CHANGES IN COGNITIVE AND FUNCTIONAL STATUS OF THE HOSPITALIZED ELDERLY AND THEIR RELATED FACTORS: A CROSS-SECTIONAL STUDY

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Abstract

Introduction: Since desirable cognitive and physical performances are vital factors to promote and preserve the quality of life for the elderly, the present study was conducted to investigate concurrent changes in functional and cognitive status of the hospitalized elderly and their related factors.

Materials and Methods: This descriptive cross-sectional study was conducted with a sample size of 400 people chosen through availability sampling. The data was collected through two questionnaires. The first questionnaire consisted of two parts, including the demographic characteristics and the 6-Item Cognitive Impairment Test (6CIT), and the second questionnaire was the Barthel Index.

Results: The results showed significant relationships between disease diagnosis and age with cognitive status, between age and diagnosis type with functional status, and between functional decline and cognitive status in daily activities of the elderly. Moreover, the odds ratio of unhealthy cognitive status in the elderly with functional decline (or dependent functional status) was about 8 times the ratio in the independent functional status.

Conclusion: There are concurrent changes in functional status in daily activities, and cognitive status of the hospitalized elderly. This study showed that 8 out of 10 of the hospitalized elderly patients suffered from varying degrees of undesirable cognitive status.

Key words: functional status, cognitive status, elderly, hospital

Introduction

In mid-2004, about 10% of the world population, namely 606 million people, were aged 60 years or older (1), and this number will exceed 1.1 billion people by 2025 (2). According to the 2007 census in Iran, this country has become an old country, having more than 7.2% of the elderly aged over 60 (3). Determining care priorities in this group is of great importance because of their visits to emergency departments for medical treatment, and their costly health care, therapy, and rehabilitation services (4). Care and concern for the elderly cannot be limited to a single principle, but it can be implemented optimally through joint efforts (5). Demographic studies have shown that approximately 5% of people aged 65 and over suffer from significant cognitive impairments. The incidence of the disorder after the age of 65 doubles every five years, so that it exceeds 40% in the population aged 80 years old and over (6). In addition, it is estimated that the number of elderly with functional decline will nearly triple by 2050 (3). Physical and cognitive performance disorders represent two of the most frightening conditions in the elderly because they can lead to physical dependence and social isolation (7). Melzer, as mentioned in Adibhajbagheri et al., states that one-third of the elderly suffer from cognitive impairment, and more than 60% of them need help in their daily activities (8). The multi-dimensional nature of physical performance emphasizes the complexity of its investigation. The connected nature of physical and cognitive performances highlights the importance of cognition in investigating physical performance in the elderly (7). On the other hand, hospitalization has been identified as a critical event in the life of the elderly (9), and optimal cognitive performance is a crucial factor for improving and maintaining the mental health and life quality

of the elderly (10). Psychological evaluation is performed to determine the quality of elderly people's consciousness and awareness of their environment, and the levels of their confusion, delirium, or dementia (11). In addition, patients with impaired cognition on admission have less compatibility with the risks associated with hospitalization, show less willingness for medical treatment, and tend to have more problems in reporting drug side effects (12). The risk of functional decline or disability is also higher in elderly patients because hospital environments are not often compatible with the special needs of this population (9). On the other hand, determining the overall score for daily living activities and level of independence in these activities is important, can determine the overall health status of an elderly person, and can function as an appropriate guide to provide classification and type of services for the elderly (13). The goal of nursing is to maintain and enhance the functional status of the elderly and to help them in identifying and applying their abilities in order to achieve optimum independence (5). The elderly people need constant care and supervision when they lose their abilities to perform their simple daily activities (14), and the nurse helps them to maintain their personality and maximize their independence (5). Therefore, the assessment of cognitive and physical performance in hospitalized elderly patients is essential, and it is hoped that the results of the present study will be effective in improving care programs in hospitalized elderly patients. The present study was conducted to investigate the coincident changes in functional and cognitive status in hospitalized elderly people and their related factors.

