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Original Article

The relationship between nutritional knowledge and practice with nutrition counseling and education in adult athletes in Ahvaz, 2017

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ABSTRACT

Introduction: The aim of this study was to evaluate the relationship between nutritional knowledge and practice with nutrition counseling and education in adult athletes in Ahvaz, 2017.

Methods: In this cross-sectional study, 550 male and female athletes were randomly selected from 4 regions in Ahvaz, Iran. A questionnaire, including demographic information, sport information sources, nutritional knowledge and practice level, was filled by athletes. Chi-square and Pearson tests were used to examine the relationship between the qualitative and quantitative variables, respectively. Independent sample t-test and one-way analysis of variance (ANOVA) were used to compare the mean differences between two or several groups, respectively.

Results: Of the 11.8% of athletes who received nutrition counseling, 43.2% actively obtained nutritional information, including the contribution of coach (19.2%), internet (12%), nutritionists (9.2%), and family 3.8%. The mean score for knowledge and nutritional practice were 29.5 ± 5.36 and 10.69 ± 2.04 in men and 29.65 ± 3.96 and 10.95 ± 1.8, in women respectively. The mean score for knowledge and practice were significantly higher in subjects who received nutrition counseling ($p < 0.001$). The highest score for knowledge and practice were reported among bodybuilders. There was a direct and positive correlation between nutrition knowledge ($P = 0.01$, correlation coefficient = 0.1) and nutritional practice ($P = 0.003$, correlation coefficient = 0.12) and educational level. The knowledge level and practice increased positively with increase in age ($p = 0.001$, correlation coefficient = 0.15).

Conclusion: The findings of this study suggest that the knowledge and practice of athletes may be increased through providing appropriate nutritional counseling and increasing of the education level.

Introduction

Proper nutritional knowledge and adequate nutrient intake is considered as key factors to promote athletic practice (1). Sports dietitians often focus on nutrition education to improve awareness and compliance with dietary guidelines (2). It is indicated that physical activity, athletic practice, and recovery from exercise are improved by a healthy diet (3). Nutrition is an important component of any physical fitness program. A good diet can reduce fatigue, allowing an athlete to train and compete longer or recover faster following training sessions (4). Although the importance and application of good nutrition have been well proved, nutritional inadequacies are observed among many athletes. Several studies suggested that poor nutritional

knowledge and inadequate nutritional counseling may result in a number of dietary mistakes among athletic population (5, 6). Previous studies reported that many athletes have low dietary intakes, that may be due to lack of time, financial resources, cooking skills, and access to cooking equipment (7). Food choices may also be influenced by cultural background, taste preferences and appetite, as well as nutrition knowledge and attitude (8). Coaches are regarded as important sources of information, which is effective in terms of food and supplement choices, and dietary habits in young athletes. Several studies showed that most coaches have an insufficient level of nutrition knowledge to properly counsel athletes as they have not received specific or formal nutrition education (9). It was reported that trainers have greater influence on attitude and intention of adolescents regarding supplements usage compared to parents (10). Adolescents from low income communities have little access to educational resources and may obtain insufficient nutrition knowledge regarding healthy decisions in the choice of supplements (11). Generally, findings of previous studies revealed that female students and athletes had higher nutritional knowledge scores and have better dietary habits and eating attitudes compared to male athletes. In addition, female athletes were more concerned about their nutrition and health compared to their male counterparts (12). Particularly, females tend to use weight-loss strategies including low-calorie diets. Furthermore, females have a greater desire for dieting and losing weight, while males want to achieve their ideal V-shaped figure and gain additional muscles (13). Scientific evidence on the physiological effects of protein supplements is inconclusive. Several studies suggest that only a small subgroup of population may benefit from protein supplementation depending on factors including age, training status, type of physical activity, body composition, time, and volume of consumption (14, 15). Consumption of protein supplements with a proper proportion of amino acids may be useful among individuals undergoing intensive training (2-3 h of intensive exercise, 5-6 times per week). Furthermore, according to common guidelines, protein supplementation is unnecessary in healthy adults participating in general fitness programs, e.g., exercising 30-40 min per day, three days per week (16). Dietary recommendations indicate that most non-professional recreational sportsmen can meet their nutritional requirements through consuming a balanced and nutrient-dense diet (17). Despite these recommendations, using supplements was considerably increased in the past 10 years (18). Some supplements consist of excessive doses of potentially toxic ingredients, whereas others do not contain significant amounts of the ingredients listed on the label (19). Studies reported that the number of athletes interested in sports nutrition and nutritional information is increasing. However, there is little nutritional knowledge about the role of dietary supplements, protein, vitamins and minerals in the body among athletes (20). Therefore, this study was designed to assess the relationship between nutritional knowledge and practice with nutrition counseling and education in adult athletes in Ahvaz, 2017.

