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Original Article

Pharmacology Section

Knowledge, Attitude and Practice Related to the Use of Nutraceuticals for Prophylaxis against COVID-19 among Undergraduate Medical and Nursing Students in a Tertiary Care Teaching Hospital, Bihar, India

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ABSTRACT

Introduction: Nutritional supplements modify immune response and protect against viral infections. Health related behaviour of medical and nursing students governs their attitude towards counselling patients. This study assessed the differences in the Knowledge, Attitude, and Practice (KAP) between undergraduate medical and nursing students regarding the role of nutraceuticals in Coronavirus Disease-2019 (COVID-19).

Aim: To assess the differences in the KAP between undergraduate medical and nursing students regarding the role of nutraceuticals in COVID-19.

Materials and Methods: An analytical cross-sectional study was conducted in a tertiary care teaching hospital, Patna, Bihar, India in September 2020. A questionnaire was administered to assess the KAP of 265 medical and 150 nursing undergraduates regarding nutraceuticals. The total knowledge score varied between 0 to 12. The score of the attitude was based on 5-points Likert scale. The data was collected through self-administered google forms. Chi-square test and Fisher's exact test was used to compare the difference in categorical data.

Results: There was total 415 participants with 265 medical undergraduates and 150 nursing students. Out of total 273 (65.8%) participants with good knowledge and only 47 (11.3%) with positive attitude. About 68.7% medical students and 82.7% nursing students felt that regular intake of nutraceuticals has a positive role in protecting against COVID-19 (p-value=0.007). Out of 415, 264 participants (63.6%) had used nutraceuticals. About 156 (58.9%) medical students and 103 (68.7%) nursing students felt that the safety of nutraceuticals is a grave concern. Two- fifth of the participants (202, 48.7%) had consumed a dietary supplement to maintain good health.

Conclusion: Although the knowledge score was good, but positive attitude was lacking. Thus, Healthcare Personnels (HCP)s should be trained regarding proper usage and recommendations of nutraceuticals.

Keywords: Dietary supplements, Health personnel, Immune response, Micronutrients

INTRODUCTION

The Severe Acute Respiratory Syndrome-Coronavirus-2 (SARS-CoV-2) is a novel coronavirus, responsible for the current pandemic [1]. Antibiotics, dexamethasone, pronging and oxygen support have been the only approaches with a clearly established benefit in COVID-19; maximally effective only when given to the right patient at the right time [2]. Several therapeutic agents like hydroxychloroquine, remdesivir, tocilizumab, convalescent plasma, immunoglobulins, monoclonal antibodies and different types of vaccines offering chemoprevention against the virus like Astra zeneca- Covishield, Moderna, Pfiser-BionTech, Covaxin, Sputnik V etc. are constantly being investigated to reduce the viral load. However, all of these drugs have shown inadequate efficacy as well as undesirable toxicity and vaccines are able to attenuate the morbidity and mortality due to COVID-19, only to a limited extent [2-5]. Reducing the risk of infection and transmission by employing respiratory hygiene measures (masks, social distancing and sanitisers) has remained the most effective measure from the start of the pandemic [6]. However, the virus continues to take a huge toll on the lives of humanity worldwide and we are yet to figure out a truly curative drug regimen.

Therefore, apart from hygiene changes, a boosting of the immunity through food or dietary supplements to prevent infection and ameliorate disease severity which seems to be the most useful approach right now. COVID-19 morbidity and mortality is largely related to the huge inflammatory response of the host against the virus. For this reason, it seems advisable to invest in the use of nutritional supplements with multipronged action against the virus e.g immunomodulatory, anti-inflammatory, antiviral, lung protective etc [7]. There is increasing evidence that vitamin C, D, zinc, probiotics and various other micronutrients modify the immune system and a number of activities in the body in a manner that protects us against various viral infections particularly cold and cough [8-10].

The research has shown that vitamin C causes leads to an improvement in oxygenation, and a decrease in the level of inflammatory biomarkers in infected individuals while ability of zinc to retard the interaction between SARS-CoV-2 S protein and Angiotensin Converting Enzyme 2 (ACE2) that might prove to be lifesaving in the ongoing battle against the disease [11-13]. Similarly, a recent study reported that 5000 International Unit (IU) of vitamin D reduces the time to recovery of cough and gustatory symptoms in patients with suboptimal vitamin D and mild to moderate COVID-19 symptoms [14].

