PREVALENCE OF FUNCTIONAL CONSTIPATION AND ITS ASSOCIATED FACTORS AMONG ELDERLY PATIENTS IN HOSPITAL UNIVERSITI SAINS MALAYSIA

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ABBREVIATIONS

HUSM	Hospital Universiti Sains Malaysia
FC	Functional constipation
CIC	Chronic idiopathic constipation
BM	Bowel movement
FGID	Functional gastrointestinal disorder
FDA	Food and drugs administration
OTC	Over the counter
NHANES	National Health and Nutrition Examination Survey

ABSTRAK

KELAZIMAN SEMBELIT FUNGSIAN DAN FAKTOR-FAKTOR YANG BERKAITAN DI KALANGAN PESAKIT WARGA EMAS DI HOSPITAL UNIVERSITI SAINS MALAYSIA

Pengenalan: Sembelit fungsian (FC) merupakan gangguan fungsi gastrousus (FGID) yang lazim dijumpai. Kelaziman sembelit berbeza-beza bergantung kepada metodologi kajian dan kawasan geografi. Sembelit boleh menyebabkan komplikasi jika tidak dirawat dengan betul.

Objektif: Objektif kajian ini untuk menentukan prevalens sembelit fungsian dan faktor-faktor yang berkaitan dengan sembelit. Kajian ini juga untuk mengetahui kekerapan membuang air besar di kalangan mereka yang sembelit.

Metodologi: Satu kajian keratan rentas telah dijalankan dari 1 Disember 2015 hingga 1 Mac 2016 di klinik pesakit luar Hospital Universiti Sains Malaysia (HUSM). Ia melibatkan 237 warga tua yang berusia ≥ 60 tahun. Pemilihan subjek dibuat menerusi pelbagai peringkat dan persampelan rawak sistematik. Kriteria diagnostik Rome III versi Bahasa Malaysia bagi sembelit fungsian telah disahkan dan telah menjalani kebolehpercayaan ujian semula dalam tempoh 14 hari. Nilai Cronbach alpha 0.88 dan korelasi antara kelas (ICC) adalah 0.88 (95% 0.84,0.91). Soal selidik juga termasuk faktor sosiodemografi, gaya hidup, penyakit, ubat-ubatan dan catatan bagi kekerapan membuang air besar dalam seminggu dan kekonsistenan najis.

Keputusan: Prevalens sembelit fungsian adalah 13.5% (95% CI: 9.5-17.5). Terdapat 81.3% daripada mereka membuang air besar lebih 3 kali seminggu (≥3/minggu) dengan Min(SD) pembuangan air besar 3.25(1.02). Ramai mempunyai najis Jenis 1 (65.6%) berbanding

mereka yang tidak sembelit (10.7%) . Begitu juga Jenis 2, (34.4%) berbanding (5.9%) dan Jenis 3, (46.9%) berbanding (26.8%). Analisis multivariat menunjukkan bahawa umur (adj OR 1.08, 95% CI:. 1.02, 1.14; p = 0.010) dan pengambilan air kosong (adj OR 0.81, 95% CI: 0.67, 0.97; p = 0.025) berkait dengan sembelit fungsian secara signifikan.

Kesimpulan: Prevalen sembelit fungsian di kalangan warga tua dalam kajian ini adalah 13.5%. Ramai di antara mereka membuang air besar lebih daripada tiga kali seminggu dengan najis Jenis 1 hingga 3. Faktor umur dan pengambilan air kosong adalah faktor utama penyebab kepada sembelit fungsian ini.

ABSTRACT

PREVALENCE OF FUNCTIONAL CONSTIPATION AND ITS ASSOCIATED FACTORS AMONG ELDERLY PATIENTS IN HOSPITAL UNIVERSITI SAINS MALAYSIA

Introduction: Functional constipation (FC) is a common functional gastrointestinal disorder (FGID). The prevalence of this disease depends on the methodology of the study and geographical area. Constipation can cause medical complications and psychological impact if left untreated.

Objectives: The aim of this study is to determine the prevalence of functional constipation and its associated factors among elderly attending the outpatient clinic in Hospital Universiti Sains Malaysia (HUSM). Besides that, stool consistency and frequency of bowel movement among those with constipation will be described.

Methodology: A cross-sectional study involving 237 elderly patients aged ≥ 60years old who attended the outpatient clinic at HUSM from 1st December 2015 to 1st March 2016 was carried out via multistage and systematic random sampling. A validated self-administered Rome III functional constipation (Bahasa Malaysia version) questionnaire, which underwent test-retest reliability in a 14 days interval, had a Cronbach alpha of 0.88 and inter-class correlation (ICC) of 0.88 (95% 0.84,0.91) was given to every patient. Another part of the questionnaire included sociodemographic, lifestyle, disease, medication and stool diary recall to assess the frequency of bowel movement (BM) in a week and stool consistency.

Result: The prevalence of functional constipation among elderly is 13.5% (95% CI: 9.5, 17.5). This study found that elderly patients with constipation (81.3%) had bowel movement

more than 3 times per week (≥3/weeks) with a mean (SD) for bowel movement of 3.25 (1.02). These patients had more Type 1 stool (65.6%) compared to those without constipation (10.7%). Likewise, for Type 2 it was, (34.4%) vs (5.9%) and for Type 3 it was (46.9%) vs (26.8%). Multivariate analysis demonstrated that age (adj.OR1.08,95%CI:1.02,1.14; p=0.010) and plain water intake (adj OR 0.81, 95% CI: 0.67,0.97; p=0.025) are significantly associated with functional constipation.

