A CASE- CONTROL STUDY ON RISK FACTORS FOR FALLS AMONG OLDER ADULTS ATTENDING KLINIK RAWATAN KELUARGA IN HOSPITAL UNIVERSITI SAINS MALAYSIA

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ABBREVIATIONS

ADL	Basic activities of daily living
AMMSE	Abbreviated Mini- Mental State Examination
AMT	Abbreviated Mental Test
BMI	Body mass index
CI	Confidence interval
ECAQ	Elderly Cognitive Assessment Questionnaire
GDS	Geriatric Depression Scale
IADL	Instrumental activities of daily living
KRK	Klinik Rawatan Keluarga
M-GDS	Malay Geriatric Depression Scale
MMSE	Mini Mental State Examination
OR	Odds ratio
PS	Power and Sample Size Calculation
ROC	Receiver operating characteristic
SBP	Systolic postural hypotension
SD	Standard deviation

SRV	Self- reported vision
USM	Universiti Sains Malaysia
VA	Visual acuity
WHO	World Health Organisation

ABSTRACT

English

A Case- Control Study On Risk Factors For Falls Among Older Adults Attending Klinik Rawatan Keluarga In Hospital Universiti Sains Malaysia

Background: Falls is an important geriatric problem due to its potential negative impacts on the affected older adults. But, little is known about the risk factors for falls among older adults who attend the health clinics.

Objectives: The objective of the study was to identify the associated factors for falls among older adults attending Klinik Rawatan Keluarga (KRK) of Hospital Universiti Sains Malaysia (USM).

Methods: An unmatched case- control study was conducted among 60 older adults with self- reported falls and 60 “normal controls”. Both cases and controls were recruited from the KRK, Hospital USM via convenient sampling from December 2014 to June 2015. All participants completed a questionnaire regarding sociodemographic and other health risk factors. Logistic regression analysis was used for obtaining the odds ratio (OR) for associated factors.

Results: Independent associated factors observed for falls were female sex (adjusted OR: 5.72, 95% CI: 2.50, 13.07, p <0.001) and impaired physical function capacity (adjusted OR: 4.33, 95% CI: 1.67, 11.28, p = 0.003).

Conclusions: Female older adults and older adults with impaired physical function capacity were significant associated factors for falls among older adults attending KRK, Hospital USM.

Malay

Kes- Kontrol Mengenai Faktor Risiko Jatuh Di Kalangan Warga Tua Yang Menghadiri Klinik Rawatan Keluarga, Hospital Universiti Sains Malaysia

Pendahuluan: Jatuh merupakan masalah geriatrik yang penting disebabkan ia merupakan masalah berpotensi ke atas warga tua yang mengalaminya. Akan tetapi, faktor risiko jatuh di kalangan warga tua yang menghadiri klinik kesihatan adalah tidak diketahui.

Objektif: Objektif kajian ini adalah untuk mengenalpasti faktor risiko jatuh di kalangan warga tua yang menghadiri Klinik Rawatan Keluarga (KRK), Hospital Universiti Sains Malaysia (USM)

Kaedah: Kes- kontrol yang tidak dipadankan dan ini melibatkan 60 orang warga tua yang melaporkan jatuh dan 60 warga tua sebagai “kawalan normal”. Pencarian dan pemilihan bagi kedua- dua kes dan kontrol dijalankan di KRK, Hospital USM melalui pensampelan mudah dari bulan Disember 2015 sehingga Jun 2015. Semua peserta dikehendaki untuk melengkapkan borang soal selidik mengenai faktor risiko sosial-demografi dan masalah kesihatan yang berkaitan. Analisis “logistic regression” digunakan bagi mendapatkan “odds ratio” untuk faktor risiko.

Keputusan: Faktor risiko jatuh yang dikenalpasti adalah jantina perempuan (adjusted OR: 5.72, 95% CI: 2.50, 13.07, p <0.001) dan kurang kemampuan fungsi fizikal (adjusted OR: 4.33, 95% CI: 1.67, 11.28, p = 0.003).

