

Functional outcomes of elderly women following hip fracture surgery

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ABSTRACT

Hip fracture is often a catastrophic event that carries an overwhelming threat to an individual's independence and ability to live in the community. Also it is considered one of the most fatal fractures for elderly women, resulting in increased morbidity and mortality and impaired functional capacity, particularly for basic and instrumental activities of daily living. **Objective:** To assess functional outcomes following hip fracture among elderly women in Aswan Governorate. **Methodology:** A descriptive correlational design was used. The study subjects comprised 60 elderly women. Four tools were used to collect the data; socio- demographic and clinical data structured interview schedule, Barthel Index, Short Portable Mental State Questionnaire, and Rapid Disability Rating Scale version-2. **Results:** Statistically significant differences were found between functional outcomes of elderly women with hip fracture and their age, education, income, housing condition, body mass index, length of hospital stay, degree of dependence, and cognitive impairment. **Conclusion & recommendations:** Functional outcomes of elderly women after hip fracture surgery depend on their pre-fracture health status and functional abilities of the elderly women. These findings suggest that, it is necessary to assess and modify the home environment, in order to apply measures to overcome hazards that might lead to fall and fracture.

Key words: Hip fracture, Functional outcomes, Elderly women, Functional recovery

Introduction

Among all bone fractures, hip fracture represents a major health problem for older adults. As it is associated with the highest degree of morbidity, mortality and functional disabilities and is considered a dangerous problem that requires hospitalization and surgery. After surgery, patients require additional support through rehabilitation (Zaki & El Badawy, 2009). Hip fracture is ranked in the top ten of all impairments worldwide and a leading cause of morbidity, mortality, permanent functional disabilities, and institutionalization. It is reported that death usually occurs after 6 months in 10-

28%, and up to 33% of all fracture cases during the first year of fracture (Bass, et al., 2007). Notably, the number of hip fracture will increase worldwide with the continued aging of the population; especially those over 75 years. Women represent approximately 75% of hip fracture victims. This is probably due to increased longevity of the female population and the increased incidence of osteoporosis in the same population after menopause. As they get older, women lose 30 to 50 % of their bone density (thickness). The rate of bone loss speeds up remarkably after menopause because less estrogen is produced. Estrogen contributes to maintain bone density and strength (Osaki, et al., 2012). In Egypt, a study estimated that 53.9%

of postmenopausal women have osteopenia and 28.4% have osteoporosis which may predispose to fracture (*Taha & Fahmy, 2001*).

In USA, women older than 65 years constituted 80% of all hip fractures and the lifetime prevalence of hip fracture is 20% for women and 10% for men (*Wu, et al., 2013*). In the UK, 70,000 cases of hip fracture occurred in 2013, about 8 in 10 people who suffered a hip fracture were women, and the most common age was 80 years and older (*Culley, 2013*). In Alexandria- Egypt, 2004 musculoskeletal injuries are considered major public and social problem, as they predispose to future disabilities. About 83,000 hip fractures occur annually and about 33,000 annual hip replacement operations are done in Egypt (*Eid, 2004*) While in Aswan 2013, 67% of all hip fracture cases were among elderly women admitted to Aswan University Hospital (*Statistical Records of Orthopedic Department of Aswan University Hospital, 2014*).

The consequences of hip fracture in elderly women are significant in terms of life loss and the associated negative impacts of hip fracture on women's functioning and quality of life (*Johnell & Kanis, 2004*). This is because elderly women do not tolerate long periods of immobilization and hospitalization. They are liable to complications such as mental confusion, dehydration, bed sores, chest infection, venous thrombosis, embolism, and urinary problems. The increasing number of hip fracture among the aged women leads to exhaustion of health care resources due to the long hospital stay and rehabilitation period. This, in turn leads not only to financial burden but also to caregiver stress. As well, it increases the risk for dependency and institutionalization. Approximately 25 to 75% of hip fracture patients do not return to their previous level of independent living within the year following the fracture. Many elderly women who sustained hip fracture fail to regain their prior functional ability

following the surgery (*Taha & Fahmy 2011; Beaupre, et al., 2012*)

