

HEALTHY DIETARY HABITS, BODY MASS INDEX, AND PREDICTORS AMONG NURSING STUDENTS, NORTHEAST THAILAND

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Abstract. This study aimed to assess body mass index (BMI) of nursing students, and examine the links between health behavior in terms of healthy dietary habits, positive health habits, dieting and BMI. A structured questionnaire was used for obtaining information on dietary habits, positive health habits, demographic characteristic including body weight, and height by administering self-answering questionnaires to all of nursing students in the 1st, 2nd, 3rd, and 4th year-classes of the College of Nursing located in northeast Thailand. Three hundred and eleven female nursing students with an average age of 19.9 (SD = 1.4), had an average BMI of 20.3 kg/m² (SD = 1.9). Most of the subjects (82.6%) were in the acceptable weight category (BMI > 18.5-24.99 kg/m²), 5.1% underweight (BMI ≤ 18.5 kg/m²), and 2.3% overweight (BMI ≥ 25.0 kg/m²). About half of them (50.8-66.2%) practiced healthy dietary habits in terms of avoiding eating fat/cholesterol, enriched fiber foods, while one-fourth practiced daily fruit consumption. Positive health habits in terms of having breakfast, and taking exercise over the last two weeks, were practiced by 49.5% and 59.8%, respectively. Persistent health problem occurred 13.5% amongst the subjects. The univariate analyses revealed significant associations between dieting with the BMI; perception of body size with the BMI; the enriched fiber food consumption with dieting; and the avoidance of fat/cholesterol with dieting. It suggests that the choice of food was predominantly attributable to dieting. Results from multiple logistic regression analysis showed that dietary belief, dieting, and exercise had effects on the strength of the association ($p = 0.0191, 0.0024, 0.0165$; Odds ratios = 0.97, 2.21, 1.87, respectively). The results and implications are discussed.

INTRODUCTION

Dietary habits have been studied in the context of health behavior research. In a recent survey of American adolescents (French *et al*, 1995), the majority of dieters reported healthy dietary habits such as avoiding eating fat and eating more fruits and vegetables, only a small number reported dieting or weight loss practices. The use of body mass index (BMI) as a useful tool in both clinical and public health practice for assessing adult nutritional status has been encouraged by concerned organizations (Bailey and Ferro-Luzzi, 1995). BMI is internationally accepted as an index for expressing the extent of overweight (excess weight relative to height) and underweight or thinness (insufficient body mass relative to height) (WHO, 1995). Empirical studies (Rhoads and Kagan, 1983; Garriso and Castelli, 1985; Mattila *et al*, 1986; WHO, 1990) have revealed that

both overweight and have adverse effects on health and increased risk of mortality. Thus, this article's objective is to assess BMI of nursing students as they will be one of the health personnel who are important for the health care services sector. It is also the aim to examine the links between health behavior in terms of healthy dietary habits, positive health habits, dieting and BMI of the Thai nursing students.

MATERIALS AND METHODS

A structured questionnaire was used for obtaining information on dietary habits, positive health habits, demographic characteristics including body weight (in kilograms), and height (in centimeters). Its detail has been described elsewhere (Nanakorn *et al*, 1999). In brief, dietary habits were assessed as follows: (a) frequency of fruit consumption (daily, 2-3 times a week, once a week, less than once a week, never); (b) enriched fiber food consumption (yes, no); (c) avoidance of fat or cholesterol (yes, no); (d) frequency of adding salt or fish sauce to

