Identifying the relationship among mental status, functional independence and mobility level in Turkish institutionalized elderly: Gender differences

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Abstract

The purpose of this study was to examine gender differences in older people living at a rest home in terms of functional independence, mental status and mobility level and to describe the relationship among the three outcome variables. One hundred and thirty-three elderly people (60 women, 73 men), aged 65 years and above were included in the study. The average age was 75.3 ± 6.7 years (range, 65–90 years). Mental status was assessed using the Hodkinson Mental Test (HMT). Functional independence was measured using Functional Independence Measurement (FIM). Mobility level was evaluated using the Rivermead Mobility Index (RMI). Elderly women had lower scores regarding all the outcome variables when compared to older men. The older men had higher cognitive performance than women. In addition, women were at low level of mobility and depended upon the daily living activities ($p < 0.05$). Both genders showed a significant negative correlation between mental status and functional independence or mobility level, while the correlation between functional independence and mobility level was significantly positive. The data showed that mental impairment decreases both functional status and mobility level of the institutionalized elderly people. Gender difference was found to be an important factor affecting the outcome variables of the study.
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1. Introduction

Aging is not a disease or disability, even though significant number of the elderly suffer from disabilities. There are multiple chronic diseases that may be associated with aging. Although there is no one-to-one correlation between diseases and illness, or disease and disability, many elderly people are limited in the kind of usual activity or mobility. In fact, over 60% of adults with functional impairments due to chronic health problems are at the age of 65 and over (Freedman and Berk, 1988; Clark, 1993). Physically impaired older people tend to become socially isolated, which may result in exacerbation of medical problems, functional deficits and mental health problems, particularly depression (Murphy, 1983; Alexopoulos et al., 1993; Burns and Zaudig, 2002). There are several general principles regarding the aging effects on performance of various organ systems. In the elderly, dependency stems from physical, emotional, social or mental changes. Age-dependent changes are (1) decreased activity levels (hypokinesis); (2) loss of muscle strength and muscle mass; (3) decreased power and endurance; (4) decreased peripheral and cerebral blood flow and decreased oxygen delivery to muscles; (5) loss of range of motion; (6) decreased functional mobility; (7) increased need for assistive devices; (8) decreased speed and cadance; and (9) anxiety or depression (Freedman and Berk, 1988).

Functional activities and cognitive ability are highly skilled components, which have been developed and refined with many years of practice (Stuck, 1999; Kerem et al., 2001). Muscle strength, muscular endurance, balance, flexibility and coordination are very important to improve independency in daily living activities and to enhance the quality of life in elderly people (Lewis and Bottonley, 1994; Cavlak and Buker, 2004).

It was therefore decided to design the current study to describe the relationship among mental status, functional independence and mobility level. The main questions of the research were

(a) Is there any significant relation among mental status, functional independence and mobility level in older people?
(b) How does gender affect the relationship among mental status, functional independence and mobility level in older people?

2. Subjects and methods

2.1. Subjects

Subjects living in rest homes in Denizli, Afyon and İzmir, which are located in Aegean Region, Turkey, were invited to participate in the study. Only the subjects who were eligible for participation were included. For inclusion into the study, subjects had to be at the age of 65 or above, mobile and able to participate in the tests and have no medical conditions, which would interfere in the study. Although all participants had systemic problems, such as diabetus mellitus, heart disease, hypertension or renal disease etc., they were physically active and free from musculoskeletal injury at the testing.

A total of 133 residents (60 women, 73 men) enrolled the study after informed consent. All participants of 65–90 years of age were evaluated individually by two physical therapists for the study at a period of 5 months (April–August 2004). Sociodemographic data belonging to the sample ($n = 133$) are illustrated in Table 1.

Baseline information, such as age, gender, duration of stay in a rest home, social status, education level, employment status, systemic problem, exercise habit and hearing or visual aid usage were all collected from all the participants during a special arranged visit to the rest homes.

2.2. Outcome measures

The Hodkinson Mental Test (HMT), Functional Independence Measurement (FIM) index and Rivermead Mobility Index (RMI) were selected as the primary outcome measures.

The HTM is a brief, 10-question mental test used to evaluate cognitive impairment in older people. It is widely used by physical therapists and other health providers to detect mild cognitive impairment and dementia in the institutionalized elderly people (Hodkinson, 1972; Gale et al., 1996).

