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Knowledge, Attitude and Practices Related to Dietary Supplements and Micronutrients in Medical Students

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Abstract

Dietary supplements and micronutrients have always been a big part of healthcare. Ever since five decades ago, when Nobel Laureate Linus Pauling published his book, Vitamin C and the Common Cold, the interest towards dietary supplements and micronutrients have only been increasing. As the doctors and medical personnel of tomorrow, we believe it is very important for medical students to have proper knowledge, attitude and practices regarding dietary supplements and micronutrients. Therefore, this study aims to determine the knowledge, attitude and practices among the medical students of Melaka Manipal Medical College regarding dietary supplements and to determine their knowledge, attitude and practices regarding micronutrients. A cross-sectional study was conducted among MBBS students of Melaka-Manipal Medical College (MMMC), Malaysia. The data was collected by distribution of questionnaires via a google form link. The questionnaire included questions on socio-demographic data, knowledge, attitude and practices regarding the dietary supplements and micronutrients. Data was analysed using Epi Info. A total of 67 (33.17%) out of the 202 participated. A majority of the participants (65.67%) used dietary supplements, out of which most were using with the intention of maintaining good health and to ensure adequate nutrition. The main sources of information on dietary supplements were found to be the internet and via family members. The study showed poor knowledge among most of the participants (77.61%) about the topic, while the rest had a moderate knowledge (22.39%). The attitude in most (49.25%) was moderate, while 31.34% and 19.40% students had poor and good attitudes respectively. There were no significant associations between age, gender, nationality, smoking, alcohol usage and regular physical activity with the usage of dietary supplements. Only smokers showed significant association with the usage of dietary supplements, as all of them consumed dietary supplements. Since most of the students had poor knowledge towards dietary supplements and micronutrients, we recommend medical institutions to refresh the knowledge of the participants with seminars and talks, followed by competitions and quizzes to reinforce their knowledge in this aspect.

Keywords

Dietary Supplements, Knowledge, Attitude, Practices, Medical Students

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1. Introduction

According to the US Food and Drug Administration (FDA) dietary supplements are defined as any product that contains ingredients like vitamins, minerals, herbs and botanicals which can be taken orally and intended to complement the diet [1]. The consumption of supplements may lead to health benefits like prevention of nutritional deficiency, prevention of diseases and prevention of birth defects and also enhance immunity [2]. According to a recent research in 2014, there is an intake of dietary supplements among 28.1% of Malaysians and the most common supplements are vitamin C and

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multivitamin/multimineral [3].

Knowledge about dietary supplements is important for everyone as we need to understand what we are consuming, and whether there is a need to consume it. Among the general public, for urban areas, it has been found that there is a high prevalence of Vitamin D deficiency among adult Malays in Kuala Lumpur [4]. In rural areas, a previous study described that there were 16% and 27% respectively of Malay and Indian children in rural areas who have a low serum level of vitamin A and are at risk for vitamin A deficiency [5]. There is also evidence that almost half of all cases of vitamin A deficiency occurs in South East Asian countries, which includes Malaysia [6]. As for the population who were prescribed supplements, one study has shown that 50.8% of pregnant women do not comply with their prescribed vitamins and minerals, with reasons such as forgetfulness, side effects and concerns about the effects the supplements will have on their babies being the most common [7]. As such, it is clear that the knowledge and understanding of dietary supplements and micronutrients is very important as it affects the practices and attitudes of the general populace towards them. However, it is doubly important in medical practitioners, as their understanding and attitude of these supplements will directly reflect their approach when advising or prescribing these to their patients [8, 9]. Previous studies have shown that pharmacists and healthcare workers have "unacceptably low scores" when it comes to knowledge of dietary supplements [10, 11]. While medical students tend to have better knowledge regarding dietary supplements and micronutrients as compared to nursing or BDS students, there is still a lack of knowledge among them [8, 9]. In a medical setting, where physicians and patients were both asked to rate the importance of vitamin D, only 22% of physicians and 43% of patients have indicated that they believe vitamin D to be extremely important [12].

In this study, we consider many factors to see if they have an effect on the knowledge, attitude or practices among medical students regarding dietary supplements and micronutrients. These include the age, gender, ethnicity, BMI, smoking and physical activity habits as well as prior knowledge and usage of dietary supplements. According to previous literature, most medical students have tried or are currently using dietary supplements [13, 14]. However, no clear correlations have been made between the aforementioned factors and the knowledge, attitude and practices regarding dietary supplements and micronutrients.