Kesimpulan: Jantina perempuan dan warga tua yang mengalami kurang kemampuan fungsi fizikal di kalangan warga tua yang menghadiri KRK, Hospital USM adalah berisiko untuk jatuh.

CHAPTER 1

INTRODUCTION

Falls have been labelled as one of the geriatric giants. As the world population is aging, it is expected that the number of falls among older people will be increasing. As from 2000, the proportion of population aged 60 years and above is expected to double from 11% to 22% by 2050. The absolute number of this group of population will soar from 605 million to 2 billion within the same period of time.[1] Majority of the aged population are women. Eighty percent of the elderly population will be in developing countries particularly in Asia.[2] Similarly, in Malaysia, the transition of age structure towards the aging population is in line with the change in global demographic.[3] The arising issues of falls among elderly population posed by the rapid changes in age structure will be a daunting challenge in the future.

The incidence of falls varies by countries.[4(p.1)] Though the prevalence of falls in Asian countries is lower than in Western countries, the negative impact of falls should not be overlooked. Falls is an important cause of injury, reduced functional capacity and even death. Falls accounts for two- third of the unintentional injury deaths in older adults.[5] Thirty- one percent of falls require a doctor visit or result in restricted activity for at least one day. Even though majority are minor soft tissue injuries, 29.4% of falls result in open wound and 5.9% of falls result in major physical injury including fractures, joint dislocation and brain injury.[6] Women, who comprise a larger portion of the elderly population, are more susceptible to fall- related injuries than men (35.7% versus 24.6%).[7]

Falls are often multifactorial.[8(p.107-14)] Falls have significant impact on the elderly population, even among older people without a fall- related injury. Functional decline, anxiety and depression and social isolation are associated with falls. These negative impacts contribute to a relentless downward spiral that leads to subsequent episode of falls and further decline in health. Falls have also imposed a substantial financial burden to the health care systems.[9]

Older adults perceive falls to be part of normal aging process while some of them believe falls to be accidental and not preventable.[4(p.13)] At the other end of the spectrum, among elderly who believe falls are preventable, they do not view themselves to be at higher risk of falling as compared to other adults with similar falls risk.[10] It is therefore necessary for primary care physicians to be able to identify high-risk older adults to prevent future falls.

In Malaysia, falls risks screening (to identify extrinsic and intrinsic risk factors) is recommended for high- risk patients with multiple comorbid diseases followed by comprehensive falls risk assessment and relevant interventions.[11(p.103)] Despite numerous studies done on falls among the elderly population, there is no universal agreement regarding the predictor of falls. However, it is agreeable that falls are preventable. Most of the studies have been done in population- based studies, little is known about the risk factors for falls among older adults who attends health clinics. Hence, identification of the modifiable risk factors for falls in this population is imperative for falls prevention in line with the falls screening outlined in the Consensus Guide to Adult Health Screening for General Population Attending Primary Care Clinics.[11]

1.1 Justification of study

There are substantial amount of studies that have been conducted in other countries looking at the prevalence of falls and its associated factors in older population.[12-18] These are mostly cross- sectional studies. The findings and recommendations generated from these studies might not be fully extrapolated to the elderly population who attend primary health clinics in Malaysia in view of different sociodemographic background and varying degree of health resources.

Identifying factors associated with falls among older adults attending Klinik Rawatan Keluarga (KRK) in Hospital Universiti Sains Malaysia (USM) may shed new light on falls prevention strategies at local level. This study was an endeavour to identify modifiable associated factors so that evidence- base, personal, and relevant falls prevention messages could be conveyed in implementing effective local interventions. This might allow the health policy maker to understand the needs of the older population in regard to falls and to provide useful insights into the construction of falls prevention strategies.

