Comparision of Overweight and Obesity in Medical Cadets Before and After 6 Months Studying at Phramongkutklao College

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Objective: *To evaluate prevalence of overweight and obesity in second-year medical cadets and to determine risk behaviors before and after 6 months studying at Phramongkutklao College of Medicine (PCM).*
Material and Method: *Data on self-report behavioral questionnaires was collected from 92 medical cadets before and after 6 months studying at PCM in 2008. Body weight, height, waist circumference, blood pressure and body fat were measured according to standard protocols.*
Results: *Overall, prevalence of overweight and obese medical cadets before studying at PCM was 16.30% and 15.22% according to BMI and 27.17% and 15.22% by percent body fat. After 6 months of study, overall mean of body fat and systolic blood pressure were significantly reduced. For males, the mean of weight, BMI and waist circumference were reduced significantly. In contrast, the mean of body weight and BMI of females were significantly increased. The prevalence of overweight in total participants determined by body fat was significantly reduced from 27.17% to 15.22 %. Determination by BMI, obesity was significantly reduced from 34.29% to 14.29% only in males. Behaviors that were found to be significantly increased ($p < 0.001$) were regular physical activity, night eating, sugar-sweet beverage consumption, amount and frequency of coffee or tea consumption. Significant decrease in time of watching TV or using a computer, and duration of sleep was also determined.*
Conclusion: *The present study indicated that overweight, obesity, waist circumference and body fat of medical cadets were decreased after study at PCM which is possibly due to increasing exercise. Nevertheless, behavioral risks for obesity were also increasing, therefore, it might result in increased the prevalence of obesity in the future.*

Keywords: *Overweight, Obesity, Behaviors, Medical cadets*

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Obesity, a major public health problem worldwide[1,2], is a risk factor for coronary heart diseases, diabetes mellitus and hypertension[3-5]. It impairs quality of life[6] and needs high cost for maintaining good health[7]. There are substantial data showing that prevalence of overweight and obesity is dramatically increasing in developed and developing countries[8] such as Mexico, China and Thailand[9].

Prevalence of overweight and obesity in Thailand is very high and increasing[10]. This is maybe due to 1) the rapid change in food lifestyle patterns 2) the shift of eating pattern from a traditional Asian diet -cereal-base and low fat to a more Westernized diet characterized by increased consumption of animal products, fats and sugar and decreasing consumption of complex carbohydrate foods[11]. Epidemiological studies show that physical inactivity and sedentary behaviors such as watching television or using a computer are linked with overweight and obesity[12-14]. Energy-dense diets and bad eating habits such as fast food consumption[15], sugar-sweet beverage[16,17], night eating[18] and short sleep duration are also the caused of overweight and obesity[19,20].

Before studying in Phramongkutklao College of Medicine (PCM), the medical cadets have enjoyed freedom. When they study in PCM, all of them must take a physical training program for medical cadets such as running 30 minutes, plus muscle strengthening and flexibility exercise 30 minutes every morning and evening. They eat three meals that are prepared by cooks in PCM.

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Therefore, they should have reduced their individual weight. Thus, the present study aimed to evaluate overweight and obesity status of second-year medical cadets before and after 6 months studying with the addition of physical training program. The risk behaviors to overweight and obesity and behavioral changes are also determined.

Material and Method

The present study was approved by Ethic Committee of Phramongkutklao College of Medicine.

Ninety-two informed consents were received from the second-year medical cadets enrolled in the academic year 2008. Before and 6 months after studying at PCM, data was then collected. These consisted of anthropometry, body composition and self-report questionnaires on lifestyle risks including: exercise, fast-food consumption, eating after dinner, eating between meals, type of soft-drink, frequency of drinking coffee or tea, duration of watching TV or using a computer, and sleeping.

Anthropometric measurement and body composition

Anthropometric measurement was measured by trained nurses and physicians according to standard protocols. Body weight and body height were measured to the nearest 0.1 kilogram in body weight and 0.5 centimeter in body height using a stadiometer while participants were wearing light cloth and without shoes. Participants stood upright on a flat surface with the back of the heels and occiput on the stadiometer. Waist circumference was measured to the nearest centimeter using non-stretchable tailor's measuring tape on bare skin at midway between the lower rib margins. For analysis of percent body fat, the leg-to-leg bioelectric impedance (BIA) system (Tanita Model BC 536) was utilized by allowing participants to step on metal foot pad electrodes with bare feet after inserting sex, age and height.

Three reading systolic and diastolic blood pressure were taken from the right arm with participants seated and the arm at heart level after 5-minutes rest, using a standardized mercury sphygmomanometer. The mean of three reading was calculated as the individual's blood pressure.

Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters. According to InterAsia criteria, obesity was defined as BMI $\geq$ 25 kg/m^2, overweight as BMI = 23.1-24.9 kg/m^2 and normal as BMI $\leq$ 23 kg/m^2. Waist circumference $\leq$ 90 cm is normal and $\geq$ 90 cm is abnormal in men. Waist circumference $\leq$ 80 cm is normal and $\geq$ 80 cm is abnormal in women[21]. Following the American Diabetic Association recommendations, individual with percent body fat $\leq$ 25 percent is defined as normal, overweight as percent body fat 25.1-29.9 percents and obesity as percent body fat $\geq$ 30 percent[22].

Statistical analysis

Demographics data were expressed as mean $\pm$ SD for continuous variables or as a percentage of the group of origin for categorical variables. Paired t-test and McNemar's Chi-square test were used to assess behavioral change, anthropometric measurement, blood pressure and body fat. All p-values are two-tailed and p-value < 0.05 was considered statistical significance. All statistical analysis in the present study was performed using SPSS software (version 13.0, SPSS Inc., Chicago).

Results

Of 92 participants, 38.04% were males, 61.96% were females and their ages ranged from 18 to 21 years with the mean of 19.47 ($\pm$ 0.69) was shown in Table 1. Comparisons of anthropometric data and body fat, according to gender, between before and after 6 months of studying at PCM is shown in Table 2. Overall, means of systolic and diastolic blood pressure, waist circumference and body fat were significantly decreased after 6 months. The means of systolic blood pressure and body fat were reduced significantly in both genders. Weight, BMI and waist circumference were significantly reduced only in males. In females, weight and BMI after 6 months increased significantly.

Table 3 demonstrates the comparison of percent change in numbers of normal, overweight and obesity before and after 6 months studying categorized by BMI and percent body fat. By these tools normal weight, overweight and obesity were classified. Overall, prevalence of overweight and obesity was 16.30% and 15.22% according to BMI and 27.17% and 15.22% by percent body fat. Determination using percent body fat, percent change in overweight was significantly reduced by 11.95% and percent change in normal was significantly increased by 16.30% after 6 months. However, there was no significant difference in percent change in each group when categorized by BMI. The comparison in males revealed that after 6 months there was a significantly 20% increased in normal weight and also 20% decreased in obesity if determining by BMI. Using percent body fat, percent changes in overweight and obesity were reduced by 25.71% and

2.85%, respectively and percent change in numbers of normal was increased by 28.57% but there were no significant changes. In females, both tools showed not significant differences in percent change in each group categorized. Prevalence of abnormal waist circumference was 6.52% before and 4.35% after 6 months of studying at PCM but not significant was found in both genders.

Table 4 shows the comparison of behavioral changes of risk behaviors to obesity in participants before and after studying for 6 months. Before studying, 88.04% of participants had physical inactivity, 43.48% and 33.70% liked to drink sugar-sweet beverage and sweet milk, respectively. There was 32.61% spending more than 4 hours/day watching TV or using computer, 31.52% had less than 6 hours/day for sleep and only 18.48% had regular night eating. After 6 months of studying, physical activity, night eating, sweet-beverage consumption, frequency and amount of coffee or tea consumption were found to be significantly increased both in males and females. A decrease in duration of sleeping was also demonstrated in both genders. In addition to those behaviors, sweet milk consumption and watching TV or using a computer less than 4 hours/day were increased significantly in females.