Conclusion: The prevalence of functional constipation among elderly in this study is 13.5% and many of them had bowel movement more than three times per week with stool Types 1 to 3. Age and plain water intake are found to be significantly associated with functional constipation.

CHAPTER ONE: INTRODUCTION

People who are 60 years and above are defined as elderly, according to the National Policy for the Elderly (Zawawi, 2013). In 2016, the total population in Malaysia was estimated to be 31.7 million compared to 31.2 million in 2015. Department of Statistic Malaysia reported in 2016 that, the population of people aged 65 years and above has increased by 0.2% (Kei, 2016). Commonly, the elderly will have more health related problem compared to young population. Majority of the elderly will develop age related physiological decline affecting the metabolic, immunological and neurological systems. Therefore, the elderly population are at risk to develop colonic function disorder which may lead to constipation (Firth and Prather, 2002).

Constipation affects 2% to 27% of the North American adult population, which is approximately 63 million people. Constipation affects women more than men, and those > 65years old (Amy E.Foxx-Orenstei *et al.*, 2008). Despite that, constipation is a common disorder that causes significant health care costs. In the United States, about $ 821 million was spent on over-the-counter (OTC) laxatives for treatment of constipation (Rao and Go, 2010).

If left untreated, constipation may lead to discomfort and affect the quality of life. In addition, it is associated with complications such as faecal impaction, stercoral ulcer, bowel obstruction, faecal incontinence, rectal prolapse, urinary retention, and syncope (Wong *et al.*, 1999).

Traditionally, constipation is defined as having less than three bowel movements per week. Nevertheless, patients often describe constipation based on stool consistency, feeling of incomplete emptying, straining, and urge of defecation. Thus, a standardized consensus to

define Functional Gastrointestinal Disorders (FGIDs) the Rome III criteria was released in 2006 for FC. The existence of the criteria is beneficial as it created a standardised method that can be utilised to select patients for clinical research, thus making it easier to conduct clinical trials. Moreover, for FDA-approved studies, the Rome criteria are the standard method to choose respondents. Besides that, the criteria allowed to conduct broader based research resulting in the comprehension of this disease in relation to visceral hypersensitivity, mucosal immune dysfunction, and inflammation and brain–gut interactions (Drossman, 2007). Another benefit would be patients being reassured that they do have a real condition, i.e. no longer something unexplained, done through a positive diagnosis. Furthermore, doctors are satisfied because they do not have to perform more studies to exclude other diseases.

Rome III criteria were modified based on the Rome II criteria, i.e time frame for onset of the symptoms was modified. Rome III diagnostic criteria for functional constipation provides a consistent diagnostic approach for use in clinical practice and clinical trials for constipation. These criteria are internationally recognised as the clinical criteria for diagnosis of irritable bowel syndRome (IBS) and is widely applied in clinical research. Rome III criteria is also applied in clinical trials on chronic idiopathic constipation including epidemiological investigations of chronic constipation (Xin *et al.*, 2014).

Study of functional gastrointestinal diseases among Sri Lankan adolescents showed that Rome III criteria appears to be twice more effective in diagnosing most types of functional gastrointestinal diseases compared to Rome II (M.Devanarayan *et al.*, 2011). Another study proved that there was a good agreement between Rome III and Rome II criteria in diagnosis of functional constipation; nevertheless, Rome III criteria was more practical than Rome II for Chinese patients (Xin *et al.*, 2014).

1.1 Justification of Study

Constipation is associated with medical and psychological complications if left untreated or due to inappropriate management. Besides that, chronic constipation may cause psychological impact such as anxiety and depression (Cheng, 2003). Moreover, constipated individuals have a higher score for psychological distress (Dennison, 2005).

Constipation is subjectively defined by patients in reference to frequency of bowel movement and maneuver such as having to strain, hard stool, and incomplete and infrequent defecation. Commonly, patients will not complain unless the symptoms are troublesome.

Since there are no studies in Malaysia on elderly and constipation, this study is conducted to investigate the prevalence of constipation among the elderly and its associated factors. In this study, Rome III functional constipation criteria is used to define functional constipation. Thus, the results from this study will help to identify the prevalence and associated factors of constipation among elderly. Other than that, it will help increase awareness among healthcare providers and patients towards the importance of determining the problem and starting early treatment if necessary among elderly with constipation. On the other hand, this research will aid in improving diagnosis, investigation, and management of constipation, especially among the elderly.

CHAPTER TWO: LITERATURE REVIEW

2.1 Functional Constipation

As mentioned before, Rome III criteria was developed in 2006 to improve the understanding and diagnosis criteria for constipation in general. Those who fulfilled the Rome III for FC is diagnosed for FC.

Rome III criteria for constipation is having at least two of the following: (1) straining during ≥25% of defecation; (2) lumpy or hard stools in ≥25% of defecation; (3) sensation of incomplete evacuation in ≥25% of defecation; (4) sensation of anorectal obstruction/blockage in ≥25% of defecation; (5) need for manual maneuvers to facilitate in ≥25% of defecation; and (6) fewer than three defecations per week. Patients should rarely have loose stools without laxatives and be distinct from having irritable bowel syndRome (please refer to operational definition, page 28 for further information) (Leung *et al.*, 2011).