Thus, it is clear that these essential micronutrients, vitamins and minerals have burst into focus during the current pandemic with anecdotal, mechanistic and clinical evidence in COVID-19. These micronutrients/dietary supplements generally come under the broad umbrella term of Nutraceuticals- any product derived from food sources or herbal products, dietary supplements (nutrients), specific diets, and processed foods such as cereals, soups, and beverages with extra health benefits in addition to the basic nutritional value

found in foods. Nutraceuticals is a term derived from "nutrition" and "pharmaceutics". Nutraceuticals, also referred as medical foods, designer foods, phytochemicals, functional foods and nutritional supplements, includes "bio" yoghurts, vitamins, herbal remedies and genetically modified foods and supplements [15-17].

Since, the health related behaviour of medical and nursing students governs their attitude regarding counselling of patients about the pros and cons of nutraceuticals usage in COVID-19 and overall health, therefore this study was conducted to assess the differences in the KAP between undergraduate medical and nursing students regarding the role of nutraceuticals in COVID-19.

MATERIALS AND METHODS

An analytical cross-sectional study was conducted in a tertiary care teaching hospital, Patna, Bihar, India in the month of September 2020 after getting the clearance from the Institutional Research and Ethics Committee (AIIMS/Pat/IEC/2020/462 dated 25.06.2020). The study participants were the undergraduate medical and nursing students.

Inclusion criteria: The medical undergraduate and nursing students aged between 18-25 years, irrespective of gender, willing to participate and gave consent for the study were included.

Exclusion criteria: Students, who did not gave informed consent were excluded from the study.

Sample size: A minimum sample size was calculated using the formula ($n=3.96\ pq/L^2$) where p is proportion of students having knowledge of dietary supplements, "q" is (1-p) and L represents margin of error, which was set at 5%. On the basis of previous literature, p was assumed as 61% [18,19]. Thus, a minimum sample size of 366 was calculated at 95% confidence level. However, on consecutive sampling and after taking consent, 415 undergraduates were included in the study. The medical undergraduates were 265 in number while there were 150 nursing students.

Data Collection

Data collection was done using a pretested semi-structured questionnaire [20,21]. The questionnaire was self-administered through online channels. The structured questionnaire contained four sections.

- The first section was related to data about demographic characteristics of the participants and certain background characteristics. It had one question each for age, gender, course (medical or nursing), year of course, diet, addiction to smoking and daily exercise duration. Thus, there were total of seven questions in the first section.
- The second section had 12 questions which included items regarding the knowledge about the role of nutraceuticals in COVID-19. The response was recorded as true/false, and 1 score was given for correct answer and 0 for wrong answers. The total knowledge score varied between 0 (with no correct answer) and maximum score 12 (for all correct answers). The overall median score was 5 and a cut-off level of less than median i.e. 5, was evaluated as poor knowledge, and ≥5 as good knowledge.
- The third section assessed attitude of the participants with 11 questions which was measured on 5-point Likert Scale. The score of the attitude was based on 5-points Likert scale, in which the score of 1 to 5 was given from strongly agree to strongly disagree. A mean score of 2 (answering for strongly agree or agree) was considered as a positive attitude and a score of 3 to 5 was considered as a negative attitude (answering strongly disagree or disagree or undecided) for each question. The score ranged between 11 to 55. Based on the aforementioned criteria the score ranging from 11 to 22 was taken as positive attitude and more than 22 i.e. 23-55 was labelled as negative score.
- The last section contained items based on practice which had 10 questions. Data for practice was collected in number and percentage.

The final questionnaire was created on google forms and the link was sent to the potential participants. The cover page of the google form included an introductory page mentioning the purpose of the study and a consent form of the participants at the beginning of the survey. The survey form got activated only after getting the consent of the participant. No personal identification was recorded in the survey form, and hence, the confidentiality of the participants were maintained.

Data management: Since the data was collected through a web-based survey, it was automatically transferred to the designated server through the link. The final data was transferred to excel sheet.

STATISTICAL ANALYSIS

Data analysis was performed using Stata Version 12 (Stata Corp., College Station, TX, USA). Descriptive analysis was presented as mean with 95% Confidence Interval (CI) for normally distributed variables. Student's t-test was used to compare the mean difference of normally distributed continuous variables. Chi-square test and Fisher's-exact test was used to compare the difference in categorical data accordingly. For all the differences of estimated variables statistically significant was considered if p-value <0.05.

