

Original Research Article

Assessment of knowledge towards nutrition and nutrition-related health problems among medical and dental students of a medical college in Manipur: a cross-sectional study

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ABSTRACT

Background: Nutrition plays a critical role in maintaining health and preventing disease. In India, the dual burden of malnutrition (undernutrition and overnutrition) poses a significant public health challenge. Future healthcare professionals must possess adequate nutrition knowledge to effectively counsel patients and promote healthy behaviours. This study aimed to assess the knowledge of medical and dental students regarding nutrition and its related health problems, as well as determine the association between knowledge of nutrition and selected variables.

Methods: A cross-sectional study was conducted from September to November 2024 among undergraduate medical and dental students of a tertiary care medical college in Imphal East, Manipur, using a pre-tested, self-administered, validated questionnaire (GNKQ). Descriptive and analytical statistics (chi-square test) were applied. A p value of <0.05 was taken as statistically significant.

Results: A total of 405 participants were included. Only 29.1% of MBBS students and 18.8% of dental students demonstrated good knowledge of nutrition and nutrition-related health problems. Overall, general awareness was 26.7%. Participants >22 years and MBBS students were found to have significantly higher knowledge levels with 32% and 22.2% respectively.

Conclusions: Only about 1 in 3 MBBS students (29.1%) and 1 in 5 dental students (18.8%) demonstrated good knowledge of nutrition and nutrition-related health problems. Overall, general awareness of nutrition was inadequate, with only 26.7% of participants displaying adequate knowledge. Conducting hands-on training like workshops and symposiums on dietary assessment can help mend the knowledge gap.

Keywords: Cross-sectional study, Dental students, Health problems, Medical students, Nutrition knowledge

INTRODUCTION

Nutrition plays a critical role in maintaining health and preventing disease. Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity.¹ The complex relationship between nutrition and health has been acknowledged by Hippocrates, the father of modern medicine himself, with his statement, "Let food be thy medicine and medicine be thy food".

Over recent decades, rapid urbanization and lifestyle changes have led to a nutrition transition characterized by high consumption of ultra-processed foods (UPFs) and significant reductions in physical activity. This is always accompanied by a rapid increase in the prevalence of overweight-obesity and other nutrition-related noncommunicable diseases (NCDs), the so-called lifestyle diseases.²

Globally, NCDs kill 41 million annually, representing 74% of all deaths. Each year, 17 million people die from

NCD before age 70, of which 86% occur in low- and middle-income countries.¹ Poor dietary habits contribute significantly to the burden of NCDs, such as obesity, diabetes, cardiovascular diseases, and certain types of cancer. India faces a dual burden of malnutrition, where undernutrition coexists with overweight and obesity. In this context, improving nutrition awareness and behaviour is critical for disease prevention and health promotion.

Medical and dental students, being the future healthcare professionals, are expected to possess adequate knowledge of nutrition to counsel patients effectively and to model healthy lifestyle practices. However, studies suggest that medical students' knowledge of experts' advice and diet-related diseases were insufficient.³ Despite the increasing importance of nutrition in clinical practice, there is limited research evaluating the knowledge and awareness of nutrition among medical and dental students in Manipur, a state in northeastern India.

This study aimed to assess the knowledge of medical and dental students in a medical college in Manipur regarding nutrition and its related health problems, and to determine the association between knowledge of nutrition and nutrition-related health problems with selected variables. Understanding the gaps in knowledge can help inform curriculum development and foster the integration of nutrition education in medical and dental training, ultimately improving patient outcomes and public health.

METHODS

A community-based cross-sectional study was conducted between September and November 2024 among undergraduate medical and dental students of a tertiary care medical college in Imphal-East district, Manipur. The undergraduate medical students in CBME phase 1, phase 2, phase 3 part-I, phase 3 part-II and dental students in 1st, 2nd, 3rd and 4th years were included in the study. Those who were not willing to participate, those who could not be contacted after 2 consecutive visits and 38 students involved in the research were excluded from the study. A total of 621 students (MBBS and dental) were enrolled in the institution as per data collected from the academic block. A universal sampling method was used, and the final sample size was taken as 583.

