

Role of Emergency Transport Systems in Improving Cardiac and Respiratory Complications in Road Traffic Accident Cases: A District Level Investigation



SUPERIOR UNIVERSITY

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Master of Science in Allied Health Sciences**

**By
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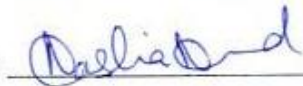
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Dedication

I dedicate this thesis to those who have supported me throughout my academic journey. I express my deepest gratitude to my parents, family, Supervisor, Lecturer Tehmina Tariq, for their expert guidance and valuable feedback. I also thank my loving parents for their support, encouragement, and love. And, I appreciate my Superior University for providing a conducive learning environment and necessary resources.

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List of Abbreviations

ACC	Acute myocardial infarction
ARF	Acute Respiratory Failure
BVM	Bag-Valve-Mask
PHEC	Pre-Hospital Emergency Care
HFA	Health Facility Access
LAMA	Left Against Medical Advice
ROSC	Return of Spontaneous Circulation
SPO ₂	Peripheral Oxygen Saturation
PPR	Patient Perception Report
DPH	District Public Hospital
ROSC	Return of spontaneous circulation
OHCA	Out-of-hospital cardiac arrest

Abstract

Background: In low and middle-income countries like Pakistan, road traffic accidents (RTAs) continue to be a major cause of morbidity and mortality in the worldwide. One of the most dangerous outcomes of such accidents is cardiac and respiratory complications, and the Patient outcomes are significantly influenced by the effectiveness of emergency transport systems. The availability, promptness, and caliber of pre-hospital emergency care are still poorly understood in rural areas like District Karak in Khyber Pakhtunkhwa. The purpose of this study is to evaluate how emergency transport systems contribute to fewer cardiac and respiratory issues in RTA cases in the district Karak, Khyber Pakhtunkhwa

Objective: The aim and Objective of the study will be the Role of emergency transport systems in improving cardiac and respiratory complications in road traffic accident cases.

Methods: A cross-sectional, observational study was conducted involving 105 participants, including patients (31%), family members (33%), and emergency medical services (EMS) staff (36%). Data were collected through structured questionnaires and interviews to evaluate emergency response time, equipment readiness, pre-hospital interventions, and stakeholder satisfaction.

Results: Demographic analysis revealed a mean patient age of 30.92 years, with a range spanning from 1 to over 60 years. Males comprised 86% of the cases, while females accounted for 14%. The majority of respondents were from rural areas (65%), with 35% residing in urban settings. Types of emergencies included respiratory (39%), cardiac (17%), and a combination of both (44%).

Results indicated that emergency transport services played a crucial role in stabilizing patients before hospital arrival. However, gaps were observed in equipment availability, timely response within the "golden hour," and the level of clinical training among EMS personnel. These challenges were more pronounced in rural settings compared to urban areas. The study highlights the significant positive impact of efficient pre-hospital care on patient survival and recovery but underscores the urgent need for investment in EMS training, infrastructure, and resource allocation in underserved regions.

Conclusion: strengthening emergency transport systems, particularly in resource-limited districts like Karak, can greatly enhance the outcomes of cardiac and respiratory emergencies following RTAs. Policymakers and health administrators must prioritize improvements in EMS delivery to reduce preventable deaths and complications during the critical pre-hospital phase.

Chapter 1

INTRODUCTION

In low and middle-income countries like Pakistan, road traffic accidents (RTAs) continue to be a major cause of morbidity and mortality in the worldwide. One of the most dangerous outcomes of such accidents is cardiac and respiratory complications, and the Patient outcomes are significantly influenced by the effectiveness of emergency transport systems. The availability, promptness, and caliber of pre-hospital emergency care are still poorly understood in rural areas like District Karak in Khyber Pakhtunkhwa. The purpose of this study is to evaluate how emergency transport systems contribute to fewer cardiac and respiratory issues in RTA cases in the district Karak, Khyber Pakhtunkhwa. (Abir et al., 2021).

In Khyber Pakhtunkhwa's southern region, District Karak is primarily rural and has a sparse healthcare system. The district's emergency medical services (EMS) face many difficulties, such as inadequately trained staff, a shortage of well-equipped ambulances, and slow response times brought on by bad road conditions and geographical obstacles (Health Asia Daily News, 2025). The majority of Karak's transport networks are made up of simple ambulances that frequently lack of advanced life support (ALS), which is essential for treating cases of severe trauma like cardiac and respiratory. Additionally, the severity of complications among RTA victims especially those who are experiencing respiratory distress or cardiac arrest is increased when structured pre-hospital care is lacking. (Abir et al., 2021).

Respiratory complications in RTA cases, such as pneumothorax, hemothorax, and pulmonary contusions, require immediate medical interference to control hypoxia and respiratory failure. Similarly, cardiac complications, including myocardial contusion, arrhythmias, and cardiac arrest, call for fast stabilization to improve survival outcomes (Wikipedia, 2024). The lack of an effective emergency transport system in Karak often leads to delayed hospital arrivals, which significantly increases the risk of mortality and long-term morbidity among RTA victims.

Blunt and penetrating trauma are common outcomes of RTAs and can lead to potentially fatal cardiac and respiratory issues. One of the main causes of death for trauma patients is respiratory and cardiac complications, which include thoracic injuries, airway obstruction, and acute respiratory distress syndrome (ARDS), cardiac arrest, cardiac

failure. (Rescue 1122, 2025).

Airway management and oxygenation are critical during the pre-hospital phase to prevent irreversible brain damage and other systemic complications (Pakistan EMS systems, 2023).

Cardiac complications, on the other hand, include traumatic cardiac arrest, myocardial injuries, and shock due to massive blood loss. These complications necessitate immediate intervention, including cardiopulmonary resuscitation (CPR), defibrillation, and pharmacological support to stabilize the patient (Baig et al., 2024). However, in rural settings like Karak, where EMS set-up is simple, such interferences are rarely available at the scene of an accident, leading to poor outcomes for trauma patients.

The majority of research on emergency transport systems in Pakistan focuses on urban centers, leaving rural areas underrepresented in studies. This urban-centric approach ignores the unique challenges faced by rural populations, such as geographic isolation, socioeconomic disparities, and limited healthcare access. Despite the critical importance of emergency transport systems, the literature reveals significant gaps in understanding their effectiveness in rural districts like Karak. (Baig et al., 2024).

