

Awareness of medication related falls and preferred interventions among the elderly

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Abstract: Falls are a major problem among the elderly and can lead to serious injury. Adults older than 65 years suffer the greatest number of severe falls. This study aims to evaluate the knowledge and perception of medication related falls as well as preferred medication related fall prevention programs in the local population. A cross-sectional survey was conducted among the elderly patients in a tertiary hospital. A total of 86 patients (n=86) were interviewed. Approximately 23.3% (20 patients) of the elderly had a history of falls over the past 6 months. Majority of the elderly considered falls as a major concern (80 patients, 93%) and is preventable (55 patients, 64%). Patients with a medical condition reported a significantly greater number of falls within the past 6 months ($p<0.001$). Approximately 69% (59 patients) of the elderly were aware of their medication and associated risk of falls. In patients that were unaware of medication associated risk of falls, 81.5% (22 patients) had a potentially inappropriate medication preferred preventive interventions for medication related falls were related to strength and training programs (37 patients, 43%). The knowledge of falls, medication related falls and intervention strategies in the elderly were minimal.

Keywords: Elderly, falls, medication, fall prevention.

INTRODUCTION

Falls are a major problem among the elderly. Approximately 28-35% of people over 65 years old fall each year while 20-30% of them encounter injuries (World Health Organization, 2007). Falls in the elderly may lead to functional decline, anxiety, depression and an increased risk of premature death (World Health Organization, 2007; Todd and Skelton, 2004). Subsequently, this results in increased hospitalization and health care cost (World Health Organization, 2007).

The risk factors for falls among the elderly include a complex interaction of biological, environmental, socioeconomic and behavioral factors (World Health Organization, 2007; Todd and Skelton, 2004). In addition, poly pharmacy is also associated with increased risk of falls (Todd and Skelton, 2004; Riefkohl *et al.*, 2003). The probability of using a drug that increases the risk of falls increases proportionally with the total number of medications taken (Steinman *et al.*, 2006; Buck *et al.*, 2009). The risk of falls also increases significantly when at least one established risk drug was part of a poly pharmacy regimen (Baranzini *et al.*, 2009). In view of this, an effective targeted multifactorial strategy to reduce risk of medication related falls in the elderly is required.

Fall prevention programs have been shown to benefit the elderly. Generally, fall prevention interventions can be classified into several main categories: fall risk

assessment, exercise program, training on assistive device use, environmental assessment and modification, medication management and patient education (Braun, 1998; Rubenstein and Josephson, 2006; Tinetti, 2003). In developed countries, although numerous intervention programs have been implemented to prevent falls in older adults, the attendance rates of these intervention programs have been disappointing (Laing *et al.*, 2011). Low self-perceived fall risk and minimal awareness of the proven fall prevention measures were barriers to fall prevention programs (Braun, 1998; Laing *et al.*, 2011). Interestingly, those that perceived falls to be important were significantly more likely to participate in fall prevention programs (Braun, 1998; Laing *et al.*, 2011). There is a lack of work addressing medication related fall prevention programs among the elderly in the local population. Therefore, this study aims to evaluate fall-related risk factors with medication as well as willingness to participate in medication related fall prevention programs in the local population.

MATERIALS AND METHODS

Study design

A cross-sectional study was conducted among elderly patients in outpatient clinics of a local tertiary hospital. Patients included in the study were aged 60 years old and above (Karim, 1997; Azidah *et al.*, 2012) with informed consent. Patients that were unable to understand or answer questions due to language or cognitive difficulties and those who did not co-operate were excluded. Ethical

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approval was obtained from the local medical research ethics committee (ID: 1.5.3.5/244).

Knowledge and perception of falls

The knowledge and perception of falls was evaluated using a questionnaire as previously described (Mackintosh *et al.*, 2007; Murad *et al.*, 2011). Participants were asked about their fall history, the importance of falls as a health concern, if falls can be prevented, if they avoid physical activities due to fear of falling, the likely consequence of a fall and risk factors, which they considered most likely to cause a fall. A scale of 0 (least likely or least important) to 10 (most likely or most important) was used to evaluate the importance of falls and fall-related risk factors.

