

A PRE-POST INTERVENTION STUDY: ASSESSING AWARENESS ABOUT TYPES, USES, AND EFFECTS OF SUPPLEMENTS AMONG YOUTH IN JEDDAH, SAUDI ARABIA

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Abstract

Background: A supplement is a commercially available product that is taken in addition to the regular diet and contains vitamins, minerals, herbs (botanicals), amino acids, and a variety of other ingredients. The demand for dietary and herbal supplements is increasing in the Middle East. Saudi Arabia's market is expanding in tandem with the country's rapid population growth, and the supplements market now accounts for approximately 4% of total pharmaceutical market sales.

Objectives: To assess the awareness level about types, uses, and effects of supplements, to determine factors affecting awareness level, and measure the effectiveness of the health education campaign in raising awareness of youth about supplements, Jeddah, Saudi Arabia.

Methods: A quasi-experimental pre-and post-study was carried out through an educational campaign. A multistage sampling technique was followed where stage one was a random selection of two gyms one for males and another for females, stage two was the inclusion of a convenient sample of 220 youth aged between 15-25 years. The campaign assessed the youth's knowledge and attitude regarding supplements using a self-administered questionnaire pre- and post-campaign.

Results: Among the studied population 188 (85.5%) had secondary education or more, 145 (65.9%) were single, 94 (42.7%) students and 114 (51.8%) were practicing moderate exercise. The mean time elapsed since attending the gym was 5.2 with SD (2.23) years, with mean practicing times per week of 3.1 with SD (2.4) times and mean duration in hours of 2.1 with SD (2.32) per time. There was a significant increase in the total knowledge score between pre- and post-

assessment mean (SD) 63.6 (6.82) versus 82.2 (8.90) ($p=0.002$) and a significant decrease in the attitude of youth toward supplements between pre- and post-assessment. The significant predictors for awareness were age, nationality, education, and number of practicing exercises per week. 180 (82%) of the participants were satisfied with the health education campaign.

Conclusion: The awareness, knowledge, and attitude of youth towards supplements significantly improved in the post-measurement of educational campaigns. Age, nationality, education, and the number of exercise sessions per week were significant predictors of supplement awareness. The immediate evaluation of the campaign was generally satisfactory.

Keywords: Awareness; Knowledge; Attitude; Supplements; Educational campaigns.

Introduction

A supplement is a commercially available product that is taken in addition to the regular diet and contains vitamins, minerals, herbs (botanicals), amino acids, and a variety of other ingredients (1).

Vitamins, minerals, herbs, meal supplements, and products that boost nutrient levels are examples of dietary supplements (DS) (2). People take nutritional supplements for a variety of reasons, including disease prevention (e.g., stress, colds, heart attacks, osteoporosis, cancer, tooth decay, and neural tube defects in infants), energy enhancement, physical performance improvement, and correction of various lifestyle deficiencies (3).

The demand for dietary and herbal supplements is increasing in the Middle East, particularly in the Gulf states (4). Saudi Arabia's market is expanding in tandem with the country's rapid population growth, and the supplements market now accounts for approximately 4% of total pharmaceutical market sales (roughly \$80 million) (5). Dietary supplement sales in Saudi Arabia reached 875 SR million by 2021. This may be due, in part, to Saudis' increased emphasis on the importance of maintaining health and disease prevention in recent years (6). Many students and athletes in Saudi Arabia and the Middle East in general use and approve of dietary supplements (6,7).

Some substances' marketing claims encompass improved overall health, enhanced cognitive or physical performance, increased energy, weight loss, pain relief, and other purported benefits (3). Dietary supplement usage patterns may vary across different subpopulations. Athletes, in particular, often participate in strenuous and prolonged physical activities, citing improved performance and post-exercise recovery as the primary reasons for using dietary supplements (4)

A study conducted at King Abdul Aziz Hospital in Jeddah revealed that 22% of patients, with 24% of them being female, used dietary supplements (8). The prevalence of use was higher at 44.6% among students at Imam Abdulrahman bin Faisal University in Dammam, Saudi Arabia (9), and even higher (76.6%) among female college students at King Saud University. Among the latter group, 36.7% were unaware of the side effects of these products (10).