RESULTS

Demographic data of the study participants: There were total of 415 participants with 265 medical undergraduates and 150 nursing students. The mean age of medical students was significantly lower 20.94±1.75 years) than nursing students (21.35±1.58 years) (p-value=0.018). The gender wise distribution of medical and nursing students was also statistically different (p-value <0.01). This difference was attributed to the fact that only female students were enrolled in nursing course. Most of the study participants, 174 (65.7%) medical students and 89 (59.3%) nursing students were non vegetarian (p-value=0.199). About 256 (96.6%) medical students and 149 (99.3%) nursing students never smoked (p=0.211). Thus, the distribution of medical and nursing students based on aforementioned factors was comparable [Table/Fig-1].

Background characteristics	Overall (N=415) n (%)	Medical students (n=265) n (%)	Nursing students (n=150) n (%)	p-value
Mean age±SD (years)	21.08±1.70	20.94±1.75	21.35±1.58	0.018#
Gender				
Female	240 (57.8)	90 (34.0)	150 (100)	<0.01@
Male	175 (42.2)	175 (66.0)	0	
Year-wise				
1st	108 (26.0)	69 (26.0)	39 (26)	0.998*
2nd	110 (26.5)	71 (26.8)	39 (26)	
3rd	107 (25.8)	68 (25.7)	39 (26)	
4th	90 (21.7)	57 (21.5)	33 (22)	
Diet				
Vegetarian	152 (36.6)	91 (34.3)	61 (40.7)	0.199*
Non vegetarian	263 (63.4)	174 (65.7)	89 (59.3)	
Smoking				
Never	405 (97.6)	256 (96.6)	149 (99.3)	0.211*
Occasionally	10 (2.4)	9 (3.4)	1(0.7)	
Exercise				
Never	100 (24.1)	70 (26.4)	30 (20)	0.419*
Whenever I find time	95 (22.9)	60 (22.6)	35 (23.3)	
2-3 times a week	39 (9.4)	26 (9.8)	13 (8.7)	
Daily	181 (43.6)	109 (41.1)	72 (48)	

[Table/Fig-1]: Demographic characteristics of the study participants (N=415).
#Independent t-test; @Fisher's exact; *Chi-square test; p-value <0.05 considered significant

Assessment of knowledge of the study participants regarding nutraceuticals: The study participants were asked 12 questions to assess their knowledge about nutraceuticals. The most correctly answered question was whether nutraceuticals are different from herbal medicine, 234 (88.3%) and 127 (84.7%) gave the correct answer. The students were then enquired about what comprises of nutraceuticals. Significantly lower proportion of nursing students 65 (43.3%) were aware that vitamins and minerals are included under nutraceuticals, than medical students 154 (58.1%) (p-value=0.004). Similarly, 131 (49.4%) out of 265 medical students compared to 46 (30.7%) of nursing students knew that probiotics and yoghurt are included among nutraceuticals (p-value <0.001). However, 68 (45.6%) out of 150 nursing students knew that phytoestrogens, carotenoids and flavonoids are also nutraceuticals (p-value=0.033). Almost 157 (59.2%) medical and 77 (51.3%) nursing students were aware that there are specific vitamins, minerals and herbals that boost immunity against cough and cold [Table/Fig-2].

Knowledge based questions related to nutraceuticals	Medical students (N=265) n (%)	Nursing students (N=150) n (%)	p-value*
Vitamins and minerals are included among nutraceuticals	154 (58.1)	65 (43.3)	0.004
Probiotics and yoghurt are included among nutraceuticals	131 (49.4)	46 (30.7)	<0.001
Phytoestrogens, carotenoids, flavonoids are included among nutraceuticals	92 (34.7)	68 (45.6)	0.033
There are specific vitamins, minerals and herbals that boost immunity against cough and cold	157 (59.2)	77 (51.3)	0.118
Vitamin C boosts immunity against cough and cold	228 (86.0)	113 (75.3)	0.006
Zinc boosts immunity against cough and cold	94 (35.6)	21 (14.1)	<0.001
Vitamin D boosts immunity against cough and cold	17 (6.4)	04 (2.7)	0.071
Vitamin A boosts immunity against cough and cold	33 (12.4)	09 (6.0)	0.036
Vitamin E boosts immunity against cough and cold	15 (5.7)	07 (4.7)	0.664
Probiotics boosts immunity against cough and cold	21 (7.9)	08 (5.3)	0.320
Dose of nutraceuticals should be increased during infection	204 (77.0)	122 (81.3)	0.299
Nutraceuticals and herbal medicine are different	234 (88.3)	127 (84.7)	0.290

