

Original Article

Functional Outcome Following Non-surgical Management of Pelvic Ring Injury

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Abstract

Introduction: Pelvic fractures are among the most severe and life-threatening orthopedic injuries, accounting for approximately 1.5% to 3% of all skeletal injuries. These fractures can occur in up to 20% of severely injured patients and have a mortality rate of up to 10%. The burden of trauma is substantial in countries with limited resources, including Ethiopia. However, there is limited data concerning the outcomes of non-operative management of pelvic ring fractures and associated injuries in Ethiopia.

Objectives: The objective of this study is to assess the functional outcomes following non-surgical management of pelvic ring injuries at Tikur Ambessa Specialized Hospital, Orthopedic and Trauma Care Center from April 2019 to August 2022.

Methods: This study is an institution-based Retrospective Record Review of patients treated for pelvic ring injuries at TASH from April 2019 to August 2022. A total of 50 patients were treated non-surgically for pelvic ring injuries during this period. Data were extracted from patient medical records using a structured data collection form. The Majeed pelvic scoring system was used to evaluate functional outcomes by phone or email. Data entry and analysis were performed using SPSS version 26 software.

Results: The overall Majeed score for pelvic ring injuries in this study was 82.92 ± 11.04 SD (95% CI, (80.13, 85.12)). At the end of the assessment, the majority of patients (26, 52%) had excellent functional outcomes, followed by 19 (38%) with good functional outcomes, 4 (8%) with fair functional outcomes, and 2 (4%) with poor functional outcomes.

Conclusion: According to this study, the mean Majeed score for pelvic ring injuries was found to be considerable. Notably, approximately half of the patients achieved excellent functional outcomes.

Keywords: Functional outcome, Non-surgical, Pelvic Ring, Injury, Ethiopia

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Introduction

Pelvic fractures are among the most severe and life-threatening orthopedic injuries, comprising approximately 1.5% to 3% of all skeletal injuries [1]. These fractures can occur in up to 20% of severely injured patients and have a mortality rate of up to 10% [2-4]. Studies have shown that pelvic injuries account for 2% of all orthopedic admissions and 3% of all skeletal injuries[5]. Although pelvic fractures represent only a small percentage of injuries, they are associated with significant morbidity and mortality [6].

Pelvic ring injuries are increasingly common in motor vehicle trauma. The minority of pelvic ring injuries require operative fixation. Other causes include falls from height and the fall of heavy objects [7,12]. Patients with

pelvic injuries often have associated multiple systemic injuries, contributing to the overall morbidity and mortality [7]. The pelvis is a ring formed by the fused bones of the ischium, ilium, and pubis, which attaches to the sacrum, housing vital structures such as major blood vessels and nerves, as well as digestive and reproductive organs.

Major pelvic fractures can be fatal, primarily due to blood loss. These fractures are often associated with a number of complications that may require extensive rehabilitation. Deaths from pelvic trauma frequently occur as a result of associated injuries and complications rather than the pelvic injury itself [8]. The man-

agement of pelvic fractures requires a specialized facility and a multidisciplinary team-based approach [9].

In Ethiopia, the incidence of injuries in general is on a rise due to sub optimal roads and traffics, currently few tertiary hospitals are treating pelvic injuries across the country almost all of them are in the capital city. The trained specialists managing this complex injury are also few and most of working in Addis Ababa. There are limited data concerning the functional outcome of conservatively managed pelvic ring injury in Ethiopia. Therefore, this study aimed to assess functional outcome following non-surgical management of Pelvic Ring Injury at Tukur Anbessa Specialized Hospital Orthopedic and trauma center.

Methods and Materials

Study setting

The study was conducted in Tikur anbessa specialized hospital, Department of Orthopedic Surgery. It was founded and established on September 25, 1987 as the premier orthopedic center in the country. The department gives a full-fledged Musculoskeletal clinical service, offers specialty and sub-specialty training, and conducts research.

The study participant were identified using the Patient charts. The study was retrospectively considering document of patients who had pelvic fracture from April 2019 to august 2022.

Study population:

The study population included all patients who were treated non-operatively for pelvic fracture at Tikur Ambessa Orthopedic and Emergency Clinic from April 2019 to August 2022.

