CHAPTER 5
DISCUSSION

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 favour of attaining the set objectives, the study sample of 250 subjects were enrolled from the Baroda football academy. Athletes challenge their bodies on regular basis through physical training. In order to keep up with the demands of sport, athletes need to fuel their bodies with proper nutrition. Athletes those who are trained and socialize together often obtain nutrition related information from each other. However they lack accurate and up to date knowledge of the nutrition which can enhance their sport performance.

Adolescence is a transition period when habits are formed and they are carried into adulthood. Good habits, like regular exercise and a healthy balanced diet, are likely to bring many benefits, including improved performance in school (Doku and others 2013). According to WHO, 2009, high intake of processed foods, high BMI, and iron deficiency are among the top risk factors of disability-adjusted life years (DALYs) and later they pose risks for non-communicable diseases, which are responsible for two of every three deaths globally (Sawyer and others 2012).

According to Bull 2005, the junior players, face problems related to socio economic status, psychological behavioral and emotional. In the study Chandrasekaran 2010, mentioned players of low socio-economic status stratum generally had greater frustration in life as compared to the high class people. In the present study all the football players were playing football since past 1-2 years and were trained for more than 1 hour per day for 5-7 days in a week. Out of total subjects, 10% of them had played upto interschool level and only 15% of them had played at district level. Since the age group was young (11-14 years) and just started playing football, none of the players had reached upto state level. Around 46% of football players belonged to lower middle socio-economic class.

Height and body weight was seen to increase with age in players due to normal growth and maturation process. In the current study also, group 2 had more height (153.6±4.9

cm) and weight (50.41±5.3 kg) compared to group 1 (Height: 140.39±8.7 cm; weight 38.84±9.5 kg).

Research study conducted by Gabbett, Jenkins and Abernethy 2010 concluded that when comparing height and body weight between playing standards, increased size provided a small advantage for selection between elite (178.0±5.9 cm, 77.5±10.0 kg) and sub-elite (175.2±6.9 cm, 72.3±11.7 kg) levels in players in the under 16 age category. Small to moderate difference was observed between starters and non-starters in both elite and sub-elite levels at under 14, 16 (body weight 77.5±10.0 vs. 74.3±13.4 kg) and 18 age categories. Similar results were observed by Till et al 2016, senior professional players from two European Super League clubs were also taller (183.2±5.8 vs.179.2±5.7 cm) and heavier (96.5±9.3 vs. 86.5±9.0 kg) than their academy under 19 counterparts. Such results do suggest that increased size is advantageous may be due to the ability to generate greater impact forces throughout the frequent contacts involved in the sport for selection to higher playing standards in rugby league (Johnston, Gabbett and Jenkins 2014; De Lacey et al 2014). In contrast to these no differences were observed for height and body mass between playing standards among homogenous samples (i.e. regional and national level within the UK between under 13s and 15s (Till et al 2011). Another study conducted by Till et al 2015 on comparing height and body mass of 13 to 15 year old against future career attainment (i.e. whether players achieved amateur, academy or professional status in adulthood), no differences were found between career attainment levels and, in the under 14 age category, future professionals (61.7±9.2 kg) had a significantly lower body mass than amateur (71.1±11.8 kg) and academy (70.0±10.7 kg) players (Till et al 2016). Thus these differences supports the fact that no relationships were observed between height and body mass and tackling ability in junior players despite contrasting findings in senior cohorts (Gabbett 2009).

Due to unhealthy behaviours like inadequate dietary pattern and sedentary lifestyle, the percentage of overweight children has increased exponentially in recent years (Emamian, Hashemi and Fotouhi 2019). According to World Health Organization, 2016 around 340 million children and adolescents aged 5-19 were overweight or obese. In the present study, from the total subjects, 10% of players were seen in thinness category, 75% were classified as normal, 5% as overweight and 10% were obese according to BMI for age. Though BMI has low specificity, proper body composition measurements are recommended. Accurate assessments of fat mass and fat-free mass

can be beneficial. However, not all physical activities or sports have adequate elements to generate improvements in body composition (Ubago-Guisado et al 2015), but team sports like football have specific qualities and characteristics to prevent or reduce obesity as the energy expenditure is high due to the high aerobic component (Krustrup et al 2010) which leads to higher fat oxidation during exercise and greater fat loss compared to other activities of lower physical intensity (Aguiar et al 2012). Also football includes multitude high-speed actions, sprints, turns, jumps, and shots (Rebelo et al 2013) and has been seen that the practice of football at an early age helps in bone development due to the impacts generated during its practice (Maillane-Vanegas et al 2020).