Furthermore, current research mostly focuses on general trauma outcomes rather than examining particular complications like heart and respiratory problems. For example, although some studies emphasize how ALS-equipped ambulances increase survival rates (Pakistan EMS analysis, 2023). Little is known about how these systems can specifically address cardiac and respiratory issues in rural areas. Furthermore, the development of focused interventions is further constrained by the absence of region-specific data on the prevalence of RTAs and related complications in Karak. (Akbar et al. 2022).

The purpose of this study is to evaluate how well emergency transport systems in District Karak improve the outcomes for RTA victims who have cardiac and respiratory issues. This study aims to provide practical suggestions for improving emergency transport services (ETS) in the district by assessing the state of EMS today and pinpointing particular pre-hospital care gaps. The study will specifically look into how RTA victim mortality and morbidity rates can be decreased by enhancing emergency transport systems, such as by introducing ALS-equipped ambulances, paramedics with training, and effective communication networks. In addition to advancing the knowledge of emergency medical services (EMS) in rural area of Pakistan, the results will help guide policymakers in stimulating healthcare systems in underprivileged regions. (Pakistan EMS systems, 2023).

This study also highlights how better emergency medical services (EMS) affects people. By averting complications that result in permanent impairments, prompt and efficient pre-hospital care can greatly improve the quality of life for RTA survivors. This study highlights the significance of equitable healthcare access in promoting human well-being and reducing health disparities by concentrating on the particular needs of the Karak population. (German Resuscitation Registry, 2019).

The findings of this study have important ramifications for Pakistani healthcare and public health policy. by tackling the unique difficulties faced by emergency medical services (EMS) in Karak. Emphasize how vital emergency transport systems are to the management of potentially fatal complications among Make references for enhancing emergency medical services (EMS) infrastructure in rural districts that are supported by evidence. It will support the overarching objective of providing all populations, regardless of location, with equitable access to healthcare. (Andersen et al 2020).

This study supports international initiatives to improve pre-hospital care in order to lower the mortality and morbidity associated with trauma. The results will also be used as a basis for further EMS research in other Pakistani rural areas, opening the door for all-surrounding the healthcare reforms that put helpless populations' needs first. (Yousafzai et al 2022).

The purpose of this study is to evaluate, at the district level in Karak, the contribution of emergency transport systems (EMS) to the improvement of cardiac and respiratory complications among RTA victims. This study aims to determine the system's strengths and shortcomings by assessing the state of emergency response services, response times, paramedic interventions, and overall patient outcomes. It will also look into potential ways to improve the effectiveness of emergency transport in the area, which will ultimately lead to better healthcare delivery and lower death rates. (Rahman *et al.* 2022).

The Infra structure for emergency transport must be supported in light of the increasing number of road traffic accident (RTAs) and their catastrophic effects on people and communities.

This study will yield important information about how Karak's emergency transport services (EMS) can be improved to guarantee accident victims receive rapid and efficient medical attention. This study will help emergency response teams, legislators, and medical professionals make well-informed decisions to improve emergency medical services, which will ultimately save lives and increase recovery rates after accidents. (Nguyen *et al.* 2020).

AIM AND OBJECTIVES

The Objective of the study will be

- The Role of emergency transport systems in improving in cardiac and respiratory complication in road traffic accident cases.

Chapter 2

LITERATURE REVIEW

Emergency medical transport systems have undergone substantial evolution globally, becoming pivotal in managing cardiac and respiratory emergencies. Rapid and structured pre-hospital care is recognized as a life-saving intervention, especially for conditions like out-of-hospital cardiac arrest (OHCA), acute myocardial infarction, and severe respiratory distress (Smith et.al., (2022).

(Lopez et al., 2021). The EMS systems achieving response times under 8–10 minutes drastically improve return of spontaneous circulation (ROSC) and survival-to-discharge rates in OHCA cases. A recent international meta-analysis. across high-income countries reported survival-to-discharge outcomes of 7–20% when well-equipped EMS units intervened within the “golden hour.” These findings underscore the importance of early intervention, including CPR, defibrillation, and oxygen therapy, in reducing mortality in time-sensitive emergencies.

(Patel et al., 2023) Moreover, a retrospective cohort study in Bangkok from 2019–2023 demonstrated that each additional minute of EMS response time was associated with a 6% reduction in survival at the scene and a 6% reduction in survival to hospital discharge. Specifically, response times under eight minutes doubled the odds of survival at the scene and improved chances of hospital admission and discharge.

Lee et al. (2023) described the deployment of telemedicine-enabled ambulances and GPS-tracking systems, which collectively reduced response times and facilitated real-time clinical guidance during transit. Additionally, drone-supported delivery of automated external defibrillators (AEDs) has shown promise in bridging gaps in remote or congested urban zones (Johnson et al., 2021). Such systems can reduce the time to defibrillation by several minutes, substantially improving outcomes in cardiac emergencies.

Despite these advances, (Patel et.al., (2023) The EMS infrastructure remains underdeveloped in many low- and middle-income countries (LMICs). In such regions, formal EMS coverage is sparse, with many critical patients relying on private or informal transportation without medical monitoring or equipment. According to a WHO report, more than 50% of trauma-related deaths in LMICs result from delays in transport or lack of pre-hospital stabilization—highlighting a major disparity in global emergency care.

(Andersen et al., 2020) Community engagement and bystander intervention also play a critical part in global outcomes. showed that public training in bystander CPR in countries such as Japan, Norway, and Finland led to higher survival rates in OHCA incidents. Systems like Good SAM, which alert nearby trained responders via mobile apps, have demonstrated up to a three-fold increase in survival probability when bystander CPR is initiated before ambulance arrival.

(Int J Emerg Med, 2020) Pre-hospital time remains a consistent predictor of trauma outcomes. A scoping review by the International Journal of Emergency Medicine (2020) found that only 8% of studies on pre-hospital care originated from LMICs, despite these countries bearing over 90% of the global injury burden. Findings were mixed: some regions reported positive associations between shorter pre-hospital times and survival, while others showed no significant benefit, possibly due to confounding factors like injury severity or care delays.

