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Knowledge, attitude and practices with respect to sports nutrition of elite cricketers from India and impact evaluation of nutrition education module

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Abstract
The objective of the study was to explore the existing knowledge, attitude and practices of Elite cricketers from Vadodara, India toward sports nutrition. Based on inclusion criteria, all elite cricketers from urban Vadodara were enrolled after consent. Semi-structured questionnaire was used to collect data on their knowledge, attitude and practices regarding sports nutrition. The study consisted of 81 Participants; 54 males, 27 females. Nutrition education booklet was developed and distributed to the participants followed by daily reinforcement of the key messages for 21 days. Impact evaluation was conducted after 2 months. Knowledge (Pre and post intervention scores), attitude and practices of participants regarding sports nutrition were assessed. According to the findings, over 89.3% of the respondents indicated that nutrition support is critical in their sport and over 86.7% believed that a nutritionist should be a member of their professionals' team. Only about 21% of them consumed solid foods within the recommended period of 30 minutes post-match. Sports drinks were consumed by 96% of the participants, protein by 44% and BCAA by 3%. In all the squads the post-intervention knowledge scores improved compared to pre-intervention (p<0.001), thus emphasizing the need of nutrition education.

Keywords: Sports nutrition, knowledge, attitude, practices, elite cricketers, nutrition education, supplement use

1. Introduction
Cricket is the second most popular international sport and the most popular in India with millions of dollars being spent and earned on competitive events [1, 2, 3]. Along with recreational cricket being enjoyed by the mass, elite/professional cricket has also been quite big in India with several State teams and Ranji squads in addition to the National team. Cricket is an intermittent sport which is dominantly endurance based, and also requires speed, flexibility, agility, strength, coordination and occasional bouts of power demands [4].
Athletes across various sports worldwide use nutritional supplements for many benefits including promoting adaptation to training, accelerating recovery, enhancing competitive performance and being a convenient source of nutrients [5, 6]. The American College of Sports Medicine has cautioned that athletes should be counseled regarding the appropriate use of supplements and should consider taking them after careful evaluation [7] and sports nutritionists can help do that [8]. Nutrition education programs improve nutrition knowledge which eventually leads to better diet quality [9]. The importance of hydration in sports is also well-established [10]. Sobana and Many reported significant improvement in hydration knowledge, as well as the hydration status in 120 college athletes, post imparting hydration education [11]. Systematic review of 36 studies on Nutrition knowledge of Coaches and athletes highlighted that areas like energy density, the need of supplementation and role of protein are the ones which require education as the proper knowledge around these is lacking [12]. Thus, it is important to discover the existing knowledge, practices and attitude of athletes toward sports nutrition. There is a dearth of data on the basic sports-specific nutrition knowledge, attitude and practices of Elite cricketers from India. Therefore, the study aimed to assess the nutrition knowledge, attitude and practices of Elite cricketers from India, as well as to construct a nutrition education module for intervention and examine the post-intervention improvement.

2. Materials and Methods

2.1 Sampling technique

All the sports associations located in Vadodara, Gujarat, India involved with cricket were visited. Elite cricketers from these associations were identified. The operational definition of elite male cricketers is those who train for a minimum of 5 hours for at least five days a week. The operational definition of elite female cricketers is those who train for a minimum of 4 hours for at least five days a week. The following inclusion criteria were used to enroll the participants in the study; elite male cricketers 19 to 30 years of age, elite female cricketers 14 to 30 years of age and those willing to participate. Elite cricketers who were not residing in Vadodara were excluded. Purposive sampling of the participants was carried out based on the above-mentioned criteria. In all, 81 participants (males-54, females-27) belonging to 4 squads, namely; Ranji boys (n=26), Under-23 (U-23) boys (n=28), Senior women (n=12) and Under-19 (U-19) women (n=15) fulfilled these criteria. The Ranji boys were in the age range of 23-29 years, Under-23 boys- 19-22 years, Senior women- 19-27 years and Under-19 women- 14-18 years. All of them play through the Baroda Cricket Association. The age, level of education, cricketing experience and place of residence were obtained using a semi structured questionnaire using interview method by the Researcher (doctoral student). After receiving well-informed, written consent, the participants were enrolled in the study. The study has received clearance from Institutional Medical Ethics Committee of the Maharaja Sayajirao University of Baroda, Vadodara with approval number IECHR/2015/18.