Besides, this study might serve as a future reference for researchers who are interested in falls among older adults. The data gathered from this study could be used for subsequent comparison with other target groups (elderly hospital inpatients, elderly who visit emergency department, elderly with neuromuscular disorders, etc.) in the future studies.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition of Falls

There are different definitions of “falls” to convey a multitude of nuances of various clinical implications. A frequently used definition is “inadvertently coming to rest on the ground, floor or other lower level, excluding intentional change in position to rest in furniture, wall or other objects”. Overall the definition of falls remains poorly elucidated in published trials. It is crucial to have a valid and consistent definition in order to compare between studies and to conceptualise other fall- related research. Besides, a solid definition will influence the way that subsequent information is interpreted.[19]

Lamb et al. has proposed the definition of falls as “an unexpected event in which the participants come to rest on the ground, floor, or lower level”. This definition is simpler yet appropriate for a common data set.[20]

2.2 Epidemiology and Burden of Falls in the Older Population

Falls are common among older population. About one in three older people fall each year. However the prevalence of falls among older people Asian countries ranges from 17 to 21%,[12, 13, 18] much lower compared to Western countries. In Malaysia, the falls prevalence was 18.8% according to a cross sectional studies done among elderly diabetes aged 60 years and older at Hospital Universiti Sains Malaysia.[21] The incidence of falls increases with age.[4(p.1)]

The common mechanisms of falls are trips and slips when older people were hurrying.[22] The neuromuscular and sensory systems are necessary to maintain postural stability. These involve the reaction time, vestibular sense, vision, peripheral sensation, neuromuscular control and muscular strength.[8(p.41)] As people age, the progressive decline in body functions will lead to disturbances of the "balance homeostasis" and result in falls.

According to Lord et al., 22% - 60% of older people suffer injuries from falls, 10% - 15% suffer serious injuries, 2% - 6% suffer fractures and 0.2% - 1.5% suffer hip fractures.[8(p.10)] Most fractures among older adults are due to falls. The most commonly associated age-related fractures are wrist, spine, hip, humerus and pelvis. Of these, 25% are hip fractures. Approximately half of all fallers who fracture their hips are never functional walkers again and 20% will die within six months.[23] Even if an older adult does not suffer from injury, depression and fear of falling are common psychological consequence after a fall.[23, 24] The negative psychological response will unlock the vicious cycle of activity restriction, loss of physical fitness and increase the risk of subsequent falls.[25, 26]

The financial burden incurred by fall- related injuries is substantial. A study done in United Kingdom showed that fall- related injuries cost the UK government £981 million, of which the National Health Service (NHS) incurred 59.2%. Most of the costs (66%) were attributable to falls in those aged 75 years. The largest portion was spent on inpatient admissions, accounting for 49.4% of total cost of falls followed by long term care costs which was 41%, mainly for those aged 75 years and above.[9] Therefore, the impact of falls on individual level and the subsequent financial burden

provide an impetus for health care providers to take preventive action against the incidence of falls in older adults.

2.3 Risk Factors

Falls are often perceived as a normal process of aging thus is unpreventable. However, contrary to the normal belief, falls are preventable and predictable. Many risk factors attributable to falls are modifiable.

A complex mechanism is involved to maintain postural stability. The factors involved are vision, vestibular sense, peripheral sensation, neuromuscular control and muscle strength. Thus, the causes of falls are multifactorial. Falls are often a result of "mal-interaction" between intrinsic (internal to the patient) and extrinsic (environmental) factors. The non- modifiable intrinsic factors are advanced age, and previous falls. On the other hand, the modifiable intrinsic factors are muscles weakness, gait and balance problems, poor vision, postural hypotension, fear of falling and chronic illnesses such as arthritis, diabetes, stroke, Parkinson's, incontinence or dementia.[8(p.4,8,19,40-1,58,67,107,111)]

The identified extrinsic factors, despite weak evidence, are environmental hazards (lack of stair handrails, poor stair design, lack of bathroom grab bars, poor lighting, obstacles and tripping hazards, slippery or uneven surfaces), psychoactive medications, improper use of assistive devices.[8(p.98,112-3,169-70)] People with history of falls are more likely to fall again.[27] It is therefore important to identify the risk factors so that primary preventive measures can be implemented.

