Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v6i4.1670
*Biol. Clin. Sci. Res. J., Volume 6(4), **2025**: 1670*
Original Research Article

Association of Knowledge and Quality of Life With the Intake of Dietary Supplements Among the Students

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(Received, 24th February 2025, Accepted 25th April 2025, Published 30th April 2025)

Abstract: *Dietary supplements refer to the products that contain vitamins, minerals, herbs, amino acids, oil supplements, or other substances intended to supplement the diet. Nutrient deficiencies are frequently addressed with dietary supplements. Supplements can fill in these gaps and ensure that you get enough nutrients.* ***Objectives:*** *The aim of the study was to assess the frequency of dietary supplement intake, to assess the association between knowledge and intake of dietary supplements and to assess the association of quality of life with the intake of dietary supplements among the university students.* ***Methodology:*** *It was an analytical cross-sectional study which was conducted among the students at the University of Lahore. Probability Simple Random Sampling was employed to select students of the departments, and the data was gathered through self-administrated questionnaire. The data was analyzed using SPSS version 25.0. Used SF-36 questionnaire to measure quality of life while a pre validated self-administered questionnaire was used to access the knowledge and intake of dietary supplements.* ***Results:*** *Data from 266 participants was collected. The frequency of dietary supplement use among students was 75.9%. Intake of dietary supplement was higher in females (71%) as compared to males (60.5%). Moreover, it revealed a significant association between the level of knowledge about dietary supplements with the intake of dietary supplements (p-value < 0.05). Intake of dietary supplement was higher among those students who have adequate knowledge regarding dietary supplements (88.1%) as compared to those who have inadequate knowledge regarding dietary supplements (73.7%). However, no significant difference was observed in the domains of quality of life between ds users and non-ds users. (p>0.05) except for physical functioning (p=0.041*).* ***Conclusions:*** *It was observed that the use of dietary supplements increases the physical functioning capacity of its users.*

Keywords: knowledge, health status, intake of dietary supplements

[***How to Cite:*** Majeed A, Khan IH, Gohar A, Shah FI. Association of knowledge and quality of life with the intake of dietary supplements among the students. *Biol. Clin. Sci. Res. J.*, **2025;** 6(4): 84-90. doi: https://doi.org/10.54112/bcsrj.v6i4.1670

Introduction

Vitamins and minerals are necessary for your body's proper development and operation. Healthy eating provides most people with enough nutrients, but some people need a little extra nutrient boost. That void is filled by supplements, which give your body the support it needs to be healthy.(1, 2)

The European Food Safety Authority (EFSA) defines food supplements as concentrated sources of nutrients or other substances that have a physiological or nutritional effect and are intended to complement a regular diet. (3) These products may contain vitamins, minerals, herbs, amino acids and other substances, or their constituents.(4) Tablets, capsules, powders, and pills are frequently used to provide DS. The goals of DS intake are to prevent disease, improve mental and physical health, improve athletic performance, and make up for nutritional inadequacies. (5) When used in the proper dosage and according to instructions, the benefits of DS are clearly evident (6, 7)

Studies show that roughly half of adult US citizens utilize DS in some capacity. (8) Contrary to popular belief, a large majority of Pakistan's population is still unaware of the nutritional requirements and needs that go unmet due to subpar dietary habits, but some health-conscious individuals do take pills and tablets containing vitamins and dietary supplements. (9, 10) It has been observed that the Vitamin supplements are frequently misused in Pakistan. (11) Out of the 121 nations with sufficient data to calculate the rankings for the Global Hunger Index in 2022, Pakistan is ranked 99th. With a score of 26.1, Pakistan has a serious level of hunger**..** (12) In a list of 125 nations, Pakistan was ranked 97th in the food index for accessibility, cost, and dietary health. Pakistan is one of the nations with the most unhealthy and scarce diet, according to the ranking. In comparison to other developing nations, Pakistan is said to have one of the highest prevalence rates of child malnutrition. (13)

