CHAPTER 4

RESULTS

The results of the present study entitled, **"Assessment of nutritional status, fitness profile and capacity building of football players of Urban Vadodara to understand food labels and healthy processed food choices using smartphone application"** are presented, discussed and deduced in this chapter. The results are presented into the three main phases according to the objectives of the study.

PHASE I: Situational analysis of football players of urban Vadodara

PHASE II: Market survey of processed foods and sports supplements

PHASE III: Capacity building of football players on food labeling

PHASE I: Situational analysis of football players of urban Vadodara

In order to achieve optimal performance, athletes may try to gain weight, lose weight or try to modify their body composition. In some sports like football, heavy weight wrestling and boxing, there has been the perception that bigger is better, especially in almost all positions in football. Such sports in which a greater body mass is beneficial, have a higher incidence of overweight and obesity. In certain sports athletes have to gain weight before each event in order to compete in the event whereas in others, speed, power and agility may improve due to less body fat. In order to meet such demands, athletes undergo pressure which sometimes may lead to an obsession about weight or body composition and result into disordered eating. Eating disordered athletes may develop nutritional deficiencies over the time. Obese athletes can develop obesity related conditions in future in spite of high activity levels. It becomes very important that athletes receive accurate and timely nutrition information in order to improve their performance). Children (from birth to 17 years old) do not typically prepare their own meals, so most food choices are dependent on what parents provide. Few studies have

shown that children as young as five to six years old are able to identify healthy snacks if given the proper guidance (Baskale and Bahar 2011 and Pettigrew 2009).

Hence, the present phase of the study was commenced to assess the nutritional status, fitness status, body composition and food choices of the football players. In favor of attaining the set objectives, the study sample of 250 subjects was enrolled from the Baroda football academy. The detailed methodology for eliciting the parameters has been described in the Materials and Methods chapter.

The results of this chapter have been segregated in the following sections:

4.1.1: Socio-demographic characteristics of the subjects

4.1.2 Duration and level of participation in football competition of the subjects

4.1.3: Anthropometric profile of the subjects

4.1.4: Fitness profile of the subjects

4.1.5: Body composition profile of the subjects

4.1.6: Factors affecting food choices in selection of processed foods

4.1.7: Dietary profile of the subjects

4.1.8: Frequency of consumption of processed foods among the subjects

4.1.1: Socio-demographic characteristics of the subjects

Socio-demographic data was collected by using semi-structured questionnaire. Data of the football players revealed that majority of them were Hindus (68%). Mean age of the male football players was 13 years. There were 80 footballers in younger age group (11-12 years) and 170 footballers in older age group (>12-14 years). With respect to education, all the players were at primary school level, 47% of them belong from nuclear family and remaining (53%) were living in joint family. Almost 46% of the subjects belong to lower middle socio-economic class as per Kuppuswamy scale classification (Table 4.1.1.1).

Table 4.1.1.1: Socio-demographic characteristics of the subjects

Parameters	Boys (N=250)
Age (11-14 years)	
11-12	80 (32)
>12-14	170 (68)
Total	250 (100)
Education level	
Secondary school	0 (0)
Primary school	250 (100)
Illiterate	0 (0)
Religion	
Hindu	169 (67.6)
Muslim	47 (18.8)
Christian	13 (5.2)
Jain	16 (6.4)
Other	5 (2)
Type of family	
Nuclear	118 (47.2)
Joint	132 (52.8)
Extended	0 (0)
Socio-economic class	
Upper class	23 (9.2)
Upper middle	59 (23.6)
Lower middle	116 (46.4)
Upper lower	50 (20)
Lower	2 (0.8)

Note: Numbers in parenthesis indicate percentage

4.1.2 Duration and level of participation in football competition of the subjects

Training is an important factor for success in sports. Well-designed training programmes help athletes in achieving optimal outcomes. FITT (Frequency, Intensity, Type and Time) principle is generally used for planning a programme. Several types of trainings are given with goal of enhancing performance. In the present study, all the players were actively playing football since past 1-2 years and the amount of time spend in specific training in a day was more than 1 hour. All the players spend around 5-7 days in week in playing football. From the total subjects, around 15% of the players had played at district level and 10% of them had played at interschool level (Table 4.1.2.1).

Table 4.1.2.1: Duration and level of participation in football competition of the total subjects

Parameters	Football players (N=250)
Duration of playing football	
1-2 years	250 (100)
3-4 years	-
>4 years	-
Duration of training (Hrs/day)	
≤ 1 hour	-
> 1 hour	250 (100)
Duration of training (days/week)	
<5	-
5-7	250 (100)
Level of participation	
Interschool	26(10)
Inter college	-
District	37 (15)
State	-
National	-

Note: Numbers in parenthesis indicate percentage

4.1.3: Anthropometric profile of the subjects

Nutritional status is an important parameter to screen and do the assessment for the enrolment of subjects in the sport. Nutritional status of the football players was assessed by taking anthropometric measurements like height, weight, waist circumference, hip circumference. The football players had mean Body Mass Index (BMI) of 21.22. BMI of group 2 (older age group) was significantly higher ($p<0.001$) than younger age group. With respect to the hip circumference, there was insignificant difference amongst both the groups. Both waist circumference and hip circumference were higher in younger age group compare to older age group (Table 4.1.3.1).

Table 4.1.3.1: Mean values of anthropometric measurements of total subjects

Anthropometry (Mean ± SD)	**Total N=250**	**Group 1 (11-12 years) n=80**	**Group 2 (>12-14 years) n=170**	**P value (t test)**
Weight (kg)	46.73±8.7	38.84±9.5	50.41±5.3	<0.001
Height (cm)	149.37±8.8	140.39±8.7	153.6±4.9	<0.001
BMI (kg/m^2)	21.22±7.7	19.67±4.1	21.31±1.7	0.001
WC (cm)	65.42±3.3	67.63±3.1	64.38±2.8	<0.001
HC (cm)	77.50±2.72	77.69±3.6	77.42±2.2	0.54

Subjects were further classified into various grades of nutrition using anthropometric indices namely BMI for age (WHO-Z score). Of the total subjects (N=250), 10% fall in thinness, 75% were classified as normal, 5% as overweight and 10% as obese. Figure: 4.1.3.1 depicts classification of total subjects according to BMI for age (in percentage)

Table 4.1.3.2: Percentage of total subjects showing their nutritional status as BMI classification (in percentage)

Classification	**Total N=250**	**Group 1 (11-12 years) n=80**	**Group 2 (>12-14 years) n=170**
Severe thinness	0 (0)	0 (0)	0 (0)
Thinness	25 (10)	20 (25)	5 (2.94)
Normal	184 (73.6)	28 (35)	156 (91.76)
Overweight	13 (5.2)	11 (13.75)	2 (1.17)
Obese	28 (11.2)	21 (26.25)	7 (4.11)

Note: Numbers in parenthesis indicate percentage

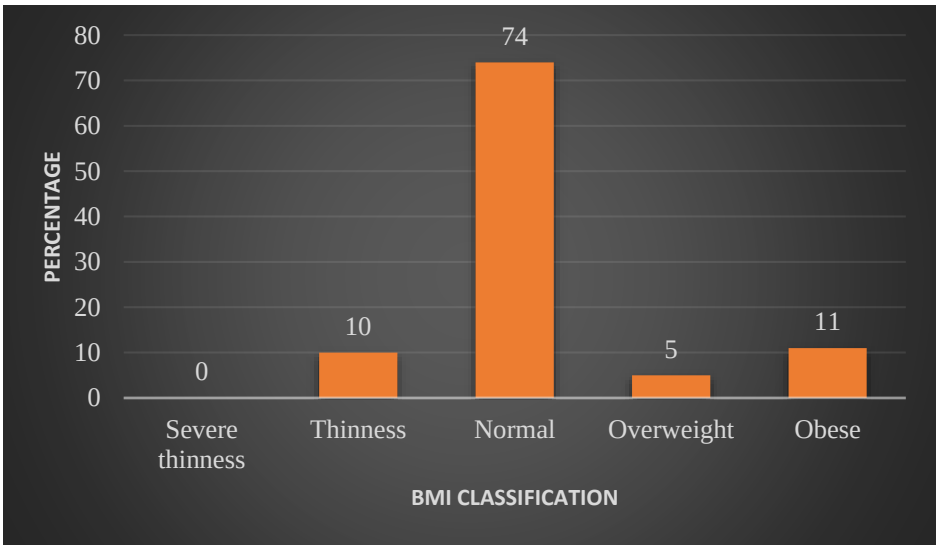

Figure: 4.1.3.1: Classification of total subjects according to BMI for age (in percentage)

4.1.4: Fitness profile of the subjects

Fitness test like step test, sit and reach test, 30 metre running test, juggling test and kicking test were conducted to assess the fitness status of the football players. Mean value of the fitness test of football players is depicted in table 4.1.4.1. Data reveals that there is a statistically significant difference between age groups with respect to fitness test.

Table 4.1.4.1: Mean value of the fitness test of football players

Fitness Test (Mean ± SD)	**Total N=250**	**Group 1 (11-12 years) n=80**	**Group 2 (>12-14 years) n=170**	**P value**
Step test	59.32±4.32	57.53 ± 5.09	60.18 ± 3.64	<0.001*
Sit and reach test	11.22±4.09	7.55± 3.11	12.98±3.31	<0.001*
30 metre running test	5.80±0.29	6.13±0.26	5.65±0.16	<0.001*
Juggling test	13.34±3.73	8.86±1.73	15.4±2.28	<0.001*
Kicking test	7.34±1.34	5.93±1.17	8.02±0.78	<0.001*

*Significant at p<0.001

Further as per standard tools of each fitness test, players were categorized into poor, average and good category (table 4.1.4.2). Data for step test revealed that almost half (48%) of the players in group 1 had poor cardiorespiratory endurance whereas half (48%) football players in group 2 were found with good cardiorespiratory endurance (figure: 4.1.3.2). Around 74% players in group 1 and 58% players in group 2 had good flexibility respectively (figure: 4.1.3.3). In 30 metre test (figure: 4.1.3.4), juggling test (figure: 4.1.3.5) and kicking test (figure: 4.1.3.6), with respect to age group not much difference was seen among the various categories.

Table 4.1.4.2: Classification of subjects on the basis of fitness test

Parameter	**Group 1 (11-12 years) n=80**			**Group 2 (>12-14 years) n=170**		
	Poor	**Average**	**Good**	**Poor**	**Average**	**Good**
Step test	38 (47.5)	16 (20)	26 (32.5)	62 (36.4)	26 (15.2)	82 (48.2)
Sit and reach test	21 (26.2)	0 (0)	59 (73.7)	72 (42.3)	0 (0)	98 (57.6)
30 metre test	43 (53.7)	17 (21.2)	20 (25)	58 (34.1)	51 (30)	61 (35.8)
Juggling test	30 (37.5)	25 (31.25)	25 (31.2)	52 (30.5)	55 (32.3)	63 (37)
Kicking test	27 (33.7)	28 (35)	25 (31.2)	53 (31.1)	67 (39.4)	50 (29.4)

Note: Numbers in parenthesis indicate percentage

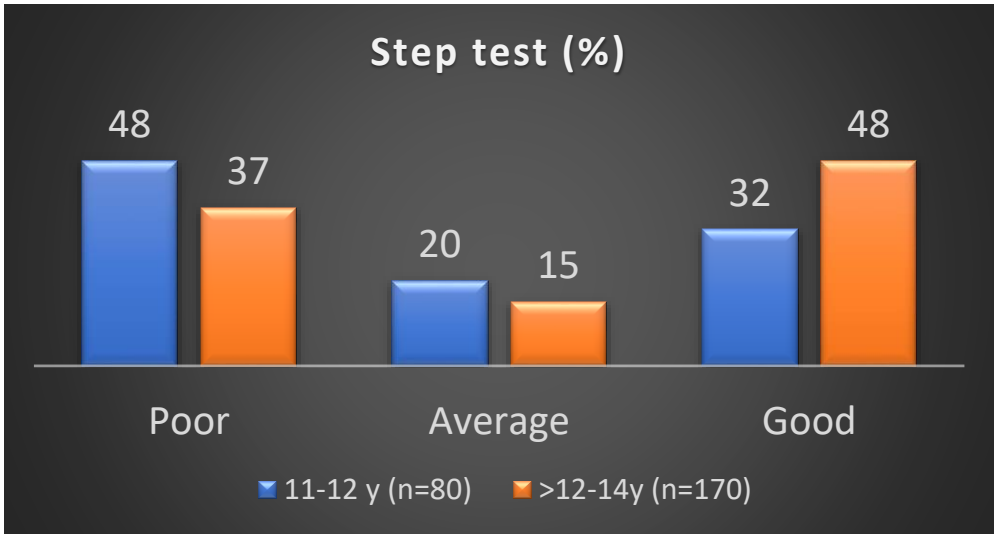

Figure: 4.1.3.2: Classification of total subjects according to step test (in percentage)

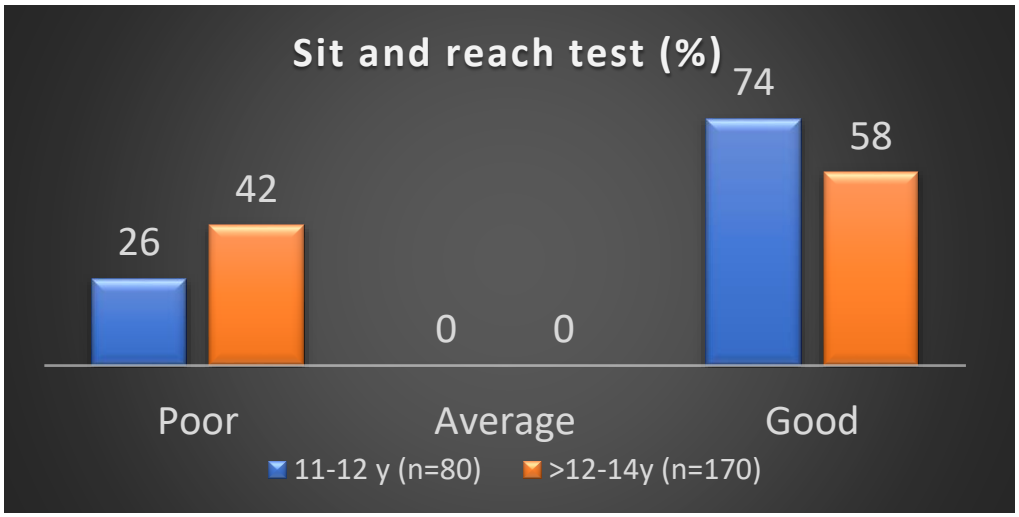

Figure: 4.1.3.3: Classification of total subjects according to sit and reach test (in percentage)