Constipation is categorised into primary or secondary causes. Primary type include normal transit (FC) which is the most common and has slow transit and outlet dysfunction. Secondary type may occurs due to lifestyle, drugs and diseases. However, there is often overlap of primary and secondary types in an individual (E.Foxx-Orenstein and Umar, 2015). Functional constipation can have many different causes, ranging from changes in diet, physical activity, or lifestyle to primary motor dysfunctions due to colonic myopathy or neuropathy. Several medications such as groups of NSAIDs, calcium channel blockers, diuretics, tricyclic antidepressants, narcotic analgesics, antispasmodics, antihistamines, and anti-Parkinson drugs can cause constipation in general (Lindberg *et al.*, 2011). Besides that, several studies reported that lifestyle (physical activity, smoking, and dietary intake),

medications, and medical illnesses are associated with constipation in general (Robson *et al.*, 2000; Salmoirago-Blotcher and crawford, 2011)

2.2 The Prevalence of Functional Constipation

A recent study in Malaysia among adult tertiary students discovered that the prevalence of functional constipation among students was 16.2% (Lim *et al.*, 2016). A systemic review of pooled data from Western and Asian populations showed that prevalence for functional constipation among elderly was 17% (95% CI: 13–22) (C.Suares and Ford, 2011). Other than that, a community based cross sectional study conducted in Singapore among elderly (aged 60 years and above) was carried out to identify sociodemographic and lifestyle factors associated with functional constipation. The age and gender adjusted prevalence rate of functional constipation was 11.6% per 100 persons (95% CI: 11.4–11.7) (Wong *et al.*, 1999).

Next, a cross sectional study was done in New York among elderly aged above 65 years at nursing homes. This study aimed to determine prevalence of constipation and risk factor development of constipation. Results showed that prevalence of constipation was 12.5%, with a mean age of 83 years old (Robson *et al.*, 2000).

Furthermore, a cross sectional research was done in Hong Kong among adolescents (aged 11–18 years) to examine association of constipation with physical activities. In this study, some parts of Rome III questions i.e frequency of bowel movement were used to assess constipation symptoms. The results showed that prevalence of students having constipation was 15.4% (95% CI: 14.9–15.8) (Huang *et al.*, 2014).

The National Health and Nutrition Examination Surveys in the US conducted a cross sectional study among community members aged above 20 years old to assess the prevalence and association of dietary fibre and liquid intake to constipation. The population based prevalence was higher in women (10.2%) compared to men (4.0%). Prevalence of constipation in general was defined by stool consistency (7.2%; 95% CI: 6.7, 7.8) versus stool frequency (3.1%; 95% CI: 2.6, 3.8). Nevertheless, only 0.8% (95% CI: 0.6, 1.0) met both stool consistency and stool frequency definition for constipation (Markland *et al.*, 2013).

2.3 Social and Economic Implication

Functional constipation without alarm symptoms is not a life-threatening condition. Nevertheless, it has important social and economic implications, especially among the elderly. Constipation may cause mental and physical ailments for many patients(Sanchez and Bercik, 2011). In addition, unnecessary investigation and management causes high economic burden to countries. The hundreds of millions of dollars spent yearly on laxatives alone leads to the high health care costs. Furthermore, laxative usage in the US appears to be increasing because many patients purchase OTC preparations before escalating to prescription medications (Sanchez and Bercik, 2011).

Besides that, constipation also leads to medical and psychological complications if left untreated or due to inappropriate management. Studies have reported that chonic constipation is associated with anxiety and depression (Cheng, 2003) and constipated individuals have a higher score for psychological distress (Dennison, 2005).

2.4 Rome Criteria

The Rome Foundation provides support for activities designed to create scientific data and educational information to assist in the diagnosis and treatment of FGIDs. This foundation is organised to improve the lives of people with FGIDs. In the past 17 years, the Rome organisation has updated and continued research on their clinical knowledge of FGIDs. It involves scientists and clinicians from around the world who classify and critically appraise the science of gastrointestinal function and dysfunction. Thus, with this knowledge, it permits clinical scientists to make recommendations for diagnosis and treatment that can be applied in research and clinical practice. The Rome criteria has been evolving since the first set of criteria was issued in 1989 through the Rome Classification System for FGIDs in 1990. Subsequently, Rome I was developed. In 1999, Rome II was developed to improve the diagnostic criteria in Rome I. Further along in 2006, Rome III criteria was developed with some changes to Rome II (Drossman and Dumitrascu, 2006)

2.4.1 Rome III

Studies have shown that Rome III criteria for FC lists more accurate symptoms for diagnosis and duration of symptoms are better defined to reflect constipation symptoms (refer to appendix 1). Moreover, the Rome foundation noted that developing countries were not represented in Rome II; thus, experts from Asia and South America were included for Rome III (Drossman, 2007). For example, a study has shown that Rome III is more practical than Rome II for Chinese populations (Xin *et al.*, 2014). Besides that, a cohort study in Sri Lanka about prevalence of FGIDs among Sri Lankan adolescents to compare Rome II and Rome III criteria was conducted. The results showed that Rome III criteria was able to diagnose FGIDs

more comprehensively than Rome II (M.Devanarayan *et al.*, 2011). Another of Rome II's concern was also rectified in Rome III, whereby now the design is not only suitable for research purposes but also is practical for clinicians. This was achieved by simplifying Rome III's criteria and using clinical algorithms that can assist in attaining better application in practice (Drossman, 2007).

2.5 Associated Factors (Sociodemographic)

There are many causes and associated factors for constipation in general. Based on World Gasteroenterology 2010, sociodemographic data such as age, gender, inactivity, education level, income, dietary intake, medication and disease increase risk for constipation. Nonetheless, these factors may not be the cause of constipation (Lindberg *et al.*, 2010).
There are numerous factors associated with constipation. The following subsections discusses the common factors.