Methods

In this cross-sectional study, 550 male and female semi-professional athletes were recruited from 5 women's gyms and 5 men's gyms from four regions of Ahvaz (Golestan, Kianpars, Naderi, Saadi), Iran. The research protocol was approved by the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences (IR.AJUMS.REC.1396.178). The inclusion criteria were: male and females between 18 and 60 years old and performing at least 3 to 4 days of regular weekly exercise (including body building, football, volleyball, and basketball) for a minimum of 1.5 hours. All subjects were asked to sign a written informed consent before participating in the study. All subjects were asked to complete a two-part questionnaire. The first part of questionnaire included demographic (age, sex, duration of exercise, type of sport) and anthropometric information (height, body weight and body mass index). The second part of questionnaire, was a 30-item questionnaire (21), which included about the source of nutritional information and subject's awareness of food labels (3 questions), level of knowledge (22 questions) and level of athletes' nutritional practice (5 questions). The demographic and knowledge related questions were completed by the subjects, and the practice section was completed by the researcher through interview. Subjects were divided into three categories, including weak, moderate and desirable levels, based on the scores of knowledge and practice. For evaluation of the level of knowledge, each positive answer was given a score of 2, 1 score was given to "I'm not sure", while a negative answer was scored zero. The scores were divided into 4 quartiles. The first quartile was considered as weak, the second and third quartiles were considered as moderate, and the fourth quartile was considered as desirable level of knowledge. In terms of practice, the scores ranged from 0 to 10. Nutrition attitude scoring was made as follows; score of 1 was allocated to scores between 0 and 5, the score of 2 for scores between 5 and 9; and score of 3 for 10. The minimum scores of knowledge and practice levels were 0 and 5, and the maximum scores were 44 and 15, respectively. In order to assess the validity of the

questionnaire, 10 nutritionists were asked to review the questionnaire and make necessary corrections. Moreover, in order to assess the reliability, the questionnaire was completed by 20 athletes twice in 20 days. The reliability coefficients of the knowledge section were calculated using test-retest (76%) and the reliability of the practice section was calculated using Cronbach's alpha (83%). In this study, body weight was measured by a body composition monitor with digital scale. A measuring tape was used to measure height. The statistical package for social sciences (SPSS) software version 19 was used for statistical analysis. The chi-square test was used to examine the relationship between the qualitative variables. The Pearson correlation coefficient was also used to evaluate the relationship between quantitative variables. Besides, the Spearman correlation coefficient was also used to evaluate the relationship between quantitative and qualitative variables. Independent sample t-test and one-way analysis of variance (ANOVA) were used to compare the mean differences between two groups and several groups, respectively. The significance level was set at $P < 0.05$.