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meals (usually, sometimes, occasionally, never). The positive health habits were assessed by five questions on: (a) physical exercise over last two weeks (yes, no); (b) sun protection use (yes, no); (c) frequency of breakfast eating (everyday or almost everyday, sometimes, rarely or never); (d) tooth brushing (twice or more a day, once a day, less than once a day); and (e) sleeping time (in hours). Preventive health care questions concerned blood pressure measurement (yes, no); regular dental check-up once a year (yes, no); and regular access to a doctor (yes, no). Perception of body size was rated from very fat, slightly fat, about right, slightly thin, and very thin. A question on "Are you on a diet?" was also recorded. Belief in the importance of healthy dietary habits (hereafter termed as dietary belief) was rated on a scale from 1 (of very low importance) to 10 (of very great importance), of the following dietary habits to be: (a) eating breakfast; (b) eating enriched fiber food, (c) eating plenty of fruit; (d) avoiding sugar; (e) avoiding salt or fish sauce, (f) avoiding food additives, and (g) not eating animal fat. The dietary belief index was defined as a composite of these seven items' scores. The healthy dietary habits index was defined as a composite of four items of dietary habits recommended for health (WHO, 1990), for example, daily fruit consumption, avoidance of fat or cholesterol, and avoidance of salt. Thus, frequency of fruit consumption was scored as 5 for daily eating-response while 2-3 times a week-, once a week-, less than once a week-, and never-responses were scored as 4 to 1 respectively; enriched fiber food consumption was scored as 2 for yes-, and 1 for no-response, the same as in avoidance of fat or cholesterol; frequency of adding salt or fish sauce to meals was scored as 4 for never-, 3 for occasionally-, 2 for sometimes-, and 1 for usually-responses. A sum of scores of these four items was used in a multivariate analysis in which higher scores indicated healthier dietary habits.

The BMI is a measure of body mass index relative to height, calculated as weight (kg)/height (m)² which was classified into three categories (WHO, 1995) as following: overweight (BMI \geq 25.0), acceptable weight (BMI > 18.5-24.99), and underweight (BMI \leq 18.5). For the reason of data comparison with another study, the acceptable weight was classified into low normal (BMI > 18.5-20.0) and normal weight (BMI > 20.0-24.99). For the purpose of multivariate logistic regression analysis, two categories of the BMI were used: acceptable weight, and overweight plus underweight, due to the small cell number of the overweight.

Study subjects were all female nursing students in the 1st, 2nd, 3rd, and 4th year-classes of the College of Nursing located in northeast Thailand. They were instructed to honestly self-administer the structured questionnaire and were assured of anonymity. Of 312 respondents, one was omitted due to an incomplete questionnaire. Therefore, 311 subjects were used for analyses. Data collection was conducted in January 1997.

Univariate and bivariate analyses were used to characterize the study population in terms of frequency for the categorized data, or mean value with standard deviation for the continuous data. Statistical significance of bivariate associations or correlations was calculated using the chi-square test or Pearson correlation coefficient as appropriate (Moore and McCabe, 1993). Multivariate logistic regression analysis was used to control for confounders in examining the relation of the healthy dietary habits and explanatory variables. Logistic regression analysis as the most appropriate statistical method was chosen according to deviation from normal distribution of the healthy dietary habits index scores (SAS Institute Inc, 1997). The likelihood ratio difference test was used to check the fit of the model. All statistical analyses were carried out using SAS release 6.12 for Windows at the Computer Center for Education, Kurume University School of Medicine, Japan. Two-sided tests of significance at the 5% level were considered statistically significant.

RESULT

Socio-demographic characteristics

The average age of the female nursing students was 19.9 (SD = 1.4) with the age range between 17-25 years. The number of siblings was an average of 3.3 (SD = 1.4), ranging from 1-9. Proportions in the 1st, 2nd, 3rd, and 4th year-class were 58.8, 11.6, 11.3, and 18.3%, respectively.

Body mass index (BMI)

The BMI was an average of 20.3 (SD = 1.9). Most of the female nursing students (82.6%) were in the acceptable weight category, 15.1% underweight, and 2.3% overweight as shown in Table 1.

Healthy dietary habits

The proportions of individual healthy dietary habits are also shown in Table 1. About one-fourth

had daily fruit consumption, three-fourth consumed enriched fiber food, about half avoided eating fat or cholesterol, and only 5.8% never added salt or fish sauce to meals.

The interrelationship between healthy dietary habits using the Pearson correlation coefficient revealed a strong correlation between the avoidance of fat or cholesterol and the enriched fiber food consumption ($r_p = 0.37, p = 0.0001$), the daily fruit consumption and the avoidance of fat/cholesterol ($r_p = 0.22, p = 0.0001$), and inverse moderate correlation between the daily fruit consumption and

the avoidance of salt/fish sauce ($r_p = -0.12, p = 0.03$).

