Dependency in Activities of Daily Living Following Limb Trauma in Elderly Referred to Shahid Beheshti Hospital, Kashan, Iran in 2013

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Background: Activities of daily living (ADL) are an important indicator of health and independence in elderly. It provides useful information for proper planning in the field of elderly care. Trauma in elderly population is frequent and can negatively affect the independence in ADL.

Objectives: The purpose of the present study was to evaluate elderly independence in activities of daily living (ADL) following limb trauma and its related factors in patients referred to trauma emergency ward of Shahid Beheshti Hospital, Kashan, Iran, in 2013.

Patients and Methods: This descriptive study was conducted on 200 traumatic patients admitted to trauma emergency ward of Shahid Beheshti Hospital in 2013. The questionnaire used in this study had three parts as demographic data, information related to trauma and ISADL (independency scale of activities of daily living). ISADL was completed in emergency ward to declare pretraumatic status; it was also completed 1 and 3 months after trauma. Statistical analysis was conducted by Chi-square test, One-way and two-factor ANOVA, and Multiple regression analysis. Data analysis was conducted using SPSS software, version 16.

Results: The average age of participants was 70.57 ± 9.05 years. In total, 80.5% of the elderly were completely independent in ISADL before trauma; this decreased to 13.5% one month after trauma. Besides, 32% of the elderly were completely or relatively dependent three months after trauma. Two-factor ANOVA showed a significant association between the scores of ISADL, the time interval and the type and location of an injured organ, and having the surgery as a treatment.

Conclusions: More than three-quarters of the elderly were independent in ISADL before the trauma, but trauma in elderly patients had a substantial negative effect on patients' ability and ADL function.

Keywords: Activities of Daily Living; Limb; Trauma; Elderly

1. Background

In recent years, there has been an increase in geriatric population worldwide (1). According to the recent studies, elderly population of the United States has been growing rapidly since 1980 at a rate of 21%. By the year 2040, this percentage is estimated to reach nearly 20% of the total population in the US (2). This trend can be seen in many other countries including Iran. More than 7% of Iran population is elderly (3). The incidence of health problems increases in this age group, such as cognitive impairment, chronic diseases, and musculoskeletal disorders (1). The elderly consume 29% of medical care costs (4). The propensity for fall-related injury in elderly is due to a high prevalence of clinical diseases (e.g. osteoporosis, impaired vision, impaired balance) and age-related physiologic changes (e.g. slowed protective reflexes), which make even a mild fall particularly dangerous (5, 6). In a study performed in Iran, Adib Hajbaghery and Masoodi Alavi found that hip fractures due to osteoporosis occur 10 years sooner than developed countries showing a high risk of fractures in elderly in this country

(7). Trauma in the elderly population is frequent and associated with significant mortality and morbidity rates (2). Trauma is the fourth cause of death in the world (8). Chang et al. reported a mortality rate of nearly 10% in injured patients with a mean age of 77.5 years (2). Mohtasham Amiri et al. found that trauma was the second cause of hospitalization in elderly in hospitals of Rasht, Iran (9). Fractures due to fall and accidents are considered as important public health problems among elderly (1, 10). Compared to individuals without fractures, those with a previous hip fracture have a two to threefold higher risk of sustaining a subsequent fracture (11). Elderly patients have worse outcomes compared to the younger trauma patients (1). Approximately 5-20% of falls have serious consequences including major head trauma, major lacerations, or fracture and may lead to immobility or death (12). Elderly with hip fractures following falls have 20% to 30% mortality within one year of fracture (6). In a study in Shiraz, 24.6% of elderly remained disabled following trauma (13). Fall-related injuries are often associated with

