

**OBESITY AMONG HEALTH CARE
WORKERS IN PAHANG AND
ITS ASSOCIATION WITH
JOB CATEGORIES**

DR MUHAMMAD SYAFIQ BIN KUNYAHAMU

UNIVERSITI SAINS MALAYSIA

2020

**OBESITY AMONG HEALTH CARE
WORKERS IN PAHANG AND
ITS ASSOCIATION WITH
JOB CATEGORIES**

By

DR MUHAMMAD SYAFIQ BIN KUNYAHAMU

**Research project report submitted in partial
fulfillment of the requirements for the degree of
Master of Public Health**

JUNE 2020

ACKNOWLEDGMENTS

بِسْمِ هَلَا الرَّحْمَنِ الرَّحِيمِ

In the name of Allah, The Most Gracious, The Most Merciful. With the guidance and grace of Allah S.W.T, I have able to finish and completed this dissertation

I would like to express the deepest appreciation to my supervisor, Associate Professor Dr. Aziah Daud, for the guidance, encouragement, constant supervision, and continuous supports from the beginning of this research project until the completion of this dissertation.

My special gratitude and thanks also go to Dr. Nazirah Jusoh and Dr. Ehmadi Hamdi Bin Naem from the Occupational Health and Safety Unit of Pahang Health State Department for their invaluable assistance in providing the research data.

I would like to take this opportunity to express my sense of gratitude and love to my loving wife, Nurfariha Firdaus, whose care and understanding has made it all possible. Last but not least, my ever-supportive mother, as well as the rest of the family. Thank you for all the prayers, love, and support.

Thank you, and may the blessings and rewards of Allah be upon all of you.

TABLE OF CONTENTS

ACKNOWLEDGMENTS	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF APPENDICES	ix
LIST OF ABBREVIATIONS	ii
LIST OF SYMBOLS	iii
ABSTRAK	iv
ABSTRACT	vi
CHAPTER 1 : INTRODUCTION	1
1.1 Overview of Obesity	1
1.2 Obesity and HCWs	3
1.3 Overview of KOSPEN Plus	4
1.4 Statement of the problem	5
1.5 Rationale	5
1.6 Research questions	6
1.7 Objectives	6

1.7.1 General objectives	6
1.7.2 Specific objectives	6
1.8 Research hypotheses	6
CHAPTER 2: LITERATURE REVIEW	7
2.1 Global burden of obesity	7
2.2 Burden of obesity in Malaysia	8
2.3 Burden of obesity among HCWs	10
2.4 Factors associated with obesity	11
2.4.1 Age	12
2.4.2 Gender	12
2.4.3 Ethnicity	13
2.4.4 Marital Status	14
2.4.5 Job Category	15
2.4.6 Workplace	16
2.4.7 Smoking Status	16
2.4.8 Comorbid	17
2.4.9 Level of Physical Activity	17
2.4.10 Unhealthy Diet	18

2.5 Conceptual framework	19
CHAPTER 3 : METHODOLOGY	21
3.1 Study location	21
3.2 Study design	21
3.3 Study duration	21
3.4 Reference population	21
3.5 Sampling Frame	22
3.5.1 Inclusion Criteria.....	22
3.5.2 Exclusion criteria	22
3.6 Sample size calculation	23
3.7 Sampling method and subject recruitment.....	25
3.8 Data collection	25
3.9 Operational definition	26
3.10 Statistical Analysis.....	27
3.11 Ethical consideration.....	27
3.12 Study flowchart	28
CHAPTER 4 : RESULTS	29
4.1 Characteristics of the study population.....	29

4.2 Prevalence of obesity among HCWs.....	32
4.3 Characteristics of obese and non-obese HCWs	33
4.4 Factors associated with obesity among HCWs	35
CHAPTER 5 : DISCUSSION	40
5.1 Characteristics of the study population.....	40
5.2 Prevalence of obesity among HCWs in Pahang.....	42
5.3 Factor associated with obesity among HCWs.....	45
5.4 Impact on policy.....	51
5.5 Strength of the study	53
5.6 Limitation of the study	53
CHAPTER 6 : CONCLUSION AND RECOMMENDATIONS	55
6.1 Conclusion	55
6.2 Recommendation.....	55
REFERENCES.....	56
APPENDICES	67
APPENDIX A	68
APPENDIX B	70
APPENDIX C	72

LIST OF TABLES

Table 3-1:	BMI classification	26
Table 4-1:	Socio-demographic characteristics of study subjects ($n = 4241$).....	30
Table 4-2:	Characteristics of study subjects based on the job categories.....	31
Table 4-3:	BMI status among HCWs in the Pahang ($n = 4241$).....	32
Table 4-4:	Characteristics of obese and non-obese HCWs in Pahang ($n = 4241$). 34	
Table 4-5:	Simple logistic regression on the association between each variable and obesity among HCWs in Pahang ($n = 4241$).....	36
Table 4-6:	Multiple logistic regression analysis of the factor associated with obesity among HCWs in Pahang.....	38

LIST OF FIGURES

Figure 1 :	Conceptual Framework of Factors Associated with Obesity among HCWs.....	20
Figure 2:	Flow chart of the study	28
Figure 3:	The Receiver Operation Characteristics (ROC) curve of the final model fitness of factors associated with obesity.	39

LIST OF APPENDICES

Appendix A	Universiti Sains Malaysia Ethical Approval Letter
Appendix B	NMMR Ethical Approval Letter
Appendix C	Pahang Health State Department Approval Letter