The knowledge about nutritional supplements is vital to Malaysia as its dietary supplement market is about US $17.30/month, increasing tremendously over the past decade [15]. Previous studies state that the prevalence of vitamin/mineral supplements intake and food supplements intake in the country records as 28.05% and 34.02% respectively, reflecting the need for improvement in nutritional knowledge among the general public [3]. Also a study by Al Naggar and Chen (2011) [2] reported there was a significant association between household income with intake of vitamin - mineral supplements status among students of Management and Science University, Malaysia. This may reflect a correlation between occupational status and nutritional knowledge. Out of all age and sex groups in Malaysia, the highest prevalence for consumption of supplements appear to be adolescent males [16]. Among healthcare workers in Malaysia, it has been found that there is a need for pharmacists to be well educated on effectiveness of dietary supplements so that they can provide adequate information to those seeking to purchase them [17]. As for patients, a study has shown that as much as 72.7% of cancer patients in Malaysia are using or have used complementary alternative medicine, with dietary supplements and religious practices as the two most common modalities [18].

Being the future generation of this profession, it is important to know that medical students play a vital role in influencing and advising people regarding the usage of dietary supplements and the usage of those supplements on health [19, 20]. Usage of dietary supplement among Malaysians is prevalent but there are only a few published reports [19]. Therefore, the aim of this study being conducted is to determine the knowledge, attitude and practices among the medical students of Melaka Manipal Medical College regarding dietary supplements and to determine their knowledge, attitude and practices regarding micronutrients.

2. Methods

2.1. Study Design, Study Time, Study Setting, Study Population

A cross-sectional study was conducted among MBBS students of Melaka-Manipal Medical College (MMMC). MMMC has two campuses, one in Muar, Johor and the other in Bukit Baru, Malacca. The Muar campus accommodates MBBS students of semester 6 and 7 while the Malacca campus accommodates MBBS students from semester 8, 9 and 10 as well as BDS and FIS students. This study includes MBBS students from both campuses, which is around 500 students. Study time will be during the month of August of the year 2020. The aim of this study is to assess the knowledge, attitude and practices regarding dietary supplements and micronutrients among medical students.

2.2. Sample Size

Based on a previous study, it is found that 49.6% of students have consumed dietary supplements [14]. The population of

MBBS students of semester 6, 7, 8, 9 and 10 was taken as 500. Using Epi Info version 7.2.4.0, we have determined the sample size as shown below:

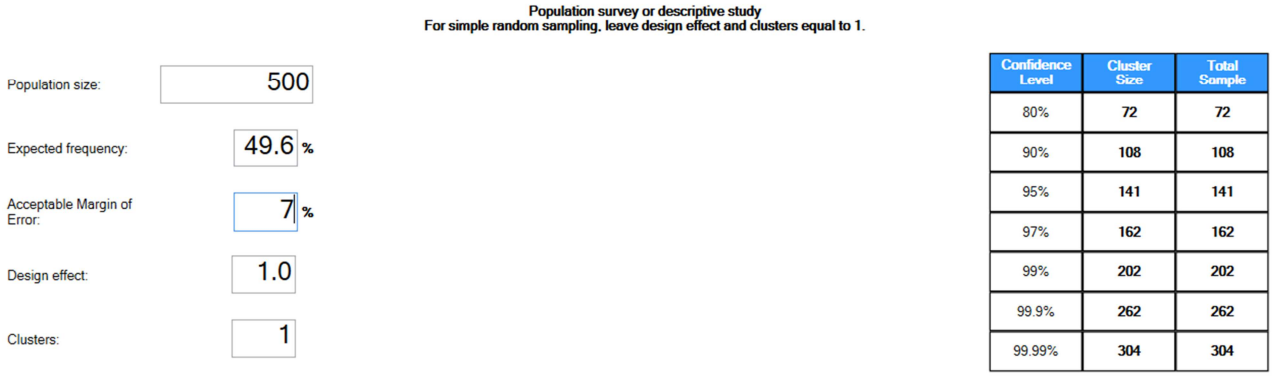

Figure 1. Sample Size Calculation using Epi Info

With a 7% acceptable margin of error, the sample size obtained was 141.

Allowing for 30% of non response rate, the following formula was then used for further calculation:

$$\text{n (final)} = \frac{n(calculated)}{1-(non-response)} = \frac{141}{1-0.3} = 201.4$$

As such, 202 was taken as the final sample size.

2.3. Sampling

The sampling method for this study will be purposive sampling, a non-probability sampling method. Inclusion criteria are MBBS students of MMMC who have consented to participate in this study and each response must be fully completed to be considered valid. Exclusion criteria are BDS and FIS students of MMMC and if multiple responses were given, all the latter responses will be considered invalid.