considerable long-term morbidity. Among community-dwelling fallers with hip fractures, between 25% and 75% do not recover their prefracture level of function in ambulation or activities of daily living (6). Fear of falling also has been recognized as a negative consequence of falls (14). Surveys have reported that between 30% and 73% of older persons who had fallen acknowledge a fear of falling (8). Loss of confidence in the ability to ambulate safely can result in further functional decline (10), depression, feelings of helplessness, and social isolation (6, 14). Independence in activities of daily living (ADL) is an important indicator of health. It provides useful information for proper planning in the field of elderly care (15). ADLs are essential activities that a person needs to perform to be able to live independently. ADLs are defined as "the things we normally do such as feeding, bathing, dressing, grooming, working, homemaking" (16). In spite of common believes that elderly are accompanied by dependency, several studies showed that people can enjoy an independent life in elderly (4). Habibi et al. reported that only 0.7% of elderly were completely dependent, 5.9% were relatively dependent and 93.4% were completely independent (4). Tavakoli et al. also reported that more than 80% of people aged 65-74 years, more than 70% of people aged 75-84 years, and a half of those older than 85 years were independent in performing activities of daily living (17). Trauma and injuries can negatively affect independence in ADL. Inaba et al. reported that most elderly (98%) were living independently at home before injury. However, 3 years after injury, only 63% were living independently and 20% required home care (18). It seems that aging is not a factor for inevitable dependence of daily living activities, but trauma in the elderly can change this life process and lead to dependency. Gill et al. reported that 43.8% of elderly fallers had no recovery after one year (19). Sipila et al. also reported that only 40% of hip fracture survivors recovered to their prefracture ambulatory level and only 20% recovered to prefracture level in advanced mobility tasks (14). There are different and conflicting results about the rate of dependency following trauma in other countries (14, 18, 19), while there is not enough information about this important issue in Iran. Geographic variation in trauma patterns may occur, but there is limited information available about geriatric trauma in Kashan. Estimation of ADL capabilities after trauma is essential for proper nursing care planning and family education. It also gives us information about the need for rehabilitation services.

2. Objectives

The aim of this study was to evaluate the independence of elderly in activities of daily livings (ADL) following limb trauma and its related factors in patients referred to trauma emergency ward of Shahid Beheshti Hospital, Kashan, Iran in 2013.

3. Patients and Methods

3.1. Study Design

This descriptive study was conducted in autumn and winter of 2013 in the trauma emergency ward of Shahid Beheshti Hospital in Kashan, Iran. It is the only general hospital in Kashan city and provides medical care for about 400000 populations, and all serious injuries in this area are referred to this hospital.

3.2. Subjects

Sampling population were elderly with limb trauma referring to emergency ward of Shahid Beheshti Hospital. Sample size was calculated based on the formula $(ZS/E)^2$ with an alpha of 0.05, sampling error of 2 and estimated standard deviation of ADL one month after limb trauma as 14 according to a pilot study performed previously on 20 patients. Therefore, 188 subjects were estimated to be needed; however, 200 subjects entered sequentially to the study to compensate possible attrition. The inclusion criteria were age over 60 years, no history of dementia, ability to respond to questionnaires, and independence in activities of daily living before injury. The exclusion criterion was refusal of subjects to continue the study.

3.3. Measurement

The questionnaire used in this study had three parts. The first part of the questionnaire included questions regarding demographic information (age, sex, education level, marital status, occupation, place of residence, and socioeconomic status). The second part included information related to trauma such as time of trauma (morning, noon and afternoon, and night), place of trauma (home or out of home), cause of trauma (fall or accident), type of trauma (fracture, contusion or dislocations), location of an injured organ (upper limb, pelvic, femur, knee and below knee) and history of previous diseases. Content validity of the first and second parts of the questionnaire was approved by 10 experts and their comments were applied. Reliability of the questionnaire was set at 0.95 by split-half method on 20 patients. The third part was ISADL (Independency Scale of Activities of Daily Living) used to evaluate independency in ADL one month before and one and three months after traumatic injury. This questionnaire was designed by Yaghmaei to assess independency in activities of daily living in elderly (15). ISADL has 20 questions about activities of daily living such as bathing, toileting, personal hygiene, shopping, managing finances, transporting, climbing stairs, walking, cleaning, dressing, using the telephone, washing and ironing clothes, preparing meal, eating and drinking, controlling urination and defecation, taking medications, getting up from a chair, going to bed and getting up from the bed, sorting and preparing the