LIST OF ABBREVIATIONS

BMI	Body Mass Index
CI	Confidence Interval
CVD	Cardiovascular diseases
HCW	Healthcare workers
KOSPEN	Komuniti Sihat Perkasa Negara
NCDs	Non-communicable diseases
NHMS	National Health and Morbidity Survey
NMRR	National Medical Research Registry
OR	Odd Ratio
Adj OR	Adjusted Odd Ratio
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

LIST OF SYMBOLS

$>$	More than
$<$	Less than
$=$	Equal to
$\geq$	More than and equal to
$\leq$	Less than and equal to
α	Alpha
β	Beta
Δ	Delta
$\%$	Percentage

ABSTRAK

OBESITI DALAM KALANGAN PEKERJA KESIHATAN DI NEGERI PAHANG DAN HUBUNG KAIT ANTARA JENIS KATEGORI PEKERJAAN

Latar Belakang: Masalah obesiti dalam kalangan pekerja kesihatan akan mempengaruhi perkhidmatan kesihatan yang diberikan sama ada secara langsung atau tidak langsung disamping boleh mendatangkan masalah kesihatan kepada pekerja kesihatan itu sendiri. Tambahan pula, setiap jenis kategori pekerjaan dalam kalangan pekerja kesihatan ini dipercayai mempunyai risiko yang berbeza untuk mengalami obesiti. Pelbagai kaedah dan strategi yang telah dilaksanakan oleh Kementerian Kesihatan Malaysia (KKM) bagi mengatasi masalah peningkatan kadar obesiti dalam kalangan pekerja di Malaysia, antaranya adalah program KOSPEN Plus, yang bertujuan untuk mempromosikan gaya hidup sihat di kalangan kakitangan.

Objektif: Kajian ini bertujuan untuk mengenal pasti peratusan masalah obesiti dalam kalangan pekerja kesihatan di negeri Pahang dan hubung kait antara faktor jenis kategori pekerjaan dengan risiko mengalami obesiti.

Metodologi: Kajian secara hirisan lintang telah dijalankan dengan menggunakan data sekunder yang diperolehi daripada data saringan kesihatan KOSPEN Plus yang melibatkan semua pekerja kesihatan di negeri Pahang. Indeks Jisim Tubuh telah dikira bagi setiap subjek kajian. Hubungkait antara faktor jenis pekerjaan dengan obesiti telah dikenalpasti menggunakan regresi logistik berganda.

Keputusan: Sampel yang diekstrak dari data adalah sebanyak 4241 (94.47%) setelah mempertimbangkan kriteria inklusi dan kriteria eksklusi. Didapati sebanyak 248 sampel tidak lengkap disebabkan oleh ketiadaan maklumat berat atau tinggi atau data BMI. Dari semua subjek yang dikumpulkan, 1405 (33.1%) pekerja kesihatan mengalami masalah berat badan berlebihan, dan 892 (22.1%) mengalami masalah obesiti. Hasil perbandingan antara tiga jenis kategori pekerjaan, sebahagian besar subjek mengalami masalah obesiti adalah dari kalangan jururawat (50%) diikuti oleh kategori lain-lain pekerjaan (42.4%) dan doktor (7.6%). Hasil dari analisis regresi logistik berganda, hanya faktor kategori pekerjaan dan faktor ko-morbid yang mempunyai hubung kait secara signifikan dengan obesiti. Dari segi faktor kategori pekerjaan, hasil analisis menunjukkan bahawa jururawat mempunyai 1.91 kali lebih risiko (Adj OR 1.91, 95% CI 1.45,2.53) untuk mengalami masalah obesiti berbanding dengan doktor manakala kategori pekerjaan lain mempunyai 1.63 kali lebih risiko (Adj OR 1.63, 95% CI 1.23,21.6) untuk mengalami obesiti berbanding dengan doktor.

Kesimpulan: Masalah obesiti dalam kalangan pekerja kesihatan di Pahang adalah lebih tinggi dari peratusan masalah obesiti dalam kalangan populasi dewasa negeri Pahang. Faktor jenis pekerjaan telah dibuktikan mempunyai hubung kait yang signifikan dengan obesiti. Risiko untuk mengalami masalah obesiti lebih tinggi di kalangan jururawat berbanding doktor dan lain-lain kategori pekerjaan. Usaha perlu dilakukan bagi mengatasi masalah obesiti dalam kalangan pekerja kesihatan ini memandangkan peranan mereka dalam mempromosikan kesihatan dalam kalangan masyarakat umum. Program intervensi dan pelaksanaan dasar yang lebih cekap perlu dilakukan untuk mengatasi masalah ini.

Kata Kunci : obesiti, pekerja kesihatan, faktor risiko obesiti

ABSTRACT

OBESITY AMONG HEALTH CARE WORKERS IN PAHANG AND ITS ASSOCIATION WITH JOB CATEGORIES

Background: Burden of obesity among health care workers will affect the health service given either directly or indirectly as well as the HCWs health. Furthermore, different types of job categories are believed to have different risks to develop obesity. There have been multiple methods and strategies implemented by the Ministry of Health (MOH) as a result of the increased rate of obesity among workers in Malaysia, including the KOSPEN Plus program, which aims to promote a healthy lifestyle among staff.

Objective: To determine the prevalence and characteristics of obese HCWs in Pahang and its association with the job category.

Methodology: This study was conducted using a cross-sectional method that was derived from the secondary data of the KOSPEN PLUS health screening program involving all job categories government HCWs in Pahang. BMI was calculated for each individual subject. The association of obesity among HCWs with different job categories were then identified using multiple logistic regression.

