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Knowledge, Attitude, and Practices (KAP) Towards Basic Nutrition Concept: Its effect on the body mass index of student-athlete

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Abstract
This study examined the relationship between athletes' knowledge, attitude, and practices regarding basic nutrition concepts and their body mass index (BMI). Data was collected from 304 athletes participating in various sports, and a descriptive-correlational research design was employed. The results revealed that the athletes possess a moderate knowledge of weight management, macronutrients, micronutrients, supplementation, and alcohol. Their attitude towards basic nutrition is generally positive, emphasizing hydration and healthy food. However, there are disagreements regarding the perception of healthy food being expensive. Athletes' practices towards basic nutrition could have been more consistent, with more vital adherence to consuming lean protein sources but less frequent consumption of energy gel during exercise. It was also revealed that knowledge and attitude significantly influence BMI distribution, while practices do not significantly affect it. Therefore, the study recommends implementing a nutrition training program for student-athletes to improve their overall health, performance, and BMI distribution by enhancing knowledge and attitudes through comprehensive education and evidence-based information and promoting positive mindsets toward hydration and healthy food choices.

Keywords: Knowledge, attitudes, practices, body mass index, athletes

1. Introduction
Nutrients are essential for the proper functioning of the human body, as it does not produce most of these crucial elements on its own[19]. Nutrients play a vital role in providing energy, building body structures, and regulating chemical processes, allowing the body to perform essential functions such as movement, waste excretion, respiration, growth, and reproduction. A healthy lifestyle, good nutrition, and regular exercise are crucial for overall health, as poor dietary choices and inactivity have been linked to preventable diseases and premature death (CDC). Hence, understanding the nutritional value of food is a key factor influencing dietary decisions.

Athletes, in particular, must pay close attention to their nutrition to optimize their performance and achieve their specific athletic goals. Proper nutrition can reduce fatigue, minimize the risk of injuries, and enhance recovery and training optimization [16]. However, adolescent athletes face unique challenges due to intense physical growth and training requirements. A thorough literature review has revealed that adolescent athletes with disordered eating attitudes or eating disorders are at risk of nutritional deficiencies, dehydration, electrolyte imbalances, and changes in body composition that may lead to menstrual irregularities and decreased bone mass density [10]. Educational programs and early detection of disordered eating and eating disorders are essential to address these concerns.

In the context of college athletes, a study emphasized the significance of collaboration between athletic trainers and sports dietitians to devise effective performance nutrition programs [13]. Athletic trainers were identified as the primary source of nutrition information for collegiate athletes, highlighting their role in promoting healthy eating habits—however, challenges related to time constraints and adhering to preferred diets while travelling were observed.

To ensure the well-being of college athletes, educational programs and access to healthy food options should be provided, and the collaboration between athletic trainers and sports dietitians should be strengthened.

In Bangladesh, a study on sports departments of Bangladesh Krira Shikkha Protishtan (BKSP) found that nutrition knowledge and practices were positively influenced by previous nutrition training [3]. This highlights the importance of regular nutrition instruction and intervention for adolescent athletes to improve their nutritional knowledge and practices.

Furthermore, a study conducted in India emphasized that adequate nourishment is crucial for growth and physical performance in both athletic and non-athletic teenagers [18]. The study found that nutrition education significantly improved nutrition knowledge, attitudes, and practices among the participants.

A study on boxing and taekwondo athletes in the Philippines revealed that proper nutrition knowledge sources can positively impact athletes' eating habits and nutritional understanding [15]. The study emphasized the importance of ensuring access to reliable nutrition information for athletes.

Nutrition plays a fundamental role in athletic performance and overall health. Good nutrition's significance and impact on performance is crucial for athletes. The researcher aims to assess the knowledge, attitudes, and practices (KAP) related to basic nutrition concepts among athletes to develop a plan to enhance their nutrition concepts, ultimately improving their performance and well-being. This study can also strengthen the quality of nutrition education in educational institutions, promoting healthier eating habits among all learners.

2. Materials and Methods

2.1 Methods and Techniques Used

Descriptive-correlational research was considered an appropriate research design for the present study as it aimed to explore the relationship between knowledge, attitudes, practices on basic nutrition, and the BMI of athletes. Data collection for this study involved using a modified questionnaire to gather information on the athletes' basic nutrition knowledge, attitudes toward nutrition, dietary practices, and BMI measurements. Descriptive correlational research was chosen because it allows for examining patterns or trends in the relationship between these variables and can provide valuable insights into the factors contributing to changes in BMI among athletes.