Many risk factors may cause hip fracture among elderly women. These can be categorized into two broad categories; intrinsic and extrinsic factors. The intrinsic factors are related to the elderly as a result of complex interaction between the changes associated with the normal aging process leading to the marked decrease in bone density and bone mass that occur with advanced age as female gender, medications, and medical disorders as the overactive thyroid. Furthermore, a low body mass index suggesting malnutrition is associated with increased risk for hip fracture (*Lee, et al., 2014*). Extrinsic factors are related to environmental hazards or the surroundings of the elderly. Some studies reported that between 30% and 50% of falls among community-dwelling older people are due to environmental causes (*Kamel, 2005*). Older people often have problems slipping, lacking good balance or proper mechanisms for preventing the fall. Environmental hazards include poor lighting, unstable furniture, slippery floors, and uneven surfaces (*Friesendorff, 2010*). In Egypt, the incidence of fall in elderly homes is reported to be 22.5% (*El- Ibrahim, 2001*).

Recovering functional abilities is the main goal of any health care plan for elderly women with hip fracture. Functional outcomes are commonly measured by the ability of elderly women to perform basic and instrumental activities of daily livings which are considered the cornerstone of maintaining independence and quality of life. Functional outcomes are a multidimensional construct that encompasses an individual's ability to perform activities of daily livings (ADLs) and instrumental activities of daily livings (IADLs), and to participate in various life situations, as social functioning. Functional outcomes tend to reflect the micro- skills of daily living tasks. Accordingly, functional outcomes are typically measured as the level of

achievement of independent living, and social domains that are occurring in the individual's natural living environments (*Ebersole, et al., 2011*). Since functional outcome is usually affected by hip fracture, in terms of disability and functional decline. Therefore this study aimed to assess functional outcomes of elderly women following hip fracture surgery in Aswan governorate.

Research question:

What are the functional outcomes of elderly women following hip fracture surgery in Aswan Governorate?

Materials and Method

Design, setting: this descriptive correlational study was conducted at the Orthopedic Inpatient unit in Aswan University Hospital. The Aswan University Hospital serves six cities in Aswan Governorate (Aswan, Daraw, Balana, Komombo, Abo-Simbel, Nasr El-Nuba).

Subjects: The study subjects comprised all elderly women suffering from hip fracture admitted to Aswan University Hospital during a three months period, and fulfilling the following criteria; aged 60 years or more, being independent in activities of daily living before the fracture, had non-pathological femoral neck or trochanteric hip fracture for the first time and with normal cognitive function. Their number amounted to 60 elderly women (the response rate was 80%).

Tools: four tools were used to collect the necessary data.

Tool I: Socio-demographic and clinical data structured interview schedule. This tool was developed by the researchers and included the following; socio-demographic characteristics and health profile of the studied subjects, anthropometric measurements, present

fracture history, and follow-up data as the occurrence of complications and commitment to discharge instructions.

Tool II: Short Portable Mental State Questionnaire (SPMSQ). This instrument was developed by Pfeiffer (1975) (*Pfeiffer, 1975*) for rapid screening of cognitive deficit in institutionalized and community-dwelling older adults. It includes ten simple questions that cover short and long-term memory, orientation to surroundings, knowledge of the current events, and ability to perform mathematical tasks. This tool was translated into Arabic language and tested for reliability by Abd El Salam (2012) ($r = 0.89$) (*Abdel Salam, 2012*). The scoring of SPMSQ is as follows; 0 -2: Normal mental functioning, 3-4: Mild cognitive impairment, 5-7: Moderate cognitive impairment, and 8 or more: Severe cognitive impairment.

Tool III: Barthel Index (BI). This instrument was developed by Barthel (1965) to measure the performance of activities of daily living (*Mahoney & Barthel 1965*). The tool was translated into Arabic language and tested for reliability by Hallaj (2007) ($r = 0.971$) (*Hallaj, 2007*). The scale consists of 10 items and the score of zero is given when the elderly cannot meet criteria as defined dependent, score of one is given when she needs help and score of two when she is independent in performing the activity. The total score of the scale is 20 and is classified as follows; 0-7: Dependent, 8-12: Independent with assistance, and 13-20: Independent.

Tool IV: Rapid Disability Rating Scale version-2 (RDRS-2) which was developed by (Linn & Linn 1982) to measure the functional outcome of hip fracture (*Linn & Linn 1982*). This scale comprises 18 items grouped into three domains: activities of daily living (eight items), degree of dependence (seven items), and cognitive impairment (three items). The total score ranged from zero (no functional impairment)

to 54 (severe global functional impairment) and classified as follows: 0 – 18: No functional impairment, 19- 36: Mild functional impairment, and 37-54: Severe functional impairment.