Results: The samples extracted from the data were 4241(94.47%) after considering inclusion and exclusion criteria. Two hundred and forty-eight samples were incomplete with missing of weight or height or BMI data. Descriptive and multiple logistic regression analysis were performed. From all of the subjects collected, 1405 (33.1%) of the HCWs were overweight, and 892 (22.1%) were obese. Compared to the three job categories, nurses contribute half of the subject in obese groups (50%)

while doctors 7.6% and other job categories 42.4%. From multiple logistic regression, only the variable job categories and co-morbid were significantly associated with obesity among HCWs. In terms of association with the job category, the result has shown that being a nurse has 1.91 times the odd (95%CI 1.45,2.53) to become obese compared to a doctor when adjusted for co-morbid. Being other job categories has 1.63 times odd (95%CI 1.23,21.6) to become obese compared to the doctor when adjusted for co-morbid.

Conclusions: The burden of obesity among HCWs in Pahang was higher than the general adult population in Pahang. The job category was significantly associated with obesity, and nurses were found to have a higher risk of developing obesity than doctors and other job categories. There is a need to improve the obesity status of these HCWs in view of their roles as health advocates within the community. More efficient intervention and policy implementation programs need to be done to tackle this issue.

KEYWORDS: obesity, healthcare worker, obesity risk factor, and health staff.

CHAPTER 1

INTRODUCTION

1.1 Overview of Obesity

Obesity has evolved over time to a major threat to public health that is being increasingly seen throughout the world. Obesity is referred to as excessive body fat accumulation that can affect our well-being. Obesity happens when the consumption of energy from eating habits is more than the usage of energy resulting in gaining weight and fat deposition (Romieu *et al.*, 2017).

In the current approach, obesity status is assessed by a body mass index (BMI) measurement. A standardized weight-for-height index termed as BMI is commonly used for the classification of obesity in adults (WHO, 2018). The BMI is measured by dividing the weight (in kilograms) of a person by height (in squared meters). Based on World Health Organization (WHO)'s 1998 classification, a BMI between 25.0 kg / m² to 29.9 kg / m² is defined as overweight while having a BMI of equal to or greater than 30.0 kg / m² is defined as obesity. BMI can provide an estimate of the amount of fat in the body. However, BMI does not accurately determine the total body fat. For certain people like muscular athletes, they may be classified as obese using the BMI classification even though they do not possess any excess body fat (Etchison *et al.*, 2011).

In 2005, the obesity prevalence worldwide was 9.7% (95% CI 9.5–9.9%). The researchers also predicted that in the year 2030, 573 million people would become obese (Kelly *et al.*, 2008). However, in 2016, the WHO reported that there were 650

million adults aged more than 18 years old were obese (WHO, 2018). This report has shown that the rate of obesity is increasing overtime rapidly worldwide. The increases in obesity prevalence were seen in both developed and developing countries.

There is also a steep increase in the prevalence of NCDs, such as diabetes, hypertension, and dyslipidaemia worldwide. A study by Banjare and Bhalero (2016) about obesity-associated NCDs burden discovered that, although there were differences in the strength of association, obesity is a significant risk factor of NCDs such as cardiovascular disease, cerebral vascular accident, diabetes, hypertension, arthritis, and cancer (Banjare and Bhalerao, 2016). Other than that, obesity is linked with an increased morbidity and mortality risk, particularly due to cardiovascular diseases and cancer. With each five-unit increase in BMI of above 25 kg/m², there is a 29% increase in the overall mortality (Apovian, 2016). A cohort study of a southern community in the United States also found that an increased risk of all-cause mortality among obese young adults with the hazard ratio of 1.64 and an increased risk of mortality of cardiovascular diseases with a hazard ratio of 1.87 compared to the risks observed in normal weight adults (Hirko *et al.*, 2015). Due to the fact that obesity is highly prevalent and is one of NCD's major risk factors, this makes obesity as an important worldwide public health challenge.

1.2 Obesity and HCWs

Same with other types of professions, HCWs are also affected by obesity. Health care workers are the workers that deliver health-related care services to sick patients and also to the community either directly or indirectly. They are the backbone of healthcare services worldwide. Just because their job is to care for the sick and injured patients, HCWs are often viewed as unlikely to develop health-related issues.

According to (WHO, 2018), there are over 59 million HCWs around the world, and they are exposed to a complex variety of health issues, including infection, injury, NCDs, and others. Although HCWs are working in an environment related to disease prevention and health promotion, studies conducted in the United States have reported that HCWs had an increased obesity trend over time (Chou and Johnson, 2008; Luckhaupt *et al.*, 2014). Furthermore, different job categories of HCWs bear different risks of becoming obese (Hegde *et al.*, 2015; Kyle *et al.*, 2016; Kyle *et al.*, 2017).

An accurate assessment of the prevalence of obesity among HCWs becomes a much needed essential that must be acquired. Obesity among HCWs will affect the health service given either directly or indirectly. Besides that, HCWs are considered to be the exemplar in ideal body weight maintenance, a healthy lifestyle, and promoting health.

An increase in the burden of obesity among HCWs should encourage decision-makers to tackle this issue. Comparing obesity levels in different HCWs job categories and also the general population can help to recognize the potential contributing factors in the workplace such as accessibility to a healthy diet, shifts work, and job requirements that can lead to HCW obesity (Kyle *et al.*, 2016; Kyle *et al.*, 2017).

1.3 Overview of KOSPEN Plus

Komuniti Sihat Perkasa Negara (KOSPEN) Plus is a program that was first introduced in 2017 by the Ministry of Health in order to build a healthy and productive workforce with a healthy work environment. The objective is to decrease the prevalence of NCDs and its risk factors among workers. Other than that, this program aims to create healthy employees who practice healthy lifestyles and to increase productivity and competitiveness in the organization and empowering employers and employees in the promotion of well-being (MOH, 2020).