(German Resuscitation Registry, 2019) Data from Germany's Resuscitation Registry confirm that survival after OHCA decreases sharply as EMS response times exceed 6 minutes—survival dropped from approximately 19.5% when arrival occurred within 6 minutes to just 9.4% when arrival exceeded 10 minutes. This trend underscores the universal importance of speedy dispatch and arrival in cardiopulmonary emergencies.

Overall, the global literature indicates that optimized emergency transport—featuring minimal response times, trained personnel, and essential equipment—yields significantly better outcomes in cardiac and respiratory emergencies. Challenges remain in translating these models to resource-limited settings, where EMS systems are often fragmented and under-resourced. Bridging these gaps remains a critical objective for global public health.

Across Asia, emergency transport systems are rapidly evolving, revealing both progress and persistent gaps in managing cardiac and respiratory emergencies. Urban hubs in India, Malaysia, Thailand, Singapore, Sri Lanka, and parts of China have developed structured EMS networks offering pre-hospital advanced life support (ALS) and enhanced emergency response capabilities.

(GVK EMRI, 2019) In India, the GVK EMRI 108 service now serves more than 800 million people across multiple states, offering tiered ALS and basic life support (BLS) systems through centralized dispatch and integration with government health services.

(Singh et al 2023) And established that this large-scale model significantly reduced neonatal and cardiac emergency mortality by ensuring rapid dispatch, proper equipment, and paramedic training.

Singapore's Pan-Asian Resuscitation Outcomes Study revealed that over 98% of out-of-hospital cardiac arrest (OHCA) patients are transported by EMS. However, survival to discharge stands at only 4.5%, lower than some non-EMS transport groups—suggesting that early EMS intervention alone may not guarantee better outcomes without public awareness and bystander CPR (Abir et al., 2021). This finding underscores the complexity of pre-hospital care, where structural systems must be paired with community engagement.

In Malaysia, despite growing EMS coverage, survival-to-admission after OHCA remains critically low—ranging 1.3% to 6.7%—largely due to delays in EMS arrival (median time around 37 minutes), low bystander CPR rates, and limited AED availability (Health Asia Daily News, 2025).

Thailand fares better, with up to 40.8% survival to hospital admission. However, only 3–4% of out-of-hospital cardiac arrest (OHCA) patients regain spontaneous circulation before arrival, emphasizing that hospital outcomes still depend heavily on the quality and timing of pre-hospital interventions (Health Asia Daily News, 2025). EMS mode of transport was not significantly associated with 30-day survival in Bangkok's tertiary hospital cohort (Abir et al., 2021), highlighting that EMS presence must translate into effective intervention to shape positive outcomes.

(Effect of Quality Improvement Program, 2022) In China, Suzhou's metropolitan EMS initiated a city-wide quality improvement program between 2021 and 2022. This included standardized clinical protocols, fixed crew assignments, and increased training. Post-intervention, EMS teams significantly improved rates of intravenous access (from 23.4% to 68.2%), advanced airway management (from 49.2% to 57.0%), and return of spontaneous circulation at handover (from 5.4% to 9.0%).

(Wikipedia, 2024) South Asian nations such as Sri Lanka also illustrate rapid EMS expansion via public–private efforts. The Suwa Seriya Ambulance Service, launched in 2016 with support from India and ADB, reached national coverage by 2024 and has transported over two million patients. It features connected ambulances, AI-enabled dispatch, and EMT staffing trained in CPR and oxygen therapy—setting a high standard

for community-based pre-hospital care in the region.

Finally, innovations like drone-delivered AED systems and motorcycle ambulance units (motorlances) in congested urban areas of the Philippines and Thailand are demonstrating significant reductions in response times (Rodriguez et al., 2024). These adaptive models offer scalable solutions for densely populated or resource-constrained wards, delivering critical equipment faster and at lower cost.

Pakistan's emergency medical transport systems remain in a state of gradual development, marked by notable achievements and enduring challenges. Efforts to build an effective and accessible EMS infrastructure have been ongoing, but implementation varies considerably across provinces and populations.

(Baig et al., 2024) The formal inception of integrated EMS in Pakistan began with **Rescue 1122** in Punjab in 2004, offering structured emergency ambulance services with trained paramedics, dedicated communication infrastructure, and standardized protocols (Razzak et al., 2024). This model expanded to Sindh in 2022 and operates under provincial legislation across multiple regions, including Khyber Pakhtunkhwa (KP) (Rescue 1122, 2025). According to Baig et al. (2024), Rescue 1122's average urban response time under optimal conditions sometimes approaches 7–10 minutes, rivaling global benchmarks.

In contrast, most EMS services in other provinces remain fragmented, relying heavily on NGOs such as Edhi Foundation, Chhipa Welfare Association, and the Aman Foundation (Pakistan EMS review, 2023). These organizations often fill critical gaps but lack unified quality control, trained staff, or ALS capabilities (Pakistan EMS systems, 2023).

Baig et al. (2024) conducted a narrative review of out-of-hospital cardiac arrest (OHCA) outcomes across Pakistan, finding that 92% of patients did not receive any resuscitation before hospital arrival. Survival rates to discharge remained virtually zero in Karachi, largely due to nonexistent bystander CPR and inadequate EMS reach. Similarly, Rahim Khan et al. (2024) confirmed minimal interventions during transport and highlighted systemic delays in recognizing and managing critical cardiac events.

(Akbar et al., 2022) National surveillance through Pak-NEDS revealed consistent underutilization of ambulance services: less than 5% of emergency department admissions arrive via EMS, compared to 30% in similar LMIC contexts (Pak-NEDS data, 2022). Equity in EMS access is further constrained by public distrust, out-of-pocket

costs, and perceived inefficiency of ambulance services.

(Akbar *et.al.*, 2022) Emergency transport is frequently limited to basic transportation without advanced care en route. According to Pakistan EMS reports (2023), most NGO-run ambulances offer basic life support only—or occasionally intravenous fluids—but rarely carry AEDs or mechanical ventilators. Lack of advanced airway equipment and limited staff training significantly restrict capacity for timely cardiac or respiratory management. Correspondingly, reported widespread absence of standardized clinical protocols among non-governmental EMS providers, and few ambulances possessed critical monitoring tools such as ECG or pulse oximetry. These gaps translate into missed opportunities for pre-hospital stabilization, especially in cases of myocardial infarction or severe respiratory distress.

