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FREQUENCY OF SCAPHOID FRACTURES AND ITS OUTCOME IN PATIENTS PRESENTING TO ORTHOPEDICS UNIT MTI GOMAL MEDICAL COLLEGE DERA ISMAIL KHAN

Original Research

Shahab Falak[1]*, Muhammad Shafiq[2], Irfan Khan[3], Zia Ullah[3], Maab Falak[4], Altaf Ahmad[5], Ahmad Daud[6], Muhammad Sani[1], Ahmad Mustafa[1], Naveed Ullah[1], Maarij Saleem[1]
[1]PGR Orthopedic Surgery, DHQ Hospital, Dera Ismail Khan, Pakistan.
[2]Professor Orthopedic Surgery, DHQ Hospital, Dera Ismail Khan, Pakistan.
[3]PGR Orthopedic Surgery, Khyber Teaching Hospital, Peshawar, Pakistan.
[4]Northwest School of medicine, Peshawar, Pakistan.
[5]Medical officer, Orthopedic Surgery, DHQ Hospital, Dera Ismail Khan, Pakistan.
[6]PGR Medicine, DHQ Hospital, Dera Ismail Khan, Pakistan.
Corresponding Author: Shahab Falak, PGR Orthopedic Surgery, DHQ Hospital, Dera Ismail Khan, Pakistan. drshahabfalak@gmail.com
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ABSTRACT

Background: Scaphoid fractures are the most common carpal bone fractures, often resulting from falls on an outstretched hand. Due to its unique blood supply and anatomical structure, delayed diagnosis can lead to complications such as nonunion, avascular necrosis, and post-traumatic arthritis. Despite the prevalence of these fractures, there is a lack of comprehensive local data, leading to reliance on international literature that may not fully represent regional demographics, injury mechanisms, and healthcare accessibility.

Objective: To determine the frequency and clinical outcomes of scaphoid fractures in patients presenting to the orthopedic unit of MTI Gomal Medical College, Dera Ismail Khan.

Methods: This prospective cross-sectional study was conducted at the Department of Orthopedics, MTI Gomal Medical College, Dera Ismail Khan, from July 2, 2024, to December 25, 2024. A total of 115 patients of both genders, aged 18–60 years, presenting with wrist pain following hand trauma, were included. Patients with prior wrist injuries, arthritis, or minor avulsion fractures were excluded. Scaphoid fractures were diagnosed using CT imaging. Treatment varied based on fracture characteristics, with nondisplaced fractures managed conservatively and displaced fractures treated surgically. Functional outcomes were assessed using the Modified Mayo Wrist Score, classifying results as excellent (90–100 points), good (80–89 points), and poor (<80 points). Data were analyzed using IBM SPSS 26.0, with stratification performed based on demographic and clinical variables.

Results: The study population was predominantly male (73%). The mean patient age was 38.24±12.74 years, mean BMI was 26.24±3.01 kg/m², and mean fracture duration was 9.61±3.84 days. Scaphoid fractures were diagnosed in 16.5% (n=19) of cases. Among these, 68.4% had excellent outcomes, 26.3% had good outcomes, and 5.3% had poor outcomes. Stratification showed significant associations between scaphoid fractures and gender (p=0.028), fracture duration (p=0.017), socioeconomic status (p=0.001), education (p=0.002), and residential status (p=0.031), while treatment outcomes had no significant associations with demographic factors.

Conclusion: Scaphoid fractures, though relatively uncommon, require timely diagnosis and appropriate management to achieve favorable outcomes. The findings reinforce the importance of early intervention and standardized treatment protocols to minimize complications and optimize functional recovery.

Keywords: Bone fractures, Carpal bones, Epidemiology, Fracture healing, Orthopedic injuries, Scaphoid bone, Wrist injuries.

