

Evaluation of sport nutrition knowledge of coaches in Ethiopian premier league football clubs

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Abstract

Nutrition knowledge is vital for improving sport and exercise performance. Sports nutritional science is not well recognized in Ethiopia. Hence the focus of this study was intended to examine the nutritional knowledge of football coaches in Ethiopian premier league football clubs, specifically emphasizing on the knowledge of macro nutrients, micro nutrients, hydration, recovery, and supplements. A Cross-sectional research design (survey), involved 12 coaches from four clubs (two top finishing and two bottom finishing clubs) were purposively selected. Nutrition knowledge of coaches were assessed using validated questionnaire. ANOVA was used for the group comparisons of Football clubs, coaches' responsibility, as well as age of the coaches and Post-hoc test was used when statistically significant mean differences was observed. Coaches' nationality and knowledge was analyzed using independent sample t-test. The result indicates almost 60% of macro & micro nutrients questions were answered correctly by Ethio coffee FC and no statistically significant difference. In hydration knowledge the total correct percentage score was higher for St Gorge FC 66.67% and no statistically significant difference. All the football clubs' under study has good recovery nutrition knowledge, but in contrary they lacks knowledge of sport supplements. The main coaches has better knowledge in most of nutrition knowledge category except in supplement knowledge, where all lacks it. Least score (below 46%) in the category of macro nutrients, hydration, and recovery were observed for the strength and conditioning coaches. While deputy coaches has less correct score (less than 41%) in micro nutrient knowledge. There was no any statistical significant deference in the all categories of nutrition knowledge for the age groups of the coaches. The nationality of coaches indicates significant difference under the categories of macro nutrients, micro nutrients and hydration knowledge, but no statistical deference were observed for recovery and supplements knowledge subcategory. Foreign coaches correct knowledge scores were higher than Ethiopian coaches in all the nutrition knowledge domains. Even though St Gorge FC coaches and Ethio Coffee FC coaches has adequate sport nutrition knowledge than ELPHA FC and Hadiya Hosanna FC, but in common the coaches sampled in this study did not possess adequate sport nutritional knowledge.

Keywords: sport nutrition knowledge, macro nutrients, micro nutrients, hydration, recovery, supplements

1. Introduction

Nutrition knowledge is vital for enhancing sport and exercise performance. It's known that physical activity, athletic performance and recovery from exercise are all enhanced with appropriate nutrition (Rodriguez, DiMarco, & Langley, 2009a) [15]. According to Schwartz, 2014; Dr. David Costil-the most recognized and respected researcher in the field of sport and exercise science quoted by saying- "other than the limits imposed by heredity and training no single factor plays great role in optimizing performance than diet"(Schwartz, 2014) [19]. Likewise, (Webb & Beckford, 2014) [25], assumed that high levels of nutritional knowledge and positive attitudes can result in increased performance and health of an athlete. Consequently, nutrition knowledge is a vital component of any athletic or physical activity program. Nearly each process in the body encompasses some aspect of nutrition. Hence, knowledge of how the body utilizes nutrients and the relation of nutrients with metabolism in health and disease, energy production, and recovery from exercise are all important aspects of sports nutrition.

Research has shown that most athletes obtain sports nutrition

related information from team personnel who work closely with them, such as coaches, athletic trainers, and strength and conditioning coaches, who have little or no educational background in sport and exercise nutrition [(Burns, Schiller, Merrick, & Wolf, 2004) [3], (Jacobson, Sobonya, & Ransone, 2001) [10], (Shifflett, Timm, & Kahanov, 2002) [20], and (Torres-McGehee *et al.*, 2012) [23]. According to (Paugh, 2005) [14] Understanding proper nutrition is a common problem that most people have. But As athletic trainers, it is must to know how athletes should eat. With gaining knowledge of the new crazes, the athletic trainer should be able to help those who choose types of diets and help them become aware of what foods to eat and how much. For every athlete, an optimized diet is important for growth, health and athletic performance (Thompson, 1998) [23].

Sports Nutritional science is not well recognized in Ethiopia yet sports have played a great role in the development and broadcasting Ethiopia as a country. Currently football in Ethiopia has become very lucrative and the youth look this sport as a career opportunity. Therefore to develop the next cadre of excelling professional football player, it would be

important to develop the field of sport nutrition and promote appropriate nutritional standards and understanding of this knowledge and practices by both the coaches and athletes. For Ethiopian football federation, this information on sports nutrition knowledge will be important to help formulate guidelines and support coaches & athletes in endeavoring towards improvement and sustenance of good athletic performance. The information will also help to foster the one mission of the ‘Ministry of Sports and Youth Affairs of Ethiopia’ to *empower and maximize full potential of the youth*”.

Hence the focus of this study was intended to examine the nutritional knowledge of coaches in Ethiopian premier league football clubs specifically emphasizing on the knowledge of macro nutrients, micro nutrients, hydration, recovery, and supplements.

2. Material and methods

In Ethiopia a total of 14 football teams were contest in the league for the country championship in the competition year of 2015/16. Among them the top two finishing teams (St Gorge & Ethio Coffee FC) and bottom two finishing teams (ELPHA & Hadiya Hossana FC) were selected purposively and cross sectional research design (survey) were used to attain the objectives of the study. Hence a total of twelve (12) coaches, three coaches from each of the four clubs were purposefully selected.

Using validated questionnaire, nutrition knowledge of coaches

and information on socio-demographic data were collected. The questions on nutrition knowledge were structured to assess the coach’s knowledge of food nutrients. The questionnaire was face and content validated by experts of nutrition lecturers at ambo university, Ethiopia. It was checked immediately after filling to minimize missing data. The questionnaire was pretested in a similar group of coaches at another football clubs, with good internal consistency, Cronbach's alpha of 0.767.

The data which was collected from the subjects were statistically analyzed. ANOVA was used for the intra-group comparisons of Football clubs, coaches’ responsibility, as well as age of the coaches and Post-hoc test was used when statistically significant mean differences was observed between groups. Descriptive statistics was also used to analyze the nutritional knowledge status of various groups. Coaches’ nationality (Ethiopian and foreigner) was analyzed using independent sample t-test.

