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S. Suppapitiporn

J. Udompanyavit

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Overweight and obesity and the associated lifestyle factors in Thai adult individuals who came for service at King Chulalongkorn Memorial Hospital during August-September 2004

Suchat Suppakitiporn *

Jinda Udompanyavit * Siriluck Suppakitiporn **

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Objective : *To study the prevalence of overweight and obesity with the new WPRO (Who Health Organization Western Pacific Region) BMI criteria for overweight and obesity in individuals who came for service at King Chulalongkorn Memorial Hospital and to determine the associated lifestyle in those individual.*

Method : *A cross-sectional study using a self-reported questionnaire asking information on general sociodemographic characteristics, underlying disease and lifestyle .Body weight and height were recorded and used for calculation of BMI. The sample consisted of 403 individuals who came for OPD service at King Chulalongkorn Memorial Hospital during August to September 2004.*

* Department of Outpatient, Thai Red Cross Society, King Chulalongkorn Memorial Hospital

** Department of Psychiatry, Faculty of Medicine, Chulalongkorn University

Results : *The prevalence for overweight and obesity according to the new criteria issued by the WPRO was 43.9 %. The study both two groups found to have nearly the same proportion of activity; low work activity level 39.7 % and high work activity level 32.0 %. Most had low leisure time activity level (53.1 %), sleep 6-8 hours (71.5 %), watch 1-2.5 hours of TV (43.7 %). About half of them were sitting while watching TV (53.1 %) but 23.3 % were also eating. Most of subjects had never smoke (78.4 %) and never drink (66.5 %). The factors which were significantly associated with overweight and obesity were male, age above 35 years, marital status, lower education, cardiovascular and diabetes underlying disease and moderate or high work activity level. The predictive variables from multiple logistic regression analysis were sex, age and work activity level ($R^2 = .162$).*

Conclusion : *Overweight and obesity according to the criteria of the WPRO had increased to 43.9 % almost half in the population studied. Factors associated with overweight and obesity were sex, age above 35 years, marital status, education, underlying disease and work activity level. Recognition and prevention of overweight and obesity particularly in those with associated factors may be beneficial for reducing burden of overweight and obesity including other following health problems.*

Keywords : *Overweight, Obesity, Lifestyle.*

Reprint request: Suppapitiporn Su. Department of Outpatient , Thai Red Cross Society,
King Chulalongkorn Memorial Hospital, Bangkok 10330, Thailand.

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วัตถุประสงค์ : เพื่อศึกษาความชุกของภาวะน้ำหนักเกินและอ้วน โดยใช้เกณฑ์การแบ่งระดับใหม่ของชาวเอเชีย คือดัชนีมวลกายตั้งแต่ 23 กิโลกรัมต่อตารางเมตรขึ้นไป และเพื่อค้นหาความสัมพันธ์ระหว่างปัจจัยด้านการดำเนินชีวิตกับภาวะน้ำหนักเกินและอ้วนในผู้มารับบริการที่โรงพยาบาลจุฬาลงกรณ์

วิธีการวิจัย : การวิจัยเชิงพรรณนา ณ จุดเวลาหนึ่ง ศึกษาผู้ป่วยอายุ 20 ปีขึ้นไป ซึ่งมาใช้บริการที่แผนกผู้ป่วยนอก โรงพยาบาลจุฬาลงกรณ์ ในช่วงเดือนสิงหาคมและกันยายนปี พ.ศ. 2547 โดยใช้แบบสอบถามเกี่ยวกับปัจจัยพื้นฐาน การดำเนินชีวิตประจำวัน วัดส่วนสูงและน้ำหนักเพื่อกำหนดดัชนีมวลกาย

