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Research article

Coaches' perceptions about food, appetite, and nutrition of adolescent Indian athletes - A qualitative study

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ABSTRACT

Adolescence is a transitional phase of development with the risk of adopting unhealthy behaviours, which is carried on to adulthood. Adolescent athletes tend to resort to unhealthy eating habits resulting in eating disorders and other clinical outcomes. Hence, it forms a crucial age to understand modifiable food habits and provide appropriate counselling. In India, coaches closely monitor the adolescent athletes, even concerning their eating habits due to the lack of multi-disciplinary support staff. Thus, our study aimed to understand the perceptions of coaches towards food, appetite and nutrition of adolescent athletes using In-depth interviews (IDI). Of all 14 coaches at the state-sponsored residential sports centre, 10 consented. The IDI were conducted in a standardized manner and were recorded and transcribed. They were coded manually, using the open and axial coding in the grounded theory approach to determine themes. They considered nutrition as key to performance and consumption of higher animal protein as important. Majority of them considered sprouts, dry fruits, fruits and vegetables as healthy foods, though were unable to define the quantities nor nutrients therein. Coaches considered protein as "important", while fat as "unhealthy". They also observed that athletes were avoiding fruits and vegetables, while consuming more rice. Meal timing, fluid and supplement intake were considered essential for international performance, albeit unaware of the specific requirements. Hygiene practices and peer isolation were considered to affect food intake. This lacunae in the nutrition knowledge and the modifiable nutrition practices explored can be targeted by developing a nutrition education and assessment tool for coaches and junior athletes. Further, a long-term engagement of a nutritionist with every sports academy in India is recommended.

1. Introduction

In the arena of international sports with its high level of competence, even the slightest variation in physical fitness can affect performance. Thus, research on sports nutrition, which is a major contributor to health and performance related fitness, has seen an increase over the last decade [1]. There has been a shift of focus from adult athlete to the adolescent athlete, as this is an age requiring special attention because perceptions, dietary behaviours and practices are still modifiable [2]. Even in India, the sports policies and schemes [3, 4] show a focus on scientifically grooming adolescent athletes with an emphasis on nutrition.

Adolescent athletes are considered a "special" group owing to the added nutritional demands of growth and the higher risk of inadequacy. Further, they tend to have strong peer pressure leading to increased risk of unhealthy behaviours, mood swings and strong taste preferences affecting food intake [5]. These eating habits formed during adolescence tend to remain into adulthood [6], resulting in unhealthy practices that are difficult to change. On the other hand, adolescent athletes were also found to adopt to changes upon nutrition counselling compared to adult counterparts [7]. Thus, it is important to explore the modifiable nutrition practices of adolescent athletes and provide nutrition education, wherever possible.

Though nutrition has evolved as a separate faculty in sports, the work of sports nutritionists is often carried out by the coaches in resource-deprived countries. For instance, a study [8] in Iran stated that 89.4 % athletes found coaches to be their main nutrition informers. Also, in 2016 a study [9] reported that coaches were the primary source of nutrition information for the athletes in Egypt. In India, very scanty research on

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coaches is available and most sports training centres for adolescent athletes are not equipped with nutritionists. Most often, young athletes turn to their coaches for nutrition information and dietary suggestions during training and competitions. Therefore, the perception of coaches towards nutrition and performance of adolescent athletes, can serve as a proxy for their understanding and attitude towards nutrition and the nutrition practices of young adolescent athletes.

Previous research has analysed the nutrition knowledge and attitudes from the perspective of athletes [10, 11, 12, 13] and there have been very limited studies on the perceptions of coaches [14]. Even if there were studies, they focussed on testing nutrition knowledge, attitude and practice of coaches in empirical terms, by using quantitative questionnaires [15, 16, 17]. The use of In-Depth Interviews on persons who closely observe athletes was suggested to be the quickest way to understand their problems [18]. This study is therefore unique as it aims to determine the perception of coaches on food, appetite and nutrition of adolescent athletes. This would help in understanding modifiable practices of adolescent athletes for providing a context-specific nutrition education.

2. Materials and methods

2.1. Study setting

This study was carried out in the sole government funded sports school in the South Indian state of Telangana, which offers residential facilities providing both academic and sports training. Approval was taken from the Institutional Ethical Committee of National Institute of Nutrition (Indian Council of Medical Research), Hyderabad, India.