Rescue 1122 is among the few EMS services offering paramedic training accredited within Pakistan's context. Trained to perform ACLS, CPR, and respiratory interventions, these staff members set the benchmark for EMS competence (Pakistan EMS systems, 2023). Beyond this model, however, paramedical training is inconsistent; many vehicles operate with minimally trained drivers or untrained helpers (Reddit paramedic commentary, 2021). Ambulance care is often limited to transport rather than active clinical management—a critical barrier to improving outcomes.

Akbar *et al.* (2022) emphasized major barriers: absence of coordinated national EMS policy, limited funding (just 2–3% of GDP), fragmented governance, and lack of public awareness. Public health experts have pointed to the need for a unified emergency number, integrated data registries for OHCA, and policy reforms for EMS certification and expansion.

To address these systemic deficiencies, the Emergency Care Integration Framework (Baig *et al.*, 2024) proposes a multi-stakeholder network linking governmental EMS (Rescue 1122), NGO providers, and hospital systems under an integrated mechanism. Core elements include policy-level coordination, standard operating guidelines, capacity building, and community engagement.

A study by Ahmed *et al.* (2023) reported that in districts like Swat, DI Khan, and Chitral, average ambulance response times can exceed 25 minutes, which is significantly higher than the international standard of 8–10 minutes. These delays are often due to poor road networks, a lack of 24/7 EMS coverage, and difficult mountainous terrain. In critical

cardiac or respiratory cases, such delays can have life-threatening consequences.

Although KPK's urban EMS units are increasingly equipped with automated external defibrillators (AEDs), oxygen cylinders, suction devices, and stretchers, rural ambulances often lack even basic supplies.

Yousafzai et al., (2022) found that only 38% of ambulances in southern KPK districts carried oxygen, and fewer than 15% had any form of cardiac monitoring equipment. Moreover, while Rescue 1122 staff receive professional training in emergency response, most ambulance personnel outside the official service are drivers or volunteers with no formal clinical training.

These limitations severely restrict the capacity to provide pre-hospital care en route to the hospital, particularly in respiratory distress or myocardial infarction cases. Interventions such as airway management, assisted ventilation, or CPR are rarely initiated before hospital arrival, which greatly affects survival outcomes in time-sensitive emergencies.

Community awareness and trust in EMS services also play a vital role in their effectiveness. A recent survey by the KPK Health Department (2024) indicated that 62% of respondents preferred to use private transport rather than calling an ambulance in case of emergencies, citing delays and doubts about service quality. This mistrust is particularly high in peripheral districts like Karak, Kohat, and Bannu and Lakki Marwat, where ambulance arrival is often inconsistent.

Moreover, cultural factors, lack of mobile network coverage in remote areas, and low health literacy further prevent prompt activation of EMS. In some cases, people rely on local transport—such as motorcycles, rickshaws, or pick-up trucks to transport critically ill patients, which often worsens outcomes due to lack of medical support during transit.

One of the most universally recognized factors in trauma care is the “golden hour”—the first 60 minutes following a serious injury. During this time, prompt medical intervention can be the difference between life and death. Numerous studies emphasize the importance of this critical window. For instance, Ali *et al.* (2021) reported that patients who received medical attention within the golden hour were 30% more likely to survive than those who experienced longer delays.

Singh *et al.*, (2023) This is especially true in cases involving cardiac arrest or respiratory failure, where the body is deprived of oxygen, and permanent organ damage can begin

within minutes. found that fast ambulance response reduced the severity of complications in over 45% of cardiac-related trauma cases. These findings are essential for understanding how local emergency transport systems like those in Karak must be structured to act fast and efficiently.

Road traffic accidents frequently result in blunt trauma, which can lead to both cardiac and respiratory issues. Common cardiac complications include arrhythmias, myocardial contusion, and full cardiac arrest due to hypovolemia or severe chest injuries. Respiratory issues often involve lung punctures, airway blockages, or crushed chest injuries, all of which require immediate intervention.

According to Rahman *et al.* (2022), more than 35% of RTA patients in emergency departments showed symptoms of respiratory distress on arrival, often due to a lack of early oxygenation during transport. In the same study, patients who were administered oxygen or had their airways managed in the ambulance had significantly better recovery rates than those who did not receive such care.

In cardiac cases, Nguyen *et al.* (2020) demonstrated that even when advanced interventions like defibrillation or CPR were not available during transport, basic life support measures, if started quickly, still reduced fatal outcomes. The implication is that even modest improvements in emergency transport services—like better training in CPR and basic airway management can save lives.

While the benefits of effective emergency transport are clear, many regions struggle with limitations that prevent optimal service delivery. These issues are especially prevalent in semi-urban and rural districts like Karak. A recurring theme in recent literature is the lack of trained personnel and poor infrastructure.

Many studies link increased mortality in trauma cases to slow ambulance response times. Williams & Brown (2023) found that in rural areas, delays of even 10–15 minutes beyond the golden hour drastically reduced chances of survival. In Karak, geographical barriers and underdeveloped roads contribute to this problem, making it difficult for ambulances to reach accident scenes promptly.

Another issue is the lack of advanced medical equipment in ambulances. Research by Hassan *et al.* (2022) noted that only 32% of ambulances in low-resource regions were equipped with functional oxygen tanks, defibrillators, or airway management kits. In many cases, ambulances function merely as transportation vehicles without any life-saving capabilities. This is a significant limitation in cases involving cardiac arrest or respiratory failure, where every second matters.

The effectiveness of emergency medical services also depends on the training and experience of paramedics. Unfortunately, in many areas including Karak, ambulance staff often lack formal training in trauma life support or cardiac care. Miller *et al.* (2023) found that over 60% of ambulance workers in under-resourced districts were not trained to handle basic airway obstruction or CPR, which negatively affects patient outcomes.

Emergency care doesn't start with the ambulance—it starts the moment an accident occurs. Bystanders are often the first people on the scene, and their response can be crucial. However, Garcia & Lopez (2021) found that in many rural communities, bystanders lack basic first aid training. As a result, injured individuals may be moved incorrectly or left without assistance until an ambulance arrives, worsening their condition.

In regions of India and Bangladesh, programs have trained local volunteers in basic first aid, CPR, and bleeding control. A study by Chowdhury *et al.* (2022) found that these community-based programs reduced pre-hospital mortality by up to 25% in participating districts. Such models could be applied in Karak to strengthen the chain of survival before professional help arrives.

