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Research Article

OMEGA-3 KNOWLEDGE AND ATTITUDES AMONG ADULT PATIENTS ATTENDING PRIMARY HEALTH CARE CENTERS IN TAIF CITY, KSA, 2018

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Abstract:

Background: There are several benefits to eating omega-3 rich foods, including normal growth and development, healthier heart and brain, and lower cancer and mental problems. This study was conducted to estimate patients' knowledge and attitude levels attending primary care centers in Taif regarding omega-3 fatty acids. **Methodology:** This was a cross-sectional conducted in Taif city and included a sample of adult patients attending the primary health care centers belonging to the Ministry of health in Taif. A self-administered questionnaire was utilized for data collection. **Results:** A total of 400 participants were included in this study; more than half of them (51%) were males with a mean age (37.6 ± 11.9). The knowledge mean score was (34.1 ± 22.3), and most participants (66.5%) had poor knowledge about omega-3. The mean attitude score of (59.3 ± 24.5) towards diet (including omega-3) and health, and less than half of the participants (42%) have positive attitudes. There were significant associations between the knowledge mean score about omega-3 and age (P=0.000), gender (P=0.018), educational level (P=0.000), receiving health education about healthy diet from doctors (P=0.000), and hearing of Omega-3 foods (P=0.000). **Conclusions:** We found low knowledge levels and generally negative attitudes towards an omega-3 and healthy diet. Females, highly educated participants, and patients who received health education from physicians were more knowledgeable and had positive attitudes.

Keywords; Omega-3, fatty acids, knowledge and attitude, Saudi Arabia.**Corresponding author:****Abdullah Saeed Alzahrani,**

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INTRODUCTION:

Omega-3 fatty acids are essential long-chain polyunsaturated fatty acids necessary for normal growth and development of the human body in general and especially the brain.¹ Prevention and management of hypertension, coronary artery diseases,² diabetes mellitus, and bronchial asthma are related to an essential role played by fatty acids.^{3,4}

In addition, fatty acids have an important role in preventing allergies and reducing the prevalence of rheumatoid arthritis, other autoimmune and inflammatory diseases.⁵ They also help reduce certain premenstrual and postmenstrual symptoms and the risk of cancer.³

Omega-3 fatty acids assist in memory retention and improve learning skills.⁶ They improve mood disorders such as depression,⁷ minimize aggression, prevent Alzheimer's disease⁸ and improve patients with attention deficit hyperactivity disorders (ADHD).⁹ The Institute of Medicine in Washington, USA, recommended an intake of 1.1 gram of omega-3 fatty acid for normal healthy males and a 1.6 gram for normal healthy females.¹⁰

Fish intake alone can provide all the omega-3 daily requirements. However, most of the fish supply worldwide is polluted with industrial toxins and heavy metals (lead, mercury, cadmium and arsenic, and radioactive substances). Therefore, it is not recommended to eat fish daily. The highest concentrations of mercury are found in tuna, even canned type.¹¹⁻¹³ High-quality fish oils are important sources of omega-3 fatty acids. Unfortunately, fish oil is low in antioxidants, so there is a need to supplement antioxidants with increased omega-3 intake through fish oil consumption.¹¹⁻¹³

Plant-based omega-3 has fewer health benefits than animal-based sources (fish and fish oils). Furthermore, unlike animal-based omega-3 fatty acids, plant-based omega-3 fatty acids are quickly absorbed, reaching a peak level in around two hours and then disappearing within ten hours. As a result, relying solely on plant-based sources for omega-3 is a very inefficient health strategy.¹¹

Human studies have suggested that many populations cannot consume enough omega-3 fatty acids through fish alone¹⁴. Recent advances in food technology, such as microencapsulated fish oil¹⁵, can provide the daily recommended supply of omega-3.