Materials and Methods

This descriptive, cross-sectional (correlational) study was conducted with a sample size of 400 persons in 2012. After the official permissions were taken from Lorestan University of Medical Sciences, Iran, for visiting the hospital, the sampling was performed through the availability sampling method. The data collection was performed with the joint help of two questioners (nurses). All the elderly patients (60 years and over) who were admitted to the hospital wards were sampled at one point of time. The two questioners, when aware of the hospitalization of an elderly patient in the hospital, attended the hospital and did the sampling through surveying the elderly patient and completing two questionnaires. The sampling was performed from the winter of 2011 and continued to the beginning of the summer of 2012. All the ethical considerations were regarded and the elderly patients unwilling to participate in the study were excluded.

The data in this study was collected via two questionnaires. The first questionnaire consisted of two parts including the demographic characteristics, and the 6-Item Cognitive Impairment Test (6CIT), and the second questionnaire was the Modified Barthel Index. Concerning the reliability and validity of these tools, since the 6-Item Cognitive Impairment Test (6CIT) has been applied in various studies including in a study by Hatfield et al., and because it does not contain any cultural components, its reliability and validity have been confirmed (15). The maximum score for this scale is 28. Subjects with a score of 0-7 are of normal cognitive status, and those with a score of 8-28 are considered to have undesirable cognitive status or cognitive impairment. The Modified Barthel Index is applied to assess a persons' daily performance in daily activities, and their mobility. The index has 10 items, including the questions related to eating, bathing, grooming, dressing, controlling urine and feces, using the toilet, transferring from the bed to the chair and the reverse, mobility on smooth surfaces, and using the stairs. The major goal of this scale is to assess the level of independence from any physical or verbal help and for any reason, and a need for supervision in a patient's activities signifies dependence. However, the patients using aids such as crutches, etc. is not a barrier to independence. The various items of this modified scale have scores from 0 to 3, with a total of 20 scores. The Barthel Index scoring is as follows: Scores lower than or equal to 4 are evaluated as completely dependent, scores of 5-8 as highly dependent, scores of 9-11 as almost dependent and doing things with help, and scores of 12 or more as completely independent. The reliability and validity of the scale have been confirmed in several studies (4, 16). The data was analyzed by the SPSS 17 software using descriptive statistics, the chi-square, the Fisher's exact test, and the logistic regression models.

Results

In this study, out of a total of 400 elderly people who participated in the study, 175 (43.8%) were male and 225 (56.2%) were female. The mean age and standard deviation was 76.28 ± 8.3, including 10.3% in the age range of 60-64 years, 12% in the age range of 65-69, 13% in the 70-74 age group, 26.3% in the 75-79 age group, and 38.4% in the age range of 80 and over, with the highest frequency in the group of 80 and over. The study also found the reasons for the admissions to be cardiovascular (40.3%), respiratory (26%), psychiatric (9.5%), and gastrointestinal diseases (6.5%), respectively. Moreover, 66.8% of the patients were hospitalized in the internal ward, 18.5% in the emergency department, 1.5% in the eye and ear ward, 8% in the CCU, and 5.3% in the surgical ward, with the highest number of the elderly patients in the internal ward. The data showed that 245 (61.2%) and 155 (38.8%) samples were living in urban and rural areas, respectively.

In addition, 22.8% of the hospitalized elderly patients had normal cognitive status, and 77.3% had cognitive impairment, indicating the high importance of cognitive status investigation. Additionally, 58.5% of the patients aged 60-64 years, 73.1% of those aged 70-74 years, 75.2% of those aged 75-79 years, and 93.5% of those aged 80 years and over had cognitive impairment. There was a statistically significant