Method: the study protocol was approved by the Ethical Research Committee at the Faculty of Nursing-Alexandria University, and the permission of the hospital's administration to carry out the study was taken. After a thorough review of the relevant and recent literature, the socio-demographic structured interview schedule was developed by the researchers. Tools II, III (SPMSQ & BI) were already tested for reliability in previous studies. The RDRS-2 was translated into Arabic language by the researchers. Then it was tested for content validity by five experts and tested for reliability using Alpha Cronbach test ($r = 0.903$). A pilot study was carried out on 10 elderly patients selected from Aswan Health Insurance Hospital (those patients were not included in the study sample). The necessary modifications were done and the tools were ready for data collection. All elderly women admitted to the Orthopedic Unit during data collection period were assessed by the researchers using tools II and III to identify those fulfilling the study inclusion criteria (Their number amounted to 75 elderly women). From those only 60 women were enrolled in the study because some of the original sample refused to participate in the study and others were excluded because of the language barrier (they spoke the Nubian language). Each of the women enrolled in the study was interviewed three times (on admission to the hospital, before discharge and after three months from discharge to assess her functional outcomes. Before patient's discharge, the researchers measured the weight (to the nearest kilogram) using a scale, height using a measuring tape (to the nearest centimeter) while the patient is in the lying position in bed. The height was measured from the top of head to the foot from the unfractured side of each woman in order to calculate the body mass index (BMI)

weight kg

following this formula; $BMI = \frac{Weight}{(Height)^2}$. After 3 months the researchers met the patients in the Orthopedic Outpatient clinic each Monday according to the hospital's follow up routine to evaluate their functional outcome using tool IV. Data was collected during a period of six months from the first of November 2014 to the end of April 2015.

Limitations of the study: some difficulties were encountered by the researchers during the process of data collection. The language barrier was the main problem encountered as some patients spoke only the Nubian language which is different from the Arabic language. These were 10 patients and were excluded from the study. In addition, some patients refused to participate or complete the study sheets. Their number amounted to 5 patients these were also excluded from the study.

Statistical analysis: statistical analysis was done using SPSS version 20.0. The scale and categorical data were described using mean and standard deviation. **Paired t-test** was used to compare the mean for one group (pre and follow-up). **Pearson's χ^2 test** was used to test the association between the categories of two independent samples. **Mont Carlo Exact Test and Fishers Exact Test** was alternatives for the Pearson's Chi-square test if there were many small expected values.

Results

Table (1) shows the relationship between functional outcomes of elderly women following hip fracture surgery before and after three months from hospital discharge and their socio- demographic characteristics. The table verified that there was a statistically significant relation between elder's age and functional outcomes ($p=0.007$). It was observed from the table that, there was an improvement in the functional status of women in all age groups

after 3 months with the highest improvement in the age category of 65-70 years.

Statistical significant relation was found between the elder's educational level and functional outcomes (p=0.001). Most of the women who attained high education showed improvement in their functional abilities. Concerning occupation before retirement, the table showed that housewives had the highest functional improvements,

with a statistically significant relation (p=0.006).

Statistical significant relation was found between functional outcomes of the elderly women following hip surgery and their income, living condition, and housing condition (p= 0.001, 0.003, and 0.002 respectively) but no statistical significant relation found between functional outcomes (pre-discharge and after 3 months) and marital status (P= 0.316).

Table (1): Relationship between functional outcomes of elderly women following hip fracture surgery before and after three months from hospital discharge and their socio-demographic characteristics