3. Result and Discussion

3.1 Demographic Characteristics of Coaches

The total number of coaches was 12, i.e. three coaches from each of the four clubs under investigation. There were almost the same number of main coaches, deputy coaches and strength and conditioning coaches taken from the clubs. In terms of ages of coaches, the average age was between 36-40 years old (41.67%). Moreover, most of the coaches has Ethiopian nationality (83.33%).

Table 1: Demographic Characteristics of Coaches N=12

Variables	Characteristics	Frequency	%
Names of the club	St Gorge FC coaches	3	25
	Ethio coffee FC coaches	3	25
	ELPHA FC coaches	3	25
	Hadiya Hosanna FC coaches	3	25
Responsibility in the club	Main coach	4	33.33
	Deputy coach	4	33.33
	Strength & conditioning coach	4	33.33
Age of coaches	less than 30 years old	1	8.33
	30-35 years old	2	16.67
	36-40 years old	5	41.67
	41-46 years old	3	25
	More than 46 ye, old	1	8.33
Nationality	Ethiopian	10	83.33
	Foreigner	2	16.67

3.2 Assessment of Nutrient Knowledge of Coaches

In this section a one-way ANOVA between groups was conducted independently to compare coaches means score of macronutrient, micronutrient, hydration, recovery and supplement knowledge with the independent clubs based on their responsibility, age, and experience with $p < 0.05$. Coaches’ nationality (Ethiopian and foreigner) was analyzed using independent sample t-test.

3.2.1 Result of Macronutrients

Coaches were divided into four groups according to their clubs (coach of St Gorge, Ethio coffee, ELPHA and Hadiya Hosanna). A one way ANOVA showed that the macronutrient knowledge scores between coaches of St Gorge FC (n = 4, M=7.00, SD=2.646), Ethio Coffee FC (n = 4, M =7.67, SD=3.055), ELPHA FC (n = 4, M=4.67, SD=2.082) and Hadiya Hosanna FC (n= 4, M=5.33, SD=1.528) were no statistically significant, $F(3,8) = 1.024, p = 0.432$.

Table 2: ANOVA results of Macro nutrient score for the clubs

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.667	3	5.889	1.024	.432
Within Groups	46.000	8	5.750		
Total	63.667	11			

But as it was observed from the mean and total percentage, Ethio coffees FC coaches score in macronutrient were more than 60% compared to the other clubs. Defining what is considered to be acceptable knowledge is challenging, as studies measuring nutrition knowledge have used different scoring criteria to define it. A nutrition Knowledge Score of $\geq 60\%$ was reflective of having adequate nutrition knowledge (Hornstrom, Friesen, Ellery, & Pike, 2011) [9]. The majority of coaches responded to macronutrient questions indicates they did not have adequate macronutrient knowledge, except Ethio Coffee FC coaches. While coach of St Gorge obtained 58%, ELPHA 38.89% and Hadiya Hosanna obtained 44.44%, in macronutrient knowledge, it would be discomfoting to advocate that most of the sample has satisfactory macronutrient knowledge.

In the educational situation, a mark of 60% would not normally be taken as having an appropriate or adequate

thoughtful of the knowledge being measured. Roughly 40% from Etio Coffee, 42% from St Gorge, almost 60% from ELPHA Fc & 55% from Hadiya Hosanna of the macronutrient knowledge statements were answered incorrectly by participants, which is suggestive of the need for additional macronutrient nutrition education and training for the coaching population because knowledge of what, which, when and why to eat macronutrient are particularly important not only for athletic performance, but even for normal health.

In the other case the scores of macronutrient correct responses shows a statistically significant mean difference between groups of main coach, deputy coach and strength and conditioning coaches as determined by one-way ANOVA ($F(2, 9) = 7.691, p = 0.011$). The effect size, calculated using eta squared, was 0.63 which was large according to Cohen (1988).

Table 3: Post hoc comparison between macro nutrient knowledge and coaching staff

Tukey HSD						
(I) coaching staff	(J) coaching staff	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Main coach	deputy coach	3.750*	1.143	.023	.56	6.94
	strength and conditioning coach	4.000*	1.143	.017	.81	7.19
deputy coach	Main coach	-3.750*	1.143	.023	-6.94	-.56
	strength and conditioning coach	.250	1.143	.974	-2.94	3.44
strength and conditioning coach	Main coach	-4.000*	1.143	.017	-7.19	-.81
	deputy coach	-.250	1.143	.974	-3.44	2.94

*. The mean difference is significant at the 0.05 level.

Post hoc comparisons using the Tukey HSD test indicated that the mean score for the macronutrient knowledge of main coaches ($M = 8.75 \pm 2.062$) was significantly different for deputy coaches ($M = 5.00 \pm 1.414, p = 0.023$) & strength and conditioning coaches ($M = 4.75 \pm 1.258, p = 0.017$). However, there was no statistically significant difference in macronutrient knowledge mean scores between deputy coaches and strength and conditioning coaches as $P = 0.974$.

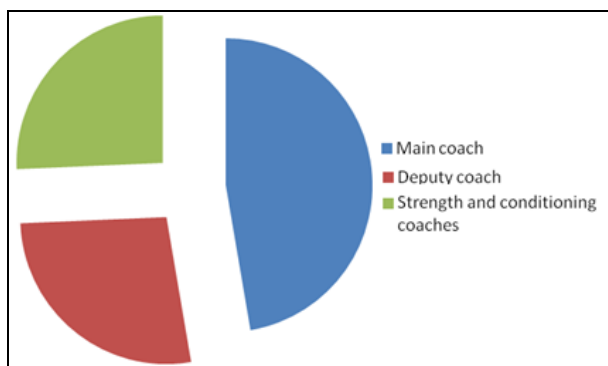


Fig 1: percentage of macronutrient knowledge score among different coaching responsibilities

Optimum understanding of nutrition knowledge is important for the coaches and athletes. Coaches could influence dietary

habits of athletes since they are important figure in the athletes' lives (Benari, 2010) [2]. The result of this study was dissimilar with the study conducted to assess concepts of nutrition of coaches in Texas as Eighty-five percent of the coaches scored almost 70% on knowledge of nutrition (Bedgood & Tuck, 1983) [1]. According to the result of this study the main coach answered almost 73% as a correct knowledge which is rational to say they do have satisfactory knowledge when compared to deputy coaches (41.66%) and strength and conditioning coaches 39.58%, hence the practical implication shows a great room aimed at improving for the gaps observed by dupery coaches and strength and condition coaches by designing training and education program to enhance their knowledge. In contrary, the study conducted by (Parr, Porter, & Hodgson, 1984) [13] suggest certified athletic trainers had the best nutrition knowledge backgrounds, and they believed they should take primary responsibility for athletes' nutrition and they think the main Coaches and deputy coaches are most concerned about fluid intake than macronutrients.