		Healthy	Cognitive impairment N (%)	Level of significance
Type of diagnosis	Cardiovascular	42(26.1%)	119(73.9%)	X2=11.4
	Respiratory	19(18.3%)	85(81.7%)	P=0.023
	Psychiatric	2 (5.1%)	37(94.9%)	
	Internal	21(29.6%)	50(70.4%)	
	Others	7(28%)	18(72%)	
Ward	Internal	56(21%)	211(79%)	X2=13.603
	Emergency	16(21.6%)	58(78.4%)	P=0.009
	Eye and ear	5(83.3%)	1(16.7%)	
	CCU	9(28.1%)	23(71.9%)	
	Surgical	5(23.8%)	16(76.2%)	
Functional status	Completely dependent	0(0%)	38(100%)	X2=20.5
	Highly dependent	2(10.5%)	17(89.5%)	P<0.001
	Almost dependent	1(4.5%)	21(95.5%)	
	Completely independent	85(27.2%)	228(72.8%)	

Table 1: The relationships between some characteristics and cognitive status in the hospitalized elderly

relationship between age and cognitive impairment (p=0.001), showing that the percentage of cognitive impairment in the higher age groups was higher than that in the lower age groups. Concerning functional status, 9.7% of the elderly patients were completely dependent, 4.8% were highly dependent, 5.6% were almost dependent, and 79.8% were completely independent.

The data presented in Table 1 shows that there were significant relationships between cognitive status and disease diagnosis, meaning that there was a significant difference at least between the percentage of cognitive impairment in the patients with cardiovascular and internal diseases, on the one hand, and the percentage in those with respiratory or psychiatric diseases, on the other hand. More investigation is required to understand the relationship between cognitive status and each type of diagnosis (Table 1). The results also showed that 79% of the patients hospitalized in the internal ward, 74.4% of those in the emergency department, 76.2% of those in the surgical ward, 71.9% of those in the CCU, and 16.7% of those in the eye and ear ward suffered from cognitive impairment, showing a statistically significant relationship (p=0.009). The prevalence rates of cognitive impairment, in descending order, were in the internal, emergency, surgical, CCU, and eye and ear wards, respectively. The chi-square test results showed that the percentage of cognitive impairment in the eye and ear ward was lower than that in the other wards (Table 1).

Moreover, 62.3% of the men and 88.9% of the women suffered from cognitive impairment, showing that the rate of cognitive impairment in the women was significantly more than that in the men (p <0.001). Also, 80.6% of the elderly patients living in rural areas and 75.1% of those living in urban areas were cognitively impaired, showing no significant difference (p=0.198).

The vast majority of the studied population (over 99%) had elementary school education or were illiterate, including 310 (77.5%) illiterate patients, 86 (21.5%) patients with elementary school degrees, 1 patient with a junior high school degree, 1 patient with a senior high school degree, and 2 with associate degrees. Therefore, assessment was not possible in terms of educational level.

The findings showed a significant relationship between age and functional decline (p=0.004), and the highest dependence was for the patients in the age group of 80 and over. No significant relationships were found between gender (p=0.902), rural and urban place of residence (p=0.253), and type of ward (p=0.160) with the rate of functional dependence, while a significant relationship was found between diagnosis type and functional status (p <0.001) (Table 2 - top of next page).