The FIM instrument, which is widely used by physical therapists, occupational therapists or nurses etc., is a valid and reliable measurement of functional independence. It consists of a cognitive subscale (5 items) and a motor subscale (13 items). Items' scores range from 1 (total dependence) to 7 (total independence). The cognitive FIM scores range from 5 to 35 and a motor FIM score ranges from 13 to 91 (Dodds et al., 1993; Kidd et al., 1995; Putten et al., 1999; Barnes et al., 2004). The highest FIM score is 126. For the current study, the raw FIM scores were used to describe the functional status of the participants.

The RMI is a undimensional scale with a hierarchy of easy-to-hard test questions. In this study, specific mobility was measured using the RMI, which refers to a specific kind of mobility termed "fundamental mobility." This construct represents basic mobility activities, such as walking or standing. The scale has two major subgroups with scores ranging from 0 (not able) to 15 (completely able). Its scores are "yes" or " no" (legend: yes = 1, no = 0). The highest RMI score is 15 (Collen et al., 1991; Gabrialle et al., 2002; Akın and Emiroglu, 2003; Hsueh et al., 2003; Green et al., 2004).

2.3. Statistical analysis

The analysis was performed using the Statistical Package for the Social Science (SPSS) for Windows (version 10.0, SPSS Inc., Chicago, IL, USA). The significance level was set at 0.05. Descriptive statistics were computed (mean ± S.D.) on all variables in the study. Baseline comparisons were made between women and men to look for any significant difference using Mann–Whitney U-test. Addionally, Pearson correlation coefficient and Spearman correlation coefficient were also calculated to determine any significant correlation among the outcome variables.

Table 1
Demographic data at study entry

Variables	Women ($n = 60$)		Men ($n = 73$)		Total ($n = 133$)	
	n	$\%$	n	$\%$	n	$\%$
Age (year)[a]	75.6 ± 6.7[b]		74.9 ± 6.7[b]		75.3 ± 6.7[b]	
Stay duration at rest home (month)[a]	34.6 ± 36.3[b]		32.6 ± 37.0[b]		33.6 ± 36.6[b]	
Social status						
Married	9	15	7	9.6	16	12
Divorced	10	16.7	20	27.4	30	22.6
Widowed	37	61.7	42	57.5	79	59.4
Never married	4	6.7	4	5.5	8	6
Education level						
Primary school	43	71.7	57	78	90	75.2
Middle school	4	6.7	6	8.2	10	7.5
High school	10	16.7	3	4.1	13	9.8
University	3	5	7	9.6	10	7.5
Employment status						
Government officer	9	15	12	16.4	21	15.8
Skilled worker	1	1.7	12	16.5	13	9.8
Self employment	3	5	49	67.1	52	39.1
House worker	47	78.3	–	–	47	35.3
Systemic problem						
Yes	45	75	43	58.9	88	66.2
No	15	25	30	41.1	45	33.8
Exercise habit						
Never	31	51.7	24	32.9	55	41.4
Once a week	6	10	6	8.2	12	9
Three times a week	4	6.7	11	15.1	15	11.3
Everyday	19	31.7	32	43.8	51	38.3
Hearing aid						
Yes	1	1.7	5	6.8	6	4.5
No	59	98.3	68	93.2	127	95.5
Visual aid						
Yes	37	61.6	45	56.2	82	48.1
No	23	38.3	28	38.4	51	51.9

Note: Mann–Whitney *U*-test and Pearson chi-square test were used.

[a] No significant differences were detected between women and men; age: $t = 0.551$, $p = 0.582$; stay duration: $t = 0.301$, $p = 0.764$.

[b] The values are presented as mean $\pm$ S.D.

3. Results

One hundred and thirty-three eligible participants living at the rest homes completed the three primary measures. The average age with standard deviation was 75.3 ± 6.7 years (range, 65–90 years). Among the subjects 45.1% were women, the rest being men.The averages of the age and duration of staying in a rest home can be seen in Table 1. There was no significant difference between women and men regarding the age and duration of stay ($p > 0.05$).

Distribution of the numbers and percentages of the outcome variables belonging to the sample are shown in Table 2.

As is easily seen in Table 2, the HMT results showed that women had higher score concerning mental impairment than men. In other saying, 58.3% of women have much more severe mental impairment. On the basis of the results of the FIM instrument, although women and men had nearly the same functional level statistically, the level of men was seen to be a little higher than that of women.

Table 3 presents the means with S.D. of the outcome variables belonging to all the participants. The table also shows that older women have more cognitive impairment and less mobility level. The women were also dependent on the daily living activities.