But no significant statistical difference was indicated for macro nutrient knowledge score and ages of coach as ($F(4, 7) = 0.480, p = 0.751$) which is similar with the study conducted by (Corley, Demarest-Litchford, & Bazzarre, 1990) were there are no significant relationships between nutrition knowledge and age.

Table 5: Independent sample t-test of macronutrient and nationality of coaches

		coaches Macro nutrient correct responses		
		Equal variances assumed	Equal variances not assumed	
Levene's Test for Equality of Variances	F	1.563		
	Sig.	.240		
t-test for Equality of Means	T	4.922	7.742	
	Df	10	3.038	
	Sig. (2-tailed)	.001	.004	
	Mean Difference	5.200	5.200	
	Std. Error Difference	1.056	.672	
	95% Confidence Interval of the Difference	Lower	2.846	3.077
		Upper	7.554	7.323

An independent-samples t-test was conducted to compare coaches having Ethiopian nationality and coaches who are foreign-working in Ethiopian premier league football clubs. There was statistically significant difference between foreigner coaches scores of macronutrient knowledge (M=10.50, SD=0.707) and Ethiopian coaches (M=5.30, SD=1.418) conditions; $t(10) = 4.922, p = 0.001$. These results imply that foreign coaches have more macronutrient knowledge than Ethiopian coaches. This difference (as to my judgement) may be resulted because of many factors, as like cultural differences in the countries, coaching education & academic education system in the countries, the outlooks professionalism of football coaching in in the countries, etc...

More consideration from Ethiopian football federation were required to capacitate and boost sport and exercise nutrition knowledge of this coaches by preparing continues sport nutrition education and training for the football coaching population from time to time to upgrade their knowledge and skill.

3.2.2 Results of Micronutrients

In this section the results and discussion of micro nutrient knowledges of coaches in respect to the club they are working in, responsibility of coaches, age, qualification and their nationality were provided in detail.

Table 6: ANOVA result of micro nutrient knowledge of coaches in different clubs

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.667	3	1.889	.840	.509
Within Groups	18.000	8	2.250 ^a		
Total	23.667	11			

There was no any statistically significant difference at the $p < .05$ level in micronutrient scores between coaches of St Gorge FC (M=4.67, SD=1.528), Ethio Coffee FC (M=5.00, SD=2.000), ELPHA FC (M=3.33, SD=0.577) and Hadiya Hosanna FC (M=3.67, SD=1.428) at ($F(3, 8) = 0.840, p = 0.509$)" which is almost the same with the result of macronutrient knowledge of coaches. But mean scores of Ethio coffee and St Gorge FC coaches were greater than ELPHA and Hadiya Hosanna FC respectively. Moreover, according to Hornstrom *et al.*, 2011 nutrition knowledge scoring system, the correct responded percentage shows Ethio coffee FC (62.50%) coaches do possess better micronutrient

knowledge than neither of St Gorge (58.33%), ELPHA (41.67%) and Hadiya Hosanna (45.83%) FCs. This result indicates both Hadiya Hosanna and ELPHA FC incorrectly responded beyond 50% of the total questions wrongly. Generally it is rational to say that they don't understand as micronutrients play an important role in energy production, hemoglobin synthesis, maintenance of bone health, adequate immune function, and the protection of body tissues from oxidative damage and they also don't know as micronutrient help build and repair muscle tissue following exercise (Rodriguez, DiMarco, & Langley, 2009b) ^[18].

Table 7: ANOVA results of Micro nutrients and coaching responsibilities

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11.167	2	5.583	4.020	.057
Within Groups	12.500	9	1.389		
Total	23.667	11			

In the above table, ANOVA result at $p < .05$ level indicates that there was no statistically significant difference for micronutrient score between responsibility of coaches in the club at ($F(2, 9) = 4.020, p = 0.057$)", but the descriptive percentage of correct answers for main coach (68.75%) was greater than from both deputy coaches (40.62%) and strength and conditioning coaches (46.87%). Hence it was logical to

say the main coach has satisfactory micro nutrient knowledge, in contrary deputy coaches and strength and conditioning coaches has maximum incorrect responses, and they lack knowledge in this sub category. Generally, according to (Parr *et al.*, 1984) ^[13], (Graves, Farthing, Smith, & Turchi, 1991) ^[8] & (Lewis, Massoni, & Crawford, 2000) ^[15] the responsibility for disseminating nutrition information to athletes is shared

between coaches and strength and condition training. But as the result of this study exposes the knowledge level of

strength and conditioning coaches was too low so the information they disseminate to the athletes became incorrect.

Table 8: ANOVA results of micro nutrient knowledge for age of coaches

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.967	4	1.492	.590	.681
Within Groups	17.700	7	2.529		
Total	23.667	11			

As seen from the above ANOVA results, statistically there was no significant mean difference for micro nutrients and ages of coach at ($F(4, 7) = 0.590, p = 0.681$). The descriptive statistics (mean and percentage values) of correct micronutrient knowledge responses indicates coaches whose

age were greater or equal to 46 years old ($5.00 \pm 0.000, 62.5\%$) score higher than the other age category. According to Hornstrom *et al.*, 2011 nutrition knowledge scoring system, the results for this age category is rational to say they have satisfactory micro nutrient knowledge.

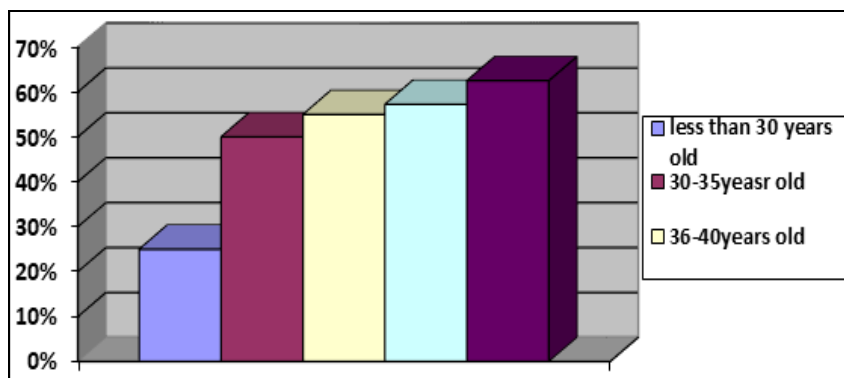


Fig 2: Micronutrient percentage Score for Different Age Category of Coaches

As it was observed in the above figure Coaches whose ages were greater than 46 years old score higher micronutrient knowledge than the other age categories and even it shows as

the age of the coaches increase their micronutrient knowledge also increase proportionally.