Adolescents use DSs in large numbers (14) such as university students who are moving from adolescence to adulthood. Adjustments to university life, where actions and choices are less governed than in high school, have led to this usage. Therefore, this adjustment to academic life may result in significant shift in nutritional choices (15) and dietary patterns (16-18) Among these behaviors are irregular eating patterns, skipping breakfast, eating less fruits and vegetables, and consuming more junk foods. (19) Dietary habits and the use of DS have a substantial correlation**.** (20, 21) This is most strongly motivated among college students by the desire to improve overall health and boost vitality. According to consumption trends, over two-thirds of surveyed university students in the U.S. routinely use these products. (21) Due to their independence and imbalanced eating habits, university students in particular use DSs to reduce stress and improve their health. Dependence on DSs, however, could develop unhelpful eating patterns in people for the rest of their life. (22)

Behaviors related to DS intake differ from those associated with the consumption of food. Food is typically regarded as a low-involvement product. (23) whereas DSs demand high involvement (24) The degree of participation reveals how personally significant or involved you are in using a product and how much knowledge you require to make a choice. However, low-involvement decisions often involve products that are reasonably priced and pose little danger to the buyer if a mistake is made in buying them.(25) Decisions with a high level of engagement are those that have been given serious thought and consideration. Three crucial aspects of highly involved purchasing decisions are listed below. They are costly, complicated, and risky.(26) Dietary or health-related involvement behaviors include contemplation of things like diversity in

nutritious meals, nutritional content, and meals that support individual dietary patterns. (27) According to the findings of a study done in Germany, German consumers were more likely to be involved in nutritional supplements purchase than regular food items. (28), considering the additional health advantages that come along with it, beyond what is provided by food options. (24)

Numerous studies show that people who take nutritional supplements are substantially more likely than nonusers to follow a somewhat healthier diet, exercise frequently, stay at a healthy weight, and abstain from tobacco use. Overall, the data show that people who use dietary supplements are interested in wellness and actively pursuing a range of lifestyle choices they believe to be supportive of a healthy lifestyle.(29, 30) A healthy mindset may thus be a key determinant of DS consumption. (21).

Previous research has shown that the nutritional needs of many students are not adequately met through their regular meals alone. As a result, the use of dietary supplements (DS) has emerged as a strategy to help reduce the risk of nutritional deficiencies. However, there are mixed opinions regarding the role of knowledge in influencing DS consumption. Despite being aware of nutritional deficiencies and related health issues, many university students continue to engage in poor dietary practices. This study aims to explore the frequency of dietary supplement intake among university students and to evaluate how their knowledge of dietary supplements relates to this behavior. Additionally, the study seeks to examine whether there is an association between the intake of dietary supplements and the quality of life among students in Lahore. The investigation is guided by the hypothesis that there is no significant difference in the quality of life between students who take dietary supplements and those who do not. Conversely, the alternative hypothesis suggests that a significant difference does exist between the two groups.

Methodology

Dietary supplements intake: Vitamins, such as multivitamins or individual vitamins (like biotin and vitamin D), minerals (such as calcium, magnesium, and iron), botanicals or herbs (like echinacea and ginger), botanical compounds (like caffeine and curcumin), amino acids (like tryptophan and glutamine), proteins, multiminerals, carbohydrates, hormone activators, and oil supplements are all examples of these.

Students taking any of the above mentioned were considered in dietary supplement intake. (31). Quality of life was measured using the validated questionnaire i.e., SF-36 questionnaire. The SF-36 consists of eight domains. (32)It was an Analytical cross-sectional study conducted among students from two universities of Lahore including The University of Lahore and Punjab University. Based on anticipated frequency (p) was taken 22.6% of Japan students taking dietary supplement among students in Japan 22.6% (T. Chiba, et al. 2020), d is the margin of error = 0.05 and confidence interval (CI) of 95%, N= 266. (Using openepi.com) Simple Random sampling was employed and included students with either gender particularly age 18 to 40 years. Exclusion Criteria had Students with chronic illness or those undergoing medical treatment for health problems.