In 2023, a Saudi study involving 1572 participants found that 76% had a low level of knowledge about supplements. The study identified significant associations between gender, education profession, monthly income, and knowledge scores. Despite this, a notable proportion

of participants demonstrated overall proficiency in supplement usage (6). Therefore, this study was carried out to assess the awareness level about types, uses, and effects of supplements, to determine factors affecting awareness level, and measure the effectiveness of the health education campaign in raising awareness of youth about supplements, Jeddah, Saudi Arabia.

Subjects and Methods:

Study design: A quasi-experimental pre- and post-study was carried out within six months' duration in Jeddah, Saudi Arabia.

Study setting: The study comprises three phases: planning, implementation, and evaluation of educational campaigns on supplement types, uses, and effects. Various interactive instructional methods were planned and then executed within two selected gyms—one for males and the other for females in Jeddah city. The final stage involved the evaluation of these campaign activities from the perspective of the youth.

Sample Size and Sampling Technique

The total number of the 15-25 years' youth to be selected was estimated using the following formula: (11)

$$n_0 = Z^2 pq / e^2$$

where: Z = the critical value of the desired confidence interval (1.96 at 95%, 1.645 at 90%, 2.33 at 98%, and 2.575% at 99%), e = margin of error; 0.05, p = the estimated proportion of attributes that are present in the population; 0.50, $q = 1-p$; 0.50.

A multistage sampling technique was followed where stage one was a random selection of two gyms one for males and another for females, stage two was the inclusion of a convenient sample of 220 youth aged between 15 and 25 years: 110 from each gym. was done. the multistage sampling technique.

Inclusion criteria: Male or female youth, Saudi or non-Saudi Arabic speakers, aged between 15 and 25 years who regularly attend the selected gym in Jeddah city.

Study instrument: A specially prepared pre-coded, closed-ended, pilot-tested reliable questionnaire in Arabic was used (Cronbachs'alpha = 0.815). It included data about sociodemographic characteristics such as gender, age, education, work status, and marital status. It also included the type of exercise, time lapse since attending the gym, times of training per week, duration of training each time, and BMI.

The questionnaire was self-administered for participants to complete before the educational campaign. Two educational campaigns were organized for youth in both gyms—one for males and another for females. It was in the form of a short lecture, scenarios, group discussion, pamphlets, and leaflets specifically designed for the study's purpose. Following the campaign, participants completed the same questionnaire again, followed by an immediate evaluation of the educational campaign. This evaluation utilized a specially designed, pre-coded, self-administered form to assess its content from the perspective of the youth

Scoring system

The mean percent scores for the questionnaire different sections were calculated using the following formula:

Percent score = Σ Scores of questions selected / maximum possible score for these questions $\times 100$

The maximum possible score that could be obtained for those questions was calculated. To calculate the percent score, the mean value \pm SD was multiplied by 100.

Statistical analysis

The data was collected and coded before being entered into Excel, then analyzed with SPSS version 25.0, and presented as frequencies, means, and standard deviations. A bivariate analysis was conducted to test for significant differences. Chi-square and independent t-tests were used to analyze the variables, and paired t-tests and the Mac Nemar test were used for pre-and post-assessment. Binomial logistic regression was used to assign the predictors of awareness level among youth. To control potential confounding factors, multivariate analyses using the forward stepwise (Wald) method were carried out to determine the independent predictors of awareness among youth. Variables included in the final model of the multivariate analysis were age, gender, education, work status, nationality, type of exercise, duration of lapsed since attending the gym, times of training each week, and duration of each.

For each variable, the awareness level-adjusted prevalence odds ratio (OR) and 95% confidence interval (CI) were presented and computed directly from the logistic regression. Alpha less than 0.05 was considered significant.

Ethical approval

Ethical approval was obtained from the ISNC Research and Ethics Committee (Ref. No. IRRB-031MP06122018). Participants were given the right to decline to participate in the study for any reason without prejudice. The data was kept confidential, and the questionnaire form was anonymous. Informed consent was obtained from each participant before inclusion in the study.