Discussion

The present study demonstrated high overweight and obesity prevalence among medical cadets before studying in PCM. After 6 months, the mean of body fat and systolic blood pressure were found to have decreased both in males and females and weight, BMI and waist circumference were significantly decreased only in males. Categorization by percent body fat, overall numbers of overweight were significantly reduced after 6 months of studying. Obese medical cadets were also reduced but it did not reach statistically significant. Determination by BMI, a significant decrease in obesity and significant increase in normal weight were demonstrated in males. Significant increase in physical activity[23,24] seems to be important behavior for turning overweight and obesity to be normal weight despite of increased risk behaviors such as night eating, regular consumption of sweet beverage and coffee or tea and sleeping less than 4 hours/day. Energy output might exceed energy input. Consequently, weight, waist circumference and body fat was then decreased shown in anthropometric data described above. For females, although, a similar trend in behaviors was seen (increased physical activity, high sweet beverage consumption, sleeping less than 4 hours/day and night eating significantly) but significant weight gain and increased BMI were demonstrated. The risk behavior that was found different from males was increased sweet milk consumption and this may be the cause of significant increased weight gain and BMI in females. However, it was found in females that percent body fat was decreased after studying for 6 months and this may have resulted from increased significance in physical activity by running 30 minutes, plus muscle strengthening and flexibility exercise 30 minutes in every morning and evening. When categorized into normal, overweight and obesity, there was no significant difference in percent change after 6 months in each group by measurement using BMI or percent body fat. Data shows that there were increased risk behaviors of overweight and obesity among students after studying for 6 months. These included sugar-sweet beverage drinking (43.48% to 66.30%), sweet milk drinking (33.70% to 55.43%), coffee or tea drinking (4.35% to 28.26%), sleeping less than 6 hours/day (31.52% to 75.00%) and night eating (18.48% to 45.65%). Increasing sugar-sweet beverage consumption and sweet milk drinking have provided high caloric energy to the body resulting in weight gain[16,17] if there was no balance with energy output. Previous data showed that short sleep duration was associated with reduced nocturnal leptin and increased ghrelin. These could result in increased hunger, appetite and BMI[20]. In addition, the attenuation of the rise in nighttime leptin may contribute to night eating[18]. It is possible that these sequences may have occured in medical students in the present study. Spending several hours watching

Table 1. Demographic of participants

	Mean	SD
Sex (n, %)		
Male (35, 38.04)		
Female (57, 61.96)		
Age (yr)	19.47	0.69
Weight (kg)	59.48	12.26
Height (cm)	164.31	7.57
BMI (kg/m^2)	21.78	3.52
Mean systolic (mmHg)	104.91	11.84
Mean diastolic (mmHg)	69.51	9.36
Waist circumference (cm)	74.60	7.95
Body fat	22.54	6.80

Data are express as mean $\pm$ SD

Table 2. Anthropometric and body fat of participants before and after 6 months studying, by gender

Body composition	Total (n = 92)		Male (n = 35)		Female (n = 57)	
	Before	After	Before	After	Before	After
Weight (kg)	59.48 ± 12.26	58.82 ± 9.65	70.65 ± 10.00	67.12 ± 7.35*	52.62 ± 7.61	53.73 ± 7.00*
Height (cm)	164.31 ± 7.57	164.59 ± 7.45	171.23 ± 4.63	171.54 ± 4.23	160.06 ± 5.64	160.32 ± 5.52
BMI (kg/m^2)	21.78 ± 3.52	21.61 ± 2.50	23.82 ± 3.81	22.80 ± 2.30*	20.53 ± 2.68	20.88 ± 2.34*
Mean systolic BP (mmHg)	104.91 ± 11.84	97.84 ± 9.37*	114.10 ± 11.8	105.86 ± 7.76*	99.26 ± 7.63	92.91 ± 6.42*
Mean diastolic BP (mmHg)	69.51 ± 9.36	67.61 ± 6.62*	73.27 ± 9.45	71.58 ± 6.81	67.20 ± 8.60	65.18 ± 5.21
Waist circumference (cm)	74.60 ± 7.95	72.40 ± 6.52*	80.43 ± 7.47	74.13 ± 5.92*	71.03 ± 5.89	71.33 ± 6.69
Body fat	22.54 ± 6.80	20.21 ± 7.02*	17.32 ± 5.73	13.84 ± 4.39*	25.75 ± 5.26	24.12 ± 5.26*

Data are express as mean ± SD, *Statistically significant in means (p-value < 0.05)

Table 3. Percentage changes in normal, overweight and obese categorized by BMI and percent body fat before and after 6 months studying, by gender

	Total (n = 92)			Male (n = 35)			Female (n = 57)		
	Before n (%)	After n (%)	% Change	Before n (%)	After n (%)	% Change	Before n (%)	After n (%)	% Change
BMI									
Normal	63 (68.48)	67 (72.83)	+4.35	13 (37.14)	20 (57.14)	+20.00*	50 (87.72)	47 (82.46)	-5.26
Overweight	15 (16.30)	16 (17.39)	+1.09	10 (28.57)	10 (28.57)	0.00	5 (8.77)	6 (10.53)	+1.76
Obese	14 (15.22)	9 (9.78)	-5.44	12 (34.29)	5 (14.29)	-20.00*	2 (3.51)	4 (7.02)	+3.51
Percent body fat									
Normal	53 (57.61)	68 (73.91)	+16.30*	24 (68.57)	34 (97.14)	+28.57	29 (50.88)	34 (59.65)	+8.77
Overweight	25 (27.17)	14 (15.22)	-11.95*	9 (25.71)	0 (0.00)	-25.71	16 (28.07)	14 (24.56)	-3.51
Obese	14 (15.22)	10 (10.87)	-4.35	2 (5.71)	1 (2.86)	-2.85	12 (21.05)	9 (15.79)	-5.26
Waist circumference									
Normal	86 (93.48)	88 (95.65)	+2.17	32 (91.43)	35 (100)	+8.57	54 (94.74)	53 (92.98)	-1.76
Abnormal	6 (6.52)	4 (4.35)	-2.17	3 (8.57)	-	-8.57	3 (5.26)	4 (7.02)	+1.76