Awareness of fall-related medication

Awareness of medication as a fall risk factor was assessed using a previously validated questionnaire (Riefkohl *et al.*, 2003; American Geriatrics Society, 2003). The number of medication taken over the past six months were obtained through the pharmacy system and any potentially inappropriate medication (PIM) associated with increased risk of falls was identified using the Beer's criteria 2012 (American Geriatrics Society, 2003).

Fall prevention interventions

The third part of the questionnaire assessed the elderly's knowledge, perception and participation in the recommended fall prevention interventions (Laing *et al.*, 2011). Five fall prevention interventions were included which were strength and balance training, advice on use of assistive device, home assessment and safety improvement, medication review and management, and fall education.

STATISTICAL ANALYSIS

Data collected were analyzed using Statistical Package for Social Sciences (SPSS), version 21. Chi-square, Fisher's exact and Student's t-test were used to evaluate any significant difference between patient's demographic data and perception of falls with prevalence of falls, elderly's awareness of inappropriate medication use, willingness to participate in fall prevention interventions, and the elderly's perceived importance of fall-related risk factors. Pearson's correlation test was used to determine the association between perceptions of falls with perceived importance of fall-related risk factors.

RESULTS

Demographic and prevalence of falls

A total of 86 patients were included in this study with ages ranging from 60 to 88 years old. Patients' demographic and characteristics are shown in table 1. Approximately 23.3% (20 patients) of the elderly had a

history of falls over the past 6 months. Injuries were reported in half of the elderly people who had fallen. There was no significance difference in terms of demographic variables and medication use between patients that had a history of falls and those who did not have a history of falls over the past 6 months.

Perception and prevalence of falls

Table 2 demonstrates the elderly's perception of falls and its association with prevalence of falls. Majority of the elderly considered falls as a major concern (80 patients, 93%). Patients with a medical condition that may predispose them to falls reported a significantly greater number of falls within the past 6 months ($p < 0.001$). Fall rates were significantly lower in those who perceived falls to be preventable ($p = 0.002$) and had a good health status ($p = 0.013$). Although no significance was observed between perception towards falls and prevalence of falls, further analysis demonstrated that elderly with higher perceived importance of falls compared to other health concerns considered themselves to get injured more seriously ($r = 0.531$, $p < 0.001$) and were more likely to feel that there was a lower probability to return to current living situations after a serious fall ($r = -0.242$, $p = 0.025$).

Awareness of fall-related medication

Approximately 69% (59 patients) of the elderly in this study were aware of their medications and association with risk of falls. Those with a higher number of medication were found to be unaware of the risk of falls that were related to medication ($t = 2.706$, $p = 0.008$). Similarly, a higher use of potentially inappropriate medication were found among the elderly who were not aware of fall-related medications ($p < 0.001$) (table 3). Table 4 demonstrates the frequency of awareness of medication side effects in increasing the risk of falls among elderly. Majority of the elderly were aware of medication side effects as a risk of fall ($p = 0.012$).

Preferred fall prevention interventions

Approximately 57% (49 patients) of the elderly reported that they did not receive advice or intervention to prevent medication related falls. Among the five interventions, strength and balancing training (37 patients, 43%) accounted as the most helpful method in fall prevention followed by education (19 patients, 22.1%), home assessment and modification (14 patients, 16.3%), training on use of assistive device (12 patients, 14%) and medication management (4 patients, 4.7%). Respondents that were found to take a higher number of medications preferred strength and training as a fall prevention intervention ($t = -2.235$, $p = 0.028$) (table 5).

DISCUSSION

Approximately one third of the elderly are reported to fall each year (World Health Organization, 2007). The rate of

Table 1: Demographic and subject characteristics of the study population (N=86).