Results

This study comprised 220 participants of both sexes (male and female) aged 15-25 years, recruited from two gyms in Jeddah, KSA. The results were analyzed based on the pre- (before the educational campaign) and post- (after the educational campaign) responses of youth to a specially prepared questionnaire.

The mean age of the studied youth was 21.8 with SD (1.95) years. About two-thirds of the studied youth 151 (68.6%) were Saudi, 188 (85.5%) had secondary education and more, 145 (65.9%) were single, 94 (42.7%) students and 114 (51.8%) were practicing moderate exercise. (Figure 1). The mean time elapsed since attending the gym in years was 5.2 with SD (2.23), with mean practicing times per week of 3.1 with SD (2.4) and mean duration in hours of 2.1 with SD (2.32).

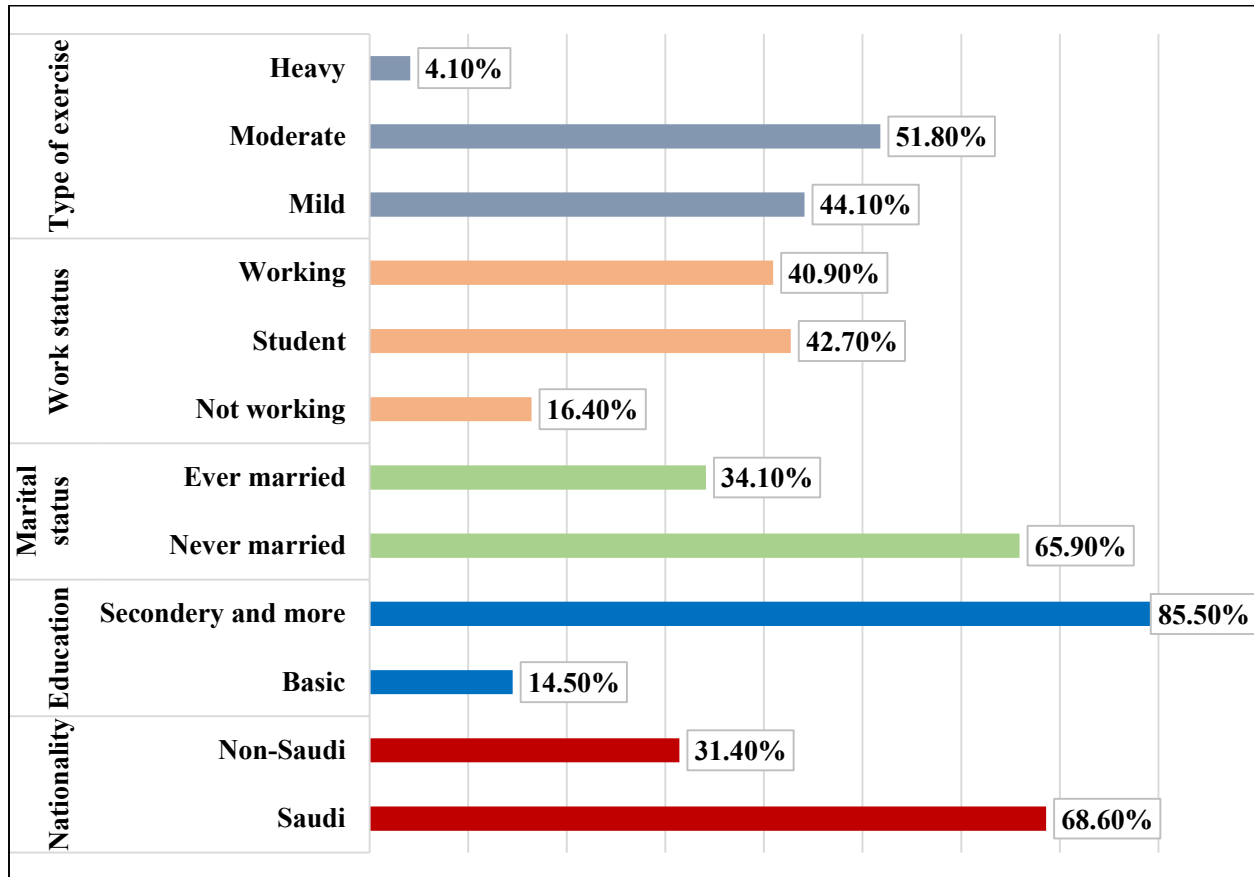


Figure 1: Description of the Socio-demographic characters of the studied youth (n=220).