However, it is essential to acknowledge that descriptive correlational research does not establish causality. It can only describe the relationship between variables and cannot determine whether changes in knowledge, attitudes, or practices of basic nutrition directly cause changes in BMI among athletes

2.2 Respondents of the Study

The primary subjects of this study consisted of 304 athletes from various sports, including arnis, archery, athletics, badminton, basketball, baseball, beach volleyball, boxing, chess, dance sports, football, futsal, karatedo, lawn tennis, mobile legends, sepak takraw, swimming, table tennis, taekwondo, volleyball, and vlogging. These athletes were chosen as respondents for the study, including a diverse range of sports for representing athletes with different training demands, dietary habits, and body types. This approach aimed to provide a more comprehensive understanding of the relationship between nutrition knowledge, attitudes, practices, and BMI among athletes.

2.3 Instrument of the Study

The researcher selected a survey questionnaire as the research instrument to fulfil the study's primary objective. To ensure its validity, the questionnaire consisted of four parts, each addressing different aspects of the study.

For the first part, which focused on nutrition knowledge, the researcher adopted the Nutrition Survey Knowledge Questionnaire (NSKQ) developed by Trakman *et al.* (2017) [21]. The NSKQ underwent a rigorous validation process involving Classical Test Theory (CTT) and Rasch analysis. The knowledge component of the questionnaire comprised 89 items divided into six subsections: Weight management, macronutrients, micronutrients, sports nutrition, supplementation, and alcohol. Performance in the NSKQ was evaluated using a scoring system that classified knowledge as "poor", "average", "good" or "excellent" based on the percentage of correct answers [21].

The second part of the questionnaire focused on attitudes toward basic nutrition and was adopted from Farjana *et al.* (2021) [6]. It consisted of 15 statements rated on a 5-point Likert scale. Before implementation, the questionnaire underwent pilot testing to ensure participants' understanding of the items. Based on the pilot test results, modifications were made to the questionnaire to enhance the participants' decision-making process. Additionally, a panel of experts reviewed the revised questionnaire to ensure its relevance to the research topic.

The third part of the questionnaire assessed practices related to basic nutrition concepts. This section was adapted from Nazni & Vimala (2010) [12]. It included questions on various concepts such as attitudes, practices, and sports supplementation. The face and content validity of the questionnaire were established through the expert review process.

Lastly, the fourth part determined the Body Mass Index of the respondents. The researcher employed Cronbach's alpha to evaluate the internal consistency or reliability of the research instrument. Cronbach's alpha is a statistical measure used to assess the extent to which items in a questionnaire or test measure the same construct or dimension. It ranges between 0 and 1, with higher values indicating greater reliability. A value of 1 represents perfect reliability, while 0 shows no reliability. Typically, Cronbach's alpha values of 0.7 or higher are acceptable, while values above 0.8 are considered good for most research studies.

To calculate Cronbach's alpha, the researcher administered the questionnaire and analyzed the collected data to determine the level of internal consistency. This involved comparing the scores of each item in the questionnaire with those of all other things. In this study, Cronbach's alpha coefficient was found to be 0.924, indicating a high level of internal consistency. Moreover, Cronbach's alpha based on standardized items was 0.930, further supporting the reliability of the statements.

2.4 Data Processing and Statistical Treatment

The gathered data were analyzed using several statistical tools. Firstly, frequency and percentage counts were utilized to examine the profile variables of the respondents. Secondly, Weighted Mean was applied to assess the level of Knowledge, Attitudes, and Practices (KAP) concerning basic nutrition. To gauge the level of knowledge, a 4-point Likert scale was used, where scores ranging from 1.00 to 1.74 indicated "Not Knowledgeable About," scores from 1.75 to 2.49 shown "Somewhat Knowledgeable About", scores from 2.50 to 3.24 indicated "Knowledgeable About", and scores from 3.25 to

4.00 indicated "Very Knowledgeable About".

To measure the level of attitudes towards basic nutrition, a 5-point Likert scale was employed. The scale was structured as follows: Scores from 1.00 to 1.79 denoted "Strongly Disagree" scores from 1.80 to 2.59 denoted "Disagree" scores from 2.60 to 3.39 denoted "Undecided" scores from 3.40 to 4.19 denoted "Agree" and scores from 4.20 to 5.00 denoted "Strongly Agree".

Additionally, a 5-point Likert scale was utilized to measure the level of practices related to basic nutrition. This scale was structured as follows: Scores from 1.00 to 1.79 denoted "Very Untrue of me" scores from 1.80 to 2.59 denoted "Untrue of me" scores from 2.60 to 3.39 denoted "Somewhat Untrue of me" scores from 3.40 to 4.19 denoted "True of me," and scores from 4.20 to 5.00 denoted "Very True of me".

Furthermore, the respondents' height and weight were used to calculate the Body Mass Index (BMI) using the formula: BMI = weight (kg) / (height (m))², where weight is measured in kilograms, and height is measured in meters. The BMI results were interpreted using the following scale: BMI less than 18.5, denoted "Underweight," BMI between 18.5 and 24.9, denoted "Normal range," BMI between 25 and 29.9, denoted "Overweight," BMI greater than or equal to 30 denoted "Obese," BMI between 30.0 and 34.9 denoted "Obese Class I," BMI between 35.0 and 39.9 marked "Obese Class II," and BMI greater than or equal to 40 denoted "Obese Class III".