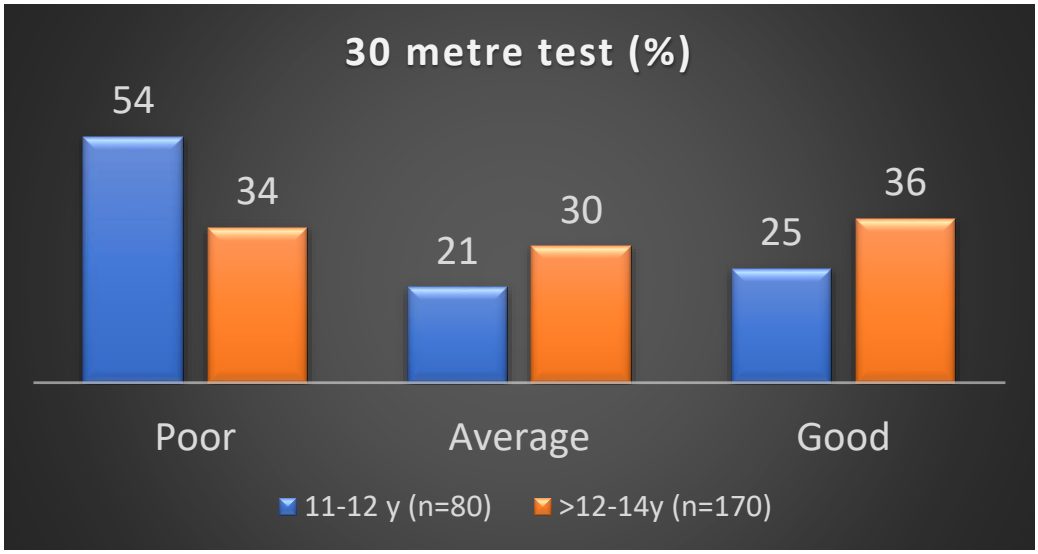

Figure: 4.1.3.4: Classification of total subjects according to 30 metre test (in percentage)

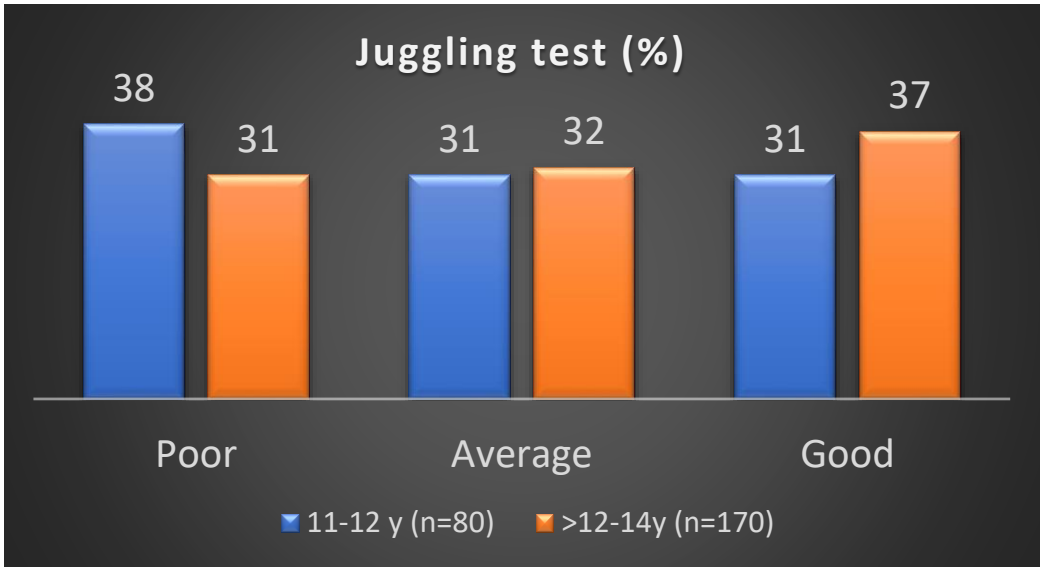

Figure: 4.1.3.5: Classification of total subjects according to Juggling test (in percentage)

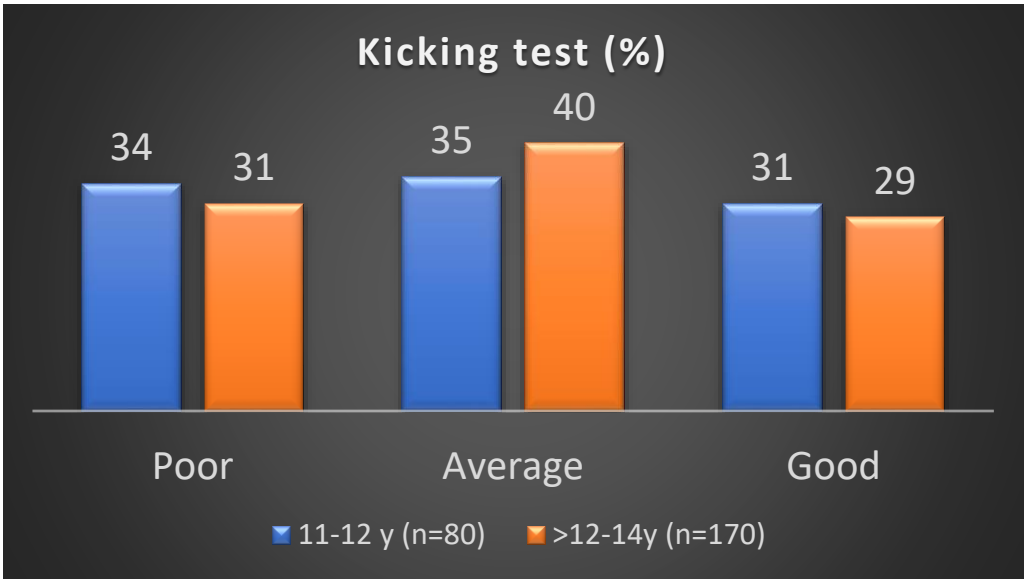

Figure: 4.1.3.6: Classification of total subjects according to Kicking test (in percentage)

4.1.5: Body composition profile of the subjects

In all the subjects four skinfold thickness (biceps, triceps, subscapular, suprailiac) were measured. As shown in table 4.4.5.1, total mean values for biceps, triceps, subscapular and suprailiac were 7.89±0.75 mm, 12.49±0.79 mm, 9.26±0.78 mm and 10.25±0.89 mm respectively. In group 1 the mean value of body fat percentage was 16.09±1.17 % and in group 2, 16.6±0.38 % respectively. Statistically significant difference between age groups with respect to body composition was observed. Group 2 have significantly higher body composition compared to group 1. However, triceps had no significant difference between age groups.

Table 4.1.5.1: Mean value of the body composition of football players

Body Composition (Mean ± SD)	**Total N=250**	**Group 1 (11-12 years) n=80**	**Group 2 (>12-14 years) n=170**	**P value (t-test)**
Biceps (mm)	7.89±0.75	7.71±0.94	8.01±0.46	0.01
Triceps (mm)	12.49±0.79	12.37±1.07	12.56±0.48	0.14
Subscapular (mm)	9.26±0.78	9.02±1.14	9.47±0.24	0.001
Suprailiac (mm)	10.25±0.89	9.73±1.28	10.56±0.33	<0.001
Fat%	16.45±0.77	16.09±1.17	16.6±0.38	0.001
Lean (kg)	39.04±7.19	32.67±7.93	42.0±4.37	<0.001

*Significant at p<0.001

Further detail analysis with respect to categories were conducted to understand relationship between various fitness test and body composition, as shown in table 4.1.5.2, 4.1.5.3 and 4.1.5.4 there was no statistically significant difference between various fitness test like 30 metre test, juggling test and kicking test with respect to the body composition. Fat percentage was almost similar in all three categories with respect to various fitness test.

Table 4.1.5.2: Comparison between 30 metre fitness test and Body Composition

	30 Meter test			
Body Composition (Mean ± SD)	**Poor (n = 101)**	**Average (n = 68)**	**Good (n=81)**	**P value (ANOVA test)**
Biceps (mm)	7.92±0.83	7.95±0.54	7.88±0.53	0.83
Triceps (mm)	12.59±0.83	12.46±0.59	12.4±0.68	0.18
Subscapular (mm)	9.34±0.95	9.32±0.43	9.30±0.48	0.93
Suprailiac (mm)	10.27±1.08	10.38±0.61	10.25±0.72	0.60
Fat%	16.49±0.96	16.52±0.56	16.36±0.66	0.41
Lean (kg)	38.83±7.6	39.77±7.49	38.69±7.19	0.62

*Significant at p<0.001

Table 4.1.5.3: Comparison between Juggling fitness test and Body Composition

	Juggling test			
Body Composition (Mean ± SD)	**Poor (n = 82)**	**Average (n = 80)**	**Good (n=88)**	**P value (ANOVA test)**
Biceps (mm)	7.98±0.73	7.85±0.69	7.91±0.67	0.48
Triceps (mm)	12.55±0.83	12.51±0.72	12.44±0.64	0.63
Subscapular (mm)	9.38±0.73	9.38±0.83	9.23±0.52	0.28
Suprailiac (mm)	10.34±0.86	10.35±0.96	10.21±0.76	0.45
Fat%	16.54±0.84	16.47±0.82	16.37±0.66	0.33
Lean (kg)	38.9±7.48	38.62±7.09	39.5±7.05	0.70

*Significant at p<0.001

Table 4.1.5.4: Comparison between kicking fitness test and Body Composition

	Kicking test			
Body Composition (Mean ± SD)	**Poor (n = 80)**	**Average (n = 95)**	**Good (n=75)**	**P value (ANOVA test)**
Biceps (mm)	7.89±0.66	7.89±0.64	7.96±0.71	0.67
Triceps (mm)	12.59±0.71	12.44±0.78	12.46±0.68	0.36
Subscapular (mm)	9.37±0.74	9.29±0.65	9.33±0.71	0.73
Suprailiac (mm)	10.35±0.92	10.24±0.84	10.30±0.83	0.72
Fat%	16.48±0.77	16.43±0.79	16.46±0.76	0.93
Lean (kg)	39.63±7.0	38.92±7.29	38.56±7.31	0.64

*Significant at p<0.001

As shown in table 4.1.5.5, step fitness test was statistically significant with respect to body composition i.e. lean (P< 0.001). Further to check the specificity of category it can be revealed that lean mass has significant effect on poor and good performance category (38.0±7.13 vs 40.67±6.57, p=0.02) and average and good category (37.37±8.12 vs 40.67±6.57, p=0.03) respectively. However, other body composition parameters were not found statistically significant with the step test. (table 4.1.5.6)

Table 4.1.5.5: Comparison between Step fitness test and Body Composition

	Step test			
Body Composition (Mean ± SD)	**Poor (n = 100)**	**Average (n = 42)**	**Good (n=108)**	**P value (ANOVA test)**
Biceps (mm)	7.81±0.76	7.9±0.52	8.01±0.61	0.09
Triceps (mm)	12.60±0.84	12.36±0.67	12.50±0.73	0.16
Subscapular (mm)	9.3±0.87	9.21±0.46	9.38±0.70	0.37
Suprailiac (mm)	10.28±0.97	10.11±0.68	10.38±0.81	0.22
Fat%	16.4±0.92	16.3±0.57	16.56±0.68	0.14
Lean (kg)	38.0±7.13	37.37±8.12	40.67±6.57	0.007*

*Significant at p<0.001

Table 4.1.5.6 represents that various body composition were not statistically significant with respect to flexibility test categories. However only lean mass was found highly statistically significant (p< 0.001).

Table 4.1.5.6: Comparison between Flexibility fitness test and Body Composition

	Flexibility test		
Body Composition (Mean ± SD)	**Poor (n = 93)**	**Good (n=157)**	**P value (t-test)**
Biceps (mm)	7.9±0.44	7.9±0.77	0.97
Triceps (mm)	12.49±0.59	12.5±0.80	0.84
Subscapular (mm)	9.32±0.35	9.33±0.84	0.97
Suprailiac (mm)	10.39±0.54	10.24±1.0	0.13
Fat%	16.5±0.52	16.42±0.89	0.41
Lean (kg)	40.57±5.83	38.14±7.75	0.005*

*Significant at p<0.001

As observed from the Table 4.1.5.8, a weak positive correlation was found between age and BMI (p<0.001), which indicated that as the age of the football players progressed, their BMI also increased. Similarly weak positive correlation was found between BMI and Fat and Age and Fat respectively.

Table 4.1.5.8 : Correlation between various parameters like Age, BMI and fat

Variable	Correlation (r)	P value	Strength
Age vs BMI	0.34	<0.001	Weak positive correlation
BMI vs Fat (%)	0.29	<0.001	Weak positive correlation
Age vs Fat (%)	0.31	<0.001	Weak positive correlation

4.1.6: Factors affecting food choices during purchasing processed packaged products

The food choice questionnaire consisted of seven factors that may influence food choice. These were health, mood, convenience, price, sensory appeal, natural content, price and weight loss. Subjects were asked to endorse the statement: 'It is important to me that the food I eat on a typical day . . .' for each item, choosing between five responses: extremely unimportant (scoring 1), unimportant (2), neither important or unimportant (3), important (4) and extremely important (5). Scores contributing to each scale were averaged so that scale scores were between 1 and 5. Age groups were statistically significant with respect to food choice. Age group >12-14 were more concern about food choice i.e. health ($p = 0.007$) and mood ($p<0.001$). However, age group 11-12 were more concern about food choice i.e. convenience ($p<0.001$) and sensory appeal (0.001) (Table: 4.1.6.1).

Table 4.1.6.1: Mean score values of factors affecting food choice during purchasing processed packaged products of total subjects

	Age			
Factors (Mean ± SD)	**Total N=250**	**Group 1 (11-12 years) n=80**	**Group 2 (>12-14 years) n=170**	**P value (t-test)**
Health	3.77±0.99	3.69±0.32	3.82±0.36	0.007
Mood	2.46±1.14	2.32±0.36	2.54±0.35	<0.001
Convenience	2.43±1.08	2.87±0.38	2.22±0.47	<0.001
Sensory appeal	3.47±1.29	3.69±0.46	3.37±0.47	0.001
Natural contents	2.13±0.86	2.28±0.49	2.07±0.53	0.003
Price	3.61±1.54	3.62±0.38	3.60±0.36	0.86
Weight loss	2.10±0.54	2.16±0.76	2.08±0.34	0.36

*Significant at $p<0.001$

Table 4.1.6.2 represents percentage distribution of various factors affecting food choice while purchasing processed products. Data reveals that factors like health, price of the

product, sensory appeal and familiarity of the product were extremely important factor while purchasing the products. Factors like convenience, natural content, weight control and ethical concern were not the major factor of concern while buying the products. Amongst health factor, around 61% players used to choose products by keeping in mind whether it will keep them healthy or not. Around 73% of players used to choose products if it makes them feel good. Majority of players didn't see the convenience factor, may be they are very small and most of the products would be bought by their parents. Among least affected factors like weight control, players could not relate role of fat/calories as important aspects.

