

# Nutrition Quality of Life among Female-Majority Malay Undergraduate Students of Health Sciences

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## Abstract

**Background:** University students generally tend to engage in problematic eating behaviours, including unhealthy dieting, skipping meals, and high intake of fast food, although they are aware of the negative consequences. Eating behaviours have been shown to be interestingly related to quality of life (QoL). Our study aimed to 1) assess general nutrition quality of life (NQoL) status and 2) compare NQoL status based on gender, financial resources, study courses, year of study, and body mass index (BMI) profiles.

**Methods:** This study was conducted among undergraduates of health sciences in a local public university in Terengganu. Students completed the Malay version of NQoL (6 domains; 50 items; Likert-type responses 1–5). Data analysis was carried out by using SPSS 16.0, utilising descriptive and parametric statistics.

**Results:** A total of 241 students were enrolled [age = 19.7 (0.1) years; female (83.0%); Malay (96.7%)]. *Social/Interpersonal Factors* [3.84 (0.43)] emerged as the best component, while *Food Impact* [3.10 (0.40)] was the worst. Across all variables, only gender and study courses showed significantly different NQoL. Females scored better than males in *Self-Efficacy* (confidence in food selection ability) ( $p < 0.05$ ). Nursing students also experienced significantly greater NQoL (mean = 3.58, 95% CI = 3.47, 3.68) than radiography students in *Self-Efficacy* ( $p < 0.05$ ). Medical laboratory technology students had a significantly more favourable NQoL rating (mean = 3.62, 95% CI = 3.47, 3.76) than nursing students in *Self-Image* ( $p < 0.05$ ). Study courses significantly influenced the NQoL status of students with *Good NQoL*, while those with *Poor NQoL* were mostly influenced by gender and financial resources ( $p < 0.05$ ).

**Conclusion:** These outcomes indicate that specific demographic characteristics seemed to make a difference in the NQoL of undergraduate students.

**Keywords:** nutrition, quality of life, undergraduates, health sciences

## Introduction

Food intake and eating behaviour play an important role in a person's physical, mental, and emotional well-being (1). It is expected that what we eat will affect our quality of life (QoL), as our identification of self, social interactions, and psychological well-being are usually influenced by our food intake (2).

Many methods have been developed to measure population-specific nutrition quality of life (NQoL), such as among patients with irritable bowel syndrome (3), cardiovascular metabolic disease (4), cancer (5), and malnutrition due to HIV infection (6). However, these measures cannot be generalized to the normal population, and the more well-established, generic ones, such as the short-form health survey with 36 questions (SF-36), fail to include items important

to respondents dealing with nutritional problems (7). A detailed, nutrition-related QoL measure is needed to obtain accurate information presenting food-related behavioural problems within the normal population. Thus, NQoL version 1.4, developed by Barr & Schumacher (2), was suitable for individuals with a fifth grade or higher reading ability and should take no longer than ten minutes to complete. This tool consists of six categories, which cover the physical, social, psychological, food impact, self-image, and self-efficacy components.

Most of the time, eating habits become worse during college years, due to several factors, such as financial problems, meal-skipping, inadequate variety of food intake, snacking, and physical inactivity (8,9). Other factors, such as time

constraint, convenience, availability, cost, taste, lack of knowledge, and peer influence also strongly influence university students' food choices (10). University students tend to engage in problematic eating behaviours, including unhealthy dieting, high intake of fast food, low intake of fruits and vegetables, and minimal consumption of dairy products, although they are generally aware of the negative consequences of those habits (11,12). These findings are mirrored in several reported studies conducted in Malaysia among university students (13–15). In addition, these young adult populations are in a transformation phase of their lives, moving away from parental guidance to being independent young adults, and therefore, are more exposed to unfavourable changes in food intake when starting university life (16–18).

Healthy dietary habits and QoL among students of health sciences are vital, as they themselves will become healthcare professionals, and students who ignore adopting a healthy lifestyle are more likely to fail to convince or promote health for their patients or clients (19,20). Essentially, QoL of the student population is influenced by a variety of factors, such as depression, poor social interaction, low self-esteem, poor academic performance, and bad behaviour (21,22). Therefore, our study intended to evaluate general NQoL status and to compare NQoL status and risk factors, including gender, financial resources, course of study, year of study, and body mass index (BMI) profiles among health science undergraduates in a Malaysian public university.