Finally, Correlation and Regression Analysis was conducted to assess the relationship between BMI and KAP on basic nutrition, enabling the examination of how these variables are connected and their potential effects.

3. Results and Discussion

3.1 Level of Knowledge of basic nutrition concepts

According to Table 1, which presents information on weight management, the general weighted mean is 2.89, indicating an average level of knowledge about the statements. Among the statements, the highest mean score of 3.08 was obtained for the statement that increasing protein in the diet is the main dietary change needed when only muscle gain is desired. This suggests strong support for the statement within the context of weight management. Conversely, the statement with the lowest mean score of 2.64 is related to swapping butter for canola spread and the potential fat gain from consuming protein beyond bodily needs. Although still considered knowledgeable, this statement has received less support or relevance than other statements in the table. Increasing protein intake is an essential dietary change when muscle gain is the desired goal. Protein plays a crucial role in muscle protein synthesis and repair. Several studies have demonstrated the positive impact of high protein intake on muscle protein synthesis and muscle mass gain, particularly when combined with resistance exercise[8, 11]. Athletes should aim to consume adequate protein from diverse sources, including lean meats, dairy products, legumes, and plant-based protein sources.

Table 1: Weight Management

Sr. No.	Statement	Weighted Mean	Verbal Interpretation
1.	In endurance sports, having the lowest weight possible benefits performance in the long term	2.91	Knowledgeable About
2.	Increasing protein in the diet is the main dietary change needed when only muscle gain is desired	3.08	Knowledgeable About
3.	Protein eaten more than bodily needs can lead to fat gain	2.76	Knowledgeable About
4.	An increased intake of low-energy foods such as vegetables effectively reduces body fat.	2.97	Knowledgeable About
5.	Swap butter for canola spread (polyunsaturated margarine). Protein eaten more than bodily needs can lead to fat gain	2.64	Knowledgeable About
6.	Exchange yogurts, muesli/granola bars, and fruit snacks for protein bars and shakes can reduce body fat.	2.86	Knowledgeable About
7.	Stop eating carbohydrate-containing foods (e.g., rice and pasta) after 4 pm can reduce body fat.	2.77	Knowledgeable About
8.	A mixed meal with a small-moderate serving of meat and carbohydrate (e.g., a small bowl of pasta with lean mincemeat and vegetable sauce) plus a large side salad is good for lunch and dinner.	3.00	Knowledgeable About
9.	Eat a minimum of 8000 kilojoules (2000 calories) per day to meet the energy requirements.	2.86	Knowledgeable About
10.	Adding eggs to your diet is helpful to lose weight.	3.05	Knowledgeable About
	General Weighted Average	2.89	Knowledgeable About

Table 2 presents the results of a survey measuring the general weighted mean and verbal interpretation of various statements related to macronutrients. The highest mean value in this table is 3.05, which corresponds to statement 5: "Protein is the main source of energy used by muscles during exercise". This indicates that the respondents have a knowledgeable understanding of this concept. On the other hand, the least mean value is 2.54, associated with statement 2: "For athletes, no more than 20g of fat should be eaten per day". Although still categorized as "Knowledgeable About," this lower mean suggests a slightly lower level of understanding than the other statements. The general weighted mean for all the statements combined is 2.81, indicating an overall knowledgeable interpretation of the macronutrient-related statements. Macronutrients play a vital role in meeting the increased energy demands and supporting optimal performance among athletes. Carbohydrates, as the primary fuel source, are crucial for sustaining high-intensity exercise and replenishing glycogen stores. Studies suggest that athletes engaging in moderate to high-intensity endurance training programs may benefit from consuming around 5-6 grams of carbohydrates per kilogram of body weight per day (g/kg/d) [5]. Adequate carbohydrate intake before, during, and after exercise helps to optimize glycogen stores, delay fatigue, and enhance overall performance [20].

Table 2: Macronutrients

Sr. No.	Statement	Weighted Mean	Verbal Interpretation
1.	Fat is required by the body to make cell membranes and molecules involved in immune function	2.80	Knowledgeable About
2.	For athletes, no more than 20g of fat should be eaten per day	2.54	Knowledgeable About
3.	When exercise intensity increases, the relative amount (%) of fat that is burnt to supply the body with fuel increases	2.94	Knowledgeable About
4.	When exercising at low intensities, fat provides almost all the substrate needed to cover energy costs	2.74	Knowledgeable About
5.	Protein is the primary source of energy used by muscles during exercise	3.05	Knowledgeable About
6.	Vegetarian athletes can meet their protein requirements without the use of protein supplements	2.75	Knowledgeable About

