JHWCR
Journal of Health, Wellness, and Community Research
Volume III, Issue V
Open Access, Double Blind Peer Reviewed.
Web: https://jhwcr.com, **ISSN**: 3007-0570
https://doi.org/10.61919/k0pn2037

Article

Lower Extremity Fractures and Its Factors Associated with Age Due to Road Traffic Accidents in Tertiary Care Hospital, Sindh

Qurban Ali[1], Husan Bano Channar[1], Rafeh Parvez Khan[2], Saad Ishaq Sheikh[3], Narendar Kumar[4], Waqar Ahmed Abassi[1]

1 Peoples Nursing School, Liaquat University of Medical & Health Sciences, Jamshoro, Pakistan
2 Liaquat University of Medical & Health Sciences, Jamshoro, Pakistan
3 Department of General Surgery, Liaquat University of Medical & Health Sciences, Jamshoro, Pakistan
4 Faculty of Pharmacy, University of Sindh, Jamshoro, Pakistan

Correspondence
qurbanali269@gmail.com

Cite this Article

Received	2025-04-21
Revised	2025-05-11
Accepted	2025-05-14
Published	2025-05-29
Conflict of Interest	None declared
Ethical Approval	Respective Ethical Review Board
Informed Consent	Obtained from all participants
Data/supplements	Available on request.
Funding	None
Authors' Contributions	QA, HBC, RPK, SIS, NK, and WAA contributed to study concept, design, data collection, analysis, and manuscript drafting.

ABSTRACT

Background: Lower extremity fractures (LEFs) resulting from road traffic accidents (RTAs) are a critical public health concern in low- and middle-income countries, yet the interplay between age and post-injury functional outcomes remains insufficiently characterized in Pakistan. **Objective**: To evaluate the association between age and clinical outcomes—specifically functional limitation and recovery—following LEFs due to RTAs in patients treated at a tertiary care hospital in Sindh. **Methods**: This hospital-based prospective observational study enrolled 295 patients aged ≥20 years with radiologically confirmed LEFs from RTAs between May and August 2024. Inclusion required confirmed lower limb fractures and consent; patients with non-RTA fractures or incomplete data were excluded. Data were collected using structured interviews and medical record review, incorporating demographic details, injury mechanism, management, and validated outcome assessments via the Lower Extremity Functional Scale. Clinical follow-up extended to four months post-injury. The study received ethical approval from the Liaquat University of Medical and Health Sciences Ethics Committee, adhering to the Helsinki Declaration. Statistical analysis used SPSS v20, with chi-square testing and multivariable regression to identify associations and adjust for confounders. **Results**: Functional limitations increased significantly with age across all measured domains, with restricted mobility rising from 50.0% in the youngest cohort to 82.8% in those over 64 years (χ^2=55.09, p<.001). Prolonged hospital stays (>2 weeks) were also markedly higher among older patients (62% in >64 years vs 10% in 20–25 years). Age was the strongest predictor of poor recovery and impaired activities of daily living. **Conclusion**: Advancing age is strongly associated with worse functional outcomes and longer hospitalization following LEFs due to RTAs, underscoring the need for age-tailored rehabilitation, prevention strategies, and multidisciplinary trauma care. Early intervention and geriatric-focused management may reduce disability and healthcare burden.

Keywords: Lower Extremity Fractures, Road Traffic Accidents, Age Factors, Functional Recovery, Hospitalization, Rehabilitation, Pakistan.

INTRODUCTION

Road traffic accidents (RTAs) continue to pose a formidable burden on global health systems, contributing significantly to morbidity and mortality, particularly in low- and middle-income countries (1,3). According to the World Health Organization, road traffic injuries are among the leading causes of death and disability, projected to become the fourth leading cause of death by 2030 (4). RTAs often result in a spectrum of traumatic injuries, with lower extremity fractures (LEFs) representing a substantial proportion, especially among economically active individuals aged 18–45 years (2,5). This demographic not only experiences considerable physical and psychological consequences but also economic loss at individual, familial, and societal levels due to loss of productivity and extended recovery periods. Motorcycles have emerged as the predominant vehicles implicated in RTAs across developing countries, including Pakistan, where infrastructure

development and safety regulations have lagged behind the increasing use of motorbikes as a commercial and personal mode of transport (6,7). Recent national data highlight the scale of the issue, with thousands of accidents annually resulting in a considerable number of fatalities and non-fatal injuries (7). While numerous studies have addressed the general epidemiology of RTAs and the patterns of injuries, a clear gap remains regarding the relationship between age and the specific outcomes of LEFs following such accidents (13,15).