Table 1: Assessment of youth knowledge about supplements pre and post campaign (n=220)

Items	Pre-campaign awareness assessment		Post-campaign awareness assessment		P-value
	N=220	%	N=220	%	
Do you know the following types of supplements?^s					0.003*#
- Vitamin	66	30.0	198	90.0	
- Dietary	57	25.9	186	84.6	
- Non-Dietary	112	50.9	201	91.4	
Do you know the most common causes of supplements use?^s					0.015*#
- Maintain strength	123	55.9	181	82.3	
- Enhance endurance	67	30.5	162	73.6	
- Increase the duration of training	89	40.5	180	81.8	
- Increase motor skills	183	83.2	201	91.4	

- Muscle built	175	79.5	195	88.6	
Do you know the perceived benefits of supplement? [§]					0.024*#
- Increase alertness	121	55.0	199	90.5	
- Better health wellbeing	108	49.1	185	84.1	
- Better muscle built	132	60.0	179	81.4	
-Better performance	152	69.1	203	92.3	
-Prevent any deficiency	87	39.5	162	73.6	
Do you know the side effects of supplements? [§]					0.022*#
- Heart	76	34.5	110	50.0	
-Blood pressure	89	40.5	145	65.9	
-Sleep pattern	127	57.7	206	93.6	
-Appetite	159	72.3	211	95.9	
-BMI	163	74.1	214	97.3	
- Muscles	154	70.0	215	97.7	
- Menstruation	99	45.0	187	85.0	
- Hair distribution among females	108	49.1	197	89.5	
-Fertility	119	54.1	186	84.5	
-Habituation effect	47	21.4	174	79.1	
Do you know usual use pattern of supplements? [§]					0.043*#
- Daily use	176	80.0	195	88.6	
-During exercise	177	80.5	214	97.3	
-During celebration	196	89.1	216	98.2	
Total Knowledge score					0.002*^
Mean (SD)	63.6 (6.82)		82.2 (8.90)		

§ For answer (Yes, I know) only

Mac Nemar Test

^ Paired t-test

***p-value is significant at less than 0.05 level**

Regarding the assessment of knowledge of youth about supplements, before the intervention, about half of the students 112 (50.9%) knew the non-dietary supplement types, 175 (79.5%) were in agreement that the most common cause of supplement use was muscle built and 152 (69.1%) agreed that the most common benefits of supplement was better performance. The most known side effects of supplements were their effect on BMI 163 (74.1%) and appetite 159 (72.3%). There

was a significant difference between pre-and post-knowledge assessment. There was a significant increase in the percentage of awareness of all aspects related to the types ($p=0.003$), causes of use ($p=0.015$), perceived benefits ($p=0.024$), and side effects ($p=0.022$) of supplements. At the same time, there was a significant increase in the total knowledge score between pre- and post-assessment mean (SD) 63.6 (6.82) vs. 82.2 (8.90) respectively with ($p=0.002$). (Table 1)

There was a significant difference in the attitude of youth toward supplements between pre- and post-assessment. After the campaign, there was a significant decrease in the participants' desire for the trial of supplements ($p=0.005$), desire to obtain the perceived beneficial effects ($p=0.024$), desire to use and try during celebrations ($p=0.032$), and desire to use when invited ($p=0.44$). At the same time, there was a significant decrease in the attitude total score post-campaign compared to pre-campaign mean (SD) 56.1 (10.54) vs. 78.8 (11.35) with ($p=0.015$). In detail, the desire to try the supplements once at a time significantly decreased from 152 (69.1%) before intervention to 118 (53.6%) after intervention. The students' desire to get the perceived beneficial effects of supplements significantly decreased from 123 (55.9%) pre-intervention to 66 (30%) post-intervention. And during celebrations, their desire to use the supplements decreased from 147 (66.8%) to only 32 (14.5%). Before the intervention, most students 177 (80.3%) had the desire to use the supplements when invited was significantly decreased to only 44 (20%) after intervention (Table 2).