Results

Out of 550 athletes who participated in the present study, 50 were excluded from the study due to lack of cooperation. Of the remaining 500 athletes, 310 were male with the mean age of 24.21 ± 5.41 years and mean duration of activity of 3.46 ± 2.72 years, and 190 were female with the mean age of 30.63 ± 10.07 years and mean duration of activity of 3.09 ± 2.99 years. A total of 210 bodybuilders, 130 soccer players, 80 basketball players, and 80 volleyball players. The education level was higher in women compared to men (Table 1). Out of 11.8% of the athletes who received nutritional counseling, 43.2% actively obtained nutritional information, 19.2% contributed with coach, 12% from internet, 9.2% from nutritionists, and 3.8% from family. About 31.2% of the subjects paid attention to food labels, 15.2% noted the calorie content, 8.2% noted the protein, 4.8% fat, 2% carbohydrate and 0.8% the vitamins and minerals contents. The amount of protein in food was the most important issue reported by the subjects (Table 2). Weak level of nutrition knowledge was observed in 1.6% of male subjects while moderate and desirable nutrition knowledge was observed in 8% and 22.6% of male subjects respectively. Weak level of nutrition knowledge was observed in 87.4% of women while moderate and desirable level of nutrition knowledge was observed each in 12.6% of female subjects. The level of practice in 2.3% of men was weak, in 43.5% was moderate and in 54.2% was desirable, while nutrition practice was weak among 1.1% of female subjects, moderate in 34.7% and desirable in 64.2% of female subjects (Table 1). The mean nutrition knowledge and practice scores of female athletes were higher than males, but the difference was not statistically significant ($p = 0.13$ for knowledge, and $p = 0.72$ for practice). Body builders obtained the highest scores in nutrition knowledge and practice. The mean knowledge ($p < 0.001$) and nutritional practice ($p < 0.001$) of those who received nutritional counseling was significantly higher compared to other subjects. The mean knowledge of overweight subjects ($p = 0.4$) and the mean practice of obese subjects ($p = 0.12$) were higher than that of non-overweight or obese subjects, but the differences were not statistically significant (Table 3). The intra-group comparison was performed in terms of nutrition knowledge and practice according to the education, type of sport and age. In terms of nutritional knowledge, there was a significant difference between athletes with bachelor's degree and those with a diploma and under diploma degrees ($p = 0.019$), and a significant difference between bodybuilders and soccer players ($p = 0.007$) as well as basketball players ($p < 0.001$). Furthermore, in terms of nutritional practice, there was a significant difference between bodybuilders and basketball players ($p = 0.007$) (Table 4). Spearman Correlation coefficient showed a direct and positive correlation between nutrition knowledge ($P = 0.01$, correlation coefficient = 0.1) and nutritional practice ($p = 0.003$, correlation coefficient = 0.12) and educational level (Table 5). Furthermore, there was a positive correlation between age and knowledge ($p = 0.001$, correlation coefficient = 0.15) and nutritional practice ($p = 0.12$, correlation coefficient = 0.06). The subjects who aged between 51 and 60 years had the highest knowledge and practice scores, while subjects who aged between 18 and 34 years had the lowest scores. Pearson correlation coefficient showed a direct and positive relationship between knowledge level and nutritional practice ($p < 0.001$, correlation coefficient = 0.39). There was also a positive correlation between duration of activity and knowledge ($p < 0.001$, correlation coefficient = 0.17) and nutritional practice ($p = 0.1$, correlation coefficient = 0.07), but this relationship was not significant for nutrition practice (Table 5).

Discussion

The findings of the present study revealed that 11.8% of athletes received nutrition counseling. The mean score of knowledge and nutritional practice were higher in female athletes compared to male athletes. The mean score of knowledge and practice were signifi-

cantly higher in subjects who received nutrition counseling. The highest score of knowledge and practice was reported among bodybuilders. There was a direct and positive correlation between knowledge score and nutritional practice and the education level of subjects. The level of knowledge and practice increased positively with increase in age. Generally, all athletes need a healthy nutrition to promote their performance (22). In this study, the level of knowledge of female athletes was higher compared to male athletes, which was consistent with the findings of some previous studies (23-25). Contrary to the findings of this study, Webb and Beckford in 2014 showed that the nutritional knowledge was higher in male athletes compared to female athletes (26). On the other hand, Montecalbo et al. stated that the mean score of nutritional knowledge of male and female athletes did not significantly differ and was identical in both groups (27). The findings of the current study suggest that paying attention to health status and appearance, obtaining nutritional information from nutritionists and club instructors, and higher level of literacy may be considered as the reasons for