2.2 Questionnaire on Knowledge, attitude and practices of participants with respect to sports nutrition

A semi-structured Knowledge, attitude, and practices questionnaire was devised, pretested, and administered using interview method to assess the knowledge and attitude of the participants regarding sports nutrition and the practices they follow. The questionnaire was administered at the academy to all the cricketers (n=81) enrolled there. The questionnaire was piloted on 30 male Under-16 cricketers from the same zone, but it was not validated. This questionnaire consisted of some very basic questions regarding nutrition and sports nutrition specifically from the angle of cricket. Some of the broad components under the KAP survey were: A. Functions of various nutrients in the body and sources of the same B. Consumption pattern of foods and fluids, before, during and after competitive events/matches C. Foods avoided in general by the participants and especially during the events and reasons for the same D. Knowledge regarding supplements and use of the same in terms of type, frequency and quantity and E. Basic information pertaining to Carbohydrate loading, ergogenic aid. The questionnaire consisted of close-ended multiple choices questions or questions with only yes or no responses. For each correct response, a score of one was assigned and the wrong answer was scored as zero. Only the responses related to the knowledge-based questionnaire were scored. The interviews were conducted by a trained doctoral student.

The criteria for correct practice for consumption of solid foods before a match or workout is 30 minutes to 1 hour before the event. The correct practice for consumption of fluids before a match is within 30 minutes before the event. The correct practice for consumption of solid foods and fluids after a match is withing 30 minutes post event [7, 13].

2.3 Development of Nutrition Education Module, Intervention and Impact Evaluation

Based on the gaps in knowledge identified from administering this questionnaire, a module in the form of a booklet was developed. This module was designed to deliver the content in a very easy-to-understand way. Some key concepts incorporated in the booklet were; A. Nutrients of significance to athletes B. Nutrition before, during and after the event C. Recovery Nutrition D. Hydration and E. Electrolyte requirements. The booklet was distributed to the participants and it was followed by daily reinforcement of the key messages for 21 days sent to their WhatsApp group through the coaches. The impact evaluation was carried out after a wash-out period of two months (n=55, males=28, females=27). The same questionnaire was used at the baseline and for collecting post nutrition education responses. Based on the knowledge scores, the participants were classified into the following categories- poor (<40%), fair (41-50%), average (51-60%), good (61-70%), very good (71-80%) and excellent (81-100%).

2.4 Statistical Analysis

The data were entered in a Microsoft® Excel® 2019 MSO (Version 2305 Build 16.0.16501.20074). Standard deviation and percentages, were also computed using Excel. Wilk-Shapiro test was performed to assess the normality of data. As the data were normally distributed, ANOVA (One-way analysis of variance) test was run to determine whether there was statistically significant difference in the means of the four groups. The significance level of 95% corresponding to p-value of < 0.05 was set for all analysis. Tukey's post hoc test was applied to identify as to which squads had significantly different means. The Wilk-Shapiro test, ANOVA and Tukey's post hoc test were computed using SPSS software- version 26.

3. Results

The U-19 women's squad (n=15) displayed the highest mean percent nutrition knowledge score (55.4±15.2), followed by Ranji boys (52.5 ±10.4, n=26), Senior women (51.1 ±8.7, n=12) and U-23 boys (45.2±10.5, n=28). It is important to note that though the Ranji boys are the most elite of these 4 squads based on their competitive level, they did not display the best knowledge scores. Table 1 depicts the categorization of participants based on their baseline percent nutrition knowledge scores.

Table 1: Categorisation of participants from Ranji boys, U-23 boys, Senior women and U-19 women based on baseline percent nutrition knowledge scores (%).

