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Differences in nutrition Status and Academic Performance between Male and Female Undergraduate Food and Nutrition Students

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Abstract

This survey research aims to investigate the differences between nutritional status and academic performance between male and female undergraduate food and nutrition students. Two hundred and forty-six students were collected from the Department of Food and Nutrition, Faculty of Home Economics Technology, Rajamangala University of Technology Thanyaburi. Nutritional assessment was determined by body composition, body mass index (BMI), blood pressure, hemoglobin (HGB), blood vessel width (%), venous oxygenation index and finger surface temperature. Academic performance was recorded from the final examination results in two subjects including Diet Therapy and Human Nutrition. Data were analyzed by using descriptive statistics, independent-samples t-test, and Pearson's correlation analysis. The results showed that males had a significantly higher than females in height, body weight, body mass index, muscle mass, systolic blood pressure (SBP), hemoglobin and blood vessel width (%). Females had significantly higher than males in all the academic score. Hemoglobin was found to be correlated significantly with academic performance but weight and body mass index were found to be correlated significantly with only Human Nutrition. This study

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showed that females performed better academically than males and had body weight and body mass index lower than males in undergraduate food and nutrition students.

Keywords: Nutritional Status, Non-Communicable Diseases, Academic Performance, Gender

1. Introduction

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults (overweight is a BMI greater than or equal to 25 kg/m^2 and obesity is a BMI greater than or equal to 30 kg/m^2) [1]. World Health Organization (WHO) reported that in 2016, more than 1.9 billion adults aged 18 years and older were overweight. Of these over 650 million adults were obese. Thirty-nine Percent of adults aged 18 years and over (39% of men and 40% of women) were overweight. Overall, about 13% of the world's adult population (11% of men and 15% of women) were obese [1]. Raised BMI is a major risk factor for Non-Communicable Diseases (NCDs) such as cardiovascular diseases (CVD), diabetes mellitus (DM), musculoskeletal disorders (MSDs) and some cancers (CA) [1].

In 2009, Thailand national health surveys by physical examination nationwide reported that from 1991-2009 the prevalence of overweight (BMI $\geq$ 25.0 kg/m^2) in Thai people aged 15 years and over was a twofold increase whereas there was a threefold increase in obese (BMI $\geq$ 30.0 kg/m^2) prevalence. The average body mass index (BMI) of Thai male and female population aged 15 years and over is 23.6 and 24.6 kg/m^2, respectively and the average waist circumference of male and female Thai population aged 15 years and over is 82.4 and 81.1 cm, respectively [2]. Studies in Malaysian shown that university students had 14.3% of males and 22.4% of females were underweight, while 14.0% of males and 12.3% of females were overweight and obese [3].

Having unhealthy can affecting academic achievement [4]. Excessive consumption of energy-dense, low-fibre, high-fat foods at age 16 years was associated with reduced academic performance [5] and nutritional status was found to be correlated significantly with academic performance [6].

Therefore, the aims of this survey research was to obtain a preliminary understanding of the differences nutritional status and academic performance between male and female undergraduate food and nutrition students. This study provides recent data on the nutritional status and academic performance among undergraduate students in the Department of Food and Nutrition, which could provide data for the development of future intervention and nutrition education programs that aim to improve the nutritional status of university students.

2. Materials and Experiment

This cross-sectional study was conducted in the Department of Food and Nutrition, Faculty of

Home Economics Technology, Rajamangala University of Technology Thanyaburi, Pathum Thani, Thailand.

2.1 Subjects

Data were collected in 2017-2018 between June to August. Subjects is 246 undergraduate food and nutrition students, consisting of 79 males and 167 females.

2.2 Nutritional Assessment

Body composition including body weight, percentage body fat (%BF), muscle mass and visceral fat area was measured using an InBody720 [7], and height was measured using an InBodyBSM370 [8]. Body Mass Index (BMI) was calculated as weight (kg) divided by the square of the height (m^2). Body weight status was classified by BMI, criteria of WHO [9]. Percentage body fat status was classified by healthy percentage body fat ranges: an approach for developing guidelines based on body mass index [10]. Visceral fat area (VFA) more than 100 cm^2, this is known as abdominal obesity [11].

Blood pressure measurement consisting of systolic blood pressure; SBP (mmHg), diastolic blood pressure; DBP (mmHg), and pulse rate (bpm) by using Omron HEM-8712 [12-13]. Blood pressure status was classified by Thai Guideline on The Treatment of hypertension 2012 update 2015 [14].