The study tool was adapted from the UK-based 'general nutritional knowledge questionnaire' (GNKQ) and modified according to local context. The tool was pre-tested on a group of students who were not included in the study. The finalized structured questionnaire consisted of the following 4 domains- sociodemographic profile, knowledge regarding expert advice on nutrition, nutritional composition of different food groups, health problem or disease related to diet and weight management, with each correct response scored as 1 and incorrect/not sure as 0; the total score ranged from 0-71, and participants scoring <50% (<36) were classified as having poor knowledge, while those scoring ≥50% (≥36)

were considered to have good knowledge. The purpose of the study was clearly explained to participants, and verbal informed consent was taken before data collection. The questionnaire was self-administered, and participants were asked to complete it while the investigator waited. The average time to complete the questionnaire was approximately 20 minutes per participant. The questionnaire was collected back after checking for completeness.

Statistical analysis

Data were entered in MS Excel and analyzed in SPSS v 22 (IBM). Descriptive statistics like mean, median, proportion, and standard deviation were used to summarize the findings and Associations were assessed using the chi-square test and Fisher-exact test. A p value of less than 0.05 was taken as statistically significant.

Ethical approval

Ethical approval was obtained from the institutional ethics committee vide protocol number 583-102-24 dated 06-11-24. Informed consent was taken from the study participants and purpose of the study were clearly explained prior to data collection. Strict confidentiality of the information was maintained. All the collected data were in the custody of the investigators in password protected computers.

RESULTS

After exclusions and non-response, 405 students were included in the final analysis. The mean age was 22.3±2.01 years (range: 18-30), with 53.8% aged ≤22 years. Females constituted 53.6% of the study population. Medical students comprised 76.3%, while the remaining were dental students. Among medical students, the highest proportion was in CBME phase II (30%), while among BDS students, the majority were in the first year (8.8%).

In terms of socio-demographic characteristics, the majority of the participants were from Manipur (91.9%), resided in hostels (98.3%), and belonged to nuclear families (80%). Most participants were non-vegetarians (91.9%). Regarding religion, the highest proportion belonged to Hinduism (36.3%), followed by Christianity (29.6%), Sanamahism (21.2%), and Islam (9.9%).

The mean weight and height were 58.2±9.3 kg and 162.9±8.6 cm. Based on BMI, 61.5% were within normal range (18.5-22.9 kg/m²), while 24.4% were overweight and 9.1% were obese.

Knowledge regarding expert advice on nutrition

Participants demonstrated good awareness of general recommendations (Table 1), with most correctly identifying increased intake of fruits (89.6%), vegetables

(90.4%), water (90.6%), and reduced intake of sugars (83.5%), fats (77.8%), and salt (74.3%). However, knowledge gaps were evident in recommended daily intake of fruits and vegetables (8.6%), awareness of healthy fats (16.3%), salt intake recommendations

(22.2%), and awareness of “my plate for the day” (27.7%). Only 47.9% identified whole food recommendations, and 60.7% knew about processed red meat. Misconceptions were also seen in breakfast frequency (45.4%) and fruit juice intake (11.4%).

Table 1: Knowledge regarding expert’s advice on nutrition (n=405).