Table 9: Independent sample Test for nationality of coaches

		coaches Micro nutrient correct responses		
		Equal variances assumed	Equal variances not assumed	
Levene's Test for Equality of Variances	F	1.333		
	Sig.	.275 ^a		
t-test for Equality of Means	T	3.511 ^a	4.652 ^a	
	Df	10 ^a	2.053 ^a	
	Sig. (2-tailed)	.006 ^a	.041 ^a	
	Mean Difference	2.800 ^a	2.800 ^a	
	Std. Error Difference	.797 ^a	.602 ^a	
	95% Confidence Interval of the Difference	Lower	1.023	.274
		Upper	4.577	5.326

An independent-samples t-test was conducted to compare micronutrient knowledge score and nationality of football coaches working in Ethiopian premier league football clubs. There was statistically no significant difference between foreigner coaches scores of micronutrient knowledge ($M=6.50, SD=0.707$) and Ethiopian coaches ($M=3.70, SD=1.059$) for conditions; $t(10) = 3.511, p = 0.006$, even though the mean score of foreign coaches were greater, but the percentage of correctly responded questions shows 54.16% for foreign coaches & 46.25% for Ethiopian nationality coaches.

In both case it is difficult to say they are knowledgeable in micro nutrient, because almost 46 % from foreign coach and 54% from Ethiopian coaches were answered incorrectly (Hornstrom *et al.*, 2011) ^[9].

3.2.3 Results of Hydration knowledge score

A one-way between groups analysis of variance (ANOVA) was conducted independently to compare coaches mean scores of hydration knowledge with the independent variables name of the club, responsibility of coach, age and experience.

Table 10: ANOVA results of hydration knowledge correct responses & clubs

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11.583	3	3.861	1.130	.393
Within Groups	27.333	8	3.417		
Total	38.917	11			

Statistically there was no significant mean difference at $p = .005$ level, for hydration knowledge scores and the clubs-St Gorge ($M=4.67$ $SD=2.082$), Ethio Coffee ($M=4.00$ $SD=1.732$), ELPHA ($M=2.00$, $SD=2.000$) and Hadiya Hosanna ($M=3.67$, $SD=1.528$) at $F(3, 8) = 1.130$, $p < =.393$. Generally the mean score of ELPHA FC was smaller than the other.

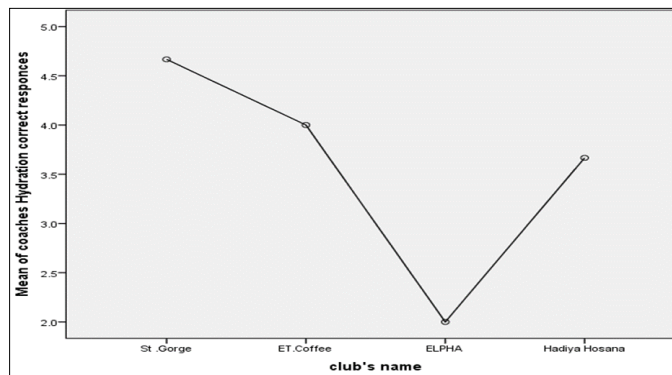


Fig 3: mean plot of hydration correct responses for the clubs

The descriptive correct responded percentage score for St Gorge FC (66.67%) shows they do have satisfactory hydration knowledge than Ethio Coffee FC (57.14%), ELPHA

FC (28.57%), and Hadiya Hossana (52.38%). Almost 72 % incorrect hydration question responses were indicated for ELPHA FC, this is the area that requires much more consideration in this sub categories. According to Judge *et al.*, 2016 hydration knowledge is an important part of athletic performance, and understanding hydration knowledge, attitudes, barriers, and behaviors is critical for sport practitioners. Additionally Fluid consumption during exercise can be influenced by fluid vessel type and hydration knowledge (Colburn, 2016) [4].

However, According to (Dizon, 2013) [6] there is still inadequate knowledge on appropriate hydration amongst coaches and athletes knowledge regarding ways to assess fluid levels, hydration status and fluid loss relevant to hydration knowledge are very limited. Hence as the percentage results in this study indicates the science of hydration strategy and its application in ELPHA FC necessities carefully designed program to capacitate their knowledge.

In the other case the scores under hydration nutrition knowledge shows a statistically significant mean difference between different responsibilities of coaches as determined by one-way ANOVA ($F(2, 9) = 6.619$, $p = .017$). The effect size, calculated using eta squared, was 0.595 which is large effect according to Cohen (1988).

Table 12: Post Hoc comparison between hydration knowledge and coaching responsibilities Tukey HSD

(I) coaching staff	(J) coaching staff	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Main coach	deputy coach	2.500	.935	.060	-.11	5.11
	strength and conditioning coach	3.250*	.935	.017	.64	5.86
deputy coach	Main coach	-2.500	.935	.060	-5.11	.11
	strength and conditioning coach	.750	.935	.711	-1.86	3.36
strength and conditioning coach	Main coach	-3.250*	.935	.017	-5.86	-.64
	deputy coach	-.750	.935	.711	-3.36	1.86

*. The mean difference is significant at the 0.05 level.

Post hoc comparisons using the Tukey HSD test indicated that the mean for the hydration knowledge score of main coach ($M = 5.50$, $SD=1.291$) was significantly different for strength and conditioning coaches ($M=2.25$, $SD=1.708$). However, there was no statistically significant difference in hydration knowledge mean scores between deputy coach ($M=3.00$, $SD=0.816$) and main coaches.

The total percentage of correctly replied answer shows the main coaches (78.57%) achieve more correct answer than both deputy coaches (42.87% and strength and conditioning coaches (32.14%). This result indicates that the main coaches has good hydration knowledge than deputy coaches and strength & conditioning coaches according to Hornstrom *et al.*, 2011 scoring system.