2.4. Data Collection

The questionnaire was a validated questionnaire taken from a previous study [14]. The data was collected by distribution of questionnaires via a google form link. The questionnaire consists of four parts. The first part was sociodemographic details consist of gender, age, batch, nationality, weight and height. There were also three questions on their habits: frequency of physical activity, smoking habits and alcohol consumption. The second part had 25 questions to test the knowledge of medical students about dietary supplements. The students were required to choose one answer from the given option that is true, false and don't know. In part three, the questions were regarding the attitude of medical students on dietary supplements. The students responded on a five point Likert Scale range from strongly disagree to strongly agree. In the final part (part four), the questions were targeted towards the dietary supplements usage in medical students. The first question was about consumption of dietary supplements. So, if they choose 'Yes' then the next questions were about the types and reasons for intake of supplements and also the source of information about dietary supplements.

2.5. Data Processing and Data Analysis

Data collected will be entered into Microsoft Excel. Data will then be analysed using Epi Info. For quantitative data (age, knowledge and attitude), the mean and range will be derived. Standard deviation will then be calculated from the mean. Level of knowledge will be categorized into good, moderate and poor. Good knowledge will be considered when participants scored more than 80% which is corresponding to a raw score of 20 out of 25 questions regarding knowledge. Moderate knowledge will be considered when participants scored between 60 to 79% corresponding to a raw score of 15 to 19 out of 25 questions. Poor knowledge will be considered in participants who scored less than 50% corresponding to a raw score of 14 out of 25 questions or less. The participants attitude towards dietary supplement was accessed with 5 questions, for each statement the participant can rate 1 to 5, and the maximum score is 25. A score of 80% and above which was a raw score of 20 out of 25 is considered as a positive attitude whereas a score less than 60% corresponding to a raw score of 14 out of 25 is considered as a negative attitude. The participants who scored between 60 to 79% with a raw score of 15 to 19 out of 25 were considered to have a neutral attitude towards dietary supplements.

For qualitative data (gender, ethnicity, BMI, smoking, physical activity habits and dietary supplement usage), frequency and percentage will be calculated. Independent variables in this cross-sectional study are age, gender, ethnicity, BMI, smoking and physical activity habits. The dependent variables are usage, knowledge and attitudes regarding dietary supplements. Odds Ratio (OR) will be calculated for the association between independent variables

and dependent variables.

2.6. Ethical Consideration

The participants were provided an informed consent form and told that the study is completely voluntary to take part in. The participants were ensured about their confidentiality, and their anonymity and privacy were well maintained. This research was approved by the Research Ethics Committee, Faculty of Medicine, Melaka Manipal Medical College, Melaka, Malaysia.

3. Results

Table 1. Sociodemographic data of participants (n = 67).

Independent variables	Frequency (%)
Age	
<=22	27 (40.30)
>22	40 (59.70)
Mean (SD)	22.6 (0.98)
Gender	
Male	25 (37.31)
Female	42 (62.69)
Nationality	
Malaysian	59 (88.06)
International	8 (11.95)
BMI	
Underweight (<18.5)	7 (10.45)
Normal (18.5-22.9)	32 (47.76)
Overweight (23-24.9)	7 (10.45)
Obese (>25)	21 (31.34)
Mean (SD)	22.6 (0.98)
Exercise	
Yes	45 (67.16)
No	22 (32.84)
Smoking	
Yes	4 (5.97)
No	63 (94.03)
Alcohol consumption	
Yes	2 (2.99)
No	65 (97.01)

A majority of participants, 40 (59.7%) are more than 22 years in age. The remaining 27 (40.30%) are less than 22 years in age. There are more female participants at 42 (62.69%) compared to male participants at 25 (37.31%). Most participants are Malaysian with 59 (88.06) while 8 (11.95%) are non Malaysian or international. For BMI, 6 (8.96%) participants were underweight, 41 (61.19%) were normal, 16 (23.88%) were overweight and 4 (5.97%) were obese. As for habits, 45 (67.16%) of participants exercise while 22 (32.84%) do not. Only a small minority of participants smoke at 4 (5.97%) with the remaining 63 (94.03%) being non smokers. Similarly, only 2 (2.99%) of participants consume alcohol while 65 (97.01%) of participants do not.

Table 2. Usage and practices of dietary supplements.

Independent variables	Frequency (%)
Usage of dietary supplements	
No	44 (65.67)
Yes	23 (34.33)
Reasons for using dietary supplements	
Maintain good health	21 (91.3)
Ensure adequate nutrition	19 (82.61)
Weight loss	0 (0)
Enhance appearance	0 (0)
Meet increased energy requirements	3 (13.04)
Prevent disease	5 (21.73)
Prescribed by doctor	4 (17.39)
Sources of information on dietary supplements	
Magazines/Newspapers	3 (13.04)
Internet	13 (56.52)
Family	15 (65.22)
Friends	8 (34.78)
Doctor	9 (39.13)
Television/radio	0 (0)
Workshop/discussion/lectures	4 (17.39)
Formal books	6 (26.09)

