

## HEALTHY SLEEP BEHAVIOUR AS WEIGHT LOSS STRATEGY IN MANAGING OBESITY AMONG WOMEN IN MALAYSIA: A REVIEW

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### ABSTRACT

*The development of overweight and obesity among women in Malaysia has shown an increasing trend between the year 2003 and 2014 base on the Malaysian Adult Nutrition Survey report in 2015. The prevalence of obesity was significantly higher in women by 22.9% compared to men 14.5%. There are many factors contributing to the upsurge of obesity among women and among most, sleep disorders has been the emerging issue which has longed been discussed. Certain important factors affecting women related to sleep quality such as stress, insomnia, depression and some biological conditions like menopause, menstrual cycle and pregnancy can affect sleep quality. This paper serves to review how lack of sleep quality is associated to the development of obesity and why healthy sleep behaviour could aid to weight loss. Public health approaches to reducing the burden of obesity must consider equipping the women in managing their sleep related issues and how they are able to control the food consumption and lifestyle of the family. Thus, promoting healthy sleep behaviour among women emphasized on the importance of deriving sleep quality through three important factors that is early bed time, sleep in the dark and sleep duration would be a contributing factor in managing obesity through healthy lifestyle changes.*

**Keywords:** *Obesity, sleep, energy balance, hormones, metabolism, circadian rhythm*

### INTRODUCTION

Managing obesity among women in Malaysia need to be expanded beyond the traditional approach that have been emphasised more on diet and exercise. Lack of sleep quality caused by sleep disorder and sleep deprivation associated to obesity need to be looked as one of important factor that leads to obesity. It is in great concern as some studies (Boccabella & Malouf, 2017) have reported that sleep disorders are affecting more women than men. According to the National Sleep Foundation, (2015) sleep problem such as lack of sleep or feeling sleepy during the day is reported to occur among women. Thus, it is important to promote behaviour change towards healthy sleep routine among this population. Azarbad & Gonder-Frederick (2010) in their study indicated that psychological stress, sleep debt, and lack of physical activity are mostly vulnerable among women which are risk aspects for the development of weight gain. The study also found that women are influenced by variety of biological, hormonal, environmental and

cultural factors making obesity a unique disease burden on women (Azarbad & Gonder-Frederick, 2010).

According to the National Sleep Foundation, having healthy sleep behaviours is often referred to as having good sleep hygiene. Sleep hygiene is a variety of different practices and habits that are necessary to have good night time sleep quality and full daytime alertness (The National Sleep Foundation, 2004). Buysse, (2014) explained that healthy sleep is a multi-dimensional form of sleep-wakefulness, adapted to individual, social, and environmental demands, that promotes physical and mental well-being. The study also emphasised that the character of a good sleep health is characterized by appropriate timing, subjective satisfaction, high productivity, sufficient duration, and continuous alertness during waking hours. Nevertheless, healthy sleep in this review would also take into account on the sleep ambience emphasising on darkness, early bed time and duration which will be reviewed in the next findings.

Women suffer more from sleep disorders and their health risks are more dangerous if they don't get enough sleep. These disruptions get worse as a woman gets older. Certain important factors affecting women related to quality of sleep such as stress, insomnia, depression and some biological conditions like menopause, menstrual cycle and pregnancy have a powerful impact on the quality of their sleep. One reason is caused by the shifting levels of hormones that a woman experiences like oestrogen and progesterone, throughout the month and over her life time that has an impact on sleep. There are many condition where shifting of hormones could affect the quality of sleep. An article from the Chemical Messenger: How Hormones Help Us Sleep have highlighted few interesting facts on how the shifting of hormones could impact sleep. Base on the article, the shifting of hormones levels occurs during menstrual cycle starts just before the period causing hormonal changes including sudden drop in progesterone level. This could affect the body temperature control which will affect the quality of sleep. As for women with severe premenstrual symptoms reduced levels of melatonin before bedtime just before menstrual period could cause deprived in sleep, including daytime sleepiness or nighttime awakenings. Shifting of hormones during menopause which cause low levels of oestrogen may also contribute to sleeping difficulties. This hormone shift means that body temperature is less stable and there may be increases in adrenaline levels, which will affect sleep. In terms of fat deposition, the loss of oestrogen could causes body fat to move more to the stomach area, which increases the chances of women having snoring and sleep apnoea. Changes in hormone levels also contribute to sleeping difficulties during pregnancy. Increased progesterone levels can cause daytime sleepiness, particularly in the first trimester. High levels of oestrogen and progesterone during pregnancy can also cause nasal swelling and lead to snoring. Jo, Abbott (2015). The findings in this article indicate that women in every stage of their life cycles, are exposed to multi-stage of hormones shifts which may affect their health. As such, it is highly recommended that these women is being supported on ways or treatment that