bed. Every item received the scores of 1-4 (1, completely dependent; 2, relatively dependent; 3, the relatively independent; 4, completely independent in activities of daily living). The score range was 20-80. Elderly who got 60-80 of score were considered independent, 40-60 as relatively independent, 20-60 as relatively dependent and 20 as completely dependent. In the study of Yaghmaei, content validity of ISADL questionnaire was confirmed by 10 nursing instructors (15). Reliability of the questionnaire was set at 0.98 by Cronbach's Alpha. Independence status score was calculated for each patient, with a score of four indicating full ability in ADL in every item. The questionnaire was completed by interview in the emergency department to declare ADL one month before injury. The questionnaires were completed at least 6 hours after patients' admission to the emergency department and when patients were stable then the patients were followed and the questionnaires were completed at 1 and 3 months after trauma. The second author interviewed all patients who met the inclusion criteria in emergency department in morning and evening shifts. Telephone numbers and addresses of patients were recorded in the questionnaires. After 1 and 3 months, the patients were called by the second author and the questionnaires were completed through telephone interviews.

3.4. Statistical Analysis

Statistical analysis was conducted using SPSS software, version 16 (SPSS Inc., Chicago, Illinois). Normal distribution of data was tested by Kolmogorov-Simonov Test. The Chi-square test was used to assess dependency level before and after trauma. One-way ANOVA was used to assess the difference between ISADL scores in different time intervals. A two-way ANOVA found an association between time intervals and other variables in the ISADL score. Multiple regression analysis was used to show the variables that could made the model with ISADL scores as a dependent variable. The significance level was set at $P < 0.05$ in all testes.

3.5. Ethical Consideration

This study was approved by the research council of Faculty of Nursing and Midwifery and its ethical aspects were approved by the Research Ethics Committee of Kashan University of Medical Sciences, Kashan, Iran. Furthermore, necessary licenses were obtained from the authorities of the concerned hospital. The purposes of the study were explained to the participants and all signed a written informed consent and assured of the confidentiality of information.

4. Results

The average age of participant was 70.57 ± 9.05 years. In total, 119 (59.5%) of the participants were female. Before the trauma, about one-thirds of the participants lived alone. Seventy patients (35%) had injuries in pelvic; other

areas of injury were 41 (20.5%) in upper limb, 58 (29%) in femur, and 31 (15.5%) in knee and below knee. Patients' characteristics are presented in Table 1.

In total, 44% of elderly had a history of previous trauma. Among them 63.6% had fractures; 29.5% had soft tissue injuries and 6.9% had head trauma. Previous trauma happened 2.37 ± 3.77 years before the current trauma. Previous trauma was 69.3% in lower limb, 17% in upper limb and 13.7% in other organs. Most injuries were occurred in the morning hours (45.5%), around 8 AM. In total, 75% of patients had undergone surgery in their treatment (internal fixator (65.5%), skeletal traction (6%), amputation and surgical reduction (3.5%). Other treatments were splint and casting (6.5%), rest and medical treatment (18.5%). In total, 80.5% of the elderly were completely independent based on ISADL before trauma; this decreased to 13.5% one month after trauma. 32% of the elderly were completely or relatively dependent 3 months after trauma. There was a significant reduction in ISADL one month after trauma.

Table 1. Demographic Data in Elderly [a]

Demographic Data of Elderly	Results
Gender	
Female	119 (59.5)
Male	81 (40.5)
Marital status	
Married	118 (59)
Widowed	82 (41)
Education	
Uneducated	134 (67)
Below diploma	54 (27)
Diploma and higher	12 (6)
Occupation	
Retired	34 (17)
Housekeeper	114 (57)
Farmer	31 (15.5)
Other	21 (10.5)
Socioeconomic status	
Good	29 (14.5)
Moderate	112 (56)
Poor	59 (29.5)
Place of trauma	
Home	105 (52.5)
Out of home	95 (47.5)
Cause of trauma	
Fall	148 (74)
Accident	52 (26)
Type of trauma	
Fracture	161 (80.5)
Contusion or dislocations	39 (19.5)

[a] Data are presented as No. (%).

