

RESEARCH ARTICLE

EFFECTS OF FRAGILITY FRACTURE INTEGRATED REHABILITATION MANAGEMENT
HIP FRACTURE IN PAKISTANI OLDER ADULTS

1. Assistant Professor Riphah College of Rehabilitation & Allied Sciences, Riphah International University, Islamabad Pakistan
2. Professor, Isra Institute of Rehabilitation Sciences, Islamabad, Pakistan
3. Lecturer/Doctor of Physical Therapy, Helping Hand Institute of Rehabilitation sciences, Mansehra Pakistan

Correspondence

Anam Aftab

Assistant Professor/In-charge Research (MSPT)
Riphah College of Rehabilitation & Allied Sciences,
Riphah International University, Islamabad Pakistan
E-mail: anam.aftab@rihah.edu.pk

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Shaista Habibullah²: Revised and accountable for all aspectsNimra Ilyas Bhutta³: Analysis & interpretation of data, Revised and accountable for all aspects

ABSTRACT

Objective: to evaluate the effectiveness of fragility Fracture Integrated Rehabilitation Management (FIRM) on older adults of Pakistan after hip fracture surgery. **Methodology:** A one-group pretest–posttest design was conducted at the National Institute of Rehabilitation Medicine (NIRM), Islamabad from March 2020 to September 2020. A total of n=11 participants with age above 55 years, both male and female, with confirming diagnosed cases of hip fracture were included. Every participants received 10 sessions of Fragility Fracture integrated Rehabilitation Management (FIRM) program in two weeks. Data was collected at baseline at 2nd day and after 10th session on 15th day, through the KOVAL scale to assess the walking ability, the Functional Ambulatory Category (FAC) to assess the level of independence, the modified Barthel index (MBI) for activities of daily living (ADLs), and quality of life (QOL) was assessed by EQ-5D. Data were analysed by using SPSS Version 21. **Result:** the mean age 76.45±9.32, of which n=6 (54.6%) were males and n=5(45.4%) were females. after 10th sessions the QOL on EQ-5D, ambulation on FAC and KOVAL scale and the ADL on MBI were significantly improved ($p<0.05$) with large effect size, except for the anxiety domain of EQ5D and subdomains of MBI; Personal hygiene, feeding, Bowel control, bladder control, Wheelchair, and Chair & bed transfer showed no significant change ($p>0.05$). **Conclusion:** FIRM care is found to be effective in improving the walking ability, functional status, ADLs and quality of life in older adults following a hip fracture surgery.

Keywords: Activity of daily living (ADLs), fragility fracture, physical therapy, rehabilitation

INTRODUCTION

A fragility fracture is a commonly occurring condition resulting from low energy mechanical forces among the old aged population specifically above 50 years. Among three major sites for fragility fracture, the hip fragile fracture is the most common condition in geriatrics.^{1,2} Hip fractures are major fractures and nearly always require hospitalization, which is fatal in 20% of cases and cause of permanent disability in 50% of these affected cases, whereas only 30% of these cases had shown full recovery.³ By 2050, it is suspected that there will be 6.26 million hip fractures worldwide of which approximately 50% will occur in Asia, but there is only a small number of reports on the incidence of hip fractures in the Asian population.⁴ Gender-wise, women are more affected than men, as they have a higher incidence of osteoporosis due to increased bone loss after menopause in women.⁵ Most of the fractures are due to fall, whereas the hip fractures occur both outside or inside the house, while the occurrence of fragility fractures are somewhat more commonly reported outside the house.⁶ Hip fractures have been reported to be the costliest of all the fragility fractures, such fractures can prompt serious morbidity, reduce the quality of life, and are associated with high mortality rates.^{7,8}