Variables	Total (N =86)	History of falls (n=20)	No history of falls (n =66)	p value
Age, years (mean $\pm$ SD)	68.6 $\pm$ 6.5	70.5 $\pm$ 5.5	68.1 $\pm$ 6.7	0.144 ^a
Age level (years), n (%)				0.190 ^b
< 75	69 (80.2)	14 (16.2)	55 (64.0)	
$\geq$ 75	17 (19.8)	6 (7.0)	11 (12.8)	
Gender, n (%)				0.254 ^b
Male	44 (51.2)	8 (9.3)	36 (41.9)	
Female	42 (48.8)	12 (14.0)	30 (34.8)	
Race, n (%)				0.826 ^c
Malay	25 (29.1)	6 (7.0)	19 (22.1)	
Chinese	47 (54.7)	11 (12.8)	36 (41.9)	
Indian	10 (11.6)	3 (3.5)	7 (8.1)	
Others	4 (4.6)	0 (0.0)	4 (4.6)	
Education level, n (%)				0.461 ^c
None	24 (27.9)	8 (9.3)	16 (18.6)	
Primary	32 (37.2)	5 (5.8)	27 (31.4)	
Secondary	19 (22.1)	4 (4.7)	15 (17.4)	
Tertiary	11 (12.8)	3 (3.5)	8 (9.3)	
Number of medication (mean $\pm$ SD)	7.4 $\pm$ 3.5	7.8 $\pm$ 3.6	7.2 $\pm$ 3.5	0.572 ^a
Number of medication, n (%)				1.000 ^c
< 4	13 (15.1)	3 (3.5)	10 (11.6)	
$\geq$ 4	73 (84.9)	17 (19.8)	56 (65.1)	
Presence of PIM, n (%)				0.816 ^b
Yes	32 (37.2)	7 (8.1)	25 (29.1)	
No	54 (62.8)	13 (15.1)	41 (47.7)	
Injuries due to falls, n (%)				
Yes	10 (11.6)	10 (50)	0 (0)	0.039 ^b
No	10 (11.6)	10 (50)	0 (0)	

^a Student's t-test; ^b Pearson chi-square test; ^c Fisher's exact test PIM= potentially inappropriate medication

falls however, is lower in the Asian population (Azidah *et al.*, 2012), similarly observed in the current study. The lower fall rate compared to western data (Todd and Skelton, 2004) may be due to under-reporting by the Asian population, who are often reluctant or forget to report incidence of falls (Rizawati and Ayu, 2008). There was a higher fall rate among the elderly aged more than 75 years old. The risk of falls increases with advanced age, most notably those above 75 years old (Todd and Skelton, 2004; Azidah *et al.*, 2012). With an increase in age, falls occur not only due to chronic medical conditions, but also due to physiologic changes of the normal aging process (Berry and Miller, 2008). The waning strength of the elderly presents a high risk for falling in this particular age group. Unfortunately, the incidence of falls which led to injuries was higher compared to other studies (Rizawati and Ayu, 2008; Berry and Miller, 2008).

In this current work, approximately 90% of the elderly acknowledged falls as a major concern, similar to previous data (Mackintosh *et al.*, 2007). Despite this, there was no difference in concern between those who

had a history of falls with those who did not. This demonstrates that despite being aware of falls as a major concern, the event of falling still occurred. However, those that did not have a medical condition, had a better health status and perceived that falls could be prevented were less likely to fall. Medical conditions such as depression and other chronic diseases have been shown to increase risk of falls (Centers for Disease Control and Prevention; 2008; Azidah *et al.*, 2012). Elderly patients that perceived the importance of falls were higher compared to other health concerns also knew that serious injury was a risk with a possibility of not returning to current living situations. Therefore, targeting fall education among patients with a medical condition and poorer health status could help prevent falls within this group of patients.

Medication plays a role in causing falls among the elderly (Riefkohl *et al.*, 2003). Drug side effects such as hypotension, sedation and blurred vision can contribute to falling. The risk of falls increases with poly pharmacy and use of potentially inappropriate medication (Steinman *et al.*, 2006). In the present study, those with a higher

Table 2: Perception and prevalence of falls amongst the elderly (N=86).

Variables	History of falls (n=20)	No history of falls (n=66)	p value
Fall is a major concern, n (%)			0.620 ^a
Yes	18 (20.9)	62 (72.1)	
No	2 (2.3)	4 (4.7)	
Presence of medical condition predisposing to a fall, n (%)			p<0.001 ^a
Yes	16 (18.6)	20 (23.3)	
No	4 (4.6)	46 (53.5)	
Current health status, n (%)			0.013 ^a
Poor	2 (2.3)	0 (0.0)	
Fair	6 (7.0)	11 (12.8)	
Good	12 (14.0)	45 (52.3)	
Very Good	0 (0.0)	10 (11.6)	
Falls can be prevented, n (%)			0.002 ^b
Yes	7 (8.1)	48 (55.9)	
No	13 (15.1)	18 (20.9)	
Avoid activities due to fear of falling, n (%)			0.319 ^b
Yes	14 (16.3)	38 (44.2)	
No	6 (7.0)	28 (32.5)	
Importance of falls compared to other health concerns (mean $\pm$ SD)	5.80 $\pm$ 2.0	4.80 $\pm$ 2.1	0.065 ^c
Probability of serious injury due to a fall (mean $\pm$ SD)	6.10 $\pm$ 2.1	5.11 $\pm$ 2.3	0.091 ^c
Probability of returning to current living situation after a serious fall (mean $\pm$ SD)	5.05 $\pm$ 2.0	5.38 $\pm$ 2.2	0.545 ^c

