



UNIVERSITI PUTRA MALAYSIA

***ASSOCIATIONS OF SOCIO-DEMOGRAPHIC FACTORS, LIFESTYLE
FACTORS AND CHRONOTYPE WITH BODY WEIGHT STATUS
AMONG FIREFIGHTERS IN SELANGOR***

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This project entitled “Associations of socio-demographic factors, lifestyle factors and chronotype with body weight status among firefighters in Selangor” was prepared by Wong Jenn Nan and has been submitted to the Faculty of Medicine and Health Sciences as a partial fulfillment of the requirements for the degree of Bachelor of Science (Nutrition and Community Health) from the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.



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ABSTRACT

ASSOCIATIONS OF SOCIO-DEMOGRAPHIC FACTORS, LIFESTYLE FACTORS AND CHRONOTYPE WITH BODY WEIGHT STATUS AMONG FIREFIGHTERS IN SELANGOR

Wong Jenn Nan

Firefighter is a profession whose working schedule follows a shift basis. The exposure to shift work especially at night, is claimed to be associated with increased risk of stress level and obesity. Previous studies have reported a high prevalence of overweight and obesity among firefighters but the factors associated with it remain unclear. Therefore, this cross-sectional study aimed to determine the factors associated with body weight status among firefighters in Selangor. A total of 113 firefighters from 6 randomly selected fire and rescue department branches in Selangor with a mean age of 29.68 ± 7.52 years old participated in this study. A self-administered questionnaire was used to obtain information on socio-demographic background, physical activity level, sleeping quality, social jet lag, meal pattern and chronotype. Anthropometric measurements including weight, height, waist circumference, and body fat percentage were measured by the researcher following standard procedures. Results showed that half of the firefighters (50.0%) were overweight or obese with a mean body mass index (BMI) of $25.81 \pm 3.76 \text{ kg/m}^2$. Their mean body fat percentage was $22.83 \pm 7.81\%$, with 36.9% of them had excessive body fat percentage ($\geq 25\%$). The mean waist circumference of the firefighters in this study was $83.29 \pm 8.53 \text{ cm}$, with 19.3% had abdominal obesity. Almost all (96.3%) of them were physically active, whereas 55.8% had a poor sleep quality. A total of 43.4%, 42.5% and 52.2% skipped breakfast, lunch and dinner at least once or more times in a week, respectively. In term of chronotype, 71.7% were intermediate type, 26.3% were morning type and 1.8% were evening type. Years of service ($\chi^2 = 21.544, p < 0.001$) and marital status ($\chi^2 = 9.627, p = 0.002$) were significantly associated with BMI. Those who were married and who served the fire and rescue department for longer duration were more likely to be overweight and obese. However, there were no associations found between physical activity, sleep quality, social jet lag, meal skipping behavior and chronotype with BMI ($p > 0.5$). In conclusion, findings suggest that the prevalence of overweight and obesity among firefighters in this study was high. Those who have served longer in the service and married may pay lesser concern towards their BMI. Future studies are recommended to include other factors such as dietary intake, depression symptom, and physical fitness in relation to the development of overweight and obesity in this occupational group.

ABSTRAK

HUBUNG KAIT ANTARA FAKTOR SOSIO-DEMOGRAFIK, GAYA HIDUP, DAN KRONOTAIP DENGAN STATUS BERAT BADAN DALAM KALANGAN ANGGOTA BOMBA DI SELANGOR

Wong Jenn Nan

Bomba merupakan pekerjaan yang mengikuti waktu syif. Pendedahan kepada kerja syif, terutamanya pada waktu malam, dikaitkan dengan tekanan dan risiko obesiti yang lebih tinggi. Kajian lepas melaporkan bahawa anggota bomba berkecenderungan menghadapi peningkatan berat badan yang berlebihan dan masalah obesiti. Namun demikian, faktor yang meyumbang kepada peningkatan berat badan tidak dikenal pasti dalam kajian lepas. Justeru itu, kajian keratan rentas ini bertujuan untuk mengenal pasti faktor yang berkaitan dengan status berat badan dalam kalangan anggota bomba di Selangor. Seramai 113 anggota bomba dari 6 cawangan Jabatan Bomba dan Penyelamat yang dipilih secara rawak di Selangor telah mengambil bahagian dalam kajian ini. Purata umur mereka adalah 29.68 ± 7.52 tahun. Satu set borang soal selidik mengenai maklumat latar belakang sosio-demografi, tahap aktiviti fizikal, kualiti tidur, gangguan “jet lag” sosial, corak pemakanan dan taburan kronotaip telah dilengkapkan oleh responden. Pengukuran antropometrik termasuk berat, tinggi, lilitan pinggang, dan peratusan lemak badan telah diukur oleh penyelidik mengikut prosedur standard. Hasil kajian menunjukkan bahawa separuh daripada anggota bomba (50.0%) mempunyai berat badan berlebihan atau obesiti dengan purata indeks jisim tubuh (BMI) $25.81 \pm 3.76 \text{ kg/m}^2$. Purata peratusan lemak badan para anggota bomba adalah $22.83 \pm 7.81\%$, dengan 36.9% daripadanya mempunyai peratusan lemak badan yang berlebihan ($\geq 25\%$) manakala purata lilitan pinggang para anggota bomba dalam kajian ini adalah $83.29 \pm 8.53 \text{ cm}$, dengan 19.3% mengalami obesiti abdomen. Hampir semua (96.3%) anggota bomba adalah aktif secara fizikal, sedangkan 55.8% mempunyai kualiti tidur yang buruk. Sebanyak 43.4%, 42.5% dan 52.2% daripada anggota bomba dalam kajian *skip* sarapan, makan tengah hari dan makan malam untuk sekurang-kurangnya sekali atau lebih dalam masa seminggu. Dari segi kronotaip, 71.7% adalah jenis “intermediate”, 26.3% adalah jenis pagi dan 1.8% adalah jenis petang. Tahun perkhidmatan ($\chi^2 = 21.544, p < 0.001$) dan status perkahwinan ($\chi^2 = 9.627, p = 0.002$) didapati berkaitan dengan BMI. Mereka yang sudah berkahwin dan telah lama berkhidmat di jabatan bomba adalah lebih berisiko untuk menghadapi berat badan berlebihan dan obesiti. Namun, tidak ada kaitan didapati antara aktiviti fizikal, kualiti tidur, gangguan “jet lag” sosial, corak pemakanan dan kronotaip dengan BMI ($p > 0.05$). Kesimpulannya, hasil kajian menunjukkan bahawa prevalens berat badan berlebihan dan obesiti dalam kalangan anggota bomba adalah tinggi. Mereka yang telah lama berkhidmat dan berkahwin mungkin kurang mengambil berat terhadap BMI mereka. Kajian pada masa depan disarankan untuk memasukkan faktor-faktor lain seperti penilaian pengambilan makanan, gejala kemurungan, dan kecergasan fizikal yang mungkin berkaitan dengan berat badan berlebihan dan obesiti dalam kalangan kumpulan pekerjaan ini.

CHAPTER 1

INTRODUCTION

1.1 Background

Overweight and obesity is a rising concern worldwide. According to World Health Organization (WHO, 2018), more than 1.9 billion adults, 18 years and above, were overweight in 2016. Of these, over 650 million were obese. In other words, these figures were equivalent to 39% of adults aged 18 years old and above were overweight and 13% were obese in the world population (WHO, 2018).

The episode of overweight and obesity prevalence is an epidemic worldwide and Malaysia is of no exception, especially among those age 18 years old and above. The trend of overweight and obesity in Malaysia among this population had increased significantly in a 15-year period from year 2006 to year 2020. According to the National Health and Morbidity Survey (NHMS), the prevalence of overweight and obesity among adults aged 18 years old and above was 29.1% and 14.5% in 2006 (IPH, 2006), 29.4% and 15.1% in 2011 (IPH, 2011), 30.0% and 17.7% in 2015 (IPH, 2015). The latest NHMS 2019 revealed that these figures had further increased to 30.4% and 19.7% (IPH, 2020), respectively. The rise in the prevalence of overweight and obesity was indeed alarming as it may result in the development of non-communicable diseases such as diabetes mellitus, hypertension and cardiovascular diseases.

Shift work exposure, particularly in night shift, had been associated with higher risk of obesity (Sun et al., 2018). Night shift workers could be further classified into permanent night shift, rotating shift and irregular shift work (Sun et al., 2018). Permanent night shift workers are defined as those who work only during the nighttime. Rotating shift workers are those who work a fixed pattern of daytime and

nighttime shifts (e.g., a morning shift, followed by an evening shift, and then a night shift, which is then repeated). Irregular shift workers are those who performed night shift work that is not on a fixed schedule, in which this type of work mostly occurred for employees who handled emergencies or who had on-call duties (Sun et al., 2018).

Body weight status is a rising concern among shift workers due to the disruption of their circadian cycle which may have further altered their physiological events. Night shift working had been shown to relate to the development of obesity and central adiposity (Peplonska, Bukowska, & Sobala, 2015). Besides, the likelihood of permanent and irregular shift workers being overweight or abdominal obesity are also relatively higher than that of rotating shift workers (Sun et al., 2018). Hence, people who are committed to shift-work-nature is having unfavorable health outcomes where they are at an increased risk of developing non-communicable diseases.

Firefighter is a profession whose working schedule follows a shift basis. Their duty as the emergency responders and casualty rescuers have made body weight status an important factor in their performance. A high prevalence of overweight and obesity (79.5%) as well as obesity specifically (33.5%) among the career and volunteer firefighters in United States (US) had raised surprising attention to the public (Poston et al., 2011). In fact, the working nature of firefighters who are required to deal with workplace stress, physical, biological, psychological and chemical hazards potentially put them at a higher incidence of developing a range of diseases as compared to other public officers such as police officers, national and regional government officers (Han, Park, Park, Hwang, & Kim, 2018). Firefighters were found to be more susceptible to physical ailments and were at a significantly higher risk for traumatic stress disorders when compared to other public officers (Han et al., 2018).

When switching the concern to Malaysia, particularly in Selangor, it was shown that more than half of the 230 male firefighters aged 20-39 years old were either overweight or obese, in which both prevalence were reported at 46.5% and 10.3%, respectively (Rahimi, Sedek, Teh, & Harun, 2017). This worrying scenario of high overweight and obesity rate among the Malaysian firefighters need to be taken with drastic and pragmatic measures in order to prevent the exacerbation of the episode where development of non-communicable diseases keeps rising uncontrollably. Professional firefighting is a unique occupation, due to the high levels of stress and risk which it confers. Therefore, their body composition needs to be regularly monitored and maintained at the optimal state. A previous study in US showed that obese firefighters based on body mass index (BMI) had approximately five times higher risk of suffering from incident injury than their normal weight counterparts, while those obese based on waist circumference also showed three times higher risk of suffering musculoskeletal injury (Jahnke, Poston, Haddock, & Jitnarin, 2013).

In many fire departments, firefighters work according to rotating shifts (Yun, Ahn, Jeong, Joo, & Choi, 2015). Rotating shift workers had been closely related to changes in biological and physiological functions, in which these changes may be greatly affected by the term “*chronotype - difference between individuals regarding diurnal preference, the sleep and wake pattern of activity, and alertness in the evening or morning*” (Mirghani, 2017).

Chronotype is a human characteristic that attributes individuals according to their circadian phase. The disparity in these phases reveal the time of active state of an individual in daily physical functions, hormone levels, body temperature, eating and sleeping patterns (Levandovski, Sasso, & Hidalgo, 2013). Hence, individuals are classified as being more morningness, intermediate or more eveningness (Mirghani,

2017). There is a difference in daily activity both physically and physiologically among individuals over a 24 hours period. Morningness people had lower meal skipping tendency, lower frequency of fast food consumption, lower total daily energy, fat and carbohydrate intakes and higher daily protein intake (Toktaş, Erman, & Mert, 2018). Eveningness people were claimed to be associated with inadequate dietary habits such as high daily energy, fat and carbohydrates intakes and low protein intake as well as meal skipping habit (Toktaş et al., 2018). This may have a great impact towards body weight status due to the changes in body homeostasis that alter individual's meal patterns, sleeping pattern and physical activity level that consequently impact body weight status.

1.2 Problem Statement

Obesity is a chronic metabolic disorder associated with cardiovascular diseases (CVD) and linked with increased mortality and morbidity (Rahimi et al., 2017). Data from the Framingham Heart Study showed that the rise in BMI relatively increased the risk of heart failure by 5% in men and 7% in women (Lavie, Milani, & Ventura, 2010). Additionally, obesity also put individuals at risk of diseases by inducing hypertension, hyperglycemia, inflammation, dyslipidemia and atherosclerosis, which are disorders that can coexist, particularly in the presence of excess visceral fat to cause metabolic syndrome (Jiang, Lu, Zong, Ruan, & Liu, 2016).

Firefighters are at elevated risk for CVD (Martin et al., 2019). Cardiac fatalities are the leading cause of death among firefighters in which they contribute 47% of deaths in firefighters (Sen et al., 2016). The nature of strenuous emergency duties put firefighters at relatively higher levels of stress and physical demands as compared with non-emergency duties occupational groups (Durand et al., 2011). Thus, they are

associated with markedly higher risks of cardiovascular events that lead to death or disability. In fact, obesity puts firefighters at approximately five times higher risk of suffering from incident injury than those who are non-obese and also have three times higher risk of suffering musculoskeletal injury (Jahnke et al., 2013). Firefighters who are in class 1 obesity or classes 2 and 3 obesity combined also face greater risk for job disability through negatively impacting their safety at work, their overall well-being and their work productivity when compared with normal-weight firefighters (Soteriades et al., 2008). Therefore, it is an imperative to determine body weight status of firefighters.

Despite the high obesity prevalence among firefighters was shown in previous studies (Gurevich et al., 2017; Jahnke et al., 2013; Poston et al., 2011; Rahimi et al., 2017), epidemiological studies on firefighters and obesity have tended to focus on the associations between obesity and physiological covariates (e.g., blood pressures and lipid profiles) (Durand et al., 2011; Smith et al., 2012). Only a few studies have investigated occupational and behavioral risk factors of obesity in firefighters (Choi et al., 2011; Dobson et al., 2013; Yang et al., 2015). In Malaysia, there is no published study on the risk factors of overweight and obesity among firefighters. A local study carried out by Rahimi et al. (2017) which focused on the body weight status and physical fitness among 230 firefighters in Selangor has shown that more than half of the firefighters were overweight or obese. But the factors associated with overweight and obesity were not assessed nor identified.

Body weight status in association with chronotype differences is remained under studied. In general, chronotype differences result in changes of feeding behavior. All evening type people are more likely to skip a meal in a day, while a small proportion of intermediate type and morning type people do not skip meal in a day and

the most frequently skipped meal among these three types of people is breakfast (Toktaş et al., 2018). However, Toktaş et al. (2018) found that there was no difference in BMI among three different chronotypes of subjects. The contradicting point arises when more evening preference people are found to be directly associated with higher BMI (Anothaisintawee, Lertrattananon, & Thamakaisorn, 2018). Besides, Almoosawi, Vingeliene and Gachon (2019) concluded on their analysis of cross-sectional studies which have shown that evening chronotype was associated with lower intake of fruits and vegetables and higher intake of energy drinks, alcoholic, sugary, and caffeinated beverages, as well as higher energy intake from fat. Meanwhile, they found limited number of observational studies which demonstrated that evening chronotype was potentially related to changes in timing of food intake, irregular eating, and meal skipping, particularly breakfast skipping. No study has been conducted to determine the chronotype of firefighters. Therefore, more research is needed to be conducted to determine the association between chronotype and body weight status among this profession.

Multiple factors have been shown to be associated with overweight and obesity among adults, such as meal consumption pattern (Jakubowicz et al., 2013; Watanabe et al., 2014), physical activity level (Bradbury et al., 2017; Lee et al., 2010; Polzien et al., 2014) and sleep quality (Cooper et al., 2018; Kristiř, řtefan, & Sporiř, 2018). However, the associations between these factors and obesity in firefighters were found to be inconsistent. For example, Elliot et al. (2007) and Ranby et al. (2011) failed to show an association between physical activity and obesity in firefighters. Similarly, a recent study done by Kaipust et al. (2019) showed no association between sleep quality and obesity in firefighters. Therefore, more studies are needed to be conducted to

determine factors associated with overweight and obesity among firefighters, particularly in Malaysia.

In summary, studies on firefighters between body weight status and its contributing factors are scarce. In US, there are a number of published studies of firefighters which showed high prevalence of overweight and obesity in this profession (Baur et al., 2012; Jitanrin, Poston, Haddock, Jahnke, & Day, 2014; Poston et al., 2018). However, they did not further examine the underlying factors. In Malaysia, there is no published study determining factors associated with body weight status among firefighters. Therefore, this study aimed to determine the associations between sociodemographic factors, lifestyle factors and chronotype with body weight status among firefighters. The followings research questions were to be answered in this study:

1. What is the prevalence of overweight and obesity among firefighters?
2. What is the chronotype of firefighters?
3. What are the associations between sociodemographic factors, lifestyle factors and chronotype with body weight status of firefighters?

1.3 Significance of the Study

No published studies have been conducted to determine the factors associated with body weight status of firefighters in Malaysia. The present study will contribute by adding new knowledge regarding the associated factors with body weight status of firefighters. Additionally, this study can act as baseline data for future studies on body weight status of firefighters in Malaysia. Appropriate and effective intervention programs can be executed by health professionals on healthy weight control among firefighters according to their chronotype differences. In addition, this study can

provide nutritionists more insight regarding nutritional status of shift-workers thus helping nutritionists to design appropriate weight management programs for shift-workers to maintain a healthy body weight.

1.4 Research Objectives

1.4.1. General Objective

To determine the factors associated with body weight status among firefighters in Selangor.

1.4.2. Specific Objectives

- i. To examine sociodemographic factors (age, education level, monthly personal income and monthly household income) and lifestyle factors (meal pattern, physical activity, sleep quality, social jetlag) of firefighters.
- ii. To identify chronotype of firefighters.
- iii. To assess body weight status of firefighters.
- iv. To determine the associations of sociodemographic factors, lifestyle factors and chronotype with body weight status among firefighters.

1.5 Research Hypothesis

There are significant associations of sociodemographic factors, lifestyle factors and chronotype with body weight status among firefighters in Selangor.

1.6 Research Framework

As demonstrated in Figure 1.1, sociodemographic factors, lifestyle factors and chronotype are the independent variables while body weight status of firefighters is the dependent variable in this study.

Sociodemographic factors such as age and education level were found to be associated with BMI (Wang, Abdin, Sambasivam, Chong, & Vaingankar, 2016). The prevalence of overweight and obesity had been shown to be increasing significantly with age (El-hazmi & Warsy, 2002). Furthermore, education level and wealth were shown to be positively associated with prevalence and incidence of overweight in men and women (Rai, Jaacks, Bromage, & Barik, 2018).

A 7-year cohort study conducted by Kahleova, Lloren and Mashchak (2017) among American adults showed that there was an association between meal frequency per day with BMI. A randomized controlled trial among overweight and obese adults showed that meal consumption pattern such as high carbohydrates and protein breakfast was associated with weight loss (Jakubowicz, Froy, Wainstein, & Boaz, 2012). Physical activity plays an important role in maintaining a healthy body weight (Liu, Wang, Ma, Sa, & Zhuang, 2018). Observational studies have shown that people who do comparatively more physical activity have a lower BMI than less active people (Besson et al., 2009; Bradbury, Guo, Cairns, & Armstrong, 2017; Orsini et al., 2007). Chronotype has direct association with BMI, in which evening type people have greater BMI and sleep duration was found to be negatively associated with BMI (Anothaisintawee et al., 2018).