7.	A well-trained athlete needs more protein than a young athlete who is just beginning training	2.91	Knowledgeable About
8.	Protein absorption in a single sitting is limited	2.75	Knowledgeable About
9.	A balanced diet with adequate kilojoules/calories (energy) should meet all protein needs	2.94	Knowledgeable About
10.	5-6g carbohydrate per kg body weight is recommended for an athlete undertaking a moderate to high-intensity endurance training program for one to three hours daily.	2.72	Knowledgeable About
	General Weighted Average	2.81	Knowledgeable About

Table 3 presents a range of statements related to micronutrients, along with their weighted means and verbal interpretations. The highest mean value in the table is 3.04, corresponding to the statement that Vitamin C acts as an antioxidant in the body. This suggests that respondents viewed this statement as highly knowledgeable about the topic. On the other hand, the least mean value is 2.55, which pertains to the statement regarding the optimal calcium intake for athletes aged 15 to 24 years being 500 mg. This indicates that the respondents considered this statement less knowledgeable or less accurate than the others. The general weighted average of all the statements is 2.84, indicating an overall level of knowledgeability among the respondents for the given micronutrient statements. Micronutrients are essential components of our diet that are required in small amounts but play crucial roles in maintaining optimal health and well-being. These include vitamins and minerals, which are involved in various physiological processes within the body. Calcium, the largest structural component of bone crystals, is essential for maintaining strong and healthy bones [22].

Table 3: Micronutrients

Sr. No.	Statement	Weighted Mean	Verbal Interpretation
1.	Calcium is the largest structural component of bone crystals	3.02	Knowledgeable About
2.	Vitamin C acts as an antioxidant in the body	3.04	Knowledgeable About
3.	Thiamine (Vitamin B1) is required for the efficient delivery of oxygen to muscles	2.77	Knowledgeable About
4.	The main role of Iron is the conversion of food into usable energy	2.80	Knowledgeable About
5.	Meat, Chicken, and Fish are the best sources of zinc	2.91	Knowledgeable About
6.	Wholegrain foods are the best sources of vitamin C	2.65	Knowledgeable About
7.	Athletes have increased magnesium needs due to losses in sweat	2.73	Knowledgeable About
8.	A physically fit person eating a nutritionally adequate diet can improve their performance by eating more vitamins and minerals	3.01	Knowledgeable About
9.	Vitamins provide the body with energy (kilojoules/calories)	2.88	Knowledgeable About
10.	The optimal calcium intake for athletes aged 15 to 24 years is 500 mg	2.55	Knowledgeable About
	General Weighted Average	2.84	Knowledgeable About

In Table 4 the general weighted mean for the supplementation statements is 2.81, indicating that overall, the respondents are knowledgeable about the statements regarding supplementation. Among the individual statements, the highest mean is 3.07, corresponding to the statement, "Athletes should routinely supplement Vitamin C". This suggests that the respondents have a relatively high level of knowledge and agreement regarding the importance of Vitamin C supplementation for athletes. On the other hand, the statement with the least mean is 2.59, which pertains to the use of salt tablets by athletes experiencing cramps during exercise. Although the mean is still above 2 (indicating some level of agreement), there might be less consensus or knowledge regarding the effectiveness of salt tablets for cramp prevention. One commonly studied supplement is Vitamin C, which is believed to have antioxidant properties and support immune function. Research has shown that athletes in intense physical training may benefit from routine Vitamin C supplementation to counteract oxidative stress and reduce the risk of upper respiratory tract infections[7].

Table 4: Supplementation

Sr. No.	Statement	Weighted Mean	Verbal Interpretation
1.	Athletes should routinely supplement Vitamin C	3.07	Knowledgeable About
2.	B Vitamins should be taken when feeling low in energy	2.82	Knowledgeable About
3.	Salt tablets should be used by athletes that get a cramp during exercise	2.59	Knowledgeable About
4.	Iron tablets should be taken when a player feels extremely tired and is pale	2.85	Knowledgeable About
5.	The purity and safety of all supplements are tested before sale.	3.06	Knowledgeable About
6.	Supplement labels may contain false or misleading information.	2.84	Knowledgeable About
7.	Creatinine reduces the perceived effort of exercise by acting on the central nervous system	2.68	Knowledgeable About
8.	Caffeine improves the efficiency of muscles at a given rate of oxygen delivery	2.89	Knowledgeable About
9.	Beetroot Juice (nitrates) decreases muscle breakdown and reduces muscle soreness	2.64	Knowledgeable About
10.	Beta-Alanine produces carnosine, a protein that can buffer (“Soak up”) acid by-products produced during high-intensity activity	2.64	Knowledgeable About
	General Weighted Average	2.81	Knowledgeable About

In Table 5, various statements related to alcohol are presented, along with their weighted mean scores and verbal interpretations. The highest mean score in the table is 2.87, which corresponds to the statement that highlights that when consumed as part of the diet, pure alcohol (ethanol) contains calories/kilojoules and can lead to weight gain. This suggests that respondents perceive this statement to be highly accurate or influential. On the other hand, the least mean score is 2.50, associated with the statement implying that it is acceptable for individuals who abstain from drinking throughout the week to consume five or more drinks on a Friday or Saturday night. This suggests a relatively lower level of agreement or recognition among respondents regarding the acceptability of such drinking behaviour. Overall, the general weighted mean of 2.65 indicates that respondents in the study demonstrate a knowledgeable understanding of the statements related to alcohol. Alcohol contributes to caloric intake and can contribute to weight gain [4].