INTRODUCTION

The scaphoid bone, one of the eight carpal bones in the wrist, is crucial for wrist stability and function. A scaphoid fracture, defined as a break in this small but vital bone, is the most common type of carpal bone fracture, accounting for 60–80% of all such injuries (1). These fractures predominantly occur in young, active males aged 20–40 years, often resulting from a fall on an outstretched hand. The annual incidence in the general population is estimated at 2.87 per 10,000 (2). Due to the scaphoid's unique blood supply and anatomical structure, fractures are associated with a high risk of complications if not promptly diagnosed and managed. Scaphoid fractures are classified into displaced and nondisplaced fractures based on the alignment of bone fragments (3,4). The fracture site further determines its prognosis, with waist fractures being the most common and proximal pole fractures presenting greater challenges due to poor vascularity (5). One of the major clinical concerns is that scaphoid fractures are frequently missed on initial evaluation, as they often lack overt deformity and may not be evident on standard radiographs, particularly in nondisplaced cases (6). Advanced imaging techniques such as MRI and CT scans play a crucial role in confirming the diagnosis. Treatment strategies vary according to the severity and displacement of the fracture. Nondisplaced fractures are generally managed conservatively with cast immobilization for 6–12 weeks, while displaced or unstable fractures require surgical fixation to achieve proper healing (7).

Despite appropriate management, complications remain a significant concern. Nonunion, occurring in 5–20% of cases, results in persistent pain and dysfunction due to improper bone healing (8). Avascular necrosis, a serious complication, arises due to disruption of the scaphoid's retrograde blood supply, leading to bone death and subsequent functional impairment. Additionally, post-traumatic arthritis may develop over time, significantly affecting wrist mobility and strength (8). Delayed diagnosis, fracture displacement, and proximal pole involvement are all factors that negatively influence prognosis (9,10). Managing scaphoid nonunion is particularly challenging, with failure to address it leading to chronic pain, restricted movement, and grip weakness (11,12). Although scaphoid fractures are among the most frequently encountered carpal bone injuries, their frequency and clinical outcomes remain underreported in many regions, including ours. The absence of localized data creates a gap in understanding the unique demographics, injury patterns, and treatment responses of the population. Consequently, healthcare providers often rely on international data, which may not accurately reflect local variations in injury mechanisms, healthcare access, and treatment efficacy. Addressing this gap is essential to improve diagnostic accuracy, optimize treatment strategies, and enhance patient outcomes. This study aims to determine the frequency and clinical outcomes of scaphoid fractures in patients presenting to the orthopedic unit of MTI Gomal Medical College, Dera Ismail Khan. By generating region-specific evidence, the findings will contribute to improved clinical decision-making and more tailored management approaches for affected individuals.

METHODS

This prospective cross-sectional study was conducted at the Department of Orthopedics, MTI Gomal Medical College, Dera Ismail Khan, from July 2, 2024, to December 25, 2024, after obtaining ethical approval from the Institutional Review Board (IRB) and written informed consent from all participants. The sample size was calculated as 115 patients using the WHO sample size calculator, considering a 95% confidence level, a 4% margin of error, and an expected frequency of scaphoid fractures of 5% (7). Male and female patients aged 18 to 60 years who presented with wrist pain following hand trauma were enrolled. Exclusion criteria included a history of previous wrist injury or surgery, pre-existing wrist arthritis, and minor avulsion fractures. The diagnosis of scaphoid fracture was confirmed using CT scans of the hand and wrist. Management was tailored based on fracture characteristics. Nondisplaced and fresh fractures in the non-dominant hand of less active individuals were managed conservatively with casting for 2–3 months. Percutaneous screw fixation was performed in fresh fractures of less than two weeks' duration, particularly in athletes. Open reduction and internal fixation, either through a palmar or dorsal approach, was reserved for fractures older than two weeks. Displaced waist fractures requiring surgical intervention were approached from the volar side, utilizing stable screw fixation and bone grafting. Proximal pole fractures were primarily addressed through a dorsal approach. Surgical interventions were conducted under general anesthesia with a pneumatic tourniquet, adhering to standard antibiotic prophylaxis protocols. The primary goal of treatment was to achieve stable fixation for early mobilization and functional recovery.

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Patients were followed weekly for the first month, then fortnightly for the next two months. The final outcome was assessed three months post-treatment using the Modified Mayo Wrist Score. Outcomes were categorized as Excellent (90–100 points), Good (80–89 points), and Poor (<80 points). Functional recovery, along with demographic and clinical details, was recorded systematically. Data were analyzed using IBM SPSS Statistics 26.0. Categorical variables were summarized as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation. Stratification was performed based on age, gender, duration and cause of fracture, body mass index (BMI), profession, monthly income, socioeconomic status, education level, and residential background. Post-stratification analysis was conducted using the chi-square test or Fisher's exact test, with a p-value ≤0.05 considered statistically significant.