Socio demographic characteristics	Functional outcomes (N=60)								Mean difference of improvement	F (P)
	Pre discharge functional outcomes				After 3 months functional outcomes					
	No functional impairment		Mild functional impairment		No functional impairment		Mild functional impairment			
	No	%	No	%	No	%	No	%		
Age (years)										F= 4.5
▪ 60 –	21	88.5	3	11.5	24	100.0	0	0.0	8.6±4.0	P=(0.007) *
▪ 65 –	4	40.0	6	60.0	9	90.0	1	10.0	11.4±6.2	
▪ 70 –	1	7.7	12	92.3	9	69.2	4	30.8	9.5±4.0	
▪ 75-80	2	21.0	11	79.0	7	80.0	4	20.0	8.2±2.0	
Marital status										T=0.85
▪ Married	17	58.6	12	41.4	29	100.0	0	0.0	10.9±4.2	p=(0.316)
▪ Widow	11	35.5	20	64.5	26	83.9	5	16.1	9.7±4.8	
Educational level										F= 8.9
▪ Illiterate	4	12.9	27	87.1	20	64.5	11	35.5	10.3±3.6	P=(0.001) *
▪ Read and write	4	57.1	3	42.9	7	100.0	0	0.0	11.3±4.5	
▪ Basic education	5	71.4	2	28.6	7	100.0	0	0.0	12.7±2.1	
▪ Secondary education	8	100.0	0	0.0	7	87.5	1	12.5	5.5±4.6	
▪ High education	3	42.8	4	57.2	7	100.0	0	0.0	14.1±2.9	
Occupation before retirement										T=2.7
▪ Housewife	17	36.2	30	63.8	43	91.5	4	8.5	11.1±3.7	p=(0.006) *
▪ Employee	11	84.6	2	15.4	12	92.3	1	7.7	7.2±5.9	
Income										F=26.6
▪ More than enough	15	93.8	1	6.3	15	93.8	1	6.3	5.3±3.5	p=(0.001) *
▪ Just enough	11	35.5	20	64.5	27	87.1	4	12.9	11.3±3.6	
▪ Not enough	2	15.4	11	84.6	13	100.0	0	0.0	13.8±2.2	
Living condition										F= 4.6
▪ Alone	4	100.0	0	0.0	4	100.0	0	0.0	7.0±4.6	p=(0.003) *
▪ Family	24	43.6	31	56.4	50	90.9	5	9.1	15.1±2.3	
▪ With relatives	0	0.0	1	100.0	1	100.0	0	0.0	14.0±0.0	
Housing										F= 5.5
▪ Ground floor	11	31.4	24	68.6	32	91.4	3	8.6	11.5±4.2	p=(0.002) *
▪ First floor	6	46.2	7	53.8	11	84.6	2	15.4	10.5±4.9	
▪ Second floor	2	100.0	0	0.0	2	100.0	0	0.0	9.0±0.0	
▪ Third floor or higher	9	90.0	1	10.0	10	100.0	0	0.0	5.6±2.6	

F: One Way ANOVA t: independent samples t-test *P < 0.05 (significant)

Table (2) shows the mean score of Rapid Disability Rating Scale and its domains of elderly women following hip fracture surgery before and after three months from hospital discharge. The table claimed that there was a statistical significant relation between pre-discharge functional

outcomes and after 3 months of the elderly women following hip surgery and their activities of daily living, degree of dependence, cognitive impairment, and mean score of functional outcomes (p= 0.001, 0.001, 0.003, and 0.001) respectively.

Table (2): Mean score of Rapid Disability Rating Scale and its domains of elderly women of elderly women following hip fracture surgery before and after three months from hospital discharge

Rapid Disability Rating Scale version -2	Functional outcomes (N=60)		t (P)
	pre-discharge functional outcomes Mean ± SD	After 3 months functional outcomes Mean ± SD	
Activities of daily living	10.1± 4.0	2.7± 3.7	T=16.3 P=(0.001)*
Degree of dependence	7.3 ± 1.5	5.1± 2.1	T=9.9 P=(0.001)*
Cognitive impairment	0.8 ± 1.2	0.2 ± 0.6	T=4.6 P=(0.003)*
Total mean score of functional outcomes	18.3± 5.2	8.0±5.5	17.5 (0.001)*

t: independent samples t-test * P < 0.05 (significant)

Table (3) shows the relationship between functional outcomes of elderly women following hip fracture surgery before and after three months from hospital discharge and their physical impairment. It appeared from the table that elderly women who hadn't hearing or visual impairments and independent reported better and improved functional outcomes before hospital discharge and after 3 months than those who had hearing or visual impairments or using cane or walker with no statistically significant relation (p=0.735, 0.822, and 0.434 respectively).