*Statistically significant in percentage change (p-value < 0.05)

Table 4. Behavioral pattern before and ater 6 months studying, by gender

	Total				Males				Females			
	Before n (%)	After n (%)	% Change	p-value	Before n (%)	After n (%)	% Change	p-value	Before n (%)	After n (%)	% Change	p-value
Physical activity > 3 time/week												
No or Irregular	81 (88.04)	11 (11.96)	-76.08	< 0.001	28 (80.00)	6 (17.14)	-62.86	< 0.001	53 (92.98)	5 (8.77)	-84.21	< 0.001
Regular	11 (11.96)	81 (88.04)	76.08		7 (20.00)	29 (82.86)	62.86		4 (7.02)	52 (91.23)	84.21	
Fastfood consumption												
No or Irregular	84 (91.30)	86 (93.48)	2.17	0.625	32 (91.43)	34 (97.14)	5.71	0.500	52 (91.23)	52 (91.23)	0	1.000
Regular	8 (8.70)	6 (6.52)	-2.16		3 (8.57)	1 (2.86)	-5.71		5 (8.77)	5 (8.77)	0	
Night eating												
No or Irregular	75 (81.52)	50 (54.35)	-27.17	< 0.001	32 (91.43)	23 (65.71)	-25.72	0.012	43 (75.44)	27 (47.37)	-28.07	< 0.001
Regular	17 (18.48)	42 (45.65)	27.17		3 (8.57)	12 (34.29)	25.72		14 (24.56)	30 (52.63)	28.07	
Regular beverage consumption												
Water	52 (56.52)	31 (33.70)	-22.82	< 0.001	24 (68.57)	15 (42.86)	-25.71	0.012	28 (49.12)	16 (28.07)	-21.05	0.012
Sugar-sweet beverage	40 (43.48)	61 (66.30)	22.82		11 (31.43)	20 (57.14)	25.71		29 (50.88)	41 (71.93)	21.05	
Type of milk consumption												
No sugar milk	61 (66.30)	41 (44.57)	-21.73	< 0.001	23 (65.71)	18 (51.43)	-14.28	0.180	38 (66.67)	23 (40.35)	-26.32	0.001
Sweet milk	31 (33.70)	51 (55.43)	21.73		12 (34.29)	17 (48.57)	14.28		19 (33.33)	34 (59.65)	26.32	
Frequency of coffee or Tea												
No or Irregular	88 (95.65)	66 (71.74)	-23.91	< 0.001	33 (94.29)	23 (65.71)	-28.58	0.006	55 (96.49)	43 (75.44)	-21.05	0.002
Regular	4 (4.35)	26 (28.26)	23.91		2 (5.71)	12 (34.29)	28.58		2 (3.51)	14 (24.56)	21.05	
Amount of coffee or Tea												
No drink	84 (91.30)	63 (68.48)	-22.82	< 0.001	32 (91.43)	22 (62.86)	-28.57	0.002	52 (91.23)	41 (71.93)	-19.3	0.003
More than 1 cup/day	8 (8.70)	29 (31.52)	22.82		3 (8.57)	13 (37.14)	28.57		5 (8.77)	16 (28.07)	19.3	
Watching TV/ Using computer												
Less than 4 hour/day	62 (67.39)	84 (91.30)	23.91	< 0.001	26 (74.29)	29 (82.86)	8.57	0.508	36 (63.16)	55 (96.49)	33.33	< 0.001
More than 4 hour/day	30 (32.61)	8 (8.70)	-23.91		9 (25.71)	6 (17.14)	-8.57		21 (36.84)	2 (3.51)	-33.33	
Sleeping												
More than 6 hour/day	63 (68.48)	23 (25.00)	-43.48	< 0.001	29 (82.86)	6 (17.14)	-65.72	< 0.001	34 (59.65)	17 (29.82)	-29.83	0.009
Less than 6 hour/day	29 (31.52)	69 (75.00)	43.48		6 (17.14)	29 (82.86)	65.72		23 (40.35)	40 (70.18)	29.83	

Statistically significant in % Change (p-value < 0.05)

TV or using a computer was unlikely to be the risk behavior in this population since time spending was reduced significantly.