Questions	Frequency	Percentage
Health experts’ recommendation on eating more, same, or less amount of following food item?		
Fruits	Correct response (more)	363
	Incorrect response	42
Foods and drinks with added sugar	Correct response (less)	338
	Incorrect response	67
Green leafy veg	Correct response (more)	366
	Incorrect response	39
Fatty foods	Correct response (less)	315
	Incorrect response	90
Processed red meat	Correct response (less)	246
	Incorrect response	159
Wholegrains	Correct response (more)	194
	Incorrect response	211
Salty foods	Correct response (less)	301
	Incorrect response	104
Water	Correct response (more)	367
	Incorrect response	38
Recommended quantity of fruits and vegetables per day in a balanced diet?		
Correct response (100 gm of fruits and 400 gm of veg)		35
Incorrect response		370
Recommendation on eating different types of fats?		
Unsaturated fats	Correct response (not eat less)	66
	Incorrect response	339
Trans fats	Correct response (eat less)	188
	Incorrect response	217
Saturated fats	Correct response (eat less)	259
	Incorrect response	146
Recommended type of dairy foods?		
Correct response (reduced fat-skimmed and semi-skimmed milk)		146
Incorrect response		259
Maximum added salt intake?		
Correct response (5 gm/day)		90
Incorrect response		315
Recommended frequency of breakfast/week?		
Correct response (every day)		184
Incorrect response		221
Two glasses of fruit juice a day will count as how many of daily fruit and veg servings?		
Correct response (one serving)		46
Incorrect response		359
Proportion of vegetables, green leafy vegetables, fruits, tubers and roots in ‘my plate for the day’ (developed by ICMR-NIN)?		
Correct response (½ plate)		112
Incorrect response		293

Table 2: Knowledge regarding nutritional composition of different food groups (n=405).

Questions		Frequency	Percentage
High or low in added sugar?			
Carbonated drinks	Correct response (high)	162	40.0
	Incorrect response	243	60.0
Natural yoghurt	Correct (low)	137	33.8
	Incorrect response	268	66.2
Ice cream	Correct response (high)	135	33.3
	Incorrect response	270	66.7
Tomato ketchup	Correct response (high)	295	72.8
	Incorrect response	110	27.2
Mayonnaise	Correct response (high)	144	36.0
	Incorrect response	261	64.0
High or low in salt?			
Breakfast cereals	Correct response (high)	89	22.0
	Incorrect response	316	78.0
Bread	Correct response (high)	57	14.0
	Incorrect response	348	86.0
Pickles	Correct response (high)	160	40.0
	Incorrect response	245	60.0
Red meat	Correct response (low)	77	19.0
	Incorrect response	328	81.0
Packaged chips	Correct response (high)	221	54.6
	Incorrect response	184	45.4
Tinned fish	Correct response (high)	342	84.4
	Incorrect response	63	15.6
High or low in fibre?			
Oats	Correct response (high)	304	75.0
	Incorrect response	101	25.0
Bananas	Correct response (high)	325	80.2
	Incorrect response	80	19.8
White rice	Correct response (low)	128	31.6
	Incorrect response	277	68.4
Eggs	Correct response (low)	248	61.2
	Incorrect response	157	38.8
Potatoes with skin	Correct response (high)	97	24.0
	Incorrect response	308	76.0
Good source of protein?			
Poultry	Correct response (good)	243	60.0
	Incorrect response	162	40.0
Cheese	Correct response (good)	295	72.8
	Incorrect response	110	27.2
Fruit	Correct response (not good)	176	43.5
	Incorrect response	229	56.5
Butter	Correct response (not good)	265	65.4
	Incorrect response	140	34.6
Nuts	Correct response (good)	191	47.2
	Incorrect response	214	52.8
Considered as starchy food?			
Cheese	Correct response (not a starchy food)	96	23.7
	Incorrect response	309	76.3
Pasta	Correct response (starchy food)	157	38.8
	Incorrect response	248	61.2
Potatoes	Correct response (starchy food)	285	70.4
	Incorrect response	120	29.6

Continued.

Questions		Frequency	Percentage
Nuts	Correct response (not starchy food)	99	24.4
	Incorrect	306	75.6
Main type of fat in each of these foods?			
Olive oil	Correct response (monounsaturated)	84	20.7
	Incorrect response	321	79.3
Butter	Correct response(saturated)	64	15.8
	Incorrect response	341	84.2
Sunflower oil	Correct response (polyunsaturated)	53	13.1
	Incorrect response	352	86.9
Eggs	Correct response(cholesterol)	64	20.7
	Incorrect response	341	79.3
Foods with the most trans-fat?			
Correct response (biscuits, cakes and pastries)		99	24.4
Incorrect response		306	75.6
Amount of calcium in a glass of whole milk compared to a glass of skimmed milk?			
Correct response (about the same)		160	39.5
Incorrect response		245	60.5
Nutrient with the most calories for the same weight of food?			
Correct response (fat)		100	24.7
Incorrect response		305	75.3
Compared to minimally processed foods, processed foods are?			
Correct response (higher in calories)		123	30.4
Incorrect response		282	69.6