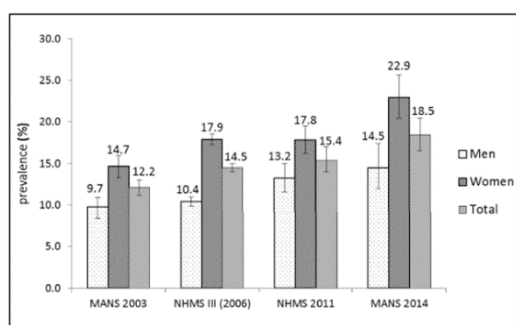
could help them to adapt healthy sleep behaviour as having lack of quality in sleep has been found to cause weight gain and obesity in the long run.

Managing obesity among women in Malaysia can be more effective should sleep behaviour is combined with other obesity intervention as the biological activity related to sleep could be the main factor that cause high calorie intake and sedentary activity. Most women in Malaysia may have overlooked on the impact of their unhealthy sleep behaviour. They may think that their pro-longed sleep problem to their weight regulation and health as a normal lifestyle transition. As such, managing weight gain and obesity to them may be sufficient by just focusing on diet and exercise or perhaps relying on diet pills in order to lose weight. Sleep quality may effects on hormones which control the desire for food and how much fat we stored. As such, promoting healthy sleep behaviour could be the main factor that helps to overcome unhealthy diet and physical activity. Changes towards healthy sleep behaviour as a routine can have powerful effects on these hormones and weight regulation. Thus, educating women on the importance of adapting healthy sleep behaviour through early bed time, dark ambience and sufficient sleep durations could instil new behaviour change in managing weight challenge and better health.

## ISSUES

Women health is negatively impacted by obesity in many ways. Not only it increases the potential risk of coronary artery and diabetes, it also increased higher risk of low back pain knee osteoarthritis and other critical health condition including cancers (Kulie et al., 2011). Between 1980 and 2014, the worldwide prevalence of obesity has shown an increased more than double with more than 1.9 billion adults, 18 years and above, was overweight and more than 600 million from the number were obese. From these numbers, about 15% of women and 11% of men in 2014 were obese, representing almost 13% of the world's adult population. While the number of overweight adults aged 18 years and above were 40% women and 38% men. Adding in is the worrying fact on

the growing number of 42million children below the age of 5 which are overweight or obese (Who, 2015) Similarly, the movement on obesity among women in Malaysia has shown a growing trend indicating a threat on influencing children and adolescent. Women played an important role in influencing the food consumption and lifestyle of the family. Thus certain important factors effecting women’s lifestyle such as unhealthy sleep behaviour caused by sleep problem such as insomnia or depression would be a threat to the choice of food and activity in the family.