There are several therapies and treatments available for the prevention and rehabilitation of fragility fractures in people who are thought to be at risk or to prevent further fractures in those who have already had one or more fragility fractures. However, identifying who will benefit from preventative and rehabilitative treatment is imprecise.⁹ The conventionally used interventions include minimally invasive surgery, anesthetics, and conventional radiography which are commonly being practiced for healing and fixing fragile hip fractures.¹⁰⁻¹² It is recognized that good multidisciplinary teamwork and care are essential for fragility fracture patients, and aspects of interventions undertaken throughout the care pathway need a more structured assessment through randomized controlled trials.¹³ As healing of occurring fractures is not enough, a comprehensive rehabilitation program is required to rehabilitate and prevent further fracture in geriatrics and to improve the functional status of patients after surgery recovery.¹⁴ The Importance and effectiveness of a comprehensive rehabilitation program after fragile hip fracture in old aged population is explained well by Abraham et al. in their recently conducted study.¹⁵ For this purpose comprehensive rehabilitation care is integrated internationally for geriatric care after fragile hip



fracture known as Fragility Fracture integrated Rehabilitation Management (FIRM), requiring a multidisciplinary team including orthopaedic doctors, physiotherapists, occupational therapists and nurses geriatricians. This protocol was incorporated by a Korean Fragility Fracture Rehabilitation study group, with a motive to decrease the level of dependency, and risk of falls, with detailed discharging plans. This protocol consists of multidisciplinary team work-integrated sessions with 10 days of physiotherapy and four days of occupational therapy post-surgical recovery of fracture, gradually increasing according to patients functional status.¹⁶

Numerous studies regarding the fragility of integrated rehabilitation have shown benefits for functional outcomes in patients with fragility hip fractures. The use of fragility integrated rehabilitation leads to improvements in functional outcomes, mobility, cognition, and overall health-related quality of a life.¹⁶⁻²¹ As per authors' knowledge, this intervention has not been practiced and tested as well as not any other standard rehabilitation protocol on hip fracture among the older adults of Pakistan. Therefore, this study is aimed to evaluate the effectiveness of

FIRM on the Pakistani adult population after hip fragile fracture surgery.

METHODOLOGY

A one-group pretest–posttest study (NCT04760756) was conducted for a duration of 6 months from March 2020 to September 2020, after approval from the Deputy Director Admin (No,F.1-70/2019-Admin/NIRM) of National Institute of Rehabilitation Medicine (NIRM) Islamabad. The n=17 patients were evaluated for eligibility and n=11 older adults with age above 55 years, diagnosed with femoral neck, sub-trochanteric or intertrochanteric fracture and underwent hip fracture management including any of bipolar hemiarthroplasty, total hip replacement arthroplasty, reduction, or internal fixation, were included in the study.(Figure 1)

The participants who declined to participate in the study, had undergone surgery for a cause other than hip fracture; (infection, arthritis, loosening, avascular necrosis, femoral shaft fracture, acetabular fracture, peri-prosthetic fracture or pathological fracture by tumor or had isolated fracture of the greater or lesser tuberosity, or multiple fractures), or having a history of repeated surgery for hip fracture were excluded.

