

# Falls in Older People with Diabetes Mellitus: a study from Kurdistan of Iraq

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## Abstract

Falls are a major cause of disability and a preventable cause of death in older people. Diabetes mellitus prevalence increases with age. The prevalence of falls is higher in diabetic elderly patients. This cross-sectional study analyzed factors associated with higher incidence of falls among 150 older people with diabetes mellitus in Kurdistan.

Results demonstrated that incidence of falls were positively associated with increased age, longer duration of diabetes, treatment with insulin therapy and sulfonylureas, poor diabetic control, polypharmacy, decreased mobility, peripheral neuropathy, osteoarthritis, retinopathy, living alone, living in a care home, smoking and excess alcohol consumption.

**Key words:** Falls, Elderly, Diabetes mellitus, insulin therapy, oral hypoglycemic drugs, Kurdistan

## Introduction

The global size of the elderly population is drastically increasing and the burden of non-communicable disease is rising concordantly (1). Although falls can occur at any age, the frequency and severity of fall-related injuries increases with age (2). People over 65 are more prone to falls; the annual incidence of falls increases from 25% at 70 years to 35% at 75 years(3).

Falls in the elderly are a major cause for attending General Practitioners (GPs), and emergency departments. Mechanical falls (i.e. accidental falls) are uncommon among the elderly population (4). Approximately 1 in 10 falls results in a serious soft tissue injury, traumatic brain injury or fracture. Even non-traumatic falls can have serious consequences including decrease in social and physical activities, disability, loss of independence and institutionalization (5).

Diabetes Mellitus (DM) is common in older people; it is estimated that approximately 50% of the patients with diabetes are over 65 years of age(6). The significance of the association between aging, DM and falls has been highlighted by previous studies that found the annual incidence of falls in elderly individuals is 39% (7).

The incidence of falls, particularly recurrent falls, is significantly higher particularly among women who were treated with insulin (8). Furthermore, in addition to the well-known cardiovascular complications, diabetes is associated with several 'geriatric-syndromes' such as cognitive decline, dementia, depression, functional limitations, physical disabilities, visual and hearing impairments, urinary incontinence and chronic pain (9). All of these are causative factors for falls among community-dwelling older people and are therefore likely to explain the excess risk of falls in individuals with diabetes (10).

There are several pathophysiological mechanisms by which DM may predispose to falls; Decreased sensory-motor function, musculoskeletal/neuromuscular deficits, foot and body pain and pharmacological complications (11). Diabetic peripheral neuropathy (DPN) is common among diabetic patients and its incidence increases with age and duration of diabetes.(11) DPN patients with diminished plantar sensation have been observed to reveal increased postural swing associated with significant loss of postural control (12). Apart from DPN, lower physical activity, muscle strength, and poor postural control were also found to be among the significant risk factors that impacted gait patterns and raised risk of falls among the DM population (12).

Those who experience neuropathic pain are frequently managed with psychotropic and other central nervous system mediated medications. Amitriptyline and duloxetine hydrochloride, for example, are commonly used to manage the aching symptoms of diabetic neuropathy. Psychotropic medications are frequently implicated in falls and nearly double an elderly adult's risk for experiencing a fall (23) and having recurrent falls (12,2).

Older adults suffering with diabetes are also more likely to be taking a larger number of medications (12) and seem to be more sensitive to the effects of polypharmacy than similar people without diabetes (13). Patients with diabetes start to experience an increased risk of falling with regimens involving 4 or more prescribed medications. One of the risks managing diabetes is the risk of hypoglycaemia. This can occur with insulin secretagogues and/or insulin use and frequently result in a state of dizziness, and postural instability which increases ones' risk for a fall accident (14).

In summary, there are plenty of opportunities for older adults with DM to experience a fall. Numerous steps to improve balance, strength, and gait in order, have found to reduce risk of falls (15). The majority of published studies on falls are from Western societies and as a consequence the prevention strategies are based on these populations. Sulaimany is a town within Kurdistan; an autonomous region from the Iraqi central government since 1991. The aim of this paper is to explore the risk factors for falls in diabetic elderly patients within this population. In obtaining a more detailed apprehension of the causes of falls in this group in a developing population a more relevant prevention strategy can be established instead of relying upon Western guidance.

## Methods

This study is a descriptive cross-sectional study to describe the prevalence of falls among elderly diabetic patients and to compare the prevalence between patients on insulin therapy and patients on oral hypoglycaemic agents.

The data were collected by direct interview between the researcher and patients (person to person questionnaire) in the diabetic centre and emergency department of teaching hospital, Shar-hospital in Sulaimani city, Iraqi Kurdistan in the period from 1st of July 2014 to 31st of June 2015; 150 patients equal to or above the age of 65 years were collected.