ผลการวิจัย : ความชุกของภาวะน้ำหนักเกินและอ้วน โดยใช้เกณฑ์กำหนดแบ่งระดับความอ้วนของ WPRO (World Health Organization Western Pacific Region) อยู่ที่ 43.9 % กลุ่มผู้เข้าร่วมวิจัยมีระดับการทำงานที่ใช้พลังงานน้อย 39.7 % ใกล้เคียงกับกลุ่มที่มีระดับการทำงานที่ต้องใช้พลังงานสูง 32.0 % ส่วนใหญ่มีกิจกรรมยามว่างใช้ระดับพลังงานต่ำ 53.1 % ดูโทรทัศน์ 1-2.5 ชั่วโมงต่อวัน 43.7 % โดยที่ส่วนใหญ่จะนั่งอยู่หน้าจอโทรทัศน์และมีการรับประทานอาหารไปด้วย 23.3 % ส่วนใหญ่นอนหลับ 6 - 8 ชั่วโมงต่อคืน 71.5 % รับประทานอาหารหนักปานกลางถึงหนักมาก (57.8 %, 30.8 % ตามลำดับ) ไม่เคยสูบบุหรี่และไม่เคยดื่มสุรา(78.4 %, 66.5 % ตามลำดับ) พบความสัมพันธ์ระหว่างภาวะน้ำหนักเกินและอ้วนกับปัจจัยพื้นฐานอย่างมีนัยสำคัญทางสถิติ ในด้านเพศชายอายุมากกว่า 35 ปี สถานภาพสมรส ระดับการศึกษาต่ำ มีโรคประจำตัวเป็นเบาหวานและโรคหลอดเลือดหัวใจ และระดับการทำงานที่ต้องใช้พลังงานระดับกลางถึงสูง จากการวิเคราะห์ถดถอยเชิงพหุ พบว่าตัวแปรที่มีนัยสำคัญทางสถิติคือเพศ อายุ และระดับการทำงาน ซึ่งอธิบายการเปลี่ยนแปลงของภาวะน้ำหนักเกินและอ้วนได้ร้อยละ 16.2

สรุป : ความชุกของภาวะน้ำหนักเกินและอ้วนตามเกณฑ์ใหม่ของเอเชีย (WPRO) พบ 43.9 % เกือบครึ่งหนึ่งของประชากรที่ศึกษา แสดงให้เห็นถึงแนวโน้มการเพิ่มขึ้นของปัญหาสุขภาพที่อาจเกิดตามมา ดังนั้นการตระหนักและวางแผนป้องกัน โดยเฉพาะในผู้ที่มีปัจจัยสัมพันธ์ดังกล่าว คงมีส่วนช่วยลดปัญหาภาวะน้ำหนักเกินและอ้วนรวมถึงปัญหาสุขภาพต่าง ๆ

คำสำคัญ : ภาวะน้ำหนักเกิน, อ้วน, การดำเนินชีวิต.

In the past decade, the problem of overweight and obesity had been widespread and increasing around the world. Evidence had shown that being overweight and obese can lead to numerous serious disorders and increased mortality. In 1998, WHO had established a BMI (body mass index) classification for overweight and obesity, enlisting those to be overweight when $BMI \geq 25$ and obese when $BMI \geq 30$.^(1,2) However in the year 2000, researches⁽³⁻¹²⁾ had found Asians to develop cardiovascular disorders and metabolic syndromes associated with being overweight and obese at a BMI lower than classified by WHO and thus led to a new, yet unofficial classification by the WPRO (The Regional Office for the Western Pacific, WHO, the International Association for the Study of Obesity and International Obesity Task Force) for overweight and obesity, enlisting those to be overweight when $BMI \geq 23$ and obese when $BMI \geq 25$. In a study of 1513 Hong Kong Chinese, the risk of diabetes. Hypertension, dyslipidaemia and albuminuria starts to increase at a BMI of about 23 kg/m^2 which is lower than the current WHO BMI cut-off used to define an increase in morbidity among Europeans and also demonstrated in data from the 1992 national health survey in Singapore. The WPRO made it clear risk is a continuum with increasing BMI and that cut-off points are merely a convenience for public health and clinical use.⁽¹³⁾ With the new criteria, it would be interesting to find out the prevalence of overweight and obesity in Thailand which may be more increased, and thus may demand the public to become more aware of the seriousness of this problem in Thailand.