The significant predictors for awareness level about supplements were age ($p=0.002$), nationality ($p=0.033$), education ($p=0.029$) and number of practicing exercise per week ($p=0.002$). (Table 3)

Table 2: Assessment of youth attitude towards supplements pre and post campaign (n=220)

Items	Pre- campaign awareness assessment		Post- campaign awareness assessment		P-value
	N=220	%	N=220	%	
Do you have the desire to try the supplements once a time?					
- No	68	30.9	102	46.4	0.005*#
- Yes	152	69.1	118	53.6	
Do you have the desire to get the perceived beneficial effects of supplements?					
- No	97	44.1	154	70.0	0.024*#
- Yes	123	55.9	66	30.0	
Do you have the desire to use the supplements during celebrations?					

- No	73	33.2	188	85.5	0.032*#
- Yes	147	66.8	32	14.5	
Do you have the desire to use the supplements when invited?					
- No	39	17.7	176	80.0	0.044*#
- Yes	181	82.3	44	20.0	
Total Attitude score					0.015*^
Mean (SD)	78.8 (11.35)		56.1 (10.54)		

Mac Nemar Test

^ Paired t-test

*p-value is significant at less than 0.05 level

Table 3: Multivariate logistic regression analysis of predictors with significant impact on supplement awareness level among youth (N=220)

	OR	95% CI for OR	p-value
Age	-3.4	-4.5-.05	0.002*
Nationality	4.2	2.7-6.3	0.033*
Gender	2.6	1.3-4.2	0.006*
Marital status	1.8	1.2-5.1	0.043*
Educational level	3.7	2.7-7.1	0.029*
Work Status	-2.6	-3.9- -1.9	0.042*
Type of exercise	2.3	1.5-6.6	0.031*
Time lapse attending gym in years	3.1	2.3-5.2	0.019*
Number of practicing per week	3.9	1.9-4.6	0.002*
BMI	-2.4	-3.2- -1.4	0.001*
OR = odds ratio; CI = Confidence interval; *P value is significant if P< 0.05. Dependent variable encoding negative = 0, positive = 1 R2=0.831			

Regarding the immediate evaluation of the health education campaign, more than four-fifths of the participated youth were satisfied with the ten evaluation items of the health education campaign: with a mean score of 82.3% with SD (15.21). (Figure 2)

