different groups. The result of the study revealed that DNI of tribal boys and girls and SAI girls is inadequate. Further it was found that there was a significant difference between the groups. SAI boys and girls showed better values as compared to tribal boys and girls. It is suggested that intervention to meet the dietary requirement of the players should be planned for optimal performance.



Article History

Received: 03 June 2020

Accepted: 25 January 2021

Keywords

Dietary nutrition index (DNI);
home diet;
Sports Authority of India (SAI);
Tribal School of Kanker (TSP).

Introduction

"To eat is a necessity, but to eat intelligently is an art"---La Rochefoucauld. Community nutrition is a big challenge in every country. Education, provisions for individuals or groups to adopt healthy eating habits is to be planned for better nutritional status.

The availability of fast food and "supersized" items are regarded positively because of their cost and convenience, for example one may bypass a salad or fruits in favour of fries or a soda drink,¹ in urban and affluent population, whereas the rural and tribal population suffers from lack of proper resources

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Doi: 10.12944/CRNFSJ.9.1.28

to meet the nutritional requirement. An idea of Balanced Diet was revealed to provide minimum requirements of protein, vitamins and minerals. Recommended Dietary Allowances (RDA) for population were first set in the 1930 and have been revised at regular intervals.² Dietary Nutrition Index (DNI) is an uncommon method to assess nutritional quality globally. It helps to assess nutritional patterns. Balance diet for children is very essential, which should include the micronutrients required along with total calories. In developing countries like India where the burden of proper nutrition is getting worse, calculating dietary nutrition index can provide a solution to cope up with the problem. According to the state food security and nutrition report 2017 number of undernourished people in the world increased to 815 million in 2016 and 777 million in 2017 and according to FAO estimated in the state of food security and nutrition in the world 2018 reported that 195.9 million people are undernourished in India, which accounts 14.8% population in India.³ Under nutrition is crucial and critical problem in tribal areas. Poor nutrition, lack of knowledge and socioeconomic status are the main causes for improper growth. India's Human Development Index (HDI) for nutrition rank 131 reflecting as a main problem of vast majority of population.⁴ Nutritional need of sports children are different from non- players.

We live in an era where sports are of eminent importance professionally as well as for recreation. Nutrition plays an important role in the physical and mental development of sports person. Protein, vitamins and minerals are important for growth, maintenance and repair of body tissues, and for optimal performance.

Nutritional deficiency among the school children of tribal area have been observed by many researchers. An article states that deficiency of macro and micro nutrients are alarming, the intake of vitamin A and vitamin C is less than 45% of the estimated mean RDA.⁵ The weight and height and anthropometric measurements were significantly lower among tribal girls as compared to NCHS 1987, CDC 2007-10, ICMR 2010.⁶ Wasting in 53.83% boys and 72.71% girls, out of which 16.12% children showed a severe degree of wasting. Stunting was found in 37% boys and 58.44% girls. The study provided evidence that school children were under acute and chronic nutritional stress.⁷ Studies found that

tribal adolescent girls height and weight were low as compared to national standard.^{8,9} Poor nutritional status, BMI below normal in adolescents of tribal children was also observed by many researches.^{10,11,12,13} In case of tribal sports children it is essential that the nutritional intake should meet the demand of growth and development along with the specific demand of sports, therefore emphasis should be laid on estimating the DNI which is necessary to know the loop hole of the under nutrition. Calculating DNI is a good method to assess the effect of total nutrients together in a diet. It also helps in comparing the nutrition adequacy of different population.¹⁴ Keeping in view of the above facts present study was undertaken.

Aims and Objectives

- To assess the dietary pattern of players of Tribal School Players (TSP) and Sports Authority of India (SAI).
- To compare the DNI of players of TSP and SAI.

Materials and Methods

Sports Persons of different schools of Kanker district and Sports Authority of India (SAI) Raipur and Rajnandgaon in Chhattisgarh were selected for the present study. Tribal School Players of Kanker (TSP) comes from rural background, they practice and are trained for about 4 hours per day according to types of games before and after school hours. SAI is an apex body of sports in India. Players of SAI come from different parts of the country and participate in training along with the educational facilities.

Selection of the Subjects

The sample size consisted of 200 players which included 100 boys and 100 girls of 14 to 17 years of age.