Results

A total of 266 university students participated in the study, with a mean age of 22.24 ± 3.02 years (range: 18–38 years). The sample comprised 114 males (42.9%) and 152 females (57.1%). The mean height was 5.14 ± 0.38 feet and the mean body weight was 58.9 ± 13.08 kg.

Overall, 202 participants (75.9%) reported using dietary supplements (DS) in the past three to six months, while 64 participants (24.1%) did not. Female students reported a significantly higher rate of DS use (71%) compared to male students (60.5%) ($p = 0.006$). Day scholars (69%) had a slightly higher prevalence of DS use compared to hostel residents (63%), though this difference was not statistically significant. Students enrolled in food or health-related disciplines had a significantly higher prevalence of DS use (73%) compared to those in non-health-related fields (59%) ($p = 0.003$). Among participants with dietary restrictions (19.5%), 73% reported using DS, while 65% of those without restrictions also reported DS use. However, this difference was not statistically significant.

When assessed by BMI, DS usage was highest among participants with BMI <18.5 (77.7%) and those within the healthy BMI range of 18.5–22.9 (76.7%), with no significant differences observed. Similarly, 71.9% of smokers and 77.7% of non-smokers reported DS use, with no significant association found between smoking status and DS intake ($p = 0.184$). Among 74 students who engaged in regular exercise, 77% used DS, which was comparable to the 75.5% usage rate among those not exercising regularly ($p = 0.797$).

The most commonly used supplements were vitamins (43.6%), followed by proteins (9.8%) and oils (7.5%). Less frequently used supplements included amino acids, hormone activators, carbohydrates, minerals, and botanicals. Students primarily used DS to promote general health (28.2%), lose weight (13.2%), or enhance immunity/energy (6%).

Regarding frequency, 20.3% of participants used supplements monthly, 18.8% daily, while 28.6% could not accurately recall the frequency of use. The most important factor influencing supplement purchase decisions was nutritional labeling (32.7%), followed by brand reputation (17.7%) and recommendations from peers (10.9%).

In terms of knowledge, 60% accuracy (≥6 correct responses out of 10) indicated adequate knowledge. Responses showed that while most students believed DS are essential for health and can prevent chronic diseases, a large number were uncertain about potential harms or the need to replace a healthy diet. The internet (n = 115), trainers (n = 61), family members (n = 61), and dietitians/nutritionists (n = 62) were the main sources of information. Only 78 students regularly reviewed ingredients of DS before use.

When quality of life was assessed, no significant differences were found between DS users and non-users in general health status, pain, social functioning, emotional well-being, energy/fatigue, or role limitations due to emotional or physical health problems ($p > 0.05$). However, DS users had significantly better physical functioning scores compared to non-users ($p = 0.041$).

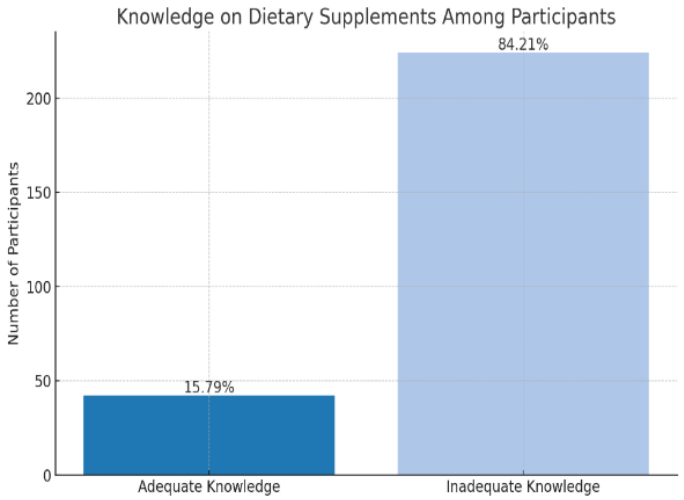

Figure 1. Percentage of adequate and inadequate knowledge regarding dietary supplement among the participants

Therefore, it was observed that 42(15.79%) had adequate knowledge about dietary supplementation intake while 224 (84.21%) had inadequate knowledge.

Table 1. Sociodemographic for the respondents of DS users and DS non-users.