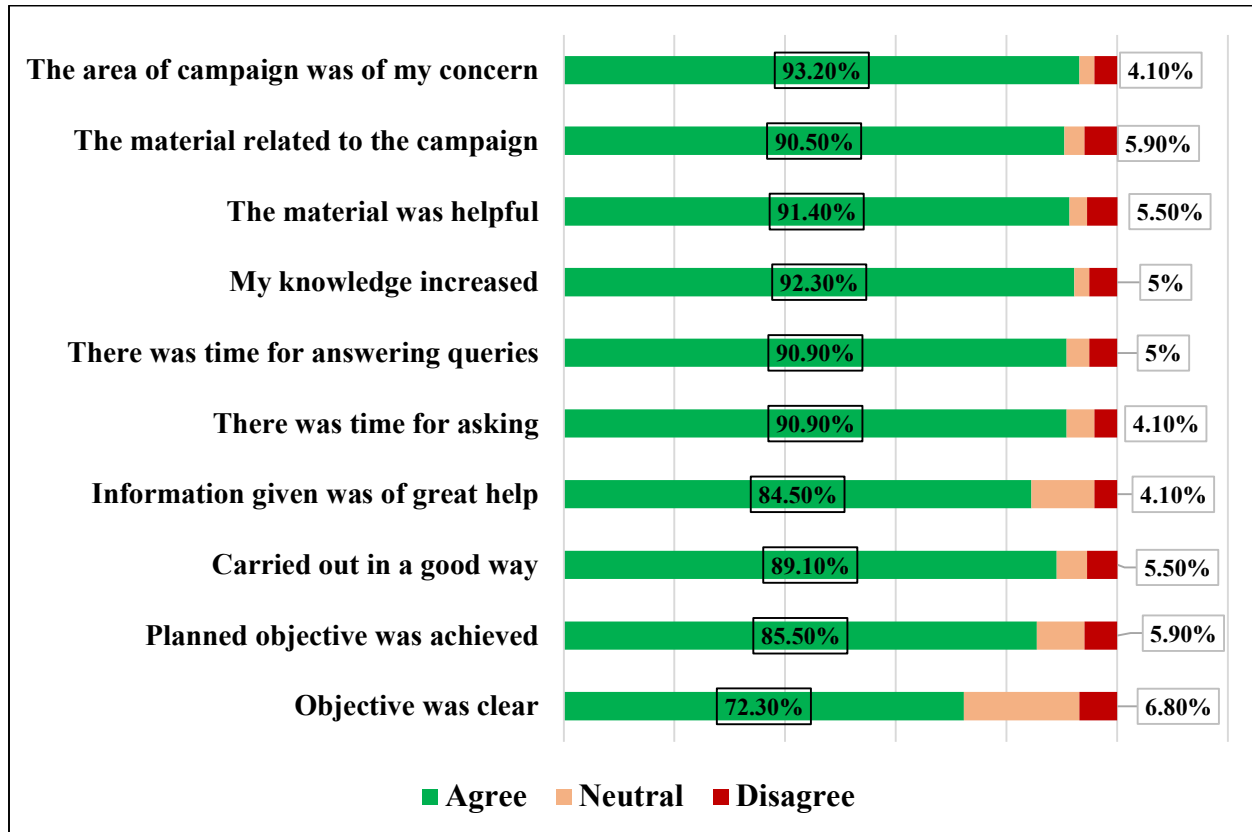


Figure 2: Immediate Health Educational Campaign Evaluation (n=220)

Discussion

The objectives of this study were to assess the awareness level about types, uses, and effects of supplements, to determine factors affecting awareness level, and measure the effectiveness of the health education campaign in raising awareness of youth about supplements, Jeddah, Saudi Arabia. These objectives were achieved through the enrollment of 220 male and female youth who were attending gyms for this quasi-experiment.

Before the campaign, approximately half of the youth were acquainted with various types of non-dietary supplements. Supplements in general, including Dietary Supplements (DSs), are deemed unnecessary for maintaining health unless an individual does not consume a well-balanced diet or has a specific medical condition. Examples of situations where DSs may be necessary include the use of folic acid supplementation by pregnant women to protect their fetuses from neural tube malformations and vitamin B12 supplementation by individuals after gastric sleeve surgery or vegetarians to prevent pernicious anemia (12-15). Here's a refined version: Dependence on dietary supplements (DSs) can result in a deficient diet, potentially leading to complications in the long run (16).

The present study disclosed that a majority of the participating youth mentioned the negative side effects of supplements on BMI and appetite, particularly when exceeding the prescribed dose or without medical supervision. Certain supplements contain herbs that have been associated with the occurrence of liver damage. Additionally, they can interact with specific

medications, leading to harmful side effects (12, 13, 14, 17). In the case of certain dietary supplements (DSs), excessive intake of folic acid, which protects fetuses from neural tube defects, may be linked to insulin resistance in children and some types of cancer (12).

In the present study, the most prevalent reason for using supplements was to build muscle, and the most commonly reported benefit was to improve performance. These findings align with responses from students studied at various universities around the world (16-20).

In a previous study conducted on students at King Abdulaziz University, Jeddah, Saudi Arabia in 2021, 51.7% of the students believed that dietary supplements (DSs) are essential for health, 41.7% classified them as both food and drugs, 67.2% understood that dietary supplements could not replace a healthy diet, and 25.8% were aware of their potentially harmful effects (9). Additionally, a Saudi study conducted in 2023 revealed that the Saudi population had limited knowledge and held negative perceptions of supplements. The study found that 67.1% of people believed there was no benefit from consuming supplements, 95.5% believed they caused side effects, and 48% were unsure about their safety (10).