Table 1. Comparison of variables according to the sex

Variable \ Sex	Female		Male	
	Frequency	Percent	Frequency	Percent
Type of sport				
Football	30	15.8	100	32.3
Bodybuilding	100	52.6	110	35.5
Volleyball	30	15.8	50	16.1
Basketball	30	15.8	50	16.1
Total	190	100	310	100
BMI				
Underweight	11	5.8	17	5.5
Normal	101	53.2	182	58.7
Overweight	58	30.5	86	27.7
Obese	20	10.5	25	8.1
Total	190	100	310	100
Education				
Diploma and sub-diploma	94	49.5	208	67.1
Bachelor	79	41.6	88	28.4
Master's and Ph.D.	17	8.9	14	4.5
Total	190	100	310	100
Knowledge				
Weak	0	0	5	1.6
Moderate	166	87.4	235	75.8
Desirable	24	12.6	70	22.6
Total	190	100	310	100
Practice				
Weak	2	1.1	7	2.3
Moderate	66	34.7	135	43.5
Desirable	122	64.2	168	54.2
Total	190	100	310	100
Age (Mean±SD; Year)	30.63 ± 10.07		24.21 ± 5.41	
Duration of activity (Mean±SD; Year)	3.09 ± 2.99		3.46 ± 2.72	

having a high score of knowledge and practice among women. This finding was in contrast with the findings of the study conducted by Basmi et al. which showed that university athletes who attended sports Olympiad had poor nutritional knowledge and attitudes and had a moderate level of practice (28). It is suggested that university athletes did not exercise professionally despite their high level of literacy and did not notice the nutrition information. In another study by Lee et al. in South Korea, it was found that athletes had a moderate and low level of nutritional knowledge and practice, which reflected the need for more nutritional education. These findings were not consistent with the findings of the current study (29). Furthermore, there was a significant and positive relationship between knowledge and practice in this study, but the correlation was not strong.

Table 2. Comparison of nutritional information sources of athletes according to the type of sport

Question		Football		Body building		Volleyball		Basketball		X^2	P value
		F (N)	P (%)	F (N)	P (%)	F (N)	P (%)	F (N)	P(%)		
Do you receive nutrition counseling?	Yes (N = 59)	14	10.8	33	15.7	8	10	4	5	0.11	0.07
	No (N = 441)	116	89.2	177	84.3	72	90	76	95		
Does actively search for nutritional information?	Yes (N = 216)	51	39.2	116	55.2	30	37.5	19	23.81	0.22	< 0.001
	No (N = 284)	79	60.8	94	44.8	50	62.5	61	76.3		
What is the source of your nutritional information?	Coach (N = 96)	13	24.5	56	46.7	17	54.8	10	55.6	0.34	0.002
	Internet (N = 60)	21	39.6	32	26.7	4	12.9	3	16.7		
	Nutritionist (N = 46)	10	18.9	29	24.2	4	12.9	3	16.7		
	Family (N = 19)	9	17	2	1.7	6	19.4	2	11.1		
Do you read nutrition labels on food?	Yes (N = 156)	31	24	93	44.5	17	21.3	15	18.8	0.23	< 0.001
	No (N = 328)	94	72.9	111	53.1	61	76.3	62	77.5		
	I do not know what the label is (N = 14)	4	3.1	5	2.4	2	2.5	3	3.8		
What is the type of nutrition label you reviewed?	Calorie (N = 76)	14	45.5	44	47.3	11	64.7	7	50	0.49	< 0.001
	Protein (N = 41)	1	3.2	39	41.9	0	2	1	7.1		
	Fat (N = 24)	7	22.6	9	9.7	3	17.6	5	35.7		
	Carbohydrates (N = 10)	6	19.4	1	1.1	2	11.8	1	7.1		
	Vitamins and minerals (N = 4)	3	9.7	0	0	1	5.9	0	0		