Table 2. Independence in Activities of Daily Living Before, One and Three Months After Trauma [a, b]

Level of Independence in ADL	Before Trauma	One Month After Trauma	Three Months After Trauma	P Value
Completely dependent	0 (0)	7 (3.5)	11 (5.5)	
Relatively dependent	5 (2.5)	116 (58)	53 (26.5)	
Relatively independent	34 (17)	50 (25)	91 (45.5)	
Completely Independent	161 (80.5)	27 (13.5)	45 (22.5)	
Results	70.22 ± 12.35	41.25 ± 13.44	48.81 ± 17.66	0.0001

[a] Abbreviation: ADL, activities of daily living.
[b] Data are presented as No. (%) or Mean ± SD.

Table 3. Two-Way ANOVA Results for Activities of Daily Living Score, Before, One and Three Months After Trauma and Other Variables [a]

Two-Way ANOVA	Source of Variation				
	SS	DF	MS	F	P Value
Type of trauma (fracture, dislocation, contusion)					
Interaction	3460.9	4	865.2	4.339	0.002
Type of trauma	7102.5	2	3551.2	17.8	0.0001
Before, 1 and 3 months after trauma	18195.2	2	9097.6	45.6	0.0001
Residual	117861	591	199.426		
The location of injured organ (upper limb, knee and below knee, pelvic, femur)					
Interaction	8530.2	18	473.9	3.12	0.0001
Location of injured organ	33390.7	9	3708.9	24.43	0.0001
Before, 1 and 3 months after trauma	30876.8	2	15438.4	101.7	0.0001
Residuals	86513.5	570	151.7		
Having a surgery					
Interaction	6268.5	2	2134.3	18.22	0.0001
Having a surgery	20013.3	1	20013.3	116.4	0.0001
Before, 1 and 3 months after trauma	51195.4	2	25597.7	148.8	0.0001
Residuals	102142.6	594	171.9		

[a] Abbreviations: ANOVA, analysis of variance; SS, sum of square, DF, degree of freedom, MS, mean of square; F, F-test.

Table 4. Multiple Regression Analyses of Associations Between Variables With Elderly Independence Before, One and Three Months After Trauma [a]

	P Value	T	Beta	Adjusted R^2	R^2
Level of independence in ADL before trauma				0.451	0.671
Age	0.0001	-5.426	-0.395		
Marital status	0.036	2.108	0.148		
Level of independence in ADL 1 month after trauma				0.527	0.726
Gender	0.024	2.284	0.169		
Age	0.001	-3.443	-0.233		
Occupation	0.043	-2.034	-0.136		
Education	0.001	3.487	0.246		
Cause of trauma	0.021	2.330	0.165		
Location of injured organ	0.024	-0.130	-2.276		
Having a surgery	0.0001	0.297	4.180		
Level of independence in ADL 3 months after trauma				0.475	0.691
Age	0.0001	-4.881	-0.347		
Having a surgery	0.0001	5.246	0.392		
Kind of treatment	0.017	2.415	0.149		

[a] Abbreviation: ADL, activities of daily living.

The ISADL score improved three months after trauma, but it did not reach to its preinjury period (Table 2). Two-way ANOVA showed a significant association between the scores of ISADL, time interval and type and location of an injured organ, and the undergoing surgery as a treatment (Table 3). Other variables including gender, education, and marital status had no significant effect.

In multiple regression analyses, age and marital status could explain 67.1% of independence in ISADL before trauma. One month after trauma, gender, age, occupation, education, cause of trauma, location of an injured organ and having surgery for treatment made a model with independence in ISADL. All these variables could explain 72.6% of ISADL score. Three months after injury only age, having surgery and kind of treatment showed significant associations with ISADL and could explain 69.1% of this variable (Table 4).