## Methodology

### *Study procedure and Ethical Approval*

Permission to conduct the study was obtained from the Institute for Health Behavioural Research (IHBR), Clinical Research Centre (CRC) and Ministry of Health Research and Ethics Committee (MREC), Malaysia. Institutional approval was also sought prior to the data collection process.

### *Study design and sample selection*

This study was based on a preliminary, cross-sectional design. Participants were a convenience sample of undergraduates with health sciences backgrounds, between the ages 18 to 24 years, who were studying in a local public university in Terengganu. Data were collected between November 2010 and March 2011. Sample size was determined using Naing's formula (23):

$$n = \left[ \frac{z}{\Delta} \right]^2 p (1 - p)$$

where n = sample size; z = z-value at confidence interval of 95%, which is 1.96; p = percentage of the obesity population that is expected in this study, which is 14.0% (24); and  $\Delta$  = detectable difference, which was set at 7%. The minimum sample size calculated for this study was 104 respondents (after considering a 10% dropout rate). However, a higher number of respondents was chosen to ensure sufficient data were obtained for more accurate and precise results. Hence, at the end of this study, 241 health science undergraduates participated in this study.

### *Instruments*

All students initially completed a personal information form, which was comprised of demographic questions recording their gender, religion, race, living arrangement, field of study, educational level, year of study, financial resources, and BMI. The BMI ( $\text{kg}/\text{m}^2$ ) was calculated using the individual's height and weight, and classified according to the Asian population categorisation (25).

### *Nutrition Quality of Life (NQoL) instrument*

Nutrition related to QoL was measured via the Malay version of the Nutrition Quality of Life, NQoL (*Kaji selidik Kualiti Nutrisi Kehidupan*) instrument, which consists of 50 items. This Malay translated version was produced based on the English NQoL Survey version 1.4 (2,7), which was developed as a tool to monitor the impact of medical nutrition therapy (MNT), a nutrition-based treatment that involves selecting the appropriate food. The original NQoL questionnaire was initially forward translated into Malay and later back translated into English. Finally, cross-cultural adaptations were conducted to polish the items. This cross-cultural adaptation was conducted and reviewed by an expert committee, comprised of methodologists and health professionals, who ensured that the items were translated correctly and were relevant in the new setting when used in a different language (26–28). This instrument assesses six domains: *Food Impact (9 items)*, *Self-Image (6 items)*, *Psychological Factors (10 items)*, *Social/Interpersonal Factors (7 items)*, *Physical Functioning (9 items)*, and *Self-Efficacy (9 items)*. Example of the items for each domain are: *I ate enough food to be satisfied (Food Impact)*; *Liked the way I look (Self-Image)*; *Rewarded myself*

with food (*Psychological Factors*); My family/friends have nagged me about food I ate (*Social/ Interpersonal Factors*); Walking at a moderate pace for 30 minutes (*Physical Functioning*); and Knew what type of food I should have been eating for my healthy lifestyle (*Self-Efficacy*). Several NQoL items are described in Appendix 1. For each item, the responses were based on a five-point Likert-type scale: 5 = all of the time, 4 = most of the time, 3 = some of the time, 2 = a little of the time, and 1 = none of the time. The Overall Score was derived from the total mean of all six domains. The frame of reference for all questions was the preceding two weeks. Scores for 28 of the 50 items were transposed so that higher scores indicated better NQoL. Only for one domain, *Self-Efficacy*, were the scores not transposed, as all the questions were already positively worded. In addition, another instrument, the *Breast Cancer and Chemotherapy Questionnaire (BCCQ)* (29,30) was administered in parallel for the

purpose of examining the concurrent validity of the Malay version of NQoL.

#### Reliability and validity of the Malay version of NQoL instrument

Cronbach's alpha coefficient (for internal consistency reliability) and Spearman's correlation coefficient (for divergent validity) were employed for the purpose of reliability and validity tests of the Malay version of the NQoL instrument. Overall, Cronbach's alpha for all NQoL domains ranged from 0.217 to 0.908, in which *Physical Functioning*, *Self-Efficacy*, and *Overall Score* demonstrated acceptable values of greater than 0.700 (31). On the other hand, NQoL domains correlated weakly and insignificantly with the chemotherapy ( $r_s = -0.058, 0.178$ ) and breast cancer subscales of the *BCCQ* ( $r_s = -0.002, 0.216$ ), indicating its divergent validity. In addition, evidence of convergent validity was shown by the correlation coefficients among all NQoL domains and *Total NQoL* as being high and significant ( $r_s = 0.442, 0.643; p < 0.05$ ). For the purpose of concurrent study, the outcomes were considered acceptable and adequate. These preliminary findings provide some early evidence of the reliability and validity of the Malay NQoL, but further validation exercises in larger samples are essential.