The mean BMI of football players was 19.67±4.1 kg/m2 for the age group 11-12 years and 21.31±1.7 kg/m^2 for >12-14 years in the present study. Similar results were observed in study conducted by Skoradal et al 2018, where the mean age of the football players was 11.1 ± 0.3 years (N=392, boys) and the mean BMI was 19.3 ± 3.2 kg/m^2. Another study conducted by Orntoft et al 2016 on boys (N=467) football players for the age group 10-12 years showed similar results with BMI 18.2 ± 2.7 kg/m^2

On contradictory, several studies conducted by Seabra et al 2014, Seabra et al 2016, Mota et al 2016, Lousa et al 2018, Cvetkovic et al. 2018 for the age group 10-12 years showed slight high mean BMI ranging from 23 to 26 kg/m^2. This variation can be due to different ethnicity background of the football players.

Several studies have shown that children under the age group of 12 who played football had better exercise capacity, lower resting heart rate, and higher muscle mass than children who did not participate in recreational sports (Orntoft et al 2018, Carl, Johnson and Martin 2017). In the present study, all the players were playing football since past 1-2 years only. Around 48% of the football players had good cardiorespiratory endurance, 74% in group 1 and 58% in group 2 had good flexibility. Lockie et al support that linear speed is a crucial factor for football players for positional play and goal scoring. However, the average age of the players analyzed in the study by Lockie et al was 21.2 ± 1.32 years (compared to the players in our study with an average age of 12.5 ± 1 years). The completion time for the 30 m sprint had a moderate to high correlation with the age of the athlete ($r = -0.77$, respectively; $p < 0.001$) in the present

study. The mean flexibility was very low in the present study when compared with the study conducted by Swapan, Nabanita and Parthasarthi 2010, on 150 male Indian footballers of six different national clubs of India. (11.22 ± 4.09 cm vs. 35.4 ± 6.88 cm; 38.9 ± 4.05 cm; 35.3 ± 5.62 cm; 37.8 ± 4.98 cm; 36.1±7.26 cm; 36.3 ± 7.77 cm). This difference can be due to age gap.

Body composition is expressed as relative amounts of fat mass and fat free mass. Fat mass includes essential and storage fat whereas fat free mass includes muscles, bones, organs, fluids and solid components. Achieving an ideal body composition is an important determinant of performance. Regular body composition assessment helps to assess the effect of sports specific training on athletes. Along with that it also helps to understand the nutritional status of athletes and whether their weight is optimal for specific sport performance. The undertaken study pointed that mean % body fat was 16.45±0.77 in the total football players. Study conducted by Rinaldo, Zaccagni and Gualdi-Russo 2016 on 60 pre-adolescent boys in Italy showed slightly higher % body fat (18.6 to 21.0 % for the age group 9-10 years). Total body fat percentage, fat mass (kg) and fat-free mass (kg) were calculated by using the formulas of Slaughter et al. This slight difference in body composition can be due to different ethnicity and age. variations. Weak positive correlation was seen between BMI vs. Fat (%) (r=0.29) and Age vs. Fat (%) (r=0.31) respectively.

Food choice is known to be influenced by many factors, including taste, convenience, price, cultural/religious beliefs (Sobal and Bisogni 2009); Furst et al 1996), food availability and security (Mello et al 2010), individual knowledge about food and nutrition, personal and/or family beliefs (Worsley 2002; Contento et al 2006), concerns about weight and body image (Wardle et al 2004). Furthermore players are also influenced by coaches, the behaviours and practices of other athletes and the culture within sport (Long et al 2011; Ono et al 2012). Athletes where attempts to achieve physique and body weight goals for performance contribute added pressure (Byrne and McLean 2002; Anderson and Petrie 2012), addition to that, the influence of the media and social facilitation (Bublitz, Peracchio and Block 2010; Cohen and Babey 2012), can affect food choice. In the present study, both the age groups were found statistically significant with respect to food choice. Older age group >12-14 were more concern about factors like health ($p = 0.007$) and mood ($p<0.001$). However, in younger age group 11-12 were more concern about factors like convenience ($p<0.001$) and

sensory appeal (0.001) which affected their food choice. Despite several studies are carried out with general populations, very little exploration has been carried out with athletes. Time was considered to be the major factor in selection of food products among the male collegiate football players in the study conducted by Long et al 2011. Another qualitative investigation conducted on factors influencing the dietary intakes of professional Australian Football Players by Jenner et al 2021 reported that the main influences included pressures to meet body composition goals and the role of peers and family (including partners).