A cross- sectional study in England revealed fallers to be mostly females as compared to males (2.7:1) but this ratio was even out with advancing age. In the same study, hypnotics and antidepressants were also found to be significant associated factors for falls. However, of all the variables only handgrip strength in the dominant hand and self- reported arthritis symptoms, giddiness and foot problems were found to be predicting falls after the discriminant analysis.[28] In Sweden, a longitudinal study was done by Svensson et al. to assess the characteristics of fallers and non- fallers among very old elderly aged 85 years old. Fallers were characterised by dizziness, vertigo and unsteadiness, transient ischemic attacks, antidepressant drugs, and poor subjectively experienced health.[29]

A 28- week prospective study was conducted by Graafmans et al. in Amsterdam to assess the risk factors for falls among elderly aged 70 and above, and they identified mobility impairment to be the main risk factor for falls. Dizziness upon standing was another risk factor associated with falls.[30]

In a cross- sectional study involving 401 elderly community dwellers in Singapore aged 60 and above, by Chan et al.,[13] the researchers found that the prevalence of falls was 17.2%. Women were twice like to have a falls than men. The other associated factors were age more than 75 years, female sex, Malay ethnicity, poor vision, impaired functional capacity, taking more than 2 or more drugs daily and those with hypertension.

In Taiwan, the prevalence of falls was reported to be 19.5% by Hsu et al. in a longitudinal study in 1996 and 1999. In the same study, the risk factors of falls

included being female, reduced function of activity of daily living, presence of depressive symptoms, using walking aids (stick or walker) but walking well, poor vision.[31] A later cross- sectional study by Wu et al. on 671 elderly people who participated in the health exam in a city hospital aged 65 years and above found that falls were also associated with female sex, low body weight or central obesity, reduced body height, frailty, polypharmacy and hyperglycaemia.[18] In a 4- year longitudinal study in Taiwan, Chien et al. revealed that nutritional status was a significant associated factor for falls among community- dwelling older adults. [32]

The prevalence of falls was similar in Hong Kong. Fong et al. in their cross- sectional study on 554 community living elderly people aged 65 years and above found the prevalence of falls to be 20%. Most of the falls (52.3%) occurred outdoors. Similar to other studies, female sex was significantly associated with falls. The other independent predictors of falls were poor mobility performance (Timed Up & go Test), self- reported history of upper limb fracture, polypharmacy (4 or more types of medications), receiving rehabilitation services and living with a couple only.[33] An earlier cohort studies by Chu et al. on 1300 Hong Kong Chinese elderly adults aged 65 years and above found the similar prevalence of falls (19.3%). The independence predictors of falls were previous history of falls, advancing age, Parkinson's disease, knee extension power and gait speed.[12]

A high prevalence of falls of 42% was reported in a retrospective study of 351 ambulatory elderly people aged 65 years and above by Sohng et al.[34] Falls were associated with restricted activity during the previous 5 years, use of alternative therapy, low knee flexor and extensor muscle strength and poor balance with closed

eyes. In this study, female sex was not found to be associated with increased falls risk because the number of elderly male subjects was relatively small.

Orces reported the prevalence of falls in Ecuador to be 37.4% in a cross- sectional study on 5227 elderly community dwellers aged 60 years and above. Female sex, presence of cognitive impairment, urinary incontinence and those being physically active during the previous years were variables independently associated with increased falls risk.[17] In Jamaica, the significant associated factors of falls among older people aged 60 and above were sex, area of residence, eyesight problems, cataracts, high blood pressure, and depression. Living in urban area was a protective factor against falls.[16]

In Nigeria, falls among elderly are not unusual. The prevalence was reported to be 23% by Bikibele et al. in a cross- sectional study.[35] In the same study, the researchers found that female sex and health problems i.e. chronic pain and insomnia were associated with falls among elderly aged 65 and above. Females were more likely to sustain fall- related injuries than males.