Score category	Ranji boys (%) (n=26)	U-23 boys (%) n=28)	Senior women (%) (n=12)	U-19 women (%) (n=15)	Total (%) (n=81)
Poor	11.5	42.8	8.3	13.3	19.0
Fair	38.5	39.3	41.7	33.3	38.2
Average	23.1	3.6	33.3	26.7	21.7
Good	23.1	14.3	16.7	0	13.5
Very good	3.8	0	0	20	5.9
Excellent	0	0	0	6.7	1.7

U-23 boys stand for Under-23 boys; U-19 women for Under-19 women

The mean percent knowledge scores of participants from the Ranji boys', Senior women and U-19 women squads were in the average (51-60% score) category and those of U-23 boys fell in the fair (41-50% score) category. The players in the Excellent (81-100% score) category were found only in U-19 Women Squad. The highest percentage of participants in the poor (<40% score) category was from the U-23 boys' squad. The U-19 women's squad obtained a significantly higher (p=0.028) mean percent knowledge score (55.4±15.2%) than the U-23 boys' squad (45.2±10.5%). In the present study, the mean nutrition knowledge score of women (32.1±7.6) was marginally higher than boys (29.2±6.6); but not statistically significant (p=0.08).

The participants obtained the poorest mean knowledge scores at the baseline for components like Basic understanding of ergogenic aids (0), knowledge of nutrients that aid in iron (0.5) and calcium absorption (0.9), the most important source of energy during exercise (0.9) and sources of iron (1.6). The components in which the participants fared well were nutrients important for cricketers (3.3), sources of protein (3.1) and role of protein (2.8).

No correlation was observed between the baseline nutrition knowledge scores of male cricketers (n=54) with age (p=0.128) or cricketing experience (p=0.627). The correlation was also not observed between the knowledge scores of females (n=27) with age (p=0.815) or cricketing experience (p=0.612). The difference was studied between the knowledge scores of participants with primary (n=4), secondary (n=13), higher secondary (n=23), graduate (n=35) and post-graduate (n=6) level education. However, no correlation was observed (p=0.58). The scores of participants with only primary level education were least (25.25± 3.10) while for others the scores ranged from 29.52 ± 8.87 to 32.17 ±4.35. Since the sample size was inadequate in the individual education category further statistical analysis was not done.

The perception of participants regarding the importance of nutrition in sports and the merits of having a sports nutritionist in the support staff squad was explored (Table 2).

Table 2: Perception of cricketers regarding the importance of nutrition and sports nutritionist

Practices	Ranji boys (%) (n=26)	Under-23 boys (%) (n=28)	Senior women (%) (n=12)	Under-19 Women (%) (n=15)	Total (%) (n=81)
Do you think nutrition support is important in sports?					
Yes	96.2	89.3	100	100	96.4
No	3.8	10.7	0	0	3.6
If yes, due to what reasons?					
It helps improve performance	72.0	60.0	83.3	86.7	75.5
It helps in better recovery post-training	88.0	76.0	75.0	93.3	83.1
It improves strength and stamina	96.0	84.0	91.7	93.3	91.2
It improves immunity	56.0	32.0	66.7	86.7	60.3
If no, then due to what reasons?					
It does not have any benefits	100	0	NA	NA	NA
A good diet is very expensive	100	66.7	NA	NA	NA
Only coaching and training help to improve performance	100	66.7	NA	NA	NA
Do you feel there is a requirement for a sports nutritionist as a part of the sports professionals' team?					
Yes	92.3	92.9	100	86.7	93.0
No	7.7	7.1	0	13.3	7.0
If yes, due to what reasons?					
To design personalized diet plans	87.5	80.8	83.3	100.0	87.9
Regularly monitor the diet plans	83.3	73.1	83.3	84.6	81.1
Conduct workshops on Sports Nutrition	33.3	38.5	66.7	53.8	48.1
Dietary Counselling for special conditions (e.g., anaemia, injury)	54.2	42.3	75.0	69.2	60.2
If not, due to what reasons?					
Support staff gives us adequate nutrition guidelines	100	100	0	100	75
We access knowledge about nutrition through media	50	50	0	0	25
A sports nutritionist may not make a significant difference in our performance	50	0	0	0	12.5