2.5.1 Age

Older adults are disproportionately affected by constipation (Dennison, 2005).Data pooled from a systemic review of Western and Asian populations showed that prevalence for functional constipation among elderly was 17% (95% CI: 13–22) (C.Suares and Ford, 2011). Besides that, in another research, older age was associated with an increased risk for persistent chronic constipation (HR: 2.10; 95% CI: 1.87–2.35) (Dik *et al.*, 2013) . A community based cross sectional study was conducted in Singapore among the elderly (aged 60 years and above) to identify sociodemographic and lifestyle factors associated with functional constipation (Wong *et al.*, 1999). The mean age of their participants was 68.4

years. From their research, it was discovered that increased rate of constipation was significantly associated with increasing age.

Furthermore, a cross sectional study to determine prevalence of constipation and risk factor development of constipation among elderly aged above 65 years old at nursing homes in New York found that prevalence of constipation in general was 12.5%, with the mean age of 83 years old (Robson *et al.*, 2000). A prospective cohort study to identify factors associated with independent risk of chronic constipation carried out in general practice, United Kingdom found that increasing age (OR: 1.96; 95% CI: 1.71–2.24) was determined to be significantly associated with chronic constipation (Talley *et al.*, 1996). Salmoirago-Blotcher et al also found similar result in their study among post-menopausal women (Salmoirago-Blotcher and crawford, 2011). A literature review on epidemiology of constipation in Europe and Oceania also determined that age factor does have a major effect on constipation prevalence (Peppas *et al.*, 2008).

However, there are instances where constipation prevalence was not associated with increasing age as noted by Markland et al in their epidemiology study of low dietary fibre intake and liquids with constipation even after adjustment of several factors during analysis. (Markland *et al.*, 2013).

2.5.2 Gender

Similar to age, there are numerous evidence that supports the notion that constipation is a prevalent condition affecting the female gender disproportionately (Dennison, 2005 ; Huang *et al.*, 2014). Longstreth et al. have highlighted that constipation is most common in women (Longstreth *et al.*, 2006). For example, the population based prevalence is higher in

women with 10.2% (95% CI: 9.6, 10.9) compared to men with 4.0% (95% CI: 3.2, 5.0), as determined by (Markland *et al.*, 2013).

Pare et al. conducted a research to estimate the population prevalence of self-reported, and Rome I and Rome II defined functional constipation in Canada. The researchers determined that the results for all three definitions, concerning gender, were similar, i.e. the rate for women was close to twice of that for men (P.pare *et al.*, 2001). Being female (OR: 1.62; 95% CI: 1.49–1.76) meant to be significantly associated with the medical condition (Talley *et al.*, 1996). Another research showed a similar conclusion, whereby the prevalence of functional constipation was higher in the female gender (OR: 2.22; 95% CI: 1.87–2.62) (C.Suares and Ford, 2011).

Other than that, Peppas et al. conducted a review, which involved searching for relevant articles in the PubMed database, concerning Europe and Oceania regions. They ended up reviewing 21 suitable papers that mostly showed the predominance of women in constipation prevalence (Peppas *et al.*, 2008). However, in Vincent and colleagues research on new chronic constipation patients, the male gender (HR: 1.29; 95% CI: 1.20–1.40) was found out to be associated with a bigger risk for persistent disease(Dik *et al.*, 2013).

2.5.3 Race

Sanchez et al. have stated that no consensus exists for the relationship between race and constipation. Nonetheless, based on their review on chronic constipation, they noted that there are a number of studies that reported an increased prevalence of the disease in non-Caucasian subjects (with a ratio ranging from 1.13 to 2.89) (Sanchez and Bercik, 2011) although at the same time, another study (i.e. a National Health and Wellness Survey) discovered that most patients with chronic constipation were of the Caucasian descent.

National Health and Nutrition Examination Surveys, pointed out a few discoveries based on race. African-American women (POR: 1.4, 95% CI: 1.0, 1.9) were found to be significantly associated with constipation. For men, it was more prevalent for Mexican Americans and Non-Hispanic Black Americans (Markland *et al.*, 2013). A similar result was found on post-menopausal women. Constipation was found to be related to women with African American and Hispanic descent (Salmoirago-Blotcher and crawford, 2011). These results agree with Longstreth et al. who stated that constipation affects and is most common among non-whites (Longstreth *et al.*, 2006). Nonetheless, in Kristen and colleagues' research conducted on nursing home residents, race was one of the factors associated independently with the development of constipation, with significant risk factor for white race (odds ratio = 1.50) (Robson *et al.*, 2000).

2.5.4 Education status

In a survey based on information from 10,914 adults, women with a higher education level (POR: 0.8; 95% CI: 0.7, 0.9) were significantly associated with constipation (Markland *et al.*, 2013) In contrast, other studies have stated that generally, people with a lower educational level tend to have higher constipation rates (Kaboli *et al.*, 2010; Peppas *et al.*, 2008)

2.5.5 Marital status

A cross sectional study in Tehran concluded being married is one of the contributing factors for functional constipation in the general Iranian population (Kaboli *et al.*, 2010) whereas a study recently done in Malaysia among tertiary students concluded that there were

no significant differences found between marital status and prevalence of constipation (Lim *et al.*, 2016)

2.5.6 Income

Systemic reviews and meta analyses reported that lower socioeconomic status was found to be associated with functional constipation (C.Suares and Ford, 2011). Another study discovered no significance differences between income and constipation (Lim *et al.*, 2016).