^aFisher's exact test; ^bPearson chi-square test; ^cStudent's t-test**Table 3:** Awareness of inappropriate medication use (N=86).

Use of medication	Awareness of inappropriate medication use in association with risk of falls		p value
	Yes (n=59)	No (n=27)	
Presence of PIM, n (%)			p<0.001 ^a
Yes	10 (11.6)	22 (25.6)	
No	49 (57.0)	5 (5.8)	
Number of medication (mean $\pm$ SD)	6.69 $\pm$ 3.4	8.81 $\pm$ 3.3	0.008 ^b

^aPearson chi-square test; ^bStudent's t-test PIM potentially inappropriate medication

number of potentially inappropriate medications were more likely to be unaware of the risks of falls. The higher number of medications among those who were not aware of medication fall risks was also observed. This finding was in line with previous work that demonstrated the use of potentially inappropriate medication was significantly associated with poly pharmacy (Buck *et al.*, 2009; Steinman *et al.*, 2006).

Fall prevention programs have been shown to significantly reduce the risk of falling among the elderly (Todd and Skelton, 2004). However, minimal awareness of the proven fall prevention measures have resulted in failure in implementing fall prevention programs (Laing *et al.*, 2011). In this study population, more than half of the respondents admitted that they were not aware of ways to reduce medication related falls. This finding was

found to be similar to previous work that reported less than 38% of the respondents were aware of fall prevention interventions (Laing *et al.*, 2011). The current study also demonstrates the lack of awareness of the role of medication in causing falls. This could be due to various factors such as low health literacy among the elderly and restricted access to health information sources (Center for Disease Control and Prevention, 2009). Interestingly, the elderly in this study population preferred strength and training as the most popular fall prevention program. Those that had a higher number of medications were also more likely to prefer strength and training as a prevention intervention. Thus, in order to promote fall prevention programs among the elderly with poly pharmacy in the local population, programs on strength and training could be initiated.

Table 4: Awareness of medication side effects in increasing risk of falls (N=86).

Side effects	Awareness of side effects in causing falls, n (%)		p value
	Yes	No	
Drowsiness	79 (91.9)	7 (8.1)	p=0.012
Dizziness	67 (77.9)	19 (22.1)	
Low blood pressure	78 (90.7)	8 (9.3)	
Gait disturbances	80 (93.0)	6 (7.0)	

Pearson chi-square test

Table 5: Participation in fall prevention interventions based on number of medication (N=86).

Fall Prevention Interventions	Number of medications (Mean $\pm$ SD)	P value
Strength and balance training		
Yes	6.18 $\pm$ 2.6	0.03
No	4.77 $\pm$ 2.3	
Training on use of assistive device		
Yes	4.84 $\pm$ 2.3	0.50
No	5.20 $\pm$ 2.4	
Home modification		
Yes	4.92 $\pm$ 2.3	0.22
No	5.83 $\pm$ 2.9	
Medication management		
Yes	5.41 $\pm$ 2.4	0.13
No	4.63 $\pm$ 2.3	
Fall-related Education		
Yes	5.21 $\pm$ 2.4	0.38
No	4.72 $\pm$ 2.5	

Student's t-test

CONCLUSION

The current study demonstrated that knowledge on falls and medication risk factors among the elderly in the local population should be further improved through fall prevention education programs. Such programs should also include medication related fall prevention strategies that focus on increasing fall awareness as well as strength and training interventions. However, it should be noted that findings from this study should not be generalized to all elderly in the local settings, particularly for those in nursing homes. Further work is required to generate more information that is able to represent the elderly population in Malaysia.

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