2.2. Study participants

In-depth interviews (IDI) were conducted among coaches aged 28–60 years, who graduated in Physical Education from the National Institute of Sports (NIS), Patiala, India. Out of 14 male coaches in the school, 10 were recruited based on their willingness to participate and their availability during the study. These coaches were training adolescent athletes aged 10–17 years in events like judo (1 coach), athletics (3 coaches), gymnastics (2 coaches), weightlifting (2 coaches), football (1 coach) and archery (1 coach). They monitored the junior athletes closely and guided athletes on food consumption and nutrition, since there was no nutritionist in the sports school. Written informed consent was obtained from coaches prior to IDI. The protocol, time and date of interviews were explained.

2.3. Preparation of moderator guide

A moderator guide was developed encompassing questions, and probes, which acted as a guide for carrying out the In-depth Interviews and further ensured that all probes were covered in the course of the interview. The probes or questions were based on the review of literature, including position statements on sports nutrition [4, 19, 20] and a study on Indian athletes [21]. They were reviewed by a 5-member panel of experts drawn from diverse fields like exercise physiology, nutrition, and social communication. Experts have reframed most of the question probes to make it open-ended and less structured, further incorporated probes/questions to gauge "sources of sports nutrition information" and "hygiene related outbreaks and its relation, if any, with food". After suitable modifications, the moderator guide was pretested among two coaches, resulting in formation of new probes or questions relating to

Table 1. Question route or guide for use in conducting in-depth interviews with coaches.

Question route	To assess perceptions of coaches:		
	Understanding	Attitude	Practices
Do you see a relationship between food, nutrition and athletes performance? Probes: 'Professional athletes have specific nutritional requirements'- your take on it? What do you think is ideal food for athletes? As a coach, can you name some nutrients essential for the athlete to achieve peak performance? How are they helpful? What are the sources? How do you gather nutrition facts? What type of foods do adolescent athletes prefer? What are your opinions about their food choices?	√	√	√
In your view, how does meal timing impact performance? Probes: 'Eating when you are hungry is important and time does not matter', what is your view on it? Advices you provide on timing and food intake before, during and after training What are the specific practices athletes follow for food selection and timing?	√	-	√
Probes: Some athletes eat certain foods only, while avoiding others to perform better, can you name a few foods and your opinion about it? Do you advice athletes on any such foods?	-	√	√
Probes: Thirst is a good indicator for drinking water, your views? Types of fluids commonly consumed by athletes? Suggestions provided on water and hydration, especially while training?	√	√	√
Probes: What is your view on supplement intake? Types of supplements suggested by you or used by athletes and reasons for consumption?	√	√	√
Probes: Usual illness that athletes face What could they be due to? Role of hygiene and precautions you usually suggest	-	-	√
Probes: Reasons for stress among athletes Does it affect eating habits? What suggestions do you provide?	-	√	√

Note: Tick mark indicates the focus points of the question route. Dash line indicates not applicable.

Table 2. Themes generated and their representative quotes from the interview transcripts in support of the findings presented.