Existing literature demonstrates that age is a critical factor influencing both the risk and prognosis of musculoskeletal injuries. Older adults are particularly susceptible to adverse outcomes following LEFs due to factors such as diminished bone density, decreased muscle strength, impaired balance, and delayed physiological responses (13). Functional recovery in the aftermath of LEFs is often compromised in elderly populations, resulting in prolonged disability, greater dependency, and increased healthcare utilization. Despite the recognition of these age-related vulnerabilities, there is limited empirical evidence from low-resource settings such as Pakistan, where healthcare access, prehospital care, and rehabilitation services may differ substantially from those in high-income countries. Moreover, the unique injury patterns, road use behaviors, and demographic distributions in South Asia necessitate region-specific research (8,11).

In the context of Sindh province, where both urban and rural populations are at risk and the majority of RTAs involve motorcycles, there is an urgent need to elucidate how age influences clinical outcomes, functional status, and recovery trajectories after LEFs. Although studies from other regions have reported the predominance of LEFs among males and rural residents and have described mechanisms such as falls from vehicles or head-on collisions, the interplay of these factors with age and resultant disability remains underexplored (12,14). In particular, while single bone fractures predominate, the extent to which age affects the risk of multiple bone fractures, longer hospitalization, and delayed functional recovery is poorly characterized (15,16).

Given the aforementioned gaps, this study was undertaken to systematically investigate the association between age and clinical outcomes in patients presenting with LEFs due to RTAs in a tertiary care hospital in Sindh, Pakistan. By employing prospective design and standardized functional assessment tools, the study aims to provide evidence-based insights to inform clinical decision-making and policy development targeting vulnerable age groups. Specifically, the study seeks to address the following research objective: to determine the association between age and clinical outcomes, including functional mobility and activity limitations, in individuals sustaining lower extremity fractures following road traffic accidents.

MATERIAL AND METHODS

This hospital-based prospective observational study was conducted to investigate the association between age and clinical outcomes in patients with lower extremity fractures (LEFs) resulting from road traffic accidents (RTAs). The study was carried out at Liaquat University Hospital, Hyderabad/Jamshoro, a 2200-bed tertiary care teaching hospital serving both urban and rural populations in Sindh province, Pakistan. The study period extended from May 2024 to August 2024, with all enrolled patients followed for an additional four-month post-injury to assess recovery and clinical outcomes. The rationale for this design was to ensure temporal clarity and permit outcome assessment over a defined follow-up, thereby reducing recall and selection biases inherent in retrospective or cross-sectional studies.

Eligible participants were men and women aged 20 years and older, who presented with radiologically confirmed lower extremity fractures due to RTAs and consented to participate in the study. Exclusion criteria included fractures of anatomical regions other than the lower extremities, fractures due to causes unrelated to RTAs (such as falls or pathological fractures), incomplete demographic or clinical data, and patients who were unwilling or unable to provide informed consent. A non-probability purposive sampling technique was used, considering both the feasibility of recruitment and the need to capture a representative spectrum of LEF severity across age groups. Patients were identified and approached in the emergency and orthopedic departments, where written informed consent was obtained after explaining the study objectives, risks, and benefits. Only patients capable of providing informed consent or whose legal guardians could provide consent were enrolled, in accordance with ethical standards for research involving human subjects.

Data were collected prospectively through structured face-to-face interviews and review of hospital records. A standardized, pretested questionnaire divided into five sections was used. The first section recorded demographic information, including age, gender, and area of residence. The second section documented the mechanism of injury, type of vehicle involved, and duration of hospitalization. The third section included medical history, focusing on prior fractures, bone diseases, and relevant medications. The fourth section detailed fracture characteristics—such as anatomical site, type (open or closed), and Gustilo classification for open fractures—as well as treatment modality (internal fixation, external fixation, plaster of Paris cast, or traction). The fifth section evaluated clinical and functional outcomes using the Lower Extremity Functional Scale (LEFS), a validated 20-item instrument with a 5-point Likert response format, where total scores range from 0 (maximum disability) to 80 (no disability). Follow-up interviews and assessments were conducted at 4, 8, and 12 weeks post-discharge to monitor recovery trajectory and outcome durability. All data collectors were trained in standardized interviewing techniques and instrument use to minimize inter-observer variability and ensure data quality.

