UNIVERSITI PUTRA MALAYSIA

FACTORS ASSOCIATED WITH SLEEP QUALITY AMONG CHINESE WOMEN IN KLANG VALLEY, MALAYSIA

LAU CHIN CHIN

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FACTORS ASSOCIATED WITH SLEEP QUALITY AMONG CHINESE WOMEN IN KLANG VALLEY, MALAYSIA

By

LAU CHIN CHIN

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

November 2015

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the Degree of Master of Science

FACTORS ASSOCIATED WITH SLEEP QUALITY AMONG CHINESE WOMEN IN KLANG VALLEY, MALAYSIA

By

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November 2015

Chairperson : Chan Yoke Mun, PhD
Faculty : Medicine and Health Sciences

Sleep problem is an emerging public health issue in Asia and Africa. Little information is available on sleep quality and its correlates among Chinese women. This study aimed to determine factors associated with sleep quality among Chinese women in Klang Valley, Malaysia. Factors including socio-demographic background (age, total family income, menopause status, education level), dietary factors (macronutrients, energy, B vitamins and calcium), anthropometry parameters (fat mass, lean mass and BMI) and lifestyle factors (physical activity, smoking and alcohol drinking). Data was from 263 Chinese women who participated in the 2012-2014 milk supplementation study.

Few instruments were used for data collection. Sleep quality was measured using Pittsburgh Sleep Quality Index (PSQI). Questionnaire was used to collect demographic background. Current dietary intake and habitual calcium intake of participants were assessed by 3 days food records and Food Frequency Questionnaire (FFQ), respectively. Physical activity was measured using International Physical Activity Questionnaire (IPAQ). SPSS version 22.0 was used for statistical analysis of association and contribution of variables towards sleep quality.

The mean age of study population was 50.3 years old, ranged from 30-69 years at time of study period. The prevalence of self-rated and objective assessed poor sleep quality was 12% and 27%, respectively. Mean sleep duration was 6.5 (1.4) hours. Older age (r=-0.299, p<0.01) and higher education attainment (r=0.219, p<0.05) were significantly correlated with short sleep duration among premenopausal participants. Higher dietary intake of energy (r=0.178, p<0.05) and fat (r=0.183, p<0.05) were significantly associated with higher total global PSQI score, indicating poor sleep quality among premenopausal participants. Higher intake of energy (r=0.196, p<0.05) and carbohydrate (r=0.188, p<0.05) were significantly associated with more sleep disturbances in premenopausal participants. None of the anthropometry parameters (BMI, lean mass or fat mass) and lifestyle factors (physical activity, cigarette smoking, alcohol drinking) were significantly correlated with sleep components including global

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PSQI score, sleep duration, sleep latency and sleep disturbance. Among postmenopausal, higher intake of calcium (r=-0.209, p<0.05) and physically active (r=0.258, p<0.01) were significantly associated with shorter time to fall asleep. Higher intake of fat (r=0.130, p<0.05), vitamin B_1 (r=0.143, p<0.05) and vitamin B_2 (r=0.150, p<0.05) were significantly associated with higher total global PSQI score, hence poorer sleep quality among participants. Older age (r=-0.172, p<0.01) and postmenopausal (r=-0.124, p<0.05) were significantly associated with short sleep duration among participants. Increased age (r=-0.169, p<0.01), premenopausal (r=0.175, p<0.01) and physically active (r=0.145, p<0.05) were significantly associated with shorter time to fall asleep. Higher intake of energy (r=0.131, p<0.05), carbohydrate (r=0.162, p<0.05), vitamin B_2 (r=0.123, p<0.05) and vitamin B_3 (r=0.133, p<0.05) were significantly associated with more sleep disturbance.

Overall, the model explained approximately 29% of variance in global PSQI score contributed by dietary factors. Protein (t=-2.375, p<0.05) and fat (t=2.787, p<0.05) intake showed significant contributions towards sleep quality. In conclusion, these results indicated the importance of having adequate dietary protein and low dietary fat intake in promotion of good sleep quality. Incorporation of healthy diet may be the preferred approach to improve sleep quality among Chinese women in Klang Valley.