Obesity is now well recognized as a disease in its own right. The obese have an elevated risk from all cause mortality. Most evidence suggests a J-shaped relationship between BMI and mortality, with the obese having the highest risk. Obesity

is associated with insulin resistance, glucose intolerance, diabetes mellitus, hypertension, dyslipidemia, sleep apnea, arthritis, hyperuricemia, gall bladder disease, certain types of cancer, coronary artery disease, heart failure, cardiac arrhythmia, hemorrhagic stroke, menstrual irregularities and significant deterioration in emotional well-being is found to be controversial.⁽¹⁴⁻²⁹⁾ Overweight and obesity are multifactorial health problems, stemming from two main etiological factors: the genetic factor and the environmental factor. In Thailand, researches remain controversial for whether which factor is more dominant. However, with the environmental factor being within our ability to modify, much research abroad had been done to find out the environmental factors involved.^(30,31) The environmental factor of focus for this research is the individual's lifestyle, which for people in Asia, has changed progressively in the past. No doubt had it had much influence from the western world, resulting in a more sedentary lifestyle.⁽³²⁾ As for Thailand, it would be interesting to document the present lifestyle of Thai people and to find out the association this lifestyle may have on the prevalence of overweight and obesity which may have increased in Thailand.

The problem of overweight and obesity must be attended to and national health programs and campaigns should be implemented to reduce the seriousness of this problem. In this research we have studied only a small sample of individuals who came for service at King Chulalongkorn Memorial Hospital. This research is intended to provide one of the basic information for creating these programs and campaigns, in hopes that in the future, the problem of overweight and obesity may be resolved in Thailand.

Method

The population studied were individuals over 20 years of age who were legible and came for service in King Chulalongkorn Memorial Hospital from OPD which included medical and surgical department service of the Bhumibol Building and whom were randomly distributed by the nurse of each floor. The tool used for data collection was the self-reported questionnaire. Body weight and height were recorded and then calculated to be body mass index (BMI) as the unit of measurement for overweight and obesity.

The questionnaire consisted of sociodemographic characteristics, work activity, TV watching hours and activity, leisure time activity, sleeping, diet, history of smoking and drinking. The questionnaire was valid and permission was requested from the ethic board committee and the hospital administration to distribute the questionnaire for this study. After receiving permission for distribution of questionnaires, the questionnaires were randomly distributed to the subjects who were waiting to meet the physicians at the OPD, during the months of August and September 2004.

Data analysis was done by using SPSS for windows version 11.0. Descriptive data was analyzed using frequency, percentage, mean, and mode methods. Association between overweight and obesity and the sociodemographic or lifestyle of individuals was found by using the chi-square. The significant factors would further undergone multiple logistic regression analysis.

Results

During the months of August and September 2004, the 403 completed questionnaires were collected.

Most of individuals who came for service in King Chulalongkorn Memorial Hospital were in the age range of 20-80 years old, the mean being 40.2 years old (SD = 13.95), mode being 25 years old. There were more females than male, female being 61.3 %. About half of the subjects were private employees 56.8 % (n=229). Students were noted to be few due to the selection of sample to have age group over 20 years old. The proportion of married individuals to single individuals was approximately the same, with married individuals being a little more in proportion (50.4 %). Other status, being divorced and widowed, are less than 10 % each. Over 50 % had an education above high school (56.8 %). Most had the income in the range of 10,001-50,000 bahts/month (42.7 %) and had no underlying diseases (56.7 %). Those that did have underlying diseases mostly had noncardiovascular diseases (24.3 %). The data are shown in table 1.

The prevalence for overweight and obesity according to the new criteria issued by the WPRO (BMI 23 kg/m^2) was 43.9 % (n=177). The range of BMI in the present study was 15.61 to 42.15 with the mean 23.07 (SD 4.23).

Regarding the lifestyle, the sample was found to have the same proportion of low work activity level (39.7 %) to high work activity level (32.0 %). Most had low leisure time activity level (53.1 %), watch 1-2.5 hours of TV (43.7 %) of which most were sitting while watching TV (53.1 %), sleep 6-8 hours (71.5 %) of which the proportion of good and bad sleep was approximately the same, had moderate (57.8 %) to heavy (30.8 %) diet, never smoke (78.4 %) and never drink (66.5 %).