[Table/Fig-2]: Assessment of knowledge of undergraduates regarding nutraceuticals (N=415).
*Chi-square test; p-value <0.05 was considered significant

Assessment of attitude of the study participants regarding nutraceuticals: Positive attitude towards role of vitamin C in COVID-19 was noted among 167 (63%) medical students and 123 (82%) nursing students (p-value <0.001). About 182 (68.7%) medical students and 124 (82.7%) nursing students felt that regular intake of nutraceuticals has a positive role in protecting against COVID-19 (p-value=0.007). About 156 (58.9%) medical students and 103 (68.7%) nursing students felt that the safety of nutraceuticals is a grave concern and maximum number of participants 232 (87.5%) medical students and 135 (90%) nursing students felt the need of more events to educate people regarding use of nutraceuticals. Significant difference in attitude towards replacement of natural foods with dietary supplements was observed among medical and nursing students (p-value <0.001) [Table/Fig-3].

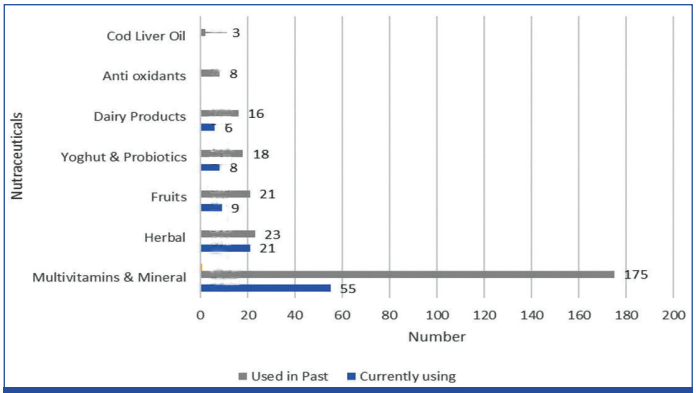
Assessment of practise of the study participants regarding nutraceuticals: The participants were enquired about their usage of nutraceuticals. Almost three-fifth of the students (264, 63.6%); 165 (62.3%) medical students and 99 (66.0%) nursing students; gave an affirmative response when asked whether they have ever used any nutraceuticals. Multivitamins and minerals were consumed by most of the participants both in present (55, 20.8%) and past (175, 66.3%) [Table/Fig-4]. Two-fifth of the participants (202, 48.7%) had consumed a dietary supplement to maintain good health. Almost 60 (22.6%) of the medical students felt that these supplements could also be used to treat minor illness. Only 88 (33.2%) and 67 (44.7%) of medical and nursing students respectively consumed it on a daily basis. It was also reported that almost 147 (55.5%) medical students had researched about nutraceuticals and 237 (89.4%) medical students had sought professional/medical help for the same [Table/Fig-5].

When inquired about the source of information about nutraceuticals, it was observed that the internet was the most sought medium (75.9%) followed by inquiry from a HCP (57.8%) and learning from classroom teaching/books (46.3%) [Table/Fig-6].

Distribution of study participants on the basis of poor and good knowledge and positive and negative attitude is shown in [Table/Fig-7]. The knowledge of the study participants was scored for every correct answer. Overall, there were total 273 (65.8%) participants with good knowledge and 47 (11.3%) with positive attitude. Significant difference in knowledge score was seen among medical and nursing students (p-value <0.001), between male and female students (p-value=0.02) and with increasing seniority (p-value <0.001).