		Completely dependent	Highly dependent	Almost dependent	Completely independent	Total	Level of significance
Age	60-64	2(5.3%)	1(5.3%)	2(9.1%)	33(10.5%)	38(9.7%)	X2=28.9
	65-69	3(7.9%)	0(0%)	1(4.5%)	41(13.1%)	45(11.5%)	P=0.004
	70-74	2(5.3%)	2(10.5%)	2(9.1%)	46(14.7%)	52(13.3%)	
	75-79	6(15.8%)	4(21.1%)	3(13.6%)	91(21.9%)	104(26.5%)	
	80 ≥	25(65.8%)	12(63.2%)	14(63.6%)	102(32.6%)	153(39%)	
	Total	38(100%)	19(100%)	22(10%)	313(100%)	392(100%)	
Gender	Male	17(44.7%)	9(47.4%)	11(50%)	134(42.8%)	171(43.6%)	X2=0.57
	Female	21(55.2%)	1052.6(%)	11(50%)	179(57.2%)	221(56.4%)	P=0.902
	Total	38(100%)	19(100%)	22(100%)	313(100%)	392(100%)	
Place of residence	Rural	26(68.6%)	14(23.7%)	16(72.7%)	184(58.8%)	240(61.2%)	X2=4.08
	Urban	12(31.6%)	5(26.2%)	6(27.3%)	129(41.2%)	152(38.8%)	P=0.253
	Total	38(100%)	19(100%)	22(10%)	313(100%)	392(100%)	
Ward of hospitalization	Internal	31(81.6%)	15(78.9%)	16(72.7%)	200(63.9%)	262(66.8%)	X2=16.73
	Emergency	2(5.3%)	2(10.5%)	4(18.2%)	64(20.4%)	72(18.4%)	P=0.160
	Eye and ear	0(0%)	0(0%)	0(0%)	6(1.9%)	6(1.5%)	
	CCU	1(2.6%)	0(0%)	2(9.1%)	29(9.3%)	32(8.2%)	
	Surgical	4(10.5%)	2(10.5%)	0(0%)	14(4.5%)	20(5.1%)	
	Total	38(100%)	19(100%)	22(10%)	313(100%)	392(100%)	
Type of diagnosis	Cardiovascular	7(18.4%)	5(26.3%)	11(50%)	135(43.1%)	158(40.3%)	X2=135.5
	Respiratory	1(2.6%)	4(21.1%)	5(22.7%)	92(29.4%)	102(26%)	P<0.001
	Psychiatric	23(60.5%)	3(15.8%)	1(4.5%)	11(3.5%)	38(9.7%)	
	Internal	4(10.5%)	4(21.1%)	4(18.2%)	57(18.2%)	69(17.6%)	
	Others	3(7.9%)	3(15.8%)	1(4.5%)	18(5.8%)	25(6.4%)	
	Total	38(100%)	19(100%)	22(10%)	313(100%)	392(100%)	
Cognitive status	Healthy	0(0%)	2(10.5%)	1(4.5%)	85(27.2%)	88(22.4%)	X2=20.58
	Cognitive impairment	38(100%)	17(89.5%)	21(95.5%)	228(72.8%)	304(77.6%)	P<0.001
	Total	38(100%)	19(100%)	22(10%)	313(100%)	392(100%)	

Table 2: The relationships between demographic characteristics and cognitive status in the hospitalized elderly

		Odds ratio	Level of significance
Functional status	Independent	1 (Reference)	-
	Dependent	9.57	0.001
Age	60-64	1 (Reference)	-
	65-69	0.89	0.832
	70-74	3.75	0.017
	75-79	2.97	0.006
	80 ≥	17.5	0.001
Gender	Male	1 (Reference)	-
	Female	9.06	0.001
Place of residence	Rural	1 (Reference)	-
	Urban	2.28	0.013
Ward of hospitalization	Internal & Eye and ear	1 (Reference)	-
	Emergency	1.38	0.425
	CCU	1.08	0.884
	Surgical	5.56	0.025
Type of diagnosis	Psychiatric	1 (Reference)	-
	Cardiovascular	0.28	0.141
	Respiratory	0.61	0.565
	Internal	0.31	0.184
	Others	0.26	0.179

Table 3: Results of the analysis of the factors associated with cognitive impairment using the logistic regression model

The results presented in Table 2 show a significant relationship between functional decline and cognitive impairment in the elderly patients' daily activities, showing 100% of cognitive impairment in the completely dependent patients, 95.5% in the almost dependent ones, 89.5% in the highly dependent ones, and only 72.6% in the completely independent patients (Table 2).

In addition, the analysis of the data showed statistically significant relationships between cognitive status and each of the items of the Barthel Index including eating, bathing, transferring from the bed to the wheelchair and the reverse, getting up from the bed, mobility, grooming (shaving, brushing, wearing make-up, combing hair, washing the face, etc.), controlling urine and feces, dressing, climbing up and down the stairs, using the toilet, and bathing ($p = 0.000$).