Knowledge regarding the nutritional composition of food groups

Participants demonstrated variable knowledge regarding nutritional composition (Table 2). While some participants correctly identified packaged chips (54.6%) and tinned fish (84.4%) as high-salt and oats (75%) and bananas (80.2%) as high-fibre foods, major gaps were observed in sugar content, protein sources, fat types and caloric density of foods.

Only 40% identified carbonated drinks as high in sugar, and 33.8% identified natural yoghurt as low in sugar. However, a higher proportion (72.8%) identified tomato ketchup as high in sugar. Fibre content was correctly identified as poor for eggs (61.2%) and white rice (31.6%). Knowledge regarding protein sources was moderate, with 60% correctly identifying poultry and 72.8% identifying cheese as good sources of protein. However, misconceptions persisted, with only 43.5% correctly identifying that fruits are not good protein sources.

Understanding of fat types was particularly poor. Only 20.7%, 15.8%, and 13.1% correctly identified the type of fat in olive oil, butter, and sunflower oil, respectively. Similarly, only 24.4% correctly identified foods high in trans fats. Furthermore, only 24.7% identified fat as the nutrient providing the highest calories per gram, and

30.4% recognized that processed foods are higher in calories than minimally processed foods.

Knowledge regarding nutrition-related health problems

Knowledge regarding diet-related diseases was suboptimal (Table 3). While 66.7% linked low fibre to bowel disorders, only 19.3% linked sugar to tooth decay and 22.7% linked salt to hypertension. Awareness regarding preventive dietary measures for chronic diseases was limited. Only 10.1% identified reducing red meat intake to lower cancer risk, and 11.6% reducing refined foods to prevent diabetes. However, 56% correctly identified reducing trans fats for heart disease. Knowledge of glycemic index (13.6%) and cholesterol-related foods (25.7%) was low. Regarding weight management practices, 53.8% correctly disagreed with eliminating fat completely, and 45.2% correctly disagreed with the need for a high-protein diet. A higher proportion correctly identified beneficial practices such as monitoring eating habits (73.6%) and monitoring body weight (77.3%), while fewer correctly identified avoiding snacking (25.4%) and avoiding eating while watching television (22.2%). Knowledge regarding BMI classification was poor, with only 20.2% correctly identifying BMI 23 kg/m² as overweight and 17% identifying BMI 31 kg/m² as obese. Only 37.5% correctly identified apple-shaped body type as a risk factor for cardiovascular disease.

Table 3: Knowledge regarding health problems or diseases related to diet and weight management (n=405).

Questions	Frequency	Percentage
Diseases related to a low intake of fibre?		
Correct response (bowel disorders)	270	66.7
Incorrect response	135	33.3
Diseases related to how much sugar people eat?		
Correct response (tooth-decay)	78	19.3
Incorrect response	327	80.7
Diseases related to how much salt (or sodium) people eat?		
Correct response (high blood pressure)	92	22.7
Incorrect response	313	77.3
Experts' recommendation to reduce chances of getting cancer?		
Correct response (eating less red meat)	41	10.1
Incorrect response	364	89.9
Experts' recommendation to prevent heart disease?		
Correct response (eating less trans-fats)	227	56.0
Incorrect response	178	44.0
Experts' recommendation to prevent diabetes?		
Correct response (eating less refined foods)	47	11.6
Incorrect response	358	88.4
Foods more likely to raise people's blood cholesterol?		
Correct response (Animal fat)	104	25.7
Incorrect response	301	74.3
High Glycaemic Index means a greater rise in blood sugar after eating?		
Correct response (white bread)	55	13.6
Incorrect response	350	86.4
To maintain a healthy weight people should cut fat out completely?		
Correct response (disagree)	218	53.8
Incorrect response	187	46.2
To maintain a healthy weight people should eat a high protein diet?		
Correct response (disagree)	183	45.2
Incorrect response	222	54.8
Eating bread always causes weight gain?		
Correct response (disagree)	109	26.9
Incorrect response	296	73.1
Fibre can decrease the chances of gaining weight?		
Correct response (agree)	147	36.3
Incorrect response	258	63.7
Options to help people to maintain a healthy weight?		
Not eating while watching TV		
Correct response (yes)	90	22.2
Incorrect response	315	77.8
Reading food labels		
Correct response (yes)	243	60.0
Incorrect response	162	40.0
Taking nutritional supplements		
Correct response (No)	43	10.6
Incorrect response	362	89.4
Options to help people to maintain a healthy weight?		
Monitoring their eating		
Correct response (yes)	298	73.6
Incorrect response	107	26.4
Monitoring their weight		
Correct response (yes)	313	77.3
Incorrect response	92	22.7