Table (3): Relationship between functional outcomes of elderly women following hip fracture surgery before and after three months from hospital discharge and their physical impairment

Physical impairment	Functional outcomes (N=60)								Mean difference of improvement	T (P)
	Pre discharge functional outcomes				After 3 months					
	No functional impairment		Mild functional impairment		No functional impairment		Mild functional impairment			
	No	%	No	%	No	%	No	%		
Hearing impairment										T= 0.34 P=(0.735)
▪ No	24	75.0	8	25.0	32	100.0	0	0.0	11.3 ± 4.9	
▪ Yes	7	25.0	21	75.0	10	35.7	18	64.3	11.1 ± 4.3	
Visual impairment										T= 0.22 P=(0.822)
▪ No	21	65.6	11	34.4	28	87.5	4	12.5	10.1 ± 5.2	
▪ Yes	10	35.7	18	64.3	10	35.7	18	64.3	8.4 ± 3.9	
Mobility										F=0.85 P=(0.434)
▪ Independent	27	60.0	18	40.0	38	84.4	7	15.6	13.0 ± 4.1	
▪ Use assistive devices	3	20.0	12	80.0	6	40.0	9	60.0	11.2 ± 6.0	

F: One Way ANOVA t: independent samples t-test * P < 0.05 (significant)

Table (4) shows the relationship between functional outcomes of elderly women following hip fracture surgery before and after three months from hospital discharge and their body mass index (BMI). It was noted that women with normal weight had better functional outcomes than those overweight and obese. A statistical significant relation between body mass index and functional outcomes was observed (p=0.042).

Table (4): Relationship between functional outcomes of elderly women following hip fracture surgery before and after three months from hospital discharge and their body mass index (BMI)

Body mass index	Functional outcomes (N=60)								Mean difference of improvement	F(P)
	Pre discharge functional outcomes				After 3 months					
	No functional impairment		Mild functional impairment		No functional impairment		Mild functional impairment			
	No	%	No	%	No	%	No	%		
Normal weight	8	44.4	10	55.6	17	94.4	1	5.6	11.7 ± 4.9	F=3.3 P=(0.042)*
Over weight	11	57.9	8	42.1	16	84.2	3	15.8	8.2 ± 3.2	
Obese	9	39.1	14	60.9	22	95.7	1	4.3	10.9 ± 4.8	

F: One Way ANOVA

* P < 0.05 (significant)

Table (5) shows the relationship between functional outcomes of elderly women following hip fracture surgery before and after three months from hospital discharge and their present fracture history. The table revealed both types (femoral neck and intertrochanteric) of hip fracture improved in functional outcomes by nearly the same percent with no statistical significant relation ($p=0.825$). The table clarified no statistical significant relation between presence of other fractures, length of surgical operation and functional outcomes ($p=0.718$, and 0.748) respectively. Concerning the length of hospital stay, the table verified that the shorter the women stayed in the hospital the better improvement in their functional outcomes with a statistical significant relation ($p= 0.038$).

Table (5): Relationship between functional outcomes of elderly women following hip fracture surgery before and after three months from hospital discharge and their present fracture history

Present fracture history	Functional outcomes (N=60)								Mean difference of improvement	F(P)
	Pre discharge functional outcomes				After 3 months functional outcomes					
	No functional impairment		Mild functional impairment		No functional impairment		Mild functional impairment			
	No	%	No	%	No	%	No	%		
Type of hip fracture										
▪ Femoral neck	16	39.0	25	61.0	36	87.8	5	12.2	10.2 ± 4.5	F= 0.10 P=(0.825)
▪ Intertrochanteric	12	63.2	7	36.8	19	100.0	0	0.0	10.3 ± 4.8	
Presence of associated fractures										
▪ Yes	3	42.7	4	57.3	7	100.0	0	0.0	10.9 ± 5.0	F= 0.12 P=(0.718)
▪ No	25	47.2	28	52.8	48	90.6	5	9.4	10.2 ± 4.5	
Duration of surgery										
▪ Less than 2 hours	30	53.6	26	46.4	53	94.6	3	5.4	8.3 ± 4.4	F= 0.12 P=(0.748)
▪ 2 hours or more	2	50.0	2	50.0	4	100.0	0	0.0	5.1 ± 2.5	
Length of hospital stay										
▪ 5 – days	24	64.9	13	35.1	34	91.9	3	8.1	13.7 ± 2.7	F= 6.8 P=(0.038)*
▪ 7 – days	8	66.7	4	33.3	12	100.0	0	0.0	9.0 ± 4.4	
▪ 9 or more	0	0.0	11	100.0	3	27.3	8	72.7	5.0 ± 0.0	

F: One Way ANOVA

* P < 0.05 (significant)