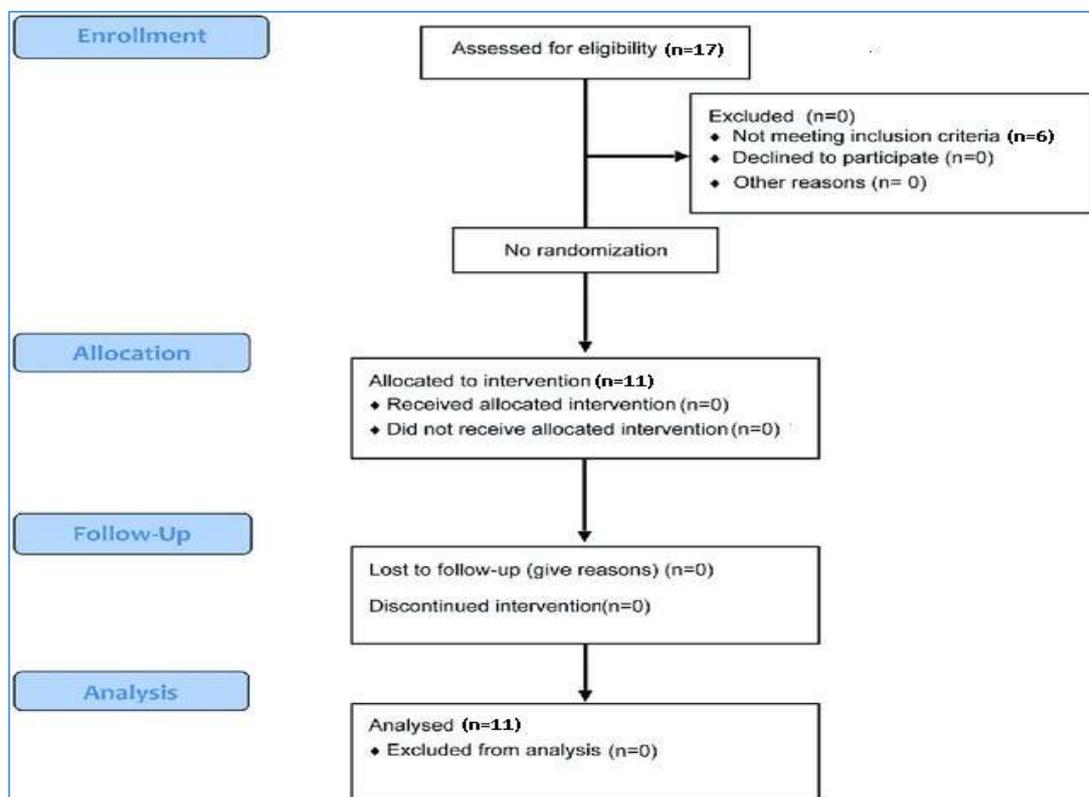


Figure 1: Study Flowchart

Each participant was admitted for 15 days for the comprehensive rehabilitation program. The FIRM program was provided by a multidisciplinary team which included; a Physician, occupational therapist, Physical therapists, social worker, clinical nurse, and a nutritionist. The aim of adding occupational and physical therapies was to improve the activities of daily living and mobility. A total of 10 sessions of Physical therapy were provided for about a duration of 40 mins session/day (FIRM#1-10); which included strengthening, aerobics, functional, weight-bearing, and gait-training exercises, whereas, four sessions of occupational therapy were provided onwards 4th session of physical therapy and every alternate day (FIRM#4,6,8, 10) which included training for the use of adaptive equipment, self-care, sit to stand, bed mobility, transfer, self-dressing, and ADLs. Comprehensive patient education was also part of this rehabilitative program.²¹

The demographic data (age, gender, and BMI) was obtained from each participant. Data was collected at baseline on 2nd day and after 10th session on 15th day, through the KOVAL scale to assess the walking ability¹³, the Functional Ambulatory Category

(FAC)¹³ to assess the level of independence, the modified Barthel index (MBI)²² for activities of daily living (ADLs), and quality of life (QoL) was assessed by EQ-5D²³

The data presented in the form of frequency (n), percentages, median and Interquartile range (IQR), p-value and effect size (*r*). As variables were in ordinal scale and total score was not normally distributed, so the non-parametric Wilcoxon Sign Ranked Test was used for pre-post analysis. The level of significance was set at $p < 0.05$ and correlation coefficient (*r*) was used to determine the effect size.

RESULTS

A total of $n=11$ participated in the study. The mean age of the study participants was 76.45 ± 9.32 . Regarding gender distribution in the study, a total of $n=6$ males and $n=5$ females participated in the study. In which the height of the participants was 159.02 ± 8.07 and weight was 57.56 ± 7.22 . The average BMI of the participant was 22.99 ± 3.95 . (Figure 2)