The five main scopes of KOSPEN Plus are Healthy Eating (Scope 1), Smoke-Free workplace (Scope 2), active living (Scope 3), weight management (Scope 4), early detection of NCDs risk factors (Scope 5), and healthy mind (Scope 6). This study used data from scope 5. Scope 5 of KOSPEN Plus offers health screening for all employees. The main components of the health screening are blood sugar level, blood pressure, waist circumference, smoking status, and BMI, which will be done by trained staff. Then, the data were compiled by the health state department and reported to MOH.

1.4 Statement of the problem

Based on the National Health Morbidity Study (NHMS) report in 2015, it showed that there was a rising trend in the prevalence of three major NCDs (diabetes, hypertension, dyslipidemia) and obesity in Malaysia. Among all workers in Malaysia, government staff had the highest prevalence of obesity (36.2%) compared to other workers (Institute for Public Health, 2015).

The rise of the burden of obesity among workers in Malaysia, especially among government staff, has led to the implementation of various efforts and strategies by the Ministry of Health (MOH). One of the programs is the KOSPEN Plus. This program aims to promote a healthy lifestyle among staff and intervention for NCDs risk factors at the workplace.

1.5 Rationale

The success of health promotion tactics by healthcare professionals may get affected the presence of obesity among HCWs. Health care workers are supposed to be role models to gain trust from the community. In addition, HCWs, particularly doctors and nurses, were also meant to create awareness and motivation for patients to change their actions towards a healthier lifestyle as well as to prevent obesity. Therefore, it is hoped that the Ministry of Health Malaysia will gain a better insight into this issue through this study's findings to enable improvements or implementation of policies regarding obesity among HCWs in Malaysia. By knowing the different groups of occupation among HCWs contribute more toward obesity will help the Ministry of Health to plan a specific intervention program towards them. This study

also may help other researchers to study further factors contributing to obesity among different job category and also intervention among HCWs

1.6 Research questions

- 1.6.1 What is the prevalence of obesity among HCWs in Pahang?
- 1.6.2 What are the characteristics of obese and non-obese HCWs in Pahang?
- 1.6.3 Is there any association between job category and obesity among
 HCWs in Pahang?

1.7 Objectives

1.7.1 General objectives

To study the prevalence and characteristics of obese HCWs in Pahang and the association with the job category.

1.7.2 Specific objectives

- 1. To determine the prevalence of obesity among HCWs in Pahang.
- 2. To explore the characteristics of obese and non-obese HCWs in Pahang.
- 3. To determine the association between job category and obesity among HCWs
in Pahang

1.8 Research hypotheses

There is an association between job categories and obesity among HCWs in Pahang.

CHAPTER 2

LITERATURE REVIEW

Selected databases were utilized to gain access on articles concerning obesity among HCWs, especially in Malaysia. Online search engines, including PubMed, Science Direct, SCOPUS, and Google Scholar, were used to search for publications and research regarding this study. Various search techniques were applied, including using Boolean operators, "AND," "OR," and "NOT." However, there were only a few studies with HCWs as their selected group of subjects. The scope of the search was broadened to encompass all types of HCWs and the studies linked to obesity risk factors. The keywords used were obesity, health care worker, obesity risk factor, and health staff.

2.1 Global burden of obesity

Obesity prevalence is rising alarmingly in most other places around the world. Since 1975, the number of the global adult population with obesity has nearly tripled. World Health Organization (WHO) has reported that more than 650 millions adults populations were obese in 2016, which is contributed up to 13% of the global adult population. In most countries worldwide, more people with obesity were recorded than underweight cases (WHO, 2018).

Many countries have reported a higher obesity prevalence than the global prevalence given by WHO. The adult prevalence of obesity was highest in the United States, Mexico, and New Zealand. For example, the National Health and Nutrition

Examination Survey in the United States revealed that the obesity prevalence among the adult population was reported as 39.8% (Hales *et al.*, 2017). Mexico was the second-highest in the list, with the prevalence of obesity, 32.4%, followed by New Zealand 30.7% (Devaux *et al.*, 2017). In England, the prevalence of obesity was much lower. The latest National survey in England reported that 27% of the adult population age more than 18 years old in England were categorized as obese (NHS, 2019).

However, some countries have a lower burden of obesity reported. Japan, for example, is the country with the lowest burden of obesity, with a prevalence of only 3.7%, followed by Korea with 5.3% (Devaux *et al.*, 2017). A study by Dagne *et al.* (2019) among adults citizen in the northeastern part of Ethiopia had discovered that the prevalence of obesity just 8.6% (95% CI: 6.6, 10.9). Another study in Ethiopia also revealed a much lower burden in which only 5% of the adult population were classified as obese (Darebo *et al.*, 2019). However, the study by Darebo *et al.* (2019) was only conducted among citizens in Hawassa city, which is the capital city of the Southern part of Ethiopia.

2.2 Burden of obesity in Malaysia

Like other countries around the world, the burden of obesity in Malaysia has continually risen. Over the span of 13 years, the Malaysian adult population has experienced a steady rise in the obesity prevalence. This situation has been reported by the National Health and Morbidity Survey Malaysia (NHMS) from 2006 until 2019. Based on WHO's 1998 classification, the obesity prevalence among adults population (more than 18 years old) has continually increased from 14.5% in 2006, 15.1% in 2011, 17.7% in 2015, and subsequently to 19.7% in 2019 (Institute for Public Health,

2006; Institute for Public Health, 2011; Institute for Public Health, 2015; Institute for Public Health, 2020).