Themes	Quotes		
	Understanding	Attitude	Practice
Nutrition for performance and specific nutritional requirements	*"Different games require different type of food, based on intensity and energy expended."-28-year-old, Gymnastics coach* *"Nutritional requirements are highly variable and different across events, but for children energy requirements are same, irrespective of the event."-45-year-old, Athletics coach* *"Carbohydrates and fats improve muscle strength." -40-year-old, Football coach* *"100% protein is a must for athletes to improve muscle mass. Beef is very good and the best source of protein"-45-year-old, Athletics coach* *"Vegetarian athletes need to eat more quantity to match the requirements because of the difference in quality of vegetarian and non-vegetarian foods." -60-year-old, Weightlifting coach*	*"Food provided to athletes was not sufficient. They need to incorporate more boiled vegetables, fruits and sea food."-37-year-old,Judo coach* *"There is no food that hinders an athlete's performance, because such a conditioned athlete, even if he eats junk food like cakes, pastries, etc. nothing will happen." -45-year-old, Athletics coach* *"Change in preparation can improve the nutrition. Like providing alternate millets like ragi porridge, sprouts, or boiled vegetables. It helps in changing monotony so that the child enjoys or relishes the food better and it also provides energy." -50-year-old, Archery coach*	*"Food provided in sports school is nutritious and sufficient for adolescent athletes. But, due to taste preferences athletes avoid eating vegetables or egg and prefer more rice." -40-year-old, Football coach* *"In this school, students are provided only 3500 and 4000 kcal diet. I have told them that for iron game, the nutrition provided here is less, they need to give higher quantities of non-vegetarian food." -60-year-old, Weightlifting coach* *"I am not sure of nutrients but daily they need to take atleast 50g of dry fruits, especially almonds. They also need to take 500g of flesh foods and milk about 1 L every day. Eggs and butter should also be consumed." -37-year-old, Judo coach*
Food choices and appetite for foods among adolescent athletes	-	-	*"The athletes in sports school come from remote villages and their main motive is to fill their stomach. So they tend to eat more rice and less of vegetables. I often educate them to take two or three servings of vegetables to fill their stomach." -50-year-old, Athletic coach* *"Once the athletes go for competitions or go outside sports hostel, they want to eat only junk and oily food, resulting in stomach upsets. This is a persisting problem we face and we have to educate them well." -50-year-old, Archery coach*
Meal timing and food intake: Pre, During and Post training	*"During regular training, it is important to follow meal timing. It is good to consume banana after 3–4 repetitions." -45-year-old, Athletics Coach* *"During training, it is sufficient to drink water. It is not mandatory to consume anything before, during and after regular training, but during competition season it is important." -28-year-old Gymnastics coach*	-	*"In the competition season, meal timings differ based on the timing of the event. I advise athletes to consume meals 2 h before their competition and suggest consuming light foods like Idli, Bread and Jam. They need to avoid traditional Indian snacks or deep fried foods, including Indian sweets."-60-year-old, Weightlifting coach* *"During outdoor competition, they tend to go for site seeing and consume different kinds of street foods, which are usually traditional Indian snacks. This result in stomach upsets and affect their performance." -50-year-old, Archery coach*
Personal experiences or beliefs related to eating or avoiding foods to boost performance	-	*"Mostly athletes want to eat a lot of beef or mutton. They think that if they eat a lot of non-vegetarian foods, they get more power." -28-year-old, Gymnastics Coach* *"Coffee before competition has incredible results and it will improve performance. I was a state gold medallist for 400m hurdles, it has worked for me." -45-year-old, Athletics Coach*	*"The athletes I train do not have any such beliefs related to eating a particular food to improve performance. They depend only on training and hard work." -50-year-old, Athletics coach*
Relationship between hydration and performance	*"If they can do 6 or 7 tonnes by drinking normal water, then they can do around 10 tonnes if they drink glucose water or ORS or lime juice. When they do more of such repetitions, their performance also improves." -37-year-old, Gymnastics coach* *"For every 20 Kg body weight, the athlete should drink 1 or 1.5 L of water." -37-year-old, Judo coach*	*"Plain water is preferable during training and it is sufficient. However, in case of muscle cramps already existing or iron deficiency, they should add some salt in water and drink it."-38-year-old, Athletics coach*	*"Adolescent athletes are not provided any electrolytes during training and they drink only plain water. It would be better to atleast provide for the players who participate in nationals." -50-year-old, Athletics coach*

(*continued on next page*)

Table 2 (*continued*)