#### Statistical analysis

The primary analysis involved descriptive statistics for all ten demographic characteristics, which were presented as frequencies and percentages. An initial normality test was carried out, utilising age and mean scores of NQoL domains as dependent variables. Outcomes complied with the normality requirements, in which the score distribution was normally distributed as indicated in Kolmogorov-Smirnov statistics by  $p > 0.05$ . Subsequently, parametric univariate analyses were employed for each independent variable for 1) all respondents and 2) respondents stratified according to *Total NQoL Score* (*Poor NQoL* = score < mean; and *Good NQoL* = score  $\geq$  mean) (32). Thus, an independent t-test was used to compare score differences between groups, and a one-way ANOVA was used to compare more than two groups. Multiple logistic regression analyses were conducted to determine whether gender, course of study, year of study, and BMI profiles (as confounders) were associated with good NQoL (as reference group) or poor NQoL. The results were presented in the form of mean, standard deviation (SD), confidence interval (CI),

#### Appendix 1: Examples of items of the NQoL version 1.4 instrument.

##### Food Impact

1. I had plenty of choice in the food I ate
2. I could afford to buy the food that was best for me

##### Self-Image

3. Liked the way my clothes fit
4. Was pleased with the way I managed what I ate

##### Psychological Factors

5. Was happy with the food I ate
6. Was frustrated about limiting the food I ate

##### Social/ Interpersonal Factors

7. I have cut down the amount of time I spend on work or other activities because of my food-related condition
8. I had someone I could talk to who understood the struggles I have had with food

##### Physical Functioning

9. Walking slowly for 10 minutes
10. Walking up a flight of stairs

##### Self-Efficacy

11. Knew what type of food I should have been eating for my healthy lifestyle
12. Made healthy food choices

and  $p$  value. A value of  $p < 0.05$  was considered statistically significant.

## Results

### Demographic characteristics

The basic demographic characteristics of students are presented in Table 1 (a) and 1 (b). A total of 241 students, with 100% response rate, participated in the study (nursing = 120, radiography = 64, and medical laboratory technology [MLT] = 57). The majority of the students were female (83.0%), Malay (96.7%), Muslim (97.9%), and not taking supplements (83.8%). The mean (SD) age of all students was 19.7 (0.9) years, ranging from 18 to 24 years. Their mean height was 1.6 (0.1) meters, and the overall weight was 52.8 (1.3) kg. Most (52.3%) were within the desirable BMI range (18.5–22.9). Approximately 77.6% of the students were living with friends, with the majority receiving an education loan scheme (either by the Perbadanan Tabung Pendidikan Tinggi Nasional/ PTPTN or Majlis Amanah Rakyat/ MARA) (76.3%).

### General Nutrition Quality of Life (NQoL) status

The median, range, standard deviation (SD), and mean scale scores of NQoL subscales are depicted in Table 2. Overall, *Social/Interpersonal Factors* [3.84 (0.43)] emerged as the highest-scored subscale, while the lowest rating was obtained for *Food Impact* [3.10 (0.40)].

### Comparison of NQoL status by socio-demographic characteristics

#### Gender

There was a significant difference in terms of *Self-Efficacy* between genders, with females scoring higher than males ( $p = 0.043$ , 95% CI = -0.59, -0.01). Among the NQoL domains, male students showed the highest mean score in the *Physical Functioning* [3.88 (1.03)] component, while female students reported the highest score

in *Social/Interpersonal Factors* [3.85 (0.43)]. The lowest mean score in *Food Impact* component was generated by both genders [male = 3.08 (0.46); female = 3.11 (0.38)]. Overall, there was a general tendency for NQoL scores to be higher among female respondents (Table 2).

### Financial resources

No significant differences were found between students receiving an education loan scheme and students not receiving an education loan scheme. However, both groups of students experienced higher NQoL in the *Social/Interpersonal* aspect. They also reported lower NQoL with regard to the *Food Impact* subscale [receiving loan = 3.09 (0.36); not receiving loan = 3.12 (0.50)]. In the majority of NQoL domains, undergraduates who were not receiving a PTPTN/ MARA loan, interestingly, reported a trend of better NQoL status than those receiving the loan (data not shown).