Omega-3 fatty acids are essential for the brain development of the in utero and growing child. It is

recommended to have omega-3 fatty acids supplementing before and during pregnancy and during breastfeeding. Higher intelligence quotients (IQs) in children have been associated with higher amounts of omega-3 fatty acids consumed during their mother's pregnancy.¹¹

Kaminski estimated Omega-3 (n-3) fatty acid intakes and evaluated knowledge and attitude about dietary fats among patients presented for colonoscopy in the UK. A 152-item n-3 food frequency questionnaire (n-3 FFQ) measuring diet fatty acids knowledge, diet attitudes, and beliefs was utilized for data collection. Daily intake of n-3 fatty acids was 0.91 ± 0.59 g from food recalls and 1.05 ± 0.63 g from the n-3 FFQ. There was a significant positive correlation between n-3 fatty acids intake and n-3 FFQ, $p < 0.01$). The highest three foods of n-3 fatty acid intake were nuts/seeds, seafood, and fats/oils. Correct scoring ranges for saturated fats, monounsaturated fats, polyunsaturated fats, and omega-3 fats were 44 – 84 %, 27 – 40%, 11 – 34%, and 10– 41%, respectively. The majority of participants (96%) believed that healthy food choices reduce contracting diseases.¹⁶

There are several benefits to eating omega-3 rich foods, including a baby's growth and development, healthier heart and brain, and a lower rate of cancer and mental problems. Eating sources containing omega-3 fatty acids in Saudi Arabia is not a common practice. Therefore, encouraging people to omega-3 intake should be a common practice in primary care settings.

Despite the great importance of this subject, up to our knowledge and based on a literature review, knowledge of the general public about omega-3 importance and sources was not studied extensively worldwide. Saudi Arabia is not an exception.

Aim of the study

To investigate the awareness and knowledge of adult patients attending primary care centers in Taif city regarding omega-3 fatty acids and factors affecting that knowledge to discover deficient points for further interventional educational programs.

Objectives

1. To assess the knowledge of adult patients attending primary health care centers belonging to the Ministry of Health in Taif city regarding omega-3 fatty acids
2. To address adult patients attending primary health care centers belonging to the Ministry of Health in Taif city towards diet, including omega3 and health.

- 3.To define factors associated with the patient's knowledge and attitude towards omega-3 fatty acids and health.

METHODOLOGY:

Study design

This was a cross-sectional study.

Study area

This study was conducted in Taif city, located in the western region of Saudi Arabia in Makkah Province, with an estimated population of 1,281,613 (2011 census).¹⁷ In Taif, there are 19 primary health care centers belonging to the Ministry of health where the study was carried out.

Target population

Adult patients (18-60 years) attending the primary health care centers belonging to the Ministry of health in Taif (n=19) constituted the study population.

Population selection criteria

Inclusion criteria

- Adult patients aged between 18 and 60 years attending PHC centers belonging to MOH in Taif, Saudi Arabia, throughout the period of the study.
- Arabic speaker.
- Both males and females.

Exclusion criteria

- Patients younger than 18 years or older than 60 years.
- Severely ill patients.
- Non-Arabic speaker patients.

Sample size

The minimum sample size for this study has been decided according to **Swinscow**,⁽¹⁸⁾ as follows:

$$n = \frac{Z^2 \times P \times Q}{D^2}$$

Where: n: Calculated sample size, Z: The z-value for the selected level of confidence (1- = 1.96), P: An estimated prevalence of insufficient knowledge regarding omega-3 fatty acids among the adult population. As it is unknown, sample size estimation was calculated using 50% prevalence, Q: (1 - .5) = 50%, i.e., 0.5, and D: The maximum acceptable error = 0.05. So, the calculated minimum sample size was: $n = (1.96)^2 \times 0.1 \times 0.5 / (0.05)^2 = 384.16 = 400$

Sampling technique

Following a random sampling technique, four PHCCs were randomly selected. A total of 100 adult patients

attending these PHCCs during the data collection period were selected by systematic random technique according to the number of patients visiting each center daily and were invited to participate in the study by filling in the study questionnaire.

Data collection tool

A self-administered questionnaire was utilized for data collection. It is composed of three main sections: Socio-demographic characteristics included age, gender, educational level, marital status, job status, family income, receiving information about omega-3 fats, and source of information about omega-3 fats.

Knowledge question comprised four questions inquiring about benefits and sources of omega-3 fats. Attitude questions: Participants were asked to indicate their response regarding 16 statements about diet (including omega-3 rich foods) and health. Five Likert scale ranged from strongly agree to strongly disagree were utilized.

The questionnaire's knowledge and attitude parts were derived from a study carried out by Kaminski in the UK. Some modifications and added questions were done to suit our situation and our study aim. The new questionnaire was face validated by three consultants in Family medicine, Community medicine, and Nutrition. Permission to utilize the original questionnaire was requested from the author through e-mail communication.