The study also showed that the odds ratio of cognitive impairment in the patients with functional decline (or dependent functional status) was approximately 9.57 times the ratio of independent functional status, and, on the contrary, the odds ratio of functional decline in the patients with cognitive impairment was 8.7 times the ratio of healthy cognitive status (Tables 3 and 4).

Discussion

The findings showed that 91 of the subjects (22.8%) had scores lower than 7 (healthy cognitive status), and 309 patients (77.3%) had scores of 8 and over (cognitive impairment), showing the high prevalence of cognitive impairment in the hospitalized elderly patients. Based on a study by Taban et al., the relative frequency of cognitive

		Odds ratio	Level of significance
Cognitive status	Healthy	1 (Reference)	-
	Unhealthy	8.7	0.001
Age	60-64	0.57	0.327
	65-69	0.29	0.066
	70-74	0.37	0.037
	75-79	0.35	0.007
	80≥	1 (Reference)	-
Gender	Male	1.71	0.092
	Female	1 (Reference)	-
Place of residence	Rural	1.42	0.286
	Urban	1 (Reference)	-
Ward of hospitalization	Internal & Eye and ear	1 (Reference)	-
	Emergency	2.30	0.062
	CCU	2.29	0.220
	Surgical	1.11	0.0873
Type of diagnosis	Psychiatric	1 (Reference)	-
	Cardiovascular	0.11	0.001
	Respiratory	0.05	0.001
	Internal	0.12	0.001
	Others	0.19	0.014

Table 4: Results of the analysis of the factors associated with functional decline using the logistic regression model

impairment ranged from 10% preoperatively to 29.1% postoperatively (17).

Our findings showed a statistically significant relationship between age and cognitive impairment ($p<0.001$), showing a higher rate of cognitive impairment in the higher age groups than that in the lower age groups. The results of research by Abolghasemi et al. confirmed the finding, that aging can affect cognitive and meta-cognitive processes significantly and that it increases the possibility of cognitive disorders through affecting cognitive performance (18). Taban et al's study showed the effect of aging on increased incidence of postoperative cognitive disorders. Most studies have considered aging as a risk factor for cognitive impairment (17). These studies have shown that older subjects suffer from more distraction, weaker concentration, more memory problems, find it harder remembering names and contents, and more oversights (18).

The results of the present study showed that cognitive impairment in the women was significantly more than that in the men ($p=<0.001$). Taban et al. revealed that there was no significant difference preoperatively between the relative frequencies of cognitive impairment in both genders, so that they were 9.7% in the men and 10.4% in the women. However, the rate in the men was more than that in the women postoperatively, showing no consistency with the results in our study (17). In a study carried out by Nejati et al, 3.33% of the women were found to have severe cognitive impairment, and 18.33% and 62.13% of the men and the women, respectively, had moderate cognitive impairment, meaning a higher rate of cognitive impairment in the women than that in the men, and showing consistency with our results (12). The results of the study by Abolghasemi

et al showed that the mean score for cognitive impairment in the elderly men was significantly higher than that in the elderly women (18). Dirik et al's study found that the elderly men had higher cognitive performance than the elderly women (19).

Our findings found the most common diseases in the elderly hospitalized patients to be cardiovascular, respiratory, psychiatric, gastrointestinal, and musculoskeletal. The most common diseases in the elderly in Isfahan, as reported by Salarvand et al., were arthritis, visual impairment, and hypertension, respectively (20). Mohtasham Amiri et al's study showed the most common causes for admission of the elderly, to be cardiovascular diseases, trauma, respiratory diseases, eye disorders, cancers, cerebrovascular diseases, and infectious diseases. As mentioned in Mohtasham Amiri et al's study, previous studies have reported the most common causes for admission of the elderly to be cardiovascular diseases, cancers, pneumonias, and cerebrovascular events (2).