Selection of Variables

24 hour recall method was used to assess nutrient intake of both the groups. The data of home diet was collected by filling information sheet in which the players were asked to self-record the food consumed in home for three successive days which included holidays also. Consumption of cooked food equal to raw food is measured and their values were calculated from the values developed by Gopalan and Balasubramanian(2016) and Longvah *et al.* (2017) for all the 12 nutrients like protein, fat, carbohydrate, calorie, calcium, iron, vitamin A,

vitamin D (retinol), vitamin D (carotene), vitamin B₁, vitamin B₂ and vitamin C.^{15,16} Recommended Dietary Allowances (RDA) by Srilakshmi (2018) and <https://www.ncbi.nlm.nih.gov> were used for calculating IN (index of nutrient) for each players using the following formula^{17,18}

Index of the nutrient = Nutrient Intake by the subject - RDA for the age and sex / Standard Deviation of nutrient of the groups

Mean and SD were calculated for the all the groups. The standard deviation of the nutrient is derived by combining all the dietary nutrient values, according

to age and sex, thus common SD was used for the calculation of IN. The dietary nutrition index was derived by totalling the IN values of all twelve nutrients for each player.¹⁹ It is uncommon method which assess total nutrients in the diet and is useful in comparing the nutritional status of different population.

Research Design

2×2 factorial design was used. ANOVA was used for the analysis of nutrient intake of the subjects. Descriptive and comparative analysis of the data was done by using IBM Statistical Package of Social Science (SPSS) statistics 25 package version.

Table 1: Difference between observed mean intake and RDA of different nutrients in TSP boys and girls

Nutrient	TSP BOYS					TSP GIRLS				
	Observed Mean	Mean RDA	Difference Mean	SD	DNI	Observed Mean	Mean RDA	Difference Mean	SD	DNI
Protein (gm)	48.3	90.2	-41.9	14.1	-2.9	46.06	87.6	-41.5	12.4	-3.3
Fat (gm)	47.01	45.9	1.11	19.8	0.05	46.7	35	11.7	14.1	0.8
Carbohydrate (gm)	313.6	360.8	-47.1	59.8	-0.7	305.2	350.6	-45.4	78.9	-0.5
Calorie (Kcal)	1871.3	3125.5	-1254.2	445.9	-2.8	1826.6	2687.3	-860.7	429.1	-2.0
Calcium (mg)	279.9	799.9	-520	133.2	-3.9	404.3	799.9	-395.6	157.5	-2.51
Iron (mg)	8.8	10.9	-2.1	2.3	-0.9	9.9	10.9	-1.05	4.3	-0.2
Vitamin A (µg)	415.5	599.9	-184.4	301.9	-0.6	1211.2	600	611.2	1391.1	0.4
Vitamin D retinol (µg)	66.5	399.9	-333.4	65.1	-5.1	75.5	399.9	-324.4	32.3	-10.0
Vitamin D Carotene(µg)	12.7	14.9	-2.2	8.8	-0.2	19.8	24.6	4.83	15.5	0.31
Vitamin B1 (mg)	0.86	1.76	-0.9	0.4	-2.2	39.0	39.3	-0.29	0.2	-1.4
Vitamin B2 (mg)	0.61	1.6	-1.0	0.3	-3.3	0.70	1.26	-0.56	0.3	-1.8
Vitamin C (mg)	31.2	40.0	-8.7	13.9	-0.6	41.9	40.0	1.9	21.5	0.08

Results and Discussion

Table 1 presents the mean DNI of different nutrients. Among the sports person DNI mean values are deficient in protein, carbohydrate, calorie, calcium, iron, vitamin D retinol, vitamin B₁, and vitamin B₂. Fat consumption is adequate in TSP boys and girls. TSP girls consume adequate amount of vitamin C whereas TSP boys consume deficient amount of vitamin C.

Table 2 presents the mean DNI of different nutrient. Among the sports person the DNI values of protein, carbohydrate, calorie, vitamin D retinol was low. DNI

mean values is deficient for calcium in SAI girls. Fat, iron, vitamin D carotene, vitamin B₁, vitamin B₂ and vitamin C are adequate in the players of both the groups.

Table 3 reveals the mean of dietary nutrition index (DNI) of TSP and SAI players. The difference of mean score of TSP boys and girls showed negative mean DNI respectively. The positive DNI (3.6944) of SAI boys indicates far better nutritional status as compare to the other three groups, the males and females of TSP and females of SAI.