Positive health habits, and preventive health care

The positive health habits assessed by these 5 items are shown in Table 1. About half of the female nursing students had breakfast everyday or almost everyday, and used sun protection; 59.8% had exercised over the last two weeks; 99% brushed their teeth 2-3 times a day and their sleeping times were an average of 6.8 hours (SD = 1.2). Preventive health care in terms of blood pressure measure-

Table 1
BMI, healthy dietary habits, positive health habits and preventive health care.

	% (number)
Body mass index (BMI):	
Overweight (BMI ≥ 25.0 kg/m ²)	2.3 (7)
Acceptable weight (BMI > 18.5 -24.99 kg/m ²)	82.6 (257)
Underweight (BMI ≤ 18.5 kg/m ²)	15.1 (47)
Mean \pm SD	20.3 \pm 1.9
Healthy dietary habits	
Fruit consumption:	
at least once a day	24.8 (77)
every 2-3 days	44.0 (137)
about once a week	22.5 (70)
less than once a week	8.7 (27)
never	0.0 (0)
Enriched fiber food consumption	66.2 (205)
Avoid fat/cholesterol	50.8 (158)
Adding salt/fish sauce to meal:	
never	5.8 (18)
very occasionally	16.4 (51)
sometimes	41.8 (130)
usually	36.0 (112)
Positive health habits	
Breakfast eaten everyday or almost everyday	49.5 (154)
Exercise over last 14 days	59.8 (186)
Tooth brushing 2-3 times/day	99.0 (308)
Sun protection use	47.3 (147)
Sleep time (hours) mean \pm SD	6.8 \pm 1.2
Preventive health care	
Blood pressure measurement	89.7 (279)
Regular dental check-up	39.2 (122)
Regular access to doctor	52.1 (162)
Persistent health problem	
Taking prescribed medication over the last month	17.7 (55)
Taking non-prescribed medication over the last month (eg, analgesics)	33.8 (105)

ment was practiced by 89.7%, regular dental check-up by 39.2%, and regular access to a doctor by 52.1%.

Persistent health problems and medication

There were 13.5% of the female nursing students who had suffered from persistent health problems, for example, allergy, asthma etc. Medication, by taking prescribed treatment from a doctor over the last month, was practiced by 17.7% compared with 33.8% taking non-prescribed medication *eg*, analgesics.

BMI and factors associated

Table 2 shows univariate analyses between BMI and factors associated *ie*, dieting, healthy dietary habits, and body size perception. It reveals that dieting, and perception of body size is significantly associated with the BMI. Fifty-five percent of subjects whose BMI were within normal range were on diets compared with approximately 30% of those who were underweight or overweight ($\chi^2 = 11.7$, $df = 1$, $p = 0.001$). The perception of body size was found to be significantly different from the actual body size on the basis of BMI; among those with acceptable weight, about half (56.0%) considered themselves so, the same as among the underweight plus overweight, approximately one-third of whom (30.6%) perceived themselves as about the right weight ($\chi^2 = 53.4$, $df = 3$, $p = 0.001$). Healthy dietary habits in terms of the daily fruit consumption, enriched fiber food consumption, avoidance of fat/cholesterol, and avoidance of salt/fish sauce, were insignificantly associated with the BMI ($\chi^2 = 0.05$, 0.77, 1.06, and 3.22; all $df = 1$, $p = 0.827$, 0.381, 0.304, and 0.073, respectively).

Association between dieting and healthy dietary habits

The univariate analysis showed significant association between healthy dietary habits in terms of enriched fiber food consumption, and the avoidance of fat/cholesterol among dieters and non-dieters, while there were no association of healthy dietary habits in terms of the daily fruit consumption, or avoidance of salt/fish sauce as shown in Table 3. Approximately 80% of dieters consumed enriched fiber food compared with approximately half of the non-dieters ($\chi^2 = 28.72$, $df = 1$, $p = 0.001$), the same as in the avoidance of fat/cholesterol *ie*, 71% of the dieters avoided to eat fat or cholesterol compared with 30.1% of the non-dieters ($\chi^2 = 51.82$, $df = 1$, $p = 0.001$, respectively).

Table 2
Association between BMI, dieting, healthy dietary habits, and body weight perception.