Table 5: Alcohol

Sr. No	Statement	Weighted Mean	Verbal Interpretation
1.	When consumed as part of the diet, pure alcohol (ethanol) contains calories/kilojoules and, therefore, can lead to weight gain	2.87	Knowledgeable About
2.	. If someone does not drink at all during the week, it is okay for them to have five or more drinks on a Friday or Saturday night	2.50	Knowledgeable About
3.	Drinking large amounts of alcohol can reduce recovery from injury	2.62	Knowledgeable About
4.	Alcohol has been shown to increase urinary losses during post-exercise recovery	2.59	Knowledgeable About
5.	For individuals who choose to drink alcohol, to reduce the risk of alcohol-related harm over a lifetime, no more than 4 standard drinks should be consumed per day.	2.68	Knowledgeable About
	General Weighted Average	2.65	Knowledgeable About

3.2 Level of Attitude towards basic nutrition

The attitudes towards basic nutrition were assessed using a survey of 15 statements. The highest mean value was found for the statement, "I acknowledge the importance of drinking at least 8 glasses or 2 liters of water daily," with a weighted mean of 4.26, indicating a strong agreement with the importance of hydration. On the other hand, the statement with the lowest mean value was "I perceive healthy food as being expensive," with a weighted mean of 3.38. Despite this, there was still an agreement that healthy food is important. The general weighted average for all the statements combined was 3.93, indicating an overall agreement with the importance of basic nutrition. These results suggest that the respondents generally recognize the significance of various aspects of nutrition and prioritize maintaining a healthy lifestyle. These results align with existing research that emphasizes the importance of hydration for overall health and the positive impact of breakfast on cognitive function [8 17].

Table 6: Level of attitudes towards basic nutrition

Statement		Weighted Mean	Verbal Interpretation
1.	Having breakfast makes it easier for me to learn.	4.18	Agree
2..	Incorporating various foods into my diet ensures I get all the necessary nutrients	4.02	Agree
3.	I perceive healthy food as being expensive.	3.38	Agree
4.	I understand the importance of consuming 2-3 servings of fruit daily.	3.89	Agree
5.	I am recommended to consume 1 cup of leafy vegetables daily.	3.82	Agree
6.	I should aim to consume half a cup of vegetables daily.	3.76	Agree
7.	It is advised to have 2-3 servings of protein per day.	3.83	Agree
8.	I recognize that vegetables and fruits are essential for maintaining a healthy and fit body.	4.21	Agree
9.	I believe that animal protein is superior to vegetable protein.	3.75	Agree
10.	Consuming fish is beneficial for my health.	4.12	Agree
11.	Drinking one glass or 150 ml of milk daily improves my overall well-being.	3.89	Agree
12.	I acknowledge the importance of drinking at least 8 glasses or 2 liters of water daily.	4.26	Agree
13.	It is recommended to use iodized salt when cooking food.	3.54	Agree
14.	I understand the need to monitor my weight at least once a month.	4.05	Agree
15.	I recognize the importance of regularly cutting and cleaning my nails to maintain good health.	4.20	Agree
	General Weighted Average	3.93	Agree

3.3 Respondents' practices towards basic nutrition

In Table 7, the general weighted mean is 3.25, which indicates that, on average, the individual's responses lean towards the "Somewhat Untrue of me" category. This means that overall, the person tends to exhibit behaviors or practices only partially aligned with basic nutrition principles. Among the statements provided, the highest mean is 3.84, which corresponds to the response "True of me" for the statement regarding the consumption of lean sources of protein to support muscle repair and growth as part of their athletic nutrition plan. On the other hand, the least mean is 2.86, which represents the response "Somewhat Untrue of me" for the statement on consuming energy gel during exercise. This suggests that, on average, the individual engages in this practice less frequently than others. Adequate protein intake is crucial for athletes as it plays a vital role in muscle recovery and adaptation [14]. Therefore, the individual's adherence to this practice is commendable.