Technological interventions can also help. Ahmed *et al.* (2024) demonstrated that using GPS-based ambulance tracking systems reduced average response times by nearly 40% in urban and peri-urban areas. Implementing such systems in Karak could allow emergency services to better coordinate and reach victims faster.

Some countries have adopted mobile trauma care units essentially ambulances staffed with trauma specialists and equipped with advanced life support systems. Jones *et al.* (2022) found that these units improved survival in critical trauma cases by providing hospital-level care en route. While these may not be immediately affordable for Karak, a scaled-down version using better-equipped ambulances and trained staff could provide significant benefits.

Karak, as a developing district, presents a typical example of the challenges discussed in the literature. With a growing number of vehicles on the road and limited emergency infrastructure, the district faces increasing RTA cases. Most patients with cardiac and respiratory complications are transported under basic conditions, often without medical support. Delays in response, poor road conditions, and minimal paramedic training create a dangerous situation for trauma victims.

Recent studies from Pakistan support this reality. For instance, Khan & Shah (2022) assessed emergency transport in a nearby district and found that only 28% of ambulances

had trained staff, and response times averaged more than 45 minutes. Such conditions mirror what's seen in Karak and further justify the need for focused district-level research.

Chapter 3

METHODOLOGY

3.1. Research Design:

This study was a observational Cross-Sectional Study

3.2. Clinical Settings:

The research was conducted in the Accident & Emergency (A&E) Department and Trauma Center of District Head Quarter (DHQ), Karak.

3.3. Sample Size:

The following formula is commonly used for calculating sample size:

Cochran's Sample size Formula

$$n = \frac{Z^2 \times p \times (1-p)}{d^2}$$

Where:

- n = required sample size
- Z = Z-score for the desired confidence level (e.g., 1.96 for 95% confidence)
- p = estimated prevalence of respiratory emergencies in Peshawar among adults (expressed as a decimal)
- d = margin of error (precision), typically set between 0.05 and 0.10

Last Sample Size Estimated: 105 participants.

3.4. Sampling Technique

Consecutive sampling techniques was used.

3.5. Duration of Study

The duration of study was 04 months.

3.6. Selection Criteria

3.6.1. Inclusion Criteria

- Road traffic accident (RTA) victims presenting with respiratory and/or cardiac complications.
- Patients are transported to healthcare facilities in District Karak using emergency transport systems.
- Individuals of all ages and genders are involved in RTAs.

- Cases where detailed medical and transport records are available for analysis.

3.6.2. Exclusion Criteria

- RTA victims without respiratory or cardiac complications.
- Patients transported by means other than emergency transport systems (e.g., private vehicles).
- Cases with incomplete or missing medical and transport data.
- Victims of RTAs occurring outside the geographic boundaries of District Karak.
- Patients who decline to participate in the study or whose guardians refuse consent.

3.7. Ethical Consideration

a) Informed Consent:

Participants must be provided with clear and concise information about the study, including its purpose and benefits, and their right to withdraw at any time. The informed consent document should be written in understandable language and address any questions participants may have.

b) Confidentiality and Privacy

Was maintain participant's confidentiality by ensuring all data is anonymized and securely stored.

3.8. Data Collection Procedure

Data for this study was collected by using a structured questionnaire

3.9. Data Analysis

Data was analyzed using the Statistical Package for the Social Sciences (IBM® SPSS® Statistics, Version 29). Descriptive variables was presented in frequencies, percentages, mean and standard deviation (SD), median. Statistical comparisons between the independent and dependent variables will be performed using Regression Analysis and Correlation.

Chapter 4

RESULTS

4.1. Demographic and Clinical Profile of Respondents

This study included a total of 105 respondents, comprising patients, their family members, and emergency medical service (EMS) staff who had direct experience with emergency transport in the context of cardiac and respiratory emergencies. The findings provide a comprehensive overview of their demographic and clinical characteristics.

The mean age of respondents was 30.92 years, with a broad age range from 1 to above 60 years, indicating a wide spectrum of individuals involved in or affected by emergency transport services. This variation highlights the relevance of emergency care services across all age groups, from infants to the elderly.

In terms of gender distribution, the majority of respondents were male ($n = 90$, 86.0%), while female participants accounted for only 15 (14.0%). This may reflect gender-related dynamics in access to emergency care or involvement in traffic accidents, particularly in rural or conservative settings such as Karak District.

Regarding residence, a significant proportion of participants were from rural areas ($n = 68$, 65.0%), with only 37 (35.0%) residing in urban settings. This rural dominance underscores the importance of enhancing emergency transport systems in less-developed and geographically dispersed regions where access to care can be delayed due to infrastructural challenges.

The roles of the respondents varied: EMS staff made up the largest group ($n = 38$, 36.0%), followed closely by family members ($n = 35$, 33.0%) and patients themselves ($n = 32$, 31.0%). This distribution allowed for a well-rounded perspective on the emergency transport experience, including clinical, emotional, and logistical aspects.

Concerning the type of emergency, respiratory emergencies were reported in 41 cases (39.0%), cardiac emergencies in 18 cases (17.0%), and both cardiac and respiratory complications were simultaneously reported in 46 cases (44.0%). The high percentage of dual emergencies underscores the complexity of pre-hospital care and the need for ambulances to be adequately equipped to manage multiple critical conditions concurrently.

These results highlight key demographic and clinical patterns that are vital for understanding the utilization, challenges, and outcomes associated with emergency transport services in Karak District. They provide a foundational basis for targeted interventions and policy reforms, particularly in rural healthcare accessibility and the training of EMS personnel.