Analyzing the relationship between the outcome variables and related factors showed that both women and men had a significant positive correlation between cognitive performance and age ($p < 0.05$).

Regarding other outcome variables, the results of FIM and RMI showed a significant negative correlation with age (Table 4). In other words, the functional independence and mobility level decrease with age in the future years.

Table 2
Numbers and percentages of all outcome variables measured in both sexes

Variable	Women (n = 60)		Men (n = 73)		Total (n = 133)	
	n	%	n	%	n	%
Based on the HTM, mental impairment						
None (number of wrong answers: between 0 and 2)	22	36.7	36	49.3	58	43.6
Mild (number of wrong answers: between 3 and 4)	3	5	23	31.5	26	19.5
Severe (number of wrong answers: 5 and more)	35	58.3	14	19.2	49	36.8
Based on the FIM, independence level						
Complete dependence (between 0 and 53)	–	–	–	–	–	–
Modified dependence (between 54 and 89)	9	15	2	2.7	11	8.3
Modified independence (between 90 and 125) (with aid)	42	70	51	69.9	93	69.9
Complete independence (126)	9	15	20	27.4	29	21.8
Based on the RMI, mobility level						
Score between 0 and 4	–	–	–	–	–	–
Score between 5 and 9	20	33.3	4	5.5	24	18
Score between 10 and 14	26	43.3	38	52.1	64	48.1
Score 15	14	23.3	31	42.5	45	33.8

Table 3
Mean ± S.D. and range of all variables measured in both sexes

Variables[a]	Women ($n = 60$)			Men ($n = 73$)			Total ($n = 133$)		
	Minimum	Maximum	Mean ± S.D.	Minimum	Maximum	Mean ± S.D.	Minimum	Maximum	Mean ± S.D.
Total HMT score (maximum score 10)	0	9	4.6 ± 3.1	0	7	2.7 ± 1.8	0	9	3.5 ± 2.6
Total FIM score (maximum score 126)	68	126	106.2 ± 15.6	88	126	115.3 ± 11.1	68	126	111.4 ± 13.9
Total RMI score (maximum score 15)	7	15	11.6 ± 2.8	8	15	13.6 ± 1.8	7	15	12.7 ± 2.5

[a] Significant differences between women and men were detected; HTM: $p = 0.001$, FIM: $p = 0.002$, RMI: $p = 0.0001$ (Mann–Whitney U-test was performed).

Table 4
Correlation (R) of outcome variables with age of the sample groups (p, the significance)

Variables	Women ($n = 60$)	Men ($n = 73$)	Total ($n = 133$)
HMT			
R	0.248	0.281	0.217
p	0.056	0.016	0.012
FIM			
R	−0.406	−0.358	−0.338
p	0.001	0.002	0.0001
RMI			
R	−0.484	−0.341	−0.385
p	0.0001	0.003	0.0001

We also detected a relation between the duration of stay in a rest home and the outcome variables. Further information about older women and men are illustrated in Table 5. There was no significant correlation between the duration of stay and the primary outcome variables ($p > 0.05$). In terms of this result, length of the stay in a rest home had no significant negative effect on the mental status, functional independence or mobility level.

We also compared all the outcome variables with one another to understand the correlation between the outcome variables in the older people. The results for women, men and overall (women + men) are shown in Tables 6–8.

We found that there was a significant correlation between cognitive performance and functional independence and mobility level in elderly women. At the same time, a significant positive correlation was also detected between the functional independence and mobility level in elderly women.

For men, no significant negative or positive correlation between cognitive performance and mobility level was detected. However, there was a significant negative correlation between cognitive performance and functional independence. There was also a significant positive correlation between functional status and mobility level in older men like older women (Table 7). Of the 133 older people, results concerning the correlation between the outcome variables were similiar in both the sexes (Table 8).