Eligibility Criteria

Adult Patients who had closed isolated or associated pelvic fractures treated non-operatively at TASH and those who had Type A and Type B pelvic treated non-operatively at TASH. Incomplete medical records are excluded.

Sample Size and sampling procedure

We included all eligible Patients who fulfilled the inclusion criteria.

Study Variables

Dependent variable

Functional outcome (Excellent, Good, Fair, Poor)

Independent variables

Age, Sex, Type of fracture, Side of fracture, Mechanism of injury, any associated injury, Type of associated injury, Occupational change and Neurological deficiency.

Operational Definitions

Pelvic Fracture Tiles Classification [10]

Stability:- is the ability of pelvic ring to withstand

physiologic forces without abnormal deformation. Stability of the pelvis following trauma is assessed by clinical and radiological parameters. Clinically stability is examined by pelvic compression and distraction test. Radio-logically the criteria for instability are sacroiliac joint displacement of 5 mm in any plane, -posterior fracture gap (rather than impaction), and avulsion of fifth lumbar transverse process, lateral border of sacrum (sacrotuberous ligament), or ischial spine (sacrospinous ligament)

Tiles Type A: stable

Tiles B: Partially Stable, vertically stable but rotationally unstable

Tiles C: unstable both rotationally and vertically, due to complete disruption of the anterior arch, posterior arch, and pelvic floor. The patients' functional outcome was assessed by Majeed pelvic scoring which is currently is the most widely used disease-specific instrument.

For measuring outcomes after pelvic fractures, it has been done via phone call based interview. The scoring system devised by Majeed is a well-established self-reported questionnaire, which is considered functionally oriented and is a valid pelvic specific outcome scoring system.

Instruments

A checklist was developed by reviewing relevant works of literature on the problem under the study to include variables that address the objective of the study. It was designed in the English language; and it had information including socio-demographic profile age, and sex, mechanism of injury, associated injury, radiologic patterns pelvic ring injuries, duration of presentation Vs. at presentation, duration of in-hospital stay, types of management given, complications encountered, condition on discharge and early outcomes, etc. Majeed derived self-reported questionnaires will be used. Five criteria were chosen for functional assessment after major pelvic fractures: pain, standing, sitting, sexual intercourse and performance at work. Each of these clinical parameters is scored, the total being a maximum of 100 points for patients who were working before the injury and 80 points for those who were not. The five sections of the assessment are scored as shown in (ANNEX) and discussed below:

Pain: Pain is an important sequelae of major pelvic injury and is given a score of 30 points, allocated according to the six grades listed in annex.

Standing: Weight bearing in the erect position is given 36 points, in three main categories (aids, gait and walking ability), each of which has six grades.

Sitting: Sitting is an important function in relation to the pelvis, but less so than gait or walking ability. A total score of 10 points is given in four grades.

Sexual intercourse: For both men and women, four points are allocated for comfort during sexual inter-

course. This does not take account of neurological or psychological impotence and is recorded in four grades. If, for any reason, sexual intercourse has not been attempted, a score of four points is given.

Work: Work performance is allocated 20 points in five grades, ranging from no regular work to return to the same job as before injury with no loss of performance. A patient who was not working at the time of his injury is not scored.

This overall assessment is then out of 80 points. The accumulative grading system is shown in the following Table. This gives a breakdown into excellent, good, fair and poor for both working and non-working patients (**Table 1**).

Table 1: Accumulative grading system according to the Majeed scale score

Working before injury	Not working before injury	Grade
>85	>70	Excellent
70 to 84	55 to 69	Good
55 to 69	45 to 54	Fair
<55	<45	Poor

Data Collection and procedure:

Data were extracted from morning report sheet, patient's charts in TASH Orthopedics department over study period. Data were extracted by a trained junior orthopedics resident. The principal investigators supervised and provided all items necessary for data collection. To assure the quality of data, properly designed data collection format was prepared; training was given for data collectors about research objective, the data collection format, how to review chart and fill the data to assure the quality of data. The principal investigator controlled all activities daily for the collected data completeness and clarity. After all the data on the charts of patient chosen in the study period had been collected the principal investigator then called or emailed each study subject on their address and perform the questionnaires according to the majeed scoring system.