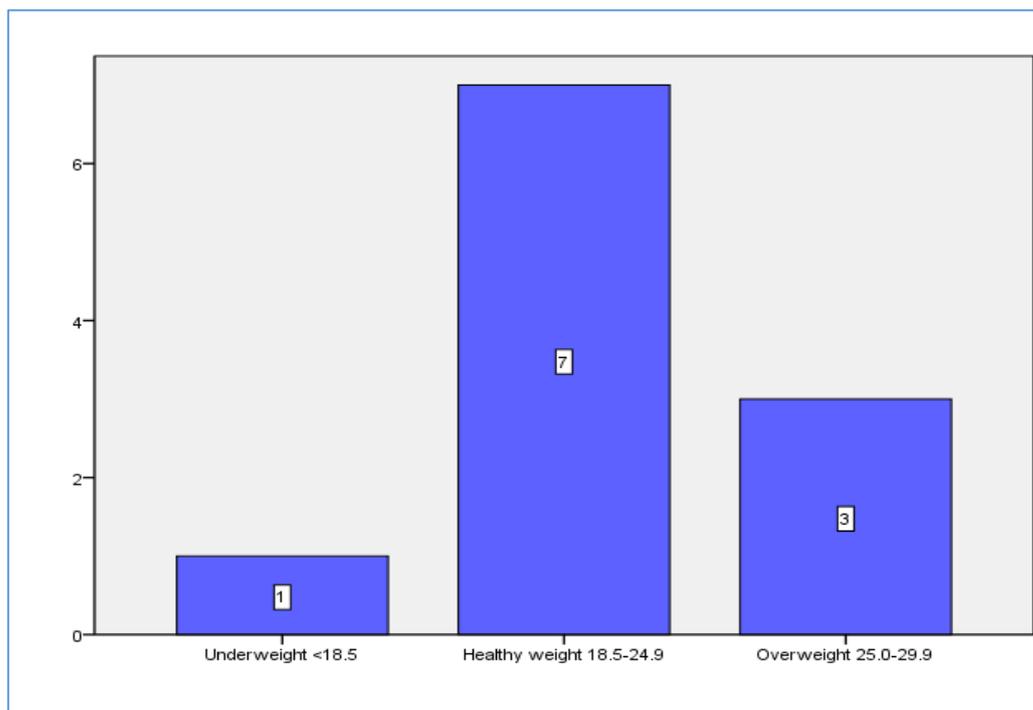


Figure 2: Frequency distribution of study participant

The FIRM protocol was given to all participants and the data was analyzed after 10 days. The analysis showed that quality of life on EQ5D significantly

improved with large effect size {0.316(0.201) ver. 0.573 (0.107), $p=0.003$, $r=-0.88$ }. All domains of EQ5D also showed significant improvement

($p < 0.05$) with large effect size, except in anxiety ($p > 0.05$). The ambulation also showed significant improvement with large effects size measured on Functional ambulatory category scale {1(1) ver. 3(1), $p = 0.010, r = -2.58$ } and KOVAL {6(1) ver. 6(0), $p = 0.025, r = -2.23$ } respectively.

The activities of daily living on modified Barthel index (MBI) showed a significant improvement {61(17.750) ver. 78(15.500) $p = 0.005, r = -0.84$ }. While

considering the subdomains of MBI, the following domains significantly improved with large effect sizes such as bathing self, Toilet, stair climbing, dressing, and ambulation. While remaining domains, no significant change ($p > 0.05$) was observed including Personal hygiene, feeding, Bowel control, bladder control, Wheelchair, and Chair & bed transfer.

Table 1: Pre and post-analysis of Study variables

		Pre		Post		Z	p-value	r
		Median	IQR	Median	IQR			
EQ5D	Exercise	4	2	2	2	-2.83	0.005**	-0.85
	Self-care	4	0	3	2	-2.58	0.010*	-0.78
	ADLs	5	1	4	0	-2.27	0.023*	-0.68
	Pain	4	1	2	1	-3.20	0.001**	-0.96
	Anxiety	2	1	1	1	-1.34	0.18	-0.67
	Total	0.316	0.201	0.573	0.107	-2.93	0.003**	-0.88
FAC	-	1	1	3	1	-2.58	0.010*	-2.58
KOVAL	-	6	1	6	0	-2.23	0.025*	-2.23
MBI	Personal hygiene	4	1	4	1	-1.00	0.317	-1
	Bathing self	1	3	3	3	-2.12	0.034*	-10.55
	feeding	10	2	10	0	-1.00	0.317	-1
	Toilet	3	3	5	6	-2.22	0.026*	-2.22
	Stair climbing	0	0	5	8	-2.45	0.014*	-2.45
	Dressing	5	3	5	3	-2.41	0.016*	-0.80
	Bowel control	10	2	10	2	-1.00	0.317	-0.5
	Bladder control	10	0	10	0	-1.00	0.317	-0.33
	Ambulation	3	8	12	4	-2.55	0.011*	-0.77
	Wheel chair	0	0	0	0	0.00	1	0
	Chair & bed transfer	12	9	12	4	-1.84	0.066	-0.92
Total MBI	61	17.75	78	15.5	-2.80	0.005**	-0.84	

Significance Level: $p < 0.05$ *, $p < 0.01$ ***, $p < 0.001$ ***.