2.5.7 Employment

Epidemiology review in Beijing, via Rome III for FC found that, prevalence rate of constipation was higher among mental effort group and mental effort work(less physical labor) compared to physical effort work (Zhang *et al.*, 2015)

2.6 Associated Factors (Lifestyle)

2.6.1 Smoking status

In a study, which consisted of 73,047 women, smoking status was determined via a self-administered questionnaire. Constipation was determined to be associated with smoking (Salmoirago-Blotcher and crawford, 2011)

2.6.2 Physical activity

A cross sectional study was done in Hong Kong among adolescents (aged 11–18 years old) to examine association of constipation with physical activities as part of Hong Kong Student Obesity Surveillance (HKSOS) project. Prevalence of students with constipation were 15.4% (95% CI: 14.9–15.8). Constipation was consistently associated with insufficient

exercise (adj.OR: 1.26; 95% CI: 1.16,1.36), insufficient non-exercise physical activities (adj.OR: 1.21; 95% CI: 1.10,1.33), and excessive sedentary behaviours (adj.OR: 1.25; 95% CI: 1.17,1.34) (Huang *et al.*, 2014).

Study among adults with constipation determined that most subjects (54.4%) were physically inactive or sedentary i.e. categorised as 'low' physical activity level under IPAQ. Although a lack of physical activity is commonly thought to be a contributing factor to constipation, in this research, constipation severity was instead associated with higher physical activity levels (OR: 2.467; 95% CI: 1.054,5.777) (Mena *et al.*, 2013).

Among post-menopausal women on the other hand, constipation was associated with lower physical activity levels (Salmoirago-Blotcher and crawford, 2011).

As part of lifestyle change in the steps to manage constipation, adding exercise to one's daily living is one of the modifications(Dennison, 2005). Furthermore, Gandell et al. have stated that appropriate physical activity has a possibility to improve symptoms of constipation (Gandell *et al.*, 2013). However, maintaining regular nonstrenuous exercise, although useful, there exists little evidence to support its effect in the management of constipation (Rao and Go, 2010). In another research, it was noted that carrying out exercise for easing chronic constipation will only help patients with true deficiency (Leung *et al.*, 2011).

2.6.3 Dietary intake

A cross sectional study among adults found that frequency of defecation and stool output were positively associated with dietary fibre among the study subjects(Mena *et al.*, 2013)Another research on post-menopausal women showed that low fibre intake is associated with constipation (Salmoirago-Blotcher and crawford, 2011). In a previous study

among people 60 or older in Singapore, a lower intake of fruits and vegetables and a decreased intake of rice was significantly related to an increased rate of constipation (Wong *et al.*, 1999).

Among the steps to manage constipation is via lifestyle modification, which usually includes adding diets rich in fibre to one's daily meal regime. However, adding fibre to one's diet is not always the best remedy (Dennison, 2005).

For instance, in the research by Gwee and colleagues, a detailed review of the literature was carried out by experts on matters related to constipation, i.e. epidemiology, pathophysiology, psychosocial, and treatment, with attention on Asian literature. Finally, an updated review of the key aspects of Asian chronic constipation was ready. Based on the review, it was advised that a formal evaluation of dietary fibre must be undertaken before recommending further increases in dietary fibre(Gwee *et al.*, 2013).

Another example is the study by Leung et al. who wanted to increase knowledge on chronic constipation and its aetiology and best-evidence treatment. They collected data from papers published in three databases, namely PubMed, EMBASE, and Cochrane Database of Systematic Reviews; 62 relevant full-text articles were included. From their study, they determined that adding dietary fibres, the typical advice to relieve constipation, will only be useful for people with true deficiency (Leung *et al.*, 2011). Similar study found that dietary fibre is not a predictor for constipation (Markland *et al.*, 2013).

2.6.4 Plain water intake/water intake

Managing constipation includes lifestyle modification and one of it is having a diet rich in fluids (Dennison, 2005). In an analysis based on data from 10,914 adults ($\geq$ 20 years)

from the 2005 - 2008 cycles of the National Health and Nutrition Examination Surveys, low liquid consumption remained a predictor of constipation among women (POR: 1.3; 95% CI: 1.0, 1.6) and men (POR: 2.4; 95% CI: 1.5, 3.9). This study recommended treating constipation with increased liquid (Markland *et al.*, 2013).

Insufficient intake of fluids is associated with aggravated constipation symptoms. This research was a cross sectional study of stool patterns of Malaysian adults with functional constipation (Mena *et al.*, 2013).

On the other hand, Robson et al. conducted a study on nursing home residents and determined that decreased fluid intake is a factor associated independently with the development of constipation. Poor consumption of fluids is a significant risk factor with an odds ratio of 1.49 (Robson *et al.*, 2000).

However, Gandell et al. have stated that encouraging the intake of fluid with the aim of reducing or alleviating constipation symptoms is not supported by the literature (Gandell *et al.*, 2013). Similarly, maintaining adequate hydration also lacks proof as one of the ways to manage constipation (Rao and Go, 2010). Besides that, increasing the consumption of fluids to help ease chronic constipation would only be beneficial to those who truly have a deficiency issu (Leung *et al.*, 2011).