Table 4.1.6.2: Percentage distribution of factors affecting food choice during purchasing processed packaged products among total subjects

Questions	Extremely Unimportant (1)	Unimportant (2)	Neither important or unimportant (3)	Important (4)	Extremely important (5)
Factor 1: Health					
a) Contains a lot of vitamins and minerals	0	0	91 (36.4)	53 (21.2)	106 (42.4)
b) Keeps me healthy	0	0	0	97 (38.8)	153 (61.2)
c) Is nutritious	0	6 (2.4)	107 (42.8)	111 (44.4)	26 (10.4)
d) Is high in protein	0	14 (5.6)	40 (16)	90 (36)	106 (42.4)
e) Is good for my skin/teeth/hair/nails etc	0	67 (26.8)	134 (53.6)	16 (6.4)	33 (13.2)
f) Is high in fibre and roughage	0	69 (27.6)	103 (41.2)	48 (19.2)	30 (12)
Factor 2: Mood					
a) Helps me cope with stress	53 (21.2)	85 (34)	111 (44.4)	1 (0.4)	0
b) Helps me to cope with life	52 (20.8)	108 (43.2)	84 (33.6)	2 (0.8)	4 (1.6)
c) Helps me relax	36 (14.4)	49 (19.6)	155 (62)	6 (2.4)	4 (1.6)
d)Keeps me awake/alert	145 (58)	73 (29.2)	32 (12.8)	0	0
e) Cheers me up	83 (33.2)	85 (34)	78 (31.2)	1 (0.4)	3 (1.2)
f) Makes me feel good	0	0	4 (1.6)	183 (73.2)	63 (25.2)
Factor 3: Convenience					
a) Is easy to prepare	39 (15.6)	35 (14)	170 (68)	6 (2.4)	0
b) Can be cooked very simply	66 (26.4)	108 (43.2)	76 (30.4)	0	0

c) Takes no time to prepare	89 (35.6)	57 (22.8)	102 (40.8)	2 (0.8)	0
d) Can be bought in shops close to where I live or work	90 (36)	60 (24)	49 (19.6)	38 (15.2)	13 (5.2)
e) Is easily available in shops and supermarkets	58 (23.2)	40 (16)	38 (15.2)	28 (11.2)	86 (34.4)
Factor 4: Sensory Appeal					
a) Smells nice	0	0	18 (7.2)	122 (48.8)	110 (44)
b) Looks nice	0	0	64 (25.6)	51 (20.4)	135 (54)
c) Has a pleasant texture	58 (23.2)	58 (23.2)	114 (45.6)	15 (6)	5 (2)
d) Tastes good	50 (20)	46 (18.4)	80 (32)	41 (16.4)	33 (13.2)
Factor 5: Natural Content					
a) Contains no additives	82 (32.8)	78 (31.2)	80 (32)	9 (3.6)	1 (0.4)
b) Contains natural ingredients	56 (22.4)	81 (32.4)	90 (36)	18 (7.2)	5 (2)
c) Contains no artificial ingredients	92 (36.8)	74 (29.6)	75 (30)	9 (3.6)	0
Factor 6: Price					
a) Is not expensive	0	0	8 (3.2)	133 (53.2)	109 (43.6)
b) Is cheap			8 (3.2)	102 (40.8)	140 (56)
c) Is good value for money	89 (35.6)	100 (40)	59 (23.6)	1 (0.4)	1 (0.4)
Factor 7: Weight Control					
a) Is low in calories	4 (1.6)	201 (80.4)	38 (15.2)	3 (1.2)	4 (1.6)
b) Helps me control my weight	22 (8.8)	152 (60.8)	69 (27.6)	4 (1.6)	3 (1.2)
c) Is low in fat	108 (43.2)	70 (28)	72 (28.8)	0	0
Factor 8: Familiarity					
a) Is what I usually eat	0	0	0	250 (100)	0
b) Is familiar	0	0	0	250 (100)	0
c) Is like the food I ate when I was a child	0	0	250 (100)	0	0
Factor 9: Ethical Concern					
a) Comes from countries I approve of politically	250 (100)	0	0	0	0
b) Has the country of origin clearly marked	250 (100)	0	0	0	0
c) Is packaged in an environmentally friendly way	250 (100)	0	0	0	0

4.1.7: Dietary profile of subjects

The data was collected by using 24 hour diet recall method as discussed in materials and method chapter. The availed data was compared with the standard RDA's. Table 4.1.7.1 is representative of the macro-nutrients and micro- nutrients intake by the players. The mean energy intake was 2199 calories/day for group 1 and for group 2 it was 2244 calories/day. Mean nutrient intake of protein was found to be very low (66 gm and 84 gm) and fat consumption was also found less than the RDA (78 gm and 74 gm) in group 1 and 2 respectively. Calcium and iron consumption was also found less than RDA. As per the age group it can be noted from the table that younger group had lower mean intake for various nutrients as compared to older age group except in case of carbohydrate and fat consumption which were slightly higher intake.

Table 4.1.7.1: Mean intake of nutrients of subjects as per 24 hour dietary recall

Nutrients	**RDA* (11-12 years)**	**RDA* (>12-14 years)**	**Group 1 (11-12 years) n=80**	**Group 2 (>12-14 years) n=170**
Energy (Kcal)	2700	3460	2199±563	2244±607
Protein (g)	101	130	66±5	84±4
Fat (g)	93	120	78±17	74±39
CHO (g)	370	475	286±28	280±34
Calcium (mg)	850**	1000**	725±33	813±27
Iron (mg)	16**	22**	13±3	15±2

*Nutrition and hydration guidelines for excellence in sports 2007 and
**NIN by C. Gopalan, ICMR, Hyderabad 2020

The percentage of calories obtained from macronutrients is shown in table 4.1.7.2. Distribution of energy from macronutrients was compared between two groups. According to NIN, athlete's macronutrients requirements vary from event to event i.e 55-60% of carbohydrate, 15-20% of protein and 25-30% of fat. Carbohydrate contributed 52% and 50% of energy in group 1 and group 2 respectively. Protein contributed around 12% and 15% of energy in group 1 and group 2 respectively. Fat contributed highest amount of energy in group 1 (27%) and in group 2 (30%). Thus protein and carbohydrate intake was lower than recommended values and that of fat was in the range of recommended values.

Table 4.1.7.2: Percent distribution of calories from Macronutrients intake of the football players (in percentage)

Macro-nutrients	Group 1 (11-12 years) n=80	Group 2 (>12-14 years) n=170
Carbohydrate (%)	52	50
Protein (%)	12	15
Fat (%)	27	30

Table 4.1.7.3 represents the number of football players showing percentage of RDA. Results indicated that group 1 (58%) and group 2 (70%) could meet 51-75% RDA of calorie and group 1 (41%) and group 2 (30%) could meet 76-100% RDA of calorie. Likewise, group 1 (47%) and group 2 (38%) could meet 51-75% RDA of protein and group 1 (29%) and group 2 (37%) could meet 76-100% RDA of protein. Approximately 36% of total football players met >100% RDA for carbohydrate, followed by 43% falling into 76% - 100% range. Total 42% of football players met their 51%-75% RDA for protein and 62% met 76%-100% RDA for fat. Irrespective of age groups, 100% could meet 76-100% RDA of iron and calcium.

Table 4.1.7.3: Percentage of football players belonging to different age-groups showing percent RDA

Nutrients %RDA	Group 1 (11-12 years) n=80	Group 2 (>12-14 years) n=170	Total
Energy			
<25%	0(0)	0(0)	0(0)
26%-50%	0(0)	0(0)	0(0)
51%-75%	47(58.75)	119 (70)	166 (66.4)
76%-100%	33 (41.25)	51 (30)	84 (33.6)
>100%	0(0)	0(0)	0(0)
Carbohydrate			
<25%	0(0)	0(0)	0(0)
26%-50%	0(0)	0(0)	0(0)
51%-75%	14 (17.5)	38 (22.35)	52 (20.8)
76%-100%	29 (36.25)	79 (46.47)	108 (43.2)
>100%	37 (46.25)	53 (31.17)	90 (36)
Protein			
<25%	0(0)	0(0)	0(0)
26%-50%	19 (23.75)	42 (24.7)	61 (24.4)
51%-75%	38 (47.5)	66 (38.82)	104 (41.6)
76%-100%	23 (28.75)	62 (36.47)	85 (34)
>100%	0(0)	0(0)	0(0)
Fat			
<25%	0(0)	0(0)	0(0)
26%-50%	0(0)	0(0)	0(0)
51%-75%	29 (36.25)	67 (39.41)	96 (38.4)

76%-100%	51 (63.75)	103 (60.58)	154 (61.6)
>100%	0(0)	0(0)	0(0)
Calcium			
<25%	0(0)	0(0)	0(0)
26%-50%	0(0)	0(0)	0(0)
51%-75%	0(0)	0(0)	0(0)
76%-100%	80 (100)	170 (100)	250 (100)
>100%	0(0)	0(0)	0(0)
Iron			
<25%	0(0)	0(0)	0(0)
26%-50%	0(0)	0(0)	0(0)
51%-75%	0(0)	0(0)	0(0)
76%-100%	80 (100)	170 (100)	250 (100)
>100%	0(0)	0(0)	0(0)

Note: Numbers in parenthesis indicate percentage

4.1.8 Frequency of consumption of processed foods among the subjects

The Food frequency questionnaire consisted of various processed food items. For each food item, football players had to choose between seven responses: 1-once in day, 2-once in 3 days, 3-once in week, 4-once in 15 days, 5-once in month, 6- occasionally and 7-never. Scores contributing to each scale were given where Table 4.1.8.1 reveals the frequency of various most commonly consumed processed foods as per the food frequency method along with the quantity of consumption per sitting. The mean score of food frequency for the most consumed food item Jam/jellies was 2.59±1.18 for group 1 and 2.5±1.23 for group 2 followed by chocolates for group 1 (3.28±1.16) and for group 2 (2.69±1.09) respectively. It was found that age groups were statistically significant with respect to sweet biscuits, salt biscuits, chocolates and popcorn. However, cold drink, fruit juices, soup, cornflakes, maggie, jam and wafers were not significant between age groups. It was seen that salt biscuits and chocolate were more consumed in group 1 compared to group 2. However, sweet biscuits and popcorn were more consumed in group 2 compared to group 1.

Table 4.1.8.1: Mean score of Food Frequency for most commonly consumed processed foods among the football players

Frequency score of Processed Foods	Group 1 (11-12 years) n=80	Group 2 (>12-14 years) n=170	Quantity of consumption per sitting	Total
(Mean ± SD)				
Cold Drink	3.51±0.55	3.57±0.65	200-250 ml	0.47
Fruit juices	4.84±0.72	4.76±1.13	200-250 ml	0.54
Soups	6.19±0.68	6.35±0.59	200-250 ml	0.06
Sweet Biscuits	3.38±0.51	3.70±0.79	25-30 g	<0.001

Salt biscuits	6.25±0.58	5.09±1.67	25-30 g	<0.001
Cornflakes, oats, muesli	4.66±1.25	4.67±1.27	30-40 g	0.96
Maggie/Noodles	3.65±0.72	3.66±0.71	40-60 g	0.93
Chocolates	3.28±1.16	2.69±1.09	10-100 g	0.001
Jams/Jellies	2.59±1.18	2.5±1.23	10-20 g	0.59
Popcorn	3.95±0.99	4.82±1.09	30-40 g	<0.001
Wafers/Kurkure	3.90±1.13	3.79±0.98	20-40 g	0.43

*Significant at p<0.001

In table 4.1.8.2 data obtained from the food frequency questionnaire has been described. Subjects are distributed in percentages as per the frequency of consumption of particular selected processed packaged products. Data revealed that around 52% of total subjects used to consume cold-drink once in week, 36% of total subjects consumed fruit juices once in month. Soup was consumed occasionally (58%) by majority of the players. Sweet biscuits (53%) were more preferred by subjects once in week compare to salt biscuits (22%). Jams/ jellies (30%) were consumed more frequently that is once in 3 days followed by chocolates (32%) once in week. Wafers/ Kurkure (44%) were also frequently consumed by subjects once in week.

Table 4.1.8.2: Distribution of Frequency consumption of Processed Packaged Foods among football players N=250

Food items	**Once in day**	**Once in 3 days**	**Once in week**	**Once in 15 days**	**Once in month**	**Occasionally**	**Never**
Cold Drink	0 (0)	0 (0)	129 (51.6)	104 (41.6)	17 (6.8)	0 (0)	0 (0)
Fruit juices	0 (0)	0 (0)	25 (10)	75 (30)	88 (35.2)	52 (20.8)	10 (4)
Soup	0 (0)	0 (0)	0 (0)	4 (1.6)	10 (4)	144 (57.6)	92 (36.8)
Sweet Biscuits	0 (0)	0 (0)	132 (52.8)	93 (37.2)	19 (7.6)	6 (2.4)	0 (0)
Salt biscuits	0 (0)	0 (0)	56 (22.4)	16 (6.4)	9 (3.6)	95 (38)	74 (29.6)
Cornflakes, oats, muesli	1 (0.4)	6 (2.4)	38 (15.2)	75 (30)	59 (23.6)	52 (20.8)	19 (7.6)
Maggie/Noodles	0 (0)	0 (0)	120 (48)	97 (38.8)	32 (12.8)	1 (0.4)	0 (0)
Chocolates	35 (14)	56 (22.4)	80 (32)	64 (25.6)	13 (5.2)	2 (0.8)	0 (0)
Jams/Jellies	58 (23.2)	74 (29.6)	66 (26.4)	34 (13.6)	17 (6.8)	0 (0)	1 (0.4)
Popcorn	0 (0)	0 (0)	49 (19.6)	81 (32.4)	73 (29.2)	34 (13.6)	13 (5.2)
Wafers/Kurkure	0 (0)	2 (0.8)	109 (43.6)	101 (40.4)	20 (8)	5 (2)	13 (5.2)

Note: Numbers in parenthesis indicate percentage

Further processed products were distributed into two categories frequent and less frequent based on frequency consumption. Foods consumed once in a day, once in 3 days and once in week were considered as frequently consumed products and products that were consumed once in 15 days, once in month, occasionally and never were grouped into less frequent category. The results showed in Table 4.1.8.3 shows that 79% subjects were frequently consuming jams/jellies irrespective of age group, followed by chocolates (68%), sweet biscuits (53%), cold-drinks (52%), popcorn (49%), maggie (48%), wafers (44%), salt biscuits (22%), cornflakes / oats / muesli (18%). Consumption of soup and fruit juices was on lower level of the scale with 100% and 90% of the subjects eating them less frequently. Almost half of the football players (50%) were consuming sweet biscuits less frequently. (Table 4.1.9.3).

Table 4.1.8.3: Frequency consumption of Processed Packaged Foods among football players N=250

Food items	Frequent N (%)	Less frequent N (%)
Cold Drink	129 (52)	121 (48)
Fruit juices	25 (10)	225 (90)
Soup	0 (0)	250 (100)
Sweet Biscuits	132 (53)	118 (47)
Salt biscuits	56 (22)	194 (78)
Cornflakes, oats, muesli	45 (18)	205 (82)
Maggie/Noodles	120 (48)	130 (52)
Chocolates	171 (68)	79 (32)
Jams/Jellies	198 (79)	52 (21)
Popcorn	49 (49)	201 (80)
Wafers/Kurkure	111 (44)	139 (56)

Note: Numbers in parenthesis indicate percentage

Table 4.1.8.4 represents the frequency of consumption of food items which was multiplied by the mean portion size to calculate the grams of food consumed per day. The values used for each frequency option were the following: once in a day = 1; once in 3 days = 1.5/7; once in a week = 1/7; once in 15 days = 1/15; once in month = 1/30; Occasionally = 1/60 and Never = 0. The food items (g/d) were subsequently converted into daily nutrients intake by using the nutritive value mentioned on food label. Around 58 football players used to consume jam/jellies once in a day, which contributed Energy- 65 kcal/d, Fat- 0.13 g/day, Saturated fat- 0.08 g/d, Sugar- 3.78 g/d, Salt- 0.01 g/d, Protein- 0.1 g/d and Carbohydrate- 14.1 g/d. Similarly, chocolates which was consumed by 35 football players per day, contributed Energy- 220 kcal/d, Fat- 13.74 g/day, Saturated fat- 7.57 g/d, Sugar- 17.9 g/d, Salt- 0.06 g/d, Protein- 2 g/d and

Carbohydrate- 22.3 g/d. Cold-drinks which was consumed by 52% of subjects once in week contributed empty calories. (Energy- 14kcal/day, sugar 0 g/d and carbohydrates 4 g/ day). 53% football players used to consume sweet biscuits once in week which contributed almost negligible amount of protein (0.1%).