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Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

FAKTOR YANG BERKAITAN DENGAN KUALITI TIDUR DALAM KALANGAN WANITA CINA DI LEMBAH KLANG, MALAYSIA

Oleh

LAU CHIN CHIN

November 2015

Pengerusi : Prof. Madya Chan Yoke Mun
Fakulti : Perubatan dan Sains Kesihatan

Masalah tidur adalah isu kesihatan umum yang terbaru di Asia dan Afrika. Infomasi tentang faktor berkaitan dengan kualiti tidur adalah sedikit dalam kalangan wanita Cina. Kajian ini bertujuan untuk mengkaji faktor-faktor yang berkaitan dengan kualiti tidur dalam kalangan wanita Cina di lembah Klang. Faktor yang diuji termasuk latar belakang sosio-demografi (umur, status menopaus, jumlah pendapatan isi rumah, tahap pendidikan), faktor pemakanan (makronutrien, tenaga, vitamin Bs dan kalsium), parameter antropometri (jisim otot, jisim lemak badan dan Indeks Jisim Tubuh (IJT)) dan faktor gaya hidup (aktiviti fizikal, merokok, pengambilan alkohol). Data kajian didapati dari 263 wanita Cina yang mengambil bahagian dalam kajian suplementasi susu dalam tempoh 2012-2014.

Beberapa instrumen telah digunakan untuk pengumpulan data. Kualiti tidur dinilai melalui borang *Pittsburgh Sleep Quality Index* (PSQI). Informasi berkaitan dengan socio-demografi dikumpul melalui borang soal selidik. Pengambilan makanan semasa dinilai melalui rekod makanan tiga hari, maka borang kekerapan pengambilan makanan semi-kuantitatif (FFQ) digunakan untuk menilai kekerapan pengambilan kalsium. Aktiviti fizikal dinilai melalui borang *International Physical Activity Questionnaire* (IPAQ). Program SPSS versi ke-22.0 digunakan untuk mengenalisis perkaitan dan sumbangan pembolehubah kajian terhadap kualiti tidur.

Hasil kajian menunjukkan min umur populasi kajian ialah 50.3 tahun, berusia dari 30 hingga 69 tahun semasa tempoh kajian. Kadar kelaziman kualiti tidur yang rendah dinilai secara subjektif and objektif wanita cina ialah masing-masing 12.0% dan 27.0%. Min tempoh tidur ialah 6.5 (1.4) jam. Tempoh tidur menurun secara signifikan dengan penambahan umur (r=-0.299, p<0.01) dan pendidikan (r=0.219, p<0.05) di antara peserta sebelum menopaus. Pengambilan tenaga (r=0.178, p<0.05) dan lemak (r=0.183, p<0.05) yang tinggi dari makanan menunjukkan korelasi positif yang signifikan dengan jumlah skor PSQI, menunjukkan kualiti tidur yang rendah di antara peserta sebelum menopaus. Pengambilan tenaga (r=0.196, p<0.05) dan karbohidrat (r=0.188, p<0.05) yang tinggi dari makanan menunjukkan korelasi positif yang signifikan

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dengan lebih gangguan tidur di antara peserta sebelum menopaus. Tiada perkaitan yang signifikan di antara parameter antropometri (IJT, jisim otot atau jisim lemak badan), gaya hidup (aktiviti fizikal, merokok, pengambilan alkohol) dan komponen tidur (skor PSQI, tempoh tidur, latensi tidur atau gangguan tidur). Pengambilan kalsium yang tinggi (r=-0.209, p<0.05) dan aktiviti fizikal (r=0.258, p<0.01) terdapat perkaitan signifikan dengan latensi tidur di antara peserta selepas menopaus. Jumlah skor PSQI meningkat secara signifikan dengan nutrien lemak (r=0.130, p<0.05), vitamin B_1 (r=0.143, p<0.05) dan vitamin B_2 (r=0.150, p<0.05), menunjukkan kualiti tidur yang rendah di antara peserta. Berumur tua (r=-0.172, p<0.01) dan selepas menopaus (r=-0.124, p<0.05) mempunyai perkaitan negatif dengan tempoh tidur yang pendek di antara peserta. Latensi tidur menurun secara signifikan dengan penambahan umur (r=-0.169, p<0.01), sebelum menopaus (r=0.175, p<0.01) dan aktif fizikal (r=0.145, p<0.05). Gangguan tidur menambah secara signifikan dengan pengambilan nutren tenaga (r=0.131, p<0.05), karbohidrat (r=0.162, p<0.05), vitamin B_2 (r=0.123, p<0.05) dan vitamin B_3 (r=0.133, p<0.05) yang berlebihan.