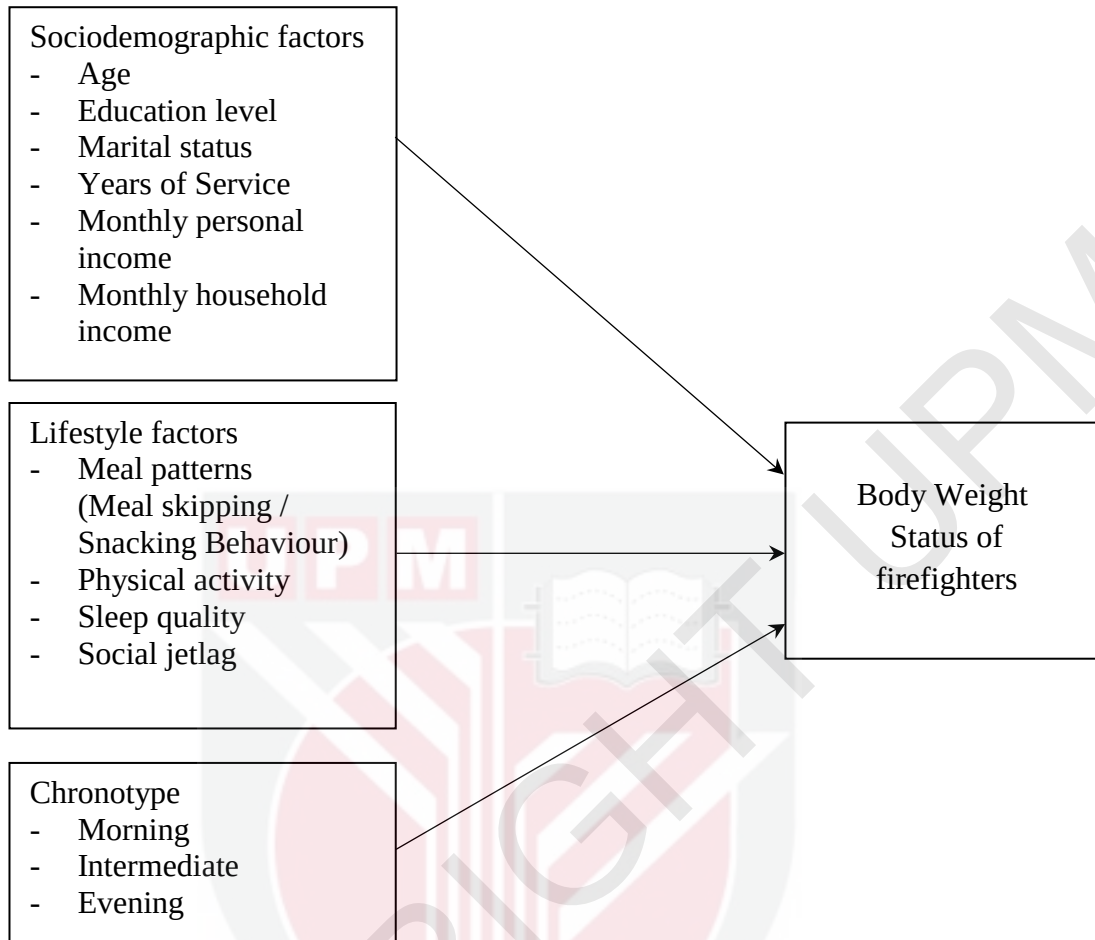


Figure 1.1: Research framework of this study

CHAPTER 2

LITERATURE REVIEW

2.1 Overview of Overweight and Obesity

Overweight and obesity is defined by the WHO as having abnormal or excessive fat accumulation and present a risk to health (WHO, 2011). In year 2019, the number of people who were obese in the entire world population has recorded at a remarkably high figure of approximately 2.1 billion, which made up about 30% of the total population (World Population Review, 2019). This number continued to rise and over 3 million people each year die from obesity. In fact, the worldwide obesity rate has tripled since 1975 (World Population Review, 2019).

The United States (US) and the United Kingdom (UK) are two of the most economically enriched and developed countries in the world and both of these countries were ranked 12th and 36th respectively in a recent world-population-obesity review. Overall, the prevalence of obesity reported among US adults was 39.8% and this prevalence was higher among adults aged 40–59 (42.8%) than in adults who aged 20–39 (35.7%) (Hales, Carroll, Fryar, Ogden, & Ph, 2017). The data collected (from year 2013 to 2014) by the National Health and Nutrition Examination Survey (NHANES) also revealed that on average, 1 in 3 adults (37.7%) was considered to have obesity ($\text{BMI} \geq 30 \text{ kg/m}^2$) and about 1 in 13 adults (7.7%) was considered to have class-3 or extreme obesity ($\text{BMI} \geq 40 \text{ kg/m}^2$) (Flegal, Kruszon-moran, Carroll, Fryar, & Ogden, 2016).

The trends in obesity and severe obesity prevalence in US youths and adults from year 2007-2008 to year 2015-2016 was studied by Devito, French, and Goldacre (2018). It was found that the prevalence of obesity among youth rose from 16.8% (in

2007–2008) to 18.5% (in 2015–2016). As for adults, the prevalence of obesity increased from 33.7% (in 2007–2008) to 39.6% (in 2015–2016). Meanwhile in UK, the Health Survey for England (HSE) in year 2017 found that among 7,997 adults participated in the survey, the prevalence of overweight or obesity was as high as 64%. Men were more likely to be overweight but women on the other hand, were more likely to be obese (NHS Digital, 2017).

Although Asian countries have some of the lowest prevalence of overweight and obesity worldwide, they are experiencing alarming rates of increase in recent years. China, one of the most populated countries for instance, had been experiencing an increase in obesity rate. Between 1980 and 2013, China's overweight and obesity prevalence in adults rose from 11.3% to 27.9% (Cheong & Re, 2014; IHME, 2014). Meanwhile, in Malaysian adults, obesity had reached an epidemic level to the extent that Malaysia was the leading country in South East Asia in obesity prevalence (14%) in year 2008 (Cheong & Re, 2014). In fact, a three-fold increase in obesity prevalence had been observed from year 1996 (4.4%) to year 2006 (14.4%) (Cheong & Re, 2014; Khor, 2012). After year 2006, the trend of adulthood overweight and obesity continued to show a significant rise. This increasing trend was reported in the NHMS, in which the prevalence of overweight and obesity among adults aged 18 years old and above was found to be 29.1% and 14.5% in 2006 (IPH, 2006), 29.4% and 15.1% in 2011 (IPH, 2011), and 30.0% and 17.7% in 2015 (IPH, 2015) as well as 30.4% and 19.7% in 2019 (IPH, 2020).

The primary cause of overweight and obesity is an energy imbalance between calories consumed and calories expended (WHO, 2018). Overweight and obesity are correlated with a number of non-communicable diseases (NCDs) which includes

cardiovascular diseases, musculoskeletal disorders, diabetes mellitus and development of some cancers (WHO, 2018).

2.1.1 Overweight and Obesity in Firefighters

The prevalence of obesity in firefighters was explored in a number of studies worldwide (Gurevich et al., 2017; Jahnke et al., 2013; Poston et al., 2011; Soteriades, Hauser, Kawachi, Christiani, & Kales, 2008). However, the underlying factors associated were not studied further. The perspective of great physical fitness and low prevalence of obesity among firefighters was not accurate when a study published in year 2011 showed that alarmingly high prevalence rates of overweight ($\text{BMI} \geq 25 \text{ kg/m}^2$) and obesity ($\text{BMI} \geq 30 \text{ kg/m}^2$) were found in career (79.5%; 33.5%) and volunteer firefighters (78.4%; 43.2%) in US (Poston et al., 2011). In fact, the obesity rate in the US fire service has been rising and reached the epidemic level (Baur, Christophi, Tsismenakis, Jahnke, & Kales, 2012). In New York, a previous study conducted by Smith et al. (2012) found that 51.7% of the firefighters ($n=116$) were obese. Another study conducted by Jitnarin, Poston, Haddock, Jahnke, and Day (2014) reported a mean BMI of 28.6 kg/m^2 , a mean body fat percentage of 23.2%, and a mean waist circumference of 97.3 cm among 994 firefighters in US.

A 6-month-study concerning weight loss advice and its effect on weight changes among 757 overweight and obese male firefighters conducted by Brown et al. (2016) had reported that healthcare professional weight advice was not significantly associated with weight loss or other outcomes. Thus, more research on the effective and feasible management of body weight status shall be conducted to address obesity within this occupation. On the other hand, Leischik, Foshag, Strauß, Littwitz, and Garg (2015) compared the metabolic parameters among 198 German civil servants which

consisted of firefighters, police officers and sedentary clerks. Findings revealed that there was a significant difference in waist circumference between the firefighters and police officers (OR = 5.63, 95% CI= 2.10– 9.15, $p = 0.002$), in which firefighters had lower ($89.8 \text{ cm} \pm 10.0$) waist circumference than the police officers ($97.8 \text{ cm} \pm 12.4$). The difference also found to be statistical significant between the firefighters and sedentary clerks (OR= 4.89, 95% CI= 1.24 – 8.55, $p = 0.009$) with sedentary clerks had a higher ($97.3 \text{ cm} \pm 11.7$) waist circumference than the firefighters. The firefighters also had lower body fat percentage ($17.7\% \pm 6.2$) than the police officers ($21.4\% \pm 5.6$) and the difference was significant between these two occupations (OR= 2.75 , 95% CI= 0.92–4.59, $p = 0.004$). However, the difference was not significant from the sedentary clerk ($20.8\% \pm 6.5$) (OR= 1.98, 95% CI= -0.29–4.25, $p = 0.086$). As for BMI, the firefighters were reported to have lowest BMI ($25.9 \text{ kg/m}^2 \pm 6.2$) as compared to police officers ($28.0 \text{ kg/m}^2 \pm 3.2$) and sedentary clerk ($26.4 \text{ kg/m}^2 \pm 4.1$). There was a statistical difference between firefighters and police officers (OR= 1.65, 95% CI= 0.57 – 2.74, $p = 0.003$) but no statistical difference found between firefighters and sedentary clerk (OR = 0.08, 95% CI= -1.22 – 1.39, $p = 0.899$).

In UK, a cohort study conducted by Munir, Clemes, Houdmont, and Randall (2012) reported an increasing trend in obesity among 735 male firefighters from year 2008 to 2011. The obesity rate in 2008 was 11% and rose to 13% in 2011, while the figures of overweight rate were also high (54% in 2008 and 53% in 2011). This indicated the proportion of overweight firefighters was higher than that found in the general population samples (42%) in UK.

Another cohort study by Kiss et al. (2014) in Belgium assessed the cardiorespiratory fitness in a large representative sample of male firefighters ($n=1225$) aged 18 to 59. Results showed that more than half of the firefighters were overweight

(41%) or obese (16%). A large proportion of firefighters (52%) with body fat percentage $\geq 25\%$ was also reported. A study in Russia carried out by Gurevich et al. (2017) among 167 male firefighters revealed that 22% were obese based on BMI, 60% based on body fat and 20% based on waist circumference. However, as many as 65% (obese based on body fat) and 36% (obese based on waist circumference) were false negatives when assessed on their BMI. Thus, Gurevich et al. (2017) suggested that there is a need to assess body weight status through different parameters for a more reliable result.

In Malaysia, a study done by Rahimi et al. (2017) on 230 male firefighters showed that 46.5% of the firefighters were overweight and 10.3% were obese. As a result, factors associated with body weight status in this occupation needed to be studied as obesity can lead to high risk of job disability among firefighters. Soteriades, Hauser, Kawachi, Christiani, and Kales (2008) found that an increase of one-unit in BMI was associated with a 5% increased risk of job disability. When compared to firefighters with lowest tertile of BMI ($< 27.2 \text{ kg/m}^2$), those in the highest BMI tertile ($\geq 30.2 \text{ kg/m}^2$) had a significantly increased risk of an adverse employment event with a multivariable-adjusted hazard ratio (HR) of 1.98 (95% CI 1.06–3.72) (Soteriades et al., 2008). Therefore, body weight status of firefighters should be a concern. Appropriate interventions need to be conducted to ensure healthy weight among firefighters in order to increase their work performance and to prevent non-communicable diseases.

2.2 Association between Sociodemographic Factors and Body Weight Status

Epidemiological studies had reported that sociodemographic characteristics of individuals in any region are among the most important determinants of overweight

and obesity (Longo, Segheto, Governador, & Coelho, 2015). Therefore, sociodemographic determinants of overweight and obesity had to be determined to help in designing intervention plans and programs to promote a healthy lifestyle and prevention and control of overweight and obesity.

2.2.1 Age

Consistent findings from a number of studies showed that age is associated to body weight status. According to Kolahi, Moghisi and Ekhtiari (2018) in Iran, except for the 20-29 years old age group (overweight or obese = 38.1%), most participants in other age groups were overweight or obese [30-39 years (57.9%), 40-49 years (69.1%), 50-59 years (69.6%) , ≤ 60 (69.7%)] and the differences among these groups were significant ($p < 0.001$). The study also indicated that majority of those aged 50 – 59 years and ≤ 60 years had the highest abdominal obesity (51.2% and 54.7%, respectively) as compared to the other age groups [20-29 years (17.7%), 30-39 years (34.6%), 40-49 years (48%)].

In a population-based study ($n = 2022$) conducted among adults aged 20-59 years old in Brazil, body composition such as abdominal circumference was found to be positively associated with age ($p < 0.001$) (Longo et al., 2015). Besides, obesity and overweight were also reported to be higher at ages 31–35 than at ages 16–20 (8.4 % compared to 20.9 %, and 12.8 % compared to 28.4 %, respectively) based on a cross-sectional analysis conducted among 5475 adolescents and young adults in Malaysia (Pell et al., 2016). The proportion of underweight and normal BMI was also lower in the older age groups (21.7% at ages 16–20 versus 4.6% at ages 31–35, 56.7% at ages 16–20 and 46.1% at age 31–35, respectively). Results showed that one unit increase

in age leads to an increased probability of 1.05 ($p < 0.001$) of being overweight and 1.06 ($p < 0.001$) increase of being obese (Pell et al., 2016).

2.2.2 Marital Status

A study conducted among Greek adults (Tzotzas et al., 2010) found that the prevalence of overweight and obesity were 35.2% and 22.3% respectively. When looking at risk comparison, married men were found to be at higher risk of obesity (OR: 2.28; 95% CI: 1.85-2.81). Similarly, married women were also found to be at higher risk of obesity (OR: 2.31; 95% CI: 1.73-3.10) than those who were unmarried. Also, a greater risk of abdominal obesity was found in married men (OR: 3.40; 95% CI: 2.86-4.03) and in married women (OR: 2.40; 95% CI 2.00-2.88) as compared to unmarried ones.

Besides, there was also another study conducted in Iran which found that marital status was an influence in increasing the likelihood of developing overweight, obesity, and abdominal obesity in both men and women (Janghorbani, Amini, Delavari, & Alikhani, 2008). The study had found that married men and women had twice higher prevalence of overweight (OR: 2.24; 95% CI: 2.08 – 2.41 ; OR: 2.36; 95% CI: 2.20 – 2.53) than non-married men and women. In addition, the prevalence of abdominal obesity was also twofold higher among married men (OR: 2.02; 95% CI: 1.79 – 2.29) and about threefold higher among married women (OR: 2.87; 95% CI: 2.69 – 3.06).

However, in another study, there was different findings reported in which there was no association found between marital status and body weight gain in men (Suzuki, Wuren, Kuriki, & Study, 2019). The association was only significant for the women, where the ORs were 0.31, 1.00 and 0.77 (0.17–0.58, and (0.52–1.29), $p < 0.001$) as

per their marital status: unmarried, married, and bereaved/divorced, respectively. The study concluded that single women had higher body weight than married women.

2.2.3 Education Level

A local study conducted by Tan and Yen (2011) among 3040 adults aged 25 to 64 years found that less-educated Chinese and Malays were more likely to be overweight and obese than their higher educated counterparts. Another study conducted by Wang et al. (2016) among Singaporean citizens aged 18 years old and above also found that obesity was inversely associated with education level, with lower education linked to higher risk of obesity. Besides, a population-based study across 2,022 adults which was conducted by Longo et al. (2015) in Brazil had also reported a significant difference between years of education received with waist circumference ($p < 0.001$). In Iran, Zeinali, Habibi, Samadi, Azam, and Djafarian (2016) conducted a cross-sectional study among 380 elderly people had shown that education level was one of the significantly associated factors with BMI ($p < 0.001$) and waist circumference ($p = 0.01$). Individuals who received longer years of education or highly educated are more likely to be health conscious and have greater knowledge to the access to health information, thus they are unlikely to be linked with overweight and obesity as compared to individuals who are lower educated (Tan & Yen, 2011).

2.2.4 Income Level

Income level had shown different results in relation to body weight status among adults population. A cross-sectional study in Singapore examining sociodemographic association with BMI of 6616 residents (including Singapore citizen and Permanent Residents) aged 18 years old and above showed no significant association between

different income levels (below \$SD 20,000; \$SD 20,000 to 49,999; \$SD 50,000 and above) and overweight or obesity ($p > 0.05$) (Wang et al., 2016). However, a study in Malaysia conducted by Tan and Yen (2011) reported that high income earners among Malays and Chinese were significantly associated with overweight than lower income earners. When switching the focus to adolescents, a cross-sectional study with 3798 adolescents aged 12 years old who came from 136 different primary schools in Kuala Terengganu and Besut showed that there was a significant association between household income and obesity among these adolescents (Zulaily et al., 2017). Nonetheless, the association between family income and obesity was not found in a study conducted by Sidik and Rampal (2009) among 972 obese women in Selangor ($p = 0.189$). Thus, the association of income level and body weight status needs to be studied further.

2.3 Association between Lifestyle Factors and Body Weight Status

Obesity had been portrayed by several current evidence as a multifactorial condition that arises due to many variables, including genetic, demographic and lifestyle factors. Among these factors, lifestyle factors which include sedentary behaviors, physical inactivity and unhealthy dietary habits in association with overweight and obesity are often the modifiable factors (Al-hazaa, Abahussain, Al-sobayel, Qahwaji, & Musaiger, 2012). Primary prevention of obesity by promoting a healthy diet and active lifestyles should be a national public health priority (Al-hazaa et al., 2012). However, limited study was conducted to determine the association of these factors with body weight status of firefighters. Therefore, studies on adults were reviewed.

2.3.1 Physical Activity

Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure, in which energy expenditure is measured in kilocalories (WHO, 2019). Physical activity is often confused with the term “exercise” where exercise has been defined as a subset under physical activity is defined as a planned, structured, repetitive physical activity which aims to improve or maintain one or more components of physical fitness (WHO, 2019). The cornerstone of lifestyle interventions include reduced energy intake and increased energy expenditure, and a key behavior for enhancing weight loss is physical activity (Polzien, Neiberg, Rickman, & Erickson, 2014).

A study conducted in Malaysia among 214 males and 172 females in determining the status of physical activity level and body mass index (BMI) had shown that there was a negative correlation between physical activity and BMI ($r=-0.24$, $p<0.001$). The study also found that the obese group (obese class I) had lower physical activity than other groups at the significance level of $p<0.05$, $F(4,381)=10.483$, $p<0.001$ (Iskandar, Mohamad, & Othman, 2017).

A review conducted by Swift et al. (2014) explored the role of physical activity (PA) and exercise training (ET) in the prevention of weight gain, initial weight loss, weight maintenance, and the obesity paradox reported that aerobic ET programs consistent with public health recommendations may promote up to modest weight loss (approximately 2 kg). The review also concluded that ET, regardless of weight loss, provides numerous health benefits especially for overweight and obese individuals at risk for cardiovascular diseases or with current cardiovascular conditions.

In addition, association was also reported in a prospective cohort study conducted to assess physical activity and weight gain prevention among a total of

34,079 healthy US women with a mean age of 54.9 years old (Lee et al., 2010). Findings showed that those with lower physical activity level (expending 7.5-<21 and <7.5 MET-hr/week) significantly gained more weight (0.11 kg and 0.12 kg, respectively) than women with higher physical activity level (expending ≥ 21 MET-hr/week) (Lee et al., 2010).

An 18 months period randomized clinical trial study conducted among 260 adults aged 18 to 55 years in US revealed that physical activity level was positively associated with weight loss (Polzien et al., 2014). Subjects who recorded MET-min/week for MVPA ≥ 10 was significantly greater in number in the group of weight loss (WL) $\geq 10\%$ compared to the group of weight gain (GAIN), weight loss 5-10% (WL <10%). Furthermore, a cross-sectional study conducted in UK among 119 230 men and 140 578 women aged 40–69 years indicated that BMI and body fat percentage were highly correlated ($r=0.85$ in women; $r=0.79$ in men) (Bradbury et al., 2017). Both of these parameters were negatively associated with physical activity. The same study also reported that for a given BMI, greater physical activity was associated with lower mean body fat percentage (for a BMI of 22.5–24.99 kg/m²) had 2.0 (95%CI 1.8 to 2.2) percentage points lower body fat in men and 1.8 (95% CI 1.6 to 2.0) percentage points lower body fat in women (Bradbury et al., 2017).

In Brazil, a study concerning the combined physical activity (PA) and sitting time (ST) and their contribution to BMI among 1411 adults aged 18-65 years was done by Lopes (2017). This study indicated that there was an inverse association between “low weight” and “active / not sedentary” (OR=0.15, 95% CI=0.03-0.67), “obese” and “active / sedentary” (OR=0.45, 95% CI=0.26-0.77) and “obese” and “active / not sedentary” (OR=0.52; 95% CI=0.32-0.48). Inverse association was also found between “low weight” and “active / not sedentary” (OR=0.35, 95% CI=0.13-0.93),

“overweight” and “active / sedentary” (OR=0.63, 95% CI=0.43-0.92), “obese” and “active / sedentary” (OR=0.56; 95% CI=0.35-0.92), “obese” and “active / sedentary” (OR=0.52; 95% CI=0.33- 0.82). These studies showed that there was a negative association between physical activity and body weight status.