Continued.

Questions	Frequency	Percentage
Snacking throughout the day		
Correct response (no)	103	25.4
Incorrect response	302	74.6
If someone has a BMI of 23 kg/m², what would their weight status be?		
Correct response (Overweight)	82	20.2
Incorrect response	323	79.8
If someone has a BMI of 31 kg/m², what would their weight status be?		
Correct response (Obese)	69	17.0
Incorrect response	336	83.0
Body shape increasing the risk of CVD?		
Correct response (apple shape)	152	37.5
Incorrect response	253	62.5

Table 4: Association between sociodemographic variables and knowledge towards nutrition and nutrition related health problems.

Variables	Category	Good knowledge (%)	Poor knowledge (%)	Total (N)	P value
Age group (years)	≤22	48 (22.0)	170 (78.0)	218	0.022
	>22	60 (32.1)	127 (67.9)	187	
Gender	Male	57 (30.3)	131 (69.7)	188	0.122
	Female	51 (23.5)	166 (76.5)	217	
Course	MBBS	90 (29.1)	219 (70.9)	309	0.045
	BDS	18 (18.8)	78 (81.2)	96	
Phase/Year	Phase 1/1 st year	22 (20.0)	88 (80.0)	110	0.309
	Phase 2/2 nd year	44 (30.0)	103 (70.0)	147	
	Phase 3 Part I	22 (27.5)	58 (72.5)	80	
	Phase 3 Part II	20 (29.4)	48 (70.6)	68	
BMI (kg/m²)	≤18.5	9 (45.0)	11 (55.0)	20	0.238
	18.5-22.9	67 (26.9)	182 (73.1)	249	
	23-24.9	24 (24.2)	75 (75.8)	99	
	≥25	8 (21.6)	29 (78.4)	37	
Religion	Hindu	38 (25.9)	109 (74.1)	147	0.990
	Sanamahism	23 (26.7)	63 (73.3)	86	
	Islam	10 (25.0)	30 (75.0)	40	
	Christian	34 (28.3)	86 (71.7)	120	
	Others	3 (25.0)	9 (75.0)	12	
Diet	Vegetarian	10 (30.3)	23 (69.7)	33	0.622
	Non-vegetarian	98 (26.3)	274 (73.7)	372	

Overall knowledge level

Overall, only 26.7% (n=108) of participants had good knowledge. Among subgroups, 29.1% of MBBS students and 18.7% of dental students demonstrated good knowledge.

Association between socio-demographic variables and knowledge

Statistically significant association was observed between age and knowledge level (p=0.022), with participants aged >22 years demonstrating higher levels of good knowledge (32.1%) compared to those aged ≤22 years (22%) (Table 4). Similarly, a significant association was

found between course of study and knowledge level (p=0.045), with MBBS students showing higher knowledge (29.1%) compared to dental students (18.8%) (Table 4).

No statistically significant association was observed between knowledge and gender (p=0.122), phase/year of study (p=0.309), BMI (p=0.238), religion (p=0.990), or dietary pattern (p=0.622). However, a declining trend in knowledge was observed with increasing BMI.