Regarding knowledge, a scoring system was created for participants' answers. A score of "1" was given to correct answers, while a score of "0" was given to incorrect or missing answers. Total score and score percentage were computed. Participants who scored above 50% were considered to have "good knowledge," whereas those below 50% were considered "poor knowledge."

Concerning attitude, a scoring system was created so that patients with a positive attitude had higher scores than those with a negative attitude to each attitude statement. The total score was computed, and the median value was estimated (62.5). Patients who scored below the median value were considered with "Negative attitude," while those who scored above the median value were considered "Positive attitude."

Data collection technique

The researcher visited the PHC centers after getting approvals. He explained the purpose of the study to all physicians and patients chosen for the study and didn't ask them about their names to ensure confidentiality. Self-administrated questionnaires

were distributed to selected patients while waiting for physicians' appointments and collected after half an hour. The data collection was implemented at regular day working hours. One week was spent in each PHC center involved in the study. A trained female colleague helped in data collection from female patients.

Variables

Dependent variables

- Knowledge regarding omega-3 fatty acids
- Attitude towards diet, including omega-3 and health.

Independent variables

Age, gender, educational level, marital status, family income, receiving information from health care professionals about omega-3, and source of information on omega-3.

Data entry and statistical analysis

Descriptive and analytic statistical methods and tests were adopted using the Statistical Package for Social Sciences (SPSS) version 26 software statistical program. Frequency and percentage were used to describe categorical variables, whereas mean and standard deviation (SD) were used to describe continuous variables. Chi-square test was used for association categorical variables. Nonparametric tests were used for mean analyses of knowledge and attitude scores. Pearson's correlation was used to investigate the association between knowledge and attitude scores.

Pilot study

A pilot study was conducted in one PHC center with 20 patients to test if the questionnaire is understandable and acceptable. After achieving its aims, the collected questionnaire from this center was omitted from the main study.

Ethical consideration

Written permission from the Joint Program of Family Medicine, Taif Region was obtained before conducting the research. Written permission from the director of the primary care MOH in Taif was obtained. Permission of all PHCCs directors was obtained. The researcher tried his best not to disturb the work in the PHC; he visited all the centers after arranging with their directors. The individual consent from each patient to participate in the study was a prerequisite for data collection. Accepting to participate by filling the questionnaire was considered consent. All information was kept confidential and was not accessed except for the scientific research.

RESULTS:

Table (1) shows the socio-demographic characteristics of 400 patients. More than half of them (51%) were males, with age ranges from (18-60) years and a mean age of (37.6 ± 11.9) . Less than half of the participants (42.3%) have above secondary education, and 38.8% have secondary education. Most participants (64.5%) were married, 28.2% were single, 5.3% were divorced, and only 2% were widowed. Nearly 30% were not working or housewives, 26% were governmental employees, 13.5% were working in the private sector, 13.3% were in the military forces, and 3.5% worked in business. Regarding the average family income/month, 42.3% had 5000-10000 SR, 13.5% had less than 5000 SR, and 12.3% had more than 15000.

Table (2) shows the participants' knowledge about omega-3. Most participants (67.8%) did not receive health education about a healthy diet from physicians. More than half of the 171 (57.3%) did not hear of omega-3 foods. Out of the 171 participants (53.8%) who got their information from the internet, 25.7% had friends and family as a source, and 10.5% used mass media.

Table (3) presents the participants' knowledge about the benefits of the omega-3. Nearly half of them (50.8%) did not know about the omega-3 use in utero brain development, 52% believed that it is associated with higher intelligence quotients of children, 42.5% thought that it improves cases with depression, 31% believed it prevents Alzheimer's disease, 31% believed it prevents patients with attention deficient, 23.8% believed that it is not associated with hyperactivity disorder, 18.5% thought it minimizes aggression, 26.5% thought it prevents allergies, and 29% thought it reduces the prevalence of rheumatoid.

Table (5) presents the knowledge mean score among the participants. The knowledge mean score was (34.1 ± 22.3) . Most participants (66.5%) had poor knowledge about omega-3, and 66.5% had poor knowledge.