5. Discussion

The present study showed that 80.5% of elderly population were independent before trauma; this reached to 13.5% and 22.5%, 1 and 3 months after trauma. The lowest score of ISADL was reported one month after trauma. Inaba et al. reported that most elderly (98%) were living independently at home before injury. However, at long-term follow-up (a mean of 2.8 years), only 63% were living independently and 20% still required homecare (18). Besides, Gill et al. reported that 43.8% of elderly fallers had no recovery after one year (19). Sipila et al. reported that only 40% of hip fracture survivors recovered to their prefracture ambulatory level and only 20% recovered to their prefracture level in advanced mobility tasks 6 weeks after discharge (14). Kelley-Quon et al. also reported that ADL scores declined after 12 months of trauma (20). These findings were probably due to the fact that the elderly were at rest until a month after trauma, but three months after trauma were launched by using aids and had begun rehabilitation. These findings suggest that prevention and treatment of trauma should be a high priority when decisions are made to allocate resources aimed to reduce the burden of disability in older persons. More than a half of participants were women. This finding is consistent with the results of Buczak-Stec et al. in Poland reporting that hospitalization ratio due to falls was much higher for women than men (21). Fracture occurs probably in reduced bone mass and impaired bone geometry in older women (11). Multiple regression analysis showed that gender had an association with ISADL one month after trauma and women showed a better improvement in their ISADL. The reason might be that women receive more support after trauma. Many studies showed that perceived support has a direct effect on health and well-being of older adults (22). Gill et al. reported more disability in women after trauma (23). Moreover, Gonzalez et al. reported that women with wrist fractures exhibited greater decrease of QOL (Quality of Life) than men 6

months after fall (24). This is not consistent with the findings of the current study. The present study showed that risk of dependency due to a trauma increases with age consistent with previous studies (6, 21). The present study showed that most frequent geriatric trauma injuries occur due to falls. According to Gill, about one of three people older than 65 years falls annually; this rate increases with advanced age (19). A serious fall injury is often a defining event in the life of an older person, and can dramatically affect the function of elderlies (19). Fazel et al. reported fall as the most common cause of home-related injury in Kashan, Iran in one-fifth of elderlies (25). Falling could be simply a marker for the progression of "normal" age-related changes in vision, gait and strength. For instance, visual impairment increases the risk of falling for about 2.5 times (6). According to Brand et al. 49% of patients with rheumatic disease reported one or more falls in previous 12 months (26). In the present study, most injuries were occurred in the morning hours around 8 AM, which could be due to a sudden rise from bed or side effects of drugs. The elderly should be instructed to get up from the bed slowly in the mornings, and sit on the edge of the bed for about a minute. In total, 60% of participants had a history of previous trauma. Individuals who had fallen have a threefold increased risk of falling again. Recurrent falls in an individual are frequently due to the same previous causes (6).

In the present study, fractures (80.5%) were the main consequences of trauma. Fractures are the most serious consequence of falls for seniors (27). The most common injured regions were pelvic (35%), femur (29%), upper limb (20.5%) and knee and below knee (15.5%). Community-dwelling older persons who survive a fracture need special attention (14). In addition, Gill et al. reported that 47.7% of participants had hip fractures and post-fall functional trajectories were consistently worse after a hip fracture than other injuries (28). Hip fracture is the second major cause of bedridden (26). Studies showed that patients with hip fracture have poor recovery in their deficiency in mobility might be permanent (14). In the present study, more than three-quarters of the elderly were independent based on ISADL before trauma, but trauma in elderly patients had a substantial negative effect on their ability and ADL function. In summary, our group is the first to follow a longitudinal group of elderly adults after trauma in Kashan, Iran and identify a significant and progressive loss of functional ability. Clinical consequences include increased risk of future decline, loss of independence, and mortality. We propose that care of geriatric patients with trauma should move beyond prevention of death and include multidisciplinary care targeted rehabilitation and prevention of permanent functional impairment. The elderly patients following trauma should be cared for by specialist nurses. Telephone counseling could be helpful. This study had some limitations; first, the ISADL questionnaires were completed by phone call one and three months after trauma, which might affect

the responses. The second limitation of this study was relying on self-report information, which could cause bias. We just followed patients for three months. It seems that we need longer follow-up periods to have a better image of ISADL following trauma. We recommend to continue patients' follow-up for longer periods. We also recommend interventional studies to improve ISADL following trauma in elderly.

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Authors' Contributions

Negin Masoudi Alavi was responsible for the study concept and design, made critical revisions to the paper, participated in data analysis and supervised the study; Azade Safa participated in study concept, performed data collection and literature search and prepared the first draft of the manuscript and Masoumeh Abedzadeh revised the study draft.

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