In Malaysia, a cross- sectional study conducted at a primary health care clinic, Sazlina et al. found that falls commonly happened in the house bathroom and near stairs. The prevalence was as high as 47.0%, a figure much higher even compared from studies in Asian as well as other developed countries.[36] This may be due to the fact that the participants in the study were recruited from health clinics. There may be subjected to selection bias and affect the strength of prevalence. Later in 2006, Rizawati et al conducted a community- based cross- sectional study which involved

516 participants to evaluate if home environment was a risk factors for falls among older adults aged 60 and above. They did not find a significant relationship between home falls and home environment. However, they found that depressive mood was the main associated factor for home falls in logistic regression analysis (crude OR: 1.9, 95% CI: 1.1-3.3) but the adjusted odds ratio (OR) was not reported.[37] Another cross sectional study conducted at KRK, Hospital USM by Azidah et al. on elderly patients with diabetes aged 60 years and above revealed the falls prevalence to be 18.8%. Female gender, aged more than 75 years, retinopathy and orthostatic hypotension increased the falls risk. However, high balance and gait was associated with reduced falls risk.[21]

In short, falls in the elderly is not a disease entity but a multidimensional syndrome involving a complex extrinsic- intrinsic factors interplay: chronic diseases, effect of medications on homeostasis, environmental hazards that affect the mobility and stability.[38]