Table: 4.1.8.4: Amount of processed foods consumed as per frequency among football players

Food items	Once in day	Once in 3 days	Once in week	Once in 15 days	Once in month	Occasionally	Never
Cold-drink (200 ml)							
Energy (kcal)	103	22	14	6	3	0	0
Fat (g)	0	0	0	0	0	0	0
Saturated fat (g)	0	0	0	0	0	0	0
Sugar (g)	26	5	4	2	0.78	0.26	0
Salt (g)	0.06	0	0	0	0	0	0
Protein (g)	0	0	0	0	0	0	0
Carbohydrate (g)	26	5	4	2	0.78	0.26	0
Fruit juices (200 ml)							
Energy (kcal)	121	25	17	7	4	1	0
Fat (g)	0	0	0	0	0	0	0
Saturated fat (g)	0	0	0	0	0	0	0
Sugar (g)	20.5	4.31	2.87	1.23	0.61	0.2	0
Salt (g)	0.07	0.01	0	0	0	0	0
Protein (g)	0	0	0	0	0	0	0
Carbohydrate (g)	23	4.83	3.22	1.38	0.69	0.23	0
Soup (15 g)							
Energy (kcal)	46	10	6	3	1	0	0
Fat (g)	0.48	0.1	0	0	0	0	0
Saturated fat (g)	0.2	0	0	0	0	0	0
Sugar (g)	2.2	0.46	0.30	0.13	0.06	0.02	0
Salt (g)	1.5	0.32	0.21	0.09	0.04	0.01	0
Protein (g)	0	0	0	0	0	0	0
Carbohydrate (g)	10	2	1	0.5	0.2	0	0
Sweet Biscuits (30g)							
Energy (kcal)	142	30	20	8	4	1	0
Fat (g)	5.1	1.08	0.72	0.30	0.15	0.05	0
Saturated fat (g)	1.93	0.40	0.27	0.11	0.05	0.01	0
Sugar (g)	10	2.1	1.4	0.6	0.3	0.1	0
Salt (g)	0.06	0.01	0	0	0	0	0
Protein (g)	1.7	0.35	0.23	0.1	0.05	0.01	0
Carbohydrate (g)	22	4.62	3.08	1.32	0.66	0.22	0
Salt Biscuits (30g)							
Energy (kcal)	140	30	20	8	4	1	0
Fat (g)	5.81	1.22	0.81	0.34	0.17	0.05	0
Saturated fat (g)	2.99	0.62	0.41	0.17	0.08	0.02	0
Sugar (g)	2.12	0.44	0.29	0.12	0.06	0.02	0
Salt (g)	0.24	0.05	0.03	0.01	0.0	0.0	0
Protein (g)	1.5	0.31	0.21	0.09	0.04	0.01	0

Carbohydrate (g)	16.8	3.52	2.35	1	0.50	0.16	0
Cornflakes, oats, muesli (30g)							
Energy (kcal)	114	24	16	7	3	1	0
Fat (g)	0.3	0.06	0.04	0.01	0.0	0.0	0
Saturated fat (g)	0.2	0.04	0.02	0.01	0.0	0	0
Sugar (g)	2.5	0.5	0.3	0.1	0.0	0.0	0
Salt (g)	0.24	0.05	0.03	0.01	0	0	0
Protein (g)	2.45	0.51	0.34	0.14	0.07	0.02	0
Carbohydrate (g)	26	5.5	3.6	1.5	0.7	0.2	0
Maggie/Noodles (45g)							
Energy (kcal)	192	40	27	11	6	2	0
Fat (g)	7	1.47	0.98	0.42	0.21	0.0	0
Saturated fat (g)	3	0.63	0.42	0.18	0.09	0.03	0
Sugar (g)	0.5	0.1	0.1	0	0	0	0
Salt (g)	1.26	0.26	0.17	0.07	0.03	0.01	0
Protein (g)	3.6	0.75	0.5	0.21	0.1	0.03	0
Carbohydrate (g)	28	5.88	3.92	1.68	0.84	0.28	0
Chocolates (40g)							
Energy (kcal)	220	46	31	13	7	2	0
Fat (g)	13.74	2.88	1.92	0.82	0.41	0.13	0
Saturated fat (g)	7.57	1.58	1.05	0.45	0.22	0.07	0
Sugar (g)	17.91	3.76	2.50	1.07	0.53	0.17	0
Salt (g)	0.06	0.01	0.0	0.0	0.0	0.0	0
Protein (g)	2	0.42	0.28	0.12	0.06	0.02	0
Carbohydrate (g)	22.3	4.68	3.12	1.33	0.66	0.22	0
Jams/Jellies (20g)							
Energy (kcal)	65	14	9	4	2	1	0
Fat (g)	0.13	0.02	0.01	0	0	0	0
Saturated fat (g)	0.08	0.01	0.01	0	0	0	0
Sugar (g)	3.78	0.79	0.52	0.22	0.11	0.03	0
Salt (g)	0.01	0	0	0	0	0	0
Protein (g)	0.1	0.02	0.01	0	0	0	0
Carbohydrate (g)	14.1	2.96	1.97	0.84	0.42	0.14	0
Popcorn (35g)							
Energy (kcal)	150	31	21	9	4	1	0
Fat (g)	9	1.89	1.26	0.54	0.27	0.09	0
Saturated fat (g)	4	0.84	0.56	0.24	0.12	0.04	0
Sugar (g)	0	0	0	0	0	0	0
Salt (g)	0.42	0.08	0.05	0.02	0.01	0	0
Protein (g)	2	0.42	0.28	0.12	0.06	0.02	0
Carbohydrate (g)	19	3.99	2.66	1.14	0.57	0.19	0
Wafers/Kurkure (30g)							
Energy (kcal)	165	35	23	10	5	2	0
Fat (g)	10.43	2.19	1.4	0.62	0.31	0.1	0
Saturated fat (g)	1.43	0.3	0.2	0.08	0.04	0.01	0
Sugar (g)	1.51	0.31	0.21	0.09	0.04	0.01	0
Salt (g)	0.42	0.08	0.05	0.02	0.01	0	0
Protein (g)	0	0	0	0	0	0	0
Carbohydrate (g)	15	3.15	2.1	0.9	0.45	0.15	0

RESULT HIGHLIGHTS

- Majority of subjects were Hindus & almost 66% were falling in middle income group.
- The mean weight of players was 46.73±8.7 kg and total BMI was 21.22±7.7 kg/m2.
- Seventy four percent of players belong to normal category.
- Significant difference was seen between fitness test like step test and flexibility test with body composition.
- Protein intake was higher in both age groups with respect to NIN and lower in comparison to nutrition and hydration guidelines
- The mean energy intake of group 1 and group 2 was 2199±563 kcal and 2244±607 kcal respectively
- The most frequent consumed processed food was jam/jellies irrespective of age followed by chocolates and sweet biscuits.

PHASE II: Market survey of processed packaged foods and sports supplements.

India, today, is walking on a double-edged sword. On one hand India tops the list of nations that have maximum children suffering from under-nutrition and on the other hand a similar number of urban children, suffering from overweight and obesity. The simultaneous increases in obesity in almost all countries seem to be driven by changes in global food system, which his producing more processed foods. Processed foods are energy dense, high in fat, high in sodium/salt and high in sugar and low in fiber, vitamins and minerals. Lifestyle changes like urbanization, nuclear families, less time of cooking are leading to increased demand of processed packaged food consumption.

The harmful nutrient composition of processed foods is one of the leading causes of Diet Related Non-Communicable diseases (DR-NCDs). Thus increasing consumption of processed foods and the resultant health effects create a need for the consumer awareness regarding healthy food selection from the wide range of processed packaged foods available in market.

Healthy food choices can be made by looking at nutrition label available on processed packaged foods. But to use wisely, it is very important for the consumers to understand and comprehend the given information on the product label. Many studies have shown that consumers are not able to understand food labels. Since market is flooded with many processed foods and sports supplements with lack of uniformity in food labels, hence continuing with this as a backdrop, the present phase of the study commenced to explore various types of processed packaged foods and sports supplements available in the market. With this phase an attempt was made to study the various components of foods labels. In favour of attaining the set objectives, total 768 processed packaged foods and 100 sports supplements were explored. The detailed methodology has been described in the Materials and Methods chapter.

The results of this phase are divided into the sub-categories as following:

Section 4.2.1: Market survey of processed packaged foods

4.2.1.1: Categorization of processed packaged foods examined

4.2.1.2: Nutrition Facts Panel

4.2.1.3: Ingredients List

4.2.1.4: Allergen Declaration

4.2.1.5: Health Claims, Nutrient Claims and Ingredients Claims

4.2.1.6: Symbols and Logos

4.2.1.7: Manufacture and Best Before Date

Section 4.2.2: Market survey of sports supplements

4.2.2.1 : Categorization of Sports supplements

4.2.2.2: Major nutrients present in supplements under study

4.2.1 Market survey of processed packaged foods

Market survey of the processed packaged foods was carried out in the grocery store from all zones in Vadodara and then after taking the consent from the owner all the processed packaged products having food label were photographed and were categorized. The main aim of this phase was to elicit detail information regarding components of food label and compare with FSSAI guidelines and develop colour coded GDA (traffic light colour scheme) front of pack label.

4.2.1.1: Categorization of processed packaged foods examined

A total of 768 products were examined for nutrition labelling and were categorized into 9 food groups and further into 25 food categories based on George institute for global health as shown in table 4.2.1.1. Out of total 768 products, maximum products were under the food group of bread and bakery products, i.e biscuit category (n=98), followed by food group confectionery, i.e chocolates (n= 83).

4.2.1.2: Nutrition Facts Panel (NFP)

NFP gives idea about various nutrients and other ingredients present in the food. It helps individuals to make personal dietary choices by looking on label for foods that contain more of the nutrients one wants to get more of and less of the nutrients one may want to limit. For eg. if players wants to go for foods having more protein, by looking at NFP, protein rich food can be opted.

4.2.1.2.a: Type of NFP displayed on Food labels

In the present study, data was collected considering NFP variation found among various categories of processed products. Inconsistencies was seen in reporting type of NFP among various brands within the same food category. Majority (53%) of the processed packaged foods had NFP as “per 100g” followed by “Per serving (15%)” (table 4.2.1.2.1). Only 1 % of the total processed products reported NFP as per “Per 100 g and % DV”.

Figure 4.2.1.2.a indicates graphical presentation of various types of NFP of various processed packaged products examined in the present study.

Table 4.2.1.1: Categorization of processed packaged foods examined for food labelling

No.	Food Groups	Food Categories	No. of Products
1.	Beverages (n=73)	a) Fruit and vegetable juices	44
		b) Soft drinks	6
		c) Coffee and tea	7
		d) Electrolyte and Sports Drink	5
		e) Fruit drink mix	11
2	Bread & bakery products (n=110)	a) Biscuits	98
		b) Cakes, muffins & pastry	12
3	Cereal and cereal products (n=163)	a) Cereal bars	47
		b) Noodles	20
		c) Breakfast cereals	62
		d) Pasta	30
		e) Rice	2
		f) Maise	2
4	Confectionery (n=83)	a) Chocolates	83
5	Convenience foods (n=62)	a) Soup	13
		b) Ready meals	49
6	Dairy (n=42)	a) Cheese	15
		b) Yoghurt products	7
		c) Milk	19
7	Fruit and vegetables (n=33)	a) Vegetables and fruits	9
		b) Jam and spreads	24
8	Snack foods (n=56)	a)Crisps and snacks	56
9	Sauces and spreads (n=147)	a) Sauces	82
		b) Mayonnaise/dressings	34
		c) Spreads	31
	TOTAL		**(N=768)**

Table 4.2.1.2.a: Types of Nutrition Facts Panel

Food Groups	Per 100g (n)	Per 100 g and Per serving (n)	Per 100 g, Per serving and % DV(n)	Per serving and % DV(n)	Per serving(n)	Per 100 g and % DV(n)
Beverages (n=73)	37	11	3	5	17	0
Bread & bakery products (n=110)	72	10	12	11	4	1
Cereal and cereal products (n=163)	48	39	23	10	39	3
Convenience foods (n=62)	37	1	3	0	21	0
Confectionery(n=3)	69	0	9	5	0	0
Dairy(n=42)	31	0	1	1	8	0
Fruit and vegetables (n=33)	7	2	1	13	8	2
Sauces and spreads(n=147)	82	25	7	14	17	2
Snack foods (n=56)	23	6	13	7	5	2
Total (N=768)	406	94	72	66	119	10
%	**52.86**	**12.23**	**9.37**	**8.59**	**15.49**	**1.30**