Table (6) shows the participants' attitudes towards diet (including omega-3) and health. Nearly 38.5% strongly disagreed that what people eat or drink has little effect on whether they will develop a major disease, 63.2% strongly agreed that eating the right kind of food can reduce their chances of developing major diseases, 62.5% strongly agreed that eating more fibers will help a person reduce his/her chance of getting some major diseases, 60.3% strongly agreed that eating less fat will help a person reduce his/her chance of getting some major diseases, 60.5% strongly agreed that eating more fruits and vegetables

will help a person reduce his/her chance of getting some major diseases, 44.8% strongly agreed that changing the type of fat consumed will help a person reduce his/her chance of getting some major diseases, 42.3% strongly agreed that getting encouragement from family or friends to eat more healthy foods is helpful and 41.5% strongly agreed that having the confidence they need to take a chance in my diet.

Table (7) presents a mean attitude score of (59.3 ± 24.5) towards diet (including omega-3) and health. Less than half of the participants (42%) have positive attitudes.

Table (8) investigates the associated factors with the mean scores of knowledge and attitude towards omega-3 food. There were significant associations between the knowledge mean score about omega-3 and age (P=0.000), gender (P=0.018), educational level (P=0.000), receiving health education about healthy diet from doctors (P=0.000), and hearing of Omega-3 foods (P=0.000). Higher knowledge score was recorded among younger age groups (18-32) years with a mean score of (36.5±21.4), females

(37.1±23.7), higher educational levels among those with more than secondary education (35.4±22.6), among those who received health education about healthy diet from doctors (40.7±23), and participants who heard about omega-3 foods (49.9±16.6). Attitude scores were significantly associated with educational level (P=0.020), job status (P=0.042), receiving health education about healthy diet from doctors (P=0.008), and hearing of Omega-3 foods (P=0.000). More positive attitudes were detected among participants with an educational level above secondary (62.2±24.7), governmental employees (62.7±25.9), among those who received health education about healthy diet from doctors (64.1±21.3), and participants who heard about omega-3 foods (66.2±20.8).

Table (9) indicated that there was a statistically significant association between the attitude of the patients towards diet and health and their knowledge regarding omega-3 foods as 40.3% of those with positive attitude compared to 27.6% of those with negative attitude had a good level of knowledge regarding omega-3 foods, (P=0.000).

Table (1): Socio-demographic characteristics of the respondents.

Parameter	Frequency (%)	
Age, y	18 -	163 (40.8%)
	33 -	132 (33%)
	> 46	105 (26.3%)
	Mean ± SD (Min-Max)	37.6 ± 11.9 (18-60)
Gender	Male	204 (51%)
	Female	196 (49%)
Educational level	Below secondary school	76 (19%)
	Secondary school	155 (38.8%)
	Above secondary school	169 (42.3%)
Marital status	Single	113 (28.2%)
	Married	258 (64.5%)
	Divorced	21 (5.3%)
	Widowed	8 (2%)
Job-status	Not working/housewife	120 (30%)
	Governmental employee	104 (26%)
	Private sector employee	54 (13.5%)
	Military	53 (13.3%)
	Business/trading	14 (3.5%)
	Retired	25 (6.3%)
	Others	30 (7.5%)
Family income in SR/month	<5000	55 (13.8%)
	5000-10000	169 (42.3%)
	10001-15000	127 (31.8%)
	>15000	49 (12.3%)

Table (2): Knowledge about omega-3 among the participants.

Parameter		Frequency (%)
Receiving health education about healthy diet from doctors	Yes	129 (32.3%)
	No	271 (67.8%)
Hearing of Omega-3 foods	Yes	171 (42.8%)
	No	229 (57.3%)
Source of information (n=171)	Internet	92 (53.8%)
	Healthcare professionals	11 (6.4%)
	Friends & family	44 (25.7%)
	Mass media	18 (10.5%)
	Newspapers & magazines	6 (3.5%)

Table (3): Knowledge of the participants about the benefits of omega-3 foods.

Benefits of Omega-3	True	False	Don't know
In utero brain development	185 (46.3%)	12 (3%)	203 (50.8%)
Higher intelligence quotients of children	208 (52%)	11 (2.8%)	181 (45.3%)
Improve cases with depression	170 (42.5%)	22 (5.5%)	208 (52%)
Prevent Alzheimer`s disease	124 (31%)	44 (11%)	232 (58%)
Improve patients with attention deficient	124 (31%)	51 (12.8%)	225 (56.3%)
hyperactivity disorder	95 (23.8%)	52 (13%)	253 (63.3%)
Minimize aggression	74 (18.5%)	64 (16%)	262 (65.5%)
Prevent allergies	106 (26.5%)	49 (12.3%)	245 (61.3%)
Reduce the prevalence of rheumatoid	116 (29%)	35 (8.8%)	249 (62.3%)

Table (4): Knowledge of the participants about the sources of omega-3 foods, saturated and polyunsaturated fats.