### Course of study

NQoL comparisons by the three different study courses—nursing, radiography, and MLT—are reported in Table 3. Nursing students experienced significantly greater NQoL ratings (mean = 3.58, 95% CI = 3.47, 3.68) than radiography students in *Self-Efficacy* ( $p < 0.05$ ). On the other hand, MLT students had a significantly more favourable score (mean = 3.62, 95% CI = 3.47, 3.76) than nursing students in *Self-Image* ( $p < 0.05$ ). However, in all other scales, there were no significant differences, although generally, ratings for all NQoL domains were higher among MLT students compared to nursing and radiography students.

### Year of study

NQoL comparisons by year of study are also reported in Table 3. The results showed a total absence of any significant differences across the year of study (first year;  $n = 80$ , second year;  $n = 101$ ; and third year,  $n = 60$ ). Nonetheless, all groups showed higher NQoL in *Social/*

**Table 1(a):** Demographic characteristics of students ( $n = 241$ )

Variable	Mean	Standard deviation	Median	Minimum, maximum
Age (years)	19.7	0.9	20.0	18.0, 24.0
Weight (kg)	52.8	1.3	50.0	37.0, 120.0
Height (m)	1.6	0.1	1.6	1.4, 1.9
BMI (kg/m <sup>2</sup> )	21.1	4.0	20.3	13.0, 37.9

**Table 1(b):** Categories of students ( $n = 241$ )

Categories	Frequency ( $n$ )	Percentage (%)
Gender		
a) Radiography	64	26.6
Male	20	31.2
Female	44	68.8
b) Medical Laboratory Technology (MLT)	57	23.7
Male	9	15.8
Female	47	82.5
c) Nursing	120	49.8
Male	10	8.3
Female	109	90.8
Religion		
Muslim	236	97.9
Buddhist	1	0.4
Hinduism	2	0.8
Christian	1	0.4
Race		
Malay	233	96.7
Chinese	2	0.8
Indian	3	1.2
Others	3	1.2
Living arrangement		
Alone	6	2.5
With partners/ family	48	19.9
With friends	187	77.6
Course of study		
a) Radiography		
First year	25	39.1
Second year	23	35.9
Third year	16	25.0
b) MLT		
First year	15	26.3
Second year	26	45.6
Third year	16	28.1
c) Nursing		
First year	40	33.3
Second year	52	43.3
Third year	28	23.3
Financial resources		
Education loan scheme	184	76.3
Scholarship	21	8.7
Family	27	11.2
Own saving	3	1.2
Others	6	2.5
Body Mass Index (BMI) ( $\text{kg}/\text{m}^2$ )		
Underweight ( $< 18.5$ )	56	23.2
Normal weight ( $18.5-22.9$ )	126	52.3
Overweight ( $\geq 23.0$ )	49	20.7

**Table 2:** General level of NQoL status and the differences of NQoL domains based on gender and BMI profiles ( $n = 241$ )

Domains	General			Gender, mean (SD)		95% CI
	Median	Mean (SD)	Min, max	Male ( $n = 39$ )	Female ( $n = 200$ )	
FI	3.11	3.10 (0.40)	2.00, 4.33	3.08 (0.46)	3.11 (0.38)	-0.17, 0.10
SI	3.40	3.47 (0.53)	2.20, 5.00	3.54 (0.59)	3.46 (0.52)	-0.10, 0.27
PF	3.50	3.46 (0.41)	2.40, 4.30	3.37 (0.49)	3.48 (0.40)	-0.27, 0.06
Soc	3.86	3.84 (0.43)	2.43, 4.71	3.80 (0.43)	3.85 (0.43)	-0.19, 0.10
Phy	3.89	3.77 (1.01)	1.00, 5.00	3.88 (1.03)	3.76 (0.99)	-0.22, 0.47
SE	3.56	3.47 (0.67)	1.00, 5.00	3.18 (0.83)	3.52 (0.62)	-0.59, -0.01
Total NQoL	3.53	3.52 (0.30)	2.78, 4.12	3.48 (0.34)	3.53 (0.29)	-0.18, 0.03

  