Characteristics		Frequency	DS users	DS non-users	p-Value
		(Valid percentage)	(Valid percentage)	(Valid percentage)	
Gender	Male	114 (42.9%)	69 (60.5%)	45 (39.5%)	0.006*
	Female	152 (57.1%)	108 (71%)	44 (29%)	
Marital status	Single	243 (91.4%)	164 (67.5%)	79 (32.5%)	0.07
	Married	23 (8.6%)	13 (56.5%)	10 (43.5%)	
Place of residence	Hostel	119 (44.7%)	75 (63%)	44 (37%)	0.16
	Day scholars	147 (55.3%)	102 (69%)	45 (31%)	
Major area of study	Food or health related	147 (55.3%)	107 (73%)	40 (27%)	0.003*
	Non-food or non-health related	119 (44.7%)	70 (59%)	49 (41%)	
Are you on a diet restriction	Yes	52 (19.5%)	38 (73%)	14 (27%)	0.103
	No	214 (80.5%)	139 (65%)	75 (35%)	
BMI	Below 18.5	54 (20.3%)	42 (77.7%)	12 (22.3%)	0.86
	18.5 – 22.9	146 (54.9%)	112 (76.7%)	34 (23.3%)	
	23 – 24.9	25 (9.4%)	19 (76%)	6 (24%)	
	25 and above	41 (15.4%)	29 (70.7%)	12 (29.3%)	
Smoking status	Smoker	32 (12%)	23 (71.9%)	9 (28.1%)	0.184
	Ex-smoker	14 (5.3%)	8 (57%)	6 (43%)	
	Non-smoker	220 (82.7%)	171 (77.7%)	49 (22.3%)	
, Do you do regular exercise	Yes	74 (27.8%)	57 (77%)	16 (23%)	0.797
	No	192 (72.2%)	145 (75.5%)	47 (24.5%)	

Table 2. Frequency and percentage of dietary supplement intake in the participants

No.	Questions		Frequency	Percentage
1.	Have you taken any form of dietary supplement in past 6 months?	Yes	202	75.9%
		No	64	24.1%
		Total	266	100%
2.	Which dietary supplements were you taking in the past 6 months?	Vitamins	116	43.6%
		Oil supplements	20	7.5%
		Proteins	26	9.8%
		Amino acids	4	1.5%
		Carbohydrates	7	2.6%
		Hormone activators	5	1.9%
		Minerals	10	3.8%
		Herbs	3	1.1%
		Others	11	4.1%
		Total	202	75.9%
3.	How often do you take dietary supplements?	Daily	60	22.5%
		Once a week	54	20.3%
		Once a month	12	4.5%
		Irregularly	76	28.6%
		Total	202	75.9%
4.	Reason for taking dietary supplements	Promote general health	75	28.2%
		Due to a medical condition	13	4.9%
		Recommendations from family	7	2.6%
		Weight loss or weight gain	35	13.2%
		Because of specific nutritional health promotion	11	4.1%
		Because friends taking DS	4	1.5%
		Increase energy	16	6%
		Enhance immune system	16	6%
		To improve your diet	14	5.3%
		Increase or maintain muscle mass, strength, and power	9	3.4%
		Others	2	0.8%

		Total	202	75.9%
5.	Considerations when select dietary supplements	Nutritional information on package	87	32.7%
		Brand	29	10.9%
		Advertisement	10	3.8%
		Recommendations from others	47	17.7%
		Price	20	7.5%
		Quantity	9	3.4%
		Total	202	75.9%