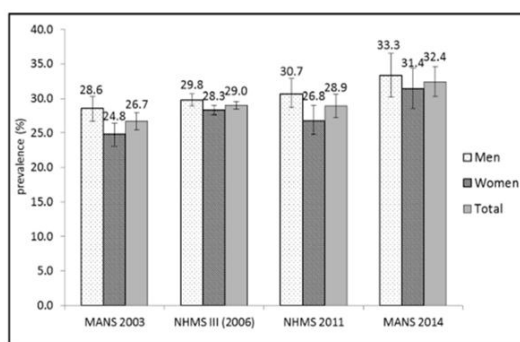


**Figure1.** Prevalence of obesity among Malaysian Adult aged 18-59years by sex (MANS 2014)

The national total prevalence on obesity in Malaysia based on Malaysian Adult Nutrition Survey (MANS 2014) in the above figure 1 report shown an increase by 6.3% since 2003, with women higher than national at 8.2% since as at 2014. There are many factors found to contribute to the increasing number. MANS survey reported high prevalence of consumption of heavy meal after dinner among Malaysian adult which leads to additional calorie obtained from the heavy meal after dinner. This leads to excess energy intake as a factor to chronic disease development including obesity. The findings also showed that Malaysian adults do not meet the recommended intake of fruits and vegetables in terms of its amount and frequency. In terms of physical activity, four out of ten Malaysian adults were found to physically inactive by the survey where the overall prevalence of physical inactivity was 36.9% in estimated 19.27 million Malaysian adults aged between 18 and 59 years old. (Aris, Zainuddin, Ahmad, & Kaur, 2014)

Adequate FV intake and physical activity are important factors to weight loss effort. The above findings showed that both food intake and physical activity of Malaysian adult are not in healthy condition. Unhealthy lifestyle such as night eating with heavy meal after dinner also could aid to the development of disease such as obesity.

The second chart in **figure 2** showed the national overweight prevalence at 10% higher than obesity prevalence with men higher than women. This chart showed that the prevalence of overweight women is higher by 31.4% than the prevalence of obesity among women at 22.9% in figure 1. This is to highlight on the worrying numbers from the overweight base towards the expected increase on obesity prevalence among women in the future if the current weight loss strategies is not been improvised from the current strategies. Most women are aware on their role as the key person in the family but awareness on their role that could contribute in managing obesity in the family are still lacking. They may not aware that healthy sleep is important factor that leads to healthy eating and sedentary lifestyle. As most of them are also having problem in sleep be it due to their current lifestyle or perhaps due to some health circumstances. These women need to be educated on the importance of healthy sleep and how they are able to overcome their current sleep problem.



**Figure2.** Prevalence of overweight among Malaysian Adults aged 18-59years by sex (MANS 2014)

All through the years we have over emphasized on diet and exercise in combating obesity however the prevalence of obesity seems to be growing. Campaign organized by the government in managing obesity that

emphasized on diets such as ‘Kawal kalori, Cegah Obesiti’ in 2016 and physical activities such as ‘Fit Malaysia’ in 2014 are among campaigns launched in combating obesity and these have been done for many years with different slogan. The national health measurement also emphasized on the same lifestyle key factors and we overlooked on lack of sleep as an emerging issues in obesity development. Healthy sleep behavior could be another weight lost factors that could be combined with diet and physical activity strategy in managing obesity.

## PURPOSE

This paper will review on how lack of sleep quality is associated to the development of obesity and why healthy sleep behaviour could aid to weight loss. This review will position healthy sleep behaviour as a weight loss strategy which may work as a multi-component strategy in managing obesity among women. Despite the traditional strategy on diet and physical activity, this review will emphasized on the importance of obtaining sleep quality through three important factors that is early bed time, sleep in dark ambience and sleep duration. Thus, positioning women in this discussion is due to their high risk in many health circumstances affected by lack of sleep quality causing to weight gain.