F; frequency, P; percentage
*According to the chi-square analysis ($p < 0.05$ is considered as significant)

Table 3. Comparison of the mean knowledge and practice scores of athletes between nutrition counseling, sex, type of sport, education, and age categories

Variable		Knowledge	Practice
Nutrition counseling	Yes	35.28 ± 2.94	12.61 ± 1.35
	No	28.78 ± 4.56	10.55 ± 1.91
	[a] P value	< 0.001	< 0.001
Sex	Man (N = 310)	29.5 ± 5.36	10.69 ± 2.04
	Woman (N = 190)	29.65 ± 3.96	10.95 ± 1.8
	[a] P value	0.72	0.13
Type of sport	Football (N = 130)	28. 82 ± 4.82	10.83 ± 1.75
	Body building (N = 210)	30.8 ± 3.82	11.01 ±1.9
	Volleyball (N = 80)	29.06 ± 5.88	10.76 ± 1.8
	Basketball (N = 80)	28.01 ± 5.57	10.15 ± 2.43
	[b] P value	< 0.001	0.01
Education	Diploma and Under Diploma (N = 302)	29 ± 5.29	10.61 ± 1.91
	Bachelor (N = 167)	30.37 ± 4.17	11 ± 2.08
	Master and PhD (N = 31)	30.7 ± 3.18	11.35 ± 1.51
	[b] P value	0.005	0.029
BMI	Underweight	28.1 ± 5.45	10.07 ± 1.99
	Normal	29. 63 ± 5.2	10.78 ± 1.93
	Overweight	29.74 ± 4.4	10.83 ± 2
	Obese	29.24 ± 5.01	11.2 ± 2
	[b] P value	0.4	0.12
Age (year)	18-30 (N = 404)	29.3 ± 5.05	10.76 ± 1.92
	31-40 (N = 54)	29.9 ± 4.14	10.46 ± 2.35
	41-50 (N = 32)	31.31 ± 2.14	11.37 ± 1.62
	51-60 (N = 10)	32.5 ± 4.14	11.7 ± 1.7
	[b] P value	0.02	0.08

a.Comparison of mean between two groups based on Independent t-test ($p < 0.05$ is considered as significant)
b.Comparison of mean between several groups based on One-way ANOVA ($p < 0.05$ is considered as significant)

Table 4. Intra-group comparison of knowledge and practice between the education, type of sport and age categories

Variable			P value	
			Knowledge	Practice
Education	Diploma and under Diploma	Bachelor	0.019	0.13
		Master and PhD	0.17	0.14
	Bachelor	Master and PhD	0.92	0.66
Type of sport	Football	Body building	0.007	0.99
		Volleyball	0.99	0.92
		Basketball	0.65	0.09
	Body building	Volleyball	0.07	0.94
		Basketball	< 0.001	0.007
	Volleyball	Basketball	0.58	0.43
Age (year)	18-30	31-40	0.85	-
		41-50	0.16	-
		51-60	0.23	-
	31-40	41-50	0.64	-
		51-60	0.49	-
	41-50	51-60	0.92	-

*. Intra-group comparison of knowledge and practice according to the Scheffe test ($p < 0.05$ is considered as significant)

Table 5. The relationship between nutrition knowledge and practices and education, age, as well as duration of activity

Variable	Knowledge		Practice	
	Correlation coefficient	P-value	Correlation coefficient	P-value
[a] Level of education	0.1	0.01	0.12	0.04
[b] Age (year)	0.15	< 0.001	0.06	0.12
[b] Duration of exercise (year)	0.17	< 0.001	0.07	0.1
[b] Practice	0.39	< 0.001	-	-

a. Correlation and significant correlation with Spearman (P-value < 0.05).
b. Correlation and significant correlation with Pearson (P-value < 0.05).