Domain	t-statistic (df)	P-value*	BMI profiles, mean (SD)			F-statistic (df)	P-value <sup>a</sup>
			UW ( $n = 56$ )	NW ( $n = 126$ )	OW ( $n = 49$ )		
FI	-0.48 (237)	0.683	3.03 (0.39)	3.14 (0.40)	3.10 (0.40)	1.41 (2, 230)	0.247
SI	0.93 (237)	0.351	3.44 (0.52)	3.48 (0.55)	3.48 (0.51)	0.13 (2, 230)	0.876
PF	-1.27 (48.19)	0.134	3.56 (0.37)	3.42 (0.44)	3.43 (0.37)	2.32 (2, 230)	0.100
Soc	-0.60 (237)	0.286	3.82 (0.43)	3.86 (0.43)	3.80 (0.43)	0.42 (2, 230)	0.656
Phy	0.71 (237)	0.887	3.65 (1.03)	3.86 (0.99)	3.65 (1.03)	1.25 (2, 230)	0.290
SE	-2.40 (45.38)	0.043	3.38 (0.66)	3.49 (0.66)	3.42 (0.68)	0.59 (2, 228)	0.556
Total NQoL	-1.00 (237)	0.159	3.48 (0.32)	3.54 (0.30)	3.48 (0.28)	1.26 (2, 230)	0.286

\*Independent t-test; <sup>a</sup>One-Way ANOVA test; FI = Food Impact; SI = Self-Image; PF = Psychological Factors; Soc = Social/ Interpersonal Factors; Phy = Physical Functioning; SE = Self-Efficacy; BMI = Body Mass Index; UW = Underweight; NW = Normal-weight; OW = Overweight; Min = Minimum; Max = Maximum; SD = Standard Deviation

*Interpersonal* aspects, with third-year students [3.86 (0.41)] having the highest rating compared to first-year [3.83 (0.44)] and second-year students [3.83 (0.43)]. In contrast, the *Food Impact* subscale was rated lowest by all respondents, with first-year students [3.05 (0.39)] showing the poorest rating compared to second-year [3.09 (0.40)] and third-year respondents [3.21 (0.37)]. Overall, students in the third year reported the best NQoL in almost all dimensions compared to students of other years.

#### Different BMI profiles

Table 2 shows that there were no significant differences among participants with various BMI profiles in all NQoL components. Nonetheless, students with normal weight had better NQoL in almost all dimensions compared to students who were either underweight or overweight. Intriguingly, better NQoL, particularly in *Social/ Interpersonal Factors* aspect, was observed among underweight [3.82 (0.43)] and overweight students [3.80 (0.43)]. Otherwise, lower NQoL was notably present in *Food Impact* relative to

other subscales in all groups [underweight = 3.03 (0.39); normal weight = 3.14 (0.40); overweight = 3.10 (0.40)].

#### Stratified respondents

The mean score for Total NQoL was 3.52, and this was used as the cut-off score for stratifying respondents according to Poor NQoL ( $n = 118$ ) and Good NQoL ( $n = 123$ ). In Table 4, an overall report for stratified respondents is presented (Table 4).

#### a) Poor NQoL

No significant differences were detected in NQoL domains among all independent variables, except for gender and financial resources. Females reported significantly higher levels of *Self-Efficacy* compared to males ( $p = 0.005$ ). Significantly better *Food Impact* was shown among those who received an education loan scheme compared to those who did not receive an education loan scheme ( $p = 0.041$ ) (data not shown).

**Table 3:** Differences of NQoL domains based on different courses and years of study ( $n = 241$ )

Domain	Mean (SD)			F-statistic (df)	P-value <sup>a</sup>
	A: Nursing ( $n = 120$ )	B: Radiography ( $n = 65$ )	C: MLT ( $n = 57$ )		
Food Impact	3.11 (0.37)	3.03 (0.46)	3.13 (0.38)	0.35 (2240)	0.703
Self-Image	3.41 (0.46)	3.46 (0.61)	3.62 (0.54)	3.12 (2240)	0.046 (A vs. C)
Psychological Factors	3.44 (0.37)	3.45 (0.47)	3.48 (0.43)	0.29 (2240)	0.751
Social/ Interpersonal	3.87 (0.38)	3.79 (0.42)	3.89 (0.49)	2.59 (2240)	0.077
Physical Functioning	3.89 (0.93)	3.57 (1.04)	3.68 (1.13)	1.65 (2240)	0.194
Self-Efficacy	3.58 (0.57)	3.26 (0.69)	3.41 (0.81)	4.02 (2238)	0.019 (A vs. B)
Total NQoL	3.53 (0.29)	3.41 (0.29)	3.51 (0.30)	2.52 (2240)	0.083

  