## FINDINGS

Chaput, (2013) in a study emphasised that diet and physical activity has been usually focused in obesity study, and that sleep should not be ignored as part of the lifestyle package. The study highlighted that there is an increasing indication proving on the impact of sleep on food consumption behaviours where lack of sleep quality, insufficient sleep duration and late bedtimes are proven to cause higher food consumption, poor diet quality, and extra body weight. Insufficient sleep also appears to cause the intake of calories due to the current obesogenic environment of accessible food exposure. It has proven to increase snacking, the amount of meals intake per day, and the choice towards energy-rich foods (Chaput, 2013)Havel, (2014) found that research shows hormones influence appetite and fat storage as

weight is largely controlled by hormones. It also shows that hormones influence the desire for food and how much fat are stored. As mentioned in another study by Schmid, Hallschmid, & Schultes (2014), the damage metabolic effects of insufficient sleep is caused by the disruption of the neuro-behaviour on human that finally cause increased in food desire and enhanced sensitivity to food stimuli. Thus far, in their studies found that Evidence on new studies prove that inadequate sleep increases hedonic stimulus processing in the brain that control the drive on food intake which is also constant with the perception that lacked of sleep could be the cause to greater desire to overeat. This findings was supported by(J.-P. & a., 2012) that alterations in the activity of neuroendocrine systems appear to be the main mediators of the damaging metabolic effects of inadequate sleep, through supporting neuro-behavioural effect such as greater desire for food, higher sensitivity to food motivations, and finally an excess in energy intake. Shlisky et al., (2012) in his findings also stated that few potential mechanisms in which lack of sleep may affect weight regulation and energy balance have been suggested to affect weight loss effort. The findings presented three basic intermediates which include higher energy intake, decreased energy expenditure and changed substrate use which was found as potential pathways to weight gain affecting overall weight regulation. Higher food desire signalled by hormones may complicate efforts in controlling energy intake which already stressed by dieting efforts (Shlisky et al., 2012).

Besides, the above findings, Shlisky et al., (2012) also highlight that weight gain and increase food intake can be increased through high cortisol level. Cortisol production can be balanced through managing stress, balanced diet and enough sleep. A study among pilots found that their loss of 15 hours sleep in a week caused their cortisol levels to increase by 50-80% (Samel, Vejvoda, & Maass, 2004). This has proven by Schulz & Laessle, (2012) that constantly increased levels of cortisol can lead to overeating and weight gain. One interesting findings also confirmed that women who carry excess weight around the middle seems to respond to stress with a

greater increase in cortisol (V.Vicennati, L.Ceroni, L.Gagliardi et al. 2002; Moyer et al., 1994) In this situation, women who are having sleep problem prone to accumulate fat around the middle part of their body due to the increase of stress hormone; cortisol which could grow into abdominal obesity. It is important to have a synchronisation between circadian and metabolic processes which include meal patterns in the regulation process of energy balance and body-weight control. Another study suggested that additional effects of circadian alignment including restoration of sleep, meal patterns, and protein diets as the treatment for overweight and obesity (Gonnissen, Hulshof, & Westerterp-Plantenga, 2013).

Although continuing interventional findings on the cause and effect relationship might be still limited, lack of sleep appears to be an attractive aim for prevention and probably the treatment of metabolic disorder. This is in line with the promotion of healthy sleep behaviour as strategy in managing obesity as sleep quality is associated with the activity in the neuroendocrine system. Maximising sleep quality would also provide sufficient time for these activities to perform their function naturally. As the above findings mostly associated lack of sleep with few biological activities affecting high energy intake and unhealthy physical activity, it is proven that healthy sleep behaviour would be another new strategy that will enhanced the current intervention program.

Nevertheless, healthy sleep behaviour should also emphasized on early time in bed and dark ambience as the main factor that drive quality in sleep due to its association on the production of melatonin as melatonin or known as ‘sleep hormone’ will influenced the metabolism regulation of brown adipose tissue (BAT) and Thyroid gland which will be