They were asked questions relating to the duration of diabetes, monitoring, their perception of occurrence of hypoglycaemic episodes, symptoms and signs of postural hypotension, type of treatments they take for diabetes, history of falls and occurrence of falls within the past 12 months (how many times, if at all, have they had a fall in the last year?). They were also asked about consequences of falls, whether non-traumatic, soft tissue injury and bruises, fractures or head injury; they were asked about their perception of visual impairment and peripheral neuropathy, past medical history and medications, poly pharmacy, social history whether living in institution or living alone or with family; mobility, whether they are walking independently or they use walking aids such as sticks or frames, questions about smoking and alcohol drinking.

A fall was defined as 'an event, which results in a person coming to rest inadvertently on the ground or other lower level'; this was explained to the patient. Information was

sought regarding contact with other medical specialties. We collected data about other risk factors for falls in diabetic elderly.

One hundred and fifty elderly diabetic patients with history of fall were included in this study; 88 (59%) were females and 62 (41%) were males. Their ages ranged between 65 – 90 years, mean age was  $77.7 \pm 7.11$  year, and the mean duration of diabetes mellitus was  $15.12 \pm 7.36$  year.

## Results

Results are summarised in the table commencing opposite page, there was an association of increased incidence of falls with increasing age. Mean age of the study population was  $77.7 \pm 7.11$  (95% Confidence Interval (CI) was 63.7–91.6). In this study we found an increased risk in the older diabetic patients (25.3 %) above 85 compared to (14.7 %) of the studied population who were in the age group (65–69). Furthermore, the current study demonstrated higher incidence of falls in females compared to males. These findings were consistent with many previous studies. (16,17)

Moreover, the existing study showed that the frequency of falls increased with the duration of DM, (13%) compared to (26%) for duration (up to 5 years) and (above 20 years) respectively, which is believed to be due to diabetic micro-vascular and macro-vascular complications. A similar finding was illustrated in a study conducted in Homerton University Hospital in the UK (18). It is likely however that if a patient has had diabetes for many years they are likely also generally older, so ideally modelling would need to be done to further determine the effect of duration of diabetes independent of age. Most patients (70%) had a HbA1c level  $\geq 7\%$ , indicating uncontrolled diabetes.

It is apparent that patients on insulin and sulfonylurea agents had the highest rates of falls, while the biggest risk factor identified within the fallers was the presence of diabetic neuropathy. There were significantly higher rates of injury than the reported 1 in 10 rates of injury noted in previous literature, with almost 2 in 3 falls resulting in injury: it is possible that this is the result of the selection methods used, as injuries are more likely to present at the emergency department which was one method of recruiting subjects.

## Discussion

Falls are multifactorial and as a result so too are their prevention (19). The risk factor for falls consequently varies between populations and different cultural groups. Identifying the risk factors for falls in elderly subpopulations will allow the design of more specific interventions. Cultural issues should be considered in falls prevention.

Diabetes Mellitus has been identified as a risk factor for falls and fall-related injuries and fractures in several prospective studies (20). In the period from 1st of July 2015 to 31st of June 2016; 150 patients equal or above the

age of 65 years in Sulaimani city/ Iraqi Kurdistan agreed to be enrolled in this study to determine the prevalence of falls among diabetic elderly on insulin therapy and/or oral hypoglycaemic agents and sought to investigate the association of being a faller with a range of putative risk factors within this population.

We examined the association between diabetes and falls among community-dwelling older individuals and found that individuals with diabetes had high risk of recurrent falls. This study affirmed that the prevalence of falls in diabetic elderly on insulin therapy and /or oral sulfonylurea is greater than those on other oral hypoglycaemic drugs. Also a significant relationship exists between falls and increasing age, female gender, longer duration of DM, poor diabetic control, poly pharmacy, peripheral neuropathy, retinopathy, smoking and alcohol drinking. All these findings are supported by previous studies mentioned below.

Furthermore, Kennedy et al, determined that insulin-treated diabetic patients were more likely to present with falls during a hypoglycaemic episode. Also, it showed that patients treated with insulin were more likely to sustain a fracture during the fall (21). This may partly explain why higher rates of injury were seen in our sample.

Amongst oral anti-diabetic medications, the risk of hypoglycaemia is higher in those on sulfonylurea medications than those on other oral drugs (22). Similarly, the current study findings were in line with above research showing higher incidence of falls among those on insulin therapy and sulfonylurea, (20.7%), (16%) or insulin only, (13.3%) on sulfonylurea only. On the other hand, only (8%) were on biguanide which is recognized as the safest drug for older diabetic people with normal renal function.

On another aspect, Tilling et al.(23) reported increased risk of falls with poor glycaemic control (HbA1c > 7%). This conclusion is agreeing with the existent study where (70%) of participants recorded uncontrolled HbA1c. However, patients with HbA1c <6% were also found to be at a higher risk of falls. Therefore, a rigid glycaemic control is usually discouraged in elderly patients (24).