	Body mass index (BMI)	
	Acceptable weight (n=257)	Under/overweight (n=54)
Dieting (%) *	55.3	29.6
Healthy dietary habits (%)^{ns}		
Daily fruit consumption	24.5	25.9
Enriched fiber food consumption	67.3	61.1
Avoidance of fat/cholesterol	52.1	44.4
Avoidance of salt/fish sauce	24.1	13.0
Perception of body size (%)*		
Very overweight	10.0	23.4
Slightly overweight	10.0	43.2
About right	56.0	30.6
Slightly to very underweight	24.0	2.8

Acceptable weight: BMI > 18.5-24.99 kg/m²

Underweight: BMI ≤ 18.5 kg/m²

Overweight: BMI ≥ 25.0 kg/m²

* $p < 0.05$

^{ns} not significant

Factors effecting healthy dietary habits

The dietary belief's score of each selected dietary habits was an average (\pm SD) as follows: (a) eating breakfast, 6.9 (\pm 2.9), (b) eating enriched fiber food, 8.4 (\pm 1.9), (c) eating plenty of fruit, 8.2 (\pm 2.0), (d) avoiding eating sugar, 6.9 (\pm 2.6), (e) avoiding eating salt or fish sauce, 6.8 (\pm 2.4), (f) avoiding eating food additives, 7.8 (\pm 2.2), and (g) not eating animal fat, 7.5 (\pm 2.5). In order to evaluate the effects of associated factors *ie*, dietary belief, dieting, BMI, and exercise on the healthy dietary habits without repeating the analyses of each variable, a healthy dietary habits index (HDI), and dietary belief index (BI) were computed. Table 4 shows the results from multiple logistic regression analysis of these explanatory variables on the healthy dietary habits. It was observed that the dietary belief, dieting, and exercise had effects on the strength of the association ($p = 0.0191$, 0.0024, 0.0165; Odds ratios = 0.97, 2.21, 1.87, respectively), while the BMI had no effect. In sum, subjects with healthier dietary habits tended to undertake dieting, exercis-

Table 3
Healthy dietary habits among dieters and non-dieters (%).

Healthy dietary habits	Dieters (n=158)	Non-dieters (n=153)
Daily fruit consumption ^{ns}	26.6	22.9
Enriched fiber food consumption *	80.4	51.6
Avoidance of fat/cholesterol *	70.9	30.1
Avoidance of salt/fish sauce ^{ns}	25.9	18.3

* $p < 0.05$

^{ns} not significant

ing, and having dietary beliefs greater than those with less healthy dietary habits.

DISCUSSION

As recommended that the mean BMI for population groups should be in the range between 20-22 kg/m² (WHO, 1990), the average BMI of the northeast Thai female nursing students for the present study (BMI = 20.3 kg/m²) is within the normal range on the basis of WHO recommendation, and is consistent with that of the Japanese females aged 15-24 years in 1995, BMI = 20.5 kg/m² (Kiriike *et al*, 1998), and that of the United Kingdom university students, BMI = 20.6 kg/m² (Wardle and Steptoe, 1991). In comparison with the study of female college students in Bangkok, the present study's BMI was categorized the same as follows: chronic energy deficiency (CED; BMI \leq 18.5 kg/m²), low normal weight (BMI > 18.5 - < 20.0 kg/m²), normal weight (BMI = 20.0 - 24.99 kg/m²), and obesity or overweight (BMI \geq 25.0 kg/m²) (James *et al*, 1988; WHO, 1990). The present study's prevalence of CED of 15.1% and 2.2% of overweight were significantly lower than that of 27.8% and 3.5%, respectively, in female college students in Bangkok (Wichaidit and Srisuwan, 1990). In contrast, the prevalence of low normal weight of 34.1% and 48.6% normal weight in the present study were significantly greater than that reported from the Bangkok study as shown in Table 5. Nevertheless, the present study's data on body weight is probably under- or over-reported

according to no actual measurement, these findings indicate that female college nursing students in northeast had a smaller proportion of CED and overweight compared with the female college students in Bangkok. These figures seem to indicate a serious nutritional health problem, and the important of implementing an appropriate nutritional means to reduce these prevalences as it is recognized that both underweight and overweight have adverse effects on health (WHO, 1990; Tanphaichitr *et al*, 1990), particularly as those who are overweight at young ages tended to die sooner than normal weight persons (Simopoulos and Van Itallie, 1984). However, in order to assess correctly the significant of a particular BMI to identify individuals at health risk due to thinness or overweight, the result of a clinical examination has to be taken into account because current illness, as well as dietary intake may effect the body weight (Bailey and Ferro-Luzzi, 1995). Therefore, individuals who had persistent health problem (13.5%) or individuals who took prescribed medication over the last month (17.7%) for the present study, should be paid more attention for clinical and nutritional assessment. Further study concerning association between those with persistent health problems together with the BMI should be investigated.