Table 1. Sociodemographic characteristics of individuals who came for service at King Chulalongkorn Memorial Hospital.

| Sociodemographic characteristics | No. of person | % |
|----------------------------------|---------------|------|
| Sex | | |
| Male | 156 | 38.7 |
| Female | 247 | 61.3 |
| Marital status | | |
| Single | 164 | 40.7 |
| Married | 203 | 50.4 |
| Divorced | 15 | 3.7 |
| Widowed | 21 | 5.2 |
| Education | | |
| Below elementary | 6 | 1.5 |
| Elementary | 59 | 14.6 |
| High school | 109 | 27.1 |
| Above high school | 229 | 56.8 |
| Career | | |
| Private employee | 229 | 56.8 |
| Government official | 57 | 14.1 |
| Self-employed business | 49 | 12.2 |
| Housekeeping/retired | 53 | 13.2 |
| Student | 15 | 3.7 |
| Income (bahts/months) | | |
| 0-5000 | 102 | 25.3 |
| 5001-10000 | 117 | 29.0 |
| 10001-50000 | 172 | 42.7 |
| >50000 | 12 | 3.0 |
| Underlying disease | | |
| None | 227 | 56.3 |
| Cardiovascular disease | 57 | 14.2 |
| DM | 21 | 5.2 |
| Noncardiovascular disease | 98 | 24.3 |

Table 2. The lifestyle of individuals who came for service at King Chulalongkorn Memorial Hospital.

| Behavior | No. of person | % |
|------------------------------------|---------------|------|
| Work activity level | | |
| Inactive (0-50 Kcal/d) | 2 | 0.5 |
| Low (50-799 Kcal/d) | 160 | 39.7 |
| Moderate (800-1599 Kcal/d) | 112 | 27.8 |
| High (>1,600 Kcal/d) | 129 | 32.0 |
| TV watching hours | | |
| <1 hour | 41 | 10.2 |
| 1-2.5 hours | 176 | 43.7 |
| 2.5-4 hours | 110 | 27.3 |
| >4 hours | 76 | 18.8 |
| TV watching activity | | |
| Sitting | 214 | 53.1 |
| Eating | 94 | 23.3 |
| Walking/doing chores | 86 | 21.3 |
| Exercising | 6 | 1.5 |
| others | 3 | 0.7 |
| Leisure time activity level | | |
| Low (0-799 Kcal/d) | 214 | 53.1 |
| Moderate (800-1,599 Kcal/d) | 132 | 32.8 |
| High (>1,600 Kcal/d) | 57 | 14.1 |
| Sleeping hours | | |
| <6 hours | 88 | 21.8 |
| 6-8 hours | 288 | 71.5 |
| >8 hours | 27 | 6.7 |
| Quality of sleep | | |
| Good | 231 | 57.3 |
| Bad | 172 | 42.7 |
| Diet | | |
| Light | 46 | 11.4 |
| Moderate | 233 | 57.8 |
| Heavy | 124 | 30.8 |
| Smoking status | | |
| Never smoke | 316 | 78.4 |
| Presently smoking | 46 | 11.4 |
| Quitted smoking | 41 | 10.2 |
| Drinking status | | |
| Never drink | 268 | 66.5 |
| Presently drinking | 73 | 18.1 |
| Quitted drinking | 62 | 15.4 |

Table 3. Association between sociodemographic characteristics and Overweight and Obesity.