2.7 Other Associated Factors

2.7.1 Disease

Primary neurological diseases (specifically Parkinsonism, dementia, and multiple sclerosis) are statistically significant in the association with risk of chronic constipation. Diabetes on the other hand was found to have a link with constipation, but it was not a strong association (J.Talley *et al.*, 2003). Amongst old people, illnesses such as hypercalcemia,

Parkinson's, hypothyroidism, stroke, and colorectal carcinoma can cause constipation symptoms (Gandell *et al.,* 2013). There are several factors significantly associated with constipation as noted by Robson et al. in their research on nursing home residents. Among the factors was diseases or having medical illnesses i.e. pneumonia, Parkinson's, arthritis, allergies, dementia, hypertension, and hypothyroidism Significant risk factor odds ratio determined were as follows: pneumonia (1.45), Parkinson's disease (1.44), allergies (1.32), arthritis (1.29), dementia (1.23), hypothyroidism (1.21), and hypertension (1.14). Besides that, they noted an odds ratio of 0.75 for congestive heart failure, which had significant protective association (Robson *et al.,* 2000). An observational study, which was a large prospective cohort done among post-menopausal women, was carried out to identify constipation and risk of cardiovascular event Results showed that 34.7% women reported having constipation with a median age of 63 years. In regards to diseases, the study recorded that constipation was associated with diabetes, hypertension, obesity, high cholesterol, depression, and family history of myocardial infarction. Additionally, constipation was determined to be associated with an increased risk of cardiovascular events (OR: 1.09; 95% CI: 1.02–1.17). Post-menopausal women having moderate (14.2 events/1000 person-years) and severe constipation (19.1 events/1000 person-years) were found to experience more cardiovascular events in comparison to those without constipation (9.6/1000 person-years). After adjustment for certain factors (demographics, dietary factors, medications, frailty, risk factors, and psychological variables), the research group concluded that there was no longer an association between constipation and increased risk of cardiovascular events except for the severe constipation group (that has a 23% higher risk of cardiovascular events) (Salmoirago-Blotcher and crawford, 2011).

Suares et al. conducted a study on chronic idiopathic constipation among adults older than 15 years old. They searched three databases namely MEDLINE, EMBASE, and EMBASE Classic to find population-based studies, which reported on the prevalence of the disease. This study determined that prevalence for chronic idiopathic constipation was notably higher in subjects who have also reported irritable bowel syndRome (IBS) (OR: 7.98; 95% CI: 4.58–13.92). This suggests a common pathogenic mechanism for both medical conditions (C.Suares and Ford, 2011)

The elderly in Singapore, that is those aged 60 years and above, are noted to have an increased rate of functional constipation in relation to the number of chronic illnesses they might suffer from. In short, functional constipation is significantly associated with long lasting diseases (Wong *et al.*, 1999)

2.7.2 Medication

Gandell et al. have stated that medications are a secondary cause of constipation and such causes are more easily identified (Gandell *et al.*, 2013). In a study on new chronic constipation patients, use of medications such as opioids (HR: 1.51; 95% CI: 1.40–1.64) and psycholeptics (HR: 1.17; 95% CI: 1.08–1.26) were noted to be independent factors associated with an increased risk for persistent chronic constipation. On the contrary, calcium antagonist (HR: 0.91; 95% CI: 0.84–0.99) recorded a decreased risk (Dik *et al.*, 2013).

In another research, samples were drawn from a general practice research database, with data from 10 years of collection. For the association of medications factors with constipation, these were their findings: opioids (OR = 1.6, population attributable risk [PAR] = 2.6%), diuretics (OR = 1.7, PAR = 5.6%), antidepressants (OR = 1.9, PAR = 8.2%), antihistamines (OR = 1.8, PAR = 9.2%), antispasmodics (OR = 3.3, PAR = 11.6%),

anticonvulsants (OR = 2.8, PAR = 2.5%), and aluminium antacids (OR = 1.7, PAR = 3.0%). These were stated to have the highest risk among medications. Talley and colleagues discovered that those medications have a nearly 2- to 3-fold increased risk of constipation (J.Talley *et al.*, 2003). Other than that, common geriatric conditions like type 2 diabetes mellitus, cardiovascular disease, and hypertension are diseases that older adults consume medications for, and many of these increase the risk of constipation (Dennison, 2005). Medications are also significantly associated with increased rate of constipation, as found out in a research on the elderly in Singapore (Wong *et al.*, 1999).

2.8 Characteristics of Stool Consistency and Frequency of Bowel Movement

2.8.1 Frequency of bowel movement

Generally, constipation was understood having bowel movement of less than 3 times in a week. This statement is not accurate as a recent systematic review and meta-analysis of FC showed that there was significant variation in stool frequency and form among the adult population. The results varies due to different study design and geographical region (Millera *et al.*, 2017).