Attitude based question related to nutraceuticals	Medical students (N=265)			Nursing students (N=150)			p-value*
	Agree n (%)	Neutral n (%)	Disagree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	
Vitamin D has a role in COVID 19	35 (13.2)	85 (32.1)	145 (54.7)	06 (4.0)	56 (37.3)	88 (58.7)	0.01
Vitamin C has a role in COVID-19	167 (63.0)	40 (15.1)	58 (21.9)	123 (82.0)	11 (7.3)	16 (10.7)	<0.001
Zinc has a role in COVID-19	55 (20.7)	24 (9.1)	186 (70.2)	30 (20.0)	32 (21.3)	88 (58.7)	0.002
Regular intake of nutraceuticals has a positive role in protecting against various disorders except COVID-19	209 (78.9)	06 (2.2)	50 (18.9)	121 (80.7)	06 (4.0)	23 (15.3)	0.424
Regular intake of nutraceuticals has a positive role in protecting against COVID-19	182 (68.7)	06 (2.2)	77 (29.1)	124 (82.7)	03 (2.0)	23 (15.3)	0.007
Need of events educating people about the role of nutraceuticals in various disorders	229 (86.4)	1 (0.4)	35 (13.2)	134 (89.3)	0	16 (10.7)	0.703[!]
Favourable changes in views on the role of dietary supplements in various corona/non corona related conditions due to the current pandemic	185 (69.8)	15 (5.7)	65 (24.5)	119 (79.3)	02 (1.3)	29 (19.3)	0.035[!]
More likely to invest in nutraceuticals research and usage considering the current pandemic?	178 (67.2)	10 (3.8)	77 (29.0)	109 (72.7)	1 (0.6)	40 (26.7)	0.118[!]
Safety of nutraceuticals is a grave concern	156 (58.9)	11 (4.1)	98 (37.0)	103 (68.7)	2 (1.3)	45 (30.0)	0.074[!]
Can dietary supplements substitute nutrients from natural food?	92 (34.7)	89 (33.6)	84 (31.7)	83 (55.3)	30 (20.0)	37 (24.7)	<0.001
Need of more events in educating people about the role of nutraceuticals in COVID-19	232 (87.5)	03 (1.1)	30 (11.4)	135 (90.0)	0	15 (10.0)	0.537[!]

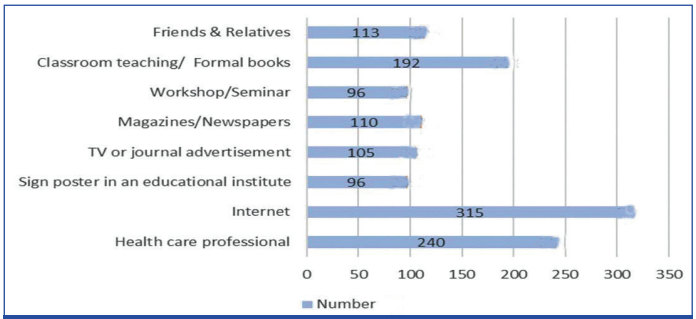
[Table/Fig-3]: Attitude of the study participants regarding use of nutraceuticals (N=415).
*Chi-square test; [!]Fisher's exact; p-value <0.05 was considered significant



[Table/Fig-4]: Comparison of various dietary supplements used by the study participants currently and in past.

Practice- based questions regarding nutraceuticals	Medical students (N=265) n (%)	Nursing students (N=150) n (%)	p-value*
Ever used any dietary supplement/nutraceutical in the past	165 (62.3)	99 (66.0)	0.447
Reasons for consuming these dietary supplements in the past			
Maintain good health	121 (45.7)	81 (54.0)	0.546
Ensure adequate nutrition and fill nutrition gap	69 (26.0)	52 (34.7)	
Meet increased body demand	12 (4.5)	11 (7.3)	
Prophylaxis to prevent diseases	36 (13.6)	24 (16.0)	
Treat minor illness	60 (22.6)	29 (19.3)	
Frequency of supplement intake in the past			
Daily	88 (33.2)	67 (44.7)	0.574
Infrequent	129 (48.7)	76 (50.7)	
Monthly	22 (08.3)	18 (12.0)	
Weekly	59 (22.3)	36 (24.0)	
Ever experienced any adverse effect with intake of any nutraceuticals?	12 (4.5)	12 (8.0)	0.145
Currently using any supplement for prevention against Corona related conditions?	35 (13.2)	39 (26.0)	0.001
Currently using any supplement for prevention against non Corona related conditions?	54 (20.4)	49 (32.7)	0.005
Ever researched about dietary supplements in the past?	147 (55.5)	90 (60.0)	0.37
Taken medical/professional help for nutraceutical intake?	237 (89.4)	148 (98.7)	0.001
Attended any workshop/seminar about nutraceuticals intake?	22 (8.3)	17 (11.3)	0.309
Impact of workshop on nutraceutical usage subsequently	67 (25.3)	48 (32.0)	0.142

[Table/Fig-5]: Practise of the study participants regarding nutraceuticals (N=415).
*Chi-square test; p-value <0.05 was considered significant



[Table/Fig-6]: Source of information about nutraceuticals among study participants.