Table 7: Practices towards basic nutrition

Sr. No	Statement	Weighted Mean	Verbal Interpretation
1.	Dietary pattern change at the time of competition.	3.41	Somewhat Untrue of me
2.	I skip meals before a competition.	2.87	Somewhat Untrue of me
3.	I consume sports drinks every day before practising.	3.23	Somewhat Untrue of me
4.	I practice carbohydrate loading before a competition.	3.41	Somewhat Untrue of me
5.	I consume a polymer drink (12g of glucose/100 ml) during exercise.	3.19	Somewhat Untrue of me
6.	I consume energy gel during exercise.	2.86	Somewhat Untrue of me
7.	I consume raisins or sultanas at the time of exercise.	2.88	Somewhat Untrue of me
8.	I practice eating bananas during exercise	3.57	True of me
9.	I consume isotonic sports drinks (6g/100ml) during exercise.	3.21	Somewhat Untrue of me
10.	I consume lean sources of protein (such as chicken, fish, or tofu) to support muscle repair and growth as part of your athletic nutrition plan	3.84	True of me
	General Weighted Average	3.25	Somewhat Untrue of me

3.4 Distribution of body mass index (BMI) among athletes

The distribution of Body Mass Index (BMI) among the respondents in Table 8 reveals some interesting patterns. Most respondents, constituting 77.00%, fall within the normal range of BMI (18.5-24.9 kg/m2). The data also shows that 9.90% of the respondents fall into the overweight category. Moreover, 2.30% of the respondents are classified as underweight, a group that may have insufficient knowledge about proper

nutrition or face barriers to accessing balanced diets [1].

In addition to these categories, the data indicates that some respondents are in various stages of obesity. While multiple factors can influence obesity, the prevalence of respondents falling into different obesity categories is noteworthy. For instance, 0.70% of respondents are in Obese Class II (35.0 – 39.9 kg/m2), and 6.30% are in Obese Class III (≥ 40 kg/m2) (Table 8). This could indicate a need for targeted interventions and education on healthy eating and nutrition to combat the rising obesity rates [2].

Table 8: Distribution of body mass index (BMI) among athletes

Body Mass Index	Frequency	Percentage
Underweight (< 18.5 kg/m2)	7	2.30
Normal range (18.5-24.9 kg/m2)	234	77.00
Overweight (25.0-29.9 kg/m2)	30	9.90
Obese (≤ 30 kg/m2)	5	1.60
Obese Class I (30.0-34.9 kg/m2)	7	2.30
Obese Class II (35.0-39.9 kg/m2)	2	.70
Obese Class III (≥ 40 kg/m2)	19	6.30
General Weighted Average	304	100.00

3.5 Level of respondents' knowledge, attitude, and practices towards basic nutrition exerts a significant effect on the distribution of body mass index (BMI) among athletes

As can be gleaned from the results, the obtained Beta coefficient of -.310 (Macronutrients) suggests that the only level of knowledge management on basic nutrition significantly affects the distribution of the body mass index. The B coefficient results indicate that in every unit increase in knowledge management on basic nutrition will mean a 0.738 decrease in the distribution of the body mass index.

Analysis of variance revealed an F ratio equal to 4.21 with an associated probability value equal to .001. The null hypothesis can be rejected since the p-value is less than the significant value set at 0.05. Therefore, it may safely be concluded that the level of knowledge management of respondents on basic nutrition exerts a significant effect on the distribution of body mass index.

Table 9: Regression analysis of knowledge management on basic nutrition on the distribution of body mass index (BMI) among athletes

Variables	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	T	Sig.	
(Constant)	4.213	.442		9.532	.000	
Weighted Management	-.396	.206	-.156	-1.924	.055	
Macronutrients	-.738	.263	-.310	-2.807	.005	
Micronutrients	.251	.263	.112	.955	.340	
Supplementation	.253	.268	.112	.942	.347	
Alcohol	.039	.158	.021	.246	.806	
ANOVA						
Variables	**Sum of Squares**	**DF**	**Mean Square**	**F**	**Sig**	**Interpretation**
Regression	36.000	5	7.200	4.208	.001	**Significant**
Residuals	509.918	298	1.711			
Total	545.918	303				
R Square	.006					
R	.257					

Table 10 presents a regression analysis examining the relationship between attitudes toward basic nutrition and the Body Mass Index (BMI) distribution among athletes. The table shows unstandardized and standardized coefficients for each variable and their corresponding standard errors, t-values, and significance levels.

The constant coefficient is 3.737, indicating the expected value of BMI when attitudes towards basic nutrition are zero. The coefficient for attitudes toward basic nutrition is -0.311, with a standard error of 0.115 and a beta value of -0.153. The negative beta value suggests that more negative attitudes towards basic nutrition are associated with lower BMI among athletes.

Moving on to the ANOVA (analysis of variance) section, the table presents the sum of squares, degrees of freedom (DF), mean squares, F-value, and significance level for the regression and residuals. The sum of squares for the regression is 12.848, with 1 degree of freedom, resulting in a mean square of 12.848. The F-value of 7.279 is significant at the 0.007 level, indicating that the regression model is statistically significant in explaining the variance in BMI distribution among athletes. However, the R Square value of 0.024 suggests that only approximately 2.4% of the variability in BMI can be explained by attitudes towards basic nutrition.