Secara keseluruhannya, model ini menunjukkan faktor pemakanan menyumbangkan sebanyak 29% varians terhadap skor PSQI. Pengambilan protein (t=-2.375, p<0.05) dan lemak (t=2.787, p<0.05) menunjukkan sumbangan signifikan terhadap kualiti tidur. Kesimpulannya, hasil kajian ini menunjukkan bahawa kepentingan pengambilan protein dengan secukupnya dan rendah lemak dalam promosi kualiti tidur yang baik. Pemakanan sihat adalah cara paling berhampiran untuk meningkatkan kualiti tidur dalam kalangan wanita di lembah klang.

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I certify that a Thesis Examination Committee has met on 17 November 2015 to conduct the final examination of Lau Chin Chin on her thesis entitled "Factors Associated with Sleep Quality among Chinese Women in Klang Valley, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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LIST OF ABBREVIATIONS

ACTH	Adrenocortocotropic hormone
Ach	Acetylcholine
ANOC	Advanced Neuroscience and Orthopedic Center
BMD	Bone mineral density
BMR	Basal metabolic rate
BMI	Body Mass Index
CARDIA	Coronary Artery Risk Development in Yong Adults
CTX	Carboxy-terminal cross linked telopeptides of type 1 collagen
DEXA	Dual-Energy X-ray Absorptiometry
EEG	Electroencephalogram
EMG	Electromyogram
EOG	Electrooculogram
ER	Endoplasmic reticulum
GABA	Gamma-aminobutyric acid
GI	Glycaemic Index
IPAQ	International Physical Activity Questionnaire
ISAK	International Society for the Advancement of Kinanthropometry
KNHANES	Korean National Health and Nutrition Examination Survey
LNAAs	Large Neutral Amino Acids
MET	Metabolic Equivalent Tasks
NHANES	National Health and Nutrition Examination Survey
NHMS	Malaysia National Health and Morbidity Survey
NREM	Non Rapid Eye Movement
PTH	Parathyroid Hormone
PSQI	Pittsburgh Sleep Quality Index
P-PERK	Phosphorylated Pancreatic ER Kinase
REM	Rapid Eye Movement
RNI	Recommended Nutrient Intakes
S-FFQ	Semi-quantitative Food Frequency Questionnaire
SOL	Sleep onset latency
SWS	Short wave sleep
SWA	Slow Wave Activity
TDO	Tryptophan 2,3-dixoygenase
TEM	Technical Error Measurement
TST	Total sleep time
TRP	Trytophan
WHR	Waist to hip ratio

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GLOSSARY OF TERMS

Sleep quality: A collection of quantitative and subjective sleep measures. Quantitative sleep measure including total sleep time (TST) or sleep duration, sleep onset latency (SOL), degree of fragmentation, total wake time, sleep efficiency, sleep disturbance like short sleep or long sleep and sleep disruptive events such as spontaneous arousals or apnea. Subjective sleep measure such as individual perception on the "depth" or "restfulness" of sleep (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989; Krystal & Edinger, 2008)

Sleep duration: The total amount of sleep obtained, either during the nocturnal sleep episode or across the 24 hour period (Luyster, 2013)

Total sleep time (TST): Operationalized as time in bed minus the amount of time needed to fall asleep (sleep latency) and amount of time spent awake during the night (wakefulness after sleep onset) (Luyster, 2013)

Sleep latency: The average amount of time an individual takes to fall asleep (Luyster, 2013)

Wakefulness after sleep onset (WASO): The total amount of wakefulness during the sleep period (Luyster, 2013)

Sleep efficiency: A proportional sleep continuity measure which refers to the percentage of time in bed spent asleep, is commonly calculated as (time spent asleep/time in bed) x 100 (Luyster, 2013)

Subjective sleep quality: An individual rates his or her overall sleep quality (Luyster, 2013)

Sleep disturbance: Quantification of specific physical and psychological events and measures the frequency with which numerous situations have troubled an individual's sleeps (Luyster, 2013)

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Health is defined as a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity (World Health Organization, 1948). Nutrition, physical activity and rest are three majors elements being recognized in promotion of better health (Imaki, Hatanaka, Ogawa, Yoshida, & Tanada, 2002). Among the elements, nutrition and physical activity have been the focused for health promotion globally (Chinese Nutrition Society, 2007; Department of Health Australia, 2014; National Health and Medical Research Council, 2013; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010; U.S. Department of Health and Human Services, 2008). At the local context, Ministry of Health Malaysia had implemented *Malaysia Dietary Guidelines 2010* (National Coordinating Committee on Food and Nutrition Ministry of Health Malaysia, 2010), *Healthy Lifestyle Campaign* (Department of Health Education, 2005) to combat the consistent rise in the prevalence of overweight and obesity among Malaysians.