| Sociodemographic characteristics | BMI group | | χ^2 | p-value | df |
|----------------------------------|-------------|-------------|----------|---------|----|
| | < 23(n=226) | ≥ 23(n=117) | | | |
| Sex | | | | | |
| Male | 73 | 83 | 8.908 | 0.003** | 1 |
| Female | 153 | 94 | | | |
| Age group | | | | | |
| 20 – 35 years | 122 | 47 | 30.668 | 0.001** | 1 |
| over 35 years | 28 | 29 | | | |
| Marital status | | | | | |
| Single | 114 | 50 | 6.62 | 0.000** | 3 |
| Married | 92 | 111 | | | |
| Divorced | 7 | 8 | | | |
| Widowed | 13 | 8 | | | |
| Education | | | | | |
| Below elementary | 1 | 5 | 8.867 | 0.031* | 3 |
| Elementary | 26 | 33 | | | |
| High school | 61 | 48 | | | |
| Above high school | 138 | 91 | | | |
| Underlying disease | | | | | |
| None | 143 | 84 | 28.028 | 0.000** | 3 |
| Cardiovascular disease | 16 | 41 | | | |
| DM | 7 | 14 | | | |
| Noncardiovascular disease | 60 | 38 | | | |

*p-value<0.05 ** p-value<0.01

The association between sociodemographic characteristics and overweight and obesity that were found statistically significant with p-value<0.05 were sex (p=0.003), age above 35 years, marital status (p=0.000), education (p=0.031), and underlying disease (p=0.000). It is worthy to note that the proportion of female that were not overweight was double of those that were overweight. Also, married individuals were more overweight than single

individuals. Those who had education above high school were mostly not overweight, unlike those with lower education. Lastly, it was found that individuals who had no underlying disease or had noncardiovascular disease were not overweight like those who had cardiovascular disease or diabetes mellitus. All of these sociodemographic characteristics which were significant will undergo multivariate analysis—multiple logistic regression.

Table 4. Association between lifestyle and overweight and obesity.

| Lifestyle | BMI group | | χ^2 | p-value | df |
|------------------------------------|-----------|------|----------|---------|----|
| | <23 | ≥ 23 | | | |
| Work activity level | | | | | |
| Inactive or Low (0-799 Kcal/d) | 101 | 61 | 4.319 | 0.038* | 1 |
| Moderate or High (>800 Kcal/d) | 125 | 116 | | | |
| TV watching activity | | | | | |
| Sitting and eating | 170 | 141 | 1.11 | 0.292 | 1 |
| Walking/doing chores, exercise | 56 | 36 | | | |
| Leisure time activity level | | | | | |
| Inactive or Low (0-799 Kcal/d) | 124 | 90 | 0.644 | 0.422 | |
| Moderate or High (>800 Kcal/d) | 102 | 87 | | | |
| Sleeping hours | | | | | |
| <6 hours | 38 | 38 | 2.539 | 0.406 | 2 |
| 6-8 hours | 146 | 108 | | | |
| >8 hours | 7 | 8 | | | |
| Quality of sleep | | | | | |
| Good | 137 | 94 | 2.290 | 0.130 | 1 |
| Bad | 89 | 83 | | | |
| Diet | | | | | |
| Light | 28 | 18 | 1.380 | 0.502 | 2 |
| Moderate | 125 | 108 | | | |
| Heavy | 73 | 51 | | | |
| Smoking status | | | | | |
| Never smoke | 176 | 140 | 0.087 | 0.768 | 1 |
| Quitted, present smoking | 50 | 37 | | | |
| Drinking status | | | | | |
| Never drink | 159 | 109 | 3.429 | 0.064 | 1 |
| Quitted, present drinking | 67 | 68 | | | |

*p-value<0.05

Table 5. Multiple Logistic Regression Analysis.

| Factors | β | SE | WALD | p-value | ExB | 95% CI of OR |
|--------------------|---------|------|--------|---------|-------|---------------|
| Sex | -0.630 | .233 | 7.899 | .005 | .533 | 0.344 - 0.824 |
| Age | 0.955 | .25 | 15.274 | .000 | 2.657 | 1.628 – 4.337 |
| Marital status | 0.442 | .23 | 3.70 | .054 | 1.557 | 0.992 – 2.443 |
| Underlying Disease | 0.292 | .229 | 1.629 | .202 | 1.339 | 0.855 – 2.098 |
| Work level | 0.442 | .222 | 3.982 | .046 | 1.556 | 1.082 - 2.402 |

R²=.162

The association between lifestyle and overweight and obesity that was found to have statistical significance with p-value<0.05 was work activity level. Work activity level which was the only significant behavior will undergo multivariate analysis—multiple logistic regression.