Data Analysis Procedures

The collected data were coded, entered and analyzed using SPSS Version 23 for windows. It was checked for its completeness cleaned, processed and analyzed accordingly. Frequency and cross tabulation were used to summarize descriptive statistics. Means for continuous variables and percentage for nominal variables were used. Fisher's exact test was used to assess association between dependent and independent variables. Graphs, pie charts and tables were used as appropriate for data presentation and dissemination.

Results

General characteristics of the study participants

In this study, a total of 58 cases of pelvic ring injury were identified, out of which 8 cases were excluded due to incomplete relevant information. Hence, 50 files were considered for analysis. Among these, 34 (68%) were male, and 33 (66%) were in the age range of 20-24 years, with a mean age of 31.5 ± 13.7 years. The overall median follow-up duration was 3.5 months (± 3 IQR). More than four-fifths (82%) of the participants had a road traffic accident, and 29 (58%) of them were managed using weight-bearing as tolerated and anti-pain.

Almost one-third (74%) of the participants had closed types of pelvic fracture, and 10 (41.67%) had associated injuries on the lower part of the extremities, followed by the upper part of the extremities (7, 29.17%). Twenty (40%) of the participants remained unchanged in their occupational status, followed by 16 (32%) who experienced a reduction. The reduction in occupational status was due to the consequences of trauma complications. Among the total participants, 44 (88%) had no neurological deficiency (**Table 2, Fig.1 and Fig. 2**).

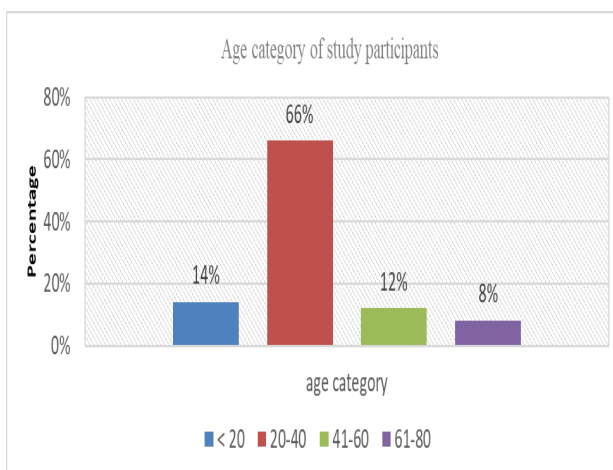


Figure 1: Age distributions of study participants at TASH Department of Orthopedic Trauma Centre, 2019-22, (n=50)

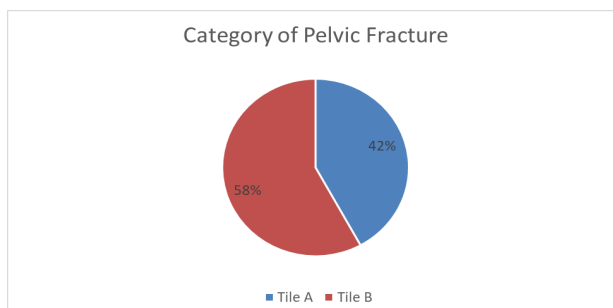


Figure 2: Category of Pelvic Fracture of study participants at TASH Department of Orthopedic Trauma Centre (n=50)
Fractures. Cureus, 2023. 15(3).

Table 2:-General characteristics of study participants at TASH Department of Orthopedic Trauma Centre, 2019-22, (n =50)

Characteristics	Frequency	Percentage
Sex		
Male	34	68
Female	16	32
Age of Patient(n=50)		
< 20	7	14
20-40	33	66
41-60	6	12
61-80	4	8
Duration of follow up	3.5	±3 IQR
Mechanism Of Injury		
Road traffic accident	41	82
Fall down	6	12
Other	3	6
Category of Pelvic Fracture		
Type A	21	42
Type B	29	58
Management protocol		
Protected weight bearing and anti-pain	21	42
Weight bearing as tolerated and anti-pain	29	58
Side of pelvic fracture		
Right	14	28
Left	18	36
Bilateral	18	36
Type of pelvic fracture		
Closed	37	74
open	13	26
Presence of associated injury		
Yes	24	50
No	24	50
Site of associated injury		
Brain	4	16.67
Upper extremities	7	29.17
Lower extremities	10	41.67
Bladder	3	12.50
Neurologic deficiency		
Yes	6	12
No	44	88
Occupational status		
Unchanged	20	40
Reduced	16	32
Incapable	14	28