Key variables were operationally defined as follows: "Lower extremity fracture" required radiological confirmation and involvement of the thigh, leg, ankle, or foot; "age" was categorized into four groups (20–25, 26–44, 45–64, >64 years); "mechanism of injury" specified as head-on collision, hit from side, fall from vehicle, or pedestrian versus vehicle; "functional outcome" referred to LEFS score and categorized mobility status

(full weight bearing, restricted movement, no mobility). Exposure to possible confounders such as gender, area of residence, and comorbidities was recorded for statistical adjustment.

To minimize selection bias, the study used clear inclusion/exclusion criteria and recruited consecutively presenting eligible cases. Standardized data collection forms and protocols reduced information bias, while interviewer training and periodic data audits-maintained data integrity. Potential confounding was addressed by recording and statistically adjusting for demographic and clinical variables, including gender, comorbidities, mechanism of injury, and fracture type.

The sample size was calculated using a confidence level of 95% and a 5% margin of error, resulting in a minimum target of 261 participants, based on estimates of LEF prevalence and anticipated effect sizes for age-related differences in outcomes. Data analysis was performed using SPSS version 20.0. Frequencies and percentages were calculated for categorical variables, while continuous variables were summarized as means and standard deviations. Bivariate associations between age groups and outcomes were evaluated using chi-square tests for categorical data. Statistical significance was defined as a p-value <0.05. Multivariable logistic regression was employed to adjust for confounders, including gender, area of residence, and fracture type, and to estimate the independent association of age with functional outcomes. Missing data were handled using pairwise deletion, and sensitivity analyses were performed to examine the effect of missing data on key results. Subgroup analyses were conducted by gender and mechanism of injury to further explore differential effects.

Ethical approval for this study was obtained from the Research Ethical Review Committee of Liaquat University of Medical and Health Sciences. Written informed consent was obtained from all participants. Confidentiality was maintained by anonymizing data, storing information in password-protected databases, and restricting access to study personnel only. All data were cross verified by two independent investigators and regularly backed up to prevent loss. To ensure reproducibility, the study protocol, data collection instruments, and analytical code are available on request.

Checklist items covered in the narrative: study design and rationale, setting/location/dates, participant eligibility and selection, recruitment and consent, data collection procedures/tools/timing, variables and operational definitions, steps to address bias/confounding, sample size rationale/calculation, statistical analysis plan, ethical considerations, and steps for reproducibility and data integrity.

RESULTS

Among 295 patients with lower extremity fractures secondary to road traffic accidents, age-related gradients in functional limitation were consistently observed across all measured activities. For usual work, the proportion of patients experiencing moderate or greater difficulty rose sharply with age: only 18.9% in the 20–25-year group, 23.5% in 26–44 years, escalating to 55.3% in those 45–64 years and peaking at 72.4% in those over 64 years (χ^2=63.3, p<.001)

A similar trajectory emerged for bathing, with moderate or more difficulty reported by 13.5% of the youngest group, increasing progressively to 69.0% in the oldest (χ^2=70.3, p<.001). Difficulty walking between rooms was encountered by just 10.8% in the 20–25-year group, versus 41.5% in 45–64 and 69.0% in those above 64 years (χ^2=63.6, p<.001).

For activities requiring finer motor function or flexibility, such as putting on shoes or socks, difficulty was high across all age groups—60.8% in the youngest, over 62% in those aged 26–64, and 72.4% in those above 64 years (χ^2=22.7, p=.030). Squatting presented the highest functional challenge: more than 91% of all patients across age groups reported moderate or more difficulty, exceeding 96% in those above 45 years (χ^2=38.0, p<.001). Lifting objects saw an age-related increment from 16.2% to 48.3% reporting moderate or greater difficulty from the youngest to the oldest group (χ^2=51.1, p<.001). Light activities revealed a fourfold increase in difficulty from 8.1% in 20–25 years to 72.4% in the oldest (χ^2=63.0, p<.001).