From multiple logistic regression analysis, there are 4 significant data. It was found that female had a 0.577 times lesser risk of being overweight compared to male (95 % CI=0.344-0.824, p=0.005). However, those who had over 35 years old had 2.657 times more risk of being overweight (95 % CI=1.628-4.337, p=0.000) and those who had moderate or high work activity level had 1.556 time more risk of being overweight than high work level (95 % CI= 1.082 – 2.402). Interestingly, in the present study underlying disease was not a significant risk for being overweight at all. The model summary according to the Nagelkerke R square was 0.162, meaning the factors listed in this study was significantly involved in being overweight takes up 16.2 % of the total model.

Discussion

The prevalence of overweight and obesity according to the WPRO (World Health Organization

Western Pacific Region) criteria is 43.9 % in this study. According to the National Nutritional Surveys during the year 1986 and 1995 by the Department of Health, MOPH, the trend of overweight (BMI \geq 25) had increased, being most prominent in ages 40-59 years old. However, the sample in this study consist mostly of people of working age and the prevalence of overweight and obesity might be lower than the general population. Additionally the sample consisted of female more than male. This may caused the prevalence of overweight and obesity to lower than the general population, due to the fact that female are at lesser risk of being overweight than male as seen from the result of this study. The occurrence of gene x and environmental factors interactions makes it more difficult to interpret the specific roles of genetics and lifestyle in obesity risk.⁽³³⁾ Nevertheless, the fundamental causes for the obesity epidemic are changing behaviors and lifestyles.⁽³⁴⁾ Women in this study tend to be lower in BMI than men. This may be explained by the self-conscious awareness of body image of women in the working age. Unlike women ages above 35 or women who stays at home as housewives, working women look after their shapes and watch their weight, more so than men. This is

universal for working women around the world. However, in the Thai culture, working men aged above 35 with a slight abdominal obesity are viewed as being financially stable, which men may appreciate being slightly obese. Thus, in this context, men usually have higher BMI than women.

As reviewed previously, individuals who were married tend to have higher BMI than those who are single.^(35, 36) In this study, the proportion of individuals who were married and who were single are approximately the same. A number of reasons could be behind this. Married individuals are not as self-conscious about their body image as before being married, due to the fact that they no longer more concern to use their image to attract a partner. Also, married individuals can enjoy eating with their partner and children almost every day, more so than singles who may occasionally share meals with friends and family. Married individuals also tend to cook for themselves and their families more than singles, and the quantity could be more than the meals outside. However, it depends whether the married individual was health conscious about his/her weight or not, because cooking could help control weight better than eating outside meals. However, as the data results have shown, most of the individuals in this study had moderate to heavy diet, although it is not specified whether the diet was large in proportion or heavy on the fat and sweets. As for diet it had been expected that those who had heavy diet should have higher BMI than those who had light diet⁽³⁷⁻⁴⁰⁾ however it was not found association between diet and overweight and obesity in this study.

However, this study contains mostly of individuals with high educational levels. It is known

that the higher the educational level, the lower the BMI.⁽⁴¹⁾ In this study, the prevalence of overweight and obesity may be lower than the general population due to the fact that most individuals in this study are of high educational status. This may be so because individuals with higher education understand the risks involved in being obese, were usually of higher socioeconomic status, and tends to have knowledge of how to control weight more so than those with lower education. It was interesting to note that the sample of this study consisted mainly of individuals who had no underlying disease and those that had underlying diseases mostly had noncardiovascular diseases. As reviewed, overweight and obesity is related with a number of cardiovascular diseases and DM. Had the sample consist mostly of individuals with such comorbidities, it would not have represented the general population and the prevalence of overweight and obesity would be higher than the general population. The sample selected has little proportion of such diseases, reflecting the general population in this aspect. Obesity is associated with various comorbidities. In this study, those who had no underlying disease or had only noncardiovascular disease were not as overweight as those who had cardiovascular diseases or diabetes mellitus. The true nature of this association is yet to be studied, whether obesity causes such diseases or such diseases usually manifest in obesity. However, it could be concluded that these diseases were significantly found together with overweight and obesity.