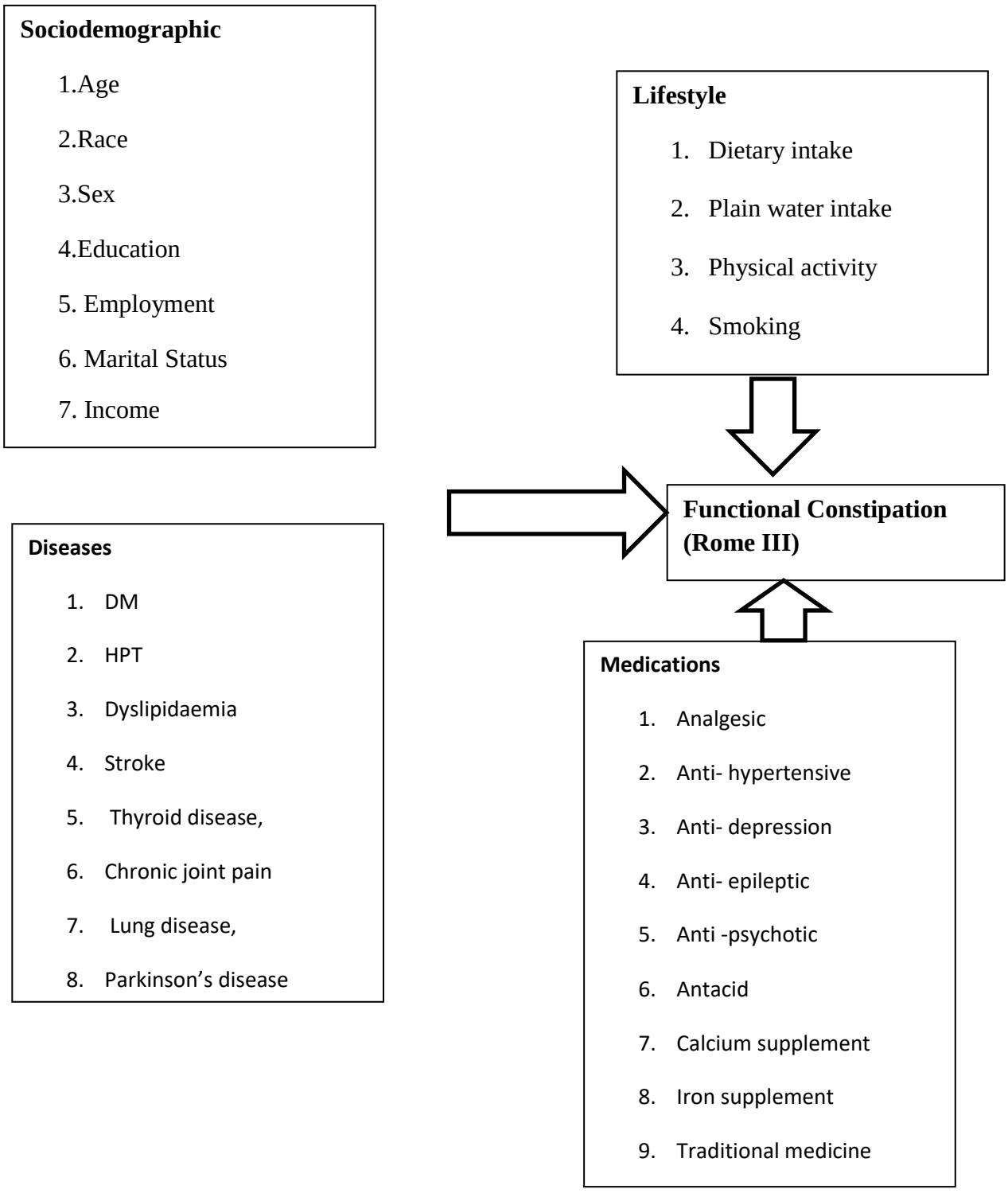
In Malaysia, a survey was done among adults with functional constipation to assess stool pattern; diet and physical activity showed a weekly stool frequency of 3.9±1.9 times (Mena *et al.*, 2013). A cross-sectional survey among adults by National Health and Nutrition Examination survey from a 5 year database, showed that only 0.8% of respondents have stool frequency of < 3 times/ week (Markland *et al.*, 2013).

2.8.2 Stool consistency

A prospective study to look at bowel habit and stool type in a general population aged 25 to 69 years old was conducted. In this study, stool diary was used to assess and only six types of stool scale ranging from hard lumpy stool to fluffy stool were included with exclusion of Type 7 (entire liquid), which the researcher presumed is absent in normal adults. They found that preponderance of women had less than 3 times bowel movement per week compared to men, while men had twice a day. In general, common stool reported in this study were Types 3 and 4 in both sexes, whereas the Types 1 and 2 (hard and lumpy) were reported significantly in women which can be concluded as constipated. This study concluded that the most suitable stool type in a normal person are Types 3 or 4. (Heaton *et al.*, 1992)

Therefore, in this study bowel frequency and stool consistency among elderly population will be determined.

Figure 1:Conceptual framework



CHAPTER THREE: OBJECTIVES AND RESEARCH HYPOTHESES

3.1 General Objectives

To determine the prevalence of functional constipation and its associated factors among elderly patients in outpatient clinic of Hospital Universiti Sains Malaysia (HUSM)

3.2 Specific Objectives

I. To determine the prevalence of functional constipation among elderly patients in outpatient clinic of Hospital Universiti Sains Malaysia

II. To describe stool consistency and frequency of bowel movement among constipation patients.

III. To determine the associated factors (socio demographic , lifestyle, medical illness and medications) of functional constipation among elderly patients in outpatient clinic of Hospital Universiti Sains Malaysia

3.3 Research Hypotheses

Sociodemographic factors, lifestyle, medications and diseases are significant associated factors for functional constipation.

CHAPTER FOUR: METHODOLOGY

4.1 Study Design

This is a cross sectional study

4.2 Study Period

This study was conducted from 1st December 2015 till 1st March 2016

4.3 Study Location

This study was conducted at outpatient clinics at Hospital Universiti Sains Malaysia (HUSM), Kubang Kerian, Kelantan. Eight outpatient clinics were involved in this study. The clinics are Klinik Pakar Perubatan(KPP), Klinik Rawatan Keluarga (KRK), Psychiatric, Orthopedic, Surgical (SOPD), Otorhinolaryngology (ORL), Ophthalmology (OFT) and Gynaecology. These clinics provide services for the population in Kelantan mainly from Kota Bharu and patients who was discharged from the ward. These clinics are handled by specialist, post graduate students and medical officers.