Most participants in this study, 44 (65.67%) do not consume dietary supplements while the remaining 23 (34.33%) consume dietary supplements. Out of those that do consume dietary supplements, the main reason was to maintain good health and to ensure adequate nutrition, with 21 (91.3%) and 19 (82.61%) participants respectively. Other reasons include to meet increased energy requirement at 3 (13.04%) participants, to prevent disease at 5 (21.73%) participants and because it was prescribed by a doctor at 4 (17.39%) participants. As for sources of information for dietary supplements, the main source for participants is family with 15 (65.22%) of participants. Other sources are magazines/newspapers with 3 (13.04%) of participants, the internet with 13 (56.52%) of participants, from friends with 8 (34.78%) of participants, from doctors with 9 (39.13%) of participants, workshops/discussions/lectures with 4 (17.39%) of participants and formal books with 6 (26.09%) of participants.

Table 3. Knowledge and attitude scores of participants.

Variable	Frequency (%)
Knowledge regarding micronutrients and dietary supplements	
Good (>80%)	0 (0)
Moderate (60-80%)	15 (22.39)
Poor (<60%)	52 (77.61)
Mean (SD)	39.58 (16.87)
Attitude regarding dietary supplements	
Good (>20)	13 (19.40)
Moderate (15-20)	33 (49.25)
Poor (<15)	21 (31.34)
Mean (SD)	16.18 (4.18)

Table above shows that 52 (77.61%) of participants have poor knowledge, 15 (22.39%) having moderate knowledge and 0 participants having good knowledge. For attitude, 33 (49.25%) students have moderate attitudes, 21 (31.34%) students have poor attitudes, and 13 (19.40%) students have good attitudes

towards dietary supplements and micronutrients.

Table 4. Answers of individual knowledge questions.

Knowledge question (CORRECT ANSWER)	Correct response frequency (%)
Tryptophan is a precursor of niacin (TRUE)	26 (38.8%)
Folate can increase plasma homocysteine levels and increase the risk of heart attack (FALSE)	23 (34.3%)
The recommended dietary allowance (RDA) for thiamine is 0.9-1.2 mg/day for adults (TRUE)	29 (43.3%)
Both iron overload and iron deficiency result in alterations in the immune response of humans (TRUE)	43 (64.2%)
Women taking oral contraceptive agents have an increased risk of developing riboflavin deficiency (TRUE)	17 (25.4%)
Microbial synthesis supplies the body with a large proportion of the daily vitamin K requirements (TRUE)	42 (62.7%)
Prolonged intake of zinc interferes with copper metabolism (TRUE)	26 (38.8%)
Acute and chronic infections and disease can reduce levels of vitamin C in plasma and leucocytes (TRUE)	25 (37.3%)
Exposing carotenoids to heat generally decreases their bio-availability (FALSE)	4 (6%)
The major promoters of non-heme iron absorption are phytates and phosphates (FALSE)	17 (25.4%)
Vitamin A deficiency produces scurvy (FALSE)	60 (89.6%)
Daily intakes of vitamin A exceeding 100000IU by pregnant women can result in fetal abnormalities (TRUE)	17 (25.4%)
Folate deficiency often resembles the haematologic features of vitamin B12 deficiency (TRUE)	56 (83.6%)
Magnesium deficiency is characterised by nausea, muscle weakness, personality changes and vomiting (TRUE)	36 (53.7%)
Avidin present in egg white, increases the absorption of biotin (FALSE)	13 (19.4%)
α-tocopherol increases the oxidative damage due to free radical generation (FALSE)	7 (10.4%)
Early symptoms of riboflavin deficiency include photophobia, soreness of lips, mouth and tongue (TRUE)	36 (53.7%)
Selenium impairs short term memory (FALSE)	8 (11.9%)
Increasing amounts of PUFA in the diet increase the vitamin E requirements (TRUE)	15 (22.4%)
A very high intake of calcium, in the presence of vitamin D can lead to excessive calcification in soft tissues (TRUE)	27 (40.3%)
Green leafy vegetables are the major dietary sources of vitamin B12 (FALSE)	35 (52.2%)
Dairy products and fish are deficient in iodine (FALSE)	38 (56.7%)
Pyridoxine deficiency causes glossitis, stomatitis and growth retardation (TRUE)	23 (34.3%)
Pantothenic acid deficiency causes leg cramps, paresthesias and insomnia (TRUE)	11 (16.4%)
High doses of zinc sulphate (2g/day or more) can cause gastrointestinal irritation and vomiting (TRUE)	29 (43.3%)