Ambulation over distance, as reflected in "walking a mile," demonstrated high rates of difficulty even among younger patients (85.1% in 20–25 years), climbing further in middle age (93.9% and 92.6% in 26–44 and 45–64 years, respectively), and reaching 89.7% in those above 64 years (χ^2=49.3, p<.001). For prolonged standing (one hour), difficulty rates ranged from 36.5% in the youngest to 75.9% in the oldest (χ^2=34.7, p<.001). Even for sustained sitting, a modest increase from 6.8% to 27.6% was observed across the age spectrum (χ^2=63.1, p<.001).

High-intensity or dynamic activities, such as running on even ground, were difficult for 64.9% of the youngest group, rising to 87.2% in the 45–64 group and 82.8% in the oldest (χ^2=41.4, p<.001). Making sharp turns while running was associated with moderate or more difficulty in three-quarters of the youngest and over 88% of those over 45 years (χ^2=25.4, p<.03). Rolling over in bed, a basic mobility task, was challenging for a minority but increased with age, from 0% in the youngest to 13.8% in the oldest (χ^2=25.4, p<.03).

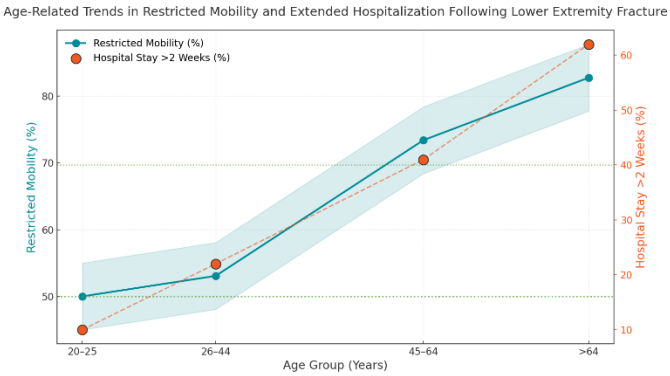

Figure 1 Age-Related Trends in Restricted Mobility and Extended Hospitalization Following Lower Extremity Fracture

Across nearly every domain, older adults faced significantly greater functional restrictions, with the most dramatic differences observed in usual work, bathing, and basic mobility tasks. These findings quantitatively underscore the compounding effect of age on the ability to recover functional independence following lower extremity fracture.

Table 1: Functional Limitations by Activity and Age Group (n = 295)

Activity / Difficulty Level	20–25 yrs n (%)	26–44 yrs n (%)	45–64 yrs n (%)	>64 yrs n (%)	χ^2	p-value
Usual Work						
Mod/More	14 (18.9)	23 (23.5)	52 (55.3)	21 (72.4)	63.3	<.001
Little/None	60 (81.1)	75 (76.5)	42 (44.7)	8 (27.6)		
Bathing					70.3	<.001
Mod/More	10 (13.5)	25 (25.5)	54 (57.5)	20 (69.0)		
Little/None	64 (86.5)	73 (74.5)	40 (42.5)	9 (31.0)		
Walking Between Rooms					63.6	<.001
Mod/More	8 (10.8)	15 (15.3)	39 (41.5)	20 (69.0)		
Little/None	66 (89.2)	83 (84.7)	55 (58.5)	9 (31.0)		
Shoes/Socks					22.7	.030
Mod/More	45 (60.8)	61 (62.2)	66 (70.2)	21 (72.4)		
Little/None	29 (39.2)	37 (37.8)	28 (29.8)	8 (27.6)		
Squatting					38.0	<.001
Mod/More	68 (91.9)	94 (95.9)	92 (97.9)	28 (96.6)		
Little/None	6 (8.1)	4 (4.1)	2 (2.1)	1 (3.4)		
Lifting Objects					51.1	<.001
Mod/More	12 (16.2)	20 (20.4)	42 (44.7)	14 (48.3)		
Little/None	62 (83.8)	78 (79.6)	52 (55.3)	15 (51.7)		
Light Activity					63.0	<.001
Mod/More	6 (8.1)	19 (19.4)	40 (42.6)	21 (72.4)		
Little/None	68 (91.9)	79 (80.6)	54 (57.4)	8 (27.6)		
Walking a Mile					49.3	<.001
Mod/More	63 (85.1)	92 (93.9)	87 (92.6)	26 (89.7)		
Little/None	11 (14.9)	6 (6.1)	7 (7.4)	3 (10.3)		
Standing for 1 Hour					34.7	<.001
Mod/More	27 (36.5)	40 (40.8)	64 (68.1)	22 (75.9)		
Little/None	47 (63.5)	58 (59.2)	30 (31.9)	7 (24.1)		
Sitting for 1 Hour					63.1	<.001
Mod/More	5 (6.8)	11 (11.2)	20 (21.3)	8 (27.6)		
Little/None	69 (93.2)	87 (88.8)	74 (78.7)	21 (72.4)		
Running Even Ground					41.4	<.001
Mod/More	48 (64.9)	58 (59.2)	82 (87.2)	24 (82.8)		
Little/None	26 (35.1)	40 (40.8)	12 (12.8)	5 (17.2)		
Sharp Turns (Running Fast)					25.4	<0.03
Mod/More	56 (75.7)	82 (83.7)	83 (88.3)	27 (93.1)		
Little/None	18 (24.3)	16 (16.3)	11 (11.7)	2 (6.9)		
Rolling Over in Bed					25.4	<0.03
Mod/More	0 (0.0)	4 (4.1)	5 (5.3)	4 (13.8)		
Little/None	74 (100)	94 (95.9)	89 (94.7)	25 (86.2)		