Domain	Mean (SD)			F-statistic (df)	P-value <sup>a</sup>
	First year ( $n = 80$ )	Second year ( $n = 101$ )	Third year ( $n = 60$ )		
Food Impact	3.05 (0.39)	3.09 (0.40)	3.21 (0.37)	2.97 (2240)	0.053
Self-Image	3.49 (0.55)	3.47 (0.49)	3.46 (0.57)	0.39 (2240)	0.962
Psychological Factors	3.40 (0.43)	3.48 (0.41)	3.50 (0.40)	1.12 (2240)	0.327
Social/ Interpersonal	3.83 (0.44)	3.83 (0.43)	3.86 (0.41)	0.13 (2240)	0.875
Physical Functioning	3.74 (0.97)	3.79 (1.01)	3.77 (1.08)	0.06 (2240)	0.947
Self-Efficacy	3.46 (0.66)	3.38 (0.64)	3.61 (0.71)	2.22 (2238)	0.111
Total NQoL	3.50 (0.30)	3.51 (0.30)	3.57 (0.30)	1.12 (2240)	0.329

<sup>a</sup> One-Way ANOVA test; SD = Standard Deviation; MLT = Medical Laboratory Technology

#### b) Good NQoL

Across all independent variables, course of study was the only variable that showed a significant difference in the *Self-Image* aspect, with MLT students experiencing a significantly higher level compared to nursing students ( $p = 0.008$ ). However, nursing students reported significantly more favourable NQoL than radiography students in the *Self-Efficacy* aspect ( $p = 0.019$ ). MLT students possessed significantly better NQoL in the *Social/Interpersonal* aspect ( $p = 0.031$ ) and Total NQoL ( $p = 0.024$ ) compared to other students (data not shown).

For multiple logistic regression outcomes, normal-weight students had 2.66 times the

odds of having good NQoL (95% CI = 1.30, 5.43;  $p < 0.05$ ) compared to overweight students when adjusted for gender, year of study, and study courses (Table 5).

## Discussion

This study evaluated the general NQoL status among undergraduate students of health sciences from three different courses at a local public university in Terengganu. The results provided several important insights for understanding general NQoL status based on gender, financial resources, study course, year of study, and BMI profile.

With regard to general NQoL status, *Social/Interpersonal Factors* emerged as the highest-ranking subscale. This result might be due to

**Table 4:** Score description across all respondents [presented as mean (SD)]

Domains	Respondent Categorisation		95% CI	t-statistic (df)	P-value <sup>a</sup>
	Poor NQoL (n = 118)	Good NQoL (n = 123)			
Food Impact	2.92 (0.36)	3.28 (0.34)	-0.46, -0.28	-8.11 (239)	< 0.001
Self-Image	3.31 (0.50)	3.63 (0.51)	-0.45, -0.19	-4.90 (239)	< 0.001
Psychological Factors	3.33 (0.40)	3.59 (0.39)	-0.36, -0.16	-5.06 (239)	< 0.001
Social/ Interpersonal Factors	3.68 (0.43)	3.99 (0.37)	-0.41, -0.20	-5.86 (230)	< 0.001
Physical Functioning	3.24 (0.98)	4.28 (0.75)	-1.26, -0.81	-9.21 (219)	< 0.001
Self-Efficacy	3.21 (0.63)	3.71 (0.60)	-0.66, -0.34	-6.25 (237)	< 0.001
Total NQoL	3.28 (0.20)	3.75 (0.18)	-0.51, -0.42	-18.80 (239)	< 0.001

\* Independent t-test

**Table 5:** Multiple logistic regression analysis of NQoL status

Variable	Crude OR	P-value	Adjusted OR (95% CI)	P-value
Gender				
Male	0.53 (0.26, 1.08)	0.079	0.73 (0.34, 1.56)	0.409
Female	1 (reference)		1 (reference)	
Year of study				
First year	1.57 (0.80, 3.08)	0.188	1.70 (0.84, 3.42)	0.139
Second year	1.25 (0.66, 2.37)	0.500	1.30 (0.65, 2.57)	0.459
Third year	1 (reference)		1 (reference)	
BMI profiles				
Underweight	1.92 (0.87, 4.25)	0.107	1.88 (0.83, 4.26)	0.132
Normal-weight	2.84 (1.42, 5.69)	0.003	2.66 (1.30, 5.43)	0.007
Overweight	1 (reference)			
Course of study				
MLT*	1 (reference)		1 (reference)	
Radiography	0.93 (0.45, 1.90)	0.837	1.04 (0.47, 2.29)	0.925
Nursing	1.61 (0.86, 3.04)	0.140	1.69 (0.85, 3.38)	0.135