Sleep is a physical and mental resting state, in which a person becomes relatively inactive and unaware of their environment (España & Scammell, 2011; Imaki et al., 2002). During sleep, body movements and responsiveness to external stimuli are reduced. An individual spent approximately one-third of life in sleep. Hence, sleep is physiologically an essential and domain behavior in an individual's daily lives (Yamaguchi et al., 2013). Although sleep is a significant part of rest, it has received relatively little attention by scientists, policy makers, federal agencies and public (Luyster, Strollo, Zee, & Walsh, 2012).

In recent years, sleep quality was increasingly being recognized as an essential aspect of health promotion and chronic disease prevention in public health community together with good nutrition and be physically active attributed to majority of studies showed an association between sleep and mortality (Ferrie et al., 2007; Heslop, Smith, Metcalfe, Macleod, & Hart, 2002; Hublin, Partinen, Koskenvuo, & Kaprio, 2007; Kripke, Garfinkel, Wingard, Klauber, & Marler, 2002; Reite, Ruddy, & Nagel, 2002). Both sleep duration and sleep quality are related to sleepiness, well-being, and health (Pilcher, Ginter, & Sadowsky, 1997). Poor sleep quantity favourably hindering an individual's daily functioning, adversely affecting an individual's longevity and health (Colten & Altevogt, 2006). While poor sleep quality affects satisfaction with life and feelings of fatigue, anger, confusion, tension and depression (Pilcher et al., 1997). Sleep quality is the focus in this study because it theoretically captures broader information including sleep duration, perception of sleep attainment, sleep disturbance and others (Patel, Grandner, Xie, Branas, & Gooneratne, 2010).

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1.2 Problem statement

An estimation of some 50-70 million of American suffered from poor sleep duration chronically and the percentage of individual reporting less than 7 hours of sleep on average has increased from 7.6% of the population in 1975 to 9.3% in 2006 (Centers for Disease Control and Prevention, 2011; Knutson, Van Cauter, Rathouz, DeLeire, & Lauderdale, 2010). Problem of sleep quality does not limited to the American or population in the west, with comparable prevalence of 20% reported among the Africa population (Stranges, Tigbe, Gomez-Olive, Thorogood, & Kandala, 2012). While sleep disturbance, a measure of sleep quality was estimated to affect 20% of adults and children in Singapore (SingHealth, 2013), daytime sleepiness and poor sleep quality were documented among 35.5% and 16.1% medical students in Malaysia, respectively (Zailinawati et al., 2009). The National Health and Nutrition Examination Survey (NHANES, 2005-2008) also reported short sleep duration was more common among adults' ages 20-39 years (37.0%) or 40-59 years (40.3%) than among adults aged ≥ 60 years (32.0%) (Centers for Disease Control and Prevention, 2011). In Malaysia, national prevalence of sleep disturbance for adult is scarce, the only available data was a high prevalent of 41% sleep disturbance among elderly with dementia (Eshkoor, Hamid, Nudin, & Chan, 2013). All the available evidence highlights and emphasize the global dimension of sleep problems as an emerging public health issue.

Few population and longitudinal studies conducted in western countries and Hong Kong reported that women in perimenopausal and postmenopausal stages had significant more subjective sleep disturbance than premenopausal women (Dennerstein, Dudley, Hopper, Guthrie, & Burger, 2000; Kravitz et al., 2003). During menopausal transition, the prevalence of sleep disturbance increases dramatically from 30% in premenopausal women to approximately 50% in peri-menopausal and postmenopausal women (Guidozzi, 2013; Polo-Kantola, 2011; Sun, Shao, Li, & Tao, 2014). However, data available to compare sleep quality between premenopausal and postmenopausal women is limited in local context. Meanwhile, available local study reported that Chinese had significantly poorer sleep quality than other ethnicities in Malaysia (Nazatul, Saimy, Moy, & Nabila, 2008).

While studies investigating food intake, eating behavior, physical activity were abundant, there were relatively less research attention on sleep quality. Given the clinical and economic impact of sleep disturbance to the nation and individual level, such study is timely necessary. In addition, although there are overwhelming evidence linking sleep problem to morbidity and mortality outcomes in western countries, such data is very limited in the local context.