NA- not applicable; the sum of the options of various questions can be more than 100% as the participants could choose multiple responses

Eighty-nine to a hundred percent of respondents indicated that nutrition support is critical in their sport (Table 2). The primary argument given was that it increases strength and stamina. For individuals who stated that nutrition support is not necessary, the most frequently given reasons were that a healthy diet is too expensive and that only coaching and exercise help enhance performance. Eighty-seven to a hundred percent believed that a nutritionist should be a member of the sports professionals' team. A sports nutritionist's most well-recognised job was that of a person who could construct customised diet plans to help athletes improve their performance. Some respondents claimed that eating a healthy diet is unreasonably expensive; this highlights the need of having a sports nutritionist who can debunk such myths.

Table 3, depicts the practices of the participants in terms of consumption of food and fluids before and after a match.

Table 3: Practices of the cricketers in terms of consumption of food and fluids before and after a match

Practices	Correct (%)	Incorrect (%)
When do you consume solid foods before a match?		
Ranji boys (n=26)	65.4	34.6
Under-23 boys (n=28)	60.7	34.3
Senior women (n=12)	75	25
Under-19 women (n=15)	60.0	40
Total (n=81)	65.5	33.5
When do you consume fluids before a match?		
Ranji boys (n=26)	100	0
Under-23 boys (n=28)	100	0
Senior women (n=12)	100	0
Under-19 women (n=15)	86.7	13.3
Total (n=81)	96.7	3.3
When do you consume solid foods after a match?		
Ranji boys (n=26)	50.0	50
Under-23 boys (n=28)	21.4	78.6
Senior women (n=12)	33.3	66.7
Under-19 women (n=15)	33.3	66.7
Total (n=81)	34.5	65.5
When do you consume fluids after a match?		
Ranji boys (n=26)	100	0
Under-23 boys (n=28)	100	0
Senior women (n=12)	100	0
Under-19 women (n=15)	100	0
Total (n=81)	100	0

Over 60% of the participants ate solid food (easily digestible and in small quantities) 30 minutes to 1 hour before a match, which is the proper procedure (Table 3). Over 86.7% of the participants said they drank water 30 minutes before a match, which is a correct practice. All the respondents stated that they consumed fluids within 30 minutes of the match, which is another acceptable practice. The window of recovery is thirty minutes after a match or other strenuous physical activity, and it is vital to ingest solid foods including carbohydrates and proteins during this time [14]. Most of the participants (over 46.2%) failed to do that and consumed solid items within 30 minutes to an hour following the contest.

Supplement use is very common in sports and varies from sport to sport. The data on supplement usage in the participants are presented in Table 4.

Table 4: Percent consumption of supplements and types of supplements consumed by participants from Ranji boys, U-23 boys, Senior women and U-19 women squads (%)

Variables	Ranji boys (%) (n=29)	Under-23 boys (%) (n=38)	Senior women (%) (n=14)	Under-19 women (%) (n=15)	Total (n=96)	p-value
Supplement consumption	100	100	100	100	100	-
Sports drinks	89.7	97.4	100	100	95.8	0.235
Protein	72.4	52.6	0	6.7	43.8	0.000*
BCAA	6.9	2.6	0	0	3.1	0.507