RESULTS

The mean age of the patients was 38.24±12.74 years, with a mean fracture duration of 9.61±3.84 days. The mean BMI was 26.24±3.01 kg/m², while the mean monthly income was PKR 52,207.45±23,645.92. The study population was predominantly male, comprising 73% of the participants. The most common cause of fracture was a fall, accounting for 65.2% of cases, followed by road traffic accidents (33%) and physical altercations (1.7%). Most patients (53%) were engaged in business professions, while 30.4% were unemployed, and 16.5% were salaried employees. A notable proportion (40.9%) of patients belonged to high-income families, whereas 38.3% were from middle-income and 20.9% from low-income groups. Regarding educational background, 39.1% had completed secondary education, 30.4% had primary education, 20.9% were uneducated, and 9.6% had attained higher education. The majority of patients (59.1%) were urban residents, while 40.9% lived in rural areas. Scaphoid fractures were diagnosed in 16.5% (n=19) of patients. Among these cases, treatment outcomes were classified as excellent in 68.4%, good in 26.3%, and poor in 5.3%. Stratification analysis revealed that scaphoid fractures were significantly associated with gender (p=0.028), fracture duration (p=0.017), socioeconomic status (p=0.001), education level (p=0.002), and residential background (p=0.031). However, no significant associations were found with age (p=0.636), BMI (p=0.133), cause of fracture (p=0.856), or monthly income (p=0.378). Further stratification of treatment outcomes showed no significant associations with age (p=0.574), gender (p=1.000), fracture duration (p=0.620), cause of fracture (p=0.106), BMI (p=0.443), profession (p=0.856), income (p=1.000), socioeconomic status (p=0.742), education level (p=0.730), or residential background (p=0.574).

Table 1: Demographic and clinical details of the study subjects (n=115)

Variable	Frequency	Percentage
Gender		
Male	84	73%
Female	31	27%
Profession		
Job	19	16.5%
Business	61	53%
Jobless	35	30.4%
Causes of Fall		
RTA	38	33%
Fall	75	65.2%
Fight	02	1.7%
Family Socioeconomic Status		
Low	24	20.9%

INSIGHTS-JHR
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Variable	Frequency	Percentage
Middle	44	38.3%
High	47	40.9%
Education		
Uneducated	24	20.9%
Primary	35	30.4%
Secondary	45	39.1%
Higher	11	9.6%
Residential Status		
Rural	47	40.9%
Urban	68	59.1%

Table 2: Outcome details among all the patients with scaphoid fracture (n=19/115)

Outcomes	Frequency	Percentage
Excellent	13	68.4%
Good	5	26.3%
Poor	1	5.3%
Total	19	100%

Table 3: Frequency of scaphoid fracture (stratification on the basis various effect modifiers)

Variable	Scaphoid Fracture		*p*-Value
	Yes	No	
Gender			
Male	10 (11.9%)	74 (88.1%)	0.028
Female	9 (29%)	22 (71%)	
Profession			
Job	1 (5.3%)	18 (94.7%)	0.052
Business	8 (13.1%)	53 (86.9%)	
Jobless	10 (28.6%)	25 (71.4%)	
Causes of Fall			
RTA	7 (18.4%)	31 (81.6%)	0.856
Fall	12 (16%)	63 (84%)	
Fight	0 (0%)	2 (100%)	

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

Variable	Scaphoid Fracture		*p*-Value
	Yes	No	
Family Socioeconomic Status			
Low	10 (41.7%)	14 (58.3%)	0.001
Middle	4 (9.1%)	40 (90.9%)	
High	5 (10.6%)	42 (89.4%)	
Education			
Uneducated	10 (41.7%)	14 (58.3%)	0.002
Primary	3 (8.6%)	32 (91.4%)	
Secondary	6 (13.3%)	39 (86.7%)	
Higher	0 (0%)	11 (100%)	
Residential Status			
Rural	12 (25.5%)	35 (74.5%)	0.031
Urban	7 (10.3%)	61 (89.7%)	
Age Groups			
18-40 Years	12 (17.9%)	55 (82.1%)	0.636
41-60 Years	7 (14.6%)	42 (85.4%)	
Duration of Fracture			
≤ 11 Days	2 (4.8%)	40 (95.2%)	0.017
> 11 days	17 (23.3%)	56 (76.7%)	
BMI			
≤ 25 kg/m^2	10 (23.3%)	33 (76.7%)	0.133
> 25 kg/m^2	9 (12.5%)	63 (87.5%)	
Monthly Income			
≤ 50,000 PKR	10 (20%)	40 (80%)	0.378
> 50,000 PKR	9 (13.8%)	56 (86.2%)	