Hemoglobin (HGB), blood vessel width (%), venous oxygenation index and Finger Surface Temperature (FST) by using ASTRIM FIT health monitoring analyzer [15]. Anemia was classified by criteria of WHO 2011 [16].

2.3 Academic Performance

Academic performance was assessed based on the student's class final test results. Results for Diet Therapy and Human Nutrition were obtained from student's academic records for the final examination. A total academic score was calculated by adding all the subject scores.

2.4 Statistical Analysis

All statistical analyses were performed with SPSS version 18.0 for window [17]. The results are presented either as mean percentage and standard deviation. Any significant difference of the outcome variables by gender was assessed by Independent-Samples T Test, 95% confidence intervals. Pearson's correlation analysis was used to determine the relationship between nutritional status with academic performance.

3. Results

3.1 Nutritional Assessment

This study included 246 undergraduate food and nutrition students, 79 males and 167 females. Ages of the students included in the study ranged from 19 to 27. Table 1 shows that males had a significantly higher than females in height, body weight, body mass index, muscle mass and BMR but had a significantly lower in percentage body fat. About 6.3% of males and 18.0% of females were underweight, while 19.0% of males and 10.8% of females were overweight and 21.5% of males and 22.1% of females were obese. The percentage body fat was found average %BF of female was normal body fat (33.95 ± 10.51) but average %BF of male

was over body fat (24.52 ± 10.42). Average VFA of male and female were normal (<100 cm^2).

Table 2 shows that males had a significantly higher than females in SBP but had a significantly lower in Pulse rate. The SBP found that 25.3% of males and 6.0% of females were prehypertension, while 7.6% of males and 3.6% of females were hypertension. And DBP found that 12.7% of males and 7.8% of females were prehypertension, while 16.4% of males and 10.2% of females were hypertension.

Hemoglobin and blood vessel width (%) of males had a significantly higher than females. Average HGB of males (14.24 ± 1.03) and female (12.01 ± 1.02) were normal (Table 3).

Table 1 Age, Height and Body Composition of Undergraduate Food and Nutrition Students by Gender

Characteristics	All (n = 246)	Male (n = 79)	Female (n = 167)	P value*
Age (year)				
Mean ± SD	20.41 ± 0.82	20.49 ± 0.78	20.37 ± 0.83	ns
(min-max)	(19-27)	(20-24)	(19-27)	
Height (cm)				
Mean ± SD	164.70 ± 8.38	173.29 ± 5.89	160.64 ± 5.96	<0.001
(min-max)	(147.0-190.4)	(161.0-190.4)	(147-175)	
Body weight (kg)				
Mean ± SD	66.53 ± 19.14	75.46 ± 18.98	62.30 ±17.77	<0.001
(min-max)	(39.3-131.0)	(47.3-131.0)	(39.3-115.3)	
BMI (kg/m^2), n (%)				
Underweight	35 (14.2)	5 (6.3)	30 (18.0)	
Normal weight	124 (50.5)	42 (53.2)	82 (49.1)	
Overweight	33 (13.4)	15 (19.0)	18 (10.8)	
Obese class I	35 (14.2)	11 (13.9)	24 (14.4)	
Obese class II	16 (6.5)	5 (6.3)	11 (6.5)	
Obese class III	3 (1.2)	1 (1.3)	2 (1.2)	
Mean ± SD	24.38 ± 6.21	25.03 ± 5.73	24.08 ± 6.42	ns
(min-max)	(14.60-42.95)	(14.60-42.95)	(14.71-42.25)	
Body fat (%bw), n (%)				
Low body fat	45 (18.3%)	12 (15.3)	33 (19.8)	
Normal body fat	90 (36.6%)	28 (35.4)	62 (37.1)	
Over body fat	34 (13.8)	11 (13.9)	23 (13.8)	
Excess body fat	77 (31.3)	28 (35.4)	49 (29.3)	
Mean ± SD	30.92 ± 11.36	24.52 ± 10.42	33.95 ± 10.51	<0.001
(min-max)	(8.0-53.3)	(8.0-48.8)	(9.1-53.3)	
Muscle mass (kg)				
Mean ± SD	24.39 ± 6.52	31.01 ± 5.57	21.25 ± 4.16	<0.001
(min-max)	(10.4-49.9)	(18.2-49.9)	(10.4-43.9)	
BMR (kcal)				
Mean ± SD	1327.69 ± 224.00	1562.82 ± 196.66	1216.46 ± 130.87	<0.001