Another study conducted on the Malaysian general adult population in 2011 by Mohamud *et al.* (2011) also discovered that 19.5% of adults were obese. This study was a cross-sectional design involving five different regions in peninsular and east Malaysia involving 4428 adults. Surprisingly, this result was higher than the NHMS reported in the same year (Institute for Public Health, 2011). A meta-analysis of pre-existing local studies in Malaysia by Chong and Lee (2018) reported that the Malaysian obesity prevalence was 13.1%, which is lower than the latest NHMS report in 2019. Twenty thousand seven hundred fifty-one subjects from 18 studies were included in the meta-analysis, and all the studies using the same definition of obesity in this study. The researcher also identified that the study did not pose any publication bias.

Comparing to another country in South East Asia, the adult prevalence of obesity in Malaysia was markedly higher than in Thailand. A study by Jitnarin *et al.* (2011) mentioned that the obese adult population only amounts to 4.8% of Thailand's total adult population. Furthermore, according to Foo *et al.* (2018) in his report, the prevalence of obesity in Thailand was 8.8%, while Timor-Leste had the least prevalence rate in South East Asia, with only 2.2 %. This can explain why Malaysia was ranked as the country that has the highest prevalence of obesity in South East Asia and the sixth in Asia Pacific Region (Foo *et al.*, 2018; WHO, 2019)

Zooming into all states in Malaysia, the prevalence of obesity among the adult population in Pahang was 19.4% (95% CI 16.1, 23.3) (Institute for Public Health, 2015). As such, it is apparent that the Pahang obesity prevalence is more than the national prevalence in the same year.

2.3 Burden of obesity among HCWs

Numerous studies also find out that obesity is an issue among HCWs worldwide and has a higher burden than the general population. Luckhaupt *et al.* (2014), through his nationwide study among all types of workers from different industries in the United States, found out that 32.0 % of workers from the healthcare industry were obese. When looking further into the healthcare occupation, 22.0% of HCWs such as doctors, dentists, staff nurses, pharmacists, and therapists, were noted to be obese. Another study across the six hospitals in Texas shows a higher obesity prevalence among HCWs than the national prevalence. There were 49.7% of HCWs reported as obese with a BMI of more than 30 (Sharma *et al.*, 2016). Two studies in Nigeria also found that the burden of obesity among HCWs was higher compared to the general adult population. Both studies revealed that one in four HCWs in Nigeria was obese with the prevalence of obesity among HCWs was 25.5% and 27.3%, respectively (Adaja and Idemudia, 2018; Iwuala *et al.*, 2015).

However, some studies reported a much lower burden of obesity among HCWs. The first large scale study among HCWs in England by Kyle *et al.* (2017) was done using data drawn from England's national health survey, which served as a national representation sample of the English population. Based on that, 24.18% of HCWs were obese. Different from other studies, the prevalence of obesity found in this study was lower than the general adult's obesity prevalence in England. Besides that, another

study in Thailand discovered that the obesity prevalence among HCWs was low, at only 6.5% (Lerssrimongkol *et al.*, 2016). A study among HCWs work in Singapore public hospitals also revealed that only 6.3% HCWs were obese (Leong and Chia, 2012). Both these studies in Thailand and Singapore also used a similar definition of obesity in this study.

In Malaysia, not much research has been done on a larger scale area to study obesity among HCWs. Similar to some other countries in the world, Malaysia also has a similar trend of a high burden of obesity among HCWs than the general adult population. A study by Ehsan (2012) among HCWS in Kulaijaya Health District Department found out that 20.1% of HCWs were obese. Another research in 2015 at Kelantan also shown similar results. The prevalence of obesity among HCWs was noted at 24.3% (Hazmi *et al.*, 2015). This study was conducted among HCWs in four government hospitals with 330 subjects comprising of doctors, nurses, assistant nurses, and assistant medical officers. However, a study among HCWs in Hulu Langat, Selangor, showed a much lower obesity prevalence among HCWs, which was 18.5% of HCWs were obese (Ghazi and Md Isa, 2013).

2.4 Factors associated with obesity

Obesity is a consequence of an assortment of causes and contributing factors, including poor eating habits, sedentary lifestyle, medication, illness, irregular and extended working hours, and stress. Additional contributing factors in our society include non-modifiable socio-demographic factors such as age, gender, ethnicity, genetic, and marital status. Other than that, the occupation factor was one of the important factors that contribute to obesity in the current population.

2.4.1 Age

People of all ages may develop obesity. This can be due to hormonal changes that occur in the body as an increase of the age. Furthermore, the body's muscle mass lessens with age. A lower amount of body muscle may result in a slower metabolism and subsequently reduces energy expenditure, causing more fat development in the body (Hunter *et al.*, 2019).

Some study has proved the association between aging and obesity. Darebo *et al.* (2019), through his study, discovered that the older the age, the higher the obesity risk. A study among HCWs in Nigeria also showed that obesity was associated with the age of more than 40 years ($p < 0.001$) (Iwuala *et al.*, 2015). Another research among HCWs in England also indicated that the obesity prevalence was much greater among senior nurses since nearly half (47.1%) of them were past the age of 45 years (Kyle *et al.*, 2017). However, this contradicts a study by Tan *et al.* (2011), which found that age did not significantly affect obesity risks among the Malaysian population. A study in Brunei also found that the obesity status bears a statistically insignificant difference between age groups (Isa *et al.*, 2016).

2.4.2 Gender

Previous studies have shown the relationship between obesity and gender. Most of the researches discovered that women had a higher burden of obesity in comparison to men. Darebo *et al.* (2019) found that women had 2.56 (95% CI 1.85–4.76) times the risk of obesity, as compared to men. Other studies among HCWs in South Africa and Nigeria also reported that more female HCWs were obese than their male colleagues (Adaja and Idemudia, 2018; Skaal and Pengpid, 2014).