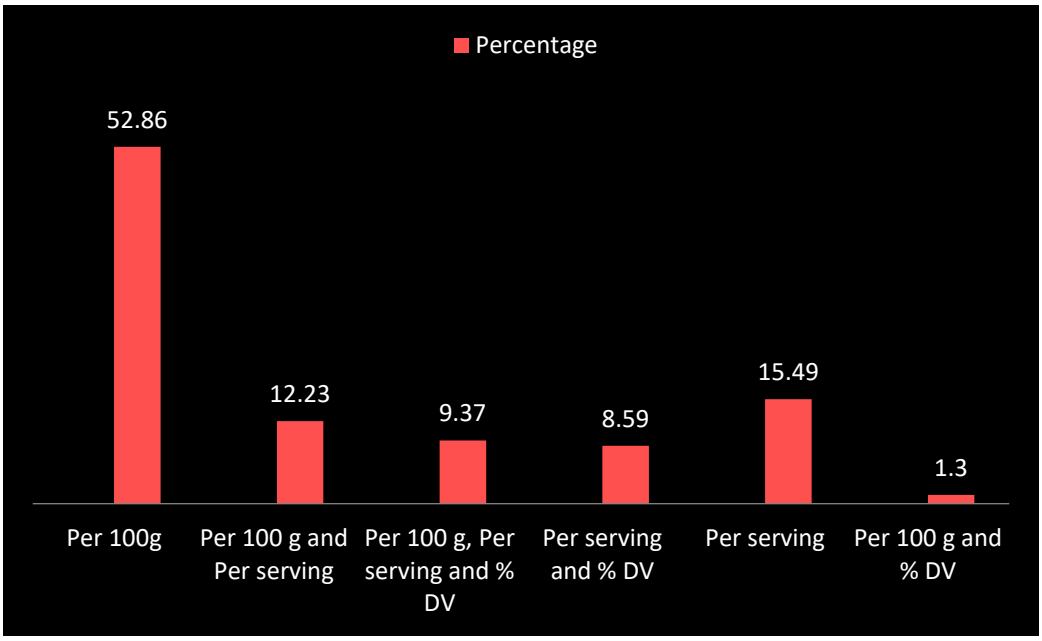

Figure: **4.2.1.2.a: Types of Nutrition Facts Panel**

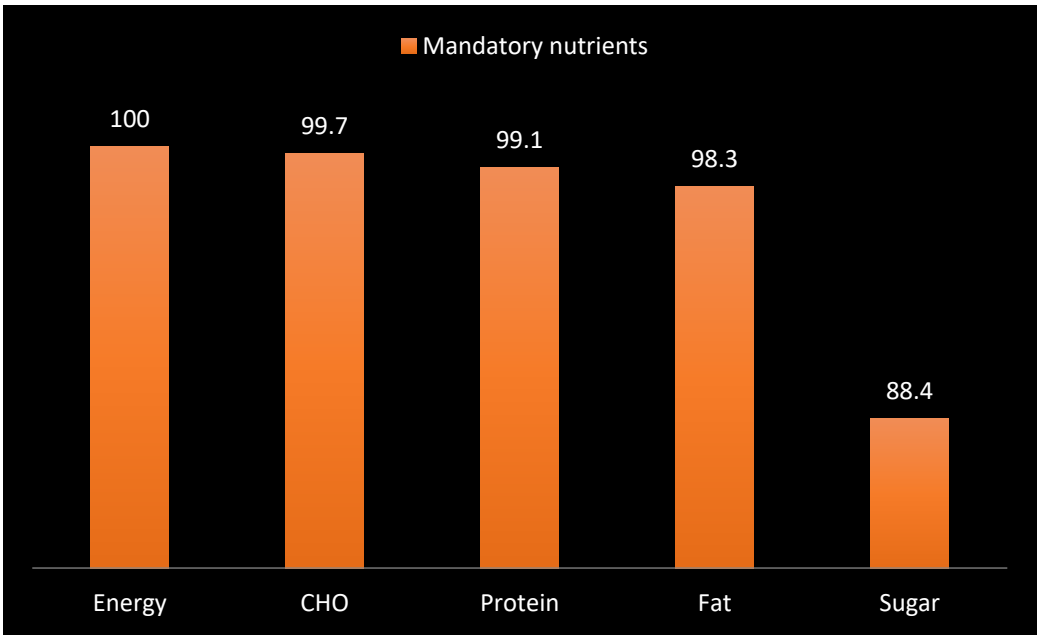

Figure 4.2.1.2.b: Reporting of Mandatory nutrients on NFP in total products in percentage

4.2.1.2.b: Mandatory nutrients on NFP

According to Codex (CAC/GL 2-1985) mentioning 7 nutrients on NFP namely, energy, protein, carbohydrates, fat, saturated fat, sodium and total sugars is mandatory. As per FSSAI it is mandatory to report basic 5 nutrients like energy value (kcal), protein (g), carbohydrates (g), sugar (of the total carbohydrates) (g), fat (g or ml) on NFP. Other than these basic five and seven nutrients, if a nutrient or health claim is made then that nutrient should also be reported on the NFP (FSSAI, 2011).

Table 4.2.1.2.b shows percentage of processed products on which mandatory nutrients like Energy, Fat, Carbohydrate, Sugar and Protein were mentioned. As per data processed packaged products examined in the present study some of the products failed to comply with reporting of mandatory nutrients on NFP. It was found that only energy was reported in 100% of the products followed by carbohydrates (99.7%), protein (99.1%), fat (98.3%) and sugar (88.4%) (figure 4.2.1.2.b). Nutrients of concern like fat and sugar compiled least.

Further it was found that almost all the products of "confectionery" and "fruits and vegetables" category reported mandatory nutrients. "Snack foods" and "sauces and spreads" category complied least in reporting mandatory nutrients.

Table 4.2.1.2.b: Mandatory nutrients on NFP in percentage in various food groups

Food Groups	Energy	Fat	Carbohydrate	Sugar	Protein
Beverages (n=73)	100	98	100	80	98
Bread & bakery products (n=110)	100	100	100	97	100
Cereal and cereal products (n=163)	100	100	100	92	100
Convenience foods (n=62)	100	99	100	88	100
Confectionery(n=83)	100	100	100	100	100
Dairy(n=42)	100	100	100	90	98
Fruit and vegetables (n=33)	100	100	100	99	100
Sauces and spreads(n=147)	100	90	99	84	98
Snack foods (n=56)	100	98	99	80	98

4.2.1.2.c: Basic 5 mandatory nutrients and other important 7 nutrients on NFP

As depicted in table 4.2.1.2.c, reporting of basic 5 nutrients was adhered by all products in confectionery (100%), followed by fruits and vegetables (99%), bread and bakery products (97%), dairy (88%), convenience foods (87%), beverages (76%), and snack foods (75%). Other important 7 nutrients include trans fatty acids, saturated fatty acids, mono unsaturated fatty acids, poly unsaturated fatty acids, cholesterol, fiber and sodium. It was found that reporting of other important 7 nutrients was adhered majority by food categories like cereal and cereal products (31%) followed by snack foods (30%), convenience foods (18%), dairy (5%) and sauces and spreads (5%).

Table 4.2.1.2.c: "Basic 5" and "Other important 7" nutrients on NFP in percentage in various food groups

Food Groups	Basic 5 nutrients	Other important 7 nutrients
Beverages (n=73)	76	0
Bread & bakery products(n=110)	97	0
Cereal and cereal products (n=163)	92	31
Convenience foods (n=62)	87	18
Confectionery(n=83)	100	0
Dairy(n=42)	88	5
Fruit and vegetables (n=33)	99	0
Sauces and spreads(n=147)	57	5
Snack foods (n=56)	75	30

4.2.1.2.d: Processed packaged foods high in Energy and Fat as per USFDA criteria in various food groups

Table 4.2.1.2.d illustrates the products that were high in energy and fat content as per United State Food and Drug Administration (USFDA) criteria due to unavailability of recommendations by FSSAI for high and low nutrients. Of the total products that reported energy value (n=719), 47.5% (n=365) of the products were high in energy and 40% (n=354) of the products were high in fat. Fifteen percent of snack foods were high in energy followed by bread and bakery products (14.8%), convenience foods (7%), cereal and cereal products (4.5%), confectionery (4%) and dairy (2.2%). Similarly in case of fat, snack foods category showed highest contribution (12%), followed by convenience foods (11.2%), bread and bakery products (7.4%), confectionery (3.2%), dairy (3.1%). cereal and cereal products (2.3%), and sauces and spreads (0.8%). None

of the products in fruit and vegetables and beverages category were high in energy and fat as per US-FDA, 2004 criteria (Figure 4.2.1.2.d).

Table 4.2.1.2.d: Processed packaged foods high in Energy and Fat as per USDA criteria in processed packaged foods in percentage in various food groups

Food Groups	Energy (≥400 kcal) (n=365)	Fat (≥35% of Total Energy from Fat) (n=354)
Beverages (n=73)	0	0
Bread & bakery products(n=110)	14.8	7.4
Cereal and cereal products (n=163)	4.5	2.3
Convenience foods (n=62)	7	11.2
Confectionery (n=83)	4	3.2
Dairy (n=42)	2.2	3.1
Fruit and vegetables (n=33)	0	0
Sauces and spreads (n=147)	0	0.8
Snack foods (n=56)	15	12

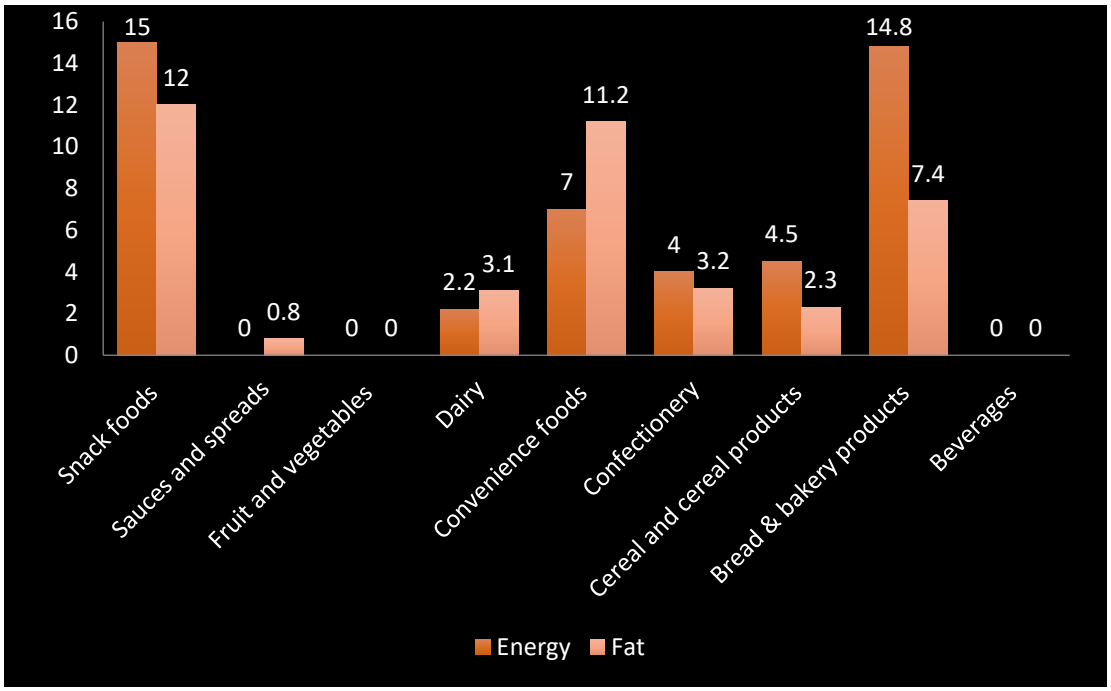

Figure 4.2.1.2.d: Processed packaged foods high in Energy and Fat as per USDA criteria in processed packaged foods in percentage

4.2.1.2.e: Food products reporting Low, medium or high content of Fat, SFA, Sugar and Salt as per UK-FSA criteria

Table 4.2.1.2.e: depicts criteria for foods to be considered high in Fat, SFA, Sugar and Salt as per UK-FSA criteria. According to UK-FSA criteria, from the total products surveyed, 29% of them were high in fat, 45% products were high in SFA, 42% products were high in sugar and 20% were high in sodium (Figure 4.2.1.2.f). Table 4.2.1.2.f gives information about food group wise categorization of low, medium of high content of various nutrients. Snack food group was highest in fat (12.36%) and SFA (19.22%) amongst various remaining food groups. Bread and bakery products had highest content of sugar (11.79%) Convenience food group (16.23%) was highest in sodium content among the surveyed products. Fruits and vegetable products contain almost negligible amount of various nutrients like fat, salt, sugar and SFA. According to the criteria, food group like dairy, bread and bakery products and confectionery were categorised into low content of fat.

Table 4.2.1.2.e: Criteria for foods to be considered high in Fat, SFA, Sugar and Salt as per UK-FSA criteria

Nutrients	Low (Per 100g)	Medium (Per 100g)	High (Per 100g)
Fat	≤3 g or less	>3 to ≤ 20 g	>20 g
Saturated Fat	≤1.5 g or less	>1.5 to ≤ 5 g	>5 g
Salt	≤0.3 g or less	>0.3 to ≤1.5 g	>1.5 g
Sugars	≤5 g or less	>5 to ≤ 12.5 g	>12.5 g

Table 4.2.1.2.f: Food products reporting Low, medium or high content of Fat, SFA, Sugar and Salt as per UK-FSA criteria in various food groups (in percentage)

Nutrients	High, Medium and Low Nutrients	Cereal & Cereal Products	Bread & Bakery Products	Confectionery	Fruit & Vegetables products	Dairy	Beverages	Convenience Foods	Sauces & Spread	Snacks
Fat	High	0.19	6.09	2.76	0.00	3.04	0.19	3.90	0.00	12.36
	Medium	7.13	7.42	1.64	0.14	0.39	1.64	16.14	1.54	1.54
	Low	3.64	0.00	0.00	4.11	0.00	9.86	6.51	5.36	0.19
SFA	High	2.91	9.03	4.37	0.00	1.84	0.39	5.63	1.26	19.22
	Medium	1.12	0.37	0.00	0.00	0.00	0.65	15.53	0.00	1.96
	Low	9.11	0.00	0.19	2.11	0.00	2.40	13.42	4.41	0.00
Sugar	High	1.78	11.79	4.79	4.32	0.56	6.90	7.94	3.90	0.28
	Medium	2.69	1.60	0.00	0.00	1.43	2.35	3.03	1.01	2.18
	Low	6.10	0.74	0.00	0.18	1.48	0.83	14.51	1.39	9.89
Sodium	High	0.75	0.00	0.00	0.19	0.00	0.00	16.23	2.73	0.80
	Medium	2.25	0.22	0.00	0.23	3.67	2.07	12.30	3.62	13.27
	Low	7.84	0.19	3.63	4.60	0.19	9.77	8.90	0.58	3.00

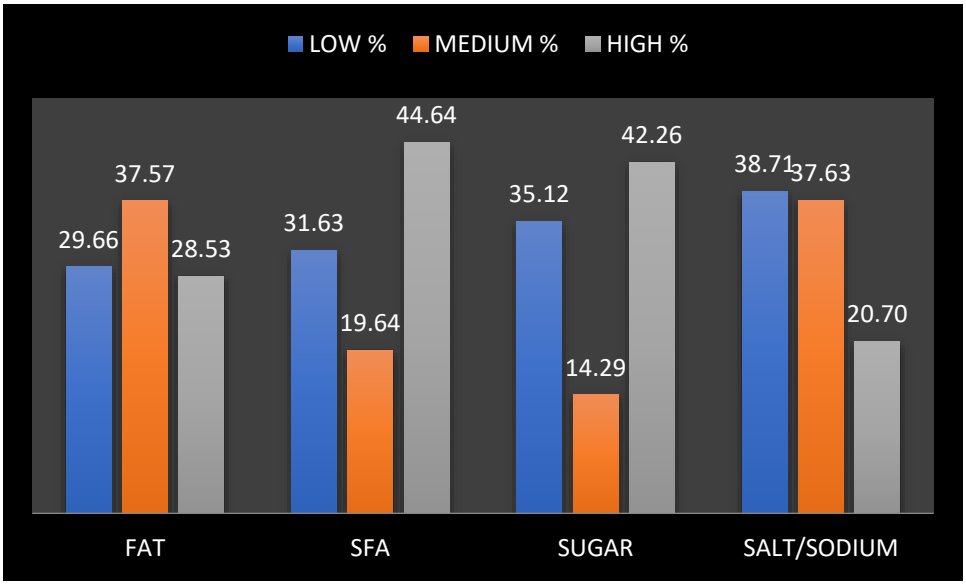

Figure 4.2.1.2.f: Food products reporting Low, medium or high content of Fat, SFA, Sugar and Salt as per UK-FSA criteria in total products (in percentage)

4.2.1 : Ingredients List

According to FSSAI guidelines 2021, the name of ingredients used in the product shall be listed in descending order of their composition by weight or volume. As shown in figure 4.2.1.3, from total products, only 28% bread and bakery products, followed by convenience food (19%), cereal and its products (16%), snack foods (12%), confectionery (9%), sauces and spread (6%), beverages (6%), fruit and vegetable products (2%) and dairy (2%) showed compliance with FSSAI guidelines.