Table 2: Difference between observed mean intake and RDA of different nutrients in SAI boys and girls

Nutrient	SAI BOYS					SAI GIRLS				
	Observed Mean	Mean RDA	Difference Mean	SD	DNI	Observed Mean	Mean RDA	Difference Mean	SD	DNI
Protein (gm)	102.6	130.5	-27.8	37.4	-0.7	63.5	102.3	-38.8	17.2	-2.2
Fat (gm)	83.9	49.7	34.8	31.8	1.09	60.0	40.1	19.9	22.2	0.9
Carbohydrate (gm)	449.8	522.2	-72.3	101.2	-0.7	364.5	409.4	-44.8	80.8	-0.5
Calorie (Kcal)	2940.9	3297.3	-356.4	706.8	-0.5	2259.0	2652.5	-393.5	514.8	-0.7
Calcium (mg)	1194.8	800	394.8	910.3	0.4	480.5	799.9	-319.4	156.1	-2.0
Iron (mg)	24.2	11.0	13.22	9.2	1.4	15.98	11.08	4.9	6.3	0.7
Vitamin A (µg)	1041.5	600	441.5	1147.2	0.3	756.7	600	156.7	667.8	0.2
Vitamin D retinol (µg)	359.1	399.9	-40.8	356.3	-0.11	110.3	399.9	-289.6	69.2	-4.1
Vitamin D Carotene(µg)	52.4	15.08	37.4	34.9	1.11	27.63	15.03	12.6	15.2	0.83
Vitamin B1 (mg)	2.11	1.40	0.63	0.7	0.9	1.29	1.1	0.1	0.4	0.4
Vitamin B2 (mg)	1.90	1.76	0.14	1.2	0.11	0.91	0.51	0.4	0.4	1.0
Vitamin C (mg)	47.6	40.0	7.6	26.6	0.2	45.3	40	5.3	19.4	0.2

Table 3: Mean Score and Standard Deviation of total DNI of all nutrient in TSP and SAI

Institution	Sex	Mean	Standard deviation	N
TSP	Boys	-23.6554	7.99665	50
	Girls	-20.4016	8.13656	50
SAI	Boys	3.6944	8.77775	50
	Girls	-7.3856	8.02672	50

Table 4: Percentage of TSP and SAI Players with deficient nutrients (N=50)

Nutrient	TSP		SAI	
	Boys	Girls	Boys	Girls
Nutrients	%	%	%	%
Protein (gm)	100(50)	100(50)	86(43)	98(49)
Fat (gm)	56(28)	18(9)	8(4)	18(9)
Carbohydrate (gm)	82(41)	70(35)	76(38)	74(37)
Calorie (Kcal)	100(50)	96(48)	70(35)	82(41)
Calcium (mg)	100(50)	100(50)	44(22)	100(50)
Iron (mg)	88(44)	72(36)	12(6)	22(11)
Vitamin A (µg)	86(43)	48(24)	50(25)	64(32)
Vitamin D retinol(µg)	100(50)	100(50)	76(38)	98(49)
Vitamin D Carotene(µg)	70(35)	48(24)	12(6)	24(12)
Vitamin B1 (mg)	98(49)	88(44)	16(8)	28(14)
Vitamin B2 (mg)	100(50)	94(47)	58(29)	86(43)
Vitamin C (mg)	70(35)	54(27)	54(27)	40(20)

Note: Figures in the parentheses in the body of the table indicates frequency.

It can be noted from the table 4 that percentage of deficient nutrients like protein, calcium, vitamin D retinol ranges up to 85% to 100% in both the groups. The percentage of deficiency of carbohydrate ranges from 70% to 85%. The percentage of players deficient with iron, vitamin D carotene and vitamin B₁ varies less than 30% in SAI players where as in TSP players the trend is different the deficiency varies up to 88%. More than 50% of the TSP players but less than 30% of SAI players are deficient in vitamin D carotene. Vitamin B₂ is deficient in more than 90% of TSP players. In case of fat TSP boys showed 56% deficiency as compare to TSP girls and SAI

boys and girls. It is also noted from the table that the percentage of deficient nutrients in SAI boys are lesser than the TSP players and SAI girls. Despite of their social background nutrition deficiencies is found in SAI boys and girls.

Table 5 shows significant difference between TSP and SAI players. It is observed from the table that main effect of institution and sex on DNI is significant between TSP boys and SAI boys, TSP girls and SAI girls and SAI boys and SAI girls, whereas there is no significant difference between TSP boys and TSP girls, means both the groups showed deficient DNI.

Table 5: Comparison of mean DNI among TSP and SAI players

I Sex	J Sex	Mean Difference I-J	Std Error	Sig	95% confidence Interval	
					Lower bound	Upper bound
Kanker boys	Kanker girls	-3.2706	1.64811	0.197	-7.5412	1.0000
Kanker boys	SAI boys	-27.3666*	1.64811	0.00	-31.6372	-23.0960
Kanker girls	SAI girls	-13.0160*	1.64811	0.00	-17.2866	-8.7454
SAI boys	SAI girls	11.0800*	1.64811	0.00	6.8094	15.3506

Based on observations. The error term is mean square (error) = 67.90

*The mean difference is significant at the .05 level.