Sleep is complex physiology process and the development of poor sleep quality is multi-factorial. It has been reported that various socio-demographic characteristics including age (Adams, 2006; Hale, 2005; Patel et al., 2006), poor socio-economic status (Krueger & Friedman, 2009) and education attainment (Moore, Adler, Williams, & Jackson, 2002) were found to be associated with sleep quality. On the other hand, it has been reported that anthropometry parameters (Patel et al., 2008; Patel, Malhotra,

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White, Gottlieb, & Hu, 2006), dietary factors (Grandner, Jackson, Gerstner, & Knutson, 2013; Shi, McEvoy, Luu, & Attia, 2008; Weiss et al., 2010), lifestyle factors (Roehrs & Roth, 2001; Stein & Friedmann, 2005; Tamakoshi & Ohno, 2004; U.S. Department of Health and Human Services, 1996) were also found to be associated with sleep quality. All of these studies however focused on single domain and were conducted among western population. A multi-factorial approach to determine sleep quality among women in the local context is absent. Identifying the potential underlying factors that may contribute to the development of poor sleep quality is imperative, given that impact of long term sleep quality on health status.

There are few research questions being formed from the problem mentioned above:

1. What are the socio-demographic background, anthropometry parameters, dietary factors, lifestyle factors and sleep quality among premenopausal and postmenopausal Chinese women in Klang Valley?
2. Is there any difference on socio-demographic background, anthropometry parameters, dietary factors, lifestyle factors and sleep quality between premenopausal and postmenopausal Chinese women in Klang Valley?
3. Is there any association between the following factors with sleep quality among premenopausal and postmenopausal Chinese women in Klang Valley?
    a. Socio-demographic background
    b. Anthropometry parameters
    c. Dietary factors
    d. Lifestyle factors
4. Do socio-demographic background, anthropometry parameters, dietary factors and lifestyles factors contribute to sleep quality?

1.3 Significance of the study

This study guides the understanding of sleep quality among the premenopausal and postmenopausal Chinese women. Besides examining the habitual dietary intake, the identification of other potential factors as contributors of sleep problem among premenopausal and postmenopausal Chinese women may allow a better understanding on sleep quality at the local context. Such information are deemed necessary in strategize appropriate intervention to improve sleep problem among Malaysian.

Given the sparse literature on the factors associated with sleep quality in the Malaysia context, this study will provide novel information about factors that are associated with sleep quality, which may help to widen the knowledge and data on sleep quality in local context. It also compliments the available data which were mostly on sleep disturbance in medical student and demented elderly.

The results from current study guide the formation of specific hypotheses for future intervention studies. A significant result always warrants more studies to support and make common consensus towards the result.

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The dissemination of the study results will enable the governments and relevant authorities in the formation of non-pharmacological and preventive or behavioural measures in sleep therapy. These measures are always the preferred first-line approach as there are cost-effective, lower adverse risk, affordable and accessible among public as compared to drug therapy, complementary or alternative medicine.

Since complaint of poor sleep quality among women is common at any stage of life, prevention is a life time challenge. Although it is more evident in midlife women, it is deem necessary to increase the awareness of good sleep quality among women in any age group. It is believed that the current study able to provide a platform to deliver message and education to the general population including female that poor sleep quality is an emerging public health issue in Asia.

1.4 Objective of study

1.4.1 General objective

To determine socio-demographic background, anthropometry parameters, dietary factors and lifestyle factors and their associations with sleep quality among Chinese women in Klang Valley.

1.4.2 Specific objective

1. To determine the socio-demographic background, anthropometry parameters, dietary factors, lifestyle factors and sleep quality among premenopausal and postmenopausal Chinese women in Klang Valley.
2. To compare socio-demographic background, dietary factors, anthropometry parameters, lifestyle factors and sleep quality between premenopausal and postmenopausal Chinese women in Klang Valley.
3. To determine the association between the following factors with sleep quality among premenopausal and postmenopausal Chinese women in Klang Valley:
    a. Socio-demographic background
    b. Anthropometry parameters
    c. Dietary factors
    d. Lifestyle factors
4. To determine the contribution of socio-demographic background, anthropometry parameters, dietary factors, lifestyle factors towards sleep quality.

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1.5 Null hypothesis

1. There are no significant mean differences in socio-demographic background, anthropometry parameters, dietary factors, lifestyle factors and sleep quality between premenopausal and postmenopausal Chinese women.
2. There are no significant correlations between sleep quality with socio-demographic background, anthropometry parameters, dietary factors and lifestyle factors among premenopausal and postmenopausal Chinese women.
3. There are no significant contributions of socio-demographic background, anthropometry parameters, dietary factors and lifestyle factors towards sleep quality among premenopausal and postmenopausal women.

