Pattern of Mandibular Fractures Resulting from Fall

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ABSTRACT

Objective	To find out the pattern of mandibular fractures resulting from fall among patients presenting to a tertiary care hospital.
Study design	Cross-sectional observational study.
Place & Duration of study	Department of Oral and Maxillofacial Surgery, Jinnah Postgraduate Medical Centre (JPMC) Karachi, from June 2025 to November 2025.
Methods	The non-probability consecutive sampling was applied to 100 patients aged 18-60 years with mandibular fractures due to falls. Trauma resulting from any other mechanism and causing fractures and other injuries as well as those with preexisting bone diseases, were excluded. Data were collected related to the demographic variables pattern of fall, anatomical location of fractures and number of fractures. Chi square test was applied to find out any significant association between the variables. A p value of <0.05 was taken as significant.
Results	The mean age of the patients was 35.45±12.49 years. Most of the patients (73.6%) were older than 25-years. Males comprised of 70.9% of the study population. The most common cause of injury was falls from a height of less than 3-meters (31.8%), followed by falls from greater heights (30.9%), stumbling or slipping (27.3%), and fall from stairs (10.0%). Single fractures were more common (57.3%). The most frequently involved anatomical sites were the condyle (23.6%) and parasymphysis area (20.9%), followed by the angle (18.2%), body (17.3%), symphysis (10.9%), and dentoalveolar region (9.1%). There was no statistically significant association between fracture type and age (p=0.254) or gender (p = 0.323).
Conclusion	Falls from a low height were the leading cause of mandibular fractures. Males in their middle-age were most commonly affected.
Key words	Accidental falls, Mandibular fractures, Facial injuries.

INTRODUCTION:

Falls remain a major cause of morbidity and financial burden in modern healthcare system, particularly with the increasing elderly population.[1] The costs associated with fall-related injuries extend beyond the initial treatment, encompassing expenses for routine follow-ups and long-term management. Among facial bones, the mandible is one of the most frequently fractured bone, accounting for approximately 29% of facial fractures in the United States between 2007 and 2015.[2] Mandible is the strongest and only movable bone of the facial skeleton. The incidence of mandibular fractures has risen in recent years.[3] The mandible ranks as the second most commonly fractured facial bone and the tenth most frequently fractured bone in the human body.[4, 5]

Fall is a common mechanism of injury. Facial bone fractures due to falls are reported in up to 36% of

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cases.[6] Other mechanism include road traffic accidents, firearm injuries, assaults, sports-related trauma, and industrial accidents.[7] Previous studies have reported that ground-level falls are the most frequent cause of mandibular fractures, accounting for 43.3% of cases. [8] The trend and occurrence of falls and associated mandibular fractures vary in different geographical regions due to the lifestyle, work risks, environmental risks, and social determinants. In geriatric population age-related imbalance, osteoporosis, and comorbid conditions also contribute to occurrence of fractures.[9,10] Different pattern of fractures are reported in literature including from Pakistan.[11,12] However, prospective data from our region remain limited. A comprehensive information is needed to plan preventive and treatment strategies for the local population. This prospective study was conducted to provide an evidence based data from a tertiary care hospital. It is expected to contribute in creating awareness and developing preventive strategies at a community level and provision of facilities required for the treatment and rehabilitation so as to improve quality of life of the affected individuals.

METHODS:

Study design, place & duration: A cross-sectional observational study was conducted in the Department of Oral and Maxillofacial Surgery at Jinnah Postgraduate Medical Centre Karachi, from June 2025 to November 2025.

Ethical considerations: The study was approved by IRB of Jinnah Postgraduate Medical Centre Karachi (IRB: NO.F.2-81/2025-GENL/313/JPMC). Informed consent was obtained from the patients.

Inclusion and exclusion criteria: Patients aged between 18 and 60 years of either gender who presented with mandibular fractures resulting from falls at the outpatient department were included in the study. Patients with mandibular fractures due to other causes such as road traffic accidents, assaults, firearm injuries, sports injuries, or industrial trauma were excluded. Individuals with a history of osteoporosis, ulcerative gingivitis, Paget's disease, malignancy, systemic diseases, osteomyelitis, or any other medical condition, as determined through medical history and records, were also excluded.

Sample size estimation: The sample size was calculated as 110 using Open Epi online software, based on a prevalence of dentoalveolar fractures of 7.7%,[11] a 95% confidence level, and a 5% margin of error. A non-probability consecutive sampling technique was used.

Study protocol: A detailed history was taken and clinical examination performed. Demographic (age, gender) and clinical data (affected site (para symphysis, condyle, body, dentoalveolar, symphysis, and angle), mandibular fracture (single or multiple), and fall (stumbling, slipping, or tripping; fall from stairs; or fall from height greater or less than 3 - meters) were collected using a pre designed form.

Statistical analysis: Data were entered and analyzed using SPSS version 25.0. Descriptive statistics were applied to both quantitative and qualitative variables. Mean and standard deviation were calculated for quantitative variables such as age, while frequencies and percentages were computed for qualitative variables including gender, age group, fracture site, fracture type, and mechanism of fall. Effect modifiers such as age, gender, and fall mechanism were controlled by applying the Chi-square test to assess their association with the type and site of mandibular fracture. A p-value of < 0.05 was considered statistically significant.