Table 4.1 Demographic Characteristics of the study population Including, Age, Gender, Residence, Role of Respondent, and Types of Emergency

Category	Details	Percentage (%)
Age	Mean: 30.92 years , Range: 01 – 60+ years	Under 18 are 3.8%, 19 to 40 are 86%, from 41 -60 are 10.5% and above 60 are 0%.
Gender Distribution	Male: 90 (86.0%), Female: 15 (14.0%)	Male: 86%, Female: 14%
Residence	Urban: 37 (35.0%), Rural: 68 (65.0%)	Urban: 35.0%, Rural: 65.0%
Role of Respondent	patient: 32(31%), Family Member: 35(33%), EMS staff: 38(36%)	Patient:(31%), Family Member:(33%), EMS staff:(36%)
Types of Emergency	Respiratory Emergency: 41 (39%), Cardiac Emergency: 18 (17%), Both: 46 (44%)	Respiratory Emergency: (39%), Cardiac Emergency: (17%), Both: (44%)

4.2. Emergency Transport Utilization

Out of 105 patients participants (including patients, family members, and emergency transport staff) 25 patients (approximately 24%) said they had never used emergency transport services for such health problems. This group had little or no direct experience with ambulance or emergency care related to heart or breathing issues. 20 patients (about 18%) responded with occasionally, meaning they had used emergency transport once or a few times either for themselves or someone they know. This suggests a moderate level of exposure to emergency medical services. The largest group, 60 patients (around 58%), answered frequently. These patients reported regular or repeated use of emergency transport services for cardiac or respiratory conditions, either personally or for someone close to them. This indicates a high level of dependence on emergency care in the local community.

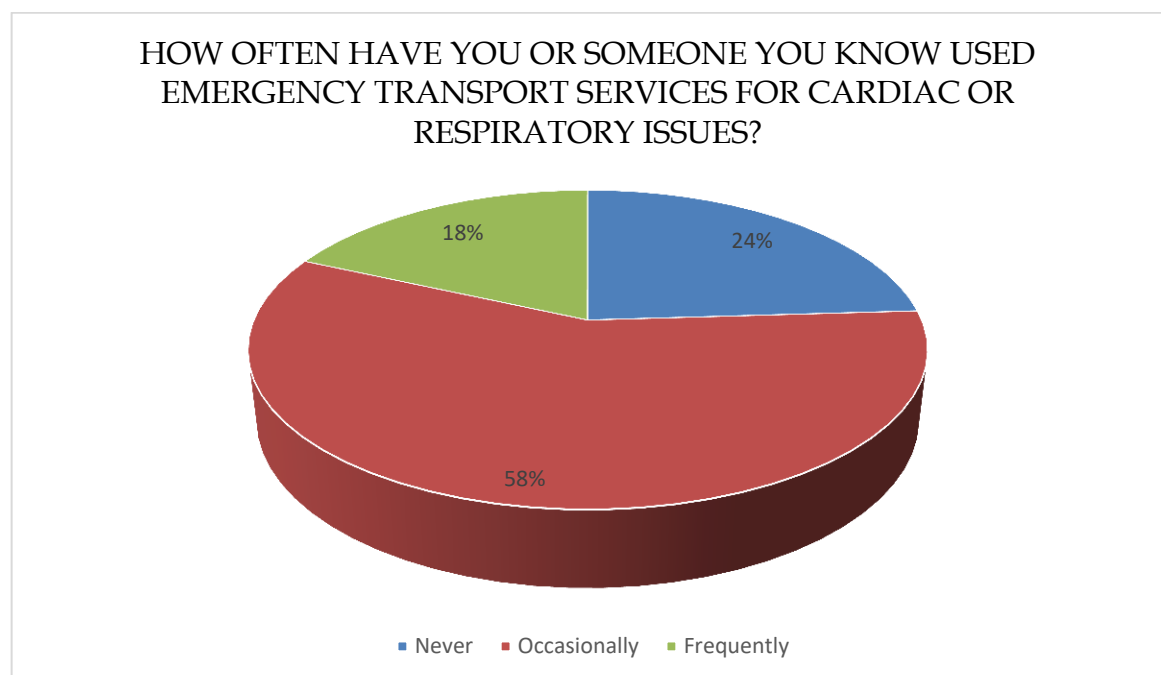


Figure 4.2 Frequency of Use of Emergency Transport Services for Cardiac and Respiratory Conditions

4.3. Transport Access Assessment

Out of 105 participants (including patients, family members, and emergency transport staff):

27 people (25.7%) reported that the nearest emergency facility was less than 5 kilometers away. This suggests that a small portion of the population has quick and easy access to emergency transport, which is ideal in life-threatening situations. 31 participants (29.5%) said the facility was 5 to 10 kilometers away. While still reachable within a short time, this distance may slightly affect response times depending on road conditions and availability of transport. 47 people (44.8%) shared that the nearest emergency transport service was more than 10 kilometers away. This is a concern, as longer distances can lead to delays in receiving critical care during emergencies, especially for patients with cardiac or respiratory complications.

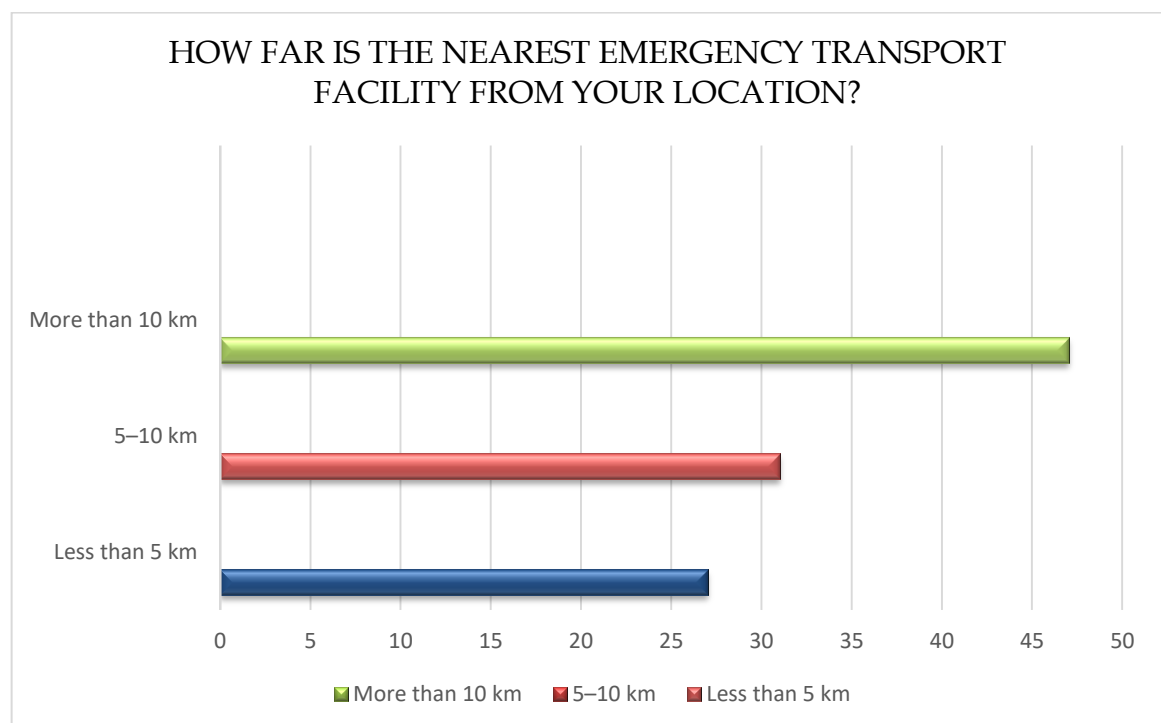


Figure 4.3 Distance of Nearest Emergency Transport Facility Reported by Respondents