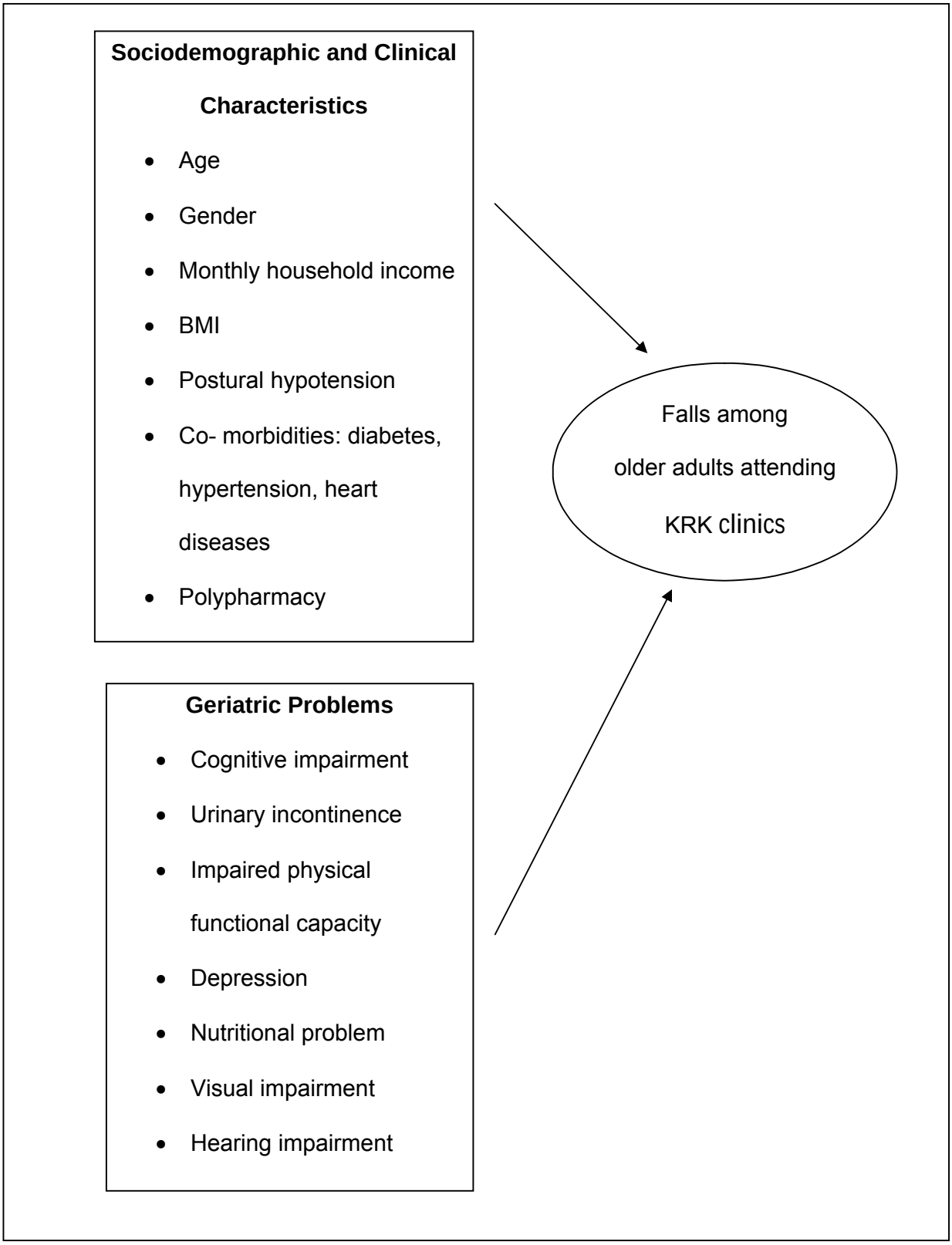

Figure 1. The conceptual framework of risk factors for falls among older adults

CHAPTER 3

RESEARCH OBJECTIVES AND HYPOTHESIS

3.1 General objective

3.1.1 To study the associated factors for falls among older adults attending Klinik Rawatan Keluarga (KRK), Hospital Universiti Sains Malaysia (USM).

3.2 Specific objective

3.2.1 To determine the associated factors for falls (sociodemography, BMI, postural hypotension, polypharmacy, chronic medical illnesses, geriatric problems) among older adults attending KRK in Hospital USM.

3.3 Research hypothesis

3.3.1 Sociodemographic factors (age, gender, monthly household income), BMI, postural hypotension, polypharmacy, chronic medical illnesses (diabetes mellitus, hypertension, heart diseases), and geriatric problems (cognitive impairment, urinary incontinence, depression, physical functional capacity, nutritional problem, hearing impairment, visual impairment) are significantly related to falls among older adults attending KRK in Hospital USM.

3.4 Operational definitions

i. Controls

Controls were defined as those participants who reported no history of falls during the past one year from the date of interview

ii. Cases

Cases were defined as those participants who reported one or more history of falls during the past one year from the date of interview

iii. Falls

An unexpected event in which the participants come to rest on the ground, floor, or lower level[20]

iv. Older adults

Older adults were defined as people aged 65 years old and more[39]

v. Body mass index (BMI)[40]

a. Normal was defined as BMI between 18.5 - 24.9kg/m^2
b. Overweight was defined as BMI between 25 – 29.9 kg/m^2
c. Obese was defined as BMI ≥ 30 kg/m^2
d. Underweight was defined as BMI < 18.5 kg/m^2

vi. Postural hypotension

Postural hypotension was defined as a reduction of systolic blood pressure of at least 20 mmHg, or diastolic blood pressure of at least 10 mmHg within 3 minutes of standing when compared with blood pressure in sitting position[41]

vii. Diabetes mellitus

Diabetes mellitus was defined as self- report of a physician diagnosis or documentation of such disease in the participant's medical record

viii. Hypertension

Hypertension was defined as self- report of a physician diagnosis or documentation of such disease in the participant's medical record

ix. Heart diseases

Heart diseases as was defined as self- report of a physician diagnosis or documentation of such disease in the participant's medical record

x. Polypharmacy

Polypharmacy was defined as the use of 4 or more medications

xi. Cognitive function

a. Not impaired was defined as ECAQ score 6 and above (> 5)
b. Impaired was defined as ECAQ score 5 and below (≤ 5)[42]

xii. Urinary incontinence

Urinary incontinence was defined as self- report of “loss of urine and gotten wet in the last year” and “lost urine over the past week”

xiii. Depression

Depression was defined as M-GDS-14 score 8 and above (≥ 8)[43]

xiv. Physical functional capacity

a. Not impaired was defined as able to “run/ walk fast to catch something” and able to “do heavy work” and able “to go shopping” and able to “use public transport” and able to “take bath” and able to “dress up”.
b. Impaired was defined as unable to “run/ walk fast to catch something” or unable to “do heavy work” or unable “to go shopping” or unable to “use public transport” or unable to “take bath” or unable to “dress up”.

xv. Nutritional problem

Nutritional problem was defined as self- perceived of change in weight over the past 6 months (either increased or decreased body weight).