Right diet is essential to so that it enables athletes to train as per coach-designed training plans so that they can achieve set goals and targets. In the present study undertaken, protein (12-15%) and carbohydrate (50-52%) intake were lower than recommended values and that of fat (27-30%) was in the range of recommended values for athletes. Similar results were observed in several other international studies which concluded inadequate nutritional intake in both male and female soccer players (Bood, Black and Birnbaum 2004; Caccialanza, Cameletti and Cavallaro 2007; Clark et al 2003; Garrido, Webster and Chamorro 2007; Gravina et al 2012; Iglesias-Gutierrez et al 2012; Martin, Lambeth and Scott 2006; Mullinix et al 2003; Ruiz et al 2005 and Russell and Pennock 2011). The nutritional composition of the diet for the players with reference to energy contribution from carbohydrate, protein and fat varies from event to event i.e., 55-65% of carbohydrate, 12- 15% of protein (of which 55-60% from animal protein) and 25-30% of fat. The ratio between these macronutrients keeps on varying time to time depending on the needs of the individual athlete in order to achieve desirable body size and composition and optimal performance levels.

Study conducted by Chandorkar and Bardoliwala 2015, also concluded that nutrient intake was low and failed to meet the RDA suggested for non-athletes. Fat consumption was very high in the study subjects. Contradictory to it study conducted by Chauhan and Inamdar 2015, concluded that according to NIN diet allowances, athletes (hockey players) in the age group of 13-15 years consume energy, protein, fat and calcium more than recommended levels while carbohydrates, iron and vitamin c was consumed into lesser amounts than recommended. When compared with nutrition guidelines for sports, it was found that protein consumption by all the players was found less. This clearly shows that our players they don't meet their nutritional requirements, which can be due to lack of nutrition knowledge and unhealthy dietary practices.

Consumption of processed foods is high and it is rising in India. It accounts for nearly 10% of the average total caloric intake in both rural and urban India. Almost 30% total daily calories come from processed food in urban households. Processed foods are usually high in sugar, salt, saturated fats, and processed flour, and so they are considered as unhealthy and they are often linked to obesity/overweight and NCDs (Kennedy, Nantel and Shetty 2006; Hawkes 2006; Moodie et al 2013; Swinburn et al 2011 and Singh and Chandorkar 2016). According to the study by Singh and Chandorkar 2016, adolescents were found to be the major consumers of all types of processed packaged products except cheese, butter, sauces and dips which were consumed more by elder and adult age-groups. In the present study the most frequently consumed processed products were jams/jellies (79%), followed by chocolates (68%), sweet biscuits (53%), cold-drinks (52%), popcorn (49%), maggie (48%), wafers (44%), salt biscuits (22%), cornflakes / oats / muesli (18%). Soups and fruit juices were consumed less.

Thus, nutrition information on packaged food labels can help athletes choose the best foods to meet their nutritional needs and enable them to compare products easily and identify high-quality, high-energy foods to fuel their workouts by increasing or decreasing intake of a particular nutrient of interest based on their unique training regimens. Based on this second phase that is market survey of processed foods was conducted.

High consumption of ultra-processed foods (UPF) (i.e >4 servings daily) is associated with an increase in non-communicable diseases, overweight and obesity. The comprehensive national nutrition survey (CNNS) 2016, shows that more than half of the 5 to 19 years old show biomarkers of NCDs (Sachdev et al 2021). The consumption of unhealthy food and drink products is rapidly rising in India. Processed foods are usually high in sugar, salt, or saturated fats, which are detrimental to health.

Food labels are an informational tool for encouraging healthful purchasing and eating habits. Several studies have shown that use of nutrition labels on packaged foods has been related to healthier dietary choices (Campos , Doxey and Hammond 2011), however, systematic reviews show that consumers may not frequently use nutrition labels to make food choices (Cowburn and Stockley 2007). Similar results were observed in our study as well. Majority of the football players were not looking at nutritional label while purchasing the products. This may be due to very young age of the subjects and lack of education. Study conducted

by Christoph et al 2019, concluded that almost a third (31.4%) of the sample (mean age was 31.0 ± 1.7 years and included 918 men and 887 women) reported using Nutrition Facts, when buying or choosing a food product for the first time.