The NHMS survey in 2015 (Institute for Public Health, 2015) among the Malaysian adult population reported that females had a significantly higher prevalence of obesity, 20.6% (95% CI 19.5, 21.8) compared to males 15.0%, (95% CI 13.9, 16.1). A study by Tan *et al.* (2011) also confirmed this by revealing that man has a lower obesity risk compared with females by 5.3%. The latest study among Malaysian adults also concluded that the higher prevalence rate of obesity falls to females as compared to males (Chong and Lee, 2018). In contrast, Ehsan (2012), through his study among HCWs in Kulaijaya districts, mentioned that more males HCWs were found to be obese compare to females HCWs (20.1%, 95% CI 0.13-0.32). Another study among Johor adults population also shared the same result that being a man has 1.28 higher risks to develop obesity (Rozita *et al.*, 2019). However, based on the National Health and Nutrition Examination Survey of the United States found that no significant difference exists in the prevalence of obesity between both genders (Hales *et al.*, 2017)

2.4.3 Ethnicity

Malaysia is a multi-racial country. Malaysian demographics are represented by three main ethnic groups which are Malay, Chinese, and Indian. Of the three main ethnicities in Malaysia, Indians were noted to be the most obese ethnic group, followed by Malays and Chinese (Mohamud *et al.*, 2011). This was also consistent with the report of NHMS in 2015, as compared to other ethnicities in Malaysia, the obesity prevalence was highest among Indians with a prevalence of 27.1% (95% CI 23.5, 31.1) followed by Malays 21.2% (95% CI 20.1, 22.3) (Institute for Public Health, 2015). Similar to the results published in Malaysia's 2015 NHMS, local research by Chan *et al.* (2017) also revealed that Indians were associated with a higher obesity risk among the diverse ethnicities in Malaysia (OR=1.54 95%CI 1.13–2.10). We can see that

numerous local studies had agreed that Indian seems to be the riskiest ethnic group to develop obesity.

Contrary to other studies, a study in Selangor by Nordin *et al.* (2020) reported that Malays were associated with a higher risk of developing obesity. However, in this study, there was a marked difference in the distribution of respondents between Malay and non-Malay group, in which Malay contributed up to 90.36% of total respondents. The unequal distribution of the respondent could be due to the respondents were taken from participants who voluntarily attended the community health screening programs by the UITM clinical training center were mainly Malay population.

2.4.4 Marital Status

Spouses are likely to share health outcomes as well as behaviours. One spouse's actions may influence another's behaviour. Persons whose partners were obese would have an increased risk of becoming obese themselves (Cobb *et al.*, 2016).

A population-based cohort study of 15,792 individuals in the United States to study the risk of obesity among married couples found that having an obese partner will increase the possibility of the partner becoming obese. Non-obese men were 1.78 (95% CI 1.30, 2.43) higher risk of being obese as their wife become obese. For a wife with an obese husband, the additional risk of obesity was 1.89 (95% CI: 1.39, 2.57) (Cobb *et al.*, 2016).

Numerous studies around the world also shared similar findings. Bogossian *et al.* (2012), through their study among nurses in the United Kingdom, Australia, and New Zealand, figured that the likelihood of being obese among married nurses was higher than their unmarried colleague. Besides that, further research in Ethiopia also

concluded that marital status was associated with obesity. The risk of obesity among married couples was 2.22 times more than unmarried adults (Dagne *et al.*, 2019).

2.4.5 Job Category

Health care workers are also vulnerable to obesity and related diseases, especially the nurses, since they are exposed to irregular and prolonged working hours, poor diet, and stress at work (Aslam *et al.*, 2018; Kyle *et al.*, 2016). Different job categories have different work scope areas, which will indirectly contribute to more risk of obesity among HCWs.

Kyle *et al.* (2017) noted that among all HCWs in England, there was a significantly higher obesity rate among nurses compared to other healthcare professions. There were 25.12% (95% CI 20.8,29.37) obese nurses compared to other healthcare professionals such as doctors, pharmacists, physiotherapy with a prevalence of 14.39% (OR 0.53 95% CI 11.00,17.77, p-value < 0.05). Other studies among HCWS in Scotland also found that the obesity prevalence in nurses was more than other healthcare professionals. Furthermore, similar to another study in England, other HCWs had a significantly lower risk (OR= 0.45, 95% CI 0.33, 0.61) when compared to nurses (Kyle *et al.*, 2016).

However, a study in Tamil Nadu, India, among doctors and nurses working at tertiary care found that the doctors had a higher prevalence of obesity (15.1%) compared to nurses (3.2%), and the difference was statistically significant (p-value <0.001) (Hegde *et al.*, 2015). This is aligned with a local study by (Ehsan, 2012) among HCWs in Kulaijaya Health District which found that, among all different job categories, doctors had the highest prevalence of obesity up to 38.5% (95% CI 0.18-0.64)

2.4.6 Workplace

The workplace is considered a contributing factor to obesity among the adult population. A study done in the United States reported that workplaces that require the workers to work over 40 hours on a weekly basis and a non-conductive work environment were significantly associated with an increased prevalence of obesity. The researcher also found that among all industry categories in the United States, workers that work in the healthcare industry were associated with a significantly higher risk of obesity (Adj OR= 1.19, 95% CI 1.08, 1.30) (Luckhaupt *et al.*, 2014).

Hatthachote *et al.* (2019), through his study among Thailand's workers, discovered that obesity prevalence was lower among outdoor workers as compared to indoor workers. Compared with those in outdoor occupations, men with indoor occupations tend to be at more risk of becoming obese (Adj OR=1.41, 95% CI 1.18, 1.67).