The increased risk behaviors may increase the prevalence of overweight and obesity if the medical students do less exercise and are not aware of lifestyle changes and eating pattern. Therefore, behavioral modification should be addressed and regular exercise should be strengthened and put into a policy throughout the study course.

Some limitation of the present study should be noted. It was conducted in a small number of participants and was a cross sectional study. The eating behavioral data was collected from self-report questionnaires. However, this was a preliminary study and was the first to investigate eating behaviors. In the future, an appropriate project for investigating overall medical students should be designed. Measurement of individual's intake and more questions on questionnaires such as skipping breakfast and frequency of having snacks should be considered, nevertheless, data on behavioral pattern should also be followed up from the same population.

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Potential conflicts of interest

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เปรียบเทียบภาวะน้ำหนักเกินและภาวะอ้วนในนักเรียนแพทย์ทหารก่อนและหลังเข้าเรียนในวิทยาลัยแพทยศาสตร์พระมงกุฎเกล้า

กิจจา สุวรรณ, ปนัดดา หัตถโชติ, สุธี พานิชกุล, วารี พร้อมเพชรรัตน์

วัตถุประสงค์*: เพื่อประเมินความชุกของภาวะน้ำหนักเกินและภาวะอ้วน และพฤติกรรมที่มีความเสี่ยงต่อภาวะดังกล่าวในนักเรียนแพทย์ทหารชั้นปีที่ 2 ก่อนและหลังเข้าเรียนในวิทยาลัยแพทยศาสตร์พระมงกุฎเกล้าเป็นเวลา 6 เดือน*
วัสดุและวิธีการ*: เก็บข้อมูลจากการตอบแบบสอบถามพฤติกรรมสุขภาพของนักเรียนแพทย์ทหารชั้นปีที่ 2 จำนวน 92 คน และทำการชั่งน้ำหนัก วัดส่วนสูง วัดรอบเอว วัดความดันโลหิต และวัดปริมาณไขมัน*
ผลการศึกษา*: ก่อนเข้ารับการศึกษาในวิทยาลัยแพทยศาสตร์พระมงกุฎเกล้า ผลการวิเคราะห์โดยใช้ดัชนีมวลกายพบว่า 16.30% ของนักเรียนแพทย์ทหารมีภาวะน้ำหนักเกิน และ 15.22% มีภาวะอ้วน และจากการวิเคราะห์ปริมาณไขมันพบภาวะน้ำหนักเกินและภาวะอ้วน 27.17% และ 15.22% ตามลำดับ หลังเข้าศึกษาเป็นเวลา 6 เดือน พบค่าเฉลี่ยปริมาณไขมันและความดันซีสโตลิก ลดลงอย่างมีนัยสำคัญทางสถิติทั้งในเพศชายและหญิง ในเพศชายมีค่าเฉลี่ยของน้ำหนัก ดัชนีมวลกาย และรอบเอว ลดลงอย่างมีนัยสำคัญทางสถิติ แต่ในเพศหญิงพบค่าเฉลี่ยของน้ำหนัก ดัชนีมวลกาย เพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติ จากการวิเคราะห์ปริมาณไขมันพบค่าเฉลี่ยภาวะน้ำหนักเกินในผู้ร่วมวิจัยทั้งหมดลดลงจาก 27.17% เป็น 15.22 % อย่างมีนัยสำคัญทางสถิติ และพบภาวะอ้วนเฉพาะในเพศชายลดลงอย่างมีนัยสำคัญทางสถิติจาก 34.29% เป็น 14.29 % โดยวิเคราะห์จากดัชนีมวลกาย พฤติกรรมที่เพิ่มขึ้นคือ การออกกำลังกาย การรับประทานอาหารตอนกลางคืน ดื่มเครื่องดื่มที่มีรสหวาน ดื่มกาแฟ หรือชา ส่วนพฤติกรรมที่ลดลงคือ การดูโทรทัศน์หรือใช้คอมพิวเตอร์ และเวลาในการนอน*
สรุป*: พบว่าหลังเข้าเรียนในวิทยาลัยแพทยศาสตร์พระมงกุฎเกล้าภาวะไขมันเกิน และภาวะอ้วนลดลงจากการออกกำลังกายเพิ่มขึ้น แต่มีพฤติกรรมที่เป็นปัจจัยส่งเสริมให้เกิดภาวะอ้วนมากขึ้น*