On the other hand, contradicting finding was reported in a recent cross-sectional study to assess correlation between physical activity with obesity among 216 medical students in Sudan (Yousif & Kaddam, 2019). In the study, it was observed that 44.9% of the students had low physical activity level, 32.0% had moderate physical activity level while 23.1% had high physical activity level. Nonetheless, the relationship between physical activity and BMI was not significant ($p = 0.133$).

2.3.2 Sleep Quality

In Iran, a cross-sectional study conducted among 118 firefighters by Abbasi et al. (2018) to identify factors affecting sleep quality had suggested a positive relationship between sleep quality and BMI ($p < 0.001$). Firefighters who had poorer sleeping quality had higher BMI reported. Besides, a cross-sectional study was conducted by Kristić, Štefan, and Sporiš (2018) to assess the associations between sleep duration and sleep quality with BMI among young adults in Croatia (N = 2100). Findings showed that both short (<6 h/day, OR = 2.72; 95% CI = 1.27 - 5.84, $p < 0.01$) and long (>10 h/day, OR = 3.38; 95% CI = 2.12 - 5.40, $p < 0.001$) time spent in bed were associated with a greater possibility of becoming overweight or obesity. The study also demonstrated that poor sleep quality (>5 points, OR = 1.45; 95% CI = 1.14 - 1.83, $p < 0.01$) was associated with a greater likelihood of being overweight or obese.

A large scale epidemiology study (n=63,433) conducted in Germany by Roenneberg et al. (2012) had shown that average sleeping duration was significantly

associated with higher BMI, controlling for age and sex (partial correlation between average sleep duration and BMI, $r = -0.082$, $p < 0.0001$). In addition, a large cross-sectional study ($n=107,718$) assessing relationship between sleep quality and BMI among Korean individuals suggested that poor sleeping quality was associated with severe obesity in male subgroup (OR =1.16; 95% CI =1.05 – 1.27, $p < 0.001$) and in the female subgroup (OR =1.66 ; 95% CI =1.40 – 1.98, $p < 0.001$) (Park, Jung, Oh, McIntyre, & Lee, 2018).

2.3.3 Social Jetlag

Social jetlag is defined as the discrepancy between biological and social timing (Wittmann, Merrow, & Roenneberg, 2006). It quantifies the discrepancy that often arises between circadian and social clocks, which subsequently leads to affect in sleeping duration that causes chronical sleep loss (Roenneberg, Allebrandt, & Merrow, 2012). It is measured by the absolute difference between mid-sleep times on free days and on workdays (Wittmann et al., 2006). As the circadian clock has great control on body homeostasis, experience in social jetlag can be contributing to weight-related-pathologies (Roenneberg et al., 2012). As social jetlag disrupts sleeping duration such as sleep timing, thus it is also reasonably possible that social jetlag has similar effects on gene expression and affects healthy habits (e.g meal timing) that may further give impact to health (Parsons et al., 2016).

The prevalence of social jetlag was found to be high in previous studies, in which averagely 69% of adults had experienced at least 1 hour of social jet lag (Roenneberg & Merrow, 2007; Roenneberg et al., 2012; Rutters et al., 2014; Wittmann et al., 2006). It was suggested that social jetlag experienced by adults may disturb the physiological processes such as blood pressure and glucose metabolism. Despite the

high prevalence reported, there was limited studies investigating the relationship between social jetlag with metabolic consequences.

Roenneberg et al. (2012) found that the correlation between sleeping duration and BMI was highly significant. This correlation was positive and doubled on work-days as compared to free-days in the studied population (work days, $r = -0.079$, $p < 0.0001$; free days: $r = -0.046$, $p < 0.0001$, $n = 64,106$). Thus, this positive association between social jetlag and obesity suggests that social jetlag is a contributing factor to obesity.

A cross-sectional study conducted by Mota, Silva, Cristina, Balieiro, and Makin (2017) which aimed to study the association between social jetlag and metabolic control in non-communicable chronic disease reported that 792 patients (from several countries: Uberlândia, Minas Gerais State, Brazil) were found to have higher risk of being overweight ($BMI \geq 25 \text{ kg/m}^2$) for individuals that presented social jetlag ($>1 \text{ h}$) ($OR=2.0$, $CI=1.2-3.6$, $p=0.006$) in comparison with those without social jetlag ($\leq 1 \text{ h}$). Similarly, a cohort study done by Parsons et al. (2016) showed that social jetlag was significantly associated with overweight. Individuals with greater social jetlag scores had higher mean BMIs ($\beta = 0.10$, $p = 0.012$) and more fat mass ($\beta = 0.08$, $p = 0.031$) were more likely to be obese ($OR = 1.2$, $95\% \text{ CI: } 1.0-1.5$, $p = 0.045$) (Parsons et al., 2016).

A cross-sectional study conducted in Japan examining the association between social jetlag and obesity among 1375 male factory workers found that workers who experienced extreme social jetlag ($> 3 \text{ hours}$) had significantly higher obesity rate and central obesity after controlling for age, presence of night shift work, chronotype and sleep duration (Kuroda et al., 2018). These findings indicated that body weight status is affected by the discrepancy of sleeping time between work days and work-free-days.

In contrast, a 2 years cohort study conducted by McMahon et al. (2018) to examine relationship between social jetlag and obesity among 390 healthy adults aged between 21 – 35 years old had observed that there was no significant association found between social jetlag with obesity (OR = 0.93, 95% CI: 0.73 – 1.16, $p = 0.71$). However, this may be attributed to the relatively lower number of respondents (16.0%) with elevated social jetlag (≥ 2 hour) which was more likely to be associated with changes in body weight status.

2.3.4 Meal Patterns

Body weight status is greatly affected by meal patterns of individuals. Recent studies in humans have reported that calories ingested in the morning are utilized more efficiently by body than calories ingested in the evening and this is manifested through the improved weight loss studies, even under-iso-energetic calorie intake (Johnston, Morgan, & Johnstone, 2018). A cross-sectional study in Japan demonstrated that skipping breakfast was correlated with obesity (Watanabe et al., 2014). The study further found that in both Japanese males and females, dietary habits such as eating dinner less than three hours before bedtime and skipping breakfast were significantly related to obesity (Watanabe et al., 2014). When comparing the dietary habits, skipping breakfast was more strongly correlated with obesity than eating dinner less than three hours before bedtime (Watanabe et al., 2014).

A randomized trial study which assessed different calorie intake at breakfast and dinner and their respective influences on weight loss in overweight and obese women showed that higher calorie breakfast group manifested greater weight loss and waist circumference reduction than that of higher calorie dinner group (Jakubowicz, Barnea, Wainstein, & Froy, 2013).

Furthermore, meal timing and frequency are also important factors associated with body weight status. Kahleova et al. (2017) conducted a cohort study among 50,660 adults aged 30 years old and above from Adventis church members in US and Canada. The 7 years follow up results reported that adults who ate 1 or 2 meals per day had a reduction in BMI per year as compared with those who ate 3 meals per day. On the other hand, the results also reported that eating more than 3 meals of snack per day was significantly associated with a relative increase in BMI ($p < 0.001$). Breakfast eaters also showed significant decrease in BMI as compared to breakfast skippers ($p < 0.001$). These results further confirmed the findings from similar studies which have concluded total kilocalorie consumed, meal frequency and meal timing are associated with weight control.

In addition, in Bangladesh, a cross-sectional study conducted by Goon and Islam (2014) to determine association between breakfast skipping and obesity among 426 urbanite adults had found that 39.5% of the respondents skipped breakfast and they showed significantly high prevalence of obesity ($\chi^2 = 30.15$, $p < 0.05$). Hence, skippers were significantly more likely being obese (OR 3.5; 95% CI 2.2-5.5).

Likewise, another cross-sectional study conducted in US among residents aged 20 – 70 years old to evaluate the relation of eating patterns and obesity had reported that a greater frequency of eating in a day was associated with a lower risk of obesity (OR = 0.55, 95% CI = 0.33 - 0.91). Those who ate 4 times or more had lower risk of obesity as compared to those who ate 3 times or fewer eating episodes (Ma et al., 2003). In contrast, skipping breakfast was found to be associated with higher prevalence of obesity (OR = 4.5, 95% CI = 1.57 -12.90), the same outcome was observed for those who reported greater frequency of eating breakfast or dinner away from home (Ma et al., 2003).

In contrast, there were also studies reported no significant association between eating behavior and body weight status. A study in Egypt conducted among 125 nurse students by Mahmoud and Taha (2017) revealed that there was no significant correlation between eating habits and BMI ($p>0.05$). Even though majority of the students were never, rarely and occasionally consumed breakfast daily (12%, 16.8% and 26.4%), as well consumed three meals every day (7.2%, 19.2% and 34.4%), these behaviors did not show any associations with BMI ($p>0.05$). Furthermore, findings also showed that the habits of repeatedly, often and occasionally consumption of fast food as well as fatty food (22.4%, 19.2% and 29.6%) and also snacking between meals (14.4%, 13.6% and 35.2%) were not associated with BMI ($p>0.05$).

2.4 Association between Chronotype and Body Weight Status

Circadian clock aligns individuals' behavior and physiology with environmental changes. Circadian clock adapts to the time giving signals, mainly the light–dark cycle as well as nutrient cycle of fasting–feeding, creating a circadian rhythm of approximately 24 hours (Maukonen, Kanerva, Partonen, Kronholm, & Tapanainen, 2017). It was known that humans showed large individual variability in entrainment characteristics, resulting in differences in timing of activity preference and preferred behavioral circadian rhythm, also described as “phase of entrainment” or “chronotype” in chronobiology (Horne & Ostberg, 1976; Huang et al., 2011; Punder, Heim, & Entringer, 2019).

Chronotype is defined as the expression of circadian rhythmicity in an individual which can be classified into three categories: morning types, evening types and intermediate types (Toktas et al., 2018; Vitale & Weydahl, 2017). Morningness and eveningness reflect personal differences in the circadian rhythms of various

biological and psychological processes (Prieto et al., 2012). Individuals who are characterized by a more extreme position toward morningness are usually known as “early larks,” whereas those who show a more extreme eveningness are known as “night owls”. Morning type individuals are early risers, perform mentally and physically at their best in the morning hours, and go to bed early in the evening. Evening type individuals stay up late at night, rise at a later time in the morning, and perform best mentally and physically in the late afternoon or evening (Róbert Urbán, Tímea Magyaródi, 2011). In other words, chronotype is the characteristic that indicates which time of the day the person prefers for rest and activity and may affect metabolism of individuals which further affects body weight status (Haraszti et al., 2014; Toktas et al., 2018).

Evening types are more prone to misalignment of the circadian clock resulting from desynchrony between chronotype and social demands, for example, due to work schedules (Maukonen et al., 2017). Furthermore, numerous studies have shown that as compared with morning types, evening types have unhealthier behaviors such as unhealthier dietary habits, poorer sleep patterns, and smoking (Maukonen et al., 2017). Animal trials as well as intervention and epidemiological studies on humans have shown that abnormal circadian timing of energy intake may lead to metabolic dysfunctions and weight gain (Aljuraiban et al., 2015; Arble et al., 2009; Bo et al., 2014; Maukonen et al., 2017).

Physiologically, chronotype influences the hypothalamic–pituitary–adrenal (HPA)-axis function, including glucocorticoid release by the adrenal gland. Glucocorticoids are important regulators of lipid and glucose metabolism and alterations in HPA-axis function and have been associated with higher BMI and abdominal fat (Incollingo Rodriguez et al., 2015; Joseph & Golden, 2017; Punder et

al., 2019). Therefore, chronotype differences are closely related to body weight differences among individuals.

A cross-sectional study conducted in Turkey by Toktaş et al. (2018) on 142 university students showed that 11.1% of morning-type individuals did not skip a meal, 14.6% of intermediate-type individuals did. Moreover, all of the evening-type individuals skipped a meal. The most frequently skipped meal was breakfast in all three groups (33.3% of the morning type, 60.0% of the evening type, 44.9% of the intermediate type). However, the study did not show significant difference among the three different chronotypes in terms of BMI. This may be due to the reason that no physical activity record was taken in the study that reflected physical activity level of the studied population.

A study conducted by Anothaisintawee et al. (2018) on a total of 2133 pre-diabetic patients showed that more evening preference, greater social jetlag and shorter sleep duration patients were associated with higher BMI. When further assessed if chronotype score and BMI was mediated by these two factors (social jetlag and sleep duration), it was shown that each unit increase in chronotype score (more morning preference) was significantly associated with an increase in sleep duration by 0.055 hour (95% CI: 0.043, 0.066). The results of the BMI outcome model then revealed that increased sleep duration was significantly associated with decreased BMI, with a coefficient of -0.156 (95% CI: -0.288 , -0.024). More morning preference (higher chronotype score) was also significantly associated with lower BMI ($p = 0.024$).

A recent small-scale study conducted by Punder et al. (2019) among 28 healthy adults with a mean age 23.8 ± 3.3 years showed that lower MEQ scores (i.e. evening tendency) were associated with higher BMI ($r = -0.40$, $p < 0.05$). Another study done by Vidal, Hollanda, Canteras, and Garaulet (2016) involving 252 adults

(mean age = 52 years old) which aimed to determine the relationship between evening chronotype with obesity and weight loss had shown that evening-type adults showed significantly higher initial body weight ($p=0.015$) and BMI ($p=0.014$) than morning-type adults. Moreover, evening-types had significant difference of weight loss as compared to morning-types ($p=0.015$). Therefore, chronotype is a factor needed to be included in the study to examine its relationship with body weight status.



CHAPTER 3

METHODOLOGY

3.1 Study Design

This study was a cross-sectional study aimed to determine the associations between socio-demographic factors, lifestyle factors and chronotype with body weight status among firefighters in Selangor.

3.2 Study Location

This study was conducted at the fire and rescue department branches located in Selangor. The fire and rescue department in Selangor was divided into seven zones, which were Shah Alam, Hulu Langat, Petaling, Klang, Rawang, KLIA, and Sabak Bernam. There were a total of 36 branches in these seven zones. Each branch consists of two divisions, which were the fire safety division and the fire inspection division. Every branch operated under three teams (A, B, and C) which are directed by a branch leader. This study involved the firefighters in the fire inspection division because they were involved in shift-work basis who needed to maintain optimal body weight status in order to maintain a high performance in their job ability. The shifts came under two schedules which were 8am to 8pm and 8pm to 8am. The working schedule for each firefighter was set as “2-day work and 1-day off” routine.

3.3 Sample Size Determination

The sample size of this study was calculated based on the formula designed by Hulley, Cummings, Browner, Grader and Newman (2013) as shown in Table 3.1.

$$N = \left[\frac{(Z_{\alpha} + Z_{\beta})}{c} \right]^2 + 3$$

$$c = 0.5 * \ln \left[\frac{(1+r)}{(1-r)} \right], \text{ where;}$$

The standard normal deviate for $\alpha = Z_{\alpha} = 1.96$

The standard normal deviate for $\beta = Z_{\beta} = 0.84$

The expected correlation coefficient = r

Table 3.1: Sample size calculation for each independent variable based on the previous studies investigating the factors associated with body weight status (BMI)

Independent variables	Correlation, r	Sample size, n
Chronotype (Punder et al., 2019)	r = -0.40	$C = 0.5 * \ln [(1 + [-0.40]) / (1 - [-0.40])]$ = -0.42 $N = [(1.96 + 0.84) / (-0.42)]^2 + 3$ = 47
Age (Zeinali et al., 2016)	r = -0.37	$C = 0.5 * \ln [(1 + [-0.37]) / (1 - [-0.37])]$ = -0.39 $N = [(1.96 + 0.84) / (-0.39)]^2 + 3$ = 55
Sleep Duration (Parvaneh, Poh, & Hajifaraji, 2014)	r = -0.29	$C = 0.5 * \ln [(1 + [-0.29]) / (1 - [-0.29])]$ = -0.30 $N = [(1.96 + 0.84) / (-0.30)]^2 + 3$ = 90
Dietary patterns (<i>High Protein and Fat Pattern Score</i>) (Gutiérrez-pliego, Camarillo-romero, Montenegro-morales, & Garduño-garcía, 2016)	r = 0.307	$C = 0.5 * \ln [(1 + 0.307) / (1 - 0.307)]$ = 0.32 $N = [(1.96 + 0.84) / (0.32)]^2 + 3$ = 80
Dietary patterns (<i>Westernized Pattern Score</i>) (Gutiérrez-pliego et al., 2016)	r = 0.316	$C = 0.5 * \ln [(1 + 0.316) / (1 - 0.316)]$ = 0.33 $N = [(1.96 + 0.84) / (0.33)]^2 + 3$ = 75

The highest number of sample size was selected as the final sample size of this study, which was 90 respondents based on Table 3.1. As shown in Table 3.2, this was the additional adjustment in computing the sample size.

Table 3.2: Additional adjustment in computing the sample size.

Criteria	Adjustment	Sample size, n
Adjust for the estimated sample effect	nadj * DEFF DEFF = 1.3	117
Adjust for the expected proportion response rate	response rate = 0.90 (Munir et al., 2012)	130

After consideration of design effect and response rate, the final sample size required for this study was 130 respondents.

3.4 Respondents

The target population of this study was the firefighters in the fire inspection division in Selangor. The firefighters were selected based on the inclusion and exclusion criteria as stated in Table 3.3.

Table 3.3: Inclusion and exclusion criteria for the selection of respondents

Inclusion Criteria	Exclusion Criteria
• Malaysian • Age 18 years old and above	• Firefighters who have musculoskeletal injuries that prevent them from active, on-duty task

3.5 Sampling Design

The sampling design is shown in Figure 3.1. The fire and rescue departments in Selangor were divided into 7 zones, namely Shah Alam, Petaling, Hulu Langat, Klang, KLIA, Rawang and Sabak. A total of 36 branches, each with 2 divisions, were located in these 7 zones.

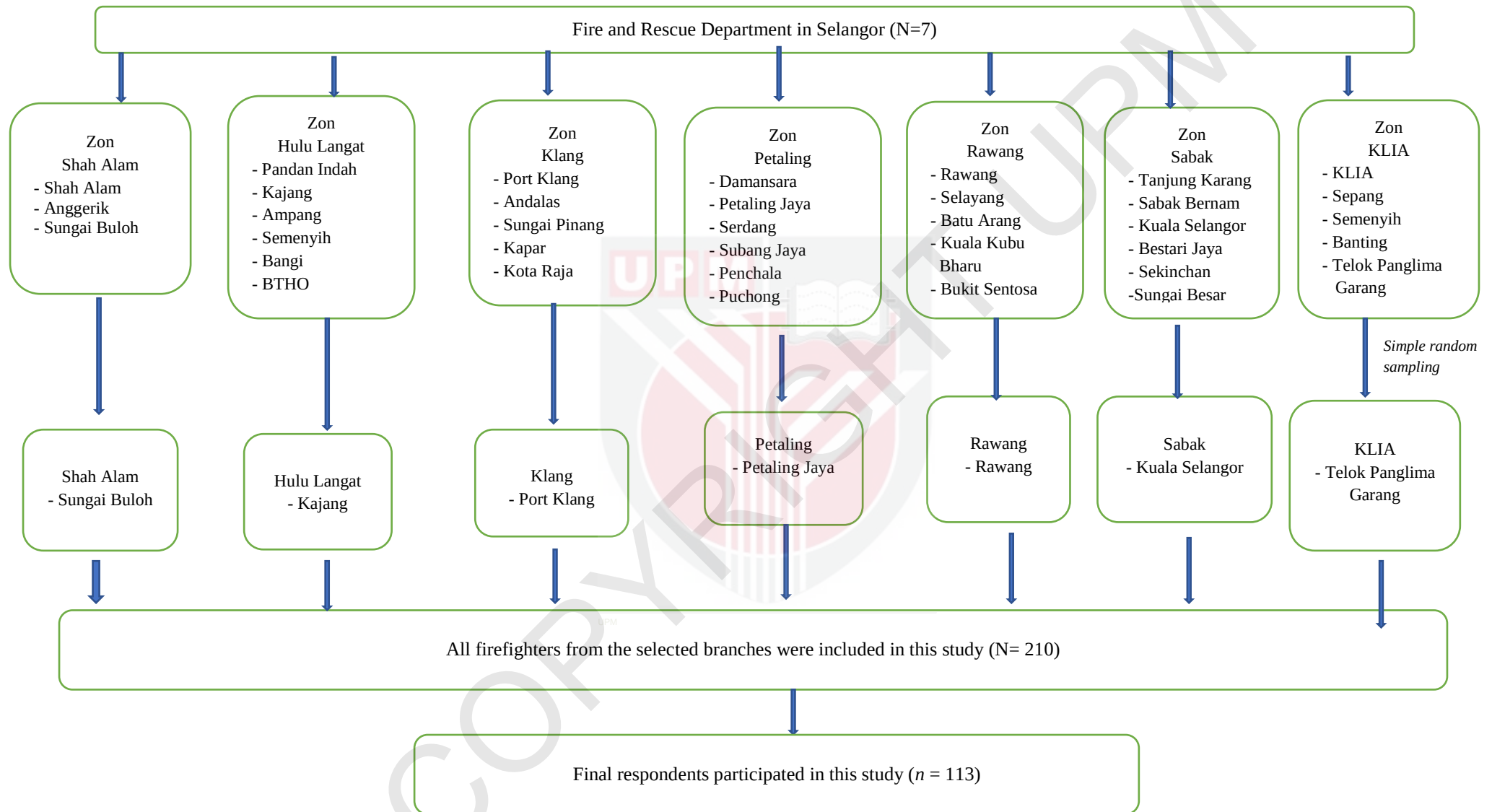


Figure 3.1. Flow chart of the sampling design of this study

This study involved the fighters in the fire inspection division. Firstly, all fire and rescue departments in all 7 zones were selected. Then, one branch was randomly selected from each zone. All firefighters in the randomly selected branches were invited to participate in this study ($n = 210$). The total number of firefighters who eventually participated in this study was 113.