Questions	Correct answer		
	Answer	No.	%
Which of the following had more saturated fats? <ul style="list-style-type: none"> • Roast beef • Chicken • I don't know/not sure 	Roast beef	218	54.5
<ul style="list-style-type: none"> • Full-fat milk • Low-fat milk • Both • I don't know/not sure 	Full fat milk	299	74.8
<ul style="list-style-type: none"> • Olive oil • Peanut oil • Both • I don't know/not sure 	Both	42	10.5
Which of the following had more polyunsaturated fats? <ul style="list-style-type: none"> • Sunflower oil • Butter • Both • I don't know/not sure 	Sunflower oil	151	37.8
<ul style="list-style-type: none"> • Corn oil • Palm oil • Both • I don't know/not sure 	Corn oil	106	26.5
<ul style="list-style-type: none"> • Olive oil • Sunflower oil • Both • I don't know/not sure 	Both	39	9.8
Which of the following had more omega-3 fats <ul style="list-style-type: none"> • Salmon fish • Beef • Both • I don't know/not sure 	Salmon fish	195	48.8
<ul style="list-style-type: none"> • Nuts • Chicken • Both • I don't know/not sure 	Nuts	150	37.5
<ul style="list-style-type: none"> • Corn oil • Sunflower oil • Both • I don't know/not sure 	Sunflower	53	13.3

Table (5): The knowledge mean score.

Parameter	Mean \pm SD
Knowledge score	34.1 \pm 22.3
Parameter	Frequency (%)
Good knowledge	134 (33.5%)
Poor knowledge	266 (66.5%)

Table (6): Responses of the participants regarding their attitude towards diet (including omega-3) and health.

Attitude item	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
What people eat or drink has little effect on whether they will develop a major disease	121 (30.3%)	35 (8.8%)	48 (12%)	42 (10.5%)	154 (38.5%)
By eating the right kind of food, people can reduce their chances of developing major diseases	253 (63.2%)	65 (16.3%)	51 (12.8%)	14 (3.5%)	17 (4.3%)
Eating more fibers will help a person reduce his/her chance of getting some major diseases	250 (62.5%)	60 (15%)	73 (18.3%)	12 (3%)	5 (1.3%)
Eating less fat will help a person reduce his/her chance of getting some major diseases	241 (60.3%)	79 (19.8%)	65 (16.3%)	8 (2%)	7 (1.8%)
Eating more fruits and vegetables will help a person reduce his/her chance of getting some major diseases	242 (60.5%)	77 (19.3%)	64 (16%)	11 (2.8%)	6 (1.5%)
Changing the type of fat consumed will help a person reduce his/her chance of getting some major diseases	179 (44.8%)	81 (20.3%)	112 (28%)	12 (3%)	16 (4%)
Eating more saturated fats will help a person reduce his/her chance of getting some major diseases	87 (21.8%)	71 (17.8%)	100 (25%)	57 (14.2%)	85 (21.3%)
Eating more polyunsaturated fats will help a person reduce his/her chance of getting some major diseases	108 (27%)	88 (22%)	151 (37.8%)	36 (9%)	17 (4.3%)
Eating more omega-3 fats will help a person reduce his/her chance of getting some major diseases	138 (34.5%)	71 (17.8%)	142 (35.5%)	36 (9%)	13 (3.3%)
Healthy food taste good	123 (30.8%)	97 (24.3%)	111 (27.8%)	49 (12.3%)	19 (4.8%)
Eating healthy food is easy	127 (31.8%)	87 (21.8%)	105 (26.3%)	61 (15.3%)	20 (5%)
Healthy foods generally cost more than other kinds of food	131 (32.8%)	99 (24.8%)	102 (25.5%)	44 (11%)	24 (6%)
Getting encouragement from family or friends to eat more healthy foods is helpful	169 (42.3%)	82 (20.5%)	105 (26.3%)	28 (7%)	16 (4%)
I would be willing to make changes in the type of fat I eat to reduce the chance of developing some major diseases	(38%)	99 (24.8%)	106 (26.5%)	31 (7.8%)	12 (3%)
I have the confidence I need to make a change in my diet	(41.5%)	94 (23.5%)	100 (25%)	26 (6.5%)	14 (3.5%)
I would need more information in order to increase omega-3 fats in my diet	(40.8%)	95 (23.8%)	91 (22.8%)	19 (4.8%)	32 (8%)

Table (7): Mean attitude score towards diet (including omega-3) and health.