Table 4 highlights the frequency and percentage of participants who answer the questions correctly in the respective questions. Majority of the participants are able to answer questions about effect of Vitamin A deficiency (89.6%), haematological resemblance of folate deficiency and Vitamin B12 deficiency correctly. For questions 'Both iron overload and iron deficiency result in alterations in the immune response of humans' and 'Microbial synthesis supplies the body with a large proportion of the daily vitamin K requirements', 64.2% and 62.7% of the participants are able to answer them correctly. Participants have low grasp of knowledge with low correct response percentage in questions like 'Exposing carotenoids to heat generally decreases their bio-availability' (6%), 'Avidin present in egg white, increases the absorption of biotin' (19.4%), 'α-tocopherol increases the oxidative damage due to free radical generation' (10.4%), 'Selenium impairs short term memory' (11.9%) and 'Pantothenic acid deficiency causes leg cramps, paresthesias and insomnia' (16.4%).

Table 5. Attitude about dietary supplements.

Statements	Frequency (%)				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dietary supplement is necessary for all ages	6 (8.95)	7 (10.45)	20 (29.85)	11 (16.42)	23 (34.34)
Dietary supplement is generally harmless	1 (1.49)	4 (5.97)	28 (41.79)	21 (31.34)	13 (19.40)
Regular use of supplement prevents chronic diseases	5 (7.46)	11 (16.42)	27 (40.30)	15 (22.39)	9 (13.43)
Dietary supplements can prevent cancers	15 (22.39)	16 (23.88)	22 (32.84)	7 (10.45)	7 (10.45)
Health personnel should promote use of supplements	4 (5.97)	7 (10.45)	35 (52.24)	14 (20.90)	7 (10.45)

Table above shows the students' response to each of the 5 statements assessing their attitude towards dietary supplements. Out of 67 students, 34 students agreed that supplements are necessary for all ages while 13 students disagreed with that statement and 20 students neither agree or disagree. For the second statement 34 students agreed that it's safe to consume dietary supplements while 5 students showed disapproval and 28 students neither agree or disagree. 24 students agreed that regular use of supplements will prevent chronic diseases while 16 students disagreed with that statement. 27 students remain neutral for this statement. 22 students were unsure about the role of supplements in cancer prevention even though 31 students disagreed with that statement. 14 students agreed with this statement. Maximum students, 35 were neutral about the statement that health personnel should promote use of

supplements whereas 28 students agreed to that and the remaining 11 students disagreed with that statement.

Table 6. Association between sociodemographic data of the participants and their usage of dietary supplements.

Independent variables	Usage of dietary supplements		OR (95% CI)	P value
	Yes (n%)	No (n%)		
Age				
≤22	10 (37.04)	17 (62.96)	1.222 (0.439, 3.401)	0.701
>22	13 (32.50)	27 (67.50)	Reference	
Gender				
Male	11 (44.00)	14 (56.00)	1.964 (0.698, 5.531)	0.198
Female	12 (28.57)	30 (71.43)	Reference	
Nationality				
International	3 (37.50)	5 (62.50)	1.170 (0.254, 5.401)	0.840
Malaysian	20 (33.90)	39 (66.10)	Reference	
Smoking				
Yes	4 (100.00)	0 (0.00)	Undefined	0.012
No	23 (36.51)	40 (63.49)	Reference	
Alcohol				
Yes	1 (50.00)	1 (50.00)	1.955 (0.112, 32.761)	0.636
No	22 (33.85)	43 (66.15)	Reference	
Regular Physical Activity				
Yes	17 (37.78)	28 (62.22)	1.619 (0.531, 4.938)	0.395
No	6 (27.27)	16 (72.73)	Reference	

27 people were less than or equal to 22 years old, and 10 of them used dietary supplements while 17 didn't. 40 people were more than 22 years old, and 13 of them used dietary supplements and 27 didn't. The odds ratio indicates greater odds of association between a younger age and usage of dietary supplements. The p value indicates that there is no association between age and usage of dietary supplements.

25 participants were males, while 11 of them used dietary supplements and 14 didn't. 42 participants were females, while 12 of them used dietary supplements and 30 didn't. The odds ratio indicates greater odds of association between being a male and usage of dietary supplements. The p value indicates that there is no association between gender and usage of dietary supplements.

8 of the participants were international students, while 3 used dietary supplements and 5 didn't. 59 participants were Malaysians, while 20 of them used dietary supplements and 39 didn't. The odds ratio indicates greater odds of association between an international student and usage of dietary supplements. The p value indicates that there is no association between nationality and usage of dietary supplements.

4 of the participants were smokers, and all 4 used dietary supplements. 63 participants were non-smokers, while 23 of them used dietary supplements and 40 didn't. The p value indicates that there is an association between smoking and usage of dietary supplements.