Background characteristics	Good knowledge (N=273, 65.8%) n (%)	Poor knowledge (N=142, 34.2%) n (%)	p-value*	Negative attitude (N=368, 88.7%) n (%)	Positive attitude (N=47, 11.3%) n (%)	p-value*
Course						
Medical	157 (59.3)	108 (40.7)	<0.001	242 (65.8)	23 (48.9)	0.024
Nursing	116 (77.3)	34 (22.7)		126 (34.2)	24 (51.1)	
Gender						
Female	169 (70.4)	71 (29.6)	0.02	206 (56.0)	34 (72.3)	0.032
Male	104 (59.4)	71 (40.6)		162 (44.0)	13 (27.7)	
Year-wise						
1st	93 (86.1)	15 (13.9)	<0.001	93 (25.3)	15 (31.9)	0.368
2nd	75 (68.2)	35 (31.8)		100 (27.2)	10 (21.3)	
3rd	68 (63.5)	39 (36.5)		92 (25.0)	15 (31.9)	
4th	37 (41.1)	53 (58.9)		83 (22.5)	07 (14.9)	

[Table/Fig-7]: Distribution of study participants on the basis of poor and good knowledge, positive and negative attitude (N=415).
*Chi-square test; p-value <0.05 was considered significant

DISCUSSION

The current study suggests that greater proportion of nursing students than medical students and female than male students respectively had a good knowledge and positive attitude towards the role of nutraceuticals in human health. This finding that the female participants were more likely to use nutraceuticals was consistent with the findings of a study conducted by Sharma A and Adiga S in South India, Mohsen H et al., and Tirodimos I et al., among Greek university students [20-22].

Vitamins and minerals were reportedly used by 22.5% of students in the current study. The most-used dietary supplements were vitamins (18.0% in medical sciences students and 9.8% in non medical sciences students) in research conducted by Žeželj SP et al., in University of Croatia [23]. The knowledge and usage of other nutraceuticals such as probiotics, yoghurt and phytoestrogens, carotenoids and flavonoids were less and similar findings was reported in studies by AlTamimi JZ in Saudi Arabia and Sotoudeh G et al., in Tehran [24,25].

More than half the participants had the knowledge that vitamins and minerals boost immunity to fight off bacterial and viral infections but were relatively unaware about the beneficial effects of zinc and Vitamins D. Vitamin D in recently conducted systematic reviews has shown that it improves viral respiratory tract infections especially in those with Vitamin D deficiency [26]. Evidence suggests that zinc deficiency decreased survival odds in COVID-19 patients and also served as reliable prognostic biomarker [27].

In the current study, 78.9% of medical undergraduates had an attitude that regular intake of nutraceuticals has a positive role in protecting against various disorders. Similar findings were reported in a study conducted by Jahan I et al., among undergraduate female students in Chittagong, Bangladesh. In the study, 81% students knew the beneficial use and 53.3% recommended its regular use [28].

This trend of increasing nutraceuticals usage was evident among the medical and nursing undergraduates with about 50% of them agreeing to having used dietary supplements at some point and almost 30% consuming them on a daily basis. Kobayashi E et al., conducted a nationwide survey in Tokyo, Japan, which reported a 35% prevalence of dietary supplements usage among students [29].

Nearly half of the student used the nutraceuticals to maintain good health and to ensure adequate nutrition. Similar reasons were cited by 49% of medical students in a study conducted in Serbia by Stanojević-Ristić Z et al., [30]. Consequently, over the years the prevalence of nutraceuticals usage has significantly increased, but the reasons have remained the same i.e., for maintenance of overall health and to fill nutrient gaps [31].

In the current study, 75.9% of the study participants had researched on the internet to learn more about the utility of nutraceuticals. Likewise, a study conducted among medical and non medical

students in Croatia by Žeželj SP et al., observed that the main source of information was internet for 66.1% of students [23]. Most of the participants in present study conducted their own research about nutraceuticals and depended upon the internet to answer their queries. However, Al-Naggar RA and Chen R in their study suggests that professional help was sought by only 26.7% students [32]. This implies a healthy curiosity and proactive mindset towards optimal health in the students.

However, it also implies that the recommendations on using nutraceuticals in an adequately nourished population is ill advised. Additionally, in present study 42.2% of students felt that the nutraceuticals can substitute the nutrients in daily diet which is a misconception. This finding was corroborated by Aina BA and Ojedokun OA in their study conducted among students of College of Medicine, University of Lagos, where 64.5% students had similar thought [33]. This observation clearly indicates the need for teaching students about appropriate nutraceutical concept and usage and earlier integration of dietary supplements in curriculum, so that they could benefit society and themselves. Appropriate doses of vitamins and minerals as per the most recent literature should be taught about and personally used by all HCPs. A small step that can go a long way towards a healthier community.