However, even though hydration is an important part of athletic performance, and understanding athletes' hydration knowledge, attitudes, barriers, and behaviors is critical for sport practitioners or coaches (Judge *et al.*, 2016) [11] but, in this study both deputy coaches and strength & conditioning coaches score incorrectly almost 67% of hydration knowledge question. In contrary the study conducted by Juzwiak (2004) reveals though coaches obtained correct responses to most of the hydration questions, they did not recommend fluid in all stages of exercise, and the frequency and volume of fluid intake was not in accordance with guidelines. Generally the coaches are advised to have better knowledge of hydration and allow their player to hydrate before, during and after work out or competitions.

Table 13: ANOVA result of Hydration knowledge and age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.417	4	1.604	.346	.839
Within Groups	32.500	7	4.643		
Total	38.917	11			

Furthermore, ANOVA results of hydration knowledge score for age of coaches indicates there were no statistical significant mean difference between subjects as ($F(4, 7) = 0.346, p = 0.839$) were observed.

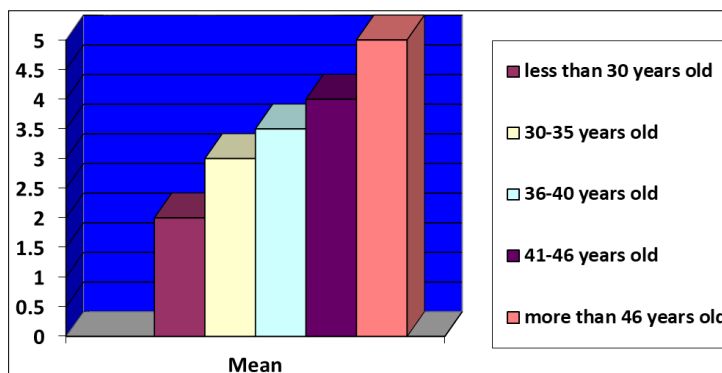


Fig 4: mean score of hydration knowledge for coaches' different age categories

As the above figure shows mean score of hydration knowledge became increasing across age group starting from less than 30 years old (less mean score) to more than 46 years old (more total correct mean scores). As the results of study conducted by (Semnara, 2007) [19] shows Coaches with more experience/age had more hydration knowledge, which is almost the same with the result of this study. Young coaches

should advised to nutrition training that integrates advanced levels of learning, such as application, synthesis, and evaluation will encourage positive nutrition practices. Lastly, nutrition education should address information appropriate and specific to the planned audience and should ultimately lead to behavior change (Semnara, 2007) [19].

Table 14: Independent sample t test for hydration knowledge and Nationality

		coaches Hydration correct responses		
		Equal variances assumed	Equal variances not assumed	
Levene's Test for Equality of Variances	F	.521		
	Sig.	.487		
t-test for Equality of Means	t	3.322	5.217	
	df	10	3.025	
	Sig. (2-tailed)	.008	.013	
	Mean Difference	3.500	3.500	
	Std. Error Difference	1.054	.671	
	95% Confidence Interval of the Difference	Lower	1.153	1.375
		Upper	5.847	5.625

An independent sample t-test of hydration knowledge scores for nationality of coaches indicates statistically significant mean difference between foreign coaches and coaches having Ethiopian nationality conditions at $t(10) = 3.322, p = 0.008$. Since the Group Statistics revealed that the Mean score for

foreigner nationality coach ($M=6.50, SD=0.707$) was greater than the Mean for the Ethiopian nationality coach ($M=3.00, SD=1.414$) condition. The total correct response of hydration knowledge score of foreign coach is 92.85% whereas Ethiopian coaches has only 42.85% correct responses.



Fig 5: Hydration knowledge of Coaches and Nationality

This result indicates coaches having Ethiopian nationality do not have adequate level of hydration knowledge when compared to foreign coaches, hence education/training about the importance and timing of hydration for sport and physical activities are the concern to be followed for Ethiopian coaches.

3.3.1 Results of Recovery Nutrition Knowledge

One-way ANOVA result of coaches recovery nutrition knowledge scores indicates, there were no statistically significant differences between group means score for the four different clubs were observed as ($F(3, 8) = 0.035, p = 0.991$).

Table 15: ANOVA result of coaches' correct recovery nutrition score in the clubs

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.333	3	.111	.035	.991
Within Groups	25.333	8	3.167		
Total	25.667	11			

The recovery nutrition knowledge category-from all the knowledge domains, were the only subcategory in which the correct percentage score were higher in all the clubs, i.e. The

correct recovery knowledge score for St. Gorge FC is (66.67%), Ethio Coffee FC (66.67%), ELPHA FC (61.11%) and Hadiya Hosanna FC (61.11%). According to Hornstrom *et al.*, 2011 nutrition knowledge scoring system it is rational to say all the clubs under investigation has satisfactory knowledge score for recovery nutrition.

Additionally a One-way ANOVA result of coaches recovery nutrition knowledge scores indicates, there were no statistically significant differences between group means score for the different ages categories as ($F(4, 7) = 1.081, p = 0.434$).

Table 16: ANOVA Result for Recovery Knowledge and Age of Coaches

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.800	4	2.450	1.081	.434
Within Groups	15.867	7	2.267		
Total	25.667	11			

In the other case there were statistically significant mean difference in recovery knowledge score for different responsibilities of coaches ($F(2, 9) = 9.088, p = 0.007$). The effect size, calculated using eta squared was 0.668 which is large effect according to Cohen (1988).

Table 17: Post Hoc Comparison between Recovery Nutrition Score and Responsibilities of Coach

Tukey HSD						
(I) coaching staff	(J) coaching staff	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Main coach	deputy coach	2.250*	.687	.024	.33	4.17
	strength and conditioning coach	2.750*	.687	.008	.83	4.67
deputy coach	Main coach	-2.250*	.687	.024	-4.17	-.33
	strength and conditioning coach	.500	.687	.754	-1.42	2.42
strength and conditioning coach	Main coach	-2.750*	.687	.008	-4.67	-.83
	deputy coach	-.500	.687	.754	-2.42	1.42

*. The mean difference is significant at the 0.05 level.