BCAA- Branched chain amino acid, Analysis of Variance (ANOVA) test was applied

As is depicted in Table 4, all the participants (100%) across all the four squads were consuming some kind of dietary supplement. Sports drinks were the most widely used segment of supplements followed by protein supplements and branched-chain amino acids (BCAA). In the Under-23 boys, Senior women and Under-19 women all the cricketers consumed sports drinks and the usage of sports drinks was equally high in the Ranji squad with 88.5% of the individuals doing so. Sports drinks were consumed during matches and also during off-season training to compensate for the water and electrolyte loss and to gain energy. Protein and BCAA supplements were majorly consumed during the offseason as during the match season, they are avoided due to the chances of positive dope tests because of possible contamination with banned substances. ANOVA test revealed significant difference ($p<0.001$) in the mean protein supplement consumption of the four groups. Protein supplement usage was found to be significantly greater in Ranji boys compared to Senior women ($p<0.001$) and Under-19 women ($p<0.001$) based on the Tukey's post hoc test. Protein supplement usage was also seen to be significantly greater in the Under-23 boys compared to Senior women ($p<0.05$) and Under-19 women ($p<0.05$). Branched-chain amino acid supplement consumption was seen only in the Ranji boys' squad (6.9%) and the U-23 boys' squad (2.6%).

The knowledge, attitudes and practices of the participants concerning supplement use were studied and are presented in Table 5.

Table 5: Knowledge, Attitude and Practices of the participants from Ranji boys, U-23 boys, Senior women and U-19 women squads with regards to supplement use (%)

Variables	Ranji boys (%) (n=26)	Under-23 boys (%) (n=28)	Senior women (%) (n=12)	Under-19 Women (%) (n=15)	Total (%) (n=81)
Do you think supplements are useful to you as a cricketer?					
Yes	100	100	83.3	93.3	94.2
No	0	0	16.7	6.7	5.8
If yes, then due to what reasons?					
To improve performance	57.7	42.9	58.3	40.0	49.7
To build strength	76.9	64.3	58.3	73.3	68.2
To improve fitness	53.8	50.0	25	26.7	38.9
To improve cardiorespiratory endurance	42.3	50.0	41.7	46.7	45.2
If no, then due to what reasons?					
They are officially banned	NA	NA	0	0	NA
Do not have any benefit	NA	NA	0	100	NA
Have a negative impact on health	NA	NA	0	0	NA
Have more side effects compared to benefits	NA	NA	100	0	NA
In how many instances do you choose the supplements yourself?					
Never	7.7	14.3	75	86.7	45.9
Occasionally	61.5	39.3	25	6.7	33.1
Majority of the times	7.7	0	0	0.0	1.9
Rarely	23.1	46.4	0	6.7	19.0
What is the source from where you procure supplements?					
Sports association	100	100	100	100	100
Sport supplement stores	0	0	0	0	0
Online	0	0	0	0	0
Others	84.6	89.3	16.7	6.7	49.3
If you have to take supplements, whose advice would you follow?					
Physiotherapists	46.2	53.6	75	86.7	65.4
Strength and conditioning coaches	76.9	67.9	66.7	60.0	67.9
Coaches	7.7	0	25	6.7	9.8

Note: For certain questions, the sum of the percentages can be greater than 100 as the participants could choose multiple responses

As is presented in Table 5, the majority (83.3%) of the participants across all squads reported that supplements were useful to them in their sport. The most frequently quoted reason for consuming supplements was for building strength which was reported by over 58.3% of the participants. In the Ranji squad, 61.5% reported occasionally choosing supplements themselves instead of advice from a professional. This can be a matter of concern as it can result in incorrect choice, excess or inadequacy of the required nutrient etc. The one common source of procurement of the supplements as reported by all the participants was their Sports association. The supplements received from the Sports association were only Sports drinks and that too only during competitive matches.

The participants procured other supplements like protein supplements or BCAA from their strength and conditioning coaches and at times from the gym trainers. When it came to taking advice regarding supplements majority of the participants consulted strength and conditioning coaches and physiotherapists, whereas none of them consulted a Sports Nutritionist or a Nutritionist.

3.1 Impact Evaluation of Nutrition Education Intervention

The pre and post-intervention knowledge scores among participants across the squads were compared to study the impact of nutrition education intervention. The post-intervention data could not be collected in the Ranji boys' squad due to their long-term professional commitment. In all the squads the post-intervention percent knowledge scores improved over the pre-intervention scores (p<0.001). Under-19 women showed maximum improvement in the post-intervention knowledge scores compared to the baseline (55.4±15.2%to 85.1±21.8% i.e., 53.6%), followed by U-23 boys (45.2±10.5% to 66.7 ±15.3% i.e., 47.6%) and senior women (51.1 ±8.7% to 71.3±17.4% i.e., 39.5%). ANOVA test pointed out that the post-intervention knowledge scores were significantly different (p<0.001) and Tukey's post hoc test revealed that the scores of the U-19 women's squad (85.1±21.8) were significantly higher (p=0.06) than the U-23 boys' (66.7 ±15.3).