\* MLT = medical laboratory technology

the majority of the students living with friends (77.6%), an arrangement that would inevitably influence their dietary choices (33). Moreover, most items in this domain asked about their dietary habits when accompanied by friends; e.g. “I had someone I could talk to who understood the struggles I have had with food” (2). Therefore, they would have experienced desirable

social communication, being able to share their problems or joys with their friends, particularly while having meals together. Meanwhile, *Food Impact* appeared as the lowest-ranking domain, which emphasizes the impact of food or nutrition on a person’s physical, mental (mind), and social well-being (e.g. “I could afford to buy the food that was best for me”) (2). This situation could be due



to the new environment, which is associated with the changes in lifestyle induced by the transition of moving away from their family homes and assuming responsibility for their own diets (34). In order to improve their NQoL status, they should slowly adapt to the new university surroundings and learn how to practice proper dietary habits, information which is readily obtained through the Internet, magazines, books, brochures, and leaflets.

In our study, female students had slightly higher NQoL scores compared to male students in most of the six dimensions of the Malay version of the NQoL instrument, except for the *Physical Functioning* and *Self-Image* components. This trend somehow indicates that female students adopted a more sedentary lifestyle, with minimal regular physical activity compared to male students. Lack of energy, time, and self-confidence have always been reported among females (35,36). The rising rates of inactivity are often linked to obesity, diabetes, heart disease, and certain cancers, commonly referred to as the “diseases of inactivity” (37). Therefore, it is essential to promote regular physical activity as a part of the strategy to improve NQoL in students. Furthermore, the *Self-Image* aspect appeared to be scored lower by female students, possibly because of the substantial percentage of underweight and overweight students among them (42.6%). Nonetheless, this finding was only our observation in this population, and such a condition may have contributed to body image dissatisfaction among university students, exposing them to the development of eating disorders, such as anorexia nervosa and bulimia nervosa (38,39). Even so, female students reported significantly higher *Self-Efficacy*, or more confidence in their ability to choose healthy foods, such as those high in calcium and low in fat, compared to male students.

Based on the sample of students surveyed in this study, 76.3% of students are receiving an education loan scheme (from PTPTN or MARA). This group of students experienced poorer NQoL in almost all domains, except *Self-Efficacy*. The main reason could be due to their restricted financial resources, as well as the tendency to be thrifter with their spending. Consequently, the likelihood of changing their eating habits was greater when starting university life. This situation could have indirectly decreased their weekly consumption of fresh fruits, vegetables, oily fish, and seafood, and at the same time “encouraged” their fast food intake and meal-skipping practices (40). Despite the fact that the

majority of the students are unemployed and their main source of income comes from educational loans (PTPTN = RM3000 per semester), they also might be receiving money from their parents (41). Thus, this condition might be seen as quite lucrative, even though they are just beginning a major transition in their lives.

The findings of this study seem to indicate further that nursing students possessed a significantly more positive perception of their *Self-Efficacy* towards their eating habits compared to MLT and radiography students. It could be that nursing students are more exposed to a wealth of information and different academic experiences during their university years. They might also have a rather positive perception of health, and therefore, value health status differently compared to the general population (20). This is encouraging, because only when nursing students have confidence in their own abilities are they able to focus on the needs of their patients (42). However, the *Self-Image* of nursing students was lower compared to MLT students; it is probable that the high percentages of underweight (22.5%) and overweight (18.3%) students in the nursing group, factors that are commonly associated with lower body image perception, contributed to this phenomenon (43). On the other hand, undergraduates in MLT courses appeared to have higher QoL in the majority of NQoL subscales, especially in the aspects of *Food Impact*, *Self-Image*, *Psychological Factors*, and *Social/Interpersonal Factors*, compared to their counterparts. The possible explanation could be that these students enjoy better personal relationships and stronger social lives than the other students (19), although the actual reason could not be elucidated at this point. Possibly due to the lack of a nutrition component in their syllabus, radiography students showed lower NQoL in all subscales. Nonetheless, as future healthcare providers, they too should be expected to possess minimal knowledge about nutrition in the process of providing general health advice.

In addition, the analysis of relationships among NQoL dimensions and different years of study showed that students in the third year had the highest scores in all domains, except for *Physical Functioning* and *Self-Image*. This finding could be because the senior students (third year) had already adapted to the environment of university life and were probably more “aware” in selecting healthier food compared to their juniors (first and second year). Limited knowledge and information related to healthy eating also might have been another possible factor, as the junior

students were likely to be more ignorant of the importance of healthy eating, as a consequence of the process of adaptation to a new study and living environment. A previous study by King et al. (10) found that most junior students live in dormitories and rely on hostel food or fast food served there as their main source of nutrition. Based on these results, fresh recruits should be exposed to healthy eating guidelines and its impact on nutritional habits during their orientation period.