Table 4: Stratification for treatment outcome of scaphoid fracture

Variable	Treatment Outcome of Scaphoid Fracture			*p*-Value
	Excellent	Good	Poor	
Gender				
Male	6 (60%)	3 (30%)	1 (10%)	1.000
Female	7 (77.8%)	2 (22.2%)	0 (0%)	

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Variable	Treatment Outcome of Scaphoid Fracture			*p*-Value
	Excellent	Good	Poor	
Profession				
Job	1 (100%)	0 (0%)	0 (0%)	0.856
Business	5 (62.5%)	2 (25%)	1 (12.5%)	
Jobless	7 (70%)	3 (30%)	0 (0%)	
Causes of Fall				
RTA	7 (100%)	0 (0%)	0 (0%)	0.106
Fall	6 (50%)	5 (41.7%)	1 (8.3%)	
Fight	0 (0%)	0 (0%)	0 (0%)	
Family Socioeconomic Status				
Low	7 (70%)	3 (30%)	0 (0%)	0.742
Middle	3 (75%)	1 (25%)	0 (0%)	
High	3 (60%)	1 (20%)	1 (20%)	
Education				
Uneducated	7 (70%)	3 (30%)	0 (0%)	0.730
Primary	2 (66.7%)	1 (33.3%)	0 (0%)	
Secondary	4 (66.7%)	1 (16.7%)	1 (16.7%)	
Higher	0 (0%)	0 (0%)	0 (0%)	
Residential Status				
Rural	9 (75%)	3 (25%)	0 (0%)	0.574
Urban	4 (57.1%)	2 (28.6%)	1 (14.3%)	
Age Groups				
18-40 Years	9 (75%)	3 (25%)	0 (0%)	0.574
41-60 Years	4 (57.1%)	2 (28.6%)	1 (14.3%)	
Duration of Fracture				
≤ 11 Days	2 (100%)	0(0%)	0(0%)	0.620
> 11 days	11 (64.7%)	5(29.4%)	1(5.9%)	
BMI				
≤ 25 kg/m^2	8 (80%)	2 (20%)	0 (0%)	0.443
> 25 kg/m^2	5 (55.6%)	3 (33.3%)	1 (11.1%)	
Monthly Income				
≤ 50,000 PKR	7 (70%)	3 (30%)	0 (0%)	1.000
> 50,000 PKR	6 (66.7%)	2 (22.2%)	1 (11.1%)	