Characteristics	All (n = 246)	Male (n = 79)	Female (n = 167)	P value*
(min-max)	(975-2148)	(1112-2148)	(975-1560)	
Visceral fat area (cm^2)				
Mean ± SD	83.04 ± 38.27	79.66 ± 45.29	84.64 ± 34.49	ns
(min-max)	(14.6-190.0)	(14.6-190.0)	(25.9-172.3)	

* Independent-Samples T Test between male and female, ns = no significant difference between male and female

Table 2 Blood Pressure and Pulse Rate of Undergraduate Food and Nutrition Students by Gender

Characteristics	All (n = 246)	Male (n = 79)	Female (n = 167)	P value*
SBP (mmHg), n (%)				
Hypotension	2 (0.8)	2 (2.5)	-	
Normal	202 (82.1)	51 (64.6)	151 (90.4)	
Prehypertension	30 (12.2)	20 (25.3)	10 (6.0)	
Hypertension stage I	11 (4.5)	7 (7.6)	5 (3.0)	
Hypertension stage II	1 (0.4)	-	1 (0.6)	
Mean ± SD	117.33 ± 12.99	122.51 ± 14.49	114.89 ± 11.47	<0.001
(min-max)	(71-171)	(71-157)	(91-171)	
DBP (mmHg), n (%)				
Hypotension	11 (4.5)	3 (3.8)	8 (4.8)	
Normal	182 (74.0)	53 (67.1)	129 (77.2)	
Prehypertension	23 (9.3)	10 (12.7)	13 (7.8)	
Hypertension stage I	21 (8.5)	12 (15.2)	9 (5.4)	
Hypertension stage II	9 (3.7)	1 (1.2)	8 (4.8)	
Mean ± SD	77.09 ± 10.98	78.99 ± 10.55	76.20 ± 11.09	ns
(min-max)	(39-109)	(39-109)	(48-107)	
Pulse rate (bpm)				
Mean ± SD	80.55 ± 12.06	76.33 ± 12.09	82.55 ± 11.55	<0.001
(min-max)	(46-120)	(46-104)	(50-120)	

* Independent-Samples T Test between male and female, ns = no significant difference between male and female

Table 3 Hemoglobin, Blood Vessel width, Venous Oxygenation Index and Finger Surface Temperature of Undergraduate Food and Nutrition Students by Gender

Characteristics	All (n = 246)	Male (n = 79)	Female (n = 167)	P value*
Hemoglobin (g/dL), n (%)				
Anemia	95 (38.6)	7 (8.9)	88 (52.7)	
Normal	151 (61.4)	72 (91.1)	79 (47.3)	
Mean ± SD	12.73 ± 1.46	14.24 ± 1.03	12.01 ± 1.02	<0.001
(min-max)	(9.6-16.5)	(12.0-16.5)	(9.6-15.0)	
Blood vessel width (%)				
Mean ± SD	1.15 ± 0.25	1.28 ± 0.25	1.09 ± 0.22	<0.001

(min-max)	(0.74-1.96)	(0.78-1.79)	(0.74-1.96)	
Venous oxygenation index				
Mean ± SD	90.83 ± 16.48	93.03 ± 14.52	89.80 ± 17.27	ns
(min-max)	(41-135)	(57-135)	(41-127)	
Finger surface temperature (℃)				
Mean ± SD	34.08 ± 1.67	33.81 ± 1.79	34.21 ± 1.60	ns
(min-max)	(29.1-38.5)	(29.1-38.5)	(29.3-37.2)	

* Independent-Samples T Test between male and female, ns = no significant difference between male and female

3.2 Academic performance

Diet Therapy and Human Nutrition were record score for the final examination. These two subjects are taught about nutrition knowledge and health care. We found that females had significantly higher than males in the academic score of Diet Therapy (p = 0.005), Human Nutrition (p = 0.001) and total academic (p = 0.001) (Table 4).