Themes	Quotes		
	Understanding	Attitude	Practice
Supplement usage: Essential vs. Optional	*"Supplements are essential, though I don't know the various types available. Multivitamin tablets like iron and calcium are suggested by doctors and it is important for athletes involved in training." -47-year-old, Weightlifting coach* *"Now worldwide everyone is dependent on steroids but in India it is not promoted. However, coach feels that supplements to some extend needs to be promoted. Supplements are not steroids, it is like a diet only. For example, soya bean powder, crab shell powder, Ashwagandha, Chyawanprash. They don't give energy but have an effect on muscle mass."-37-year-old, Judo coach*	*In athletics, 99.9% we avoid supplements. Athletes should go for supplements after winning a national medal or after 18 years because they will have international competitions." -38-year-old, Athletic coach*	*"Weightlifters need to take B complex, Vitamin B1, B2 & B6 in the form of medicine. However, they are not provided all these and none of them can afford it." -60-year-old, Weightlifting coach.*
Hygiene practices among athletes	-	*"Preparation, serving and eating hygienic food is as important, as the quality of food itself." -50-year-old, Archery coach*	*"Interchanging clothes is common among these athletes and it causes spread of skin disease. If it occurs in one person in the team, it will affect everyone." -40-year-old, Football coach* *"For personal hygiene, I advise them to take bath, both morning and evening and to wash hands before eating. Socks I ask them to wash daily. If socks are stinking, they get punishment." -45-year-old, Athletics coach* *"Now sports school has become little strict about maintaining hygiene and it has improved much, especially hygiene in the food serving area. A common bad hygiene practice among junior athletes is wearing wet clothes like socks. Also not drying the clothes properly under sun resulting in fungus formation due to dampness." -50-year-old, Athletics coach*
Influence of psychological factors on food intake and performance	-	*"Athletes are made to face extreme emotional changes and this usually do not affect their food intake or performance." -28-year-old, Gymnastics coach*	*"A sudden change in routine diet menu or emotional disturbances due to friends teasing, pre-match anxiety or losing a game, cause discomfort and stress to the athletes."-50-year-old, Athletics coach* *"Sometimes, if the best food is available also, if an athlete is sad or hurt, he tends to skip the meal or eat little." -50-year-old, Archery coach*
Sources of nutrition information	-	-	*"My main learning about nutrition is from my interaction with other coaches, and by observing the diet plans provided in national camps."-47-year-old, Weightlifting coach* *"The physical education course I studied had a subject on nutrition and I even used to go through various nutrition books during my college days." -50-year-old, Athletics coach*

eating or avoiding foods based on personal beliefs/experiences and psychology. The final moderator guide included questions to gauge the perception of coaches towards food, appetite and nutrition of adolescent athletes. The guide was used to qualitatively determine the understanding and attitude of junior athletes towards nutrition and the practices of adolescent athletes as perceived by coaches (Presented in Table 1).

2.4. Conducting IDI

The IDI were conducted at a mutually convenient place during October and November 2016. The coaches were briefed about the purpose of this study. The interviewee team consisted of an appropriately trained moderator and two note takers to conduct standardized IDI. The moderator sat opposite to the coach and the two note takers towards the side. The interviews were carried out mainly in the local languages i.e. Telugu or Hindi, with moderate use of English. The interview lasted 30–40 min and it was audio recorded with the consent of the coaches. To avoid spill-over effect, coaches were specifically requested not to reveal any details of the IDI with others.

2.5. Data analyses

After each interview, the moderator and note takers consolidated the information and listened to the audio records to fill the missing links, thus the entire interview was transcribed word to word from the native language to English, without missing any points. The translated transcript was re-assessed by another native personal for any differences across translations and making relevant corrections. For analysing the transcript, coding was done based on the grounded theory approach, using the open and axial codes [22, 23]. The open codes were determined by consolidating the entire transcript into highlights or bullet points of each interview with individual coaches. These codes were utilised to arrive at the ten thematic areas. Using these open codes, the researcher re-read the transcript and arranged each point under a theme, forming the axial codes. Quotes were flagged if it either represented a collective view of coaches or a contrasting opinion of an individual coach. Quotes were grouped under the categories of Understanding, Attitude and Practice. This categorising was done manually based on whether the axial codes represented the knowledge or understanding towards a probe, or thinking/attitude or whether the response of coaches were related to the practices of adolescent athletes (depicted in Table 2).

Opinions and views were constantly exchanged among all the authors at every stage of analysis and coding. The In-depth interview reports were also independently read and there were discussions among all the authors to arrive at a common consensus of each point.

3. Results

Nine themes identified from the analysis of transcripts and relevant quotes exhibiting viewpoints of coaches are presented in Table 2.

3.1. Background of nutritional status and food intake of children joining the sports school

Although the sports school followed a formal selection process through competitive tests, it was reported that most children who appear for these tests were from low socio-economic background. Most of them were also undernourished and came from disturbed homes, which the coaches felt made them vulnerable to nutritional insults linked to emotional burden.

3.2. Nutrition for performance and specific nutritional requirements

Most coaches believed that food and 'proper' diet had a direct bearing on performance, and they felt diet must be provided based on "training intensity" or "energy expended". However, on probing, they were unable to elaborate on the calories required nor the amount of calories to be provided through diet.