The present study's findings also reveal an association between dieting and the BMI, and the perception of body size was likely to be different from actual body size. This is consistent with findings among adolescent Australian girls which found 41% considered themselves as overweight while only 18% were actually in this category on the basis of BMI (Tienboon *et al*, 1994). This suggests that dieting to be slim is probably seen as desirable for young women as a symbol of beauty and success, not only in western countries or in Japan (Kiriike *et al*, 1998) but also in Thailand.

The present study's findings of an association between body size and dieting, and between dieting and healthy dietary habits, in terms of enriched fiber food consumption and avoidance of fat/cholesterol, while no association was found between body size and the healthy dietary habits, suggests healthy dietary habits, or in other words, choice of food was predominantly attributable to dieting rather than to body size.

Three factors which concerned dietary belief, dieting and exercise, were found significant predictors of the healthy dietary habits among female nursing

Table 4
Regression coefficients of explanatory variables on healthy dietary habits index¹.

Explanatory variables	B	SE	Wald χ^2	df	p	R	Odds ratio
Belief ²	0.031	0.013	5.49	1	0.0191	0.17	0.97
Dieting ³	0.793	0.262	9.18	1	0.0024	0.22	2.21
BMI ⁴	0.471	0.362	1.69	1	0.1934	0.10	0.62
Exercise ⁵	0.626	0.261	5.75	1	0.0165	0.17	1.87

¹ Healthy dietary habits index score ranged from 4-13; higher score indicates healthier dietary habits. Cutting point at ≥ 10 .

² Belief index: a score of the sum of scores on 7 items concerning belief in importance of healthy dietary habits; higher score indicates higher belief in importance of healthy dietary habits. It was treated as a continuous variable.

³ Dieting was treated in binary as dieting and non-dieting.

⁴ BMI: body mass index was treated in binary as acceptable weight and overweight plus underweight.

⁵ Exercise was treated in binary as ever had exercised over the last two weeks and none.

Model fitting: $\chi^2 = 32.45$, $df = 4$, $p = 0.0001$

B: Parameter estimate

SE: Standard error

R: Standardize estimate

Table 5
Comparison of BMI among female college students in Bangkok and northeast Thailand (%).

Body mass index (BMI)	Bangkok ^a (n = 403)	Northeast ^b (n = 311)
Overweight (BMI ≥ 25.0 kg/m ²)	3.5 (14)	2.2 (7)
Normal (BMI >20.0 -24.99 kg/m ²)	36.9 (149)	48.6 (151)
Low normal (BMI > 18.5 -20.0 kg/m ²)	31.8 (128)	34.1 (106)
Underweight (BMI ≤ 18.5 kg/m ²)	27.8 (112)	15.1 (47)

^a Wichaidit and Srisuwan (1990)

^b Present study

$\chi^2 = 19.46$, $df = 3$, $p = 0.001$

students in northeast Thailand, which is consistent with findings among the European students, that dieting, dietary belief and gender were significant predictors (Wardle *et al*, 1997). As the results are based on cross-sectional design, which precludes causal relationship testing, therefore a causal inference can not be drawn. Other limitations in terms of international comparisons, and restricted group of study population need to be taken into account. Samples were drawn from one college of nursing and so cannot be generalized for national characteristics. The female nursing students are not representative of the population as a whole as they are in their formative adult years and are likely to develop into health personnel professionals, so they are an

important group to study for health behavior.

Despite these limitations, the results of the present study have given some insights into health dietary habits and factors effecting them. In view of the public health implications of these findings, further research efforts, including intervention approach, especially on nutritional and physical education, are desirable.

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