2 of the participants consumed alcohol, while 1 used dietary supplements and 1 didn't. 65 participants didn't consume alcohol, while 22 of them used dietary supplements and 43 didn't. The odds ratio indicates greater odds of association between a smoker and usage of dietary supplements. The p value indicates that there is no association between alcohol consumption and usage of dietary supplements.

45 of the participants took part in regular physical activities, while 17 of them used dietary supplements and 28 didn't. 22 participants didn't take part in regular physical activities, while 6 of them used dietary supplements and 16 didn't. The odds ratio indicates greater odds of association between those doing physical activity and usage of dietary supplements. The p value indicates that there is no association between doing regular physical activities and usage of dietary supplements.

Table 7. Multiple logistic regression of association between attitude and knowledge with usage of dietary supplements and micronutrients.

Independent Variable	Adjusted Odds Ratio	95% CI	Standard Error	P-Value
Attitude score	1.211	1.049, 1.398	0.073	0.009
Knowledge percentage	0.999	0.967, 1.031	0.016	0.937

Table 7 shows the association between attitude score and knowledge percentage with the usage of dietary supplements and micronutrients. For attitude score, the odds ratio is 1.211. The confidence interval is from 1.049 to 1.398 and the p-value is 0.009, thus showing there is significant association. Therefore, students with higher attitude scores are 1.211 times more likely to use dietary supplements than those with lower attitude scores. For knowledge percentage, the confidence interval is from 0.967 to 1.031 and the p-value is 0.937. Thus, there is no significant association between

knowledge percentage and usage of dietary supplements.

Table 8. Association between age, gender and nationality and the knowledge percentage score.

Independent Variable	Knowledge percentage mean (sd)	Mean Difference (95% CI)	P value
Age			
≤22	40.00 (17.001)	0.700 (-7.756, 9.156)	0.870
>22	39.3 (16.992)		
Gender			
Female	41.333 (16.871)	4.693 (-3.805, 13.191)	0.274
Male	34.640 (16.800)		
Nationality			
International	43.000 (15.081)	3.881 (-8.875, 16.638)	0.546
Malaysian	39.112 (17.166)		

Table 8 shows the association between age, gender and nationality with knowledge percentage score. Those at 22 years or below has a mean score of 40.00 (SD=17.001), which is slightly higher than those older than 22 years with a mean score of 39.3 (SD=16.992). The mean difference is 0.700 with 95% Confidence Interval range from -7.756 to 9.156. The p value is 0.870 thus showing that there is no significant association between usage of dietary supplements and the knowledge percentage of dietary supplements. Females have a mean score of 41.333 (SD=16.871), higher than males with a mean score of 34.640 (SD=16.800). The mean difference is 4.693 with 95% CI range from -3.805 to 13.191. The p-value is 0.274 thus showing that there is no significant association between gender and the knowledge percentage of dietary supplements. International students have a mean score of 43.000 (SD=15.081), higher than Malaysians with a mean score of 39.112 (SD=17.166). The mean difference is 3.881 with 95% CI range from -8.875 to 16.638. The p-value is 0.546 thus showing that there is no significant association between nationality and the knowledge percentage of dietary supplements.

Table 9. Association between age, gender and nationality and the attitude percentage.

Independent variable	Attitude percentage mean (SD)	Mean difference (95% CI)	P value
Age			
≤22	61.333 (17.179)	6.333 (-2.471, 13.805)	0.169
>22	67.00 (15.792)		
Gender			
Male	67.36 (18.337)	4.217 (-12.926, 4.492)	0.337
Female	63.143 (15.257)		
Nationality			
International	63 (21.237)	1.950 (-10.478, 14.378)	0.755
Malaysian	64.950 (15.853)		

Table 9 indicates that the association between age, gender and nationality with the attitude percentage rather than the knowledge percentage shown in table 8. The attitude percentage mean of individuals less than or equal to 22 years old (61.333) is slightly lower than that of individuals older than 22 years (67). A 0.169 p value indicates no significance between age and the attitude. The attitude percentage mean of males (67.36) is greater than that of females (63.143) and a p value of 0.337 indicates no significance between gender and attitude. The attitude percentage mean of international participants (63) is lesser than that of Malaysians (64.95), and a p value of 0.755 indicates no significance between nationality and attitude as well.