In the current study, when compared to the youth's prior knowledge level, awareness about supplements significantly improved after the campaign. There was a notable increase in the percentage of participants who were aware of all aspects of supplement types, reasons for use, benefits, and side effects. Simultaneously, the total knowledge score showed a significant increase. Moreover, the inclination to try supplements only once decreased from 69.1% before the intervention to 53.6% after the intervention, reflecting changes in the youth's attitudes. Additionally, the desire to obtain perceived beneficial effects from supplements decreased significantly from 55.9% pre-intervention to 30% post-intervention. The youth's desire to use supplements during celebrations decreased from 66.8% to 14.5%. Before the intervention, a majority of students (80.3%) expressed a desire to use supplements when invited; however, after the intervention, this desire decreased to only 20%.

A previous study in the USA, which involved 39 high school students from a low-income community, demonstrated that a health education campaign significantly influenced youth knowledge and attitude. This research revealed that a short-term nutrition education program can significantly enhance students' knowledge of nutrition and sports supplements (21). Several studies have identified a lack of basic nutrition knowledge among adolescents (22, 23, 24). Additionally, prior research has emphasized the need for further health education on nutrition supplements among adolescents (22-26).

In the current study, age, nationality, education, and the number of exercise sessions per week were identified as significant predictors of supplement awareness. This aligns with findings from a previous study, which observed a statistically significant relationship between education and knowledge score. These results are consistent with previous studies emphasizing the need for evidence-based education to enhance supplement knowledge at all levels (27-29).

The current study demonstrates a significant increase in the mean knowledge score in the pre-and post-comparison, indicating the effectiveness of the educational intervention in improving

youth supplement knowledge and attitude. Concerning the immediate evaluation of the health education campaign, over four-fifths of the participating youth expressed satisfaction with the ten evaluation items of the health education campaign. In a study involving university students, Almas, Vançelik et al., and Özdoğan and Özçelik (28-30) found that the mean score of students who participated in a health educational campaign was 67.00 ± 8.80 , while those who did not take part had a mean score of 55.60 ± 13.00 (28-30). The effectiveness of our health educational campaign is comparable to the results reported by Hartman et al. 1997, who successfully used an educational intervention to improve baseline-to-post-intervention nutrition knowledge (30).

Conclusion

The awareness, knowledge, and attitude of youth towards supplements significantly improved in the post-measurement of educational campaigns. Age, nationality, education, and the number of exercise sessions per week were significant predictors of supplement awareness. The immediate evaluation of the campaign was generally satisfactory.

Recommendation

Additional research is recommended to encompass a broader segment of Saudi Arabia's youth community. The demonstrated effectiveness of these educational campaigns underscores the importance of widespread implementation among all youth, aiming to enhance awareness about dietary supplements (DSs) and improve attitudes and practices associated with them.

Study Limitations:

The utilization of a self-administered questionnaire, with its potential for recall bias, represents one of the limitations of this study. Additionally, an evaluation of the educational campaign's impact after three months or more could have provided valuable information, but this was not conducted due to challenges in reaching the same participants.

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Role of authors

Manal Ibrahim Hanafi Mahmoud devised the study, supervised the study procedures, contributed to data analysis and interpretation, and drafted the initial manuscript. Asmaa Abdel Nasser, Kameelya Hussain N Alsulaimani, Layan Omar Abdullah Alkarimi, Ahmed Kalid A Mohammed Hussain, and Abdullatif Ahmad A Maimny designed the educational materials for the campaigns, developed the survey, implemented the educational campaigns, collected the data, and contributed to the initial draft of the overall manuscript. Asmaa Abdel Nasser and Kameelya Hussain N Alsulaimani participated in reviewing the literature and the introduction. Manal Ibrahim Hanafi

Mahmoud and Asmaa Abdel Nasser made substantial contributions, critically reviewed, and approved the final version of the manuscript.

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