3.3 Relationship among Body Weight, Body Mass Index, Percentage Body Fat, Visceral Fat, Systolic Blood Pressure, Diastolic Blood Pressure, Hemoglobin and Academic Performance

A Pearson's correlation shows that body weight and BMI significantly negatively correlated with Human Nutrition only while HGB significantly negatively correlated with Diet Therapy and Human Nutrition (Table 5)

Table 4 Academic Performance of Undergraduate Food and Nutrition Students by Gender

Characteristics	All (n = 246)	Male (n = 79)	Female (n = 167)	P value*
Diet Therapy				
Mean ± SD	69.09 ± 8.35	66.91 ± 8.94	70.12 ± 7.88	0.005
(min-max)	(50-92)	(50-89)	(50-92)	
Human Nutrition				
Mean ± SD	69.28 ± 7.00	67.22 ± 7.32	70.26 ± 6.64	0.001
(min-max)	(51-91)	(51-91)	(54-88)	
Total academic				
Mean ± SD	138.37 ± 14.20	134.13 ± 14.97	140.38 ± 13.40	0.001
(min-max)	(101-180)	(101-180)	(106-178)	

* Independent-Samples T Test between male and female

Table 5 Correlation between Body Weight, Body Mass Index, Percentage Body Fat, Visceral Fat, Systolic Blood Pressure, Diastolic Blood Pressure and Hemoglobin with Academic Performance

Characteristics	Diet Therapy		Human Nutrition		Total academic	
	r	P-value	*r*	P-value	*r*	P-value
Body weight (kg)	-0.074	ns	-0.189	<0.01	-0.137	<0.05
BMI (kg/m^2)	-0.038	ns	-0.134	<0.05	-0.089	ns
Body fat (%bw)	0.103	ns	0.053	ns	0.086	ns
Visceral fat (cm^2)	-0.010	ns	-0.119	ns	-0.065	ns
SBP (mmHg)	0.010	ns	-0.035	ns	-0.011	ns
DBP (mmHg)	0.057	ns	0.027	ns	0.047	ns
Hemoglobin (g/dL)	-0.141	<0.05	-0.180	<0.01	-0.172	<0.01

* ns = no significant difference

4. Discussion

The prevalence of obese was quite high (21.9%) among students in our study, and the prevalence of underweight and overweight were almost the same (14.2% and 13.4%, respectively) in the student. Female students were more underweight (18.0%) than underweight male students (6.3%) but male students (40.5%) were more high normal weight (BMI $\geq$ 25.00 kg/m^2) than high normal weight female students (32.9%). These findings are consistent with the study of Gan WY et al [3] on 237 male and 347 female students in Malaysian University Students which reported that 22.4% of females were more underweight than underweight male students (14.3%) and male students (14.0%) were more high normal weight (BMI $\geq$ 25.00 kg/m^2) than high normal weight female students (12.3%). These findings are also consistent with other studies which found a high prevalence of underweight among female students [18-19]. And in our study found that the average BMI of female students (24.08 ± 6.42) lower than average BMI of male students (25.03 ± 5.73). These findings are consistent with the study of Gan WY et al [3] found that the average BMI of male students was 21.91 ± 3.57 and the average BMI of female students was 21.26 ± 3.66. These findings are also consistent with other studies which found a high average BMI of male students [19-20]. We found that the high normal %BF was 49.3% among male students and 43.1% among female students, and low %BF was 15.3% among male students and 19.8% among female students. These findings are consistent with the study of Gan WY et al [3] found that high normal %BF of male students was 42.2% and female students were 31.8%, low %BF was 4.6% among male students and 9.0% among female students. The average %BF of male students were higher than a female student; 24.52 ± 10.42 and 33.95 ± 10.51, respectively. These findings are consistent with the study of Gan WY et al [3] which reported that average %BF of male students were

19.29 ± 6.04 and female students were 27.65 ± 5.89, and GG. Bogna et al [20] reported that that average of %BF of male students were 19.3 ± 3.6 and female students were 27.6 ± 4.2. Blood pressure was found that the average SBP and DBP of male and female students were normal.

Academic performance of undergraduate food and nutrition students in our study was found that the average score of Diet Therapy and Human Nutrition of females was higher than the male. This data shows that the nutrition knowledge of female students was higher than male students, which are consistent with the average body weight and body mass index of male students were higher than female students.

A Pearson's correlation shows that body weight and BMI significantly negatively correlated with only Human Nutrition, which this data shows that if there is no nutritional knowledge, there is a risk factor to cause nutritional problems.

5. Conclusions

In our study, the average of body weight, BMI, SBP, and DBP of male students were higher than female students, but the average score of Diet Therapy and Human Nutrition of male students were lower than female students. Thus, this study shows that should more attention should be focused on Nutrition knowledge in university students and an emphasis on male students.