Coaches considered non-vegetarian foods as the most ideal for athletes and majority suggested fish curry, alongside beef and mutton. Most of the coaches felt that these foods contain protein, which they considered as the most essential nutrient for athletes and carbohydrates was only secondary. Fat was perceived to be unhealthy and hence not considered an essential nutrient. Although they considered consuming fruit/vegetables as important sources of nutrients, they were not aware that these were sources of micronutrients. However, one of them felt there were deficiencies of micronutrients like iron and calcium among the athletes.

3.3. Food choices and appetite for foods among adolescent athletes

On probing about the food choices of adolescent athletes, most coaches felt that athletes tend to dislike food provided in the sports school. From the foods served in the school, they consumed more rice with less vegetables. They, like any other adolescents, had more appetite for 'junk food'. On probing about what do they mean by 'junk food', most coaches referred to Chinese fast foods, ice-creams, cakes and some traditional Indian fried snacks like Mirchi Bhaji (Green chili dipped in chickpea flour batter and deep fried) as 'junk food'. Most coaches considered these to be unhealthy, however, one coach felt that athletes can consume these foods too, because he is physically fit (Table 2).

3.4. Meal timing and food intake: pre, during and post training

Majority of the coaches felt that it was important to consume small frequent meals, about five-six meals a day. However, they raised concerns that it was not regularly practiced, only in national camps they followed meal timing. Listed below are some of the perceptions of coaches about pre, during and post-training foods.

Before training: According to coaches, athletes should drink lime juice or any fruit juice and eat dry fruits or groundnut or bengal gram, otherwise at least milk or tea and biscuits should be consumed.

During training: Few coaches emphasized electrolyte consumption after short burst activities and glucose for long endurance activities and also provide banana or dark chocolate for instant energy and improved concentration.

Immediately after training: Most coaches suggested lime juice, soup or a protein drink and after 30 min move onto a heavy meal.

3.5. Personal experiences or beliefs related to eating or avoiding foods to boost performance

There were different beliefs among the coaches, one believed "pig's blood or pork improved performance", while another believed "eating a lot of ghee (clarified butter) can improve performance", yet another talked about drinking coffee before competitions to improve performance (Table 2). Many coaches perceived an association between consumption of beef or red meat with performance. Coaches believed that seafood improved training ability and reaction time of athletes. However, they could not substantiate when probed about the scientific rationale behind these beliefs.

3.6. Relationship between hydration and performance

Majority of the coaches recommended intake of water at regular intervals, irrespective of thirst, however, the time gap denoting regular intervals differed across coaches, from 20 to 40 min. Even for water requirements, coaches provided varied responses from drinking 1–1.5 L of water per 20kg body mass to 1 L early morning amounting up to 4–5 L a day. Coaches stated glucose, electrolytes, lime or sweet lime juice as preferred drinks for hydration. Coaches found it difficult to gauge

information on girls as they rarely opened with their male coaches. The coaches presumed that girls consume less water than boys, in order to avoid visiting restrooms while training.

3.7. Supplement usage: essential vs. optional

Coaches believed that supplements were essential for athletes. On probing about the different types of supplements they have heard of or prescribed, most coaches could only state the brand names, but had very little understanding of the nutrients these supplements provide. When probed about specific nutrients, none of them listed, except one (Table 2). Weightlifting coaches considered, whey protein and creatine, along with a liver detoxifying supplement, to avoid components that they perceived "was accumulating in liver during heavy training". Another coach vouched for herbal decoctions based on Ashwagandha (Withania somnifera) and Chyawanprash (Herbal Ayurvedic preparation) as useful for cardiovascular activity and muscle building.

3.8. Hygiene practices among athletes

Coaches believed that apart from personal hygiene, the room, food service and training area cleanliness are also important aspects. Most coaches felt that cleanliness of the rooms were maintained, however, few coaches talked about the lack of ventilation in rooms. Most of the coaches raised concern over lack of hygiene in food preparation and distribution. A majority of the coaches claimed that they also advised athletes on personal hygiene and cleanliness of training area (Table 2). Coaches reported that skin allergies were common among athletes, the reported reasons were lack of automated washing and drying facility, which meant that the athletes had to wash their own sportswear. Some of them ended up wearing damp clothes and also interchanged their sportswear with peers.

3.9. Influence of psychological factors on food intake and performance

Most of the coaches felt that at the adolescent stage, there is a greater psychological stress due to changes in personality traits, body image/perceptions, peer acceptance, being away-from-home and being-to-oneself. Most of them fail to develop suitable coping mechanisms. Coaches stated that this stress impacted athlete's food consumption pattern and they often resort to skipping meals.