Finally, the table shows that the overall R-value is 0.153, representing the correlation between attitudes toward basic nutrition and BMI distribution among athletes. While this value is positive, it indicates only a weak correlation.

The results suggest that attitudes toward basic nutrition have a statistically significant but weak impact on the distribution of BMI among athletes. Other factors not considered in this analysis might play a more substantial role in determining BMI among athletes.

Table 10: Regression analysis of attitudes of respondents towards basic nutrition on the distribution of body mass index (BMI) among athletes

Variables	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	T	Sig.	
(Constant)	3.737	.459		8.146	.000	
Attitudes Toward Basic Nutrition	-.311	.115	-.153	-2.698	.007	
ANOVA						
Variables	Sum of Squares	DF	Mean Square	F	Sig	Interpretation
Regression	12.848	1	12.848	7.279	.007	**Significant**
Residuals	533.070	302	1.765			
Total	545.918	303				
R Square	.024					
R	.153					

Table 11 presents a regression analysis investigating the relationship between practices towards basic nutrition and the distribution of Body Mass Index (BMI) among athletes. The table displays unstandardized and standardized coefficients and their corresponding standard errors, t-values, and significance levels.

The constant coefficient is 2.630, indicating the expected value of BMI when practices towards basic nutrition are zero. The coefficient for attitudes toward basic nutrition is -0.035, with a standard error of 0.097 and a beta value of -0.021. The beta value is negative, suggesting that more negative practices towards basic nutrition are associated with lower BMI among athletes.

The ANOVA section of the table shows the sum of squares, degrees of freedom (DF), mean squares, F-value, and significance level for the regression and residuals. The sum of squares for the regression is 0.235, with 1 degree of freedom, resulting in a mean square of 0.235. However, the F-value of 0.130 is not statistically significant at the 0.719 level. This indicates that the regression model needs to be revised to explain a significant amount of the variability in BMI distribution among athletes based on practices towards basic nutrition.

The R Square value of 0.000 further supports this finding, indicating that practices towards basic nutrition explain almost no variability in BMI among athletes. Additionally, the overall R-value is 0.021, representing the correlation between practices towards basic nutrition and BMI distribution among athletes. However, this value is close to zero, suggesting an extremely weak relationship.

The results from Table 11 indicate that practices towards basic nutrition have no significant impact on the distribution of BMI among athletes in this study. The lack of statistical significance and very low R Square value suggest that other factors not accounted for in this analysis are likely more influential in determining BMI among athletes.

Table 11: Regression analysis of practices of respondents towards basic nutrition on the distribution of body mass index (BMI) among athletes

Variables	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	T	Sig.	
(Constant)	2.630	.324	-.021	8.128	.000	
Attitudes Toward Basic Nutrition	-.035	.097		-.361	.719	
ANOVA						
Variables	Sum of Squares	DF	Mean Square	F	Sig	Interpretation
Regression	.235	1	.235	.130	.719	Not Significant
Residuals	545.683	302	1.807			
Total	545.918	303				
R Square	.000					
R	.021					

3.6 Nutrition training programs to develop the student-athletes Knowledge, Attitude, and Practices

Proper nutrition plays a crucial role in the overall health, performance, and well-being of student-athletes. Recognizing the significance of this aspect, it is essential to implement a comprehensive nutrition training program tailored specifically to the needs of these young athletes. Such a program aims to enhance their knowledge, attitudes, and practices related to nutrition, aiming to promote optimal health, performance, and body mass index (BMI) distribution.

The nutrition training program outlined here is designed to address the specific areas of improvement identified through extensive research and analysis. This program aims to equip student-athletes with the necessary tools and information to make informed decisions regarding their nutrition and dietary habits by focusing on knowledge enhancement, attitude improvement, and practice modification.

To begin, the program places a strong emphasis on knowledge enhancement. Student-athletes will receive comprehensive education on macronutrients and micronutrients, ensuring they understand the roles and importance of these essential nutrients in their athletic performance. Specific attention will be given to areas where knowledge gaps were identified, ensuring that athletes have a well-rounded understanding of nutrition-related concepts.

In addition to knowledge enhancement, the program aims to improve attitudes toward basic nutrition. By addressing common misconceptions and providing evidence-based information, student-athletes will develop positive mindsets and attitudes toward healthy food choices, hydration, and sustainable eating habits. Motivational talks, group discussions, and success stories from athletes who have achieved positive outcomes through nutrition will be incorporated to inspire and reinforce positive attitudes.