4. Discussion

This study was a cross-sectional study done to determine the knowledge, attitude and practices among the medical students of Melaka Manipal Medical College regarding dietary supplements and to determine their knowledge, attitude and practices regarding micronutrients. Regarding the knowledge of dietary supplements and micronutrients among medical students of MMMC, 77.61% of the students have poor knowledge while 22.39% have moderate knowledge and 0% have good knowledge. However, most students display good knowledge when it comes to the function of vitamins, with a vast majority of them having correct answers when it comes to features of vitamin deficiencies. On the other hand, students have very poor knowledge regarding the biochemical properties of vitamins. Almost all of them either answered wrongly or chose the 'Don't know' option on questions assessing the biochemical parameters of vitamins, such as bioavailability in regard to heat. Similarly, students also have very poor knowledge about micronutrients such as the functions of minerals. In comparison with a previous study which was conducted on health sciences students, medical students had an average knowledge score of 48.4%, which corresponds to poor

knowledge. The participants in our study scored an average of 39.58% which was much lesser compared to the previous study [14]. Another study done among medical students in Nigeria has shown that 48.1% of the students were not sure if dietary supplements even have any side effects [26]. In this study, we also assessed the factors associated with knowledge towards dietary supplements and micronutrients. We found that there were no significant differences of knowledge between different age groups, genders and nationalities.

According to the results of our study, 49.25% students have moderate attitudes, 31.34% students have poor attitudes, and 19.40% students have good attitudes towards dietary supplements and micronutrients. Most of the students show a good attitude towards dietary supplements when the statements are about consumption of supplement in all age groups and its safety. Another study conducted among medical students at Ajman University, shows the students have a good attitude about the use of supplements is necessary in all age groups and they are generally harmless [21]. The majority of our students remained neutral when it comes to the benefits of supplements and role of health personnel in promoting supplements. A cross-sectional study carried out in Saudi Arabia by Alowais MA et al shows their health science students agree that regular use dietary supplement prevents chronic diseases [22]. In our study, nearly half of students have poor attitudes about the role of dietary supplements in cancer prevention. The previous study shows students have similar opinions about dietary supplements except for two statements. Most participants were unsure about dietary supplements and cancer prevention while half of the students agreed that health personnel should promote dietary supplements [14]. Based on another study about perceptions related to dietary supplements among college students, most students agreed that it's not essential to use dietary supplements for overall health and can be achieved through healthy food and regular exercise [23]. In this study, we also assessed the factors associated with attitude towards dietary supplements and micronutrients. We found that there were no significant differences of attitude between different age groups, genders and nationalities.

In our study, it is found that 34.33% of the students consume dietary supplements, which is in accordance with similar previous study done in the United Arab Emirates (39%) [24] and Croatia (30.5%) [25]. There was a significant association between smoking and dietary supplements consumption. All the students who smoke consume dietary supplements. The main reasons for consuming dietary supplements among medical students were to maintain good health (91.3%) and ensure adequate nutrition (82.61%) which is similar to findings found in the previous studies. [2, 14, 24, 25]. When we assessed the association between knowledge and attitude regarding supplements and micronutrients with usage of dietary supplements, we found no significant association for knowledge. There is also no significant association between sociodemographic data (except smoking) and usage of dietary supplements. However, there is a positive significant association between the attitude of medical students towards dietary supplements and usage among them. The students with higher attitudes scores are more likely to use dietary supplements. Contrary to our findings, in a study done by Ajitha Sharma et al. almost half of the students used dietary supplements while their attitude regarding supplements were generally between ‘unsure’ and ‘agree’ [14]. Similarly, these findings were also seen in the study conducted by Teng CL et al. [19].

5. Limitations and Recommendations

As with every other study, our study has had certain limitations. Due to a busy academic calendar, our study received a response rate of 33.17%. A noticeable limitation in the questionnaire was that it consisted of too many questions about biochemistry, thus creating non response among the participants. The research was conducted via a cross sectional study, leaving with an obvious disadvantage of not being able to assess the changes in knowledge and attitude of the participants over a duration of time. Another limitation of this study is that our findings cannot be generalized to other institutions or populations.

As the majority of the students had poor knowledge towards dietary supplements and micronutrients, the primary recommendation would be to refresh the knowledge of the participants with seminars or talks. Friendly competitions and quizzes could follow, to enhance the interests of the participants towards the subject. Future studies are recommended with a larger sample size and spanning multiple medical professions like nurses, health sciences, pharmacists, etc.

6. Conclusion

In our study, there is relatively low usage of dietary supplements among the medical students, in which among those who consume dietary supplements are to maintain good health and ensure adequate nutrition. Regarding knowledge towards dietary supplements, there is an insufficient of knowledge of roles of dietary supplements and micronutrients in health and disease among the medical students. Hence, it is essential that knowledge regarding dietary supplements and micronutrients be highlighted in the

medical course in order to produce well-informed healthcare professionals who can bring upon a positive impact in the health of the society in the future.

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Questionnaire

Participation Information Sheet

Knowledge, Attitude and Practices Related to Dietary Supplements and Micronutrients in Medical Students

Investigators: Ms Helinathevi Maganathan, Mr Suchira Praveen Maldini Pinnaduwa, Mr Wong Kian Yong, Mr Jason Yew

Please take time to read this form carefully. Should you decide to take part in this study, you agree to consent to this study and give your consent.