The relatively lower NQoL among overweight students than students with normal weight might be due to skipping breakfast, a habit that normally contributes to obesity (44), as well as their sedentary lifestyles, coupled with minimal physical activity (8). The positive influence of being normal-weight was confirmed in the subsequent multiple regression analysis for those with good NQoL. Generally, BMI profiles have been strongly associated with QoL, whereby QoL impairment has been shown to worsen with increasing obesity and the probability of developing chronic conditions, such as type 2 diabetes and cardiovascular diseases (45–47). In addition, underweight students have been shown to exhibit poorer NQoL, suggesting that some aspects of QoL could be attributed to being underweight (48). Unfortunately, studies have less concerned with identifying trends in QoL among underweight populations, although many reasons for low body weight might exist; for example, someone classified as “underweight” may be so because of dysfunctional eating behaviours (e.g., food restriction and excessive exercise), suffering from distinct medical conditions (e.g., long-term chronic health conditions), or some factors unrelated to health status, such as naturally low BMI (49). With these findings, it is clear that efforts are needed to explore the relationship between BMI and QoL in longitudinal studies by using larger samples with Asian-version BMI profiles.

Lastly, according to the stratified respondents of Poor NQoL and Good NQoL, it was apparent that those with Good NQoL possessed better scores in all domains than those with Poor NQoL. However, the huge differences in the score of *Physical Functioning* could be due to these young adults with Good NQoL being more active compared to those with Poor NQoL. A similar observation was reported in a systematic review showing that higher physical activity level was consistently associated with better QoL among the general adult population (50). A study by Huang (51) also reported that over 70% of college students were found to perform active and

moderately active physical activities daily. Such physical activities, coupled with regular exercise, are especially beneficial to university students for increasing their overall body fitness and well-being, as well as reducing their risk of various diseases (35). Nevertheless, due to the lack of direct physical activity assessment in our current study, concrete evidence to support this finding requires further investigation.

Although our study relied on the inclusion of a large, convenient sample, a major limitation still exists. Essentially, the sample was rather imbalanced between genders, due to the recruitment of more females than males as respondents; hence, the results were heavily biased towards females. This is due to a higher proportion of female students in their faculty, which represents a common trend in the universities in our country, Malaysia (52). Nevertheless, our data generally included all the representatives of the three different courses in this health sciences population. In addition, our sample from public university was highly dominated by a Malay population (96.7%) practicing Islam, which prohibits the consumption of alcoholic beverages. Other than that, the instrument used was considered reliable for this current population, whereby several NQoL domains showed Cronbach’s alpha values of greater than 0.700. In addition, the instrument used was considered valid when the NQoL domains correlated weakly and insignificantly with BCCQ, which conceptually measured completely unrelated issues. Moreover, convergent validity was confirmed via strong relationships between *Total NQoL* and the respective domains. Nonetheless, further psychometric analysis for this instrument should be encouraged in future. It also would have been more appropriate to ask the respondents to identify whether or not an item was completely understood (26). Because of the cross-sectional nature of this study, no definite conclusion regarding the factors affecting NQoL can also be drawn at this moment. Future longitudinal studies are needed to determine factors influencing NQoL specifically in this population. In addition, the actual eating habits and food intake of university students in the current cohort should be explored, as this study was rather focused on the general perceptions and beliefs towards eating habits.

## Conclusion

The current evidence suggests that gender and course of study seemed to make a difference in NQoL status among undergraduates. However,

NQoL status did not differ by financial resources, course of study, or BMI profiles. Additional strategies to increase healthy nutritional habits in university students are clearly warranted, even though some may not be directly involved in this specialized area. As health science students will become future healthcare professionals, it is vital for them to have appropriate NQoL themselves before educating their patients. A simple healthy eating guideline would be a useful mechanism for promoting such changes, especially within the period of their studies in university.

### Conflict Of Interest Statement

The authors have no conflict of interest or relevant financial relationships in this study.

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### Authors' Contribution

Conception and design, critical revision of the article for important intellectual content, final approval of the article, and statistical expertise: LPL

Analysis and interpretation of the data, drafting of the article, and collection and assembly of data: WPEWD

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