3.6 Study Instruments

A self-administered questionnaire in Malay version was used in this study. The questionnaire consisted of sociodemographic background, meal pattern, physical activity, sleep quality, social jetlag and chronotype. During the period of “Movement Control Order (MCO)” due to the Covid-19 pandemic, the questionnaire was converted into online questionnaire. Anthropometric measurements (body weight, height, waist circumference and body fat percentage) was measured by the researcher prior to MCO and self-reported by respondents during MCO period. Details of the instruments used in this study were as below.

3.6.1 Self-administered Questionnaire

3.6.1.1 Sociodemographic Background

This section contained respondent’s personal information: age, marital status, education level, monthly personal income, monthly household income, fire department branch and shift routine.

3.6.1.2 Physical Activity

The Global Physical Activity Questionnaire (GPAQ) which was developed by WHO (Bull, Maslin, & Armstrong, 2009) was used to evaluate the physical activity (PA) level of the respondents in this study. It comprised 16 questions in total and it collects information on physical activity participation in three settings (or domains) which are the activity at work, travel to and from places, recreational activities as well as sedentary behavior. The result collected from the GPAQ will be analyzed through METS (Metabolic Equivalents), which is a parameter commonly used to express the intensity of physical activities. MET is the ratio of a person's working metabolic rate relative to the resting metabolic rate. One MET is defined as the energy cost of sitting quietly and is equivalent to a caloric consumption of 1 kcal/kg/hour. It is estimated that, compared to sitting quietly, a person's caloric consumption is 4 times higher when being moderately active, and more than 8 times higher when being vigorously active. Table 3.4 displayed the intensity of PA level and the comparative METs value.

Table 3.4 METs value according to intensity of physical activity (PA) level

Intensity of PA	METs
Sedentary	1.0
Moderately active	4.0
Highly active	8.0

The level of physical activity of the respondents was measured in MET-minutes/week, which was calculated through the formula as shown below:

$$MET-min / week = (MET \text{ level}) \times (Number \text{ of Minutes of activity/ day}) \times (number \text{ of days / week})$$

The level of physical activity was further classified into three categories (High, Moderate, Low) according to the total physical activity per week (MET-minute per week) based on GPAQ guideline:

(a) High: A person meeting any of the following criteria is classified in this category:

(1) Vigorous-intensity activity on at least three days achieving a minimum of 1500 MET-minute per week

(2) Seven or more days of any combination of walking, bicycling, moderate-intensity AND vigorous-intensity activities achieving a minimum of 3000 MET-minute per week.

(b) Moderate: A person not meeting the criteria for the 'high' category, but meeting any of the following criteria is classified in this category:

(1) Three or more days of vigorous-intensity activity of at least 60-minute per week

(2) Five or more days of moderate-intensity activity of at least 150-minute per week

(2) Five or more days of any combination of walking, bicycling, moderate-intensity AND vigorous-intensity activities achieving a minimum of 600 MET-minute per week.

(c) Low: A person not meeting any of the above-mentioned criteria

The GPAQ had shown its validity and reliability in estimating physical activity level and changes in physical activity level (Cleland et al., 2014). The validated Malay version GPAQ (Soo et al., 2012) was used in this study.

3.6.1.3 Sleep Quality

The Pittsburgh Sleep Quality Index (PSQI) was used to measure sleep quality and patterns of adults (Buysse et al., 1989). It assessed between “poor” and “good” sleep by measuring seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction over the last month. Respondents self-rated each of these seven areas of sleep. Scoring of the answers was based on a “0 – 3” scale, where 0 = no difficulty (better sleep quality), 1 = mild difficulty, 2 = moderate difficulty and 3 = severe difficulty (worse sleep quality). It comprised a total of 9 questions where the total scoring of the PSQI ranged from 0 to 21. A lower score denoted a better sleep quality. A total score of above 5 indicated poor sleep quality. The Malay version of PSQI showed good internal consistency and reliability (Cronbach’s α coefficient of 0.82) in assessing sleep quality among adults in Malaysia (Musa, Moy, & Wong, 2018). In the current study, PSQI showed acceptable internal consistency reliability with a Cronbach’s alpha value of 0.642.

3.6.1.4 Social Jetlag

Social jetlag or the discrepancy between work and free days was measured by calculating the absolute difference (ΔMS) between the time of mid-sleep on workdays (MSW) and mid-sleep on free days (MSF) of the respondents (Wittmann et al., 2006).

$$\Delta MS = |MSF - MSW|$$

(Unit : hours)

3.6.1.5 Meal Patterns

The meal pattern of the firefighters was assessed through the Eating Behavior Questionnaire (EBQ) (Chin & Mohd Nasir, 2009). Respondents will be questioned in terms of the number of days in a week (0 to 7 days) that they have taken main meal consumption (breakfast, lunch, dinner) and snacks. Meal skipping behavior was assessed from the total scoring of respondents: “1” score was given to respondent who did not skip any day of a particular meal (e.g breakfast) and “0” score was given to respondent who had skipped at least once of a particular meal. The scoring for each main meal consumption (breakfast, lunch, dinner) was added and the cut-off range was set at “lesser than 3” which indicated meal skipping practice of respondents. Meanwhile, snacking behavior was assessed from the total number of days in a week in which respondents had ever consumed snacks in between meals (midmorning, afternoon, and late-evening snack). A score of “0” indicated respondents never snacked between meals and a score of “1 and above” indicated respondents snacked in a week. The EBQ has been used among Malaysian adolescents (Chian, Chin, & Nasir, 2018; Tee et al., 2018) and university students (Gan et al., 2011).

3.6.1.6 Chronotype

The chronotype of the firefighters was assessed using the Morningness and Eveningness Questionnaire (MEQ), which was developed by Horne and Östberg (1976). It comprised 19 multiple-choice-questions which asked about the preferred time of different activities by individuals. Generally, the MEQ was used to estimate phase preferences in circadian rhythms based on self-description by individuals, identifying whether individuals were characterized as morning types or evening types as a continuous variable. The questions were in Likert-type responses and individuals

answered according to their preferences. The MEQ score ranged from 16 to 86. The respondents were classified into three different categories (Horne & Östberg, 1976) according to the scores acquired as shown in Table 3.5 below. Intermediate is defined as both or neither morning type or evening type and not being clearly categorized within parameters of morning or evening types (Horne and Ostberg, 1976).

Table 3.5: Scoring of MEQ and its classification

Classification	Score
Evening type	16 – 41
Intermediate type	42 – 58
Morning type	59 – 86

The MEQ was valid in assessing chronotype (Taillard, Philip, Chastang, & Bioulac, 2004). It had been used among Malaysian university students population, with good internal consistency reliability as estimated by Cronbach's α value of 0.758 (Lai et al., 2013). In the current study, the Cronbach's alpha value for MEQ was 0.505.

3.6.2 Anthropometric Measurements

3.6.2.1 Body Mass Index

Body weight and height of the respondents were measured to determine their BMI. Body weight was measured by using a TANITA Digital Weight Scale HD-319 (TANITA Corporation, Arlington Height, IL, USA) to the nearest 0.1 kg. Height was measured using a SECA portable stadiometer 213 (SECA, Hamburg, Germany) to the nearest 0.1 cm. Before weighing their weight, they were asked to remove their shoes, watch, bracelet and clearing off any heavy items on their body. Then, the respondent's BMI was calculated using formula as below:

$$\text{Body Mass Index (BMI)} = \frac{\text{body weight (kg)}}{\text{height (m}^2\text{)}}$$

The body weight status of respondents was categorised according to the WHO cut-off points (WHO, 2000) for BMI as shown in Table 3.6.

Table 3.6: Classifications of BMI

Classification	BMI (kg/m²)
Underweight	< 18.50
Normal	18.50 – 24.99
Overweight	25.00 – 29.99
Obesity Class I	30.00 – 34.99
Obesity Class II	35.00 – 39.99
Obesity Class III	> 40.00

Source: WHO (2000)

3.6.2.2 Body Fat Percentage

The body fat percentage of the firefighters was measured using Omron Karada Scan HBF-375 Body Fat Analyzer (Omron Health Care Pvt Ltd, China). The measured reading was classified according to the classification of body fat percentage which is shown in Table 3.7.

Table 3.7: Body fat category

Classification	Males
Unhealthy (too low)	≤ 5%
Acceptable (lower end)	6 ~ 15%
Acceptable (upper end)	16 ~ 24%
Unhealthy (too high)	≥ 25%

Source: Nieman (2003)

3.6.2.3 Waist Circumference

Waist circumference was measured to determine abdominal obesity among respondents by using a Lufkin Executive Thinline Tape W606PM (Cooper Hand Tools, Raleigh, North Carolina, USA). The measurement was taken by measuring the distance between around the smallest area below the ribcage and above the umbilicus. The tape shall be snug and did not compress to the skin. The classification of

abdominal obesity followed the cut off points of WHO/IOTF/IASO (2000) for male $\geq$ 90 cm.

3.6.2.4 Waist-to-Height Ratio (WHtR)

The waist-to-height ratio (WHtR) was another measure used for the assessment of the distribution of body fat. It is was calculated through the ratio of waist circumference (WC) to height. The higher the values of the ratio indicated a higher risk of obesity-related cardiovascular diseases. In general, WHtR of > 0.5 indicated increased risk of obesity (Ashwell & Hsieh, 2005).

$$WHtR = \frac{\text{Waist Circumference (cm)}}{\text{height (cm)}}$$

3.7 Study Approval

Ethics approval was acquired from the Ethics Committee for Research Involving Human Subjects in Universiti Putra Malaysia (JKEUPM; Reference No.: JKEUPM-2019-421; see Appendix A) prior to data collection. A written authorization letter was obtained from the Director of the Fire and Rescue Department of Selangor to conduct the study among the firefighters (Reference No.: JBPM/SL/KOR: 100-3/4 JLD.3 [26]; see Appendix B).

3.8 Pre-Test

The pre-test was conducted in December 2019 among 20 firefighters in a non-selected branch of the fire and rescue department. These selected firefighters were excluded from the study. The purpose of the pre-test was to assess the suitability of

the questionnaire. The respondents spent about 15 minutes to complete the questionnaire.

3.9 Data Collection

Data collection was conducted from February to April 2020. There were two phases of the data collection (Phase I and Phase II) due to the Covid-19 outbreak in the country (Figure 3.2). Phase I was conducted from 24th February to 17th March 2020, where the respondents were physically attended by researcher prior to the enforcement of MCO on 18th March 2020 onwards, whereas Phase II was carried out from 18th March to 24th April 2020 through online questionnaire during the onset of MCO.

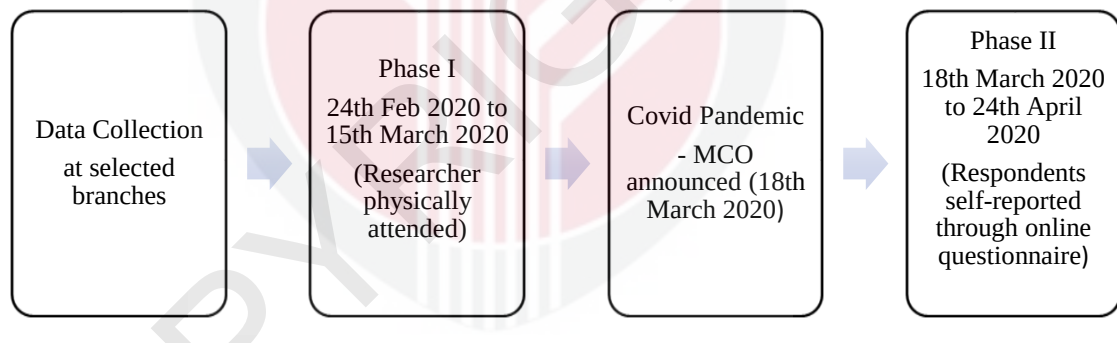


Figure 3.2: Flow chart of data collection of the study

As for Phase I, the venue of data collection was in a closed-office-space in each selected fire department. A brief explanation regarding the aims of the study was given to the respondents with an information sheet provided. Written informed consent was obtained from the respondents prior to the administration of the questionnaire. The respondents answered a self-administered questionnaire regarding information on sociodemographic factors, lifestyle factors and chronotype. After completing the questionnaire, anthropometry measurements (body weight, height, waist

circumference and body fat percentage) were measured by the researcher. Token of appreciation in the form of cereal samples was given to the respondents upon completion of the questionnaires during phase I of data collection.

In phase II of data collection, online questionnaire consisting sociodemographic factors, lifestyle factors, chronotype and anthropometric measurements for height and weight was sent to respondents to self-report the relevant data. No token of appreciation was given for phase II due to the enforcement of MCO.

3.10 Statistical Analysis

Statistical analysis was performed by using IBM SPSS Statistics 25 (IBM Corp., Armonk, NY). All variables in the study were expressed in descriptive statistic, in which categorical variables were expressed in the form of frequencies and percentages, and the continuous variables were expressed in the form of means and standard deviations. Inferential statistic was used to test the hypothesis, where level of significance was set at $p < 0.05$. Pearson product-moment correlation test was used to determine the relationship between two continuous variables, while chi-square test was used to determine the association between two categorical variables.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Screening and Recruitment of Respondents

Firefighters from 7 selected branches in Selangor were approached by researcher. The data collection was carried out in two phases from February to April 2020. Phase I was carried out in three branches (Petaling Jaya, Teluk Panglima Garang and Kajang) through researcher administered method prior to the Movement Control Order (MCO) which was implemented on 18 March 2020 due to the Covid-19 outbreak in Malaysia. Phase II was carried out in the remaining four branches (Sungai Buloh, Rawang, Kuala Selangor and Pelabuhan Klang) through self-administered online questionnaire during the onset of MCO.

A total of 210 firefighters were approached in this study. Out of these 210 firefighters, 45 were from Phase I (21.4%) while 165 were from Phase II (78.6%). Out of the 165 firefighters in Phase II, 72 did not provide consent to participate in the study. This made the total number of firefighters who agreed to participate in the study to be 138. Then, all the 25 firefighters from Sungai Buloh branch were removed as they did not provide valid data, in which all of them responded in the same pattern in the questionnaires. Therefore, the final analysis involved only 113 participants. The low response (53.8%) from the firefighters to participate in this study was due to their commitments as front liners during MCO period in disinfecting operations and their core duties to emergencies rescue.

4.2 Socio-demographic Background

Table 4.1 shows the socio-demographic characteristics of the firefighters in this study. A total of 113 firefighters participated in this study. The mean age of the firefighters were 29.68 ± 7.52 years old, in which 69.8% of them were at early adulthood (18 to 30 years old) and 85.0% were Malays. The mean duration of service of these firefighters was 7.42 ± 6.80 years. Almost half of them (44.7%) had served between 5 to 10 years. As for work shift distribution, two-third of the firefighters (66.4%) were involved in morning shift, 31.0% in night shift and only 2.7% had worked in two consecutive shifts. Besides, majority of the firefighters in this study (77.0%) had completed secondary education. More than half (59.3%) of them were married. Nearly all firefighters (99.1%) had a monthly personal income of less than RM3860. Majority of them (78.9%) had a monthly household income of less than RM3860.

Table 4.1: Socio-demographic characteristics of firefighters (n=113)

Characteristics	Mean $\pm$ SD	n (%)
Branches		
Kuala Selangor		20 (17.7)
Rawang		25 (22.1)
Pelabuhan Klang		14 (12.4)
Teluk Panglima Garang		10 (8.8)
Petaling Jaya		24 (21.2)
Kajang		20 (17.7)
Age (years) (n=106)	29.68 $\pm$ 7.52	
18-30		74 (69.8)
31-50		31 (29.2)
51-70		1 (0.9)
Ethnicity		
Malay		96 (85.0)
Indian		1 (0.9)
Bumiputera Sabah		10 (8.8)
Bumiputera Sarawak		5 (4.4)
Jawa		1 (0.9)

Table 4.1: Socio-demographic characteristics of firefighters (n=113) (cont.)

Characteristics	Mean $\pm$ SD	n (%)
Years of service (n=103)	7.42 $\pm$ 6.80	
<5		39 (37.9)
5-10		46 (44.7)
> 10		18 (17.4)
Work shift		
8am to 8pm		75 (66.4)
8pm to 8am		35 (31.0)
Two shifts		3 (2.6)
Education level		
Secondary		87 (77.0)
Tertiary		26 (23.0)
Marital status		
Single		44 (38.9)
Married		67 (59.3)
Divorced		1 (0.9)
Widowed		1 (0.9)
Monthly personal income[#]		
< RM3860		112 (99.1)
RM3860 – RM8319		1 (0.9)
Monthly household income[#] (n=109)		
< RM3860		86 (78.9)
RM3860 – RM8319		21 (19.3)
> RM8319		2 (1.8)

[#]Classifications based on the Department of Statistics' (DOSM) Household Income and Basic Amenities (HIS/BA) survey of 2016

4.3 Body Weight Status

The mean values of the parameters of body weight status of firefighters of the present study are shown in Table 4.2. The mean BMI of the firefighters was $25.81 \pm 3.76 \text{ kg/m}^2$, which was consistent with a previous local study by Rahimi et al. (2017). They reported a mean BMI of 25.59 kg/m^2 ($SD=3.62$) among 230 firefighters in Selangor (Rahimi et al., 2017). Similarly, in Belgium, Kiss et al. (2014) revealed that the mean BMI of the firefighters was $26.0 \pm 3.8 \text{ kg/m}^2$. The mean BMI of the firefighters in the present study was lower as compared to American firefighters, in which Baur et al. (2012) found that their mean BMI was $29.4 \pm 4.4 \text{ kg/m}^2$.

Table 4.2: Distribution of firefighters by anthropometric measurements (n=113)

Characteristics	Mean $\pm$ SD	n (%)
Body Mass Index (BMI) (kg/m²) (n=110)	25.81 $\pm$ 3.76	
Normal (18.50 – 24.99)		55 (50.0)
Overweight (25.00 – 29.99)		39 (35.5)
Obese class 1 (30.00 – 34.99)		13 (11.8)
Obese class 2 (35.00 – 39.99)		3 (2.7)
Body Fat Percentage (%) (n=65)	22.83 $\pm$ 7.81	
Unhealthy too low ($\leq$ 5%)		2 (3.1)
Acceptable lower end (6 - 15%)		8 (12.3)
Acceptable higher end (16 - 24%)		31 (47.7)
Unhealthy too high ($\geq$ 25%)		24 (36.9)
Waist Circumference (n=88)	83.29 $\pm$ 8.53	
Non-abdominal obesity (< 90cm)		71 (80.7)
Abdominal obesity ($\geq$ 90cm)		17 (19.3)
Waist-to-Height Ratio (WHtR) (n=81)	0.49 $\pm$ 0.05	
Lower risk of obesity ($\leq$ 0.50)		56 (69.1)
Increased risk of obesity (> 0.50)		25 (30.9)

Another cross-sectional study conducted by Gurevich et al. (2017) in Russia reported a mean BMI of 27.2 ± 3.9 kg/m² among firefighters. Seferiades et al. (2018) suggested that BMI classification is crucial for firefighters as every 1-unit increase in BMI is associated with 5% increased risk of job disability.