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7. References

[1] World Health Organization (WHO) [Internet] *Obesity and overweight.* [updated 2018 Feb 16; cited 2019 Apr 29]. Available from: http://www.who.int/mediacentre/factsheets/fs311/en/.

[2] W. Ekapakorn. (Editor). *Report of the Thai Public Health Survey by the 5th Physical Examination 2014.* Nonthaburi: Health Systems Research Institute (HSRI). 2014: 134.

[3] WY. Gan, MT. Mohd Nasir, MS. Zalilah and A. Hazizi. *Differences in Eating Behaviours, Dietary Intake and Body Weight Status between Male and Female Malaysian University Students.* Mal J Nutr. 2011. 17(2): 213-218.

[4] National Center for Chronic Disease Prevention and Health Promotion (CDD). *Health and academic achievement.* [cited 2019 Apr 29]. Available from: https://www.cdc.gov/healthyyouth/health_and_academics/pdf/health-academic-achievement.pdf.

[5] P. Correa-Burrows, R. Burrows, E. Blanco, M. Reyesa and S. Gahaganb. *Nutritional*

quality of diet and academic performance in Chilean students. Bull World Health Organ. 2016. 94: 185–192.

[6] JJM. Hamid, KM. Amal, H. Hasmiza, CD. Pim, LO. Ng and MWM. Wan. *Effect of Gender and Nutritional Status on Academic Achievement and Cognitive Function among Primary School Children in a Rural District in Malaysia.* Mal J Nutr, 2011. 17(2): 189-200.

[7] InBody CO., LTD. [Internet]. *InBody720.* [cited 2019 Apr 29]. Available from: https://inbody.com/eng/product/inbody720.aspx.

[8] InBody CO., LTD. [Internet]. *InBodyBSM370.* [cited 2019 Apr 29]. Available from: http://inbody.com.hk/bsm370/.

[9] World Health Organization (WHO). *Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies.* THE LANCET. January 10, 2004: 363.

[10] Y. Gallagher, SB. Heymsfield, M. Heo, SA. Jebb, PR. Murgatroyd and Y. Sakamoto. *Healthy percentage body fat ranges: an approach for developing guidelines based on body mass index.* Am J Clin Nutr. 2000. 72: 694-701.

[11] Anonymous [Internet]. *Results Interpretation & Application.* [cited 2019 Apr 29]. Available from: https://www.bodyanalyse.no/gammel/images/stories/inbody/dokumenter/Inbody_720_Results_Interpretation.pdf.

[12] Omron Healthcare Asia [Internet]. *Omron HEM-8712.* [cited 2019 Apr 29]. Available from: https://www.omronhealthcare-ap.-com/th/product/164-hem-8712/1.

[13] N. Jeyanthi, BV. Gokulnath and R. Thandeeswaran. *A complete survey on blood pressure monitoring devices and applications.* Biomedical Research 2018. 29(21): 3751-3765.

[14] Thai Hypertension Society, *Thai Guidelines on The Treatment of Hypertension 2012 Update 2015.* [cited 2019 Apr 29]. Available from: http://www.thaihypertension.org/files/GL%20HT%202015.pdf.

[15] Sysmex Corporation [Internet]. *ASTRIM FIT health monitoring analyzer.* [cited 2019 Apr 29]. Available from: https://www.sysmex.co.jp/en/corporate/news/2014/140115.html.

[16] World Health Organization (WHO) [Internet]. *Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity 2011.* [cited 2019 Apr 29]. Available from: http://www.who.int/-vmnis/indicators/haemoglobin.pdf.

[17] SPSS Inc. *Released 2009*. PASW Statistics for Windows. Version 18.0. Chicago: SPSS Inc.

[18] N.H. Abdull Hakim, N.D. Muniandy and D. Ajau. *Nutritonal Satus and Eating Practices among University Students in Selected*

Universities in Selangor, Malaysia. Asian Journal of Clinical Nutrition. 2012.

[19] H. Nurul and A. Ruzita. *Preliminary Survey on Nutritional Status among University Students at Malaysia*. Pak. J. Nutr. 2010. 9(2): 125-127.

[20] GG. Bogna, T. Andrzej, K. Natalia, P. Juliusz, SJ. Agnieszka and K. Elzbieta, *Physical activity, nutritional status, and dietary habits of students of a medical university.* Sport Sci Health. 2016. 12: 261–267.