Parameter	Mean \pm SD
Attitude score	59.3 \pm 24.5
Parameter	Frequency (%)
Positive attitude	168 (42.0%)
Negative attitude	232 (58.0%)

Table (8): Factors associated with the knowledge and attitude of the participants towards omega-3 food.

Parameter		Knowledge score	P-value	Attitude score	P-value
Age, y	18 -	36.5±21.4	0.000	61.8±24	0.115
	33 -	37.3±23.4		58.8±24.9	
	> 46	26.4±21.7		56.1±24.8	
Gender	Male	31.3±21.1	0.018	58.4±22.8	0.132
	Female	37.1±23.7		60.2±26.2	
Educational level	Below secondary school	24.5±19.8	0.000	56.4±26	0.020
	Secondary school	35.4±22.6		57.5±23.5	
	Above secondary school	37.4±22.6		62.2±24.7	
Marital status	Single	32.5±20.8	0.593	59.8±25.2	0.300
	Married	35±23.4		59.8±24	
	Divorced	36.6±20.9		51.2±26.8	
	Widowed	23.7±23.4		57.9±27.5	
Job-status	Not working/housewife	33.7±22.8	0.341	61.9±24.1	0.042
	Governmental employee	37.7±23		62.7±25.9	
	Private sector employee	33.3±23.8		54.9±26.5	
	Military	31.9±23.7		53.7±23.1	
	Business/trading	40.1±17.4		59.9±18.3	
	Retired	32.3±22.2		58.3±17.3	
	Others	28±17.3		55.7±26.9	
Family income in SR/month	<5000	27.5±20.5	0.116	62.3±21.3	0.358
	5000-10000	34.1±22.4		60.5±25.3	
	10001-15000	36.4±23.7		56.4±24.9	
	>15000	35.9±21.5		59.4±24.6	
Receiving health education about healthy diet from doctors	Yes	40.7±23	0.000	64.1±21.3	0.008
	No	31±21.7		57±25.7	
Hearing of Omega-3 foods	Yes	49.9±16.6	0.000	66.2±20.8	0.000
	No	22.4±19		54.1±25.9	
Source of information (n=171)	Internet	51.8±17.5	0.421	67.3±23.8	0.147
	Healthcare professionals	49.5±20.6		73.3±15.9	
	Friends & family	47.5±16.7		63.5±19.2	
	Mass media	47.3±10.5		63.2±10.7	
	Newspapers & magazines	46.3±4.6		64.6±13.5	

Table (9): Association between knowledge of the patients regarding omega-3 foods and their attitude towards diet (including omega 3) and health

Parameter		Knowledge regarding omega-3 food diet		χ^2	P-value*
		Good knowledge	Poor knowledge		
Attitude towards omega-3 food diet	Positive attitude	100 (43.1%)	132 (56.9%)	22.9	0.000
	Negative attitude	34 (20.2%)	134 (79.8%)		
Pearson's correlation (scores)		0.422	P-value**	0.000	

*Chi-square test was used.

** Pearson's correlation test was used.

DISCUSSION:

Omega-3 polyunsaturated fatty acids are beneficial to health in various ways, including cardiovascular health, mental health, and inflammatory conditions.¹ This study was carried out to explore the awareness and knowledge of patients attending primary care centers in Taif city, Saudi Arabia, regarding omega-3 fatty acids and identifying factors affecting that knowledge.