Table 5
Correlation of the outcome variables with the length of stay in a rest home

Variables	Women ($n = 60$)	Men ($n = 73$)	Total ($n = 133$)
HMT			
R	0.011	−0.025	0.009
p	0.935	0.832	0.917
FIM			
R	0.037	0.093	0.015
p	0.781	0.433	0.862
RMI			
R	0.083	−0.094	−0.012
p	0.526	0.427	0.888

Table 6
Correlation between the outcome variables in the women

Variables	Women ($n = 60$)		
	HMT	FIM	RMI
HMT			
R	–	−0.712	−0.500
p	–	0.0001	0.0001
FIM			
R	−0.712	–	0.789
p	0.0001	–	0.0001
RMI			
R	−0.500	0.789	–
p	0.0001	0.0001	–

Table 7
Correlation between the outcome variables in the men

Variables	Men ($n = 73$)		
	HMT	FIM	RMI
HMT			
R	–	−0.453	−0.199
p	–	0.0001	0.092
FIM			
R	−0.453	–	0.779
p	0.0001	–	0.0001
RMI			
R	−0.199	0.779	–
p	0.092	0.0001	–

Table 8
Correlations between the outcome variables in the total pool

Variables	Total ($n = 133$)		
	HMT	FIM	RMI
HMT			
R	–	−0.661	−0.484
p	–	0.0001	0.0001
FIM			
R	−0.661	–	0.807
p	0.0001	–	0.0001
RMI			
R	−0.484	0.807	–
p	0.0001	0.0001	–

4. Discussion

Functional activities, mobility level and cognitive performance are highly skilled components, which have been developed and refined with many years of practice (Lundgren and Jette, 1990; Staab and Hodges, 1996; Stuck, 1999; Kerem et al., 2001). Motor performance decreased during all dual tasks in the elderly with cognitive impairment. In fact, cognitive performance depends on the task (Hauer et al., 2003). Independence in functional activities and mobility are essential to develop an independent life-style in the elderly. Thus, improving mobility, functional capacity and cognitive performance should be the major goals of geriatric rehabilitation (Morris et al., 1999; Rydwik et al., 2004).

Measuring the relationship between the outcome variables and related factors by using the standardised instruments is widely accepted as being the main goal for a good clinical practice (Guralnik et al., 1989; Stuck et al., 1993; Gama et al., 2000). Elderly people with dementia or mental impairment often need time in a skilled nursing facility rehabilitation unit to recover their functional ability. As the elderly population continues to increase rapidly in the developing and developed countries, the question of what the influence of cognitive impairment on functional capacity is gets more and more important (Stuck et al., 1993).

In literature, there are many studies giving some unclear results concerning the influence of cognition on functional capacity or mobility (Rubenstein et al., 1984; Barnes et al., 2004). Barnes et al. (2004) found that the most cognitively impaired elderly need more rehabilitation intervention to regain the lost functional capacity. They also suggest that health-care providers need to consider these factors as they create a rehabilitation plan of care for elderly patients with cognitive impairment.

A study by Gale et al. (1996) investigated the relation between cognitive function and risk of death. They revealed that cognitive impairment was associated with increased mortality in the elderly patients.

The current results are based on 133 subjects (60 women, 73 men). This study investigated the relation among functional status, mobility level and mental performance in the institutionalized elderly people. The results showed that there were significant differences between women and men. Moreover, HMT, FIM and RMI scores showed a high value in favor of older men. Some of the institutionalized elderly people (19.5%) were seen to have mild mental impairment, whilst the significant number of them (36.8%) were seen to have severe mental impairment. In contrast to this study, Gale et al. (1996) found that there was no significant difference regarding the cognitive function between the sexes.

Rahman and Lui (2000) examined the gender differences in functional ability among the older adults in terms of both self-reported activities of daily living (ADLS) and observed physical performance. They found that elderly women consistently had more limitations than men in both the outcome variables. They also reported that women had disadvantages related to the ADLS examined. On the other hand, majority of the sample in our study were found to be modified dependent (8.3%) and complete independent (21.8%). Although the participants had a good mobility level, the HMT, FIM and RMI scales showed that men had much better results than women. It is worthy of mention that our findings are in good agreement with their results.

The aim of this study was to contribute to the knowledge about the relation between cognitive impairment and functional capacity in the elderly by using the HMT, FIM and RMI. There are many interesting works highlighting the potentiality of the fundamental methods with different strategies. Our results confirm that cognitive performance negatively affects the functional status and mobility level in both the genders living in rest homes.

As known, declining cognitive performance, functional capacity and mobility are common in old people (Brouwer et al., 2004). More importantly, older women have much more cognitive impairment that results in decreased functional capacity and mobility level in comparison to men. This may have important implications in order to create the most suitable physical therapy program for the elderly population.

The FIM instrument is commonly used by health professionals especially physical therapists to measure the functional improvement in various conditions (Keith, 1984; Dettman et al., 1987; Hamilton et al., 1991). Our work suggests that the high FIM score has an important positive influence on the RMI score. Namely, the FIM and RMI score affect each other positively according to the results obtained here.