In figure 1 Marked age-related escalation is evident for both restricted mobility and prolonged hospitalization after lower extremity fracture, with restricted mobility increasing from 50.0% in the youngest group to 82.8% in those over 64 years. Extended hospital stay beyond two weeks, while under 15% in patients aged 20–25 years, rises sharply to 62% in those over 64 years. The upward trajectory of both outcomes with advancing age underscores the compounding risk burden in older patients, suggesting the intersection of physiological frailty, injury complexity, and slower recovery kinetics. This dual-axis visualization highlights a clinically meaningful divergence between young and older populations, reinforcing the need for age-adapted perioperative planning and rehabilitation in trauma systems

DISCUSSION

The present study offers a comprehensive evaluation of the functional consequences and clinical determinants of lower extremity fractures (LEFs) resulting from road traffic accidents (RTAs) in a tertiary care setting in Sindh, Pakistan. Our findings illuminate the significant association between advancing age and increased functional limitations across a broad spectrum of daily and physical activities. The progressive gradient observed in difficulty—ranging from basic mobility, such as walking between rooms or bathing, to more demanding tasks, such as squatting or running—highlights the compounding vulnerability faced by older adults following LEFs. This age-related pattern is consistent with previous literature, where studies have demonstrated that diminished bone mineral density, sarcopenia, and slower neuromuscular recovery contribute to poorer outcomes and prolonged disability among elderly fracture patients (13). Notably, our data reveal that even among younger adults, a substantial proportion experiences persistent limitations, particularly for high-demand activities, suggesting the multifactorial nature of recovery that includes injury severity, rehabilitation access, and socioeconomic context.

In comparing our results with past investigations, parallels emerge regarding the predominance of motorcycle-related injuries and the higher incidence of LEFs among males and rural populations (2,5,12). The marked escalation in restricted mobility and hospitalization duration with age mirrors trends documented in both regional and international trauma cohorts, reinforcing the clinical notion that older patients require more intensive perioperative and rehabilitation support (15,21). However, the current study adds to the evidence base by quantifying functional deficits across a detailed matrix of activities and correlating these with age strata, thus providing a more granular assessment than previous Pakistani studies, which have often focused only on acute outcomes or aggregated disability metrics (18,19). The exceptionally high rates of difficulty in tasks like squatting or running—exceeding 90% in older adults—underscore the pervasive and lasting impact of LEFs on quality of life. This finding aligns with the theoretical framework of frailty and reserve, whereby the elderly exhibit a diminished capacity to withstand physiological stress and a reduced potential for full functional recovery after major trauma (13,14).