Table 6 depicts the shift in the knowledge score categories of the participants pre and post intervention.

Table 6: Pre and post-intervention knowledge scores among cricketers across all the squads

Score category		U-23 boys (n=28)	Senior women (n=12)	U-19 women (n=15)	Total (n=55)
Poor	Pre (%)	42.8	8.3	13.3	21.5
	Post (%)	3.6	0	6.7	3.4
Fair	Pre (%)	39.3	41.7	33.3	38.1
	Post (%)	10.7	8.3	0	6.3
Average	Pre (%)	3.6	33.3	26.7	21.2
	Post (%)	17.9	25	13.3	18.7
Good	Pre (%)	14.3	16.7	0	10.3
	Post (%)	32.1	16.7	6.7	18.5
Very good	Pre (%)	0	0	20	6.7
	Post (%)	21.4	25	0	15.5
Excellent	Pre (%)	0	0	6.7	2.2
	Post (%)	14.3	25	73.3	37.5

The mean post-intervention knowledge scores of U-19 women were in the excellent category, followed by senior women (very good category) and U-23 boys (good category). The number of participants in the excellent category increased from 0% to 14% in the U-23 boys after the intervention, whereas those in the poor category decreased from 43% to 4% (Table 6). The number of players in the excellent group increased from 0 to 25% post-intervention in the senior women, whereas those in the poor category decreased from 8% to none. Similarly, in the Under-19 women, the number of athletes in the excellent group increased from 7% to 73% post-intervention, while those in the poor category decreased from 13% to 7%.

All the components of the knowledge assessment displayed improvement post-intervention. The components in which the participants were poor at the baseline showed improvement; a basic understanding of ergogenic aids showed 110% improvement, a nutrient that helps in Iron absorption-69%, a nutrient that helps in Calcium absorption- 44%, sources of Iron-39%, an important source of energy during exercise-33%.

4. Discussion

The mean baseline percent knowledge scores of the 3 squads in the present study were in the average category while of one squad was in the fair category. Literature reports average nutrition knowledge scores in athletes ranging from 46.0% ± 11.8% to 77.50±16.89%. The mean sports nutrition knowledge scores of the Gaelic footballers (n=100) were reported to be 47.6±12.3% [15]. Renard et al also reported a similar score of 46.0% ± 11.8% in 328 female Gaelic players [16]. Of the 3323 Jordanian athletes, as high as 88.3% of the participants had a score of <50% [17]. Devlin & Belski reported an average nutrition knowledge score of 60.5% in 46 elite male Australian footballers [18]. Whereas Spronk et al reported a similar score of 58% in 101 athletes surveyed [19]. Citarella et al reported much higher overall scores (77.50±16.89%) compared to the earlier cited studies in 10 elite runners [20].

Studies have evaluated the impact of gender on nutrition scores but reported mixed findings. In the present study, no such impact was seen. Elsahoryi et al reported that males scored higher than females (38.17% v/s 35.9%; p-value ≤ 0.001) in the 3323 Jordanian athletes studied [17]. Whereas Werner et al reported that females scored significantly (p<0.001) better (66.5% ±16.4% versus 46.2% ± 14.7%) amongst the 128 NCAA athletes [21]. Spronk et al concur with the findings of Werner et al by reporting that females scored higher (females: 59.9%; males: 55.6%; p =0.017) among the 101 Australian athletes [19].