The correlation coefficient (r) for effect size

DISCUSSION

This pre-post study was aimed to evaluate the effectiveness of Fracture integrated rehabilitation Management (FIRM) care on Pakistani older adults after hip fracture surgery. The results highlighted that after 10 sessions of FIRM care there was a significant improvement in the functional and mobility status of geriatric patients. And there exists a significant change in the KOVAL, FAC, MBI, and quality of life EQ-5D when assessed the mean difference of pre and post scores in a patient with a fragile hip fracture.

The present study statistics of the within-group analysis showed that the walking ability was significantly improved after 15 days of hip fracture fixation surgery. These findings are supported by several studies conducted for geriatric hip fracture

rehabilitation.^{21,24,25} Lee et al. reported in their recently published study that when measured on the KOVAL scale the ADLs, physical and walking abilities are improved in elderly postoperative patients who are enrolled in the FIRM care program.¹⁶ These findings are also evident in a study conducted on Korean adult population that FIRM care improves walking ability with crutches and walkers in elderly patients receiving rehabilitation post-hip fracture surgery.¹⁸ A meta-analysis that evaluated the hip fracture rehabilitation effect on the geriatric population reported that those rehabilitation programs which are systematically planned by the geriatric interdisciplinary team approach are more effective in improving physical ability, walking abilities, and

ADLs in the elderly population than any of the conventional care.²⁵

The present study highlighted that the functional ambulatory category was seemed to be improved when analyzed for within-group change from baseline to 10th session at 15th day postoperatively. This indicates that after surgical correction of fragile hip fracture, the FIRM is significantly effective in enhancing the functional ambulation of elderly patients. A study conducted on the effectiveness of FIRM on elderly patients with and without Sarcopenia reported that that FIRM care is clinically useful in enhancing the functional gain in ambulatory functions, quality of life walking ability, and balance.²⁰ Similar statistics are reported by another rehabilitative study conducted on the evaluation of FIRM care on functional outcomes improvement and predictor for independent ambulation, reported that FIRM is an intensive, standardized, comprehensive rehabilitative program, which had a positive short term, as well as long term effects in the elderly population suffering a hip fracture. This intensive interdisciplinary team approach is thought to be satisfactorily subtle for enhancing the functional outcomes in Sarcopenia patients with hip fracture and is a prognostic predictor for independent ambulation.¹⁹

The quality of life for activities of daily living was measured through the EUR-Q5 dimensions questionnaire, which showed significant improvement in four dimensions except for the anxiety, which was insignificant. In a study conducted among the Korean community regarding the quality of life in elderly patients with hip fracture, reported that level of pain, discomfort, mobility, anxiety, and usual activities were significantly improved in patients receiving FIRM care when assessed 10th days postoperatively.²¹ These findings are also evident by research, which reported that the interdisciplinary team rehabilitative care is effective in improving the quality of life and activities of daily living by enhancing physical functioning and reducing pain and discomfort level (26) whereas, another study supports these finding that FIRM protocol is effective in improving the quality of life, range of motion and activities of daily living by reducing pain and discomfort level in such patients.¹⁸

This study statistics showed that self-bathing, toilet training, stair climbing, self-dressing, ambulation were significantly improved except for personal hygiene, self-feeding, wheelchair, transfer between chair and bed, bowel, and bladder control. A recently published pre-test-post-test clinical trial evaluated the effect of FIRM care on the quality of life of the geriatric population suffering hip fragility fracture, assessed through modified Barthel index, and reported that the post-intervention analysis showed improvement in the quality of life after 10th-day session postoperatively, all activities were significantly improved. This provides a piece of strong evidence for our study results.²¹ As reported in the previous studies that reducing the level of rehabilitation is associated with decreased physical functioning after hip fracture, thus dependency increases and the quality of life gets worst.^{27,28} Although, in fragile geriatric population ambulation and ADLs recovery is a key factor in coping up with and returning to the daily life activities, therefore comprehensive rehabilitation care can help cope up and returning to the activities of daily living by enhancing the quality of life and mobility in such patients.^{25,29}

The current study had low sample, single centred without comparative group as well as long term effects are missing. These confounding factors limit the generalizability of the study. As compared to developed countries, imitated access to rehabilitation services and non-compliance with home plan may impede the progress. So long term effect should also be observed as after discharge at least for 6 months

CONCLUSION

Fracture integrated rehabilitation Management (FIRM) program is effective to improve level of mobility/ambulation, activities of daily livings (ADLs) and quality of life among older adults with hip fracture.

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