This study aims to investigate the knowledge, attitude and practices regarding dietary supplements and micronutrients among medical students.

This study consists of a questionnaire with 4 parts. Please answer each part truthfully. There is no time limit for answering the questions.

Entering a research study is completely voluntary. You may decline to participate without any reason. Your participation in this study will not bestow upon you any competitive academic or occupational advantages over other individuals who do not choose to participate. No academic or occupational penalty shall be imposed on those who choose not to participate either. We will do our part in ensuring the privacy and confidentiality of the personal information of the research participant and will not disclose any personal information to third parties.

If you have any questions or doubts about this form or regarding the study, feel free to contact the investigators to clarify.

Thank you.

Informed Consent

I have fully understood that my participation in this questionnaire-based study is completely voluntary and that I have the right to decline participation at anytime without giving any reasons. I have also been given sufficient opportunities to clarify my doubts and have received satisfactory responses.

Questionnaire

Part 1: Sociodemographic data

1. Gender: Male/Female
2. Age (years): _____
3. Batch: 37/38/39/40/41
4. Nationality:
5. Weight (kg):
6. Height (cm):
7. Do you exercise physically? Yes/No
8. Do you smoke? Yes/No

9. Do you consume alcohol regularly? Yes/No

Part 2: Knowledge

Table 10. Questions regarding knowledge about dietary supplements and micronutrients.

Questions	True	False	Don't know
1. Tryptophan is a precursor of niacin			
2. Folate can increase plasma homocysteine levels and increase the risk of heart attack			
3. The recommended dietary allowance (RDA) for thiamine is 0.9-1.2 mg/day for adults			
4. Both iron overload and iron deficiency result in alterations in the immune response of humans			
5. Women taking oral contraceptive agents have an increased risk of developing riboflavin deficiency			
6. Microbial synthesis supplies the body with a large proportion of the daily vitamin K requirements			
7. Prolonged intake of zinc interferes with copper metabolism			
8. Acute and chronic infections and disease can reduce levels of vitamin C in plasma and leucocytes			
9. Exposing carotenoids to heat generally decreases their bio-availability			
10. The major promoters of non-heme iron absorption are phytates and phosphates			
11. Vitamin A deficiency produces scurvy			
12. Daily intakes of vitamin A exceeding 100000IU by pregnant women can result in fetal abnormalities			
13. Folate deficiency often resembles the haematologic features of vitamin B12 deficiency			
14. Magnesium deficiency is characterised by nausea, muscle weakness, personality changes and vomiting			
15. Avidin present in egg white, increases the absorption of biotin			
16. α-tocopherol increases the oxidative damage due to free radical generation			
17. Early symptoms of riboflavin deficiency include photophobia, soreness of lips, mouth and tongue			
18. Selenium impairs short term memory			
19. Increasing amounts of PUFA in the diet increase the vitamin E requirements			
20. A very high intake of calcium, in the presence of vitamin D can lead to excessive calcification in soft tissues			
21. Green leafy vegetables are the major dietary sources of vitamin B12			
22. Dairy products and fish are deficient in iodine			
23. Pyridoxine deficiency causes glossitis, stomatitis and growth retardation			
24. Pantothenic acid deficiency causes leg cramps, paresthesias and insomnia			
25. High doses of zinc sulphate (2g/day or more) can cause gastrointestinal irritation and vomiting			

Part 3: Attitude

Table 11. Questions related to attitude of students regarding dietary supplements and micronutrients.

Question	1	2	3	4	5
Dietary supplement is necessary for all ages					
Dietary supplement is generally harmless					
Regular use of supplement prevents chronic diseases					
Dietary supplements can prevent cancers					
Health personnel should promote use of supplements					

1- Strongly disagree, 2- Disagree, 3- Neutral, 4- Agree, 5- Strongly agree)

Part 4: Practices

1. Do you consume dietary supplements? If no, skip questions 2, 3 and 4
2. What dietary supplements do you consume?
   a. Multivitamins
   b. Vitamin A
   c. Vitamin B Complex
   d. Vitamin C
   e. Folic acid
   f. Iron
   g. Calcium
   h. Protein powder
   i. Spirulina
   j. Herbal teas

k. Others (please specify): _____

3. Why do you consume dietary supplements?
   a. Maintain good health
   b. Ensure adequate nutrition
   c. Weight loss
   d. Enhance appearance
   e. Meet increased energy requirements
   f. Prevent disease
   g. Prescribed by doctor
   h. No specific reasons
4. Where do you get information on dietary supplements?
   a. Magazines/Newspapers
   b. Internet
   c. Family
   d. Friends
   e. Doctor
   f. Television/Radio
   g. Workshops/Discussions/Lectures
   h. Formal books
   i. Others (please specify): _____

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