In the present study, about half of the participants could recognize that omega-3 has a role in producing higher intelligence quotients of children, benefiting utero brain development and improving cases with depression. However, only a few participants could recognize the benefit of omega-3 in minimizing aggression and preventing allergies. Our study also reported a low mean knowledge score among the participants (34.1 ± 22.3) and stated that most participants (66.5%) had poor knowledge about omega-3. This was consistent with **Harel *et al.***, who reported a lack of knowledge about omega-3, its dietary requirements, and various sources.¹⁹ Another study investigated the determination of using omega-3 in psychiatry and found a lack of understanding and interest in diet and fatty acids as a complementary treatment for depression. In general, few assessments of patients' diets were made.²⁰

One of the important limitations and difficulties of this study was the absence of comparative subjects for discussing our results either on local or even international levels. In the present study, only 32.3% received health education about healthy diet from physicians, and 42.8% heard about omega-3 foods. In a study carried out among urban women aged between 20 and 80 years in India, **Shet and Chimmad** revealed that only 13.6% were aware of omega-3 fatty acids before an educational intervention and observed improvement in awareness of women for functional properties, health benefits, and sources of omega-3 fatty acids.²¹

This study demonstrated a mean attitude score of (59.3 ± 24.5) towards diet (including omega-3) and health, with 58% having negative attitudes. Given that attitude has the greatest impact on intentions, immediate opportunities for changing behavior are likely to come from a shift in attitude, specifically perceptions about the efficacy of enriched goods in achieving specific health benefits.²²

In the present study, various factors were found associated with knowledge of omega-3 foods and attitude towards diet and health. Among these factors was the educational level, as more educated individuals were more knowledgeable and expressed a higher positive attitude than lower educated individuals. The same has been reported by many previous literature.^{16, 23, 24}

Females were more knowledgeable regarding omega-3 foods compared to males in this study. This is expected as females are traditionally more likely to have an interest in approaches to health promotion and more interested in providing nutritional needs for their families.²⁵ The same has been reported by Shepherd and Towler (2007).²⁶ However, in a study carried out by **Kaminski**,¹⁶ men were more knowledgeable than females about saturated and polyunsaturated fats while females were more knowledgeable regarding omega-3 foods.

In agreement with **Kaminski**,¹⁶ patients in the present study were more knowledgeable about saturated fats than polyunsaturated fats. This could be attributed to the fact that patients have been more extensively exposed over a longer period to education about saturated fats than polyunsaturated fats. Previous studies have documented that women hold more positive attitudes toward diet, including fatty foods and health than men.^{16, 25} However, no gender difference has been observed in this regard in the present study.

This study found that the participants who received health education about diet from physicians and those who heard of omega-3 foods had high knowledge levels and the most positive attitudes towards omega-3, health, and diet. A study reported that low education and income had been related to a less healthy diet, increased fat consumption, and obesity.¹⁶

Overall, participants in this study expressed positive beliefs about the choices of healthy food choices and their relationship to disease states as most of the respondents agreed that eating less fat, more fruits and vegetables, more fibers, and the right kind of food will help them to reduce his/her chance of getting some major diseases. Kaminski, in his study, has observed the same.¹⁶

In this study, most participants agreed that healthy foods generally cost more than other kinds of food, which could be a barrier to prevent healthy eating. The current study, in accordance with others,^{16, 25-26} revealed a significant link between knowledge of omega-3 foods and a positive attitude towards diet and health. Moreover, Packman reported that better knowledge about diet plays a role in dietary behavior change. Those with poor nutritional knowledge are generally confused about the basic principles of a healthy and balanced diet.²⁵

Among the critical limitations of this study is it is carrying out in primary healthcare centers belonging to MOH in Taif, which could impact the generalizability of the results. Also, the applied cross-sectional design with its disadvantages was another limitation of the study.

CONCLUSION:

This study demonstrated low knowledge levels and negative attitudes towards omega-3 and healthy diet among participants in Taif city, Saudi Arabia. Female, young age, highly educated individuals, those who had received health education from physicians about eating a healthy diet, and those who heard about omega-3 foods were more knowledgeable and had more positive attitudes than the others.

Recommendations

In light of the study results, we recommend that health education campaigns include health educators and nutritional specialists to the general population in primary healthcare centers and public places, if applicable, to increase their knowledge about healthy

diets, including omega-3 foods. We should encourage primary healthcare professionals to provide health-related dietary information to their patients. Nutrition specialists should have a role in this regard by giving updated lectures to primary care professionals regarding the importance of diet to health. Mass media should play a more positive role in providing useful dietary information to the general public. A further population-based study is recommended to include a more representative sample of the adult population in Saudi Arabia.

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