2.4.7 Smoking Status

The relationship between smoking and obesity is not well understood and quite complicated to explain. Nicotine is believed to mediate much of the effects of cigarette smoking on individual body weight. In addition, smoking a cigarette may also function as a behavioral alternative to the uncontrollable appetite, leading to reduced intake of food (Audrain-McGovern and Benowitz, 2011).

A large scale of study in England comprised of 499,504 adults aged 31 to 69 years was done in order to study the relationship between smoking and obesity. The finding has demonstrated that the likelihood of active smokers being obese was lower than adults with no history of smoking (Adj OR= 0.83 95% CI 0.81-0.86). Besides

that, ex-smokers were noted to have more risk of being obese than people who actively smoke (Adj OR= 1.33 95% CI 1.30-1.37). The study also states that, even after 30 years, ex-smokers are still at a greater chance of obesity than active smokers (Dare *et al.*, 2015). A local study by Tan *et al.* (2011) also shared the same result, which demonstrated that a smoker 6.4% less likely than non-smokers to be obese.

2.4.8 Comorbid

Comorbid conditions and their treatments can also influence the development of obesity. Despite the fact that obesity will cause many obesity-related diseases, patients with comorbidities can also have the possibility of becoming obese. For example, asthmatic patients also are at risk of becoming obese. Asthma patients may become obese due to the treatment given and reduced in physical activities (Marko and Pawliczak, 2018). Furthermore, the risk of obesity is greater for the individual with non-allergic asthma or individual that develop asthma as adults. (European Lung Foundation, 2018). Other than that, a higher risk of obesity up to 4.8% was discovered by Tan *et al.* (2011) among individuals with a family history of asthma, diabetes mellitus, ischemic heart disease, or cerebrovascular accident. In relation to the usage of medication, a study by King and Morris (2014) among England population found a significant relationship between obesity and drug use in the treatment of diseases for CVD, neurological disease, and respiratory disease.

2.4.9 Level of Physical Activity

Physical activity is defined as any body movement that results in energy expenditure. Every adult should have a regular physical exercise of at least 150 minutes per week (Apovian, 2016). Numerous studies have reported a positive association between the physical activity level and the risk of obesity among the

general population. This, due to low levels of physical activity, increases the risk of increased body fat mass and will lead to excessive weight gain (Shook *et al.*, 2015). A local cross-sectional study by Chan *et al.* (2017) involving 18,296 adult respondents in Malaysia reported that the amount of physical activity was associated with the risk of obesity. Compared to those with a high level of physical activity, being obese or overweight was more likely to be seen in those with lower levels of physical activity (OR = 1.14; 95% CI 1.01–1.30). This result supports a recent study in Thailand that discovered the risk of being obese was greater in those who did not exercise regularly in comparison to those who had a routine workout (OR= 1.61; 95% CI 1.39–1.86). Among those who regularly exercise, men who exercised at least 30 minutes a day within five days in a week were less likely to be obese (OR=0.689, 95% CI 0.52–0.90) than those who exercised less often (Hatthachote *et al.*, 2019).

In relation to HCWs, Ramli *et al.* (2013), through his study among HCWs in a military hospital in Melaka, discovered that most of the workers employed in hospitals had obesity issues, mainly due to lack of physical activity. In all areas of activity at work, sport, or leisure time, the majority of the respondents seemed to be either at the lower or moderate physical activity. This is not really surprising as inadequate exercise is one of the causes of obesity.

2.4.10 Unhealthy Diet

Globalization and marked socioeconomic advancement in Malaysia cause lifestyle changes in Malaysia's communities, including the changes in the Malaysian dietary habits toward a more unhealthy diet, which leads to an increase in the obesity risk. Food choices have a direct effect on the type and amount of an individual's calorie consumption. An unhealthy diet, such as high fatty food, high sugar foods, low fiber,

are more widely available, and they are usually cheaper than healthier food (Apovian, 2016). An unhealthy eating habit, like fast-food consumption, coupled with the reduced physical activity, will lead to an increased prevalence of obesity (Verma *et al.*, 2013).