In the present study total 768 processed products having food label were surveyed. Different types of nutrition facts panel were observed on products. No consistency was seen among similar food categories also. In the present study the most common type of NFP observed was "per 100g". Similar results were observed in the study conducted by Singh and Chandorkar, 2016. NFP helps consumers with respect to the quantities present of various nutrients in the given food product. NFP includes various components. Serving size and number of servings component is very important for athlete to understand what is one serving. Majority of times consumers consider one whole packet as one serving, in fact there could be multiple servings in one packet. So it becomes important for athlete to know how to multiply the nutrition information listed on NFP by the number of servings consumed to get accurate estimate.

According to FSSAI guidelines, its compulsory to mention basic 5 nutrients like energy value (kcal), protein (g), carbohydrates (g), sugar (of the total carbohydrates) (g), fat (g or ml) on NFP. Major calories come from the above-mentioned nutrients. By reviewing the calories and other nutrients content of foods eaten throughout day will allow athletes to ensure adequate total energy consumption and other nutrients.

Fat is a calorie-dense nutrient and very important for athletes because it is capable of meeting the high daily energy requirement and serve as a primary energy source at rest and during light to moderate intensity exercise. However along with that its association with cholesterol and saturated fatty acids with heart disease is again a concern. By reading food labels, athletes can compare various brands to find low to moderate fat options. Also attempt can be made by reducing saturated fat intake. In present study almost 98% of total products mentioned information about fat content if present in the particular food item.

As shown in the study, according to USFDA criteria 15% of snack foods were high in energy followed by bread and bakery products (14.8%), convenience foods (7%) and with respect to fat, snack foods category again showed highest contribution (12%), followed by convenience foods (11.2%), bread and bakery products (7.4%). Snack food products and

sugar-sweetened beverages are often energy-dense, nutrient-poor, and high in salt or sugar (Lucan, Karpyn, & Sherman 2010; Monteiro et al 2011; Sekiyama, Roosita, & Ohtsuka 2012; Waseem et al 2014). Over consumption of snack foods and sweetened beverages has also shown to contribute to overweight and obesity among children in the United States (Nicklas et al 2003; Phillips et al 2004; Scientific Advisory Committee on Nutrition, 2014; Welsh, 2005) and Latin America (Asfaw, 2011; Rauber, Campagnolo, Hoffman, & Vitolo, 2015; Tavares, Fonseca, Garcia Rosa, & Yokoo, 2012). In addition to that energy-dense, nutrient-poor foods early in life can also displace consumption of other nutritious foods, including breast milk (Kimmons et al., 2005), potentially increasing a child's risk of inadequate nutrient intakes and contributing to childhood undernutrition.

Another important component is ingredient list. According to FSSAI guidelines 2021, the name of ingredients used in the product should be listed in descending order of their composition by weight or volume. The purpose behind this is to understand the order of predominance. By looking at the ingredient list athletes can evaluate the nutrient quality of food and can also ensure and avoid if the particular ingredient is present or not if having allergy for same. Nutrient quality of the product can be evaluated by the presence of a specific ingredient and its order list. For instance if athlete wants to consume more fibre, than he can chose whole grain products instead of refined flour products by looking at ingredient label. In the present study very less products showed compliance with the FSSAI guidelines. Similar results were seen in the study conducted by Singh and Chandorkar 2005.

According to Nutrition Labeling and Education Act (NLEA) of 1990, food manufactures can place certain nutrition related claims on food labels only if they meet certain criteria. These claims usually highlight certain characteristics of the food. Foe eg: “Low fat”, “Reduced sugar” etc can be used. By going through such claims, athletes can quickly identify the products that help them to meet their dietary goals. For eg if athletes has high cholesterol levels a product label “cholesterol free” would be easily identifiable and can be used. Health claims describe the potential health benefit of food or nutrient. The FDA allows health claims only if they have well supported scientific studies. In the present study out of 9 food groups, only 4 food groups declared health claims on food label and 84% of total products mentioned nutrient claims.

Supermarket is flooded with several types of processed products and sports supplements.

Supplements the word itself suggests is to "supplement" or support the existing diet, it is not to meant to replace the diet. Nowadays it's a multi-billion- dollar industry with marketing techniques which influences athletes with claims that sound too good to be true. Contamination of supplements may result in athletes testing positive in a doping test. Currently there is no way to be 100% sure regarding the authenticity of supplements. Supplement use is a widespread and accepted practices by athletes, having different types and brands of products. In present study, majority of supplements surveyed were in form of powder (n=83), followed by bar (n=12), beverages (n=3) and capsules (n=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%). 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. Legislation regarding supplements in India isn't strong enough and its challenging to understand whichone is safe or which one is following World Anti-Doping Agency (WADA) guidelines (Peeling et al 2019).