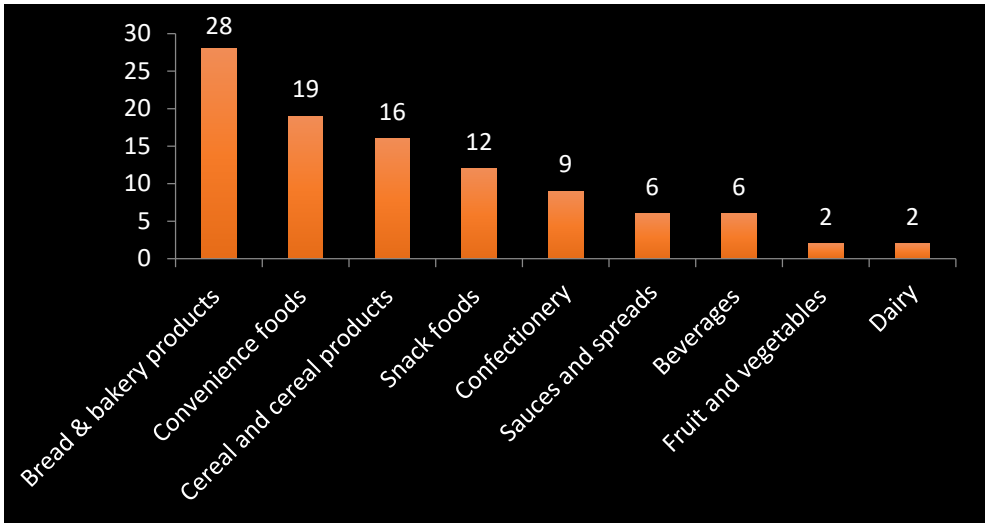

Figure 4.2.1.3: Ingredient list compliance according to FSSA of India in various food groups (in percentage)

4.2.1.1 : Allergen Declaration

According to the Codex Alimentarius, foods and ingredients that are known to cause hypersensitivity should always be declared on the food labels. Similarly, according to FSSAI if it is less than 5% quantity even than also they should be declared on food label. Of the total 768 products, 98 (12%) products carried allergen declaration on food labels. The remaining products did not carry any allergen information. As depicted in the figure 4.2.1.4, 43% of convenience foods mentioned allergen declaration information on food label followed by confectionery (16%), cereal and its products (16%), snack foods (14%), sauces and spreads (8%), beverages (1%), bread and bakery products (1%) and dairy (1%).

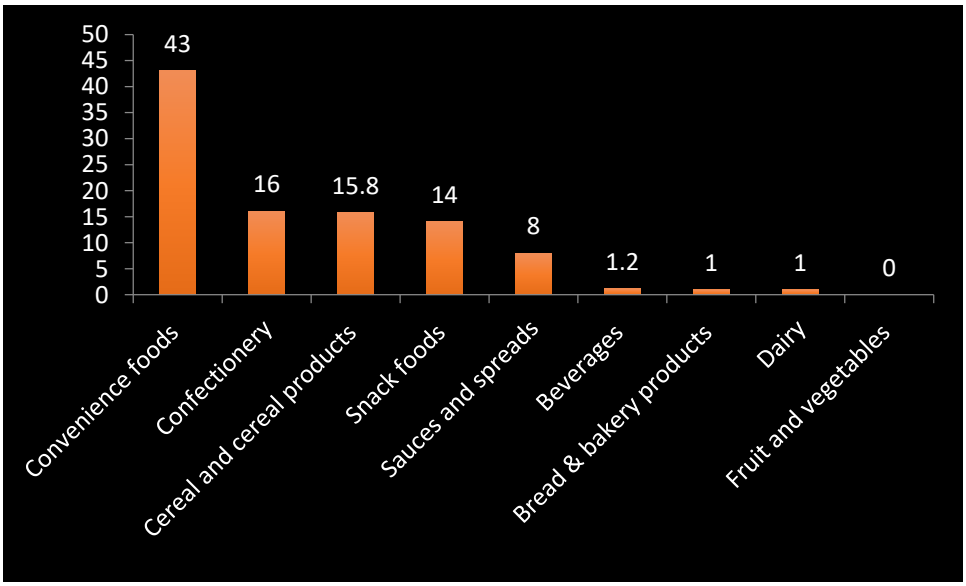

Figure 4.2.1.4: Allergen declaration in various Food groups (in percentage)

Table 4.2.1.4: Types of allergen declaration on nutrition label in various food groups (in percentage)

	Type A	Type B	Type C	Type D
Food Groups	**"Contain" Allergenic Substance**	**"May Contain" Allergenic Substance**	**"Free" from Allergenic Substance**	**Combination of "Contain" and/or "May Contain" and/or "Free"**
Total Products (%)	36	34	4	26
Cereal & Cereal Products	1.66	6.54	0.00	8.10
Bread & Bakery Products	0.46	0.00	0.00	0.49
Confectionery	5.52	4.47	0.00	4.50
Fruit & Vegetables products	0.00	0.00	0.00	0.00
Dairy	0.00	0.00	0.71	0.00
Beverages	0.83	0.00	0.00	0.00
Convenience Foods	21.54	15.47	1.29	6.26
Sauces & Spread	3.41	3.05	0.71	1.76
Snacks	2.58	4.47	1.29	4.89

Table 4.2.1.4 depicts different types of formats of declaration of allergen information on food label. Of the total products, 36% of them showed type A declaration followed by type B (34%), type D (26%) and type C (4%). Majority of convenience foods (22%) showed type A format, cereal and cereal products (9%), showed type D format, confectionery (6%) showed type A format and snacks (5%) showed type D format. Food groups like bread and bakery products, fruits and vegetable products and dairy products showed least allergen declaration. Inconsistencies was seen among the various food groups with respect to allergen declaration format.

4.2.1.5: Health Claims and Nutrient Claims

According to FSSAI (2011), Health claims means "any statement which represents that a relationship exists between a food and health". It helps in selection of healthy food choices among the consumers. Out of 9 food groups, only 4 food groups declared health claims on food label. Only 3.4% of the total products mentioned health claims (figure 4.2.1.5a).

Nutrient claims describe the level of a nutrient in particular product, by using terms such as free, high, and low, or they compare the level of a nutrient present in a food to that of another food by using terms such as more, reduced, and lite. In present study 84% of total products mentioned nutrient claims. 33% of cereal and cereal products declared nutrient claim followed by confectionery (14%), beverages (13%), convenience foods (8%), bread and bakery products (7%), dairy (4%), snack foods (3%) and sauces and spread (2%). (figure 4.2.1.5b).

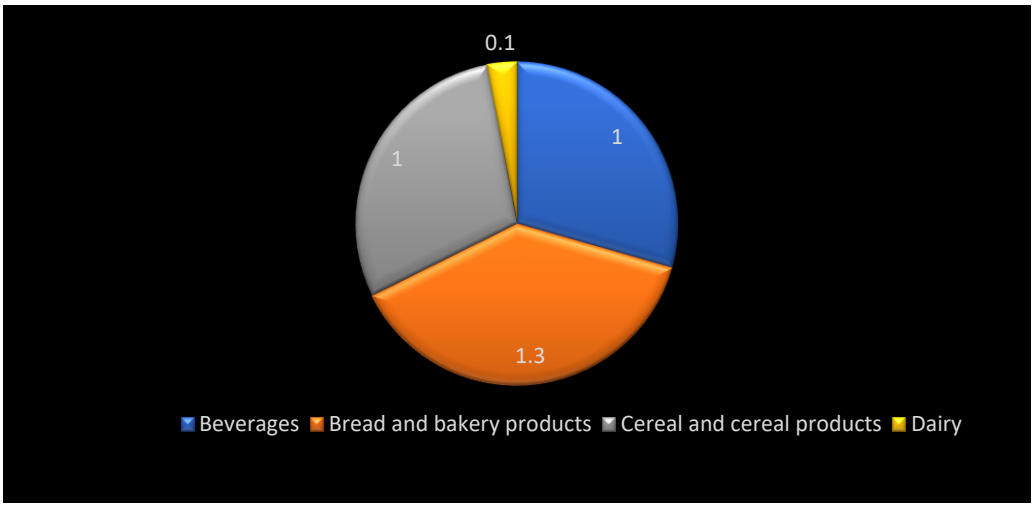

Figure 4.2.1.5a: Health claims mentioned in various Food groups (in percentage)

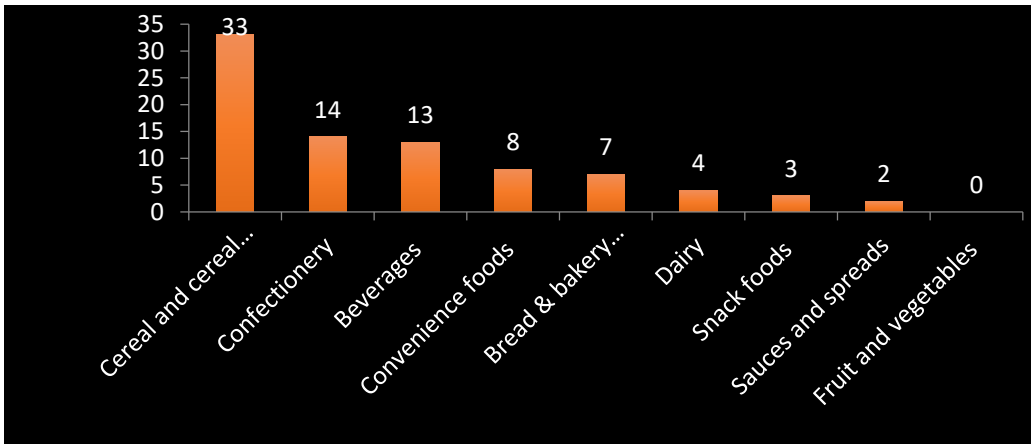

Figure 4.2.1.5b: Nutrient claims declared on food labels in various food groups (in percentage)

4.2.1.6: Symbols and Logos

Table 4.2.1.6 depicts various types of symbols and logos present on food label of surveyed products. Majority of the products surveyed were vegetarian. Vegetarian symbol was present on 94% of the products, followed by FPO (21%), ISO (11%), 100% Natural (7%), HACCP (3%), non-vegetarian symbol (2%), healthy choice (2%), ISI (0.2%) and AGMARK (0.1%). Symbols and logos helps the consumers to identify a good quality product. According to FSSAI, vegetarian or non-vegetarian logo is mandatory.

Table 4.2.1.6: Symbols and Logos on nutrition labels in various food groups (in percentage)

Food groups	Vegetarian Symbol	Non vegetarian Symbol	Healthy Choice	ISI	ISO	FPO	AGMARK	HACCP	100% Natural
Cereal & Cereal Products	10.12	0.52	0.27	0.00	0.00	0.37	0.00	0.00	0.00
Bread & Bakery Products	13.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Confectionery	3.73	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fruit & Vegetables products	4.13	0.09	0.00	0.00	0.00	1.94	0.00	0.00	0.00
Dairy	3.04	0.26	0.00	0.00	0.18	0.00	0.05	0.00	0.00
Beverages	11.00	0.00	0.00	0.00	0.89	4.81	0.00	0.42	0.00
Convenience Foods	26.13	0.61	1.73	0.20	5.94	7.77	0.00	1.56	6.61
Sauces & Spread	8.35	0.00	0.00	0.00	1.42	6.11	0.00	0.06	0.00
Snacks	14.34	0.00	0.00	0.00	2.57	0.00	0.05	0.96	0.09

4.2.1.7: Manufacture and Best Before Date

Table 4.2.1.7 represents types of formats of manufacture and best before date given on food labels. Fifty two percent of the products mentioned both manufacture and best before date together. Around 78% of products mentioned best before in months. Seventy two percent of total products displayed manufacture and best before date which were stamped and mentioned on same place whereas only 19% of total products that were stamped but mentioned on different place. Inconsistency was seen among various types of format even in similar food group.

Table 4.2.1.7: Types of formats of Manufacture and Best Before Date on nutrition label in various food groups (in percentage)

Food groups	Given together	Best before in exact date	Best before in months	MD&BB stamped and mentioned on same place	MD&BB mentioned and given on different place
Cereal & Cereal Products	4.66	0.92	9.45	5.59	4.29
Bread & Bakery Products	6.95	0.34	12.54	10.12	2.02
Confectionery	1.00	0.00	4.24	3.76	0.42
Fruit & Vegetables products	2.65	1.34	2.60	2.89	1.09
Dairy	1.83	0.33	2.89	2.12	1.09
Beverages	2.19	0.17	11.09	3.57	6.22
Convenience Foods	18.46	6.62	18.61	24.38	1.68
Sauces & Spread	4.02	0.76	6.75	6.27	1.77
Snacks	10.24	3.52	9.83	13.30	0.42

4.2.2.1: Categorization of Sports supplements

Market survey of the sports supplements was carried out in the retail store (n=5) in Vadodara, after taking the consent from the owner. All the products having food label were photographed and data was elicited based on prescribed format. A total 100 products were examined and were categorized into 4 categories based on forms available as shown in (table 4.2.2.1). Majority of supplements were in form of powder (n=83), followed by bar (n=12), beverages (n=3) and capsules (n=2). Serving size varied from 25-75 g for powder, 30-100 g for bar and 250-500 ml for beverages. Figure 4.2.2.1 depicts types of supplements in percentage.

Table 4.2.2.1: Classification of sports supplements under study

Sr. No.	Types	No. of products	Serving size (g/ml)
1	Powder	83	25-75g
2	Bar	12	30-100g
3	Beverages	3	250-500 ml
4	Capsules	2	-
	Total	N=100	

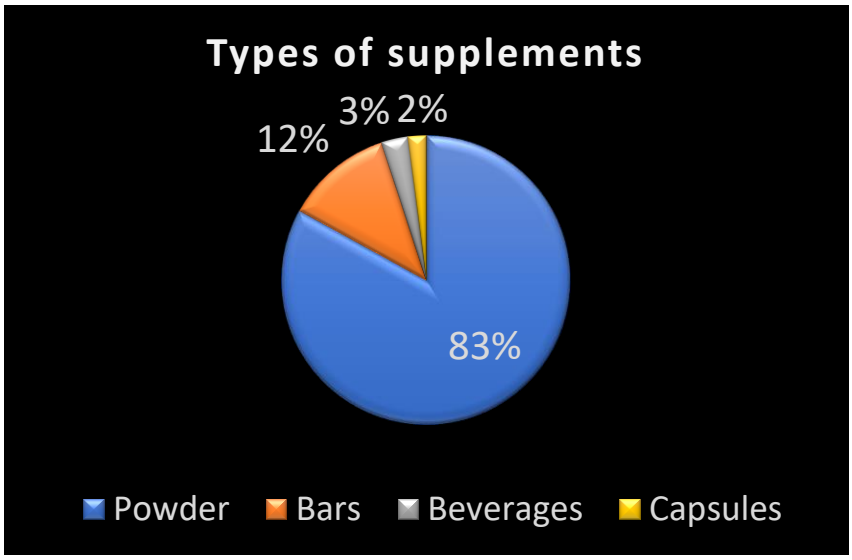

Figure 4.2.2.1 Forms of products (in percentage)

4.2.2.2: Major nutrients present in supplements under study

The main nutrients that were present in the surveyed supplements is mentioned in figure 4.2.2.2. From total 100 supplements 61% of supplements contain protein as a major nutrient followed by Branched chain amino acids (14%), Creatine monohydrate (13%), Coenzyme Q10 (9%) and beta-hydroxy-beta-methylbutyrate (3%).