Post hoc comparisons using the Tukey HSD test indicated that the mean score for the recovery nutrition knowledge of main coach ($M = 5.50, SD=0.577$) was significantly different for both deputy coach ($M = 3.25, SD=1.258$) & strength and conditioning coaches ($M=2.75, SD=0.957$), but no significant mean difference were observed between deputy coaches and strength and conditioning coaches as $p=0.754$.

Furthermore, the descriptive value of correctly answered percentage of main coach (91.67%) shows they do have appropriate recovery nutrition knowledge than deputy coaches (54.16%) and strength and conditioning coaches (45.83%). Almost 55% from deputy coaches and 64% from strength and conditioning coaches incorrectly answered the recovery nutrition questions. This shows a big recovery nutrition knowledge gap between the coaches.

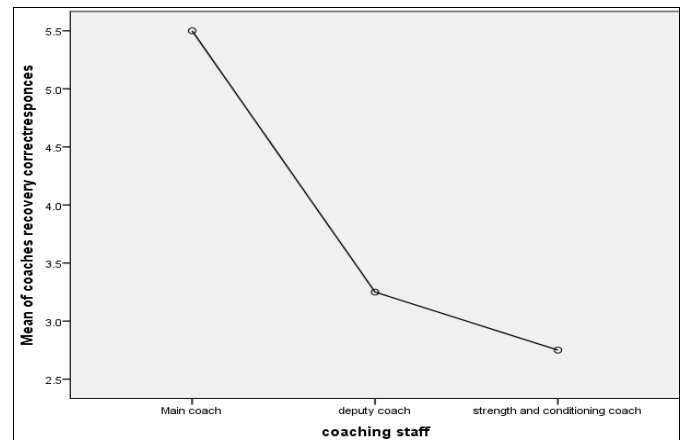


Fig 6: Mean Plot of Recovery Nutrition Knowledge Score for Coaches Responsibilities

However, there was no statistically significant difference in recovery nutrition knowledge mean scores between deputy

coach and strength and conditioning coaches.

Table 18: Independent Sample T Test of Recovery Nutrition Knowledge and Nationality of Coaches

		Equal variances assumed	Equal variances not assumed	
Levene's Test for Equality of Variances	F	1.992		
	Sig.	.188		
t-test for Equality of Means	T	1.873	2.963	
	Df	10	3.088	
	Sig. (2-tailed)	.091	.057	
	Mean Difference	2.000	2.000	
	Std. Error Difference	1.068	.675	
	95% Confidence Interval of the Difference	Lower	-.379	-.114
		Upper	4.379	4.114

An independent-samples t-test was conducted to compare coaches recovery nutrition knowledge with their corresponding nationality and the result shows there was no statistically significant difference in the mean score of foreigner coaches recovery nutrition knowledge (M=5.50, SD=0.707) with coaches having Ethiopian nationality (M=3.50, SD=1.434) conditions; $t(10) = 1.873, p = 0.091$. Even though there were no significance statistical deference was observed through independent sample t-test, but recovery nutrition mean score of foreign coaches were higher than Ethiopian coaches. The total percent of correct responses for foreign coach was (91.67%) which is particularly higher than Ethiopian nationality coaches (58.33%) in the recovery nutrition knowledge category. According to Hornstrom *et al.*, 2011 nutrition knowledge scoring system, may be it is rational to say both has knowledge of recovery nutrition knowledge score, but the difference is that coaches having Ethiopian nationality answered almost 41% of the question incorrectly. The timing of post work out energy intake is important. The recovery meal restores glycogen and helps muscles recover quickly, which is especially important for athletes who are involved in long duration & high intensity exercise (Roy, Tarnopolsky, Mac Dougall, Fowles, & Yarasheski, 1997) [17]. Hence the coaches' role- educate and motivate athletes to have proper recovery nutrition was vital to pick their performance and prepare their body for the next training/ competition.

3.3.2 Results of Nutrition Supplements Knowledge of Coaches

One-way ANOVA result, at $p < 0.05$ were conducted to

analysis coaches nutrition supplements knowledge scores and there were no statistically significant differences between group means for all the independent variables i.e. club as ($F(3, 8) = 1.944, p = 0.201$), responsibility as ($F(2, 9) = 2.824, p = 0.112$), & age as ($F(4, 7) = 0.279, p = 0.883$).

Table 19: ANOVA Results of Supplement Knowledge and Coaches Responsibility

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.667	2	1.333	2.824	.112
Within Groups	4.250	9	.472		
Total	6.917	11			

But this result is different from the study conducted by (Eskici, Yarar, & Koc, 2016) [7] where there was a significant difference among coaches in their recommendations concerning nutritional ergogenic supplements ($p < 0.01$). The coaches of strength sport mostly recommended proteins/amino acid supplements. Even the independent sample t-test result of nutrition supplement knowledge of coaches for nationality shows no statistically significant mean deference for the conditions; $t(10) = 2.029, p = 0.070$. Generally as it was observed that nutrition supplements knowledge scores from the clubs categories high mean score were reported for “St Gorge FC”, from responsibility categories “main coach” mean score was higher, from age category coaches who’s age were More than 46 years old score more and finally coaches having foreign nationality score more than Ethiopian nationality bearing coaches.

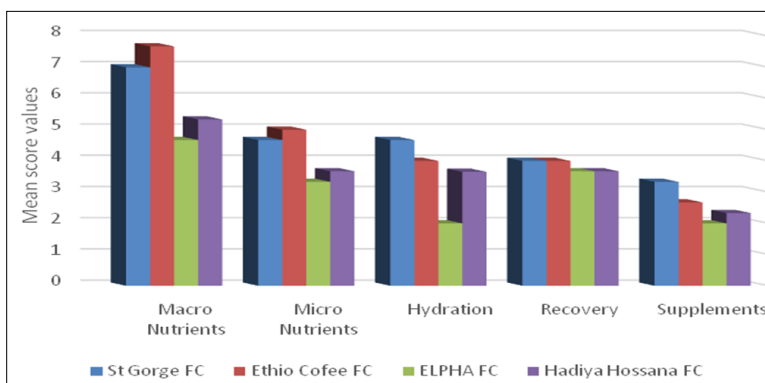


Fig 7: mean score of coaches sport nutrition knowledge in each clubs

Figure 7 clearly shows that coaches from Ethio coffee FC mean score for macro and micronutrients were high and additionally St Gorge FC coaches has more score in sub category of hydrations knowledge and nutrition supplement

knowledge, to the other end ELPHA FC mean score was less/small in all sub category of nutrition knowledge. Both Ethio Coffee and St Gorge FC have the same mean score under recovery nutrition knowledge.