Our results also revealed that cardiovascular, musculoskeletal, respiratory, psychiatric, blood, endocrine, and obstetric diseases increased cognitive status in the elderly significantly (p=0.049). Conducting more studies in this regard is recommended. Gussion et al, as mentioned in Salarvand et al's study, reported osteoarthritis, strokes, heart diseases, and depressant symptoms as having the greatest impact on the performance of the elderly (20). In the present study, a significant relationship was found between cognitive impairment and ward of admission (p=0.009), so that the highest rates of cognitive impairment were observed in the internal, emergency, surgical, CCU, and eye and ear wards. Moreover, no significant relationship was found between urban and rural place of residence and cognitive impairment (p=0.198), and no relevant studies were found in this regard.

A significant relationship was found between age and type of diagnosis with cognitive impairment, with the highest rate of dependence in the age range of 80 and over. Other studies have also confirmed that aging increases the rate of severe and moderate disabilities in the elderly (8).

In the present study, gender, urban and rural residence, and ward were not found to have significant relationships with functional dependence, while Dirik et al's study indicated that the elderly women, compared to the elderly men, had a lower level of mobility and were more dependent in their daily activities (19). Also, Adibhajbagheri et al showed significant relationships for age, gender, and place of residence, showing more moderate and severe disabilities in women than in men, more severe disabilities in cities than in suburbs, and more moderate disabilities in suburbs than in city centers (8).

Our findings found a significant relationship between cognitive impairment and dependence in daily activities in the elderly, showing cognitive impairment in 100% of the completely dependent elderly, 95.5% of the almost dependent ones, 89.5% of the highly dependent ones, and only 72.6% of the completely independent patients. Other studies have confirmed this finding, including Stuck et al's study reporting a strong relationship between cognitive impairment and functional decline (21). Also, Raj et al's study reported that the elderly people with lower cognitive performance had a greater chance of failure (58% more) in the activities of daily living (ADL) (22). In Kazemi et al's study, the more cognitive impairment the subjects had, the lower functional scores they obtained. Therefore, there was a significant relationship between cognitive status and activities of daily living (23). Moreover, Arcoverde et al found that physical activity and optimal physical performance were associated with the lower prevalence and incidence of dementia and cognitive impairment (24). Stuck et al showed a strong relationship between cognitive impairment and functional status (25).

Concerning the relationship between the components of cognition scores and activities of daily living, the highest relationship was found between performance activity and activities of daily living. It confirms the finding reported by some researchers that interference with activities of daily living possibly occurs in more advanced stages of cognitive impairment. Yan Hoon et al in their study concluded that functional decline is common in nursing homes, and that more attention should be paid to the elderly with dementia right from the admission time (26). The findings of Dirik et al's study showed that functional status, cognitive status, and motility decreased in the elderly patients hospitalized in institutions (19).

Since the relationship between cognitive impairment and functional impairment was sought in the present study, the assessment of the relationship with drug type was not possible due to the consumption of multiple medications by the elderly patients, and this was one of the limitations of the present study. The second limitation of our study was the application of the availability sampling method, which made causative relationships impossible.

Final conclusions and recommendations

In this study, we investigated the concurrent changes in functional and cognitive status of the hospitalized elderly. There was a significant relationship between functional decline in daily activities and cognitive impairment. The study showed that 8 out of 10 of the hospitalized elderly patients suffered from varying degrees of undesirable cognitive status, and this disorder was associated significantly with age, gender, ward, type of diagnosis, and educational level. Improvements in performance, mobility, and cognitive status should be among the first priorities of geriatric

rehabilitation, and initial evaluation of cognitive and functional status is essential in the assessment of the elderly in caring institutions. Independence in functional activities and an independent life-style should be taken into account in the elderly. Moreover, more research is needed to identify the mechanisms that increase the vulnerability of functional decline, and causative relationships between impairments in physical performance and cognitive performance.

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