xvi. Hearing

a. Not impaired was defined as self- report of having no difficulty to hear or do any daily activities because hearing problem
b. Impaired was defined as self- report of having difficulty to hear or do any daily activities because hearing problem

xvii. Vision

a. Not impaired was defined as visual acuity of < 6/12 in better eye
b. Impaired was defined as visual acuity of ≥ 6/12 in better eye[44]

CHAPTER 4

METHODOLOGY

4.1 Study Area

The study was conducted at an outpatient clinic known as Klinik Rawatan Keluarga (KRK) in Hospital Universiti Sains Malaysia (USM), Kubang Kerian, Kelantan. It is affiliated with Family Medicine Department. It offers outpatient service which includes primary care for elderly patients. There are about 250 patients a day, of which 25% of the patients are elderly aged 65 years and above.

4.2 Study Method

Quantitative study

4.3 Study Design

Unmatched case- control study

4.4 Study Period

December 2014 to June 2015

4.5 Reference Population

All older adults attending KRK, Hospital USM

4.6 Source Population

All older adults who attend KRK in Hospital USM from December 2014 to June 2015

4.7 Sampling Method

Convenient sampling

4.8 Inclusion Criteria

i. Older adults aged 65 years old and above

4.9 Exclusion Criteria

i. Wheel chair bound

ii. Older adults who were not able to stand for a minimum of 3 minutes

4.10 Sample Size Calculations

For objective 1, the sample size calculation to identify the associated factors of falls among older adults attending KRK of Hospital USM was done using Power and Sample Size Calculation (PS) software version 3.0.10. The sample size for comparing two proportions was used for categorical variables.

α = 0.05

power = 0.8

p_0 = 0.14 (proportion of depression among non- fallers)[45]

p_1 = 0.39 (proportion of depression among fallers)[17]

m = 1:1

n = 55

The calculated sample size comprised 55 cases and 55 controls. However, after considering the non- respond rate of 10%, the number needed for this study was 60 cases and 60 controls. This was also the largest sample. The following is the summary of the sample size calculation for objective 1.

Table 1 Sample size calculation for objective 1

Variables	p_0	p_1	Minimum sample size (n)	n+10% non respond rate
Diabetes mellitus[46]	0.04	0.29	41	45
Postural hypotension[21]	0.09	0.35	46	50
Urinary incontinence[17, 47]	0.10	0.32	53	58
Depression[17, 45]	0.14	0.39	55	60
Visual impairment[44]	0.91	0.60	29	32

4.11 Research Tools

4.11.1 General Questionnaire (Appendix 3)

The questionnaire consists of 3 parts:

a. Part A: Falls

The participants were asked if they had one or more history of falls during the past one year from the date of interview. Informants' (caregiver) accounts, if available, were accepted as response to reduce participants' recall bias.

b. Part B: Sociodemographic data

It required responses on name, age, gender, marital status, education level, monthly household income, underlying comorbidity such as hypertension, diabetes mellitus or heart disease, and list of current medications.

Data were collected from participants' medical records if they were unsure of their underlying comorbidity or medications usage.

c. Part C: Clinical data

It included height, weight, body mass index (BMI), blood pressure (sitting and standing).

i. Height

Height was measured when participants standing unassisted with shoes off. The measurement was recorded to the nearest 0.1 centimetres (cm).

ii. Weight

Weight was measured when participants standing unassisted with shoes off and all items removed their pockets. The measurement was taken to the nearest 0.1 kilograms (kg).

iii. BMI

BMI was calculated using the formula

$$BMI = Weight\ (kg)/Height^2\ (m)^2$$

The reading was rounded to the nearest one decimal place

iv. Blood pressure

Blood pressure was measured using a mercury sphygmomanometer during sitting and within 3 minutes of standing. The diastolic was recorded to the nearest 2 mmHg.

4.11.2 Ten- minute comprehensive screening

It is one of the screening tools from Age- Friendly Primary Health Care Centres Toolkit developed by World Health Organization (WHO).[48] The tool was designed as an efficient way to identify geriatric giants.