Mobility is a striking factor to develop an independent life-style. Therefore, to recover the mobility level is one of the major components of geriatric rehabilitation (Mcmurdo and Burnett, 1992; Mcmurdo and Rennie, 1993; Gillies et al., 1999). For older people, Akın and Emiroglu (2003) examined the mobility-related disability using RMI. They found in their work that measuring the mobility-related disability and considering the risk factors may serve to prevent disability. So, they suggested that the RMI can be used to observe the elderly population. Yet they emphasized that health professionals, especially nurses, would have the opportunity to recognize the mobility-related disability at early stages and consider the risk factors. To identify the mobility disabilities, clinicians or researchers need a measure of mobility being simple to administrator (Green et al., 2004; Rydwik et al., 2004). That is why we used the RMI to identify the mobility difficulties in the institutionalized elderly people. The score of the RMI of the study sample did not show severe floor effects. However, we found that the elderly men had a higher RMI score relative to the matched older women.

The fact is that we found a significant relation among mental performance, functional independence and mobility level in both the sexes who live in the rest homes. In addition, older men had higher values regarding the HMT, FIM and RMI than older women.

The results presented here tend to support the view that a considerable proportion of cognitive impairment in the elderly has negative effects on functional independence and mobility level. It is usually unrealistic to expect good results in functional independence, cognitive performance and mobility level in older people at the age of 65 years or above. Thus early assessing of cognitive impairment might be crucial in evaluating older people when planning the physical therapy and rehabilitation program to improve their quality of life. So, mental tests, such as the HMT used here, should be part of the routine assessment of the older people with or without disabilities in clinical practice and in research. In future, attention should be paid on how cognitive impairments affect the functional capacity and mobility in the elderly.

References

Akın, B., Emiroglu, O.N., 2003. Mobility related disability and associated factors in the elderly living at home. Turk. J. Geriatr. 6, 59–67.

Alexopoulos, G.S., Meyers, B.S., Young, R.C., 1993. The course of geriatric depression with reversible dementia: a controlled study. Am. J. Psychiatry 150, 693–1699.

Barnes, C., Conner, D., Legault, L., Reznickova, N., Felix-Harrison, C., 2004. Rehabilitation outcomes in cognitively impaired patients admitted to skilled nursing facilities from the community. Arch. Phys. Med. Rehabil. 85, 1602–1606.

Brouwer, B., Musselman, K., Culham, E., 2004. Physical function and health status among seniors with and without a fear of falling. Gerontology 50, 135–141.

Burns, A., Zaudig, M., 2002. Mild cognitive impairment in older people. Lancet 360, 1963–1965.

Cavlak, U., Buker, N., 2004. Physiotherapy and rehabilitation during ageing. In: Kalınkara, V. (Ed.), Aging: Multidiscipline, Problems and Management. ODAK Publishing Company, Ankara, Turkey, pp. 161–185.

Clark, G.S., 1993. Rehabilitation of the geriatric patient. In: Delisa, J.A. (Ed.), Rehabilitation Medicine: Principles and Practice. J.B. Lippincott, New York, pp. 410–429.

Collen, F.M., Wade, D.T., Robb, G.F., Bradshaw, C.M., 1991. The Rivermead Mobility Index: a further development of the Rivermead motor assessment. Int. Disabil. Stud. 13, 50–54.

Dodds, T.A., Martin, D.P., Stolov, W.C., 1993. A validation of the Functional Independence Measurement and its performance among rehabilitation inpatients. Arch. Phys. Med. Rehabil. 74, 531–536.

Dettman, M.A., Linder, M.T., Sepic, S.B., 1987. Relationship among walking performance, postural stability and functional assessment of the hemiplegic patients. Am. J. Phys. Med. 66, 77–90.

Freedman, M.L., Berk, B.Z., 1988. Rehabilitation Medicine. CV Mosby Company, Toronto.

Gabrialle, A., Aprile, T., Paolucci, S., 2002. Analysis of the Rivermead Mobility Index: a study using mobility measure of first-stroke in patients. Arch. Phys. Med. Rehabil. 83, 1442–1449.

Gale, R.C., Martyn, C.N., Cooper, C., 1996. Cognitive impairment and mortality in a cohort of elderly people. Br. Med. J. 312, 608–611.

Gama, E.V., Damian, J., Molino, J.P., Lopez, M.R., Perez, M.L., Iglesias, G.J., 2000. Association of individual activities of daily living with self-rated health in older people. Age Ageing 29, 267–270.