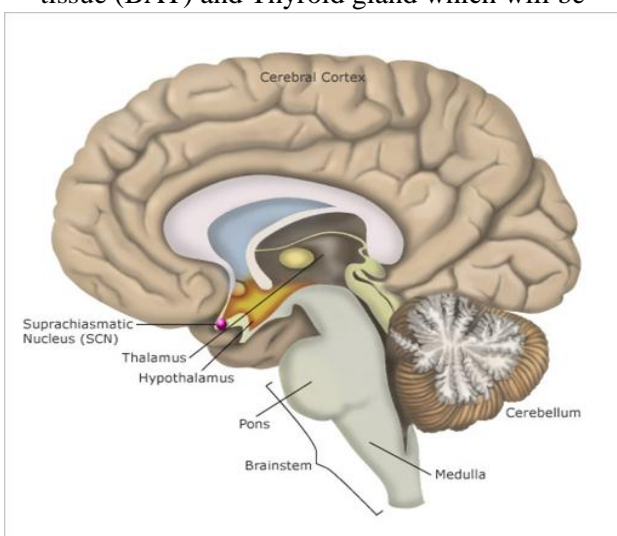
explained in the next review.

### **Early bed time and dark ambience**

Healthy sleep behavior emphasizing on early bed time and dark ambience is important in driving sleep quality which will aid to weight loss benefit. Women who understand this association may be motivated to new behavior modification and seek treatment on their ignored sleep problem. Managing obesity by just focusing on diet and physical activity without identifying the biological cause could lead to slow outcome or failure. Below are some findings that explained on why early bed time and dark ambience are associated to our natural metabolism as important factor to weight loss.

Harvard Health Publication (2015) has identified the ‘superchiasmatic’ nucleus (SCN) in rats ‘studies in 1970, where the internal clock is located. The brain centre that regulates desire on food and other biological conditions is the cluster of cells which is part of the hypothalamus. Base on the studies, the disappeared sleep or wake rhythm is caused by the damaged in the area thus making the rats no longer slept on a normal schedule. The location of the clock though is mostly self-regulating, allows it to respond to numerous types of external signals to keep it set at 24 hours. The scientists called the intake of bright light and dark night through our retina known as ‘zeitgeber’ in sleep medicine. Some among animals and humans who have sensory loss with blindness frequently have circadian rhythm disorders due to such sensory loss. Few sleep studies also confirmed that brightness may disrupt some people while sleeping. These include a television left on, bright street lights and also the LED light from a bedside alarm clock (Harvard Health, 2015).

A study found that the light and dark cycle will influenced the level of several hormones which are caused by sleep, feeding and general behaviour. Through the connections between the effects of sleep and the central circadian system, the regulation and metabolism of some hormones are impacted. The impact will include growth hormone, melatonin, cortisol, leptin, and ghrelin levels which are highly connected with sleep and



circadian rhythmicity (Kim, Jeong, & Hong, 2015). It is interesting to note that the above findings actually explained on the natural biological effect of activities that exist in the body system as the process arises early by 9pm and these activities will be more effective through early bed time with lights off. Most women having sleep problem may not aware of the existing process and how lights will impact on their sleep quality. These findings supported the importance of healthy sleep through dark ambience as this review will also explained on other related process which will impact the regulation of biological process. As the global increased in the prevalence of obesity shows ineffective battle against this disorder. This has led to urgency towards requirement for more effective strategies despite the current treatment. One of the two important factors derived from healthy sleep behaviour that emphasised on early bed time and sleep in the dark is the role of brown adipose tissue (BAT).

### **The Brown Adipose Tissue (BAT) and Metabolism**

The new discovery that a substantial amount of functional BAT is retained in adult humans provides a potential target for treatment of human obesity (Tan, Manchester, Fuentes-Broto, Paredes, & Reiter, 2011). A hormone known as Melatonin was known as another important hormones being affected by lack of sleep quality. It is associated to BAT and thyroid hormone production which is vital for natural metabolism.