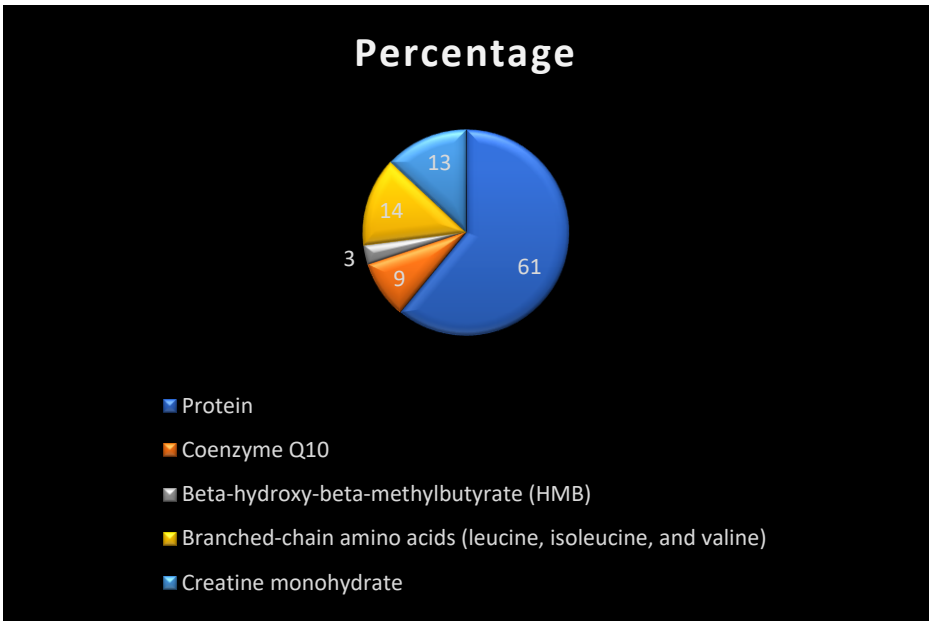

Figure 4.2.2.2 Main nutrients in supplements under study (in percentage)

Table 4.2.2.2a represents various brands, flavour and cost of the sports supplements. Majority of the products surveyed were available in different flavours. The most common flavours were chocolate, mango, and vanilla. Majority of the products surveyed were from Muscleblaze, Optimum nutrition and ultimate nutrition. Cost of the products varied from brands to brands and pack size of the supplements.

Different types of Nutrition Facts Panel (NFP) were displayed on sports supplements (Table 4.2.2.2b). The most common type of NFP displayed was Per 100 g, Per serving and % DV (68%), followed by per serving and % DV (13%), per 100 g (9%), Per 100 g and % DV(7%) and per serving (3%). Inconsistencies was seen among various types of NFP.

Table 4.2.2.2a: Brands surveyed for the sports supplements under study

Food item	Flavour	Brands	Cost
Protein	Chocolate, Kesar pista, Mango, Blueberry, Cookies and cream, Café mocha, vanilla	MuscleBlaze Mass Gainer, MuscleBlaze, Whey Performance, Bigmuscles Nutrition, AS-IT-IS, Optimum Nutrition, Ultimate Nutrition	Rs. 840-2045 / kg
Coenzyme Q10	-	Amoguard, BIO-Q Forte	10 capsules (Rs 210)
Beta-hydroxy-beta-methyl butyrate (HMB)	-	HMB, Optimu Nutrition, MRM	1000 capsules (Rs 3400), 60 capsules (Rs 1762)
Branched chain Amino acids	Orange, watermelon, green apple, mango	MuscleBlaze, Optimum Nutrition, Scivation Xtend and Ultimate Nutrition	450 g- Rs 2000-3499
Creatine monohydrate	Chocolate	MuscleBlaze, Optimum, Nutrition, Ultimate, Nutrition, GNC	Rs 4500/ - 10,000/ 2kg
Bars	-	Max protein, Nature valley, Yoga bar, Ritebite	Rs 60-100/ 50-60g,
Beverages	Lemon, orange	Red bull, Gatorade	Rs 47-100 /250-500 ml

Table 4.2.2.2b: Types of Nutrition Facts Panel displayed on sports supplements

Food Groups	Per 100g (n)	Per 100 g and Per serving (n)	Per 100 g, Per serving and % DV(n)	Per serving and % DV(n)	Per serving(n)	Per 100 g and % DV(n)
Powder (n=83)	0	0	66	10	0	7
Bar (n=12)	6	0	2	1	3	0
Beverages (n=3)	3	0	0	0	0	0
Capsules (n=2)	0	0	0	2	0	0
Total	9	0	68	13	3	7
%	9	0	68	13	3	7

RESULT HIGHLIGHTS

- Out of the total examined products, majority (52.8%) of them showed NFP as per 100g
- Processed packaged products examined failed to comply with reporting of mandatory nutrients on NFP.
- Of the total 768 products, only 337 products listed ingredients in descending order of percentage weights.
- Of the total (n=100, sports supplements) products, 83% were in form of powder, bar (12%), beverages (3%) and capsules (2%).
- Of the total products 15%, displayed allergen information, 84% displayed nutrient claims, 52% of the products displayed MF and best before date together at the same place.

PHASE- III: Capacity building of football players on food labeling

It is observed that the consumption of packaged and processed foods has increased tremendously due to high growth of the food industry (Popkin, 2017). According to the Global Nutrition Report 2018, health is likely to be impact negatively due to processed foods which contains high amount of sugar, saturated and trans-fat and salt (Development Initiatives, 2018). Understanding of food label will definitely help in consuming less harmful and more useful food products. Prior knowledge will guide consumers to select proper foods according to their needs and less attention to marketing gimmicks.

The results falling under this phase are represented under the following sub-sections:

4.3.1: Reason for consumption of processed packaged foods among football players
4.3.2: Frequency of reading food labels, ingredients list, nutrition facts panel and quality symbols among the subjects.
4.3.3: Reasons for examining food labels among the subjects.
4.3.4: Reasons for not examining food labels among the subjects and reported reasons for not understanding Food labels among football players
4.3.5: Common factors considered while purchasing processed packaged foods among football players
4.3.6: Types of information looked on NFP while purchasing processed packaged products by football players.
4.3.7: Understanding of Nutrition Facts Panels (NFP)s among the football players
4.3.8: Pre and post intervention knowledge scores on various components of food labels among football players
4.3.9: Pre and post GDA scores among football players

4.3.1: Reasons for consumption of processed packaged foods among football players

Standard questionnaire was used to elicit information on food labels. Football players were interviewed one by one to understand the knowledge and practices regarding food labels.Taste preferences often are cited as a primary motivator of individuals' food choices (Drewnowski, 1997; Drewnowski and Levine, 2003; Drewnowski et al., 1999). Table 4.3.1 shows various reasons for the consumption of processed packaged foods among the football players. Majority of the football players (87%) cited “variety and taste” as the top reason for consumption of the processed packed foods followed by convenience (8%) and do not know how to cook (5%). Since the age group was young, various factors like status, do not have time to cook, were not taken into consideration. No much difference was noted for selection when compared between the age groups.

Table 4.3.1 Reasons for consumption of processed packaged foods among football players (in percentage)

Parameter	Group 1 (11-12 years) n=80	Group 2 (>12-14 years) n=170	Total (N=250)
For Convenience	4 (5)	17 (10)	21 (8.4)
Do not have time to cook	0 (0)	0 (0)	0 (0)
Do not know how to cook	0 (0)	12 (7)	12 (4.8)
For variety and taste	76 (95)	141(83)	217 (86.8)
For status	0 (0)	0 (0)	0 (0)

Note: Numbers in parenthesis indicate percentage

4.3.2: Frequency of reading food labels, ingredients list, nutrition facts panel and quality symbols among the subjects.

Table 4.3.2 represents frequency of reading food labels among the football players. Data revealed that in both the age-groups, it was observed that food labels, ingredient list and nutrition facts panel were never seen by the players while purchasing processed products. Only nutrition quality symbols were taken into consideration by 50% of the total players. Around 78% football players were never reading food labels, 82% of them never read ingredient list, 88% of them never read nutrition facts panel. Frequency of reading food label was more in older age group (18%) compare to younger age group

(16%). Data clearly indicates that with increase in the complexity in food labels, frequency of never increased among the football players with respect to nutrition facts panel, ingredient list.

Table 4.3.2 Percentage of frequency of reading Food labels, Ingredient list, Nutrition Facts Panel and quality symbols among football players (in percentage)

Parameter	Group 1 (11-12 year n=80	Group 2 (>12-14 years) n=170	Total (N=250)
Food Labels			
Always	0 (0)	0 (0)	0 (0)
Sometimes	5 (6.2)	31 (18.2)	36 (14.4)
Rarely	7 (8.7)	13 (7.6)	20 (8)
Never	68 (85)	126 (74)	194 (77.6)
Ingredient list			
Always	0 (0)	0 (0)	0 (0)
Sometimes	3 (3.7)	24 (14.1)	27 (10.8)
Rarely	6 (7.5)	11 (6.4)	17 (6.8)
Never	71 (88.7)	135 (79.4)	206 (82.4)
Nutrition Facts Panel			
Always	0 (0)	0 (0)	0 (0)
Sometimes	3 (3.7)	12 (7)	15 (6)
Rarely	5 (6.2)	9 (5.2)	14 (5.6)
Never	72 (90)	149 (87.6)	221 (88.4)
Nutrition quality symbols			
Always	0 (0)	0 (0)	0 (0)
Sometimes	37 (46.2)	93 (54.7)	130 (52)
Rarely	19 (23.7)	44 (25.8)	63 (25.2)
Never	24 (30)	33 (19.4)	57 (22.8)

Note: Numbers in parenthesis indicate percentage

4.3.3: Reasons for examining food labels among the subjects.

As shown in table 4.3.3 very few players (n=56) out of 250 players looked for food labels while purchasing the processed packaged products. The most common reason cited for reading food labels by total football players was “concern about health” (55%) followed by “concern about specific nutrient” (26.7%) and “total calorie count” (17.8%). It was noted that older age group were more concerned about health compared to younger age group (27%).

Table 4.3.3 Reported reasons for examining Food labels among football players (in percentage).

Parameter	Group 1 (11-12 years) n=12	Group 2 (>12-14 years) n=44	Total (N=56)
For general knowledge	0 (0)	0 (0)	0 (0)
Concern about health	6 (50)	25 (56.8)	31 (55.3)
ɔncern about specific nutrie	2 (16.6)	13 (29.5)	15 (26.7)
Total calorie count	4 (33.3)	6 (13.6)	10 (17.8)

Note: Numbers in parenthesis indicate percentage

4.3.4: Reasons for not examining food labels among the subjects.

Table 4.3.4a represents various reasons for not reading food labels among the football players. Majority of the players (n=194) were not examining food labels and the reason cited for same was they did not understand food label (55%), followed by do not have time to look at food labels (35%) and not interested (11%). Around 16% in younger age group reported that they think its useless to read food labels compare to older age group (8%). Further analysis was done to understand reasons for not understanding food labels (Table 4.3.4b). 66% of total subjects out of 106 players reported that many scientific terms were used on food labels which become difficult for them to comprehend followed by don't know what to look for exactly on food labels (31%) and the print on label is too small (3%) to read.

Table 4.3.4a: Reported reasons for not examining Food labels among football players (in percentage).

Parameter	Group 1 (11-12 years) n=68	Group 2 (>12-14 years) n=126	Total (N=194)
Not interested / Think its useless	11 (16.1)	10 (7.9)	21 (10.8)
Do not have time	24 (35.2)	43 (34.1)	67 (34.5)
Do not understand	33 (48.5)	73 (57.9)	106 (54.6)

Note: Numbers in parenthesis indicate percentage

Table 4.3.4b: Reported reasons for not understanding Food labels among football players (in percentage).

Parameter	Group 1 (11-12 years) n=33	Group 2 (>12-14 years) n=73	Total (N=106)
The print on label is too small	0 (0)	3 (4.1)	3 (2.8)
You don't know what to look for	11 (33.3)	22 (30.1)	33 (31.1)
Many scientific terms are used	22 (66.6)	48 (65.7)	70 (66)

Note: Numbers in parenthesis indicate percentage

4.3.5: Common factors considered while purchasing processed packaged foods among football players

Table 4.3.5 depicts nutritional and non-nutritional information taken into consideration while purchasing processed products. The most commonly cited information was taste (100%) irrespective of the age-group, followed by price (90%, group 1) and (93%, group 2), type of food (92%, group 1) and (95%, group 2) and manufacturer and best before (82%, group 1) and (93%, group 2). Group 2 gave more preference to information like attractive package (23% vs. 16%), its popularity (43% vs. 7%), advertisement (62% vs. 55%), recommended by someone (34% vs. 15%), discount on product (52% vs. 36%), ingredient list (7% vs. 4%), nutritional panel information (5% vs 0%) and information about allergens (2% vs 0%) in comparison with group 1. Whereas group 1 gave more preference to brand (45% vs. 39%) and nutrition quality symbols (22% vs. 13%) in comparison to group 2.

Table 4.3.5 Reported common factors considered while purchasing processed packaged foods by football players (in percentage).

Parameter	Group 1 (11-12 years) n=80	Group 2 (>12-14 years) n=170
Attractive package	13 (16.2)	39 (22.9)
Its popular	6 (7.5)	74 (43.5)
Advertisement	44 (55)	105 (61.7)
Method of cooking/instructions	0 (0)	3 (1.7)
Recommended by someone	12 (15)	58 (34.1)

Brand	36 (45)	66 (38.8)
Taste	80 (100)	170 (100)
Price	72 (90)	159 (93.5)
Pack size	0 (0)	29 (17)
Type of food (veg /non veg)	74 (92.5)	161 (94.7)
Discount/offer on the product	29 (36.2)	89 (52.3)
Nutrition quality symbols	18 (22.5)	23 (13.5)
Ingredients list	3 (3.7)	12 (7)
Nutrition panel information	0 (0)	9 (5.2)
Your medical need	0 (0)	0 (0)
Information about allergens if any	0 (0)	3 (1.7)
Manufacture and best before date	66 (82.5)	158 (92.9)

Note: Numbers in parenthesis indicate percentage

4.3.6: Types of information looked on NFP while purchasing processed packaged products by football players.

Group 2 were more concerned about nutrients on NFP compared to group 1 while purchasing processed packaged products. They mostly looked for nutrients like protein (49%), followed by total fats (39%), energy (28%), sugar (18%), fibre (11%) and iron (2%) on NFP (table 4.3.7). Group 1 used to look only for 3 nutrients on NFP i.e, Energy (15%), total fats (11%) and protein (20%) (table: 4.3.6).

Table 4.3.6: Type of information looked on NFP while purchasing processed packaged products by football players (in percentage).