Table 6: Analysis of variance of players of TSP and SAI

Source	Type Sum of squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Institution	20384.430	1	20384.430	300.183	0.000	0.605
Sex	762.334	1	762.334	11.226	0.001	0.054
Institution*Sex	2574.247	1	2574.247	37.909	0.000	0.162
Error	13309.720	196	67.907			
Total	65549.421	200				
Corrected total	37030.731	199				

a.R Squared = .641 Adjusted R Squared = .635

Table 6 shows the main effect analysis that institution has significantly higher effect than sex. The computed value F (1,199) =300.183, p = .000 shows that DNI of the players of SAI is greater than the TSP. Partial Eta squared of 0.605 shows that 60% variance in DNI depends on institution. The computed value F (3,196) =11.226, p = .001 shows that DNI of the players according to sex is less significant as compare to institution. Partial Eta squared of 0.054 shows that 5.4% variance in DNI

depends on sex. The computed value F (3,200) = 37.909, p= .000 reveals that the interaction effect of institution is also significant. Partial Eta squared of 0.162 shows that 16% variance on DNI depend upon each other.

Discussion

The result of the present study revealed that DNI among players is low in tribal players as well as in girls who are taking coaching in SAI centres.

The mean intake of all the foodstuffs especially pulses, milk and milk products were lower than the recommended levels of ICMR in adolescents.²⁰ In tribal players high prevalence of under nutrition is associated with micro nutrient deficiencies like anaemia.²¹ Various studies have shown nutritional deficiency among adolescent boys and girls. Low intake of energy and blood forming micro nutrients was found in urban and rural adolescents girls.²² Comparison with DRI recommended values, the intake of energy and some nutrients such as VB₁₂, folate, Ca, Zinc and fibre were insufficient among adolescent girls as compare to DRI.²³ Women players were lacking on their calorie consumption as compared to RDA of ICMR.²⁴ Munson (2016) and other researchers states that 20-25 gm of protein every 3-4 hours is needed to maintain muscle protein synthesis. Soy, whey or animal protein consumed every day improves muscle mass and also help in maintaining body weight and fat mass.²⁵ It is useful especially for those sports person who needs to maintain low body fat for better performance. School should adopt education about nutrition and physical activity, so that physical and psychological effect of proper nutrition and physical activity benefit the future generation. Under nutrition is in high rate among school going girls.²⁶ A cluster of studies revealed the low nutritional status and lack of many macro and micro nutrient on tribal community. The prevalence of stunting as per NCHS norms in boys and girls is greater in Indian adolescents as compare to UAE.²⁷ High prevalence of anaemia (59 to 81%) and more than 60% tribal children suffer from various grades of malnutrition.^{28,29,30} The tribal when compared with children from all India showed lower height and weight and difference is significant in all ages.³¹ The prevalence of underweight is 32.5%, stunting is 22% and thinness is 24% in primitive tribe in Chhattisgarh.³² Grade I and II thinness 13.64% and 10% respectively was observed in Bhaina tribe of Chhattisgarh.³³ Distance curve of weight and height was lower in Gond tribes than non tribes and BMI of Gond tribe was 44.8%

(moderately malnourished) and 40.8% were severe malnourished.^{34,35}

Conclusion

In the result of the present study, it is concluded that the tribal boys and girls were deficient in DNI. Similarly, girls who are taking training in SAI centre are also deficient in various nutrients. The effect of institution and sex on DNI is significant, the players enrolled in SAI are from various parts of the country and have higher DNI because of higher socio-economic status, but the DNI is also deficient in SAI girls which should be taken care as it can affect the performance. Girls belonging to the tribal area showed lower DNI which may be due to socio economic status and lack of awareness regarding nutrition. The girls were residing in remote areas and they usually depend on the food sources available in that particular area where as in case of SAI girls, the lack of awareness and negligence may be the causes of under nutrition. As the players enrolled in tribal schools of Kanker have lower DNI which definitely is a barrier in their performance. Further study should be conducted to understand the causes of the deficiency. Awareness through nutritional programs and provisions of regular nutritious meals should be implemented to cope up with the high rate of undernutrition in tribal players as well as in SAI girls.

Acknowledgement

We are thankful to the players of tribal schools of Kanker and SAI girls and boys of Chhattisgarh for their cooperation and participation in the study.

Funding

The author received no financial support for the research, authorship, and or publication of this article.

Conflict Of Interest

The author declares no conflict of interest.

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