Table (6) describes the relationship between functional outcomes of elderly women following hip fracture surgery before and after three months from hospital discharge and their pre-discharge data. The table showed that women who were free from post-operative complications their functional outcomes improved more than those who had post-operative complications with no statistical significant relationship (p=0.063). Performance of exercise (as range of motion exercises) before ambulation had a profound effect on improvement of the functional outcomes (p=0.002). Early ambulation was positively correlated with the highest mean score of improvement in functional outcomes (12.7 ± 4.8) with a statistical significant relation (p=0.005). On the other hand, no statistical significant relation was found between functional outcome of elderly women and post operative complications and difficulties encountered during ambulation (P= 0.208).

Table (6): Relationship between functional outcomes of elderly women following hip fracture surgery before and after three months from hospital discharge and their pre-discharge data

Pre discharge evaluation	Functional outcomes (N=60)								Mean difference of improvement	F(P)
	Pre discharge functional outcomes				After 3 months functional outcomes					
	No functional impairment		mild functional impairment		No functional impairment		Mild functional impairment			
	No	%	No	%	No	%	No	%		
Postoperative complications										F= 4.5 P=(0.063)
▪ No	33	80.0	8	20.0	38	92.7	3	7.3	12.7 ± 5.0	
▪ Yes	6	31.6	13	68.4	15	78.9	4	21.1	11.8 ± 3.6	
Performance of exercise before ambulation										F= 12.8 P=(0.002)*
▪ No	14	93.3	1	6.7	15	100.0	0	0.0	6.7 ± 3.4	
▪ Yes	14	31.1	31	68.9	40	88.9	5	11.1	11.4 ± 4.2	
Initiation of mobility after operation										F= 10.6 P=(0.005)*
▪ First day	1	11.1	8	88.9	7	77.8	2	22.2	12.7 ± 4.8	
▪ Second day	12	46.2	14	53.8	25	96.2	1	3.8	12.0 ± 4.0	
▪ Third day or more	15	60.0	10	40.0	23	92.0	2	8.0	7.6 ± 3.6	
Type of support to initiate mobility										F= 5.3 P= (0.185)
▪ Cane	1	16.7	5	83.3	5	83.3	1	16.7	13.7 ± 4.8	
▪ Walker	7	41.2	10	58.8	17	100.0	0	0.0	9.4 ± 3.2	
▪ Crutches	0	0.0	4	100.0	3	75.0	1	25.0	13.3 ± 5.7	
▪ Person	20	60.6	13	39.4	30	90.9	3	9.1	9.7 ± 4.7	
Difficulties encountered										F=4.2 P= (0.208)
▪ No	1	100.0	0	0.0	1	100.0	0	0.0	2.0 ± 0.0	
▪ Pain	26	47.3	29	52.7	50	90.9	5	9.1	10.6 ± 4.7	
▪ Drowsiness	1	25.0	3	75.0	4	100.0	0	0.0	10.8 ± 2.4	

F: One Way ANOVA

* P < 0.05 (significant)

Discussion

Hip fracture is associated with excess mortality and morbidity that usually results in costly treatment and lengthy rehabilitation in which functional recovery and quality of life may be affected. However, the impact of hip fractures on functional outcomes has not been well established (*Boonen, et al., 2004*). Therefore, this study aimed to assess functional outcomes of elderly women following hip fracture surgery in Aswan Governorate.

Positive functional outcomes following hip fracture is associated with many factors as age, pre-fracture function status, and presence of post-operative complications. Age-related changes such as the decrease in physical function, muscle strength, and coordination are all associated with decreased functional recovery after hip fracture. Age was identified as a factor that may impact functional outcomes after hip fracture (*Pulkkinen, et al., 2011*). The current study illustrated that more than one half of elderly women suffering from hip fracture are between 60 to 70 years with a mean age of 68.6 ± 6.4 years. Barette et al (2005) reported that most of women in his study were between the age of 63 to 76 years with a mean age of 69.5 ± 8.19 (*Barette, et al., 2005*). Moreover, Qassem (2015), revealed that most of the study subjects with hip fracture were aged 60 to less than 75 years and the mean age was 61.70 ± 10.01 years (*Qasem, 2015*). This result may be explained by the nature of study subjects where the subjects of this study were females, and the highest age related changes in postmenopausal women appeared in this age group which predisposes women to muscle weakness, and bone thinning. This in turn, leads to increase risk for osteoporosis and falls among the studied subjects (*Arneson, et al., 2009*).