Melatonin was explained by The National Sleep Foundation as a natural hormone produced through the body's pineal gland, a pea-sized gland located above the middle of the brain. During the day, the pineal is inactive and only turn on by the Suprachiasmatic (SCN) when the darkness occurs and where the production of melatonin begins actively, where it is released into the blood. The process regularly arises about 9 at night causing the level of melatonin to rise sharply in the blood stream making us sleepy and feel less alert. The level of melatonin in the blood stays high at approximately 12 hours the whole night and will drop to low during the day at around 9 am. In the day time, Melatonin is hardly noticeable. (The

National Sleep Foundation, 2015). A study explained further that the production of Melatonin will be interrupted by the disruption on the neuro-behaviour. This hormone is responsible for the establishment of an adequate energy balance mainly by regulating the energy expenditure directly through energy flow regulating cycle. The process occurred when the BAT is activated and involving in the white adipose tissue (WAT) browning process. The decrease in melatonin production, as during aging, shift-work or bright surroundings at night, encourages insulin resistance, glucose intolerance, sleep disorder, and metabolic circadian disorder causing a state of Chrono-disruption leading to obesity (Cipolla-Neto, Amaral, Afeche, Tan, & Reiter, 2014).

Another study highlights on an interesting therapeutic aim for obesity and the treatment of metabolic syndrome was found in brown fat activation. The study incorporate the latest developments on the metabolic part of BAT and how its association with other tissues and its potential effect to combat obesity and the metabolic syndrome (Poekes, Lanthier, & Leclercq, 2015) Previous study also found that BAT activity is likely to decrease the risk of obesity development as fat stores is being used for thermogenesis process moreover a directed improvement of adipocyte metabolism might have contribute to weight loss (Stephens, Ludgate, & Rees, 2011).

Besides the important association of melatonin and brown adipose tissue (BAT), melatonin also plays an important role on metabolism through thyroid gland. Recent data have disclosed a relation between obesity and thyroid autoimmunity, with the adipocyte hormone leptin appearing to be the key factor linking these two conditions. The study also highlighted on the increasing evidence that changes in thyroid function are associated with obesity, a condition associated with a chronic low-grade state of inflammation (Duntas & Biondi, 2013).

Below review explained on the importance of Thyroid gland as another factor that could aid in regulating the natural metabolism. This explanation will support why healthy sleep

behaviour could be a natural therapeutic treatment in managing obesity.

### **The thyroid gland and metabolism**

Yen (2001) in a study found that the functions of every cell in the body rely on the thyroid hormones. Thyroid hormone receptors most important functions are to regulate the metabolism and heart rate. These receptors also help to regulate growth and the rate of metabolism as chemical response process in the body. Another study that associates melatonin and thyroid hormones, found that Melatonin is also a source of thyrotrophin-releasing hormone (TRH), which sequentially causes the body to release thyroid stimulating hormone (TSH), which signals for the secretion of thyroid hormone. Nevertheless melatonin may also have a direct impact on the production of thyroid hormone by stimulating TSH (Sakamoto, Nakamura, Inoue, & Sakai, 2000).

Findings also claimed that thyroid hormone (TH) is needed for the development and the regulation of metabolism among adult. The thyroid hormone receptors (TR) are expressed differentially in tissues and have different function in TH signalling. The main mechanism of TH regulation of metabolism is D2 and is expressed in the hypothalamus, brown adipose tissue (BAT), white fat and skeletal muscle which are essential for thermogenesis process. (Rashmi Mullur, Yan-Yun Liu, 20014).

As melatonin will signal Thyroid gland for metabolism and also effecting BAT which are important for natural weight loss, here is another point on the importance of inducing melatonin production through healthy sleep behaviour that emphasised on early bed time and dark ambience. In fact a study highlight that several new therapeutic targets for metabolic disorders had been led by the thyroid hormone (TH) role in regulating metabolic pathways. The study explained that understanding the interaction and mechanisms of the several thyroid hormone (TH) signalling path in metabolism may improve the possibility of recognizing selective and effective targets (Mullur, Liu, & Brent, 2014). These findings highlights on the important of melatonin production which is associated to early bedtime and dark lights during sleep. It

also associates lack of sleep quality with other biological system and activities. All of which are associated to lack of sleep quality. Thus, women who are mostly affected by sleep problem associated to obesity should change their behaviour towards healthy sleep routine. Woman who behaves to sleep late daily as a routine due to her sleep problem or perhaps performing personal task, would negatively impact not only on her as an individual but also the rest of family members.