Gillies, E., Aitchison, T., Macdonald, J., Grant, S., 1999. Outcomes of a 12-week functional exercise programmed for institutionalized elderly people. Physiotherapy 85, 349–357.

Green, I., Young, J., Forster, A., Colle, F., Wade, D., 2004. Combined analysis of two randomized trials of community physiotherapy for patients more than one year post stroke. Clin. Rehabil. 18, 249–252.

Guralnik, J.M., Branch, L.G., Cummings, S.R., Curb, I.D., 1989. Physical performance measures in ageing research. J. Gerontol. 44, 141–146.

Hamilton, B.B., Laughlin, J.A., Granger, C.V., Kayton, R.M., 1991. Interrater agreement of the seven level functional independence measure (FIM). Arch. Phys. Med. Rehabil. 72 (790) (Abstract only).

Hauer, K., Pfisterer, M., Weber, C., Wezler, N., Kligel, M., Oster, P., 2003. Cognitive impairment decreases postural control during dual tasks in geriatric patients with a history of severe falls. J. Am. Geriatr. Soc. 51, 1638–1646.

Hodkinson, H.M., 1972. Evaluation of a mental test scores for assessment of mental impairment in the elderly. Age Ageing 1, 233–238.

Hsueh, I.P., Wang, C.H., Sheu, C.F., Hsieh, C.L., 2003. Comparison of psychometric properties of three mobility measures for patients with stroke. Stroke 34, 1741–1745.

Keith, R.A., 1984. Functional assessment measures in medical rehabilitation: current status. Arch. Phys. Med. Rehabil. 65, 74–78.

Kerem, M., Meriç, M., Kırdı, N., Cavlak, U., 2001. Evaluation of elderly living at home and rest home. Turk. J. Geriatr. 4, 106–112.

Kidd, D., Stewart, G., Baldry, J., 1995. The Functional Independence Measure: a comparative validity and reliability study. Disabil. Rehabil. 17, 10–14.

Lewis, B.C., Bottonley, J.M., 1994. Geriatric Physical Therapy: A Clinical Approach. Appleton Lange, Connecticut, USA.

Lundgren, B., Jette, A.M., 1990. Mobility disability among elderly men and women in Sweden. Int. Disabil. Stud. 12, 1–5.

Mcmurdo, M., Burnett, L., 1992. Randomized controlled trial of exercise in the elderly. Gerontology 32, 292–298.

Mcmurdo, M., Rennie, L., 1993. A controlled trial of exercise by residents of old people's homes. Age Ageing 22, 11–15.

Morris, J.N., Fiatarone, M., Kiely, D.K., 1999. Nursing rehabilitation and exercise strategies in the nursing home. J. Gerontol. A. Biol. Sci. Med. Sci. 54, M494–M500.

Murphy, E., 1983. Prognosis of depression in old age. Br. J. Psychiatr. 142, 111–119.

Putten, J.J.F.F., Hobart, J.C., Freeman, J.A., Thompson, J.A., 1999. Measuring change in disability after inpatient rehabilitation: comparison of the responsiveness of the Barthel Index and the Functional Independence Measure. J. Neurol. Neurosurg. Psychiatry 66, 480–484.

Rahman, M.O., Lui, J., 2000. Gender differences in functioning for older adults in rural Bangladesh: the impact of differential reporting. J. Gerontol. A. Biol. Sci. Med. Sci. 55, M28–M33.

Rubenstein, L.Z., Wieland, D., English, P., Josephson, K., Sayre, J.A., Abras, I.B., 1984. The sepulveda VA geriatric evaluation unit: data on four-year outcomes and predictors of improved patient outcomes. J. Am. Geriatr. Soc. 32, 503–512.

Rydwik, E., Frandin, K., Akner, G., 2004. Effects of physical training on physical performance in institutionalized elderly patients (70+) with multiple diagnosis. Age Ageing 33, 13–23.

Staab, A.S., Hodges, L.C., 1996. Essential of Gerontological Nursing. J.B. Lippincott, New York, USA.

Stuck, A.E., 1999. Risk factors for functional status decline in community-living elderly people: a systemic literature review. Soc. Sci. Med. 48, 445–469.

Stuck, A.E., Siu, A.L., Wieland, G.D., Adams, J., Rubenstein, L.Z., 1993. Comprehensive geriatric assessment: a meta-analysis of controlled trials. Lancet 342, 1032–1036.