Half of the firefighters in this study were either overweight or obese (50.0%), in which 35.5% of the firefighters were overweight while 14.5% were obese. This indicates a high prevalence of overweight and obesity among the firefighters in this study. Similarly, Rahim et al. (2017) reported a high prevalence of overweight (46.5%) and obesity (10.3%) among 230 firefighters in 7 selected branches in Selangor. These findings were supported by previous studies conducted in overseas (Kiss et al. 2014; Baur et al., 2012; Smith et al., 2012; Poston et al., 2011; Soteriades, Hauser, Kawachi, Christiani, & Kales, 2008). For instance, in US, a cross-sectional study conducted by Smith et al. (2012) found a high prevalence of obesity among 116 firefighters (51.7%). Similarly, Poston et al. (2011) reported that more than half of the firefighters were overweight or obese in both career firefighters (79.5%) and voluntary firefighters

(78.4%) in US. Therefore, appropriate intervention programmes in managing body weight status of firefighters is needed to be implemented in order to ensure healthy body weight status among firefighters as it can affect their job performance.

The mean body fat percentage of the firefighters in this study was $22.83 \pm 7.81\%$, which fall in the acceptable range. However, 36.9% of them had excessive body fat percentage ($\geq 25\%$), which was considered unhealthy. The mean body fat percentage of the firefighters in this study was consistent with a previous local study, in which the mean body fat percentage was reported as $19.37 \pm 7.26\%$ (Rahimi et al. 2017). In Belgium, the mean body fat percentage of 1225 firefighters was found to be $24.6 \pm 7.00\%$ (Kiss et al., 2014), which was slightly higher than the mean body fat percentage found in the present study. In US, Poston et al. (2011) found that the mean fat percentage in career firefighters and volunteer firefighters were $38.3 \pm 4.80\%$ and $40.2 \pm 5.30\%$, respectively. These findings indicated that firefighters from US had high risk of developing obesity as both career and volunteer firefighters had exceeded the acceptable range of body fat percentage (6 – 24%).

The mean waist circumference of the firefighters in this study was 83.29 ± 8.53 cm. One-fifth (19.3%) of the firefighters had waist circumference ≥ 90 cm, indicating abdominal obesity. The mean waist circumference of firefighters reported in the present study was similar to the study conducted by Rahimi et al. (2017), which reported a mean waist circumference of 85.99 ± 9.58 cm among firefighters in Selangor. The waist circumference of firefighters was found to be higher in a study conducted in US by Poston et al. (2011) who reported the mean waist circumference was 94.1 ± 6.4 cm in career firefighters and 110.7 ± 8.8 cm in volunteer firefighters. Another US study had reported that the prevalence of abdominal obesity was 45.9% among 111 firefighters (Smith et al., 2012). In Russia, Gurevich et al. (2017) found

that the mean waist circumference of firefighters was 95.3 ± 11.6 cm and 28% of them were classified as abdominally obese. Despite the higher mean waist circumference reported among US and Russian firefighters, they were not considered as obese due to the different cut-off points used. In US and Russia, waist circumference cut-off was set at ≥ 102 cm while the cut-off set for the present study was ≥ 90 cm.

The mean WHtR of the firefighters in this study was 0.49 ± 0.05 . One third of the firefighters (30.9%) had a ratio of >0.50 , indicating increasing risk of obesity. However, previous studies did not include WHtR in assessing body weight status of firefighters. In fact, WHtR is used alongside with waist circumference and BMI when assessing obesity in general population as both waist circumference and BMI are age-dependent and gender-dependent which may affect the accuracy in determining the body weight status of the populations (Yoo, 2016).

4.4 Physical Activity

Table 4.3 shows the physical activity level of the firefighters. Majority of the firefighters performed vigorous-intensity activity (88.0%) and moderate-intensity activity (83.3%) at their workplace. The mean number of days in a typical week in performing both vigorous and moderate-intensity activity were 4.22 ± 1.52 days and 4.08 ± 1.86 days, respectively. The median time spent was 90.00 (60.00 ~ 150.00) minutes for vigorous-intensity activity and 85.00 (30.00 ~ 150.00) minutes for moderate-intensity activity. As for recreational activities, majority of the firefighters involved in vigorous-intensity (78.7%) and moderate-intensity (81.5%) activities. As the firefighters are actively involved in emergency rescue and evacuation missions as their duty, thus the firefighters in the present study showed low sedentary habits. The total time spent in sedentariness was 212.36 ± 150.34 minutes in a typical day.

Table 4.3: Distribution of firefighters by GPAQ (n=109)

Physical Activity	Mean $\pm$ SD	n (%)
At Work		
Vigorous-intensity		
Yes		96 (88.0)
No		13 (12.0)
Number of days in a typical week	4.22 $\pm$ 1.52	
1		3 (3.2)
2		6 (6.3)
3		24 (25.3)
4		24 (25.3)
5		22 (23.2)
6		4 (4.2)
7		12 (12.6)
Total time spent in a typical day (mins)[#]	90.00 (60.00~150.00)	
Moderate-intensity		
Yes		91 (83.3)
No		18 (16.7)
Number of days in a typical week	4.08 $\pm$ 1.86	
1		9 (10.0)
2		10 (11.1)
3		15 (16.7)
4		22 (24.4)
5		16 (17.8)
6		1 (1.1)
7		17 (18.9)
Total time spent in a typical day (mins)[#]	85.00 (30.00 ~150.00)	
Travel to and from places by walking or bicycling		
Yes		46 (41.7)
No		63 (58.3)
Number of days in a typical week	4.16 $\pm$ 2.20	
1		6 (13.3)
2		6 (13.3)
3		9 (20.0)
4		5 (11.1)
5		5 (11.1)
6		1 (2.2)
7		13 (28.9)
Total time spent in a typical day (mins)	80.89 $\pm$ 72.58	

Table 4.3: Distribution of firefighters by GPAQ (n=109) (cont.)

Physical activity	Mean $\pm$ SD	n (%)
Recreational Activity		
Vigorous-intensity		
Yes		86 (78.7)
No		23 (21.3)
Number of Days/Typical Week	3.87 $\pm$ 1.74	
1		6 (7.1)
2		12 (14.1)
3		25 (29.4)
4		12 (14.1)
5		15 (17.6)
6		4 (4.7)
7		11 (12.9)
Total time spent in a typical day (mins)	93.82 $\pm$ 58.19	
Moderate-intensity		
Yes		89 (81.5)
No		20 (18.5)
Number of Days/Typical Week	3.86 $\pm$ 1.66	
1		4 (4.5)
2		14 (15.9)
3		25 (28.4)
4		16 (18.2)
5		16 (18.2)
6		2 (2.3)
7		11 (12.5)
Total time spent in a typical day (mins)	87.90 $\pm$ 50.80	
Sedentary Behaviour (n=106)		
Time spent in a typical day(mins)	212.36 $\pm$ 150.34	

#Data expressed in median as data set is not normally distributed

The physical activity level based on METs-min per week is shown in Table 4.4. The firefighters were highly active, in which the average METs-min spent on a typical week was 9688.70 ± 7123.29 METs-min. As many as 96.3% of them were highly active, with only 2.8% were moderately active and 0.9% was considered inactive.

Table 4.4: Distribution of firefighters by physical activity level (n=109)

Physical activity	Mean $\pm$ SD	n (%)
MET-mins/week	9688.70 $\pm$ 7123.29	
High (≥ 1500)		105 (96.3)
Moderate (≥ 600)		3 (2.8)
Low (<600)		1 (0.9)

The physical activity level reported in the present study was higher as compared to a previous study conducted in Germany by Leischik et al. (2015) among 198 male civil servants with 97 firefighters. They reported that the average physical activity of the firefighters was 3818.8 ± 2843.50 METs-min per week. The reported METs-min per week of firefighters from this comparison study had only taken into account the vigorous-intensity physical activity but did not include moderate-intensity activity. In contrast, the present study had used GPAQ in measuring physical activity of the firefighters which included both types of intensities. Thus, it was observed that the mean METs-min per week was three times higher in the present study.

Likewise, a recent cross-sectional study done by Wagner et al. (2019) among 328 volunteer firefighters in US showed that the amount spent for moderate-to-vigorous-intensity physical activity among the firefighters was 374.1 ± 577.00 minutes per week. The huge difference in terms of physical activity time spent per week compared to the present study can be attributed by two reasons. Firstly, the present study involved career firefighters who spent more time on shifts as compared to volunteer firefighters in the study of Wagner et al. (2019). Secondly, age is another important factor that may influence physical activity frequency as increasing age is consistently associated with decreased physical activity frequency in US populations (Kales, Soteriades, Christoudias, & Christiani, 2003). The mean age of firefighters in

the present study was much lower as compared to the study of Wagner et al. (2019), thus the physical activity level of the firefighters in the present study was higher.

In addition, Garcez et al. (2015) revealed that as many as 36% were considered active in a cross-sectional study conducted among 1206 shift workers from Brazil. The percentage of workers who were active was 3 times lower than that reported from the present study. Besides, another study conducted by Loef et al. (2017) found similar percentages of shift workers (54.5%) in performing non-occupational physical activities as compared to non-shift workers (57.6%). The percentage of shift workers who were active in playing sports was also much lower than that in the present study as it did not include occupational physical activities. Also, these two previous studies had included more female respondents than male respondents while the present study had only involved male respondents. Previous studies had illustrated that males tend to be more active than females (Azevedo et al., 2007; Florindo, Catarina, Moura, & Carvalho, 2009; Florindo, Guimarães, et al., 2009).

4.5 Sleep Quality

The total time to fall asleep, total time in spent in bed and total time of actual sleep of the firefighters are shown in Table 4.5. It was reported that the firefighters took lesser than half an hour to fall asleep as the median time to fall asleep was 20 minutes. The mean total time spent in bed was 380.48 ± 90.05 minutes, approximately 6 hours per day. The total sleeping time of firefighters in this study was consistent with a previous study conducted by Bender (2018) among 269 firefighters, where 43.3% of the firefighters had 5-6 hours of sleeping.

Table 4.5: Distribution of firefighters by total time taken to fall asleep (mins), total time in bed (mins) and total time of actual sleep (mins) (n=113)

Components	Mean $\pm$ SD
Total time taken to fall asleep (mins) [#]	20.00 (10.00 ~ 33.64)
Total time in bed (mins)	380.48 $\pm$ 90.05
Total time of actual sleep (mins)	344.67 $\pm$ 111.72

[#]Data expressed in median as data set is not normally distributed

Table 4.6 shows the distribution of firefighters by PSQI Questionnaire. About half of the firefighters (41.6%) had woken up in the middle of night or early morning for at least once a week. A majority of the firefighters never had breathing difficulty during the past month (72.6%) and more than half (59.6%) had never cough or snore loudly during the past month. Most of them had not had bad dreams (68.1%) nor had pain (74.3%) during sleeping. Besides, nearly all of the firefighters (94.7%) did not take medication aid in sleeping (either prescribed or purchased over the counter). Overall, 67.3% of the firefighters had rated their sleep quality as “Fairly good”.

Table 4.6: Distribution of firefighters by PSQI questionnaire (n=113)

During the past month...	n (%)			
	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
Cannot get to sleep within 30 minutes	40 (35.4)	41 (36.3)	20 (17.7)	12 (10.6)
Wake up in the middle of the night or early morning	36 (31.9)	30 (26.6)	33 (29.2)	14 (12.4)
Have to get up to use the bathroom	37 (32.7)	27 (23.9)	36 (31.9)	13 (11.5)
Cannot breathe comfortably	82 (72.6)	22 (19.5)	7 (6.2)	2 (1.8)
Cough or snore loudly	67 (59.3)	22 (19.5)	9 (8.0)	15 (13.3)
Feel too cold	48 (42.5)	42 (37.2)	16 (14.2)	7 (6.2)
Feel too hot	50 (44.2)	36 (31.9)	22 (19.5)	5 (4.4)
Have bad dreams	77 (68.1)	26 (23.0)	9 (8.0)	1 (0.9)
Have pain	84 (74.3)	21 (18.6)	7 (6.2)	1 (0.9)
Other reason(s)	113 (100.0)	0	0	0

Table 4.6: Distribution of firefighters by PSQI questionnaire (n=113) (cont.)

During the past month...	n (%)			
	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
How often have you taken medicine to help you sleep (prescribed or “over the counter”)?	107 (94.7)	1 (0.9)	4 (3.5)	1 (0.9)
How often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	72 (63.7)	29 (25.7)	8 (7.1)	4 (3.5)
	No problem at all	Only a very slight problem	Somewhat a problem	A very big problem
How much of a problem has it been for you to keep up enough enthusiasm to get things done?	52 (46.0)	58 (51.3)	3 (2.7)	0
	Very good	Fairly good	Fairly bad	Very bad
How would you rate your sleep quality overall?	25 (22.1)	76 (67.3)	11 (9.7)	1 (0.9)

Table 4.7 shows the distribution of firefighters by PSQI score. In overall, the mean PSQI score of the firefighters was 6.29 ± 2.82 . More than half of the firefighters had experienced sleeping issues, in which 55.8% had a poor sleep quality. However, Yun et al. (2015) found that more Korean firefighters had a good sleep quality (79.6%) as compared to poor sleep quality (20.4%). The inconsistent finding was due to the different cut-off score used in the Korean version of PSQI. The cut-off score was set at 8.5 and represented a sensitivity of 0.943 and a specificity of 0.844, which is higher than the score of 5 used in the present study.

Table 4.7: Distribution of firefighters by PSQI scores (n=113)

Variable	Mean $\pm$ SD	n (%)
PSQI score	6.29 $\pm$ 2.82	
Good (≤ 5)		50 (44.2)
Poor (>5)		63 (55.8)

As firefighters are shift workers, they are more prone to experiencing poor sleeping quality as compared to non-shift workers. Han et al. (2018) found that 54% of police officers who were shift workers had suffered from poor sleep quality. In another study conducted among nurses and midwives had shown that the mean PSQI score of those who worked rotating night shifts were 6.30 ± 3.00 while those who worked day shifts had a mean PSQI score of 6.8 ± 3.6 (Peplonska, Bukowska, & Sobala 2015). This was similar to the mean PSQI score of the firefighters found in the present study.

4.6 Social Jetlag

Table 4.8 shows the total hours in social jetlag experienced by the firefighters. The median social jet lag was found to be 0.45 hours and 56.3% of the firefighters had lesser than 1 hour of social jetlag. Wittmann et al. (2006) defined social jetlag as the discrepancy between biological and social which is measured by the absolute difference between mid-sleep times on free days and on workdays. It quantifies the discrepancy that often arises between circadian and social clocks, which subsequently leads to affect in sleeping duration that causes chronical sleep loss (Roenneberg, Allebrandt, & Merrow 2012). The phenomenon of regular, weekly changes in sleep timing was coined social jetlag (Roenneberg et al., 2012). Social jetlag disrupts sleeping duration such as sleep timing, thus it is possible that social jetlag has similar

effects on gene expression and affects healthy habits that may further give impact to health (Parsons et al., 2015).

Due to limited published studies that assessed social jetlag experienced by firefighters, prior studies on general working populations were used as comparison. Islam et al. (2020) reported that social jetlag experienced by 1,404 working adults was less than 1 hour (63.5%), 1 to less than 2 hours (28.4%), and at least 2 hours (8.1%). Majority of the employees had lesser than 1 hour of social jetlag. Similarly, another cross-sectional study conducted among 2474 day and shift workers from Germany found that the mean social jetlag experienced by the workers was 1.96 ± 2.05 hours (Yong et al., 2016).

Table 4.8: Distribution of firefighters by social jet lag (n=113)

Variable	Median (IQR)	n (%)
Social Jetlag (Hours)	0.45 (0.15 ~ 1.30)	
< 1 hour		58 (56.3)
1-2 hours		43 (38.1)
≥ 2 hours		12 (10.6)

4.7 Meal Pattern

As shown in Table 4.9, the proportion of firefighters who skipped breakfast and lunch were 43.4% and 42.5%, respectively. As for dinner, more than half of the firefighters (52.2%) skipped at least once or more times in a week. Besides, morning tea (66.4%) was the most frequently consumed snack as compared to afternoon tea (19.5%) and supper (13.3%). It was observed that 30.1% of the firefighters ate at hawker centers, coffee shops or other food stalls 2 to 3 times in a week. However, the firefighters did not frequently eat at western fast food restaurants (e.g KFC, McDonalds, Pizza Hut) as nearly half of them (49.3%) ate at fast food restaurants

Table 4.9: Distribution of firefighters by Eating Behaviour Questionnaire (n=113)

How frequent do you consume ...	n (%)					
	Everyday	4-6 days / week	2-3 days / week	Once / week	1-3 times / month	Never or Lesser than once per/ month
Breakfast	64 (56.6)	24 (21.2)	18 (15.9)	5 (4.4)	1 (0.9)	1 (0.9)
Morning tea	75 (66.4)	16 (14.2)	12 (10.6)	7 (6.2)	1 (0.9)	2 (1.8)
Lunch	65 (57.5)	29 (25.7)	11 (9.7)	5 (4.4)	3 (2.7)	0
Afternoon tea	22 (19.5)	27 (23.9)	38 (33.7)	13 (11.5)	11 (9.7)	2 (1.8)
Dinner	48 (42.5)	23 (20.4)	32 (28.3)	4 (3.5)	5 (4.4)	1 (0.9)
Supper	15 (13.3)	15 (13.3)	30 (26.6)	18 (15.9)	23 (20.4)	12 (10.6)
How frequent do you eat at hawker centers, coffee shops or other food stalls?	16 (14.2)	18 (15.9)	34 (30.1)	17 (15.0)	24 (21.2)	4 (3.5)
How frequent do you eat at western fast food restaurants (e.g. KFC, McDonald's, Pizza Hut etc.)?	7 (6.2)	8 (7.1)	14 (12.4)	17 (15.0)	42 (37.2)	25 (22.1)
How frequent do you buy/take-away food from western fast food restaurants (e.g. KFC, McDonald's, Pizza Hut etc.)?	8 (7.1)	8 (7.1)	11 (9.7)	12 (10.6)	43 (38.1)	31 (27.4)

lesser than once in a week. Likewise, more than half of them (59.3%) had bought take away food from the fast food restaurants for lesser than once in a week. This may be explained by the requirement of the firefighters on shift to be physically attended at the fire rescue stations in order to immediately respond to any emergency rescue call.

Table 4.10 shows the meal consumption behaviour and types of snacks consumed of the firefighters. In general, meal skipping prevalence was high (69.9%) among the firefighters in the present study and all firefighters had snacking habit. Results showed that the top three favourite snacks of the firefighters in this study were “*kuih muih*” (34.6%), fruits (26.2%) and biscuits/crackers (14.6%). As for beverages, half of the firefighters drank tea (50.0%), followed by coffee (22.8%) and milk (15.9%).

Table 4.10: Distribution of firefighters by meal consumption pattern and types of snacks consumed (n=113)

Meal consumption Pattern	n (%)
Main Meal Skipping Behavior	
Never skipped main meals	34 (30.1)
Skipped main meals	79 (69.9)
Snacking Behaviour	
Yes	113 (100.0)
No	0
Types of snacks consumed	n (%)
Foods	
Kuih Muih	45 (39.1)
Fruits	34 (29.6)
Biscuit/Cracker	19 (16.5)
Nasi Lemak	12 (10.4)
Ice-cream	3 (2.6)
Fast Food	1 (0.9)
Instant Noodle	1 (0.9)

Table 4.10: Distribution of firefighters by meal consumption pattern and types of snacks consumed (n=113) (cont.)

Meal consumption Pattern	n (%)
Drinks	
Tea (Teh Tarik, Teh O, Teh Halia, Teh O Halia, Green Tea)	22 (50.0)
Coffee (Coffee with added milk, Coffee without milk and sugar, Nescafe)	10 (22.8)
Milk	7 (15.9)
Milo	2 (4.5)
Sweet Drinks (Lemon Juice, Syrup)	2 (4.5)
Nestum	1 (2.3)

Table 4.11 shows the eating companion of firefighters during meal time and consumption of supplementary products. Family members were the main companion as 50.4% of the firefighters ate with family members, followed by 38.1% of them who ate with friends and 11.5% of them ate without companion. On the other hand, nearly all firefighters (92.9%) did not take any nutritional supplementary products.