This finding was in line with findings of the study by Pirouznia who hypothesized that the nutritional behaviors of an individual are not solely affected by his/ her nutritional knowledge, but may also be affected by other factors, including physiological needs, self-image perception of individuals, access to food, mass media, and especially food preferences as well as peer practice (30). Similarly, Bassmi et al. showed a significant correlation between knowledge level and nutritional practice among athletes, in a way that increasing knowledge in athletes enhances their nutritional practice (28). In the present study, the major proportion of nutritional information of athletes was obtained from coaches and the Internet. These findings highlight the need for designing nutritional education programs for coaches. Furthermore, Tawfik et al. reported that coaches and peers are the main sources of nutrition information for athletes (31), which was similar to the findings of the current study. Azizi et al. showed that university athletes had a moderate level of knowledge (32) which was also in agreement with the findings of the current study. According to the study by Wallinga et al., athletes who received nutrition counseling had a better understanding of food ingredients in terms of calories, carbohydrates, protein, fat and minerals, as well as higher level of knowledge and nutritional practice (21). The findings of this study were consistent with this issue. Among different sport fields, the level of knowledge and practice of bodybuilders was higher than that of others. This finding suggests that the knowledge and practice of power athletes in sports including bodybuilding was significantly higher than that of aerobics including football, volleyball and basketball. According to the findings of the current study, receiving more nutritional counseling and information from various sources (especially from nutritionists and coaches) by bodybuilders may have been the reason for this finding. A more professional activity, longer duration of activity and greater experience over time may be the other reasons for this finding. Bodybuilders were also more interested in reading food labels including calories and proteins. Protein content, specifically, was considered as the most important item by bodybuilders, which highlights its importance. According to some studies, men have a higher tendency to have a V-shaped body and women are more interested to lose weight (13), and in both cases, protein plays an important role. In the current study, the mean score of knowledge in overweight subjects and the mean score of practice in obese subjects were higher than that of other subjects. This finding suggests that overweight subjects are more interested in nutritional principles and are interested in having appropriate nutritional practice to lose weight, which is also confirmed by the findings of this study. In the current study, there was a direct and positive relationship between level of nutritional knowledge and practice and education level. Similarly, Amir Sassan et al. showed a direct relationship between nutritional knowledge and practice and education level (33). Age is another factor that may affect athletes' knowledge and practice. The current study showed a direct relationship between age and nutritional knowledge and practice. The results of the current study were consistent with the findings of Webb and Beckford, who reported that individuals aged between 18 and 21 years, had a higher nutritional knowledge and awareness scores compared to those aged between 11 and 12 years (26). However, the findings of the studies conducted by Barzegari et al. (34) and Triches and Giugliani (35) were not consistent with the findings of this study. Their findings stated no significant difference in terms of nutritional knowledge between age and sex groups. Duration of activity may have an influence on the level of knowledge and practice of athletes. The results of the current study showed that increasing activity duration was associated with increases in the level of nutritional knowledge and practice.

Conclusion

The findings of this study indicated that coaches are the main source of nutritional information among athletes, therefore, it is suggested that a sufficient and proper nutritional education program should be provided to

coaches. Furthermore, providing nutritional counseling by nutritionists is a positive step to improve the practice and health status of athletes.

Ethical disclosure

The research protocol was approved by the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences (IR.AJUMS.REC.1396.178). All subjects were asked to sign a written informed consent before participating in the study

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Author contributions

All the authors have studied and accepted responsibility for all content of this manuscript.

Conflict of interest

The authors have declared that there is no conflict of interest.

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