Functional outcome based on Majeed scale score

The overall mean score for pelvic ring injury in this study was 82.92 ± 11.04 SD, with a 95% confidence interval of (80.13, 85.12). In terms of pain, the average score was 27, indicating that the majority of pa-

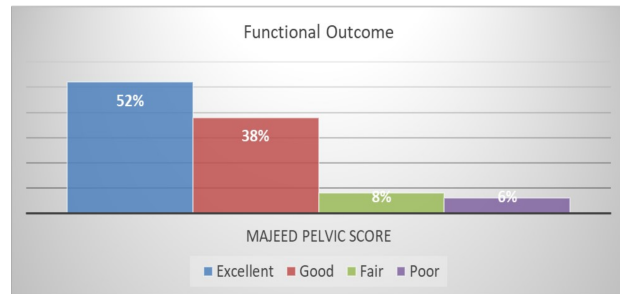
tients rarely experienced pain (Table-3). According to the different score categories, 26 patients (52%) achieved excellent functional outcomes, while 19 patients (38%) achieved good functional outcomes (Table-4).

Table 3: Functional outcome according to the Majeed scale score, TASH, 2019-22

Component of the Majeed score	Mean	±SD	95% CI
Pain/30	27	±4.52	25.95, 28.05
Work/20	13.22	±5.57	11.82, 14.62
Sitting/10	9.68	±1.02	9.34, 10.02
Sexual intercourse/4	3.26	±1.21	2.93, 3.59
Walking aids/12	9.2	±3.40	8.30, 10.10
Gait unaided/12	10.16	±3.02	9.15, 11.17
Walking distance/12	10.4	±2.88	9.65, 11.15
Overall majeed score	82.92	±11.04	80.13, 85.12

Table 4. Categories of functional outcome, TASH,2019-22

Majeed score	Frequen- cy	Percentage
Excellent (>85)	26	52
Good (70-84)	19	38
Fair (55-69)	4	8
Poor (<55)	1	2

**Figure 4:** Functional outcome using majeed pelvic score at TASH Department of Orthopedic Trauma Center, 2019-22**Factors associated with functional outcome following non-surgical management of pelvic ring injury**

Several factors were found to be associated with the functional outcome. These findings show that there is no statistically significant association between the level of functional outcome and sex, age, mechanism of injury, pelvic fracture category, or other factors. However, there was a statistically significant association between functional outcome and neurologic deficiency (Fisher's exact $p = 0.001$), (table-5).

Table 5: Factors associated with functional outcome following non-surgical management of pelvic ring injury at TASH Department of Orthopedic Trauma Centre, 2019-22

Characteristics	Frequency	Percentage	Fisher's exact (p-value)
Sex			
Male	34	68	0.606
Female	16	32	
Age of Patient(n=50)			
< 20	7	14	0.551
20-40	33	66	
41-60	6	12	
61-80	4	8	
Mechanism Of Injury			
road traffic accident	41	82	0.103
fall down	6	12	
Other	3	6	
Category of Pelvic Fracture			
Type A	21	42	0.171
Type B	29	58	
Side of pelvic fracture			
Right	14	28	0.695
Left	18	36	
Bilateral	18	36	
Type of pelvic fracture			
Closed	37	74	0.605
open	13	26	
Presence of associated injury			
Yes	24	50	0.320
No	24	50	
Site of associated injury			
Brain	4	16.67	0.103
Upper extremities	7	29.17	
Lower extremities	10	41.67	
Bladder	3	12.50	
Neurologic deficiency			
Yes	6	12	0.000
No	44	88	

Discussion

Assessment of pelvic ring function and related quality of life has been employed. Majeed pelvic score (MPS) is the most frequently used[13, 14]. However, adequate prospective follow-up studies that evaluate functional outcomes after these injuries following non-surgical management are still lacking. Therefore, this study was aimed to assess functional outcome following non-surgical management of Pelvic Ring Injury.

The overall majeed score for pelvic ring injury in this study was 82.92 ± 11.04 SD (95% CI, (80.13, 85.12)). With average follow up duration was 3.5 months with ($\pm$ 3 IQR). At the end of the assessment, the majority of patients 26(52%) had excellent functional outcomes, followed by 19(38%) with good functional outcomes, 4 (8%) scoring fair functional outcomes, and (2%) with poor functional outcomes. This is in line with study in India on functional outcome of 'LC-1 pelvic ring injury with incomplete sacral fracture' managed non-operatively indicating mean Majeed score was 82.59 ± 6.77 [15] and similarly, its supported by the study in India on functional outcome of pelvic fractures and the factors affecting it- A short term, prospective observational study at a tertiary care hospital, revealing Majeed scores was good in 29 patients[16].