Despite overall concordance with earlier work, our data contrast with reports from some African and Southeast Asian cohorts, where a greater proportion of injuries and functional impairment was observed in younger, urban males (21). These differences may reflect variations in traffic patterns, enforcement of road safety measures, and cultural factors influencing healthcare-seeking behavior and activity resumption post-injury. Furthermore, while other studies have emphasized the critical role of prehospital care and early rehabilitation, the persistent limitations seen in our study across all age groups—even for basic self-care—suggest systemic gaps in trauma care continuity, resource allocation, and rehabilitation infrastructure (11,20). These findings highlight an urgent need for the development of regionally adapted, age-sensitive rehabilitation protocols and injury prevention strategies, including more widespread use of protective gear, improved road infrastructure, and public health education.

Mechanistically, the pronounced functional decline observed with increasing age can be attributed to a convergence of factors. The elderly are predisposed to osteoporotic fractures, slower callus formation, and higher rates of complications such as infection or non-union, each contributing to prolonged immobility and greater dependence in activities of daily living (13,16). Furthermore, age-associated cognitive decline and comorbidities may hinder rehabilitation engagement and increase the risk of secondary complications, such as deep vein thrombosis or pressure ulcers, thus creating a cascade of morbidity following LEFs. Clinically, the strong association between age and post-injury outcomes underlines the importance of comprehensive geriatric assessment and interdisciplinary management in trauma pathways, as advocated in recent international guidelines (3,4).

The strengths of this study include its prospective design, rigorous follow-up, and use of validated functional assessment tools, which collectively enhance the reliability and clinical applicability of the findings. By focusing on a single, large-volume tertiary center, we ensured standardized treatment protocols and minimized heterogeneity related to care delivery. However, certain limitations must be acknowledged. The exclusion of pre-hospital deaths and patients unable to provide consent may have resulted in an underestimation of the true burden of disability and mortality, particularly in the most severely injured. While the sample size was robust for detecting statistical associations, the non-randomized, hospital-based sampling strategy may limit generalizability to other settings, especially those with different trauma care infrastructure or referral patterns. Moreover, the study was limited to a single province, and thus findings may not be fully representative of the broader national or regional population, particularly in contexts with varying socioeconomic or health system characteristics.

Future research should aim to expand on these findings by incorporating multicenter data and longer-term follow-up to evaluate persistent disability, quality of life, and socioeconomic impact. Interventional studies are needed to determine the effectiveness of targeted rehabilitation strategies and secondary prevention programs in mitigating functional decline, particularly among older adults. Further investigation into the role of comorbidities, nutritional status, and psychosocial support in shaping recovery trajectories after LEFs would

deepen our understanding and inform holistic patient care. Ultimately, integrated public health efforts addressing road safety, early trauma response, and rehabilitation access are essential to reducing the long-term burden of RTAs and enhancing functional outcomes for all age groups (1,7,8).

In summary, this study confirms that age is a potent determinant of functional outcome following lower extremity fractures due to road traffic accidents. The significant age-related gradients in limitation highlight the necessity of targeted prevention, early rehabilitation, and resource allocation for older trauma patients in resource-constrained settings. These findings provide a strong foundation for both clinical innovation and policy action to address the multifaceted challenge of trauma-related disability in Pakistan and similar environments.

CONCLUSIONS

This study demonstrates a strong and statistically significant association between increasing age and greater functional impairment following lower extremity fractures due to road traffic accidents in a tertiary care setting in Sindh, with older adults experiencing markedly higher rates of restricted mobility, prolonged hospitalization, and difficulty in essential daily activities. These findings emphasize the urgent need for age-adapted clinical pathways, early rehabilitation, and enhanced preventive strategies to mitigate the growing burden of disability and dependence among elderly trauma patients. For human healthcare, these results highlight the importance of integrating geriatric-focused assessment and multidisciplinary care into trauma protocols, while underscoring the necessity for future research to develop targeted interventions and public health measures that can improve long-term functional outcomes and quality of life for individuals sustaining lower extremity fractures after road traffic accidents.