1.6 Conceptual framework of study

Figure 1.1 spectacles the conceptual framework of current study. Independent variables are grouped into four major factors, namely, socio-demographic background, anthropometry parameters, dietary factors or nutrients intake and lifestyle factors.

In this study, sleep quality was assessed using Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989), which differentiates "poor" from "good" sleep by measuring seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, and sleep disturbances, use of sleep medication and daytime dysfunction over the past one month.

Questionnaire was used to collect information on socio-demographic, anthropometry parameters and lifestyle factors. Study showed that being old, women and poor socio-demographic background limits the resources that foster health and is associated with long and short sleep duration (Krueger & Friedman, 2009).

Bidirectional relationship may exerts between sleep quality and food intake (Yamaguchi et al., 2013) including high protein and carbohydrate meals (Lieberman, Spring, & Garfield, 1986). Recent studies had showed significant positive association between adequate serum vitamin D and sleep components, suggesting vitamin D status has extended role beyond bones (Kim et al., 2014; McCarty et al., 2012). Only selected nutrients were included in current research because more literatures on these nutrients and studied the relationship on human model. Other factors such as chronic diseases (hypertension, diabetes) were not included in this study because restrain from the main study.

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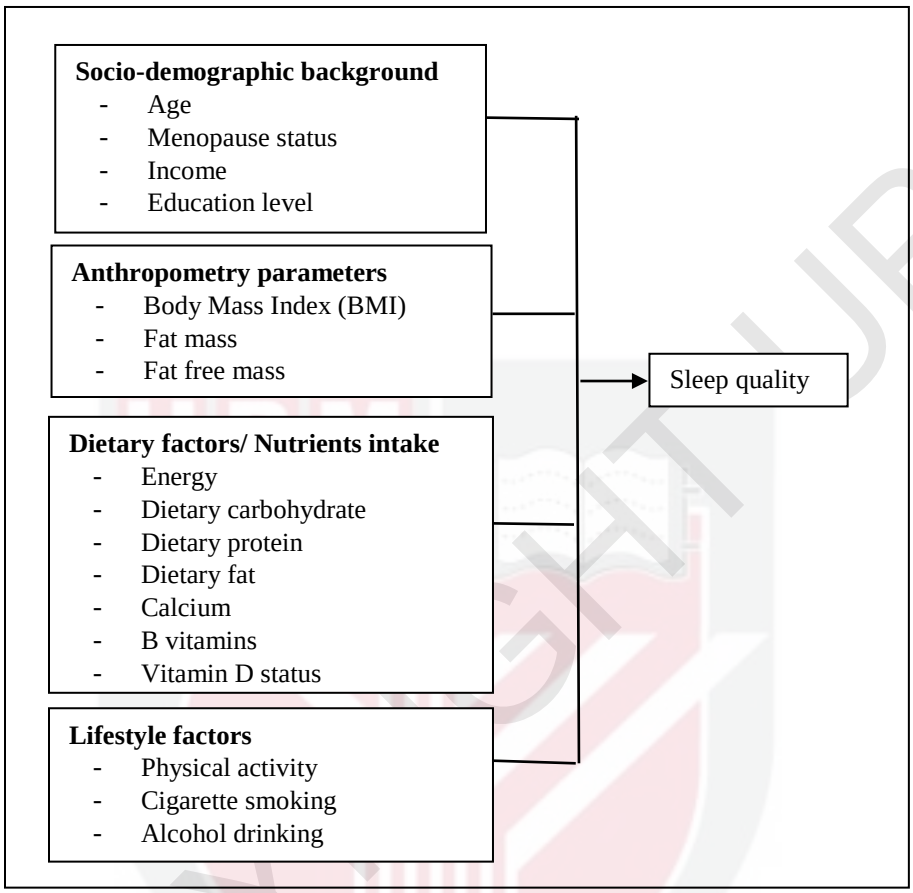

Figure 1.1. Conceptual framework of study

Lifestyle factors in this study include physical activity, cigarette smoking and alcohol drinking. Physical activity has been found to have positive and negative association with sleep duration. In contrast, both cigarette smoking and alcohol drinking demonstrated negative association with sleep duration (Ferrie et al., 2007; Ohayon, 2004; Roehrs & Roth, 2001; Stein & Friedmann, 2005). Several studies have shown significant association between obesity and short sleep duration. Modern humans are experiencing two parallel trends, increasing body mass index (BMI) (Stein & Colditz, 2004) and a decline in average sleeping time (National Sleep Foundation, 2002).

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