Table 4.11: Distribution of firefighters by companions during eating and by consumption of supplementary products (n=113)

Companions	n (%)
Family	57 (50.4)
Friends	43 (38.1)
Alone	13 (11.5)
Consumption of supplementary products	
Yes	8 (7.1)
Vitamin C	4 (50.0)
Multivitamin	1 (12.5)
Others	3 (37.5)
No	105 (92.9)

4.8 Chronotype

Morning type individuals are early risers, perform mentally and physically at their best in the morning hours, and go to bed early in the evening while evening type individuals stay up late at night, rise at a later time in the morning, and perform best mentally and physically in the late afternoon or evening (Urbán, Magyaródi, & Rigó, 2011). Table 4.12 shows the distribution of firefighters by human chronotype. The firefighters in the present study had a mean chronotype score of 54.54 ± 5.63 , ranging from 36 to 65. The distribution of chronotype in the present study indicates that the firefighters had their “best timing” for mental and physical performance in between morning hours and evening hours. They did not rise up too early in the morning nor too late in the evening as well as they did not sleep early in evening nor stay up too late at night.

When compare among the chronotype groups, a majority of the firefighters (71.7%) were intermediate type and there was more in the morning type (26.3%) than the evening type (1.8%). The possible reason for such distribution may be attributed to the number of firefighters in the present study who were from the morning shift (66.4%) was two times more than those who were from the evening shift (31.0%). Likewise, this distribution was supported by a previous studies conducted by Yun et al. (2015), who reported that majority of the Korean firefighters were classified as intermediate-type (71.3%), followed by morning-type (18.8%) and evening-type (9.9%). There is limited published study examining the distribution of chronotype among firefighters.

Marion et al. (2017) reported that a majority of the nurses were intermediate-type person in all three occupational categories – nursing assistant (50.5%), nursing technician (42.7%) and nurse (41.5%), respectively. Similarly, Alain et al. (2015)

conducted a study among 39 police officers from Quebec city in Canada and found that 66.7% of them were intermediate-types and 33.3% were evening-type but none were morning-types. In contrast, Yadav, Rani, and Singh (2016) illustrated in a study among 85 India male and female police officers that there were more morning-type people (65.9%) compared to intermediate-type people (34.1%) while none of the officers belonged to evening-type. However, these two studies were conducted among the police officers comprised of relatively small number of samples, thus, the outcomes were unable to bring significant generalization on shift workers chronotype distribution.

Table 4.12: Distribution of firefighters by human chronotype (n=113)

Variables	Mean $\pm$ SD	n (%)
Chronotype scores	54.54 $\pm$ 5.63	
Evening Type		2 (1.8)
Intermediate Type		81 (71.7)
Morning Type		30 (26.5)

4.9 Association between Socio-demographic Factors and Body Mass Index

The Chi-square test results of socio-demographic factors with BMI are shown in Table 4.13. Due to lacking studies that examined relationship between socio-demographic factors with body weight status among firefighters, the findings from present study was compared to studies conducted on general adult populations.

There was no significant association found between age and BMI ($\chi^2 = 3.697$, $p = 0.055$). However, it contradicts with several previous studies which had reported a significant association between age and BMI (Kolahi et al., 2018; Pell et al., 2016; Tan & Yen, 2011). For instance, Tan and Yen (2011) reported that middle-aged

Table 4.13: Result of chi-square test of independence of association between socio-demographic characteristics and body weight status (BMI) of firefighters

Characteristics	n (%)		χ^2	p-value
	Normal	Overweight / Obesity		
Age (years)			3.697	0.055
≤ 30	41 (80.4)	33 (63.5)		
> 30	10 (19.6)	19 (36.5)		
Years of service			21.544	<0.001
<5	30 (62.5)	9 (17.3)		
5-10	13 (27.1)	33 (63.5)		
> 10	5 (10.4)	10 (19.2)		
Work shift			0.967	0.325
8am to 8pm	35 (64.8)	39 (73.6)		
8pm to 8am	19 (35.2)	14 (26.4)		
Educational level			0.050	0.822
Secondary	41 (74.5)	43 (78.2)		
Tertiary	14 (25.5)	12 (21.8)		
Marital status			9.627	0.002
Single/ Divorce	31 (56.4)	14 (25.5)		
Married	24 (43.6)	41 (74.5)		
Monthly household income			0.516	0.472
< RM3860	44 (83.0)	40 (75.5)		
≥ RM3860	9 (17.0)	13 (24.5)		

Malay adults (41-58 years old) were more likely to be overweight and obese ($p < 0.010$) as compared to those who aged 31–40 years old. Consistently, Pell et al. (2016) found that 1-unit increase in age leads to an increased probability of 1.05 ($p < 0.001$) of being overweight and 1.06 ($p < 0.001$) increase of being obese among adults. Similarly, in Iran, Kolahi, Moghisi and Ekhtiari (2018) found that age was associated with overweight and obesity ($p < 0.05$). This is inconsistent with the findings reported by the present study which may be due to the large difference in the number of firefighters who were in the age group of ≤ 30 years old as compared to > 30 years old.

Besides, majority of the firefighters who were overweight or obese (73.6%) were involved in morning shift. However, there was no significant association observed between work shift and BMI ($\chi^2 = 0.967$, $p = 0.325$). In contrast, a study conducted in Brazil by Antunes et al. (2010) found that shift workers presented higher BMI ($p = 0.03$) and waist circumference ($p = 0.004$) than day workers. However, this study had included only 27 samples with 14 shift workers and 13 day-workers. Therefore, it was not able to be used for generalization of general shift workers population.

In a cross-sectional study among 724 female nurses and midwives, it was reported that cumulative night shift work showed significant associations with BMI (Peplonska, Bukowska, & Sobala, 2015). BMI of the respondents increased by 0.477 kg/m² per 1000 night duties and by 0.432 kg/m² per 10000 night shift hours (Peplonska et al., 2015). The relationship between shift workers with obesity is not fully explained. Possible factors such as unhealthy dietary habits, low physical activity, sleep deprivation and disruption of circadian rhythm have been proposed as the potential reasons that causes obesity among shift workers.

Lowden et al. (2010) found that meal irregularity, higher animal fat, carbohydrate and protein intake coupled with lower dietary fibre consumption, and frequent snacks taken during the night shift were identified in night shift workers. However, in the present study, the dietary factors of firefighters was not assessed. Thus, future studies should include the influence of changes in dietary intake that might be a potential factor associated with BMI of firefighters.

In addition, there was also no significant association reported between education level and BMI ($\chi^2 = 0.050$, $p = 0.822$). In contrary, Tan and Yen (2011) found that education level was significantly associated with overweight and obesity (p

< 0.01). The same study reported that tertiary level educated Malays were less likely to be overweight and obesity than secondary level educated (Tan & Yen, 2011). Likewise, another study conducted by Wang et al. (2016) among 6616 adults in Singapore citizens aged ≥ 18 years old reported that obesity was inversely associated with education level ($p < 0.05$), with lower education linked to higher risk of obesity. In Iran, (Zeinali et al., 2016) (Zeinali et al., 2016) showed that education level was one of the significant factors associated with BMI ($p < 0.001$). The insignificant association reported in the present study may be due to the huge difference between firefighters (77.0%) who had completed up to secondary level education as compared to tertiary level (23.0%).

There was also no significant association found between monthly household income and BMI ($\chi^2 = 0.516$, $p = 0.472$). This finding was supported by previous studies (Sidik & Rampal, 2009; Wang et al., 2016). However, a local study conducted by Tan and Yen (2011) reported that high income earners among Malay and Chinese individuals were significantly associated with overweight ($p < 0.01$). This may be explained by higher income individuals had established unhealthy eating habits and largely sedentary lifestyles which may contribute to overweight and obesity (Ismail et al., 2002). Moreover, higher income earners possess higher financial ability to purchase more food for consumption regardless of energy density which potentially lead to over nutrition.

On the other hand, the present study found that there was a significant association between years of service and BMI ($\chi^2 = 21.544$, $p < 0.001$). More overweight and obese firefighters (19.2%) had served in the firefighter department for more than 10 years compared to normal weight firefighters (10.4%). No previous studies have studied the mechanism of the association between years of service and

BMI. However, it is possible that the association found in this study was due to personal perspective of firefighters themselves, in which the longer they have served the fire service, the lesser concern they tend to pay towards BMI. Similarly, as time passed, they may have established a habitual meal pattern (e.g. meal skipping and snacking) and followed a consistent dietary intake (e.g. high calorie intake), which both may be affecting their BMI. In addition, it was also suggested that the association could be attributed to age factor which had been discussed earlier. Older adults tend to associate with overweight and obesity (Pell et al., 2016; Tan & Yen, 2011).

Likewise, the high prevalence of overweight and obesity found among US firefighters by Poston et al. (2011) had also reported more than one decade of service. In UK, a cohort study conducted among 735 firefighters had reported that the prevalence of obesity had increased from year 2008 (11%) to year 2011 (13%). The same study also revealed that firefighters who were classified as normal-weight in 2008 were more likely to have gained weight by 2011 in comparison to those categorised as obese at baseline (Munir et al., 2012). Although there was no significant association found between age with BMI in the present study, the value of significance ($p = 0.055$) was almost close to the cut-off.

There was also significant association found between marital status and BMI ($\chi^2 = 9.627$, $p = 0.002$) in this study. Higher proportion of overweight or obese firefighters were married (74.5%) as compared to normal weight firefighters (43.6%). A study conducted among Greek adults by Tzotzas et al. (2010) also found that married men and women had greater risk of developing overweight and obesity than those who were unmarried. Moreover, another previous study also found that the likelihood of developing overweight, obesity, and abdominal obesity were influenced by marital status in both men and women (Janghorbani et al., 2008). Married men and

women had twice higher prevalence of overweight than non-married men and women (Janghorbani et al., 2008). In contrast, a recent cross-sectional study conducted in Japan by Suzuki et al. (2019) among 6395 adults (2884 were men) aged 35 – 79 years old revealed that marital status was not associated with BMI ($p = 0.352$). This was because the proportions of single and bereaved or divorce participants with respect to marital status were relatively small. Thus, no significant association was found.

The actual mechanism linking marital status and obesity is not fully understood. Nonetheless, a longitudinal study from year 1979 to 1994 in USA which examined complete marriage histories had highlighted two most plausible hypotheses to explain increase in BMI during marriage (Averett, Sikora, & Argys, 2008). The first hypothesis is due to the social obligation of marriage, in which couples are led to eat more regular meals and richer and denser foods after marriage. The second hypothesis is the marriage market hypothesis, which stated that married individuals especially women are no longer concerned about attracting a mate thus this may allow their BMI to rise (Averett et al., 2008). Hence, it could be assumed that unmarried individuals tend to have greater concern with body image thus have higher concern in their body weight status changes.

4.10 Association between Physical Activity and Body Mass Index

Table 4.14 shows no relationship found between physical activity and BMI ($r = -0.09, p=0.347$). The physical activity level of firefighters did not relate to their BMI. Previously, there was no studies examined the direct relationship between physical activity with body weight status among firefighters. Therefore, findings from studies conducted among general adult population were used as comparison with the findings of present study.

Table 4.14: Pearson correlation between total METs-min per week, PSQI score and social jetlag with body weight status (BMI)

Variable	BMI	
	r	p-value
Physical Activity Level (METs-min/week)	-0.09	0.347
PSQI Scores	0.116	0.228
Social Jetlag	-0.043	0.652

A local study conducted by Iskandar et al. (2017) among 396 youths aged between 15 – 25 years old revealed that there was a negative correlation between physical activity and BMI ($r = -0.24$, $p < 0.001$). The study also found the obese group (obese class I) had lower physical activity than other groups. Another cross-sectional study conducted by Bradbury et al. (2017) in UK among 119230 men and 140578 women aged 40–69 years also reported that for a given BMI (22.5-24.99 kg/m²), greater physical activity was associated with lower mean body fat percentage in men (OR:2.0 ; 95% CI: 1.8 - 2.2) and in women (OR: 1.8 ; 95% CI: 1.6 -2.0).

These findings were not coherent with the finding in the present study. This might be due to almost all (96.3%) of the firefighters participated in the present study was highly active. Furthermore, the core responsibility of firefighters in fire and emergency rescues involves physical activeness, thus physical activity does not pose significant influence on their body weight status.

4.11 Association between Sleep Quality and Body Mass Index

According to Table 4.14, there was no significant relationship found between PSQI scores and BMI ($r = 0.116$, $p = 0.228$). However, a cross-sectional study participated by 118 firefighters and conducted by Abbasi et al. (2018) found that there

was a significant positive relationship between sleep quality scores and BMI ($p < 0.05$).

The finding of the present study is inconsistent from a previous study conducted by Kristić, Štefan, and Sporiš (2018) who revealed a significant association between sleep quality and likelihood of being overweight or obese (OR: 1.45 ; 95% CI :1.14 - 1.83, $p < 0.01$) among 2100 young adults in Croatia. One of the possible explanation for the inconsistent findings might be due to the measure used in assessing sleep quality. As previous studies assessed sleep quality through self-rating of respondents, thus it did not include other components such as subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction which may affect sleeping quality.

However, the present study did not replicate similar findings from previous studies that used PSQI in assessing sleeping quality. A study conducted in Korea by Park et al. (2018) among 107,718 Korean individuals reported that sleep quality was significantly associated with severe obesity in both male and female subgroup. Similarly, in China, a study conducted by Hung et al. (2013) across 2803 subjects who were overweight or obese had a significantly higher global PSQI score than those with normal weight independent of cardiometabolic risk factors. The possible reason for this is because the sample size of the present study was low and therefore unable to report significant association between the two variables. Secondly, all three studies had used self-reported data from respondents in assessing sleeping quality, which was subjective. Several sleep studies have addressed the problem of subjectivity in self-reporting of sleep quality (Marshall et al., 2008; Patel et al., 2012). Thus, it should be acknowledged that subjectivity of self-reporting might have an effect on the result outcomes. It is recommended to combine other sleep quality measures in assessing

the sleeping quality of respondents such as actigraphy, which is inexpensive to be used and poses low burden on respondents (Krystal & Edinger, 2008).

4.12 Association between Social Jetlag and Body Mass Index

There was also no significant relationship found between social jetlag and BMI ($r = -0.043$, $p = 0.652$) as shown in Table 4.14. Social jetlag experienced by firefighters was not related to their BMI. This is consistent with a previous study conducted among 350 young adults which found no association between social jetlag and BMI ($p = 0.071$) (Mcmahon et al., 2018).

Nonetheless, Parsons et al. (2016) found that social jetlag was significantly associated with overweight. It was shown that individuals with greater social jetlag scores had higher average BMIs ($p = 0.012$) and more fat mass ($p = 0.031$), and were more likely to be obese (OR: 1.2; 95% CI:1.0-1.5, $p = 0.045$). Similarly, another cross-sectional study also revealed that social jet lag was associated with elevated BMI, fat mass and waist circumference (Roenneberg et al., 2012). Social jetlag predicted increases in BMI only among those who were already overweight or obese (Roenneberg et al., 2012).

A possible reason for the inconsistent finding in this study is that most of the firefighters had experienced lesser than 1 hour of social jetlag. Previous studies found significant association between extreme social jetlag with BMI (Parsons et al., 2016; Roenneberg et al., 2012), thus, the influence of social jetlag on BMI was not significant among the firefighters in the present study.

4.13 Association between Meal Skipping and Body Mass Index

Chi-square test was performed to determine the association between meal skipping behaviour and BMI of firefighters. As shown in Table 4.15, no statistically significant association was found between meal skipping and BMI ($\chi^2 = 1.686$, $p = 0.194$). This finding was supported by a study done by Mahmoud and Taha (2017) in Egypt among 125 nurse students which showed that there was no significant association between eating habits and BMI ($p > 0.05$) where skipping breakfast and number of meals consumed daily were not associated with BMI ($p > 0.05$). Mahmoud and Taha (2017) also suggested that fast food consumption and among the students in their study were not associated with BMI ($p > 0.05$). Similarly, Benazeera et al. (2014) also showed no correlation between BMI and eating habits ($r = -0.085$, $p = 0.30$).

On the other hand, several prior studies found association between meal skipping with BMI (Goon & Islam, 2014; Kahleova et al., 2017; Watanabe et al., 2014). A study in Japan demonstrated that skipping breakfast was correlated with obesity among 766 Japanese adults (Watanabe et al., 2014). Similarly, a 5-year cohort study conducted by Sakurai et al. (2017) among 4430 factory employees also showed that skipping breakfast was closely associated with annual changes in BMI and waist circumference among men. Kahleova et al. (2017) reported that meal skipping (e.g breakfast) was correlated with BMI. Breakfast eaters showed significant decrease in BMI as compared to breakfast skippers ($p < 0.001$). Those who ate 1 or 2 meals per day had a reduction in BMI per year as compared with those who ate 3 meals per day and eating more than 3 meals of snack per day was significantly associated with a relative increase in BMI ($p < 0.001$).

In addition, another cross-sectional study conducted among 426 urban adults in Bangladesh revealed that breakfast skippers (39.5%) showed significantly high

Table 4.15: Results of chi-square test of independence of association between meal skipping and chronotype with body weight status (BMI) of firefighters

Characteristics	n (%)		χ^2	p-value
	Normal	Overweight / Obesity		
Meal Skipping			1.686	0.194
Never Skipped	11 (20.0)	18 (32.7)		
Skipped	44 (80.0)	37 (67.3)		
Chronotype			0.000	1.000
Non-intermediate (Evening/Morning)	15 (27.3)	15 (27.3)		
Intermediate	40 (72.7)	40 (72.7)		

prevalence of obesity as compared to non-skippers (15.7%) ($\chi^2 = 30.15$, $p < 0.05$). Skippers were significantly more likely to be obese (Goon & Islam, 2014). In US, Ma et al. (2003) found that breakfast skippers was associated with obesity in adults. The same study concluded that eating patterns were associated with obesity even after controlling for total energy intake and physical activity. As majority of the firefighters in the present study consumed all three main meals in a day, further studies could include analysis of meal timing and total energy intake in relation to BMI.

4.14 Association between Chronotype and Body Mass Index

The association between chronotype distribution and BMI of firefighters is shown in Table 4.15. According to the result, chronotype of firefighters was found to have no significant association with BMI ($\chi^2 = 0$, $p = 1.000$). Firefighters in both normal weight and overweight or obesity categories had equal proportion of individuals who were rather morning or evening-type (27.3%) and who were intermediate-type person (72.7%). As there was limited study conducted to examine association between chronotype with body weight status among firefighters, previous

studies conducted among general adult populations were used as benchmark for comparison.

This insignificant association of chronotype with BMI in the present study is consistent with findings reported by others (Maukonen et al. 2017; Parsons et al. 2015). Maukonen et al. (2017) found no significant differences in BMI among different chronotypes ($p = 0.44$) across 1864 adults in Finland. Besides, a study conducted in Turkey by Toktaş et al. (2018) among university students found no differences between different chronotype groups in terms of BMI ($p > 0.05$). The possible explanation may be the present study had exceptionally high number of respondents who were intermediate-type as compared to the morning-type and evening-type. As intermediate-type people could be or could not be following the habitual living patterns (meal timing, sleep-wake timing) of both of the distinct types (Morning / Evening) people (Horne & Ostberg, 1976; Mazri et al., 2020). Hence, their BMI may be unlikely to be influenced by their chronotypes.

However, the present study failed to replicate findings reported by several other studies that reported significant association between chronotype and BMI (Anothaisintawee et al., 2018; Punder et al., 2019; Vidal et al. 2016). A study conducted by Anothaisintawee et al. (2018) in Thailand reported that more evening preference was associated with higher BMI ($p = 0.024$). The study reported that more evening preferences decreased sleeping duration, while sleeping duration subsequently led to higher BMI. Likewise, in Germany, a recent study conducted by Punder et al. (2019) among young adults (23.8 ± 3.3 years) showed that more evening tendency was significantly associated with higher BMI ($r = -0.40, p < 0.05$). In Spain, Vidal, Hollanda, Canteras, and Garaulet (2016) revealed that evening-type adults showed significantly higher body weight ($p = 0.015$) and BMI ($p = 0.014$) than

morning-type. More evening-type tendency is associated with higher BMI. However, these studies did not measure physical activity level of the respondents and eating behaviours such as frequency of meal consumptions and meal skipping behaviours that may be one of the factors associated with BMI.

4.15 Limitations

The current study has several limitations. Firstly, the data collection of the study was interrupted as Malaysia had announced the implementation of Movement Control Order (MCO) to combat the rising positive cases of Covid-19. As a result, the data collection method had to be altered from researcher-administered to self-administered. Hence, the response rate was lower after the method had been switched, subsequently led to failure in reaching the required sample size.

Secondly, this study was a cross-sectional study, in which the temporal relationship between the variables could not be determined. It is suggested that longitudinal studies should be conducted in the future among the firefighter population. In addition, the sample collected consisted of only firefighters from selected branches in Selangor. Hence, the results cannot be generalized to the overall firefighter population in Malaysia.