The present study revealed a statistically significant relation between women's age and functional outcomes after hip fracture surgery where the younger the

women were the better improvement in functional outcomes she had. This finding was in harmony with a study done in Taiwan by Tseng (2012) who reported that increasing age was significantly associated with poor recovery in activities of daily living, after three as well as six months postoperatively (*Tseng, et al., 2012*). Also, in a prospective cohort study carried out by Vergara et al (2014) to investigate six months follow up after hip fracture agreed that older age was an independent predictor of poor functional recovery (*Vergara, et al., 2014*). On the other hand, another study in Spain by Quesada (2012) reported no significant difference between age and functional recovery after hip fracture (*Quesada, et al., 2012*). However, this difference between the results of other studies and the present one could be attributed to the culture, values and beliefs in Upper Egypt that governs people, which imply that the older adult should be served by their daughters and sons while keeping them in rest. Dependence on others in performance activities of daily living will lead to decrease in functional status.

The present study revealed that, more than one half of elderly women were illiterate. This may be due to the fact that illiteracy was prevailing among women in Upper Egypt due to cultural heritage where women were deprived from education. Sharara (2013) and Qassem (2015) found that a high percentage of their subjects were illiterate. Educational level plays an important role in functional recovery after hip fracture surgery (*Sharara, 2013; Qasem, 2015*). In the present study, the highly educated women were found to have better functional outcomes. This may due to the fact that education helps women to understand and follow the discharge instructions given from the doctors or nurses. Also, a statistical significant association was found between educational level and improvement in functional outcomes after hip surgery. This finding was in harmony with a study done in Norway by Meyer et al (2000), and a study in the USA by Benetou et al (2014) who

reported that the best functional outcomes and prosthesis survival rates after hip arthroplasty were observed among highly educated subjects (*Meyer, et al., 2000 ; Benetou, et al., 2014*).

As for the occupation before retirement, more than three quarters of the studied subjects were housewives. This result may be attributed to cultural heritage in Upper Egypt that doesn't allow women to work considering this to be a shame within the family. Moreover, the present study reported that housewives had significant improvement in their functional outcomes before hospital discharge and after three months from hip fracture surgery more than employees. This finding may be attributed to the fact that housewives continuously move to perform all household activities which could be considered a heavy form of exercise. Contrary most of employees assume a sedentary lifestyle (desk work).

Functional outcomes after hip fracture surgery are affected by pre fracture status of elderly women. In this study it was observed that those women who live with their families showed better improvement in their functional outcomes more than those women who live alone. This was because women living with the family had a strong social support system which can help them in early initiation of movement after surgery and help them to comply with all aspects of therapeutic regimen such as good nutrition, consume adequate amount of fluid, observe wound dressing which will lessen the post operative complications and hence, improve functional outcomes. This may be the reason for their attainment of better functional outcomes. Curry et al (2003) and Sauna et al (2007), claimed that older women residing with their families prior to hip fracture were able to achieve a functional level that will support their return to independence (*Curry, et al., 2003; Sauna, et al., 2007*). Also, a study done in Japan by Kitimura et al (2004), reported that better functional recovery was

observed in patients residing with their family before hip injury (*Kitimura, et al, 2004*).

Sensory (vision and hearing) impairments dramatically increase with age and may seriously compromise an older women's ability to carry out daily activities. Hearing impairment is the third most commonly reported chronic problem affecting the aging population. In addition to its threat to elder safety, it may decrease functional recovery (*Cummings, et al., 2014*). The current study revealed that more than one half of the study subjects had no visual or hearing impairment, and they reported improvement in functional outcomes following hip fracture surgery. Raina et al (2004) revealed that females with a higher prevalence of vision and hearing impairments than their male counterparts showed restrictions in their ability to perform instrumental activities of daily living (*Raina, et al., 2004*).