In the present study, the participants obtained the poorest mean knowledge scores at the baseline for components like basic understanding of ergogenic aids, knowledge of nutrients that aid in iron and calcium absorption, while fared well for components like nutrients important for cricketers and sources of protein. A study on 100 Gaelic footballers revealed that the players scored poorly in categories like micronutrients and supplements while did well in others such as alcohol and weight management [15]. The majority of 328 Gaelic players surveyed scored well on food-based questions and performed best in sections related to alcohol and scored poorly on questions referring to micronutrients [16]. Heikkila et al reported that the participants (n=79) scored highest in the section of fluid balance and hydration (87.2%) and lowest in the category of dietary supplements (71.4%) [22]. In another study, ten elite runners scored well on components like dietary recommendations and nutrient sources but obtained lower scores on healthiest meal option and diet-disease association components [20].

With increase in age an individual has more chances of gaining knowledge due to education. With better cricketing experience a player might have had more exposure to knowledge regarding sports in general and nutrition specifically through the coaches, strength and conditioning coaches and physiotherapists. However, in the present study corelation was not observed between baseline nutrition knowledge scores of cricketers with age or cricketing experience Mixed findings have been reported by previous studies in this area. Elsahoryi et al. reported the mean knowledge score to be significantly higher amongst participants aged 26 to 35 years and ones who had played sports for four years or more in a study on 3323 Jordanian athletes [17]. Bakhtiar et al concurred with this by reporting a positive association between age (p=0.007) and duration of sports training (p=0.004) with knowledge scores in 260 athletes from Bangladesh [23]. Whereas, a study on 100 Gaelic footballers highlighted that the mean knowledge scores did not differ significantly between different age groups [15]. (Brien et al, 2021). Renard et al (328 Gaelic athletes), Spronk et al (101 Australian athletes) and Devlin & Belski (46 elite Australian footballers) also did not find a significant correlation between knowledge scores and neither age nor years of playing the sport [16, 19, 18].

Data were analysed to examine if educational attainment affects the nutrition knowledge scores. However, in the present study corelation was not observed between education level and nutrition knowledge scores. In a study on 3323 Jordanian athletes, a significant increase in nutrition knowledge was noted with an increase in educational levels; high school or less (34.37±13.73), diploma or bachelors (36.68±15.20), postgraduate (40.73±16.25) [17]. Whereas Bakhtiar et al, 2021 (260 athletes from Bangladesh), Brien et al, 2021 (100 elite Gaelic footballers) and Spronk et al, 2015 (101 athletes from Australia) did not show an association between nutritional knowledge scores and education level [23, 15, 19]. Thus, studies investigating the association between the education levels of athletes and their knowledge scores have demonstrated mixed findings.

In the present study more than 87% of the respondents felt the requirement of a nutritionist as a part of their sports professionals' team (Table 2). A study by Hull et al has examined the impact of having a sports dietitian v/s strength and conditioning coach on the nutrition practices of baseball players (n=74, 20.7 ± 1.4 years). The sports dietitian group (n=32) did not consume fast food (31% vs. 14%, p = 0.02), caffeinated beverages (57% vs. 46%, p = 0.02), or soda (56% vs. 37%, p = 0.10), prepared their own meals more often (86% vs. 73%, p = 0.07), ate breakfast before training (67% vs. 37%, p = 0.02) and took daily multi-vitamins (56% vs. 32%, p = 0.02); whereas the strength and conditioning coach group (n=42) ate more at burger locations (21% vs. 6%, p = 0.02). The study, therefore, concluded that the presence of sports dietitian is a valuable asset to the athletic program [24].

Pre, during and post-match or workout diet is very crucial for an athlete for sustained energy and hydration which can help achieve optimal athletic performance. The findings of the present study indicate a lack of awareness among the participants mainly regarding the timing of solid food intake post-match or training (table 3). Making this tiny adjustment can significantly aid in the recovery process, which is a vital

element of every athlete's regimen. Klein et al concur with the findings of the present study where the majority (49.7% males, 59.4% females) of the 331 NCAA players consumed meals within one-to-two hours post-workouts instead of within 30-minutes [25]. A study on 31 South African soccer players revealed that none of them consumed food within the window of recovery [26].