The findings of the current study was lower than a retrospective study in Germany on functional outcome and quality of life after surgical fixation of insufficiency pelvic ring injuries in which patients scored in average 85.92 points ($\pm$ 23.39) of a maximum of 100 points using the Majeed score[17], and according to a retrospective study conducted in Indonesia on Management of pelvic ring fractures in limited resources country revealing 93 median Majeed score [18].

Possible explanations include study settings where better outcomes were likely due to available resources and specialists in their various hospitals, which were mostly in developed countries, and other possible explanations include differences in management where patients underwent a variety of interventions. However, findings of this study was higher than a systematic review of the literature conducted in Netherland on Patient-reported physical functioning and quality of life after pelvic ring injury reporting mean scores of 75 [19].

Findings from the study conducted in India regarding Functional Outcome of Internal Fixation (INFIX) in Anterior Pelvic Ring Fractures reporting Majeed score of 78 [20], study in India on Factors affecting quality of life after pelvic fracture where the average Majeed score was 76.65 ± 14.73 [21].

Less comparable study conducted in Lithuania on the Short-Term Functional Outcomes and Quality of Life after B2.1 Type Pelvic Fractures -according to AO/Tile classification- for Surgically and Non-Surgically Treated Young Patients, indicating majeed score was $31.44 \pm$

14.41 for non-operatively treated patients[22], and a 10-year prospective observational study conducted in Cameron on functional outcome of unstable pelvic fractures treated in a level III hospital in a developing country reported that the overall average majeed score was fair[23]. This disparity could be attributed to the standardization of evaluation methods, study period, study design, and follow-up length, among other factors.

Several factors have been identified as being related to the functional outcome. According to the findings, there is no statistically significant association between the level of functional outcome and sex, age, mechanism of injury, pelvic fracture category, or other characteristics. However, a statistically significant relationship was observed between functional outcome and neurologic deficiency (Fisher's exact $p = 0.001$). It is possible that patients who have no history of neurological deficiencies are more likely to achieve a desired functional outcome compared to those who do have such deficiencies.

Conclusion

According to this study, the mean Majeed score for pelvic ring injuries was found to be considerable. Notably, approximately half of the patients achieved excellent functional outcomes by the end of the assessment. In order to prevent poor functional outcomes, the Orthopedic Trauma Centre should focus on enhancing specialized care and standardizing the continuum of care from admission to discharge. It is essential to prioritize early mobilization and rehabilitation, with rehabilitation programs tailored to each patient's unique needs and initiated as soon as possible post-injury. Effective pain management is crucial to enable patients to engage in rehabilitation exercises, and providing patient education and support is vital to help patients understand their condition and the treatment process.

Limitations

The incompleteness of medical records is one limitation of this study. Furthermore, the study had a small sample size and was conducted in a single center. Hence we recommend a multicenter study with a robust sample size.

Acronyms and Abbreviations

TASH - Tukur Anbessa Specialized Hospital, ER-emergency room, FDA-falling down accident, GCS-

Glasgow Coma Scale, OR-Operating Room, RTA-road traffic accident, UK- United Kingdom, V/S-vital sign, ZMH-Zewuditu Metassebia Hospital

Ethical Clearance

Ethical clearance was obtained from the research review board of Addis Ababa University. Official letter for cooperation was sent to TASH. As this was a Phone call based study, verbal informed consent was given by study participants. Participant data were kept confidential and were only used for the study purpose.

Consent for publication

Not applicable

Availability of data and materials

All necessary information was included in the manuscript.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MY, BL, RM, and AE, conceived the idea and designed the study; led data analysis and interpretation; developed the first draft of the manuscript and made all revisions based on coauthors comments and suggestions. MY, BL, RM, and AE, critically revised the manuscript for important intellectual content; ensured the requirements of submission of the manuscript are met. MY, BL, RM, and AE, contributed towards analysis and data interpretation; revision and editing of the manuscript. All authors read and agreed to final version of the manuscript for publication.

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