Decrease physical mobility related to obesity has a detrimental effect on functional recovery after hip fracture, and it affects the ability to achieve daily activities. Elderly women may have muscle weakness related to obesity and aging process (*Bischoff, 2003*). The present study revealed that, more than one third of women were obese. This finding may be explained by the fact that obesity is most common among older females. The improvement in functional outcomes after hip surgery was observed among women with normal weight. A statistical significant relation was found between body mass index and improvement in functional outcomes after hip fracture surgery. Slaven, et al., (2012) concluded that increasing weight was significantly associated with unsuccessful functional outcome at 6 months after total hip replacement (*Slaven, et al., 2012*). This result seemed logic due to obese females were less functional than non-obese counterparts. If over time the obese females failed to modify lifestyle, obesity worsened as a spiral of

deconditioning and functional dependence developed. The ability to generate muscle strength and power declined without participation in physical activity. As the obese women got older and the negative lifestyle behaviors remain, obesity-related comorbidities will worsen their condition.

Femoral neck hip fracture is the most common type of hip fracture encountered by older women (*Pulkkinen, et al., 2011*), this figure out the result of the present study which revealed that more than two thirds of study subjects had femoral neck fracture, and there was no significant relation between functional recovery after hip fracture surgery and type of hip fracture. Bartte et al (2005), found no relationship between the type of hip fracture and functional recovery at one year (*Barette, et al., 2005*). On the other hand, this result was in contrast with a study done in Spain by Arinzon et al (2010), who found that elderly women with femoral neck hip fracture was associated with better functional outcomes within the first months after surgery (*Arinzon, et al., 2010*).

Length of hospital stay may affect the functional outcomes after hip fracture surgery. In this study early hospital discharge after hip surgery affected significantly functional outcomes where the longer the hospital stays yielded less functional improvement. This result may be due to a shorter length of hospital stay helps in decrease the number of post-operative complications as wound infection, delirium, and bed sore that lead to delayed and poor functional recovery. Deschodt et al (2011) in Belgium, and Fernández-Moyano et al (2013) in Spain, found a statistical significant relation between length of hospital stay and functional recovery after hip surgery (*Deschodt, et al., 2011; Fernández-Moyano, et al., 2013*).

Mobilization should take place during the first post-surgery day, since early mobilization has been shown to be associated with better recovery of locomotion and

physical functioning, and it also reduces post-operative complications (*Karlsson, et al., 2013*). As the hospital routine, the majority of women got out the bed the first and second day of hip surgery. This may explain the observed fact that women had better functional outcomes pre-hospital discharge and three months later. Penrod et al. (2004), Zidén et al (2008), and Handoll et al (2011) concluded that early mobilization after hip surgery helps in improving functional outcomes in elderly women. In the present study a statistical significant relation was found between early mobility after hip surgery and improving functional outcomes in elderly women. This may be attributed to early mobility and getting out of bed improve blood circulation, prevent complications, decrease dependency to carry out daily activities, and improve functional outcomes after hip surgery (*Penrod, et al., 2004; Zidén, et al., 2008; Handoll, et al., 2011*).

The present study revealed that, better functional outcomes after three months following hip fracture surgery was associated with the functional status before hospital discharge. Also improving functional outcomes in performance of daily activities, increasing level of independency, and maintaining cognitive status are associated with improved functional outcomes in elderly women pre hospital discharge and after three months followed hip surgery. Also a statistically significant relation was found between ability to perform daily activities, degree of dependence, cognitive impairment and improvement in functional outcomes after hip surgery. Royds et al (2008), and Shabat et al (2011), reported that functional outcomes after six months and one year were associated with pre-hospital discharge functional recovery (*Royds, et al., 2008; Shabat et al., 2011*).

Conclusion and recommendations

It can be concluded from the findings of the present study that, functional outcomes after hip fracture surgery in elderly women

depends on the pre-fracture health status and functional abilities of the elderly women. Better functional outcomes after hip fracture surgery are predicted in younger age, educated women, and those who live with their families, in addition to those with normal body weight, who perform exercises, early ambulation the first day after hip surgery, free from post-operative complications, and early discharge from the hospital.

The following recommendations are suggested; assessment and modification of the home environment, in order to apply measures to overcome hazards that might lead to fall and fracture. Moreover, distribution of discharge instructions' booklets at the time of patient's discharge is important. This booklet should be colorful, in simple and concise sentences regarding post-operative exercise, modifications of the home environment, maintenance of normal weight, proper nutrition, and follow up- routine. In-service educational training for nurses working with geriatric patients with hip fracture to enhance their knowledge and skills related to predications of functional outcomes after hip fracture surgery. Finally, increase awareness of older adults about the availability of assistive technologies such as recent mobility aids (cane, walker with light) to decrease the prevalence of fall.

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