The most common foods that the participants avoided in general throughout the year were fried foods, excessive oily food, fast food and soft drinks and the reason stated behind it was to avoid putting on body fat. The most common foods that the participants avoided specifically 2-3 days before a match were outside food and the reason stated was to avoid any infection, and spicy foods to avoid gastrointestinal discomfort. There have been no studies that specifically look at the food preferences and food patterns of athletes. Nonetheless, a study on 331 athletes from the NCAA found that intake of cakes, sweets, and pastries was as low as 3.4% for males and 2.8% for girls. However, chips, pretzels, and crackers were consumed by 28.9 and 35.4% of males and females, respectively [25].

All the participants in the present study were consuming some kind of dietary supplement. A study on 302 Canadian university athletes (30.5% male, 69.5% female; 20.5±1.8 years) revealed that 58.3% of the athletes reported having used at least one supplement in the past six months [27]. Muwonge et al reported lower supplement use i.e. in 13.4% of the 359 athletes from individual and team sports [28]. Another study on 182 athletes of both genders reported that 47% consumed at least one type of supplement and 38% took more than 3 types of supplements concurrently [29]. Of the 244 Portuguese athletes, 64% reported consuming supplements over the previous 12 months [30]. Aljaloud and Ibrahim reported supplement consumption in 93.3% of the 105 footballers in Saudi Arabia [31]. Thus literature depicts the consumption of at least one type of supplement to be very wide ranging from 13.4% to 93.3%.

In the present study sports drinks were the most widely consumed supplements (in >89.7% of the participants). Aljaloud and Ibrahim reported findings similar to the present study where 88.7% of the Saudi Arabian footballers were taking sports drinks [31]. In a study on 302 Canadian athletes, protein (48.7%), vitamins and minerals (48.0%) and carbohydrate (36.1%) supplements were consumed most commonly [27].

In the present study, majority of the respondents took advice regarding supplements from strength and conditioning coaches and physiotherapists, whereas none of them consulted a Nutritionist (Table 5). In a study on 302 Canadian university athletes, the most common sources of information regarding supplements were health care professionals (59.2%), friends/family (53.4%), internet (48.3%), teammates (44.8%) and coaches (39.1%) [27]. In another study on 3363 athletes, 61.8% reported social media, followed by a dietitian (38.1%), coaches (30.6%), friends (25.3%) and scientific sources (24.4%) as their source of supplement related information [17]. Of the 331 Australian athletes, 20%, 19%, and 16% of athletes chose dietitian, internet and nutritionist as their preferred sources of nutrition information, respectively [32]. Bourke et al reported that of the 306 athletes, 65% used social media for nutrition knowledge in the last 12 months [33].

Like in the present study, literature also displays the positive impact of nutrition education on nutrition knowledge of the participants. A study on 32 Brazilian athletes showed improvement ($p<0.05$) in nutrition knowledge in the participants after intervention with 4 nutrition counselling sessions. The knowledge scores were tested for three categories; basic nutrition, the food pyramid and sports nutrition and all three components showed improvement [34]. Seven weeks education programme based on a booklet covering basic sports nutrition displayed significant increments ($p<0.001$) in the experimental group's post-intervention knowledge scores in 105 elite male Malaysian athletes [35]. Heikkila et al, also reported significant improvement in knowledge scores post-intervention with three 90-minute education sessions in 79 Finnish athletes (18.0 ±1.4 years) [21]. Thus literature supports the positive impact of nutrition education on athletes.

5. Conclusion

As the present study identified gaps in the knowledge, attitude and practices of the Elite cricketers regarding sports nutrition, similar exploration should also be conducted in Elite cricketers from other states and also in other sports. The intervention with Nutrition education module demonstrated significant improvement and therefore such modules should be prepared in several other regional languages and evaluated for the impact they create. The study pointed out at the requirement of a Sports Nutritionist for the participants. Sports academies should have sports nutritionists however, in practice this is not seen. Such Researches emphasizing the requirement of a sports nutritionist can bring about this change.

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