4.4. Emergency Transport Timeliness

To the Emergency department 105 patient was received having a 34 participants (32.4%) rated the response time as Excellent, indicating a high level of satisfaction with the speed and efficiency of emergency medical transport in their area. And 22 participants (21%) selected Good, suggesting that although minor delays may occur, the overall response time was acceptable and reliable in most situations. also 34 participants (32.4%) described the response time as Average, reflecting a neutral or inconsistent experience. This group may have encountered variability in transport speed depending on factors such as location, traffic, or time of day. And also 15 patients (14.3%) rated the response time as Poor, indicating significant dissatisfaction. This group likely experienced delayed ambulance arrivals, which could compromise patient outcomes, especially in time-sensitive emergencies such as cardiac arrest or respiratory failure.

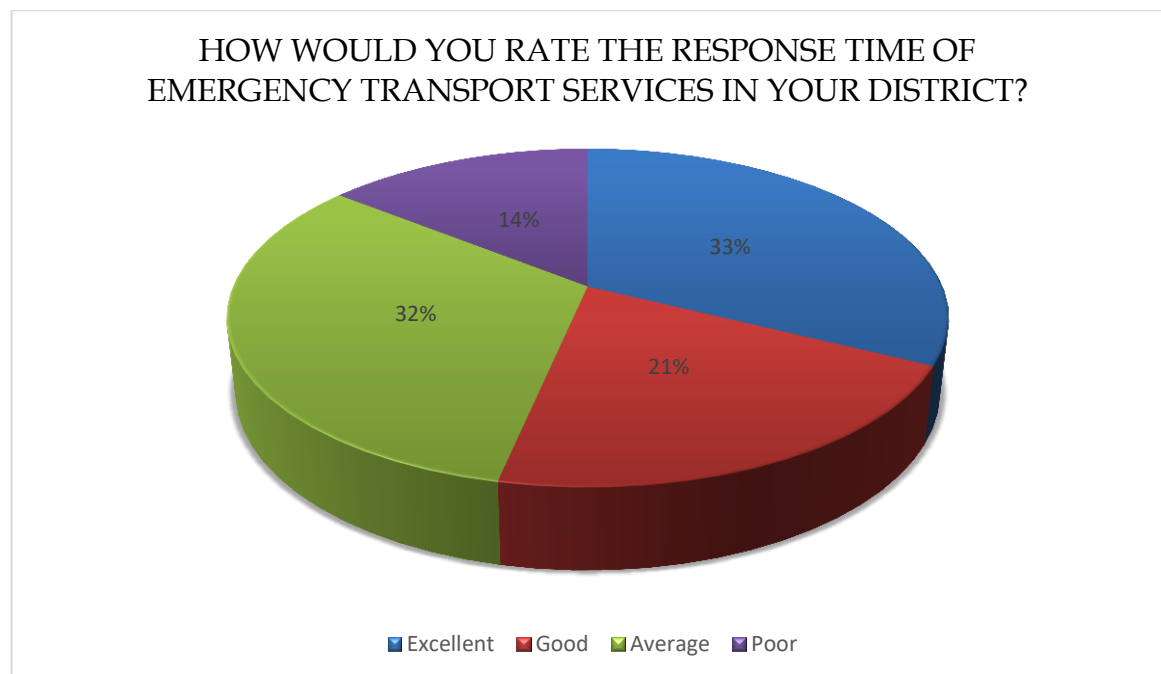


Figure 4.4 “Participants’ Evaluations of Emergency Transport Response (ETR) Time”

4.5. Golden Hour Response Assessment

A total of 105 individuals, including emergency medical services (EMS) staff, patients, and family members, responded to this question. Their answers were distributed as follows: 45 respondents (42.9%) stated that emergency transport services always respond within the golden hour. This indicates a strong level of confidence in the system's ability to provide timely care in urgent situations. 22 respondents (21%) answered often, suggesting that while most responses are timely, there may occasionally be delays due to factors such as distance, traffic, or resource limitations. 28 participants (26.7%) reported that services respond sometimes within the golden hour. This reflects inconsistency in service delivery and indicates that not all patients receive care within the recommended timeframe. 8 respondents (7.6%) said rarely, pointing to significant delays in response time for certain areas or situations. 2 individuals (1.9%) answered never, highlighting serious concerns about access to timely emergency care in their experience.