4.4 Reference Population

Elderly in Kota Bharu

4.5 Source Population

Elderly patients who attend outpatient clinics in Hospital Universiti Sains Malaysia, Kubang Kerian Kelantan.

4.6 Study population

Elderly patients who fulfilled the inclusion and exclusion criteria, and able to read and understand Bahasa Malaysia.

4.6.1 Inclusion Criteria

The inclusion criteria aged 60 years and above and able to read and understand Bahasa Malaysia.

4.6.2 Exclusion criteria

I. Presence of red flag sign for bowel habit (unexplained weight loss, rectal bleeding, family history of colorectal cancer or ovarian cancer or change in bowel habit for more than 6 weeks)
II. Underlying previous abdominal/pelvic surgery
III. Reduced cognitive function

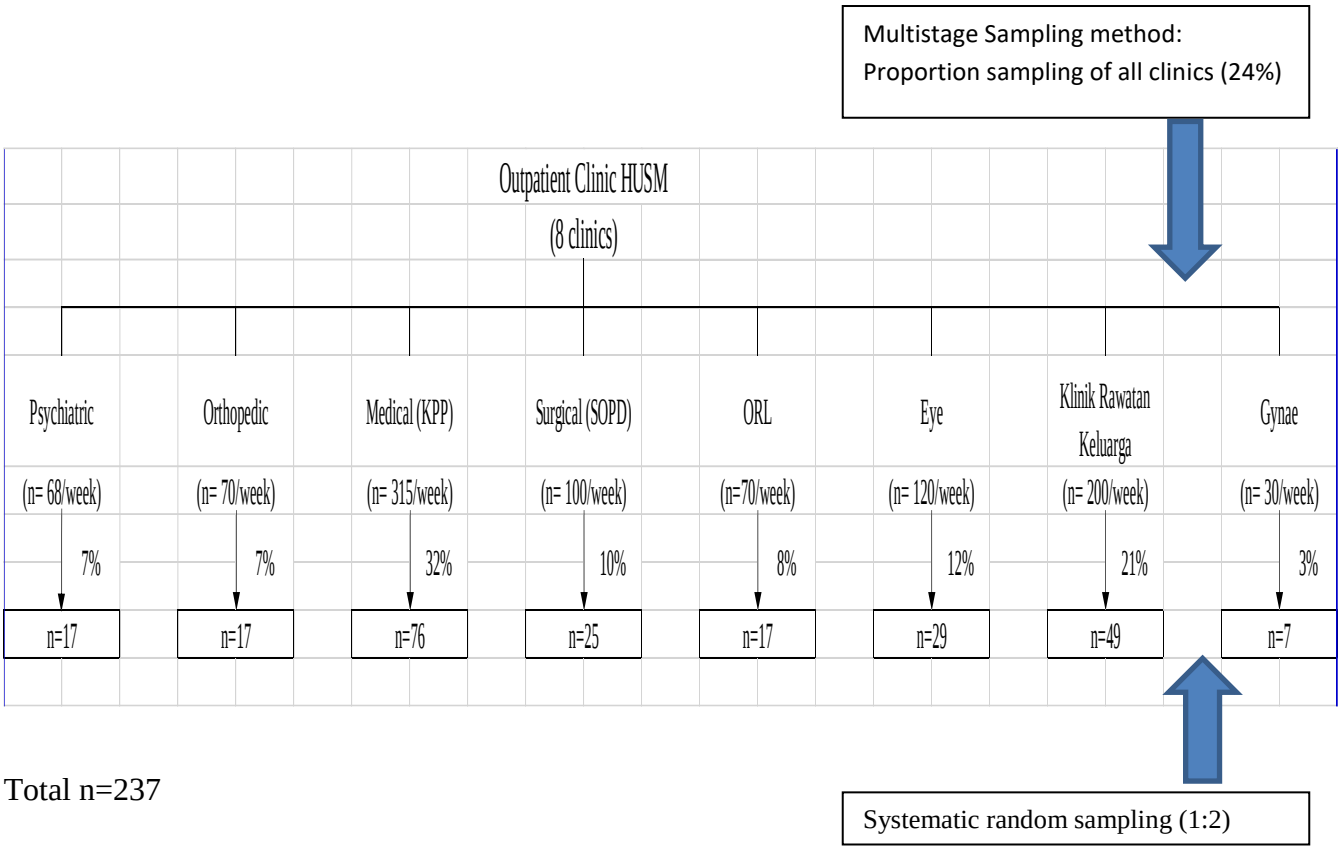
4.7 Sampling Method

In this study, multistage sampling method was conducted. Eight outpatient clinics in HUSM were selected. The total estimation for elderly patient's attendance in these eight outpatient clinics were 973 patients per week. Data collection, was conducted over a 3 months' period to obtain the calculated sample size. Proportionate sampling was applied based on the weekly attendance in the clinics. In each clinic, systematic random sampling was carried out. From a list, participants who attended the clinics, aged 60 years old and above were identified and numbered. Subsequently, they were approached based on

systematic random sampling for every second participant (1:2) and those who did not fulfill the criteria of selection or did not provide consent were place with the next number.

All patient who fulfilled the inclusion and exclusion criteria were recruited regardless whether they have constipation or not. Those with medical problems are not excluded as disease may not be the cause for constipation as mentioned in the literature review (Section 2.5). They may have had symptoms of constipation but those who fulfilled the Rome III criteria for FC is only diagnosed as having FC.

Figure 2 :Flow chart of the sampling method



Total n=237