3.10. Sources of nutrition information

Coaches have undergone a diploma course from the NIS and have some information on nutrition. However, there were no regular refresher courses on nutrition to enhance their skills. While, some coaches relied on their personal experiences or their own practices related to eating or avoiding foods for providing dietary guidance to adolescent athletes. Others learned from their interaction with fellow coaches or athletes. Few coaches also attempted to follow the guidelines provided in their course at NIS and tried to recommend the menu provided in National Camps. Based on the above, they have framed a perception about what athletes should eat and avoid, they impart the same to athletes. Apart from this, most of the coaches stated that they did not consider any other media (print and digital media) for advice, fearing the authenticity of information.

4. Discussion

Considering that adolescent athletes look up to their coaches for nutrition advice in India and that no studies have attempted to understand the perceptions of Indian coaches on nutrition, this formative study provides the preliminary information for a nutrition intervention at the national level. Athletes, in our study, were in a residential sports training centre with coaches being the foremost guide for nutrition. Thus, efforts were made to understand the perspective of coaches towards nutrition and, thereby, explore the modifiable nutrition practices of adolescent athletes.

Coaches in this study did believe that nutrition was essential for performance and could theoretically define energy requirements as assessed by energy expenditure pattern or training intensity. Some also commented on the importance of a balanced diet. However, they were unable to practically suggest athletes on the total calories to be consumed based on body weight or training intensity. Nevertheless, based on their personal experiences, they advised athletes on food intake and provided suggestions for dietary intake. This was in line with a study conducted in the UK [24], where, more than 50% of the coaches provided nutrition advice to athletes, even though they were not competent to do so. Considering that athletes place importance on the coaches' opinion [25], there is an immediate need to provide training to coaches with an access to credible recommendations and suggestions.

The most popular nutrition advice of coaches in Canada was on hydration and consumption of protein rich foods [26]. Even in our study, many of the coaches vouched for protein rich foods and identified animal foods as high protein and "ideal foods" for adolescent athletes. They even searched for restaurants serving such foods during outdoor competitions (Table 2). They believed that protein was the most important nutrient for athletes, followed by carbohydrates and majority of them lacked understanding regarding fats and micronutrients, in line with the work conducted by Long et al. on male collegiate football players [27]. Major dietary problems of college athletes as reported by their coaches were consumption of "junk foods", poor eating habits, and lack of balanced diets [16]. Though coaches in our study had opposing views of 'junk foods' (Table 2), they all said adolescent athletes had an appetite for such foods. Thus, the over-valuing of certain nutrients or foods above others by the coaches may influence the transmission of nutrition information and the practices of athletes.

Although many of the coaches suggested meal timings to be more important with consumption of small but frequent meals and consumption of pre, during and post training meals, they reported that most athletes did not practice it. Major reasons for this was non-availability and affordability since most athletes are from low socio-economic background. In line with this, few studies have found a strong relation between socioeconomic status and eating awareness [28] and the diet quality [29]. This suggests a need for recommending appropriate food based on nutrition guidelines for pre, during and post training. Also, increasing the availability of such foods to adolescent athletes.

Coaches had varied views, with no uniformity in beliefs related to foods that boost performance. They overvalued specific foods, which ranged from pork or beef or fish to ghee (clarified butter) or dark chocolate or even coffee, consistent with a similar study in Brazil [30], where they were found to over-value food myths, apart from protein foods and lower fat diets. Such approaches will have a psychological impact on athlete to consume these foods during competitions. This suggests an immediate need to educate the coaches and adolescents athletes regarding the nutritional facts associated with foods. Thus, enabling them to reflect on nutrients associated with food as required for performance, rather than over-valuing specific foods.