Furthermore, the program strongly emphasizes translating knowledge and attitudes into practical practices. Through personalized dietary guidelines, meal planning tips, and debunking myths around ineffective or potentially harmful supplementation, student-athletes will gain practical strategies to implement nutritious practices in their daily lives. Collaboration with sports teams' chefs or cafeteria staff will ensure that healthy and nutritious food options are readily

available, supporting the adoption of healthy eating habits.

Continuous program evaluation will be conducted to assess the effectiveness of the training program. Surveys, quizzes, interviews, and periodic BMI distribution monitoring will help measure improvements in knowledge, attitudes, practices, and body composition among student-athletes. The program will be modified and adapted based on the feedback and results obtained to ensure its ongoing effectiveness.

In conclusion, the nutrition training program presented here seeks to empower student-athletes with the knowledge, attitudes, and practices necessary to optimize their nutrition, enhance their athletic performance, and achieve a balanced BMI distribution. By addressing key areas of improvement, providing comprehensive education, and fostering positive attitudes and practical skills, this program aims to create a supportive environment where student-athletes can thrive and make informed choices regarding their nutrition and overall well-being.

Table 12: Nutritional Training Programs

Component	Objective	Strategies/Activities	Person Involved	Budget Allocations
Knowledge Enhancement	Provide comprehensive education on macronutrients and micronutrients to ensure a solid understanding of their roles and importance in athletic performance.	Conduct interactive sessions and workshops. Utilize educational materials such as hand-outs and infographics. Engage sports nutritionists to deliver specialized lectures and answer athlete-specific questions.	Nutritionists Sports coaches Sports nutrition experts	Budget for experts' fees, educational materials, and workshops.
	Focus on key areas where knowledge gaps were identified.			
Attitude Improvement	Emphasize the importance of positive attitudes towards basic nutrition and its impact on overall health and performance.	Address common misconceptions with evidence-based information. Organize motivational talks and success stories from athletes. Conduct group discussions.	Sports psychologists Motivational speakers	Budget for speakers' fees and organizing events.
	Encourage a positive mindset towards hydration, healthy food choices, and sustainable eating habits.			
Practice Modification	Implement practical strategies to help student-athletes translate knowledge and attitudes into daily practices.	Provide personalized dietary guidelines and meal planning tips. Ducate on appropriate supplementation practices and debunk myths. Promote lean sources of protein consumption and discourage unhealthy practices. Collaborate with sports teams' chefs or cafeteria staff for healthy food options. Practical demonstrations and cooking classes. Grocery store visits.	Nutritionists Coaches Chefs or cafeteria staff	Budget for personalized dietary plans, educational materials, and practical classes.
Program Evaluation	Conduct regular assessments to measure improvements in knowledge, attitude, and practices among student-athletes.	Use surveys, quizzes, or interviews to evaluate knowledge gains and attitude shifts. Monitor BMI distribution periodically. Modify the program based on feedback and results.	Program evaluators. Nutritionists	Budget for assessment tools and program adjustments.
Additional Considerations	Incorporate practical demonstrations, cooking classes, or grocery store visits to enhance practical skills related to nutrition and food selection.	Provide ongoing support through individual consultations with nutrition experts or coaches. Encourage peer-to-peer support and the formation of nutrition-focused support groups or clubs.	Nutritionists Coaches Support group facilitators	Budget for practical classes, consultations, and support groups.

4. Conclusions

Based on the findings of the study, several conclusions can be drawn. First, the respondents reasonably knew basic nutrition concepts, such as weight management, macronutrients, micronutrients, supplementation, and alcohol. However, there is room for improvement and further education in these areas. Second, the respondents generally held a positive attitude towards basic nutrition, particularly its importance in their lives, although specific attitudes varied. This highlights the need for targeted interventions to address attitudes that may impact dietary behaviours. Third, the respondents' practices towards basic nutrition principles were somewhat inconsistent, leaning towards "Somewhat Untrue of me." This suggests a gap between knowledge and implementation of healthy nutrition practices, which could be addressed through focused strategies. Fourth, most athletes had a BMI within the normal range, indicating a generally healthy weight status. However, a small percentage fell into categories like overweight and underweight, warranting personalized guidance to support their nutritional needs.

The study also explored the relationship between knowledge, attitudes, and practices toward basic nutrition and BMI distribution among athletes. While higher knowledge levels in weight management and macronutrients were associated with lower BMI values, the association was not statistically significant. On the other hand, more positive attitudes towards basic nutrition were significantly linked to lower BMI values. However, overall practices towards basic nutrition did not significantly impact BMI distribution among athletes.

Based on the findings and the presented information, the study supports the relevance of the Knowledge, Attitude, and Practices (KAP) theory in understanding the potential influence of knowledge and attitudes on BMI among athletes. The results suggest that enhancing knowledge and fostering positive attitudes towards basic nutrition contribute to maintaining a healthy BMI among athletes. However, further research is needed to explore additional factors that may impact BMI and to develop targeted interventions to promote healthier dietary habits in this population.

5. Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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