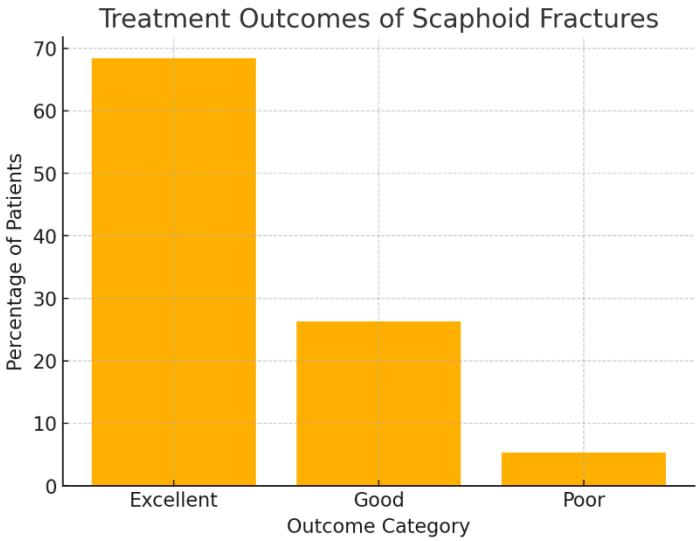

Figure 2 Treatment Outcomes of Scaphoid Fractures

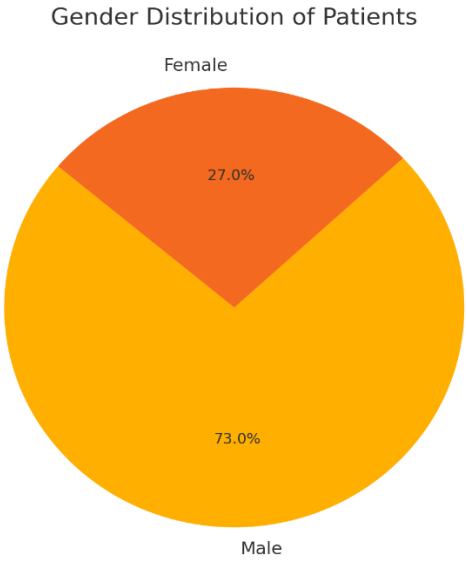

Figure 1 Gender Distribution of Patients

DISCUSSION

The findings of this study highlight that scaphoid fractures are predominantly observed in middle-aged individuals, with a mean age of 38.24±12.74 years. This aligns with established evidence suggesting that scaphoid fractures frequently occur in young to middle-aged adults due to a combination of high activity levels and age-related bone changes. The mean fracture duration of 9.61±3.84 days reflects that most patients sought medical attention in the acute phase, which is crucial for achieving optimal outcomes, as delayed diagnosis is a known risk factor for nonunion and avascular necrosis. The mean BMI of 26.24±3.01 kg/m² falls within the overweight category, suggesting that excess weight may contribute to increased fracture risk and potentially influence healing dynamics due to impaired vascularity and mechanical stress on the wrist. The average monthly income of PKR 52,207.45±23,645.92 highlights a socioeconomically diverse study population, where access to timely and quality healthcare could influence fracture management and outcomes (13). The study revealed a male predominance of 73%, which is consistent with previous reports indicating a higher incidence of scaphoid fractures in males due to increased exposure to occupational and recreational activities associated with a greater risk of falls and trauma. The most common cause of scaphoid fractures was falls (65.2%), supporting the well-established mechanism of injury where a fall on an outstretched hand results in axial loading on the scaphoid bone. Business professionals represented the largest proportion of cases (53%), suggesting that moderate occupational risks may contribute to scaphoid injuries. A substantial proportion (40.9%) of patients belonged to high-income families, which may reflect greater participation in high-impact activities, better healthcare-seeking behavior, or increased access to imaging for early diagnosis. The educational background of the study population showed that 39.1% had completed secondary education, whereas 20.9% were uneducated, emphasizing the potential influence of health awareness on timely fracture recognition and treatment. The predominance of urban residents (59.1%) compared to rural residents (40.9%) highlights possible disparities in healthcare accessibility, where urban populations may have better access to diagnostic facilities and specialized orthopedic care (14,15).

The frequency of scaphoid fractures in the study was 16.5%, which is notably higher than some previous reports, potentially due to variations in study populations and healthcare access. The treatment outcomes demonstrated an excellent prognosis in 68.4% of cases, while 26.3% had good outcomes, and only 5.3% had poor outcomes. These findings reinforce the efficacy of appropriate management strategies, particularly early diagnosis and tailored interventions. The stratification analysis indicated significant associations between scaphoid fractures and gender, fracture duration, socioeconomic status, education level, and residential background. These associations suggest that multiple biological and social determinants contribute to scaphoid fracture incidence and outcomes. Males exhibited a higher likelihood of sustaining scaphoid fractures, potentially due to differences in physical activity levels and occupational exposure. Prolonged fracture duration before treatment correlated with an increased risk of complications, emphasizing the need for early intervention. Socioeconomic and educational disparities may influence healthcare-seeking behavior, diagnostic delays, and access to

advanced treatment modalities (16). While no significant associations were found between treatment outcomes and factors such as age, gender, BMI, cause of fracture, profession, income, socioeconomic status, education, or residential status, the findings suggest that when appropriate treatment protocols are followed, favorable healing outcomes can be achieved across different demographic and socioeconomic groups. This underscores the importance of standardized, evidence-based management approaches in ensuring positive prognostic outcomes irrespective of individual patient characteristics (17).