Under and over-reporting may exist in the current study when the firefighters self-reported their body weight, height, body fat percentage and waist circumference as they were not measured by researcher using validated and reliable measurement equipment during MCO period. However, further analysis showed that there was no significant difference found in BMI of firefighters between researcher administered and self-administered methods of data collection ($t = 1.008$, $p = 0.316$). Nonetheless, it should be taken note that the total number of respondents who had applied self-

administered method (60.2%) was higher than that of researcher-administered (39.8%).

Using of BMI as the indicator for body weight status assessment among the firefighters in this study may have potential bias due to its limitation in taking into account body composition such as differentiating between lean muscle mass and fat mass. As firefighters in the present study had reported a high physical activity level which may contribute to higher muscle mass to fat mass proportion, it is possible to misclassify them as overweight and obese by solely depending on BMI. However, previous published studies on firefighters (Baur et al., 2012; Gurevich et al., 2017; Jahnke et al., 2013; Kiss et al., 2014; Rahimi et al., 2017; Soteriades et al., 2008) had used BMI as indicator in studying their body weight status.

The chronotype classification of firefighters as intermediate-type in the present study failed to clearly and reasonably assume the lifestyle habits followed by the firefighters. As intermediate-type people had not been clearly justified from previous studies in terms of the probability in adhering morning-type or evening-type lifestyles, thus, it was not possible to address mechanism between the relationship of intermediate-type people with body weight status.

Eating behaviour in the study had only taken into account of meal skipping habits. Several other factors such as meal timing, total energy intake, total macronutrients and micronutrients consumed were not assessed from the meal intake of firefighters. Thus, the association of these factors with body weight status were not stated. Finally, psychological factors such as depressive symptom was not assessed in the study which may affect the social jet lag of the respondents due to its impact in sleeping hours changes and may result in changes in sleeping quality of respondents.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

A high prevalence of overweight and obesity among firefighters was found in this study. This has raised the awareness that focus on health promotion programs should not exclude firefighters by assuming they are healthy without concerns in body weight status. As the high prevalence of overweight and obesity found in the study was supported by prior studies conducted worldwide, it is reasonable to address the need to carry out weight control intervention program among this occupation group.

As reflected from the results of the present study, it was shown that there were significant associations found between years of service ($\chi^2 = 21.544$, $p < 0.001$) and marital status ($\chi^2 = 9.627$, $p = 0.002$) with BMI. However, there was no significant association found for age ($\chi^2 = 3.697$, $p = 0.055$), work shift ($\chi^2 = 0.967$, $p = 0.325$), education level ($\chi^2 = 0.050$, $p = 0.822$) and household income ($\chi^2 = 0.516$, $p = 0.472$) with BMI.

In terms of lifestyle factors, there was no significant relationship found between physical activity level ($r = -0.09$, $p = 0.347$) with BMI despite the high average of 9688.70 ± 7123.29 METs-min/week reported. It may be suggested that their body weight status is not influenced by physical activity level due to the prolonged high physical activeness required in performing their core duties in fire and emergency rescues. Besides, there was also no significant relationship found between sleep quality ($r = 0.116$, $p = 0.228$) and social jet lag ($r = -0.043$, $p = 0.652$) as well as eating behaviour ($\chi^2 = 1.686$, $p = 0.194$) with BMI.

In terms of chronotype, a majority of the firefighters were classified as intermediate-type people. This indicates they had their “optimal” or “best timing” for mental and physical performance was between morning and evening hours. They did not wake up too early in the morning nor too late in the evening and they did not go to bed in early evening nor stay up late. There was no significant association found between chronotype with BMI.

5.2 Recommendations

The present study found high prevalence of overweight and obesity among firefighters. Hence, health promotion programs in terms of healthy weight management should be carried out for this occupational group. Furthermore, nutritionists can be placed in the cafeteria of each fire and rescue department in order to take care of diet quality of meals consumed by the firefighters.

More research are needed to be conducted in order to identify the underlying factors that contribute to changes in body weight status of firefighters. Other factors such as meal timing, dietary intake, and depression, should be included in future studies. Furthermore, physical fitness of the firefighters is not assessed in this study provided the high prevalence of overweight and obesity found among the firefighters. Future studies should examine the physical fitness level of firefighters in relation to body weight status as physical fitness plays an important role in firefighters’ job ability. It is also suggested that future studies to focus on targeted firefighters who are married and who have served the fire service department for longer years as these two characteristics were found to be significantly associated with body weight status of firefighters in the current study.

Besides, this study included only firefighters from selected branches in Selangor. It is suggested that future studies should include firefighters from the other states as there may be differences in socio-demographic background and lifestyle factors among the firefighters between one state and another.

Future studies assessing association of chronotype with body weight status should categorise respondents into only two distinct groups (Morning / Evening) by setting a cut-off score for intermediate-type score range in order to further regrouping those who are intermediate-type into either morning or evening-type. This is to clearly address the relationship between chronotype preferences with body weight status.

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APPENDICES

Appendix A

Ethical Approval from JKEUPM

**ETHICS COMMITTEE FOR RESEARCH INVOLVING HUMAN SUBJECTS
(JKEUPM)
UNIVERSITI PUTRA MALAYSIA**

Research title	: Association Between Socio-Demography Factors, Lifestyle Factors and Chronotype With Body Weight Status Among Firefighters In Selangor.
Study Site	: Fire and Rescue Department, Selangor
JKEUPM Ref No.	: JKEUPM-2019-421
Researcher	: Wong Jenn Nan
Supervisor	: Assoc. Prof. Dr. Gan Wan Ying

Documents received and reviewed with reference to the above study:

1. Ethics Application Form, Version 1 dated 24/10/2019
2. Respondent Information Sheet & Consent (Malay), Version 1 dated 24/10/2019
3. Proposal (English), Version 2 dated 30/11/2019
4. Questionnaires/ Interviews (Malay), Version 1 dated 24/10/2019
5. Curriculum Vitae of:
 - a. Assoc. Prof. Dr. Gan Wan Ying

The University Research Ethics Committee, Universiti Putra Malaysia (JKEUPM) operates in accordance to the ICH-GCP Guidelines.

Decision by JKEUPM:

- ☒ Approved
- ☒ Permission **MUST BE OBTAINED** from the respective hospitals/ institutions before conducting the research
- ☐ Disapproved

Please note that the approval is **VALID UNTIL 16 JANUARY 2021**

Researchers should comply with the following:

- I. Complete a Study Final Report upon study completion (Form 3.2).
- II. Ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.
- III. Applicable for Clinical Trial Studies and Clinical Interventional Studies only: Progress Report has to be submitted to JKEUPM at every 6 months from the date of approval (Form 3.1). Report occurrences of all Serious Adverse Events (SAEs), Suspected Unexpected Serious Adverse Reaction (SUSARs) and Protocol Deviation/ Violation at all JKEUPM approved sites to JKEUPM.

Appendix B

Approval Letter from Headquarter of Fire and Rescue Department Selangor

SEPERTI SENARAI EDARAN

1. Ketua Balai Bomba dan Penyelamat Serdang
2. Ketua Balai Bomba dan Penyelamat Kuala Selangor
3. Ketua Balai Bomba dan Penyelamat Sungai Buloh
4. Ketua Balai Bomba dan Penyelamat Rawang
5. Ketua Balai Bomba dan Penyelamat Pelabuhan Klang
6. Ketua Balai Bomba dan Penyelamat Telok Panglima Garang
7. Ketua Balai Bomba dan Penyelamat Petaling Jaya
8. Ketua Balai Bomba dan Penyelamat Kajang

**TARIKH MENJALANKAN KAJIAN PENYELIDIKAN DI CAWANGAN JABATAN
BOMBA DAN PENYELAMAT NEGERI SELANGOR YANG TERLIBAT**

Zon	Balai	Tarikh	Masa
Serdang	Balai Bomba dan Penyelamat Serdang	3/3/2020 (Selasa)	Petang 2.30pm – 4.30pm
Klang	Balai Bomba dan Penyelamat Pelabuhan Klang	8/3/2020 (Ahad) 9/3/2020 (Isnin)	Pagi 9.00am – 11.00am
Petaling	Balai Bomba dan Penyelamat Petaling Jaya	8/3/2020 (Ahad) 9/3/2020 (Isnin)	Petang 2.30pm – 4.30pm
KLIA	Balai Bomba dan Penyelamat Teluk Panglima Garang	13/3/2020 (Jumaat) 14/3/2020 (Sabtu)	Pagi 9.00am – 11.00am
Hulu Langat	Balai Bomba dan Penyelamat Kajang	13/3/2020 (Jumaat) 14/3/2020 (Sabtu)	Petang 3.30pm – 5.30pm
Sabak Bernam	Balai Bomba dan Penyelamat Kuala Selangor	20/3/2020 (Jumaat) 23/3/2020 (Isnin)	Petang 3.30pm – 5.30pm Pagi 9.00am – 11.00am
Shah Alam	Balai Bomba dan Penyelamat Sungai Buloh	29/3/2020 (Ahad) 30/3/2020 (Isnin)	Pagi 9.00am – 11.00am
Rawang	Balai Bomba dan Penyelamat Rawang	29/3/2020 (Ahad) 30/3/2020 (Isnin)	Petang 2.30pm – 4.30pm

SENARAI PERALATAN YANG DIPERLUKAN

Peralatan	Bilangan
Meja	5
Kerusi	20



FAKULTI PERUBATAN DAN SAINS KESIHATAN

Faculty of Medicine and Health Sciences

Rujukan kami : UPM/FPSK/FPD/PKK4999A/JA001

Tarikh : 31 Oktober 2019

Pengarah
Jabatan Bomba dan Penyelamat Negeri Selangor
No.3 Persiaran Teber Layar
Bukit Jelutong
Seksyen U8 40150 Shah Alam
Selangor Darul Ehsan

Melalui,
Profesor Dr. Zamri Sekawi
Dekan
Fakulti Perubatan dan Sains Kesihatan
Universiti Putra Malaysia
43400 Serdang
Selangor Darul Ehsan

PROF. DR. ZAMRI SEKAWI
Dekan
Fakulti Perubatan dan Sains Kesihatan
Universiti Putra Malaysia
43400 Serdang, Selangor

Tuan,

**PERMOHONAN UNTUK MENJALANKAN PROJEK ILMIAH TAHUN AKHIR
(PKK4999A) PELAJAR BACELOR SAINS (PEMAKANAN DAN KESIHATAN
KOMUNITI) DI JABATAN BOMBA DAN PENYELAMAT NEGERI SELANGOR**

Dengan segala hormatnya perkara di atas adalah dirujuk.

Sukacita dimaklumkan bahawa dua orang pelajar tahun akhir program Bachelo Sains (Pernakan dan Kesihatan Komuniti) di bawah seliaan saya sedang mengikuti kursus PKK4999A Projek Ilmiah Tahun Akhir di Jabatan Pemakanan dan Dietetik. Sebagai memenuhi sebahagian daripada syarat bergraduan, mereka dikehendaki menyediakan satu penulisan ilmiah. Berikut adalah maklumat pelajar-pelajar tersebut:

Nama pelajar	: Wong Jenn Nan
No. Matrik	: 188896
Tajuk Penyelidikan	: <i>Associations between Socio-demographic Factors, Lifestyle Factors and Chronotype with Body Weight Status among Firefighters in Selangor</i>
Nama pelajar	: Nurul Aminah Binti Aziz
No. Matrik	: 190015
Tajuk Penyelidikan	: <i>Nutritional Status and Blood Pressure Level According to Human Chronotype among Firefighters in Selangor</i>

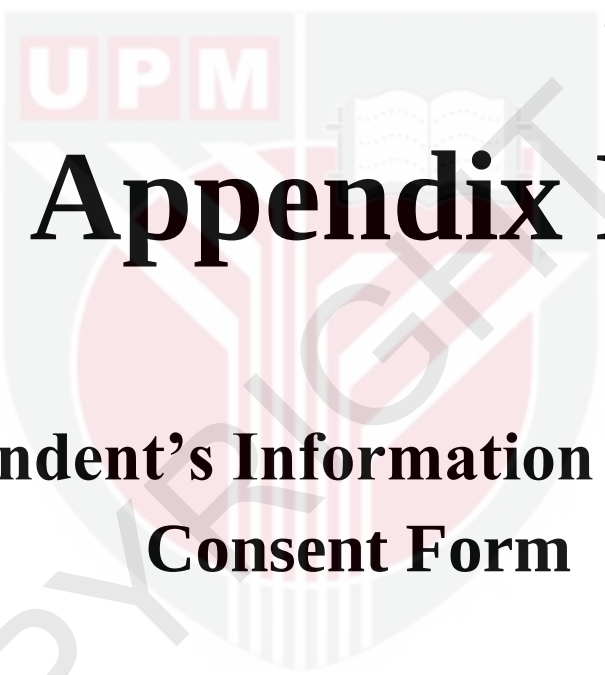
LAMPIRAN

SENARAI CAWANGAN JABATAN BOMBA DAN PENYELAMAT NEGERI
SELANGOR YANG TERLIBAT DALAM KAJIAN

Zon	Balai
Shah Alam	Balai Bomba & Penyelamat Sungai Buloh
Petaling	Balai Bomba & Penyelamat Petaling Jaya
Petaling	Balai Bomba & Penyelamat Serdang
Hulu Langat	Balai Bomba & Penyelamat Kajang
Klang	Balai Bomba & Penyelamat Pelabuhan Klang
KLIA	Balai Bomba & Penyelamat Telok Panglima Garang
Rawang	Balai Bomba & Penyelamat Rawang
Sabak Bernam	Balai Bomba & Penyelamat Kuala Selangor

Appendix C

Letter of Undertaking
(Aku Janji Penyelidik Ilmiah)



Appendix D

Respondent's Information Sheet and Consent Form



BORANG 2.4: PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1.TAJUK KAJIAN

Hubung kait antara faktor sosio-demografik, gaya hidup, dan kronotaip dengan status berat badan dalam kalangan anggota bomba di Selangor.

2. PENGENALAN

Sejak beberapa dekad yang lalu, obesiti telah menjadi masalah kesihatan yang utama yang akan mengakibatkan banyak penyakit tidak berjangkit seperti kencing manis, penyakit jantung dan tekanan darah tinggi. Pendedahan kepada kerja syif, terutamanya pada waktu malam, dikaitkan dengan risiko obesiti yang lebih tinggi. Bomba merupakan pekerjaan yang mengikuti waktu syif. Komposisi badan anggota bomba perlu dipantau dan dikekalkan secara optimal. Kajian lepas melaporkan bahawa anggota bomba berkecenderungan menghadapi peningkatan berat badan yang berlebihan dan masalah obesiti. Namun demikian, faktor yang meyumbang kepada peningkatan berat badan tidak dikenal pasti dalam kajian lepas. Tambahan pula, kajian tentang status pemakanan anggota bomba adalah terhad di Malaysia. Justeru itu, kajian ini dijalankan untuk mengenal pasti faktor yang berkaitan dengan status berat badan dalam kalangan anggota bomba di Selangor.

Kajian ini adalah sebahagian daripada keperluan untuk bergraduat bagi Ijazah Sarjana Muda Sains (Pemakanan dan Kesihatan Komuniti) dari Fakulti Perubatan dan Sains Kesihatan, Universiti Putra Malaysia yang dijangka siap dalam tempoh satu tahun pengajian. Seramai 201 anggota bomba di Selangor akan mengambil bahagian dalam kajian ini.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Anda perlu membaca dan memahami tentang kajian ini dalam borang Penerangan dan Persetujuan Responden. Jika anda bersetuju untuk menyertai kajian ini, anda diminta untuk menandatangani borang persetujuan penyertaan di halaman 3. Setelah itu, anda diminta menyerahkan kembali borang tersebut kepada penyelidik.

Anda perlu melengkapkan satu set soal selidik yang mengandungi maklumat mengenai ciri-ciri sosiodemografi, pola pemakanan, tahap aktiviti fizikal, kualiti tidur dan kronotaip manusia. Ukuran berat badan, ketinggian, lilitan pinggang, peratusan lemak badan anda akan diukur oleh penyelidik.

Anda akan mengambil masa lebih kurang 20 minit untuk menyiapkan kajian ini. Penyertaan anda dalam kajian ini adalah secara sukarela. Anda berhak untuk menarik diri daripada kajian ini pada bila-bila masa tanpa memberi sebarang alasan kepada penyelidik. Tiada penalti akan dikenakan semasa penarikan diri anda.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Anggota bomba yang menghadapi penyakit kronik seperti penyakit jantung, tekanan darah tinggi dan kencing manis.

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

a) KEPADA ANDA SEBAGAI PESERTA?

Anda akan mengetahui status berat badan anda melalui Indeks Jisim Tubuh (BMI), ukuran lilitan pinggang dan peratusan lemak badan.

b) KEPADA PENYELIDIK?

Hasil kajian ini akan memberi maklumat mengenai faktor yang berkaitan dengan status berat badan dalam kalangan anggota bomba. Selain itu, hasil kajian ini juga dapat membantu Pegawai Sains Pemakanan dan Perancang Promosi Kesihatan untuk merancang program intervensi dan promosi kesihatan yang berkaitan dengan pemakanan sihat dan pengurusan berat badan demi peningkatan status pemakanan dan kesihatan anggota bomba.

6. ADAKAH IA BERISIKO?

Kajian ini mempunyai risiko yang minimum kerana kajian ini hanya melibatkan pengisian borang soal selidik dan ukuran antropometri sahaja (ketinggian, berat badan, lilitan pinggang dan peratusan lemak badan).

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Ya. Semua maklumat yang diperolehi daripada kajian ini akan kekal sulit dan digunakan untuk tujuan penyelidikan sahaja dan tidak akan didedahkan kepada mana-mana pihak. Maklumat setiap individu tidak akan disertakan di dalam kajian atau publisiti.

8. SIAPA YANG SAYA PERLU HUBUNGI SEKIRANYA SAYA MEMPUNYAI SOALAN TAMBAHAN SEMASA MENGIKUTI PENYELIDIKAN INI?

Sekiranya anda mempunyai sebarang pertanyaan, sila hubungi;

Penyelidik : Wong Jenn Nan
011-21136793
<mailto:jnwong96@gmail.com>

Penyelia: Prof. Madya Dr. Gan Wan Ying
03-97692469
<mailto:wanying@upm.edu.my>

Sila tandatangan di sini sekiranya anda telah membaca dan memahami kandungan halaman ini _____

9. PERSETUJUAN

Saya..... No Kad Pengenalan.
beralamat.....
.....dengan ini bersetuju untuk mengambil bahagian secara
sukarela dalam penyelidikan yang tersebut di atas *(kajian klinikal/percubaan ubat-
ubatan/rakaman video/kumpulan sasaran/temuduga/ soal selidik).

Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi
metodologi, risiko dan komplikasi (seperti tertulis pada Helaian Penerangan Responden).
Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa
tanpa memberi sebarang alasan. Saya juga memahami bahawa sebarang maklumat yang
berkaitan identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yang melibatkan
saya.

Saya setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan
dalam apa jua bentuk penerbitan atau pembentangan. (sekiranya berkaitan).

*potong yang tidak berkenaan

Tandatangan Tandatangan
(Responden) (Saksi)

Tarikh : Nama :

No. K/P:

Saya mengesahkan bahawa saya telah menerangkan kepada responden ini sifat dan
tujuan penyelidikan yang tersebut di atas.

Tarikh Tandatangan
(Penyelidik)

No rujukan:

Appendix E

Questionnaire



**FAKULTI PERUBATAN DAN SAINS KESIHATAN
JABATAN PEMAKANAN DAN DIETETIK**

BORANG SOAL SELIDIK

“SULIT”

TAJUK KAJIAN:

Hubung kait antara faktor sosio-demografik, gaya hidup, dan kronotaip dengan status berat badan dalam kalangan pegawai bomba di Selangor

Penyelidik : Wong Jenn Nan (188896)
Penyelia penyelidik : Prof. Madya Dr. Gan Wan Ying
Tarikh :
Cawangan balai :

Arahan: Soalan dalam borang soal selidik ini hanya untuk tujuan akademik sahaja. Semua maklumat tidak akan didedahkan ke mana-mana pihak. Penglibatan dan kerjasama anda amatlah dihargai.

BAHAGIAN A

Arahan: Isi tempat kosong atau tandakan (✓) di ruangan yang disediakan.