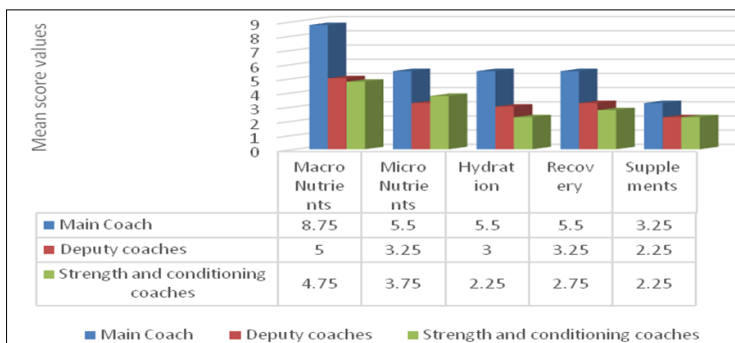


Fig 8: mean scores representing different coaching responsibility

Nutrition knowledge score as typically indicates in figure 8 the main coaches mean score in every category of nutrition knowledge domain were higher than deputy coaches, and deputy coaches have better mean score than strength and conditioning coaches respectively, except for micronutrient knowledge score where strength and conditioning coaches shows greater mean score than deputy coaches. The result of this study was different from the study conducted by (Parr *et al.*, 1984) [13] were certified athletic trainers had the best nutrition backgrounds than the other, and they believed they should take primary responsibility for athletes' nutrition.

Furthermore study conducted by (Torres-McGehee *et al.*, 2012) [23] also supports Parr *et al* results, where athlete trainer and strength and conditioning coaches have adequate sports nutrition knowledge, whereas most coaches and athletes have inadequate knowledge.

3.4 Assessment of Nutrition Knowledge coaches

In this section a one-way ANOVA between groups was conducted to compare coaches' correct, incorrect and not sure responses with the independent clubs as well as the total nutrition knowledge score were assessed.

Table 20: Total Coaches Correct, Incorrect and Not Sure Nutrition Knowledge Score in Each Football Club

Name of club	Score of correct/ agree responses	Score of incorrect/disagree responses	Score of not sure responses
	Mean, standard deviation, % P value	Mean, standard deviation,% P value	Mean, standard deviation, % P value
St Gorge FC	23.67±8.327, 60.68%	9.67±5.132, 24.78%	5.67±2.215,14.52%
Ethio. Cofee FC	23.33±7.572, 59.82%	11.33±6.351, 29.05%	4.33±1.528,11.12%
ELPHA FC	15.67±7.638, 40.17%	18.00±7.000, 46.15%	5.33±1.528,13.67%
Hadiya Hossana FC	18.67±5.508, 47.86%	13.33±2.082, 34.18%	6.67±3.215, 17.09%
Total Nutrition knowledge score for all clubs	20.33±7.165, 52.13% P=0.514	13.08±5.696, 33.54% P=0.340	5.50±2.316, P=0.732

Table 2 shows mean nutrition knowledge scores for each clubs including total correct or agree responses, total incorrect/disagree responses and not sure responses. Both St Gorge FC coaches and Ethio Coffee FC coaches score were higher in the “agree or correct responses” than the others two football club coaches, it is also important to indicate that both St Gorge FC coaches and Ethio Coffee FC coaches shows almost 60% total correct reposes. According to (Hornstrom *et*

al., 2011) [6] nutrition knowledge scoring system both St Gorge FC coaches and Ethio Coffee FC coaches do possess better nutrition knowledge than ELPHA FC and Hadiya Hosanna FC. The results of St Gorge FC coaches and Ethio Coffee FC coaches score in this study was similar with study conducted by(Smith-Rockwell, Nickols-Richardson, & Thye, 2001) [21] where the overall, participants responded correctly to 67% of nutrition knowledge questions.

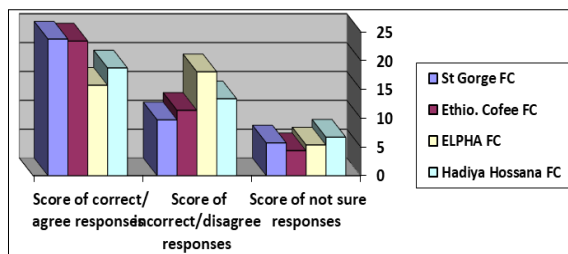


Fig 8: mean score of coach's correct, incorrect and not sure score

Furthermore, the descriptive statistics for total “correct” scores of both ELPHA FC and Hadiya Hosanna FC was below 50%- i.e. (15.67±7.638, & 40.17%), and (18.67±5.508 & 47.86%) respectively. Higher incorrect response was observed for Hadiya Hosanna FC (51.27%) and ELPHA FC (59.82%) coaches, hence those coaches are alerted to upgrade their sport nutrition knowledge from time to time to pick their athletes performances.

Table 21: ANOVA Result for Nutrition Knowledge and Clubs

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	134.000	3	44.667	.830	.514
Within Groups	430.667	8	53.833		
Total	564.667	11			

A one-way between subjects ANOVA was conducted to compare total correct nutrition knowledge mean scores between football coach’s conditions. The result indicates there was no statistically significant deference in correct sport nutrition knowledge scores at $p < .05$ level for the conditions [$F(3, 8) = 0.830, p = 0.514$].

The summation of all the correct or agree responses indicates total nutrition knowledge score of the coaches in the study, hence the total correct scores, as the descriptive statistics shows were 52.13% and the remaining percentage shows incorrect or discrepancy with knowledge of sport nutrition. According to the study conducted by (Waly, Kilani, & Al-Busafi, 2013) Most coaches have limited knowledge and training in nutrition, yet often provide nutritional advice. It is therefore important that people who provide nutritional guidance to athletes have the appropriate knowledge.

4. Summary

The aim of this study was to evaluate sport nutrition knowledge of coaches in Ethiopian premier league football clubs. In Ethiopia a total of 14 football teams were contest in the league for the country championship in the competition year of 2015/16. Among them the top two finishing teams (St Gorge & Ethio Coffee FC) and bottom two finishing teams (ELPHA & Hadiya Hossana FC) were selected purposively and cross sectional research design (survey) were used to attain the objectives of the study.