The study findings align with previous research, supporting the male predominance, the common occurrence of waist fractures, and the necessity of surgical intervention in displaced cases. Studies conducted on large datasets have confirmed similar epidemiological patterns, where the majority of fractures occur in young males, frequently resulting from falls or road traffic accidents. Prior investigations have also emphasized the importance of early diagnosis through advanced imaging, as scaphoid fractures are often underdiagnosed on initial radiographs. The role of conservative management for nondisplaced fractures and surgical intervention for displaced or high-risk fractures has been well established, with recent studies highlighting the increasing trend toward surgical fixation to reduce complications such as nonunion and avascular necrosis. Other research has demonstrated that nonunion rates are influenced by patient factors such as occupation, with manual laborers exhibiting higher risks of nonunion due to repetitive mechanical stress on the wrist. Additionally, longitudinal studies have reported that while surgical interventions have increased over time, nonunion rates have remained relatively stable, indicating that while surgery may improve early outcomes, long-term management considerations remain critical (18-20). The strengths of this study include a thorough assessment of scaphoid fracture epidemiology and outcomes within a regional population, contributing valuable data to an area with limited prior research. The stratification analysis enhances understanding of the interplay between demographic, clinical, and socioeconomic factors, offering insights into targeted interventions for optimizing fracture management. The inclusion of both surgical and conservative treatment approaches allows for a comprehensive evaluation of outcomes across different management strategies (20).

Several limitations should be acknowledged. The study was conducted at a single center, which may limit generalizability to other settings with differing healthcare infrastructures and patient demographics. The sample size, while adequate, remains relatively small for broad epidemiological conclusions. Follow-up was restricted to three months, which may not capture long-term complications such as post-traumatic arthritis or late-onset nonunion. The absence of direct comparative analysis between conservative and surgical treatments prevents a more detailed evaluation of treatment efficacy. Additionally, the study did not incorporate imaging-based assessments of fracture healing, which could provide more objective markers of recovery. Selection bias may also be present, as patients seeking treatment at a specialized orthopedic unit may not fully represent the broader population with scaphoid fractures, particularly those in rural or low-income settings who may have limited access to advanced imaging and orthopedic care (15,17).

Future research should focus on larger, multicenter studies with extended follow-up to assess long-term outcomes, including functional recovery and late complications. Comparative studies evaluating different surgical techniques and conservative management strategies would provide more detailed insights into optimal treatment pathways. The integration of imaging-based healing assessments and biomechanical analyses could enhance understanding of factors influencing fracture union. Additionally, investigating the role of patient-reported outcome measures could offer valuable perspectives on the functional impact of scaphoid fractures and treatment satisfaction. This study contributes to the growing body of evidence on scaphoid fractures, reinforcing the importance of early diagnosis, appropriate treatment selection, and consideration of social determinants in optimizing patient outcomes. Continued research and advancements in treatment modalities will be essential to improving long-term functional recovery and minimizing complications associated with these fractures.

CONCLUSION

Scaphoid fractures, though not frequently encountered in orthopedic practice, require timely diagnosis and appropriate management to ensure optimal outcomes. This study highlights that with effective treatment strategies, most patients experience favorable recovery, reinforcing the importance of early intervention and standardized care. However, a subset of cases may still face challenges such as delayed healing or functional limitations, emphasizing the need for vigilant follow-up and tailored management approaches. The findings contribute to a better understanding of scaphoid fracture patterns and outcomes, supporting continued advancements in diagnostic accuracy and therapeutic protocols to enhance patient care and long-term wrist function.

AUTHOR CONTRIBUTIONS

Author	Contribution
Shahab Falak*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Muhammad Shafiq	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Irfan Khan	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Zia Ullah	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Maab Falak	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Altaf Ahmad	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Ahmad Daud	Contributed to study concept and Data collection Has given Final Approval of the version to be published
Muhammad Sani	Writing - Review & Editing, Assistance with Data Curation
Ahmad Mustafa	Writing - Review & Editing, Assistance with Data Curation
Naveed Ullah	Writing - Review & Editing, Assistance with Data Curation
Maarij Saleem	Writing - Review & Editing, Assistance with Data Curation

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