In the current study, majority of medical and nursing students raised grave concern over safety of nutraceuticals. Pharmacological education of young medical students was advocated on this topic to achieve far reaching impact and reduce adverse effects [30].

Most of the participants in present study conducted their own research about nutraceuticals and depended upon the internet to answer their queries. This suggests a deficiency in our curriculum for medical and nursing undergraduates where not enough material is available in their standard textbooks to educate them about the role of nutraceuticals in preventive as well as therapeutic medicine. Sign posters, magasines, newspapers, journal article also served as an important source of information for the students; suggesting that these could serve as useful tools for mass education, clearing myths and creating a favorable atmosphere for nutraceuticals usage.

Limitation(s)

The main limitation of the study was representation of only female nursing students and this could be owed to difference in academic preferences and admission.

CONCLUSION(S)

Present study concludes that although the knowledge score among health personnel was on an average good, but the positive attitude was lacking. This led to usage of multivitamins and minerals driven by information gathered from internet. Thus, the source of information was not appropriate and thus, this led to certain misconception. Therefore, appropriate doses of vitamins and minerals as per the most recent literature should be taught about and personally used by all HCPs. Hopefully, the COVID-19 scare will guide us to teach the undergraduates in a more comprehensive manner by focusing on this as yet neglected but integral aspect of wholesome health. A small step that can go a long way towards a healthier community.