DISCUSSION

The present study assessed knowledge regarding nutrition and nutrition-related health problems among

undergraduate medical and dental students of a tertiary care medical college in Manipur. Overall, the findings suggest that the participants had poor knowledge, with only 26.7% demonstrating good knowledge. In contrast, findings reported by Kesapragada et al, Mogre et al, and Hu et al.^{3,8,10} had overall knowledge levels around 60% or higher. This difference may be attributed to variations in the study population, as some studies included senior students who are likely to have greater academic exposure. Secondly, differences in the assessment tools and scoring criteria may have contributed to the variation.

In the present study, knowledge regarding the nutritional composition of food items was particularly limited. For instance, only 40% of participants correctly identified carbonated drinks as high in added sugar, and only 33.8% correctly identified natural yoghurt as low in sugar. These findings are partially comparable with previous studies reported by Kesapragada et al, where a considerable proportion of students were uncertain about the added sugar content in various food items.³

About dietary practices, only 45.4% of participants correctly reported that breakfast should be consumed daily, which is lower than the 75.1% reported by Kumar et al.⁴ This difference may be due to variation in study measures, as our study assessed knowledge of recommendations, whereas theirs reported actual practices. Knowledge regarding salt content in commonly consumed foods was also inadequate, with many participants unable to correctly identify salt-rich food items such as pickles. Similar observations have been reported in other studies by Kesapragada et al and Kumar et al, suggesting a consistent gap in understanding hidden sources of salt.^{3,4} Regarding fibre content, more than 60% of participants correctly identified high-fibre foods. However, awareness regarding low-fibre foods such as white rice and the fibre content of potatoes with skin remained limited. Similar findings have been reported by previous studies. Participants also demonstrated limited knowledge regarding diet-related health problems. Although some associations, such as low fibre intake and bowel disorders, were correctly identified, awareness of other important relationships, such as sugar intake with dental caries and salt intake with hypertension, was low. Similar findings have been reported by Kesapragada et al, suggesting inadequate integration of nutrition knowledge with disease prevention.³

About 72.3% of participants were unaware of dietary guidelines for “my plate for the day” developed by ICMR-NIN. Similar findings were reported by Kesapragada et al, where only 37% of students were aware of the food content of the ‘eatwell plate’ guideline.³

Overall, students’ knowledge of the four sections is inadequate. The findings of the study indicate that the nutritional knowledge and nutrition-related health problems do not bode well and are a cause of concern, as

these future primary-care physicians lack adequate preparation as far as this vital component of modern medical practice is concerned. The reason behind the lack of proper knowledge and awareness about the expert’s advice noticed in the study may be attributed to the scarce nutrition curriculum in medical schools’ education-based approaches through nutrition experts and this can be inculcated in the medical curriculum to fill the knowledge gaps among medical students and dental students, which will help them to adopt a holistic approach towards patient health.

This study has included both medical and dental students across different phases and years of study, which provided a broader understanding of knowledge levels. Inclusion of a relatively large sample size and the use of a validated questionnaire covering multiple domains of nutrition knowledge allowed a comprehensive assessment.

The study was conducted in a single institution, which may limit generalizability. The use of a self-administered questionnaire may introduce response bias. Additionally, the study assessed knowledge only, without evaluating actual dietary practices or behaviours.

CONCLUSION

The study found that only about one-third of MBBS students and one-fifth of dental students demonstrated good knowledge of nutrition and nutrition-related health problems. Overall, general awareness of nutrition was inadequate, with only 26.7% of participants displaying adequate knowledge. Significant associations were found between the level of knowledge and the participants’ age, and course of study. However, other associations, including those with factors such as gender, religion, and BMI, were found to be statistically insignificant. To improve knowledge on nutrition and nutrition-related health problems, we can follow strategies like hands-on training: conduct workshops and symposiums on dietary assessment and counselling; emphasise the importance of nutritional education in medical and dental curricula.

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