RESULTS:

A total of 110 patients were included in the study. The mean age of the patients was 35.45±12.49 years. Most of the patients (n=81 - 73.6%) were above 25-years of age, while 26.4% were 25 years or younger. Males were more frequently affected (n=78 - 70.9%). Details are given in table I. The most common cause of injury was a fall from a height of less than 3-meters (n=35 - 31.8%), followed by falls from heights greater than 3-meters (n=34 - 30.9%). Single fracture were more frequent (n=63 - 57.3%). The most common anatomical sites of mandibular fractures were the condyle (n=26 - 23.6%) and parasymphysis (n=23 - 20.9%). Details are given in table II.

The association between type of fracture and patients' age and gender was evaluated. Although multiple fractures were slightly more frequent among patients aged =25 years compared to those older than 25 years but the association between age and fracture type was not statistically significant (x^2=1.31 -p=0.254). Similarly, no significant association was found between gender and type of fracture (x^2=0.975 - p=0.323). This is shown in table III.

DISCUSSION:

The present study described the demographic patterns, mechanisms, and anatomical distribution of mandibular fractures resulting from falls. The findings were generally in agreement with previously

Table I: Demographic Characteristics of Patients (n = 110)

Variable	Categories	Frequency (n)	Percentage (%)
Age (years)	Mean 35.45±12.49		
	<25 years	29	26.4
	>25 years	81	73.6
Gender	Male	78	70.9
	Female	32	29.1

Table II: Type of Fall, Number and Anatomical Location of Fractures

Variable	Categories	Frequency (n)	Percentage (%)
Type of fall	Due to stumbling, slipping, or tripping	30	27.3
	From stairs	11	10.0
	Fall from height > 3 meters	34	30.9
	Fall from height < 3 meters	35	31.8
Type of Fracture	Single	63	57.3
	Multiple	47	42.7
Site of Fracture	Parasymphysis	23	20.9
	Condyle	26	23.6
	Body	19	17.3
	Dentoalveolar	10	9.1
	Symphysis	12	10.9
	Angle	20	18.2

Table III: Association of Type of Fracture with Age and Gender of the Patients

Variable	Type of Fracture		Test of Significance
	Single (n=63)	Multiple (n=47)	
Age (years)			
<25 years	14 (22.2)	15 (31.9)	X^2=1.31 -
>25 years	49 (77.8)	32 (68.1)	p=0.254
Gender			
Male	47 (74.6)	31 (66.0)	X^2=0.975
Female	16 (25.4)	16 (34.0)	p=0.323

reported data, although some differences were observed that may reflect local population characteristics and the specific inclusion of fall-related injuries only.[13] In this study, the mean age of the patients was 35.45±12.49 years with male predominance. This is consistent with earlier reports where male preponderance in mandibular fracture cases, typically involving young to middle-aged adults who were more likely to engage in outdoor and labor-intensive activities were reported.[14-16]

The most common cause of injury in our cohort was a fall from a height of less than 3-meters followed by stumbling, slipping, or tripping. Roccia et al found that low-height falls and slips were significant contributors to mandibular trauma, especially among non-assault cases, where chin impact often resulted in condylar and symphyseal fractures.[17] Another study reported that condylar process fractures were the most frequent mandibular injuries following falls, highlighting the biomechanical mechanism of indirect chin impact transmission.[18] Regarding anatomical site distribution, the condyle and parasymphysis were the most commonly involved regions in our study. These findings align with other studies where a high incidence of condylar involvement in fall-related mandibular trauma were reported.[19-22] This is attributed to the fall-induced impacts compared to road traffic accidents in which more frequently angle and body fractures are reported.

In the present study, single fractures were slightly

more frequent than multiple fractures. These findings are consistent with the observations of another study based upon the Swiss cohort where isolated fractures were more frequent than multiple fractures.[23] Similar findings were reported by other researchers.[16,17] It is suggested that the mechanism and energy of impact, rather than demographic variables alone, determine the multiplicity of fractures.

The results of the index study are aligned with the general epidemiological studies of maxillofacial trauma that highlight the increasing significance of falls as a primary cause of mandibular fractures. Lee et al indicated that falls had overtaken road traffic accidents in some areas, especially in urban and aging communities, and the existence of condylar fractures in fall-related injuries was disproportionately represented.[24] Their research also indicated that mandibular fractures associated with falls are usually attributed to the forward effects and insufficiency of protective reflexes, which support the biomechanical concept of the prevalence of condylar and parasymphysis fractures in our cohort. This also supports the necessity of specific fall-prevention measures and the organized patient education, particularly in the high-risk demographic categories as revealed in the current study.

Limitations of the study: The study was conducted in a single center with cross-sectional design that limits external validity as well as fails to establish causal inferences. The use of self-reported mechanisms of injury could lead to a bias. There was also the risk of omission of other age groups and factors that could not be measured like the quality of the bone and the dynamics of fall.

CONCLUSION:

Falls, especially from low-height were the important etiological factor of mandibular fractures. The most commonly affected anatomical location were the condylar and parasymphysis parts. Middle-aged males were more frequently affected.

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Article received on: 10-02-2026
Sent for revision: 28-02-2026
Revised received on: 04-03-2026
Accepted on: 10-03-2026

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All authors are responsible for data presented in this manuscript.

Ethics statement: Institution review board approval was obtained and informed consent taken for the study.

Competing interests: Authors declare that they do not have any competing interests.

Source of funding: Nil

Disclosure: None

Use of Artificial Intelligence: AI app was not used in preparation of this manuscript.

Data availability: Corresponding author can provide data on request.

How to cite this article?
Ahmed Z, Alam J, Saddique A, Shah R, Azhar MS, Rehman MU. Pattern of mandibular fractures resulting from fall. J Surg Pakistan. 2026; 31(1):16-21.