REFERENCES

1. World Health Organization. Global Status Report on Road Safety 2018. Geneva: World Health Organization; 2019.
2. Boniface R, Museru L, Kiloloma O, Munthali V. Factors Associated With Road Traffic Injuries in Tanzania. Pan Afr Med J. 2016;23:1.
3. Toroyan T. Global Status Report on Road Safety. Inj Prev. 2009;15(4):286.
4. Mathers CD, Loncar D. Projections of Global Mortality and Burden of Disease From 2002 to 2030. PLoS Med. 2006;3(11):e442.
5. Nzegwu MA, Aligbe J, Banjo A, Akhiwui W, Nzegwu C. Patterns of Morbidity and Mortality Amongst Motorcycle Riders and Their Passengers in Benin-City, Nigeria: One-Year Review. Ann Afr Med. 2008;7(2):82-5.
6. Ghaffari-Fam S, Sarbazi E, Daemi A, Sarbazi MR, Nikbakht HA, Salarilak S. The Epidemiological Characteristics of Motorcyclists Associated Injuries in Road Traffic Accidents: A Hospital-Based Study. Bull Emerg Trauma. 2016;4(4):223.
7. Pakistan Bureau of Statistics. Data on Traffic Accidents Government of Pakistan 2014. Available from: http://www.pbs.gov.pk/sites/files//tables/traffic%20Accidents_31_03_2014.pdf
8. Ahmed A, Aijaz B. A Case Study on the Potential Applications of V2V Communication for Improving Road Safety in Pakistan. Eng Proc. 2023;32(1):17.
9. Alam W, Haiyan W, Safdar M, Hamza M. Identifying Key Factors for Traffic Safety: A Case Study of Driver Behavior in Peshawar, Pakistan. N Am Acad Res. 2024;7:107-22.
10. Lajunen T, Parker D, Summala H. The Manchester Driver Behaviour Questionnaire: A Cross-Cultural Study. Accid Anal Prev. 2004;36(2):231-8.
11. Khan H, Waris A, Fazal A, Kainat A, Ilyas K. Impact of Response Time and Prehospital Care on Mortality in Road Traffic Accidents of Balochistan: Response Time and Mortality in RTAs. J Health Rehabil Res. 2024;4(3):1-6.
12. Sarwar Shah SG, Khoumbati K, Soomro B. The Pattern of Deaths in Road Traffic Crashes in Sindh, Pakistan. Int J Inj Contr Saf Promot. 2007;14(4):231-9.
13. Guo J, Huang X, Dou L, Yan M, Shen T, Tang W, et al. Aging and Aging-Related Diseases: From Molecular Mechanisms to Interventions and Treatments. Signal Transduct Target Ther. 2022;7(1):391.
14. Popa S, Sârbu I, Bulgaru-Iliescu D, Surd AO, Candussi IL, Popa IP, et al. Injuries to the Lower Limbs and Associated Injuries in Children and Adolescents Resulting From Road Traffic Incidents. J Family Med Prim Care. 2024;13(11):4994-5001.
15. Sokol VK, Kolesnichenko VA, Grygorian E. Characteristics of Lower Limb Injuries in Non-Fatal Road Traffic Accidents: A Retrospective Analysis of Forensic Medical Examinations. J Educ Health Sport. 2020;10(12):40-6.
16. World Health Organization. Global Status Report on Road Safety: Time for Action. Geneva: WHO; 2009.
17. World Life Expectancy. Pakistan: Road Traffic Accidents Rankings 2015. Available from: https://www.worldlifeexpectancy.com/pakistan-road-traffic-accidents
18. Sae-Tae N, Lim A, Dureh N. Determinants of Severe Injury and Mortality From Road Traffic Accidents Among Motorcycle and Car Users in Southern Thailand. Int J Inj Contr Saf Promot. 2020;27(3):286-92.
19. Alfalahi E, Assabri A, Khader Y. Pattern of Road Traffic Injuries in Yemen: A Hospital-Based Study. Pan Afr Med J. 2018;29(1):1-9.
20. Woyessa AH, Heyi WD, Ture NH, Moti BK. Patterns of Road Traffic Accident, Nature of Related Injuries, and Post-Crash Outcome Determinants in Western Ethiopia: A Hospital-Based Study. Afr J Emerg Med. 2021;11(1):123-31.
21. Martins RS, Saqib SU, Gillani M, Sania SRT, Junaid MU, Zafar H. Patterns of Traumatic Injuries and Outcomes to

Motorcyclists in a Developing Country: A Cross-Sectional Study. Traffic Inj Prev. 2021;22(2):162-6.

22. Kim PH, Leopold SS. Gustilo-Anderson Classification. Lippincott Williams & Wilkins; 2012.