### **Increased Sleep duration**

As the above findings explained on the neuro-behaviour interruption due to lack of sleep quality, there are findings that also explain on how sleep duration could affects weight regulations.

A study found that there is a significant association between sleep duration and obesity-related variables and this association has been possibly altered by dietary macronutrients intake among women subjects.(Doo & Kim, 2015) Previous study among female European adolescent found that short sleep duration is related to higher adiposity signs. A combination of higher food intake and more sedentary behaviour, where this relationship appears to be related to both sides of the energy balance equation (Garaulet et al., 2011). Another study also found that macronutrient intake and meal frequency is also affected by sleep restriction. Sleeping less than eight hours regularly per night among adolescent was found to cause higher consumption of calories proportion from fat and a lower proportion of calories from carbohydrates and protein compare to those who slept eight hours or more per night.(Weiss et al., 2010)

The most interesting findings associated to sleep duration in managing obesity found that several potential investigations among individuals who were reported with sleep durations of five or six hours per night have showed a relationship within prevalence of weight increase and the development of obesity. In these studies, every additional hour of sleep among a six year Italian study established among 1597 male and female, is

proven to reduce the obesity prevalence by 30%. (Bo et al., 2011; Buxton et al., 2012) This is also supported by another study that there were evidences on the association of reduced sleep duration in the present obesity prevalence thus current findings emphasises on the importance of adequate quality sleep for metabolic health. Many aspects may need an explanation and studies on intervention also must be conducted (Zimberg et al., 2012)

The above studies support the guidance by The National Sleep Foundation who has come out with guidance on sleep range for both younger adult and adult at 7-8hours (The National Sleep Foundation, 2004). The suggested sleep duration as suggested is aligned with a study that compared among participants who reported sleeping 7-9 hours per night and found that short sleepers were more likely to be obese and have abdominal obesity (Ford et al., 2014).

Thus, sleep duration by emphasising on early bed time and dark ambience are closely related to complement each other as important elements to derive quality in sleep through healthy sleep behaviour.

Sleep loss has become common in modern societies, similarly with the growing prevalence of obesity and type 2diabetes. Epidemiological studies show an increasing number on the association between short sleep duration, sleep disruption, and circadian de-synchronisation of sleep with adverse metabolic traits, in certain obesity and type 2diabetes. In fact, experimental studies also highlighted on the existence of different mechanisms in which inadequate sleep adversely impacted to metabolic health. The effect of partial sleep on energy expenditure and physical activity is less clear, but the alteration may probably not overcome the increases in food intake. Sleep loss appears to be an attractive aim for the prevention, and probably treatment, of metabolic disease even though long-term interventional studies proving a cause and effect association are still limited (Schmid, Hallschmid, & Schultes, 2015)

## CONCLUSION

Sleep quality was known to associates to neurobehavioral and physiological effect which may risk women's health and well-being. Women who wants to lose weight would normally focus on diet and exercise in which most of them may emphasized more on reducing meal intake or reducing meal portion. However the interruption of the brain due to unhealthy sleeping behaviour will actually interrupt their decision making in food choice which will prone towards high calorie food intake and sedentary behaviour.

Public health approaches to reducing the burden of obesity must consider equipping the women with knowledge in managing their sleep related issues and how they are able to control the food consumption and lifestyle of the family. Educating women on the importance of performing healthy sleep should also include ways on handling their sleep problem as most women seems to ignore the problem without knowing the impact on her and to her family. As the key person in the family, women could play an important role as the change agent in the family. Thus, promoting healthy sleep behaviour among women as weight loss strategy would be a contributing factor in managing obesity through lifestyle changes. The review article serves to transform the presented information into an inspirational material for future studies by positioning healthy sleep as multi component strategies in managing obesity among women in Malaysia.

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