REFERENCES

[1] Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of Coronavirus Disease (COVID-19) outbreak. J Autoimmun. 2020;109:102433.
[2] Lamontagne F, Agoritsas T, Siemieniuk R, Rochwerg B, Bartoszko J, Askie L, et al. A living WHO guideline on drugs to prevent COVID-19. BMJ. 2021;372.
[3] Clerkin KJ, Fried JA, Raikhelkar J, Sayer G, Griffin JM, Masoumi A, et al. COVID-19 and Cardiovascular Disease. Circulation [Internet]. 2020 May 19 [cited 2021 Jul 22];141(20):1648-55. Available from: https://www.ahajournals.org/doi/full/10.1161/CIRCULATIONAHA.120.046941.
[4] Weinreich DM, Sivapalasingam S, Norton T, Ali S, Gao H, Bhore R, et al. REGN-COV2, a neutralizing antibody cocktail, in outpatients with COVID-19. N Engl J Med. 2021;384(3):238-51.
[5] Locht C. Vaccines against COVID-19. Anaesth Crit Care Pain Med. 2020;39(6):703-05.
[6] Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. COVID-19. 2020;382(13):1199-07.
[7] Zabetakis I, Lordan R, Norton C, Tsoupras A. COVID-19: The inflammation link and the role of nutrition in potential mitigation. Nutrients. 2020;12(5):1466.
[8] Jayawardena R, Waniganayake YC, Abhayaratna SA, Ranasinghe P. Prediction of body fat in Sri Lankan adults: Development and validation of a skinfold thickness equation. Diabetes Metab Syndr. 2020;14(2):147-50.
[9] Choe JY, Kim SK. Quercetin and ascorbic acid suppress fructose-induced NLRP3 inflammasome activation by blocking intracellular shuttling of TXNIP in human macrophage cell lines. Inflammation. 2017;40(3):980-94.
[10] Hemilä H. Vitamin C supplementation and respiratory infections: A systematic review. Mil Med. 2004;169(11):920-25.
[11] Richard SA, McCormick BJ, Seidman JC, Rasmussen Z, Kosek MN, Rogawski ET, et al. Relationships among common illness symptoms and the protective effect of breastfeeding in early childhood in MAL-ED: An eight-country cohort study. Am J Trop Med Hyg. 2018;98(3):904.
[12] Zhang J, Rao X, Li Y, Zhu Y, Liu F, Guo G, et al. High-dose vitamin C infusion for the treatment of critically ill COVID-19. Research Square. 2020;10.
[13] McPherson SW, Keunen JE, Bird AC, Chew EY, Van Kuijk FJ. Investigate oral zinc as a prophylactic treatment for those at risk for COVID-19. Am J Ophthalmol. 2020;216:A5-6.
[14] Sabico S, Enani MA, Sheshah E, Aljohani NJ, Aldisi DA, Alotaibi NH, et al. Effects of a 2-week 5000 IU versus 1000 IU vitamin D3 supplementation on recovery of symptoms in patients with mild to moderate COVID-19: A randomized clinical trial. Nutrients. 2021;13(7):2170.
[15] Nasri H, Baradaran A, Shirzad H, Rafieian-Kopaei M. New concepts in nutraceuticals as alternative for pharmaceuticals. Int J Prev Med. 2014;5(12):1487.
[16] Kalra Ekta K. Nutracetical-Defination and introduction. AAPS Pharm. 2003:01-02.
[17] Mannion M. Nutraceutical revolution continues at foundation for innovation in medicine conference. Am J Nat Med. 1998;5:30.
[18] Liu H, Yang Y, Xu D, Xia H, Pan D, Wang S, et al. Investigation and comparison of nutritional supplement use, knowledge, and attitudes in medical and non-medical students in China. Nutrients. 2018;10(11):1810.
[19] Balouchi A, Mahmoudirad G, Hastings-Tolsma M, Shorofi SA, Shahdadi H, Abdollahimohammad A. Knowledge, attitude and use of complementary and alternative medicine among nurses: A systematic review. Complement Ther Clin Pract. 2018;31:146-57.
[20] Sharma A, Adiga S. Knowledge, attitude and practices related to dietary supplements and micronutrients in health sciences students. J Clin Diag Res. 2014;8(8):HC10-13.
[21] Mohsen H, Yazbeck N, Al-Jawaldeh A, Bou Chahine N, Hamieh H, Mourad Y, et al. Knowledge, attitudes, and practices related to dietary supplementation, before and during the COVID-19 pandemic: Findings from a cross-sectional survey in the Lebanese population. Int J Environ Res Public Health. 2021;18(16):8856.
[22] Tirodimos I, Georgouvia I, Savvala TN, Karanika E, Noukari D. Healthy lifestyle habits among Greek university students: Differences by sex and faculty of study. East Mediterr Health J. 2009;15(3):722-28.
[23] Žeželj SP, Tomljanović A, Jovanović GK, Krešić G, Peloza OC, Dragaš-Zubalj N, et al. Prevalence, knowledge and attitudes concerning dietary supplements among a student population in Croatia. Int J Environ Res Public Health. 2018;15(6):1058.
[24] AlTamimi JZ. Awareness of the consumption of dietary supplements among students in a University in Saudi Arabia. Journal of Nutrition and Metabolism. 2019;2019.
[25] Sotoudeh G, Kabiri S, Yeganeh HS, Koohdani F, Khajehnasiri F, Khosravi S. Predictors of dietary supplement usage among medical interns of Tehran University of Medical Sciences. J Health Popul Nutr. 2015;33(1):68.
[26] Charan J, Goyal JP, Saxena D, Yadav P. Vitamin D for prevention of respiratory tract infections: A systematic review and meta-analysis. J Pharmacol Pharmacother. 2012;3(4):300-03. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3543548/.
[27] Heller RA, Sun Q, Hackler J, Seelig J, Seibert L, Cherkezov A, et al. Prediction of survival odds in COVID-19 by zinc, age and selenoprotein P as composite biomarker. Redox Biology. 2021;38:101764. Available from: https://www.sciencedirect.com/science/article/pii/S2213231720309691.
[28] Jahan I, Uddin AB, Reza AA, Uddin MG, Hossain MS, Nasrin MS, et al. Tendencies and attitudes towards dietary supplements use among undergraduate female students in Bangladesh. PloS one. 2021;16(4):e0249897.
[29] Kobayashi E, Sato Y, Umegaki K, Chiba T. The prevalence of dietary supplement use among college students: A nationwide survey in Japan. Nutrients. 2017;9(11):1250.
[30] Stanojević-Ristić Z, Stević S, Rašić J, Valjarević D, Dejanović M, Valjarević A. Influence of pharmacological education on perceptions, attitudes and use of dietary supplements by medical students. BMC Complement Altern Med. 2017;17(1):01-09.
[31] Lordan R. Dietary supplements and nutraceuticals market growth during the coronavirus pandemic-Implications for consumers and regulatory oversight. Pharma Nutrition. 2021;18:100282.

[32] Al-Naggar RA, Chen R. Prevalence of vitamin-mineral supplements use and associated factors among young Malaysians. Asian Pac J Cancer Prev. 2011;12(4):1023-29.

[33] Aina BA, Ojedokun OA. Knowledge and use of dietary supplements by students of College of Medicine, University of Lagos, Idi-Araba, Lagos, Nigeria. J Basic Clin Pharm. 2014;5(2):34.

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