	Maklumat	Jawapan
1.	Nama	
2.	No telefon	
3.	Tarikh lahir	___ / ___ / _____ (hari/bulan/tahun)
4.	Unit	
5.	Waktu syif pada hari ini	☐ 8 am – 8 pm ☐ 8 pm – 8 am
6.	Tempoh berkhidmat (tahun)	
7.	Tahap pendidikan	☐ Tiada pendidikan formal ☐ Sijil ☐ UPSR ☐ Diploma ☐ PMR ☐ Ijazah Sarjana Muda ☐ SPM ☐ Ijazah Sarjana ☐ STPM ☐ PhD ☐ Lain-lain: _____
8.	Kaum	☐ Melayu ☐ Cina ☐ India ☐ Lain-lain: _____
9.	Status perkahwinan	☐ Bujang ☐ Bercerai ☐ Berkahwin ☐ Duda
10.	Pendapatan peribadi bulanan	☐ < RM 3860 ☐ RM 3860-RM 8319 ☐ > RM 8319
11.	Pendapatan isi rumah bulanan	☐ < RM 3860 ☐ RM 3860-RM 8319 ☐ > RM 8319

BAHAGIAN B

Arahan: Sila bulatkan pilihan jawapan.

1. Pada waktu bilakah anda akan bangun jika anda berkelapangan untuk merancang hari anda?

a) 5:00 – 6:30 AM

b) 6:30 – 7:45 AM

c) 7:45 – 9:45 AM

d) 9:45 – 11:00 AM

e) 11:00 AM – 12 TENGAHARI

f) 12 TENGAHARI – 5:00 AM

2. Pada waktu bilakan anda akan tidur jika anda berkelapangan merancang petang anda?

a) 8:00 – 9:00 PM

b) 9:00 – 10:15 PM

c) 10:15 – 12:30 AM

d) 12:30 – 1:45 AM

e) 1:45 – 3:00 AM

f) 3:00 AM – 8:00 PM

3. Sekiranya ada waktu tertentu di mana anda perlu bangun pada waktu pagi, sejauh manakah anda bergantung pada masa yang dibangkitkan oleh jam penggera?
- a) Tidak sama sekali bergantung
b) Bergantung sedikit
c) Sederhana bergantung
d) Sangat bergantung
4. Sejauh manakah anda mudah untuk bangun pada waktu pagi (apabila anda tidak bangun secara tiba-tiba)?
- a) Sangat tidak mudah
b) Tidak mudah
c) Sederhana mudah
d) Sangat mudah
5. Sejauh manakah tahap anda berjaga pada setengah jam pertama selepas anda bangun pagi?
- a) Tidak berjaga-jaga langsung
b) Sedikit berjaga-jaga
c) Sederhana berjaga-jaga
d) Sangat berjaga-jaga
6. Sejauh manakah anda berasa lapar pada waktu setengah jam pertama selepas anda bangun pada waktu pagi?
- a) Tidak lapar langsung
b) Sedikit lapar
c) Sederhana lapar
d) Sangat lapar
7. Sejauh manakah anda berasa letih pada setengah jam selepas anda bangun pada waktu pagi?
- a) Sangat letih
b) Sederhana letih
c) Sederhana segar
d) Sangat segar
8. Jika anda tidak mempunyai sebarang komitmen pada keesokan hari, berapa lewat/awal anda akan tidur berbanding dengan waktu tidur biasa anda?
- a) Jarang atau tidak pernah lewat
b) Kurang dari satu jam kemudian
c) 1-2 jam kemudian
d) Lebih dari dua jam kemudian
9. Anda telah memutuskan untuk melibatkan diri dalam aktiviti fizikal. Seorang kawan mencadangkan anda melakukan aktiviti fizikal selama satu jam dua kali seminggu dan masa terbaik untuknya adalah antara pukul 07:00 hingga 08:00. Dengan berfikir mengenai “jam” badan anda, sejauh manakah keadaan anda apabila melakukan aktiviti fizikal mengikut cadangan masa kawan anda?
- a) Akan berada dalam keadaan baik
b) Akan berada dalam keadaan sederhana baik
c) Akan merasa sukar
d) Akan merasa sangat sukar
10. Pada waktu bilakah anda merasakan anda akan menjadi letih dan perlukan tidur?
- a) 8:00 – 9:00 PM
b) 9:00 – 10:15 PM
c) 12:45 – 2:00 AM
d) 2:00 – 3:00 AM

c) 10:15 – 12:45 AM

11. Anda ingin berada pada prestasi optimum untuk satu ujian yang anda tahu akan menyebabkan keletihan mental dan berlangsung selama dua jam. Anda berkelapangan merancang hari anda. Mengambil kira “jam” badan anda, waktu manakah akan menjadi pilihan anda untuk mengambil ujian?

- a) 8:00 AM – 10:00 AM
- b) 11:00 AM – 1:00 PM

- c) 3:00 PM – 5:00 PM
- d) 7:00 PM – 9:00 PM

12. Jika anda mula tidur pada jam 11:00 PM, sejauh manakah anda akan berasa letih?

- a) Tidak letih langsung
- b) Sedikit letih

- c) Sederhana letih
- d) Sangat letih

13. Atas sebab tertentu anda telah tidur beberapa jam kemudian dari biasa, tetapi anda tidak perlu bangun pada waktu tertentu pada keesokan harinya. Yang manakah perkara anda akan lakukan (pilih SATU)?

- a) Akan bangun pada waktu biasa, tetapi TIDAK akan tidur semula
- b) Akan bangun pada waktu biasa dan akan berlengah-lengah
- c) Akan bangun pada waktu biasa tetapi akan tidur semula
- d) TIDAK akan bangun sehingga lebih awal daripada biasa

14. Suatu malam anda perlu berjaga antara jam 4:00 - 6:00 pagi untuk menjalankan tugas memantau. Anda tidak mempunyai komitmen pada hari berikutnya. Manakah yang akan menjadi SATU alternatif yang sesuai bagi anda?

- a) TIDAK akan tidur sehingga tugas memantau selesai.
- b) Akan tidur sebelum dan tidur selepas tugas
- c) Akan tidur nyenyak sebelum dan tidur selepas tugas
- d) Akan tidur sebelum tugas memantau

15. Anda perlu melakukan dua jam kerja fizikal yang berat. Anda sepenuhnya bebas untuk merancang hari anda dan mempertimbangkan hanya "jam" badan dalaman anda. Masa manakah yang anda akan pilih untuk melaksanakan perancangan hari anda?

- a) 8:00 AM – 10:00 AM
- b) 11:00 AM – 1:00 PM

- c) 3:00 PM – 5:00 PM
- d) 7:00 PM – 9:00 PM

16. Anda telah memutuskan untuk melibatkan diri dalam aktiviti fizikal yang berat. Seorang kawan mencadangkan anda melakukan ini selama satu jam dua kali seminggu dan masa terbaik untuknya adalah antara pukul 10:00 hingga 11:00 PM. Dengan berfikir mengenai “jam” badan anda, sejauh manakah keadaan anda untuk melakukan aktiviti fizikal mengikut cadangan masa kawan anda?

- a) Akan berada dalam keadaan baik
- b) Akan berada dalam keadaan sederhana baik

- c) Akan merasa susah
- d) Akan merasa sangat susah

17. Katakan bahawa anda boleh memilih jam kerja anda sendiri. Anggapkan bahawa anda bekerja LIMA jam sehari (termasuk rehat) dan tugas anda menarik dan dibayar mengikut hasilnya. LIMA JAM KONSEKUTIF yang manakah anda akan pilih?

- a) 5 jam bermula antara 4:00 AM and 8:00 AM
- b) 5 jam bermula antara 8:00 AM and 9:00 AM
- c) 5 jam bermula antara 9:00 AM and 2:00 PM
- d) 5 jam bermula antara 2:00 PM and 5:00 PM
- e) 5 jam bermula antara 5:00 PM and 4:00 AM

18. Pada waktu bilakah anda berfikir anda mencapai puncak “rasa terbaik”?

- a) 5:00 – 8:00 AM
- b) 8:00 – 10:00 AM
- c) 10:00 AM – 5:00 PM
- d) 5:00 – 10:00 PM
- e) 10:00 PM – 5:00 AM

19. Anda mendengar mengenai orang jenis “pagi” dan “petang”. Yang manakah anda akan anggap diri anda?

- a) Sememangnya jenis “pagi”
- b) Lebih ke arah jenis “pagi” berbanding “petang”
- c) Lebih ke arah jenis “petang” berbanding “pagi”
- d) Sememangnya jenis “petang”

BAHAGIAN C

Arahan: Berikut adalah soalan mengenai tingkah laku makan anda. Sila pilih satu jawapan dan bulatkannya. Tanda (/) pada kotak yang berkenaan.

1 = Setiap hari

2 = 4–6 hari seminggu

3 = 2–3 hari seminggu

4 = Sekali seminggu

5 = 1–3 kali sebulan

6 = Tidak pernah/kurang daripada sekali sebulan

No	Kenyataan	Skala					
1a	Berapa kerapkah anda mengambil <u>sarapan pagi</u> ?	1	2	3	4	5	6
1b	Berapa kerapkah anda mengambil <u>minum pagi</u> ?	1	2	3	4	5	6
1c	Berapa kerapkah anda mengambil <u>makan tengahari</u> ?	1	2	3	4	5	6
1d	Berapa kerapkah anda mengambil <u>minum petang</u> ?	1	2	3	4	5	6
1e	Berapa kerapkah anda mengambil <u>makan malam</u> ?	1	2	3	4	5	6
1f	Berapa kerapkah anda mengambil <u>makan lewat malam</u> ?	1	2	3	4	5	6
2	Sila nyatakan 3 jenis makanan atau minuman utama yang biasa anda ambil <i>di antara waktu masa makan utama</i> (seperti teh, susu, kuih-muih, aiskrim, buah-buahan, snek bungkusan, pisang goreng dan lain-lain lagi) dan kekerapan pengambilannya.						
	i.	1	2	3	4	5	6
	ii.	1	2	3	4	5	6
	iii.	1	2	3	4	5	6
3	Berapa kerapkah anda makan di medan selera, kedai kopi, atau gerai makanan?	1	2	3	4	5	6
4	Berapa kerapkah anda makan di restoran makanan barat (seperti KFC, McDonald's, Pizza Hut dan lain-lain)?	1	2	3	4	5	6
5	Berapa kerapkah anda membungkus/membeli dengan penghantaran (delivery) makanan dari restoran makan barat (seperti KFC, McDonald's, Pizza Hut dan lain-lain)?	1	2	3	4	5	6

6. Siapakah yang biasanya makan bersama anda?

- ☐ Ahli keluarga saya
- ☐ Rakan-rakan saya
- ☐ Bersendirian
- ☐ Lain-lain, sila nyatakan: _____

7. Adakah anda mengambil sebarang makanan suplemen (seperti pil vitamin)?

- ☐ Ya
- ☐ Tidak

Jika Ya, apakah makanan suplemen yang anda ambil dan kekerapan pengambilannya (contoh: satu tablet setiap hari, dua kapsul setiap hari)?

Makanan suplemen	Kekerapan
i. _____	_____
ii. _____	_____
iii. _____	_____

Jika Ya, siapakah yang menasihat anda mengambil makanan suplemen tersebut?

BAHAGIAN D

Ketika menjawab soalan-soalan berikut, 'aktiviti berat' ialah aktiviti-aktiviti yang memerlukan keupayaan fizikal yang tinggi dan mengakibatkan peningkatan kadar pernafasan ataupun denyutan jantung yang banyak; 'aktiviti sederhana' ialah aktiviti-aktiviti yang memerlukan keupayaan fizikal yang sederhana dan mengakibatkan peningkatan kadar pernafasan ataupun denyutan jantung yang sedikit.

Soalan-soalan		Maklumbalas
Aktiviti Fizikal Berkaitan Pekerjaan		
1	Adakah pekerjaan anda melibatkan aktiviti kerja berat yang mengakibatkan peningkatan yang banyak dalam kadar pernafasan ataupun denyutan jantung seperti berlari, membawa atau mengangkat barang yang berat, menggali, mencangkul, menuai, berkebun, memburu atau melakukan kerja pembinaan sekurang-kurangnya 10 minit secara berterusan?	Ya 1 Tidak 2 Jika 'Tidak', sila ke No. 4
2	Biasanya dalam seminggu, berapa harikah anda melakukan kerja-kerja berat dalam pekerjaan anda?	Jumlah hari []
3	Pada hari biasa yang anda lakukan kerja berat, berapa lamakah anda melakukannya?	Jam : minit [][] : [][]
4	Adakah pekerjaan anda melibatkan aktiviti kerja sederhana yang mengakibatkan peningkatan yang sedikit dalam kadar pernafasan ataupun denyutan jantung seperti berjalan pantas, membawa barang yang ringan, memancing, membuat kerja rumah, mencuci kereta atau mengecat rumah sekurang-kurangnya 10 minit secara berterusan?	Ya 1 Tidak 2 Jika 'Tidak', sila ke No. 7
5	Biasanya dalam seminggu, berapa harikah anda melakukan kerja-kerja sederhana dalam pekerjaan anda?	Jumlah hari []
6	Pada hari biasa yang anda lakukan kerja sederhana, berapa lamakah anda melakukannya?	Jam : minit [][] : [][]
Aktiviti Fizikal Berkaitan Perjalanan		
Soalan-soalan seterusnya TIDAK termasuk aktiviti fizikal semasa bekerja yang telah anda nyatakan. Sekarang, saya ingin bertanya mengenai kaedah yang biasa anda gunakan untuk bergerak dari satu tempat ke tempat yang lain (seperti ke tempat kerja, pasar, membeli-belah, masjid, dan sebagainya).		
7	Adakah anda berjalan atau berbasikal secara berterusan sekurang-kurangnya 10 minit untuk menuju ke, dan dari sesuatu tempat?	Ya 1 Tidak 2 Jika 'Tidak', sila ke No. 10
8	Dalam satu minggu yang biasa, berapa harikah anda berjalan atau berbasikal secara berterusan sekurang-kurangnya 10 minit untuk menuju ke, dan dari sesuatu tempat?	Jumlah hari []
9	Dalam satu hari yang biasa, berapa lamakah anda berjalan atau berbasikal untuk bergerak dari satu tempat ke tempat yang lain?	Jam : minit [][] : [][]
Aktiviti Fizikal Pada Waktu Lapang		
Soalan-soalan seterusnya TIDAK termasuk aktiviti semasa bekerja dan semasa perjalanan yang telah anda nyatakan.		

Sekarang, saya ingin bertanya tentang aktiviti yang anda lakukan untuk rekreasi, kecergasan, dan sukan.		
10	Pada masa lapang, adakah anda melakukan aktiviti sukan, kecergasan atau riadah yang lasak yang mengakibatkan peningkatan yang banyak dalam kadar pernafasan ataupun denyutan jantung, seperti berlari, jogging, aerobik atau bermain bola sepak, sekurang-kurangnya 10 minit secara berterusan?	Ya 1 Tidak 2 Jika 'Tidak', sila ke No.13
11	Biasanya dalam seminggu pada waktu lapang, berapa harikah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang lasak?	Jumlah hari []
12	Dalam satu hari yang biasa, berapa lamakah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang lasak?	Jam : minit [][] : [][]
13	Pada masa lapang, adakah anda melakukan aktiviti sukan, kecergasan atau riadah yang sederhana yang mengakibatkan peningkatan yang sedikit dalam kadar pernafasan ataupun denyutan jantung, seperti berjalan pantas, berbasikal, berenang, menanam pokok bunga atau bermain bola tampar, sekurang-kurangnya 10 minit secara berterusan?	Ya 1 Tidak 2 Jika 'Tidak', sila ke No. 16
14	Biasanya dalam seminggu pada waktu lapang, berapa harikah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang sederhana?	Jumlah hari []
15	Dalam satu hari yang biasa, berapa lamakah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang sederhana?	Jam : minit [][] : [][]
Aktiviti Sedentari Atau Tidak Aktif		
Soalan berikut adalah berkaitan dengan aktiviti duduk atau baring/sandar di tempat kerja, di rumah, semasa dalam perjalanan, atau semasa bersama rakan- rakan. Contohnya, duduk menulis, mengguna komputer, duduk bersama rakan- rakan, perjalanan dalam kereta, bas, keretapi, duduk membaca, bermain kad atau menonton televisyen, TETAPI TIDAK TERMASUK waktu tidur		
16	Dalam satu hari yang biasa, berapakah jumlah masa yang anda gunakan untuk duduk atau baring/bersandar?	Jam : minit [][] : [][]

BAHAGIAN E

Arahan : Soalan-soalan berikut adalah berkaitan dengan tabiat tidur anda yang biasa dalam tempoh bulan yang lalu (30 hari yang lalu) sahaja. Jawapan-jawapan anda harus menunjukkan keadaan yang paling tepat bagi kebanyakan waktu siang dan malam dalam tempoh bulan yang lalu. Sila jawab semua soalan.

1. Dalam tempoh bulan yang lalu, pada pukul berapakah biasanya anda masuk tidur pada waktu malam?

WAKTU MASUK TIDUR (HARI BEKERJA): _____

WAKTU MASUK TIDUR (HARI TIDAK BEKERJA): _____

2. Dalam tempoh bulan yang lalu, berapa lamakah (dalam minit) biasanya anda ambil untuk mula tidur pada setiap malam?

JUMLAH MINIT: _____

3. Dalam tempoh bulan yang lalu, pada pukul berapakah biasanya anda bangun dari katil pada waktu pagi?

WAKTU BANGUN DARI KATIL (HARI BEKERJA): _____

WAKTU BANGUN DARI KATIL (HARI TIDAK BEKERJA): _____

4. Dalam tempoh bulan yang lalu, berapa jamkah sebenarnya anda tidur pada waktu malam? (Ini mungkin berbeza dengan jumlah jam yang anda gunakan untuk berbaring di atas katil.)

JUMLAH JAM TIDUR UNTUK SATU MALAM: _____

Bagi setiap soalan-soalan di bawah, tandakan jawapan yang paling sesuai. Sila jawab semua soalan.

5. Dalam **tempoh bulan yang lalu**, berapa kerapkah anda telah mengalami masalah tidur kerana anda . . .

No.	Item	Tidak dalam tempoh yang lalu	Kurang daripada sekali seminggu	Satu atau dua kali seminggu	Tiga kali atau lebih seminggu
a)	Tidak boleh tidur dalam tempoh 30 minit				
b)	Bangun pada waktu tengah malam atau awal pagi				
c)	Perlu bangun tidur untuk menggunakan tandas				
d)	Tidak boleh bernafas dengan selesa				
e)	Batuk atau berdengkur dengan kuat				

f)	Rasa begitu sejuk				
g)	Rasa begitu panas				
h)	Mengalami mimpi yang buruk				
i)	Mengalami kesakitan				
j)	Alasan (-alasan) yang lain, sila terangkan				
k)	Berapa kerapkah dalam tempoh bulan yang lalu anda telah mengalami masalah tidur kerana alasan tersebut?				
6.	Dalam tempoh bulan yang lalu, berapa kerapkah anda telah mengambil ubat untuk membantu anda untuk tidur (ubat yang dinasihati oleh doktor anda atau ubat yang dibeli sendiri tanpa preskripsi)?				
7.	Dalam tempoh bulan yang lalu, berapa kerapkah anda mengalami masalah untuk berjaga semasa memandu kenderaan, makan, atau melibatkan diri dengan aktiviti sosial?				

8. Dalam tempoh bulan yang lalu, bagaimanakah anda nilai kualiti tidur anda secara keseluruhan?

Sangat baik	
Agak baik	
Agak buruk	
Sangat buruk	

9. Dalam tempoh bulan yang lalu, berapa banyakkah masalah anda untuk memastikan anda cukup semangat untuk menyelesaikan kerja?

Tiada masalah langsung	
Hanya sedikit masalah	
Agak banyak masalah	
Satu masalah yang besar	

10. Adakah anda mempunyai teman sekatil atau teman serumah?

Tiada teman sekatil atau teman serumah	
Teman/teman serumah dalam bilik lain	
Teman dalam bilik yang sama, tetapi bukan atas katil yang sama	
Teman atas katil yang sama	

Jika anda mempunyai teman serumah atau teman sekatil, tanya dia berapa kerapkah dalam tempoh bulan yang lalu anda mengalami . . .

No.	Item	Tidak dalam tempoh yang lalu	Kurang daripada sekali seminggu	Satu atau dua kali seminggu	Tiga kali atau lebih seminggu
a)	Dengkur yang kuat				
b)	Masa berhenti yang panjang di antara pernafasan semasa sedang tidur				
c)	Sentakan kaki semasa anda tidur				
d)	Episod-episod kebingungan apabila bangun dari tidur pada waktu malam				
e)	Gangguan yang lain semasa anda tidur, sila terangkan: _____ _____				

BAHAGIAN G (diisi oleh penyelidik)

Ukuran antropometri dan tahap tekanan darah

Ukuran	Bacaan 1	Bacaan 2	Purata
Berat (kg)			
Tinggi (cm)			
Peratusan Lemak Badan (%)			
Ukuran Lilitan Pinggang (cm)			

SOAL SELIDIK TAMAT
TERIMA KASIH DI ATAS KERJASAMA ANDA