The overall lifestyle of individuals who attended King Chulalongkorn Memorial Hospital was low working activity, with leisure time activity being low, sitting while watching an average of 1-2.5 hours

of television and taking a moderate to heavy diet. However, most individuals had healthy practices such as sleeping 6-8 hours, no smoking, and no drinking. Work activity level varies widely from low to high, with the proportion being the same for both.

It was found that work activity level was the only one factor in the aspect of lifestyle that associated with overweight and obesity. However, this work activity level was measured in terms of energy expenditure which resulted from the calculation of the type of work activity measured in METs and the duration of that activity. Focus only on the type of work activity may help increase the level of association to overweight and obesity, thus determining whether the type of work activity can affect BMI significantly. Light work-related physical activity was the strong predictors of weight gain.⁽⁴²⁻⁴⁶⁾ In the present study those who had moderate or high work activity were found more overweight and obese than lower work activity, it may be due to they consumed more food for energy but the final net energy was excess.

Many studies have shown diet and sedentary lifestyle to affect BMI and have significant association with overweight and obesity.⁽⁴⁷⁻⁴⁹⁾ TV watching has been a controversial issue, whether it affect BMI or not and why.⁽⁵⁰⁻⁵⁵⁾ Some consider it to be a sedentary activity and replace time which could be for moderate levels of physical activities such as exercise. In this study, it was interesting to note that most Thai individuals in this study watch only 1-2.5 hours of television which might be too short a duration to cause any significance to overweight and obesity. Also, most who watch television tend to sit but because the duration may be short, it did not matter what activity was done in front of the television. However, it had

been expected that those who exercise while watching television will have significantly lower BMI than those who did not exercise. However, the sample group of those who exercise in front of the television was too small to analyze accurately. Also, no data was collected to determine the duration or intensity of exercise which may have effect on BMI because the more longer more vigorous the exercise, the more energy was expended and should have effect on BMI.

While the proportion of good and bad sleep may be the same, it was found that less of those in the good sleep group were overweight while in the bad sleep group, the proportion of those overweight and not overweight were the same. Although review has shown that sleep duration affect BMI⁽⁵⁶⁻⁵⁸⁾, but in this study, sleep duration had no significant association to BMI. However, sleep quality does. It may be possible that the sample in this subgroup was too little to find the true proportion that may occur in the general population. Another inference from the data on sleep was that Thai people sleep adequately in terms of hours but half of the samples have sleep problems. It would be worthy to research more on this topic, accurately defining the term "bad sleep", listing out the sleep problems involved, and analyzing the effect the quality of sleep might have on other chronic diseases.

Regarding drinking and smoking status, it was not found the association with overweight. Although some studies noted that those who currently smoke have lower BMI than nonsmoker⁽⁵⁹⁻⁶⁵⁾ but moderately amount consumption of alcohol has no effect on BMI.⁽⁶⁶⁻⁶⁷⁾ However in the present study the amount of cigarettes or alcohol consumed had not been analyzed.

However, this study was only meant to provide approximate initial data to give the overall idea of lifestyle found in Thai people and the association it may have on overweight and obesity. Its generalization to the general population may be difficult because it had only been done in one specialized setting which is the hospital. To generalize this type of data, samples must be taken from a larger, heterogeneous population. As for the recording of lifestyle, an interview would provide a more comprehensive picture of the different behaviors involved and new information on the variety of behavior may be found for further studies. Nevertheless, overweight and obesity according to the criteria of the WPRO had increased to almost half in the population studied. Factors associated with overweight and obesity were sex, age above 35 years, marital status, education, underlying disease and work activity level. Recognition and prevention of overweight and obesity particularly in those with associated factors may be beneficial for reducing burden of overweight and obesity including other following health problems.

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