Parameter	Group 1 (11-12 years) n=80	Group 2 (>12-14 years) n=170
Energy	12 (15)	48 (28.2)
Energy from fat	0 (0)	0 (0)
Total fats	9 (11.2)	66 (38.8)
Saturated fat	0 (0)	0 (0)
Polyunsaturated fat	0 (0)	0 (0)
Monounsaturated fat	0 (0)	0 (0)
Trans fat	0 (0)	0 (0)
Cholesterol	0 (0)	0 (0)
Protein	16 (20)	83 (48.8)
Sugar	0 (0)	31 (18.2)
Fibre	0 (0)	19 (11.1)
Vitamins	0 (0)	0 (0)
Minerals	0 (0)	0 (0)
Sodium	0 (0)	0 (0)
Potassium	0 (0)	0 (0)
Iron	0 (0)	4 (2.3)

Note: Numbers in parenthesis indicate percentage

4.3.7: Understanding of Nutrition Facts Panels (NFP)s among the football players

Four types of Nutrition Facts Panels (NFP-1: Values per 100g, NFP-2: Values per 100g and per serving, NFP-3: Values per 100g, per serving and % DV and NFP-4 values in form of % DV) were administered through questionnaire. NFP-1 (Values per 100g) was easily understood by majority of the players in both the age groups (group 1, 80% and group 2, 100%). As the complexity level increased, players faced difficulty in understanding the NFPs. NFP-4 (values in form of %DV) was least understood by most of the players (group 1, 100% and group 2, 84%) (table 4.3.7). NFP-1 was understood by 33% of total subjects and NFP-4 by 89% of total subjects as shown in figure 4.3.7.

Table 4.3.7: Understanding of Nutrition Facts Panels (NFP)s among the football players (in percentage).

Parameter	Group 1 (11-12 years) n=80			Group 2 (>12-14 years) n=170		
	Easy to understand	Difficult to understand	Do not understand at all	Easy to understand	Difficult to understand	Do not understand at all
NFP-1	64 (80)	16 (20)	0 (0)	170 (100)	0 (0)	0 (0)
NFP-2	4 (5)	76 (95)	0 (0)	61 (35.8)	109 (64.1)	0 (0)
NFP-3	0 (0)	0 (0)	80 (100)	11 (6.4)	159 (93.5)	0 (0)
NFP-4	0 (0)	0 (0)	80 (100)	0 (0)	27 (15.8)	143 (84.1)

Note: Numbers in parenthesis indicate percentage

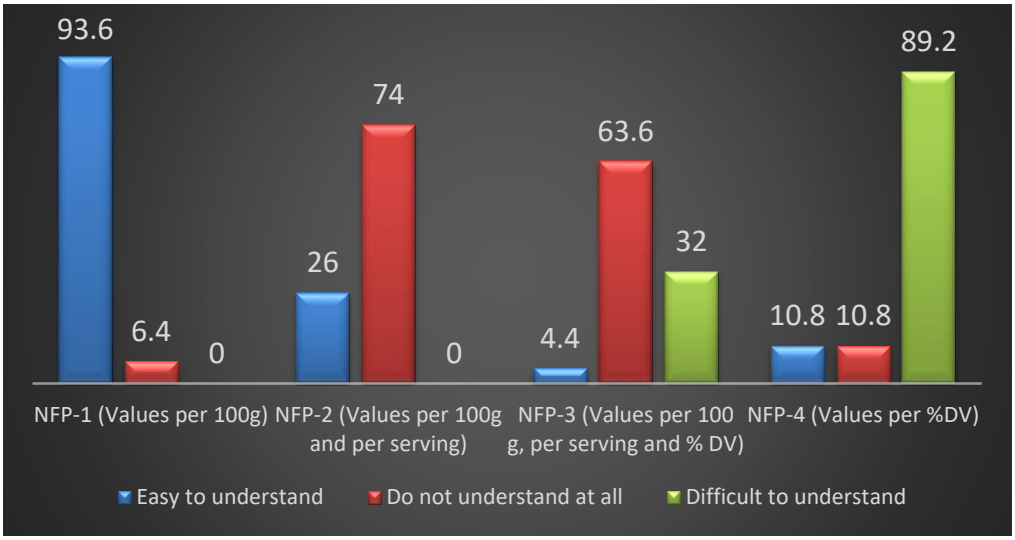

Figure 4.3.7: Understanding of different types of Nutrition Facts Panel among football players

4.3.8 Pre and post intervention knowledge scores on various components of food labels among football players

Using nutrition information for healthy food choices requires individuals understanding and interpretation of nutrient contents on food labels. However use and understanding of nutrition labels have consistently highlighted lack of understanding as an important barrier to use of this information. And so it is important to check knowledge regarding food label. Table 4.3.8 shows the pre and post-intervention mean knowledge scores of the football players on various components of food labels. Results showed that there was significant difference in the pre and post intervention mean knowledge scores. Paired sample t-test revealed statistically significant difference in the pre and post intervention knowledge scores among football players. There is a significant evidence that knowledge score for each question increased post intervention ($p<0.5$). On an average, the pre intervention score was (3.72±1.81) which increased to (5.53±2.11) significantly. Thus, the results implicate that nutrition intervention among

players was effective as it improved their scores on various components of food labeling. In both the age-groups, majority of the football players had poor knowledge score on various components of food labels before education session. In both the age-groups it was observed that majority of the football players had poor knowledge (79.4%) on various components of food labels. Only 1% of the total players had good knowledge score. After the intervention overall improvement was seen in 35% and 37% in both the age groups respectively. Thus showing remarkable shift from poor to average and from average to good score category post intervention. Graph clearly represents that post intervention, knowledge score increased among the football players (figure 4.3.8).

Table 4.3.8: Pre and post knowledge scores regarding various components of food labels (Mean±SD)

Parameter	Football players (10-11.11 years, n=80)			Football players (12-14 years, n= 170)		
	Pre	Post	t-value	Pre	Post	t-value
Q-1	0.31±0.46	0.36±0.48	2.039*	0.16±0.37	0.19±0.39	2.263*
Q-2	0.3±0.46	0.36±0.48	2.294*	0.16±0.37	0.25±0.43	4.190*
Q-3	0.27±0.44	0.31±0.46	1.754*	0.19±0.39	0.27±0.44	3.740*
Q-4	0.28±0.45	0.36±0.48	2.530*	0.24±0.43	0.3±0.45	3.073*
Q-5	0.3±0.46	0.38±0.49	2.752*	0.25±0.43	0.33±0.47	3.740*
Q-6	0.21±0.41	0.31±0.46	2.962*	0.20±0.40	0.26±0.44	3.25*

Q-7	0.19±0.39	0.3±0.46	3.164*	0.18±0.39	0.27±0.44	3.894*
Q-8	0.28±0.45	0.4±0.49	3.164*	0.26±0.44	0.35±0.47	4.044*
Q-9	0.25±0.43	0.32±0.47	2.530*	0.24±0.42	0.31±0.46	3.740*
Q-10	0.18±0.39	0.33±0.47	3.733*	0.15±0.36	0.28±0.45	4.880*
Q-11	0.2±0.40	0.28±0.45	2.752*	0.22±0.41	0.36±0.48	5.270*
Q-12	0.21±0.41	0.5±0.50	5.645*	0.21±0.41	0.37±0.48	5.523*
Q-13	0.2±0.40	0.33±0.47	3.548*	0.21±0.41	0.34±0.47	5.012*
Q-14	0.18±0.39	0.36±0.48	4.093*	0.11±0.32	0.31±0.46	6.380*
Q-15	0.16±0.37	0.32±0.47	3.915*	0.1±0.30	0.27±0.44	5.895*
Q-16	0.16±0.37	0.26±0.44	2.962*	0.12±0.33	0.26±0.44	5.270*
Total	3.72±1.81	5.53±2.11	10.034*	3.08±1.51	4.77±2.61	10.811*

Q-1 to Q-9: Questions based on Nutrition Facts Panel, Q-10- Quality symbol, Q-11 to 13- Nutrient claims, Q-14 to-16- ingredient list, preservatives and alternative source.
Note: * significant at p<0.05 level

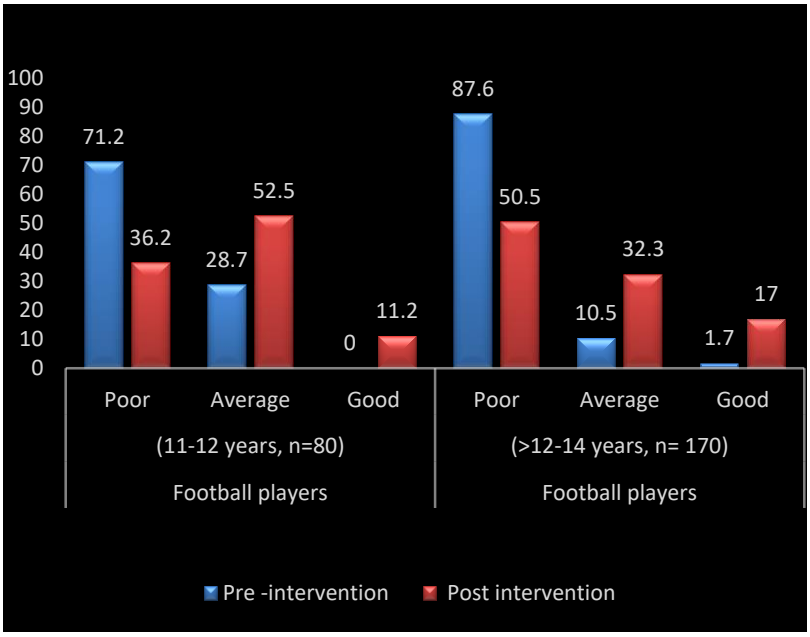

Figure 4.3.8: Pre and Post knowledge scores on food labels among football players

4.3.9 Pre and post intervention knowledge scores on GDA labelling scheme among football players

GDAs are the total or one hundred per cent (100%) of the recommended calories and the recommended maximum amounts of sugars, fat, saturates (saturated fat) and salt that an average adult should eat in one day. This FOP includes colors to depict nutrients as high, medium or low since color coding can be easily understood by people with low level of education and comprehension skills. Red indicated high, amber indicated medium and green color represented low level of nutrients, respectively. Pre intervention questionnaire included no colour GDA labelling scheme questions and

Post intervention questionnaire included colour coding GDA labelling scheme questions. Table 4.3.9 depicts that in both the age groups percentage improvement was seen in all the questions post intervention. Since colour coded GDA (traffic light colour scheme) was introduced, players were able to comprehend GDA labels easily. They were able to select healthy product from the given options efficiently. This clearly indicates that if football players are given knowledge on food labels repeatedly, they may select healthy processed products from varieties of available products. Food labels are somewhat complex in nature and difficult to comprehend, but results clearly indicate that colour coded GDA labelling scheme can be easily comprehend. Similar shift pattern was observed for GDA colour coding scheme. None of the player fall in good category pre intervention. After colour coded GDA was introduced post intervention, 70% from (11 to 12 years) and 86% from (>12 to 14 years) age group shifted to good category score (figure 4.3.9).

Table 4.3.9: Pre and post GDA labelling scores

Parameter	**Football players (10-11.11 years, n=80)**			**Football players (12-14 years, n= 170)**		
	Pre	**Post**	**t-value**	**Pre**	**Post**	**t-value**
Q-1	0.28±0.45	0.53±0.50	5.131*	0.16±0.37	0.8±0.40	15.643*
Q-2	0.3±0.46	0.57±0.49	5.474*	0.16±0.37	0.54±0.49	7.982*
Q-3	0.27±0.44	0.47±0.50	4.132*	0.19±0.39	0.51±0.50	6.897*
Q-4	0.25±0.43	0.57±0.49	6.167*	0.24±0.43	0.70±0.45	9.86*
Q-5	0.28±0.45	0.51±0.50	4.789*	0.25±0.43	0.58±0.49	6.695*
Q-6	0.2±0.40	0.38±0.49	3.957*	0.20±0.40	0.39±0.49	3.814*
Q-7	0.13±0.34	0.43±0.49	5.500*	0.19±0.39	0.50±0.50	6.481*
Q-8	0.26±0.44	0.5±0.50	4.960*	0.26±0.44	0.55±0.49	5.904*
Q-9	0.17±0.38	0.47±0.50	2.530*	0.24±0.42	0.6±0.49	7.910*
Q-10	0.16±0.37	0.45±0.50	5.646*	0.16±0.37	0.57±0.49	8.780*
Q-11	0.13±0.34	0.58±0.49	8.039*	0.22±0.42	0.81±0.39	13.755*
Q-12	0.17±0.38	0.52±0.50	6.522*	0.23±0.42	0.70±0.45	10.442*
Q-13	0.18±0.39	0.58±0.49	7.257*	0.21±0.41	0.74±0.43	12.258*
Q-14	0.1±0.30	0.42±0.49	6.167*	0.13±0.34	0.5±0.50	8.021*
Q-15	0.11±0.31	0.68±0.46	10.338*	0.1±0.30	0.88±0.32	23.838*
Q-16	0.13±0.34	0.38±0.49	4.820*	0.13±0.34	0.37±0.48	5.317*
Total	3.18±1.45	8.12±3.25	13.702*	3.15±1.44	9.80±2.27	36.692*

Q-1 to 16 has two options, based on GDA labelling scheme, one product is healthy and another one is unhealthy. Post intervention colour coded GDA was introduced.

Note: * significant at p<0.05 level

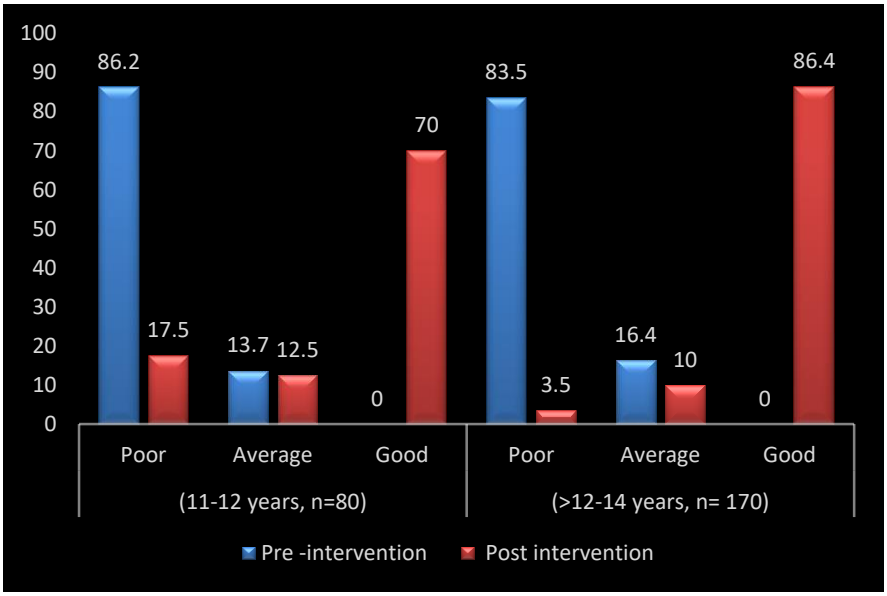

Figure 4.3.9: Pre and Post GDA scores among football players

RESULT HIGHLIGHTS

- Majority of the football players (n=106, 70%) mentioned that since many scientific terms are used on food labels, it becomes difficult for them to examine food labels.
- Non- nutritional factors like taste, price and type of food- vegetarian or non-vegetarian were preferred more while purchasing processed products in both the age-groups.
- Significant improvement in knowledge score was seen in all the questions post intervention.
- Significant improvement was seen when colour coded GDA was introduced, players were able to comprehend GDA labels easily post intervention.