The data for this research were collected using questionnaires. There were two types of questionnaires being used. Nutrition knowledge questionnaire and participant demography. The standardized questionnaires were framed and used by taking into considering the maximum coverage of the areas of sport nutrition concerns with appropriate features needed for the study, so as to get maximum valuable and significant answers from the respondents. In order to get the nutrition knowledge scores, five different areas of sport nutrition concerns were assessed independently such as macro nutrient, micro nutrient, hydration, recovery, and supplements knowledge. Statements answered correctly was given a score of “1”, and statements answered incorrectly, including those with the answer “Don’t Know,” will scored as “0”. The overall score will refer to as the Nutrition Knowledge Score.

The data which was collected from the subjects were statistically analyzed. ANOVA was used for the intra-group comparisons of Football clubs, coaches’ responsibility, as well

as age of the coaches and Post-hoc test was used when statistically significant mean differences was observed between groups. Descriptive statistics was also used to analyze the nutritional knowledge status of various groups. Coaches’ nationality (Ethiopian and foreigner) was analyzed using independent sample t-test.

The finding of the study was summarized as follows;

- There were no any significant statistical difference observed for macronutrients and micro nutrients knowledge score in the clubs, but Ethio coffee FC coaches score were higher for both of this nutrition knowledge categories. Almost 60% of macro & micro nutrients questions were answered correctly by Ethio coffee FC, whereas the other clubs score were below 60% for macro and micro nutrient knowledge.
- No significant statistical difference were observed for hydration knowledge in the football clubs, however the total correct percentage score of St Gorge FC was 66.67% which is greater than the other clubs. Furthermore, the total correct percentage for ELPHA FC (28.57%) shows the least correct score.
- All the football clubs’ score for recovery nutrition knowledge was more than 60%, and no significant mean difference were observed for recovery nutrition knowledge in the football clubs.
- In the nutrition supplement subcategory, all of the clubs’ correct responses were below 60%, a little higher score were only observed for St Gorge FC (55.56% correct responses) and there were also no statistically significant mean differences.
- Statistically significant difference were observed for category of macro nutrient, hydration and recovery nutrition knowledge in the independent variables of coaching staff/responsibility of coaches, but no significant difference for micro nutrient and supplements knowledge were observed for responsibilities of coaches.
- In most of the nutrition knowledge category domains the main coaches’ correct responses were greater than 65%, except for nutrition supplement knowledge were all the coaching staffs’ has below 55% correct responses.
- Very least correct knowledge score (below 46%) in the category of macro nutrients, hydration, and recovery were observed for the strength and conditioning coaches. While deputy coaches has less correct score (less than 41%) in micro nutrient knowledge. Supplements knowledge score were the same for both deputy and strength and conditioning coaches (37.50% correct responses).
- There was no any statistical significant deference in the all categories of (macro nutrients, micro nutrients, hydration, recovery and supplements) nutrition knowledge for the age groups of the coaches.
- The nationality of coaches indicates significant statistical difference under the categories of macro nutrients, micro nutrients and hydration knowledge, but no statistical deference were observed for recovery and supplements knowledge subcategory. Foreign coaches correct knowledge scores were higher than Ethiopian coaches in all the nutrition knowledge domains however, the correct score for macro nutrients (87%), hydration (92%) and recovery (91%) were extremely high when compared to

the correct score of micro nutrients (54%) and supplements (58%) for this foreign coaches. Moreover, the total correct percentage score of Ethiopian coaches were below 50% in all categories of nutrition knowledge domain, except in the subcategory of recovery nutrition knowledge score (58.33%).

- There were no statistically significant difference observed in the total correct nutrition knowledge score for all the clubs. However, the total correct percentage score for St Gorge FC (60.68%), and Ethio Coffee FC (59.82%) were greater than for both ELPHA (40.17%) and Hadiya Hosanna Fc (47.86%). The total incorrect nutrition knowledge responses were higher for both ELPHA FC and Hadiya Hosanna FC.
- Generally 52.13% of the coaches has total correct responses and the remaining nutrition knowledge questions were answered incorrectly by the coaches.

5. Conclusion

In conclusion, Coaches of Ethio Coffee FC have adequate knowledge under macro and micronutrient, while St Gorge, ELPHA and Hadiya Hosanna FC has unsatisfactory knowledge for macro and micro nutrient. However, St Gorge FC coaches has fundamental information for exercise hydration knowledge than the other football club coaches as sampled in this study. In the other case all the football clubs coaches under investigation has satisfactory knowledge for exercise recovery nutrition. Antagonistically, most of them lacks knowledge of sport nutrition supplements except, St Gorge FC coaches has fair sport supplements knowledge. In most of the nutrition knowledge domains, the main coaches exhibits very good knowledge except, in the category of nutrition supplements knowledge were all the coaches lacks appropriate knowledge. Both deputy coaches and strength & conditioning coaches lacks proper nutrition knowledge in all the categories.

Furthermore, foreign coaches have outstanding sport nutrition knowledge under the categories of macro nutrients, hydration, and recovery, but they do have fair nutrition knowledge under micro nutrients and supplements. However, in most of the sport nutrition knowledge domains, Ethiopian coaches lacks proper sport nutrition knowledge except, under the category of recovery nutrition knowledge where they possess fair knowledge.

Even though both St Gorge FC coaches and Ethio Coffee FC coaches has adequate sport nutrition knowledge plus ELPHA FC and Hadiya Hosanna FC lacks it, but in common the coaches sampled in this study did not possess adequate sport nutritional knowledge.

6. Recommendation

- Ethiopian football association may design a development of actual sport nutrition-education programs which are vital to increase the nutritional knowledge of coaches.
- With further nutrition training and education, it is reasonable that the sport nutrition knowledge of deputy coaches and strength and conditioning coaches are expected to increase.
- Future research could include a broader population including all coaches of Ethiopian premier league football

clubs as a whole to make inferences for the country.

- Additionally, intervention enquiries are needed to stress sport nutrition education intended at improving coaches' nutrition knowledge.

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8. Conflict of Interest

The authors affirm that there is no conflict of interests regarding the publication of this paper.

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