Table 3. Knowledge about intake of dietary supplements

No.	Questions		Frequency	Percentage
1	Diet only is sufficient or good health in all individuals	Agree	159	59.80%
		Disagree *	75	28.20%
		Don't know	32	12%
		Total	266	100%
2	Dietary supplements are necessary for all ages	Agree *	154	57.90%
		Disagree	78	29.30%
		Don't know	34	12.80%
		Total	266	100%
3	Dietary supplements can prevent chronic diseases	Agree	132	49.60%
		Disagree *	56	21.10%
		Don't know	78	29.30%
		Total	266	100%
4	Is dietary supplement essential to health?	Agree *	158	59.40%
		Disagree	53	19.90%
		Don't know	55	20.70%
		Total	266	100%
5	Can dietary supplements be used instead of health diet?	Agree	93	35%
		Disagree*	105	39.50%
		Don't know	67	25.20%
		Total	266	100%
6	Can dietary supplements be harmful to health?	Agree *	91	34.20%
		Disagree	93	35%
		Don't know	82	30.80%
		Total	266	100%
7	Dietary supplements are completely safe	Agree	109	41%
		Disagree*	92	34.60%
		Don't know	65	24.40%
		Total	266	100%
8	Do you read or search for information regarding health or nutrition	Yes *	198	74.40%
		No	68	25.60%
		Total	266	100%
9	Do you review ingredients used in the dietary supplement you are intaking?	Yes *	144	54.10%
		No	122	45.90%
		Total	266	100%
10	Where do you get information about dietary supplement you are taking	Sport/fitness trainer	61	22.90%
		Family	61	22.90%
		Internet	115	43.20%
		Medical physician	33	12.40%
		Pharmacist	17	6.40%
		Dietitian/nutritionist	62	23.30%
		Total	266	100%

**Indicates correct knowledge*

Table 4. Quality of Life of Students taking Dietary supplementation vs who are not taking dietary supplements using SF-36 questionnaire.

Domain	Items	Ds users	Ds non-users	p-Value
General Health	5	2.73 ± 0.63	2.67 ± 0.05	0.474

Pain	2	2.71 ± 1.044	2.38 ± 0.815	0.22
Social functioning	2	2.99 ± 1.033	3.062 ± 1.059	0.651
Emotional wellbeing	5	3.48 ± 0.894	3.50 ± 0.774	0.884
Energy \fatigue	4	3.37 ± 0.934	3.488 ± 0.739	0.378
Role limitation due to emotional problems	3	1.48 ± 0.351	1.557 ± 0.407	0.161
Role limitation due to physical health	4	1.52 ± 0.319	1.54 ± 0.349	0.64
Physical functioning	10	2.018 ± 0.05	2.14 ± 0.048	0.041*

Discussion

A dietary supplement is a product intended to enhance the nutritional content of a diet. Dietary supplements are frequently employed by college students to enhance their energy levels, improve their academic achievements, and enhance their overall well-being. This study found that around three-quarters of respondents (i.e., 75.9%) have taken DSs in the past 6 months, moreover, mostly participants were taking the supplements mentioned above during the research. Similar usage prevalence among American (52%), Australian (56%), and Serbian students (68.1%) students is observed. (33-36) In contrary, to the studies conducted on students at the University of KwaZulu-Natal, Saudi public university and universities in Croatia where lower prevalence of dietary supplements intake were observed, (i.e., 23%, 32.7% and 30.5% respectively. (37),(38),(39)

Participants who were taking DS were more likely to be females, non-smokers, and students with normal BMI. When association between gender and dietary supplement usage is observed in this study, it is seen that frequency of DS intake is much higher in female students (71%) than in male students (60.5%). In a study conducted on Australian population similar results were recorded. A total of 43.2% of adults (34.9% of males, 50.3% of females), 20.1% of adolescents (19.7% of males, 20.6% of females), and 23.5% of children (24.4% of males, 22.5% of females) and 68% were DS users (36) and used at least one dietary supplement in that research. (40). Similarly, studies conducted in France and Germany also showed higher prevalence of females. (41, 42)

Students with health related or food related major (73%) were more likely to be users of dietary supplements than students of non-health or non-food related major (59%), which is in accordance to similar studies conducted in universities of UAE and Serbia. (43, 44) This is expected to be due to the medical courses undertaken by these students, which give them a better knowledge about dietary supplements.