Study conducted by Sharlene 2012, among 225 children in Canada, grades (1-6) revealed a general inability to evaluate the healthfulness of a packaged food. They used package colours, spokes-characters, pictures, and front-of-package (FOP) claims, to support their choices of healthy foods. While some children used information from nutrition facts tables and ingredient lists in their assessments, these were often used ineffectively. The study revealed, quite clearly, that children need help navigating the complexity of the visual packaged food environment. In short, nutrition literacy (the skills of evaluating, processing and understanding basic nutrition information) needs to be accompanied by media literacy. Keeping this in mind third phase of study was conducted.

Healthy food choices is very important in any adolescent's life for good health, but specially more important for those involved in sports (Croll et al 2006) for optimal sport performance. Several studies have shown that adolescents don't meet their energy requirements (Croll et al 2006; Petrie et al 2004 and Purcell et al 2013). Female athletes don't meet their calcium and iron requirements (Cupisti et al 2002; Croll et al 2006 and Nemet et al 2009), because of body image and nutrition related misconceptions, they end up into unhealthy dietary practices. This further indicates the importance of nutrition education among adolescents. Children less than 17 years old usually don't cook, so most of their choices are dependent

on what parents provide. Parents are not able to make healthy choices because of lack of education. Like adults, adolescents also face similar factors that motivate food selection like taste, convenience, nutrition knowledge, personal and family beliefs, physiological, social, psychological and economic factors (Croll et al 2006, Birkenhead and Slatter 2015). Further athletes are also influenced by coaches, colleagues and culture within the sport (Lomg et al 2011). Study conducted by Magalhaes et al 2021, concluded that younger age groups and children with less educated parents are positively associated with consumption of ultra-processed foods. Numerous factors influences the adolescents eating behavior, including nutrition knowledge (Pirouznia 2001). Poor eating habits during childhood typically follow into adulthood (Fahlman et al 2008). Study conducted by Baskale and Bahar 2011 and Pettigrew 2009 showed that children as young as five years old can be taught healthy eating behaviors and increase the chance of healthier future.

With increase in the consumption of processed foods among adolescents, it becomes very important for athletes to understand and comprehend food label. The food label helps athlete by providing reliable information about the product thus empowering them to make wise food choices on daily basis. Many athletes find food label confusing and difficult to understand. Thus nutrition education with respect to food label is much needed. In present study, 87% of football players mentioned variety and taste as the major reason for consuming processed packaged products followed by convenience (8%). In the present study 194 football players never read food label and reason cited by players (66%) was they did not understand food label since it consume many scientific terms.

Athletes have always considered protein to be the most important nutrient. They are important for the repair, recovery and synthesis of cells. In general 1.5-2.2 g per kg per day is required. Nutrient timing and total protein intake both influence muscle protein synthesis and hypertrophy. Similarly in present study, elder group (49%) looked for nutrient like proteins while purchasing the processed product followed by total fats (39%), energy (28%) and other nutrients.

Past studies have shown that by imparting nutrition education intervention, improvement in knowledge score has been seen in selection of healthy food choices (Chandorkar and Singh 2015). Similar result was seen in the present study. Before intervention majority of the football players had poor knowledge score regarding various components of food labels and

after intervention knowledge score increased in both the age groups.

Several labeling schemes have been introduced around the globe to facilitate better understanding of nutrition labels among the consumers. The main purpose is to present the nutrition information in the simplest form so that consumers can select a healthier option wisely. Studies have shown that NFP at the BOP is confusing and very difficult to understand by the consumers with regard to terminology and numerical information and also time consuming (Cowburn and Stockley 2005 and Grunert and Wills 2007). Whereas, FOP labeling is easy to understand and helps in comparing products quickly (Kleef et al 2007). In present study, pre intervention questionnaire was introduced which included no colour GDA labelling scheme questions and post intervention questionnaire included colour coding GDA labelling scheme questions. None of the player fall in good category pre intervention. After colour coded GDA was introduced post intervention, 70% from group 1 and 86% from group 2 shifted to good category score. 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.

In conclusion, the results of this study showed that players did not meet their nutritional requirement and considered non-nutritional factors like taste, flavour more over nutritional factors while selecting processed packaged foods due to lack of nutrition knowledge with respect to various components of food labels. Post intervention, players were able to comprehend label and were able to chose healthy product from the available options by using colour coded GDA labeling scheme.