The questionnaire (original in English) (Appendix 4) consists of screening questions on memory, urinary incontinence, physical functional capacity (immobility), depression, falls, nutrition, hearing and vision. This questionnaire had been translated to Malay language and it had been modified and

validated for use in the local population (Appendix 5)[49(p.50-7)]. In the translated version, a question had been added to replace the whispering test to screen for hearing impairment.

The questionnaire used in this study (Appendix 6) was mainly based on the Malay version with some modifications which did not affect the validity of the content. The participants were required to answer “yes” or “no” for each question.

In Part A “Memory” (Appendix 6), participants who failed to recall the 3 objects for question 1, they proceeded with the Elderly Cognitive Assessment Questionnaire (ECAQ) (Appendix 7) instead of Mini Mental State Examination (MMSE) as in the original and the translated questionnaires (Appendix 5). ECAQ required lesser time to complete and it was less influenced by education level[50], as compared to MMSE, in view of most participants in the study had relatively low literacy levels.

In Part E “Falls” (in Malay translated version, Appendix 5), “Adakah anda pernah jatuh 2 kali atau lebih dalam masa 12 bulan lepas?” was omitted because it differed from the operational definition of “cases” in this study. Similar but modified question was asked in “Part A: General Questionnaire” (Appendix 3). The question was modified to “Adakah anda pernah jatuh dalam masa 12 bulan lepas?” to comply with the operational definition of “cases” in this study. Instruction “Sila bangun dari kerusi dan jalan mengelilinginya tanpa memegang kerusi tersebut” (Part E in Appendix 5) was not done because it

was designed for participants who answered “no” in question 1, ““Adakah anda pernah jatuh 2 kali atau lebih dalam masa 12 bulan lepas?” (Part E in Appendix 5).

In “Vision”, participants who answered “yes” to question 1, they proceeded with visual acuity testing with a Snellen chart at a distance of 6 metres in a well- lit area. Each eye was tested, one at a time (with the untested eye covered). Participants who wore glasses were tested with their glasses on in sitting position. They started reading from the top. The reading was taken as the smallest line for which they could read at least half of the letters.

4.11.3 The Elderly Cognitive Assessment Questionnaire (ECAQ)

The Elderly Cognitive Assessment Questionnaire (ECAQ) is developed to evaluate cognition among the elderly population in developing countries that takes into consideration the cultural differences and low literacy rate. It was derived from items in Mini-Mental State Examination and Geriatric Mental State Schedule. The questionnaire has 85.3 % sensitivity, 91.5% specificity, 82.8% positive predictive value.[42] The questionnaire consists of 10 items which evaluates 2 domains of cognitive function (memory and orientation). It takes about 10 minutes to complete all items.[50]

Higher cut- off value of 6/7 shows a sensitivity of 100% with all the cases have scores of 6 or less. It has been reported that the threshold score of 5/6 yields slightly better overall results than 6/7.[42]

The questionnaire was originally written in English, the Malay version of ECAQ (Appendix 7) was used in this study and it had been previously pre-tested.[51(p.28-9)] Participants who failed to recall 3 objects in memory screening were instructed to proceed with ECAQ.

4.11.4 The 14- Item Malay Geriatric Depression Scale (M-GDS-14) (Appendix 8)

The 14- Item Malay Geriatric Depression Scale (M-GDS-14) has been validated in 2004. It consists of 14 items. The Cronbach's alpha is 0.84 and test- retest reliability is 0.84 which indicate satisfactory reliability. The questionnaire shows a sensitivity of 95.5% and a specificity of 84.2% in identifying clinical significant depression (cut- off point of 5/6).[43]

Participants who responded "yes" to question 1 in Part C "Depression" (Appendix 6) were instructed to proceed with M-GDS-14.

4.12 Data Collection Technique

Older adults were recruited during their follow- up at KRK, Hospital USM, from December 2014 to June 2015. The purpose of the study was explained to the older adults. Confidentiality was emphasised. Only those who consented (Appendix 2), and fulfilled the inclusion or exclusion criteria were included in the study.

Interview with questionnaires was done by the researcher. Information was confirmed with the participants' carers (if available) during the interview to