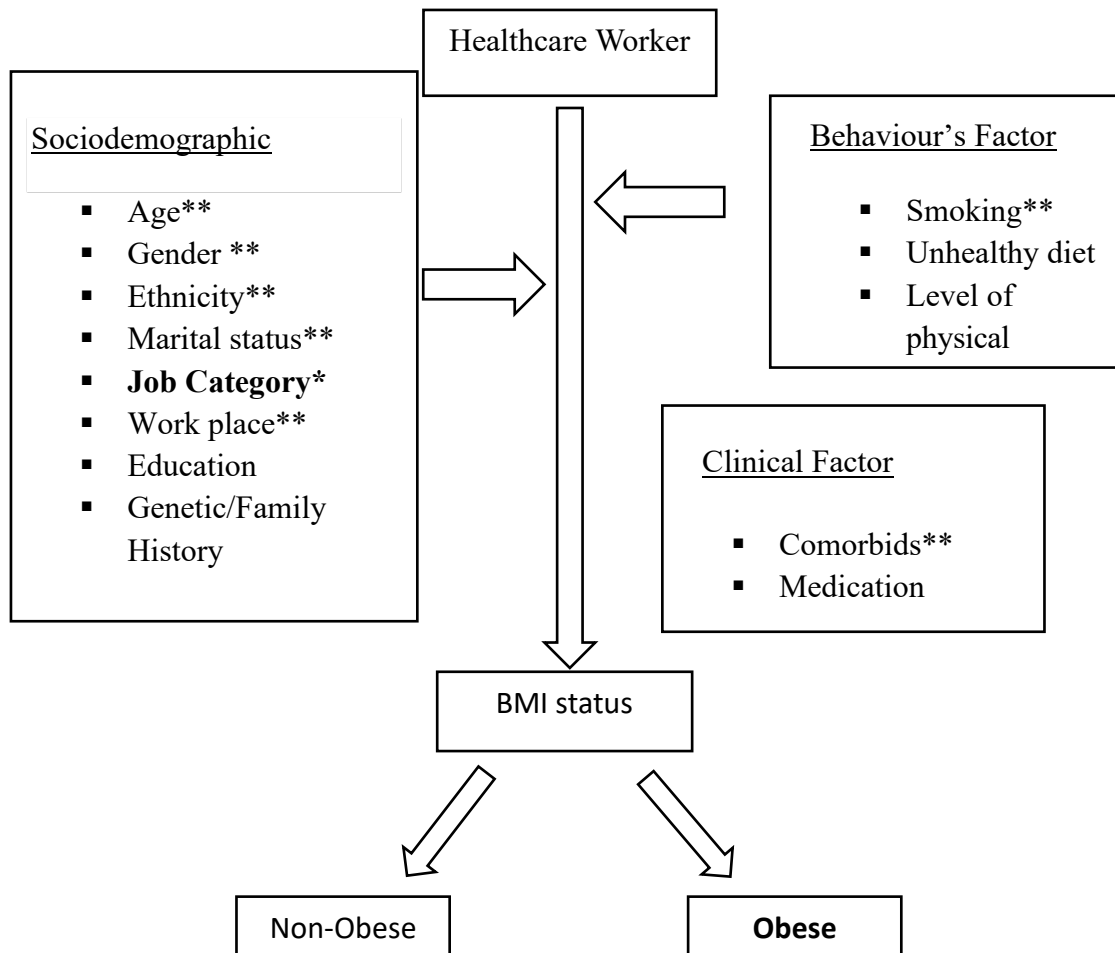
According to a study in Ethiopia, adults with routine snacks had a 1.52-fold (95% CI 1.04, 2.20) higher chance of becoming overweight or obese as opposed to adults without snack habits. In the same study, people who drink alcohol were also 1.75 times (95% CI 1.07, 2.97) more likely to be overweight or obese (Dagne *et al.*, 2019).

2.5 Conceptual framework

According to the review of the literature, many variables influenced the BMI status of HCWs. Socio-demographic variables included age, gender, race, education, marital status, genetics, job category, and workplace factors were identified. While for the clinical factors included comorbid, medication, and behaviour factors such as unhealthy diet, smoking status, and level of physical activity.

However, due to the limited secondary data that were utilized in this research, education, genetic, medication, unhealthy diet, and level of physical activity were excluded as those data were not available. In this study, obese HCWs and the relation to the different job categories are the main concern outcomes. Summary of the conceptual framework, as shown in Figure 1.

Figure 1 : Conceptual Framework of Factors Associated with Obesity among HCWs



*Factor with bold were the main factor studied

** other study factors included in this study

CHAPTER 3

METHODOLOGY

3.1 Study location

This study was conducted in the Pahang Health State Department. This research used the secondary data gathered from the health screening KOSPEN Plus program among HCWs under the Pahang Health Office, covering all health clinics and hospital in eleven districts in Pahang, which are Kuantan, Pekan, Maran, Temerloh, Bera, Rompin, Bentong, Raub, Jerantut, Lipis, and Cameron Highland.

3.2 Study design

This is a cross-sectional study.

3.3 Study duration

This study was conducted from 15th January 2020 until 30th April 2020.

3.4 Reference population

All HCWs in the Pahang Health State Department.

3.5 Sampling Frame

All HCWs in Pahang who fulfilled inclusion and exclusion criteria

3.5.1 Inclusion Criteria

- All HCWs who underwent KOSPEN Plus health screening program in 2019
(From 1st January 2019 until 31st December 2019)
- Government health care worker

3.5.2 Exclusion criteria

- Data set with no information on job category, weight or height
- Non-Citizen

3.6 Sample size calculation

The sample size was calculated based on the following study objectives:

For specific objective 1:

The sample size was calculated using a single proportion formula to determine the prevalence of obesity among HCWs in Pahang.

$$n = \left(\frac{Z_{\alpha}}{\Delta} \right)^2 * P (1 - P)$$

The precision of estimation, Δ , set as 5%, $Z_{\alpha} = 1.96$ (95% of CI), and using $P = 24.3\%$ (Prevalence of obesity among HCWs in Kelantan) (Hazmi *et al.*, 2015). The calculated sample size was set after considering an allowance of a possibility additional 20% missing or incomplete data.

$$n = \frac{1.96^2 \times 0.243 (1 - 0.243)}{0.05} = 283$$

Considering a 20% possibility of missing data; therefore, a total of 339 samples were required in this study.

For specific objective 3:

The **PS Software** was used to calculate the sample size to differentiate two proportions to determine the association between job category and obesity. The research power was fixed at 90% with $\alpha=0.05$. The calculated sample size was set after considering an allowance of a possible additional 20% missing or incomplete data.

FACTORS	Po	P1	m	n	n + 20%	Reference
Job Category (Doctor)	0.61	0.55	4	4430	5540	(Ehsan, 2012)

Po, the proportion of exposure among non-obese group based on a literature review

P1, an estimated proportion of exposure among the obese group

m, a ratio of non-obese to obese group (from a population) = 4:1

n, the sample size calculated, determine by PS software

Anticipated drop out considering an estimated 20% missing data.

Hence, the required sample size for the study was 5540.

Objective number 3 has the highest sample size estimation. So, 5540 samples were chosen as the sample size in this study.