Young athletes tend to have poor knowledge on hydration practices and studies [8, 31] have reported that majority of them never followed timing for fluid intake. All coaches in our study accorded importance to consuming fluids before, during and post-training; however, how much of this understanding percolated to athletes could not be ascertained. This is very important for athletes. During training, most coaches advised consuming water in small quantities at regular intervals, but they explained regular intervals to be every 30–40 min. Judge et al. [31] also identified misunderstandings related to intervals of hydration habits among adolescent athletes. In our study, a majority of the coaches felt that athletes were consuming sufficient water; however, they were not provided electrolyte, glucose or lime juice during training. Most coaches recommended glucose drink for endurance athletes and electrolytes for

athletes involved in short burst activities. However, these coaches admitted not knowing the proportion of constituents in oral rehydration drinks and sports drinks, this was in line with a study [8] on Iranian athletes, where they could not identify the amount of carbohydrate in a sports drink. It is, therefore, important to impart information on regular hydration assessments and the type and timing of fluid intake to create a basic awareness among the coaches and adolescent athletes.

Coaches have the greatest influence on athletes for supplement usage [32]. In our study, most coaches considered supplements to be important, albeit lacked understanding on the types of supplements and argued that athletes didn't consume any. They cautioned them about doping and its consequences. A study also reported that their respondents were concerned about the safety of supplements, although a considerable number of them considered it to be essential for success in international arena [33]. Most young athletes in a Canadian study [34] were reported to be consuming vitamin and mineral supplements only. Only a few of the coaches in our study thought that iron, calcium and multivitamin supplements are more important for adolescent athletes. A study [35] carried out in Sri Lanka, revealed that there was a widespread intake of supplements among national-level athletes for improving their overall health.

Hygiene related outbreaks were common among athletes, posing a threat to their nutritional status, health, and performance. Though the coaches in our study, stated food handling and distribution as causes for stomach upsets among athletes, they were few (Table 2). They reported skin infections due to interchange of training clothes. This was in line with most literature [36, 37, 38]. Zinder et al. [39] have emphasized that the training area hygiene, apart from the personal hygiene, played an important role in the prevention of skin diseases and provided specific guidelines for it [39]. Most coaches in our study too reflected on personal and the training area hygiene as key areas for counselling.

Adolescence is an age which triggers extreme emotional episodes resulting from the physical and psychosocial changes they undergo [40]. Coaches worry that extreme emotional episodes and stress due to environment and self-perception issues among athletes would impact their eating habits. Such observations have been reported as a major cause for eating disorders among female athletes, male or female athletes with negative affectivity and male athletes participating in endurance, technical and power sport [41].

This study is limited in terms of the geographical location, however, in the Indian context a multidisciplinary facility is yet to be provided in other state-owned sports centres and the nutrition problems explored in this study are hypothesised to be prevalent across the country. Thus, the methodology explored in this study may be replicated, though the results cannot be generalised. Further, only male coaches were available at the sports school which could have biased their view about female athletes. However, it is also a reality in India that very few of the coaches are females. In conclusion, this study certainly makes a small but important contribution, in understanding the coaches' perception on food, appetite and nutrition of adolescent athletes in India. Coaches considered nutrition as important with personal experiences and information from peers being key to their nutrition advices. Their understanding of fuelling needs differed, with the majority of them emphasising on protein, while considering fat to be "unhealthy" and not an important nutrient. Adolescent athletes were reported to have an appetite for junk foods and they preferred rice, while avoiding fruits and vegetables. Coaches provided no specific advice on nutrient intake, particularly the pre, during and post event/training requirements. Fluid recommendations were not provided based on regular assessment of hydration status and they lacked understanding on supplements and their usage. Considering the above modifiable qualitative outcomes, including fads and personal beliefs related to food, an immediate focus of future research should be to develop a context-specific nutrition education and monitoring tool for coaches and adolescent athletes. Further, exploratory qualitative approach and quantitative questionnaires may be developed based on the theme guide and methodology presented in this study for triangulation of the findings.

Nutritionists, researchers and other stakeholders need to focus on a multi-level approach to nutrition education. Considering the lack of resources and logistics in many sports centres, coaches are forced to dawn on multiple roles to cater to the athlete's needs. Thus, until suitable support staff is available, it is important to equip coaches by providing regular refresher or crash courses on sports nutrition as a short-term goal. On the other hand, the implications of this study need to be incorporated while framing policy with a long-term goal to involve the Sports Authority of India and other academies to include trained support staff, and improvise infrastructure.

Declarations

Author contribution statement

Keren Susan Cherian: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Subbarao M Gavaravarapu: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data.

Ashok Sainoji: Performed the experiments; Contributed reagents, materials, analysis tools or data.

Venkata Ramana Yagnambhatt: Conceived and designed the experiments; Performed the experiments.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

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