An average BMI of 18.5 to 22.9 was observed to be more prevalent in Ds-users (76.7%) than Ds non-users (23.3%). Other studies also showed quite similar results. (42, 45). Such results are expected since people using DS tend to be more conscious of their health and lifestyle choices. Like what's assumed, the frequency of DS intake is higher in non-smokers (77.7%) than in smokers (71.9%) and ex-smokers (57%). Similar results are observed in Belgian, French and Canadian research studies. (46) (42) (47)

In the current study, it is seen that though students used dietary supplements still, their physical activity was not much. However, the frequency of physical activity among students who used DS (77%) was still higher than those who do not take DS (23%). This result was similar to other studies. (45, 48). This may be because people who take dietary supplements are more health conscious than non-users of dietary supplements.

By assessing the knowledge of the participants, which included both DS users and non-users, it was observed that most participants knew that dietary supplements are not always safe (41%). Some participants thought it to be completely safe (34.6%) while the rest didn't know about it (24.4%) This indicates a lack of knowledge regarding DS use among the participants. For all participants in this study, the internet has the greatest influence (43.2%) on their decisions to take supplements, followed by healthcare professionals (23.3%). Other studies related to DS use revealed that family, companions and specialists were the main wellsprings of dietary enhancement data. (49, 50)

Given that 43.2 % of students do not seek the assistance of a medical professional when taking a dietary supplement, the widespread use of the internet as a source of information rather than health professionals as a trusted source is very useful information. To support healthier choices, the young population's decision regarding reliable sources needs to be revised.

It was also seen that most participants thought that dietary supplements are necessary for all age groups (57.9%) and that using them can prevent the occurrence of chronic diseases (49.6%). These are contrary to other research performed on similar topic. (39) The most popular supplements used were vitamins, protein supplements and oil supplements respectively. Similarly, to our research, in the majority of those studies, the most commonly used DS by students were vitamins and minerals. (45, 51) In some studies, protein/amino acids, fish oil/omega-3 supplements and weight loss supplements were popular as well (21, 51)

In this study, the main motivation for using DS by most of the students was promoting general health (28.2%) as well as weight loss or weight gain (13.2%), to increase energy (6%) and enhance immune system (6%) respectively. Likewise, studies in Croatian (52), North American (21) and Japanese university students (51) discovered that health enhancement or promotion were the most frequently cited reasons. Other reasons, such as the treatment of a specific disease or health issue or recommendations from family or friends, were also mentioned in those studies. Most participants taking DS experienced no side effects (40.2%). Most common side effect included headache (10.5%) and fast heart beating (7.9%).

It was seen in the study that association exist between the intake of DS and physical functioning ($p<0.05$) when comparison of Ds user and non-user regarding different domains of quality of life was made. Since the age group for this study was quite young therefore, it may account for this such results. If the study was conducted on an older age group, most probably some association might have been observed between the intake of DS and other domains of quality of life such as different levels of pain, social functioning, emotional wellbeing, energy/fatigue, role limitation due to emotional problems and role limitation due to physical health between ds users and non-ds users.

Conclusion

This study shows that participants who know more about dietary supplements take more of them. Dietary supplements may also boost physical performance. Dietary supplements did not affect social functioning, weariness, emotional wellbeing, etc. Since this study's age group was young, this may explain the results. In an older age group, DS intake may have been associated with other domains of quality of life, such as pain, social functioning, emotional wellbeing, energy/fatigue, role limitation due to emotional problems, and role limitation due to physical health between ds users and non-ds users.

RECOMMENDATIONS

Health seasons and campaigns should educate university students about dietary supplement use, benefits, and misuse. Large numbers of students in this study took nutritional supplements without knowing much about

DS. Youth must also be educated about nutritional health issues and solutions to improve it among university students.

LIMITATIONS

This study only included University of Lahore students, thus future research should include students from government and private universities and a bigger sample size to better represent the population. An improved DS need research would incorporate nutritional profile and actual nutritional intake tracking.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-MMNCS-0331d-24)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

AM

Manuscript drafting, Study Design,

IHK

Review of Literature, Data entry, Data analysis, and drafting article.

AG (Associate Professor)**,** *Conception of Study, Development of Research Methodology Design,*

FIS

Study Design, manuscript review, critical input.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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