The study has clearly shown a significant connection between falls in diabetic elderly, and diabetes complications namely peripheral neuropathy (56%), and diabetic retinopathy (51.3%). Other studies have highlighted that reduced peripheral sensation and visual impairment secondary to diabetes has been associated with higher incidence of falls (25,26). Finally, this study highlights the extent of polypharmacy, with the majority (61%) of participants studied on 4 or more medications. This correlates with research which revealed that the use of four or more medications is associated with an increased risk of falling (27).

This study has made some steps to uncovering the many factors that result in diabetic elderly patients to fall in Kurdistan. Only patients who presented to hospital were included. This includes a small number of total diabetic fallers as those who fall in the community and

Age	Number (n=)	Percentage (%)	
65-69 years	22	15%	
70-74 years	28	19%	
75-79 years	30	20%	
80-84 years	32	21%	
≥85 years	38	25%	
Mean age	Years	SD	95% CI
	77.7	±7.11	(63.7-91.6)
Gender	Number (n=)	Percentage (%)	
Male	62	41%	
Female	88	59%	
Duration of Diabetes			
0-5 years	19	13%	
6-10 years	26	17%	
11-15 years	31	21%	
16-20 years	35	23%	
≥20 years	39	41%	
Mean duration	Years	SD	95% CI
	15.12	±7.36	(0.692-29.52)
Type of treatment	Number (n=)	Percentage (%)	
Insulin + Sulfonylurea	31	20.7%	
Insulin + Biguanide + Sulfonylurea	28	18.7%	
Insulin	24	16.0%	
Sulfonylurea	20	13.3%	
Insulin + Rosiglitazone	19	12.7%	
Sulfonylurea + DPP4i	16	10.7%	
Biguanide	12	8.0%	
HbA1c levels	Number (n=)	Percentage (%)	
≥7%	105	70%	
<7%	45	30%	
Lifetime number of falls			
1	49	32.7%	
2	57	38.0%	
≥3	44	29.3%	
Falls within last year	Number (n=)	Percentage (%)	
1	85	57%	
2	65	43%	
Consequences of injury	Number (n=)	Percentage (%)	
Non-traumatic	55	36.7%	
Soft tissue injury	39	26.0%	
Fracture	36	24.0%	
Head injury	20	13.3%	
Total	150		

<b>Risk Factors</b>	<b>Number (n=)</b>	<b>Percentage (%)</b>
Diabetic Neuropathy	84	56.0%
Osteoarthritis	79	52.7%
Diabetic retinopathy	77	51.3%
Hypertension	76	50.7%
Cardiac disease	68	45.3%
Vertigo	39	26.0%
COPD	36	24.0%
Stroke	31	20.7%
Hypoglycaemia	31	20.7%
Foot ulcer	30	20.0%
Ear problems	30	20.0%
Glaucoma/Cataract	23	15.3%
Parkinsons Disease	21	14.0%
<b>Polypharmacy (≥4 prescribed medications)</b>	<b>Number (n=)</b>	<b>Percentage (%)</b>
Present	91	61%
Absent	59	39%
<b>Accommodation</b>	<b>Number (n=)</b>	<b>Percentage (%)</b>
Living alone	70	46.7%
Living with family	61	40.7%
Living in an institution	19	12.7%
<b>Use of walking aids</b>	<b>Number (n=)</b>	<b>Percentage (%)</b>
Present	80	53.3%
Absent	70	46.7%
<b>Smoking Status</b>	<b>Number (n=)</b>	<b>Percentage (%)</b>
Smoker	82	55%
Non-smoker	68	45%
<b>Alcohol Consumption</b>	<b>Number (n=)</b>	<b>Percentage (%)</b>
None	121	81%
Mild-Moderate	17	11%
Severe	12	8%

do not present to secondary care are being missed. By only selecting patients who have sustained an injury it is impossible to calculate the prevalence for all falls. Similarly, certain risk factors and characteristics are potentially being underestimated. Further studies involving community healthcare is needed to further improve the knowledge of falls and associated risk factors. Such research will also benefit Western countries in establishing fall prevention strategies where there are an increasing non white population (28).

### Recommendations

- Oral antidiabetic agents that are least likely to cause hypoglycemia should be the first choice of therapy in those elderly diabetics aged 65 years or above. Metformin and/or dipeptidyl peptidase inhibitors should be used unless contraindicated.
- Avoiding the use of sulfonylureas in patients aged 65 years or above.
- It is better to avoid using insulin therapy unless it is

necessary to control glycemic state in older diabetic patients.

- Due to increased risk of hypoglycemia and its complications in this group of population, maintenance of tight glycemic control should be discouraged.
- Consider falls risk specific for the Sulaimany population and may be nationally for Kurdistan.
- Adopting a combined approach to falls management with other specialties and allied health professionals.

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