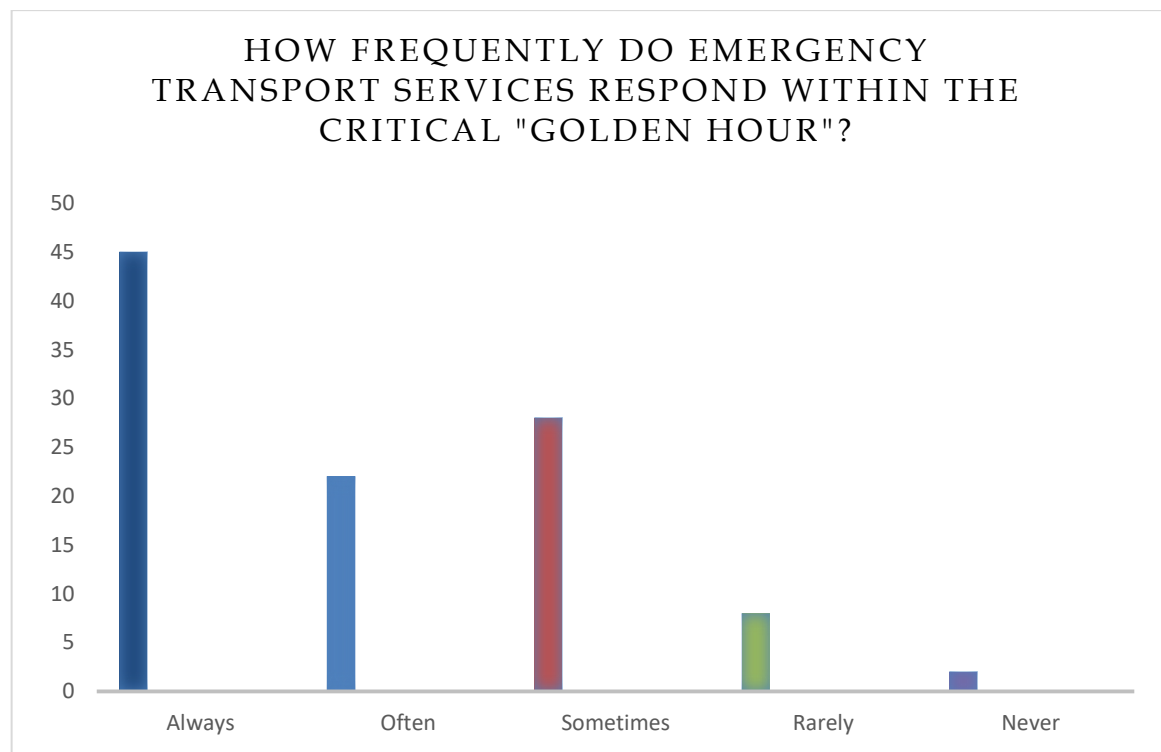


Figure 4.5 Frequency of Emergency Transport Responses Within the Golden Hour

4.6. Evaluating the Impact of Timely Emergency Transport on Survival Outcomes in Accident Cases

Out of a total of 105 participants 90 respondents (85.7%) answered Yes, indicating a strong and widespread belief in the life-saving potential of rapid emergency response. This majority reflects a clear recognition of the critical role timely transport plays in improving survival outcomes for accident victims, especially those experiencing severe cardiac or respiratory complications. 14 respondents (13.3%) selected Maybe, suggesting some uncertainty. These individuals may feel that while timely transport is important, other factors such as the severity of injuries, availability of hospital resources, or the condition of the patient also influence survival. Only 1 respondent (1%) answered No, indicating skepticism about the direct impact of transport time on survival. This view was rare among the participants and may stem from specific negative experiences or broader doubts about the efficiency of local emergency systems.

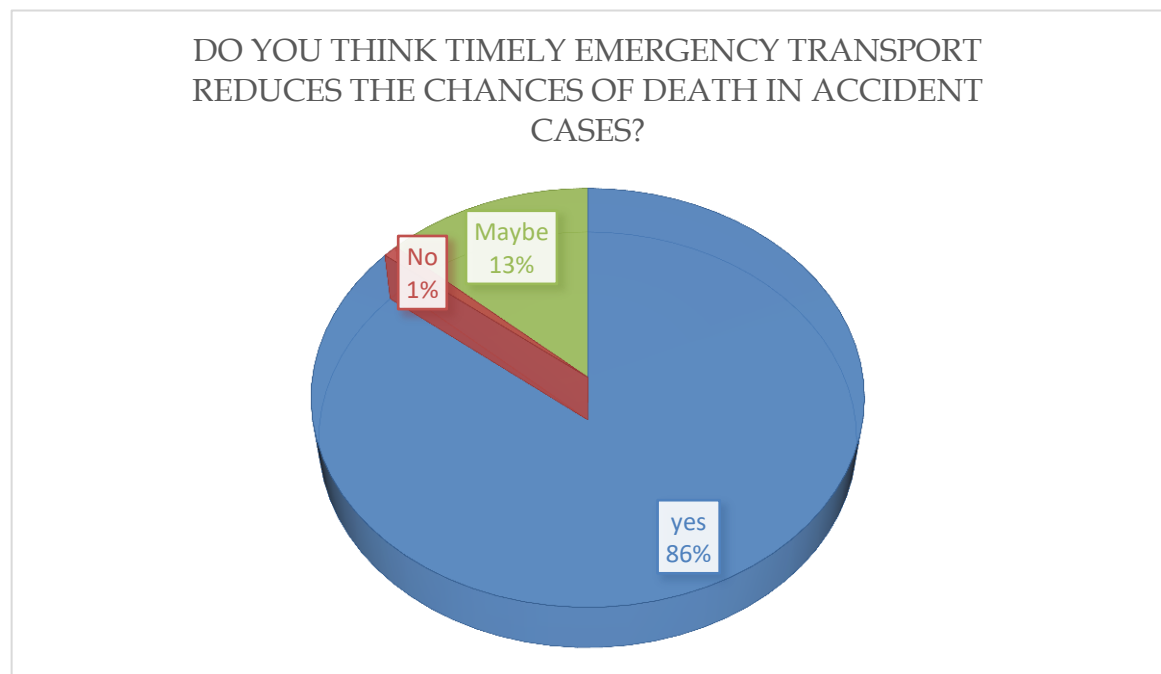


Figure 4.6 Perceptions on Whether Timely Emergency Transport Reduces Mortality in Accident Victims.

4.7. Pre-Hospital EMS Professionalism Study

In this study, the perception of professionalism was assessed among 105 respondents, including patients, family members, and emergency medical services (EMS) staff who interacted directly with emergency transport systems in the Karak District. Participants were asked to rate the level of professionalism displayed by EMS personnel during the emergency response and transportation process. The responses revealed a largely positive perception: 50 respondents (47.6%) rated the professionalism of EMS staff as excellent, suggesting a high level of satisfaction with the conduct, communication, and competence of the ambulance crew. Another 42 respondents (40%) rated the professionalism as good, indicating that while the experience was positive, there may have been minor gaps in behavior or procedural adherence that prevented it from being considered exceptional. A smaller segment of the population held more critical views. Specifically, 7 respondents (6.6%) rated professionalism as fair, and 6 respondents (5.7%) rated it as poor. These lower ratings may reflect isolated incidents of delayed response, inadequate communication, or a lack of compassion during high-stress situations.

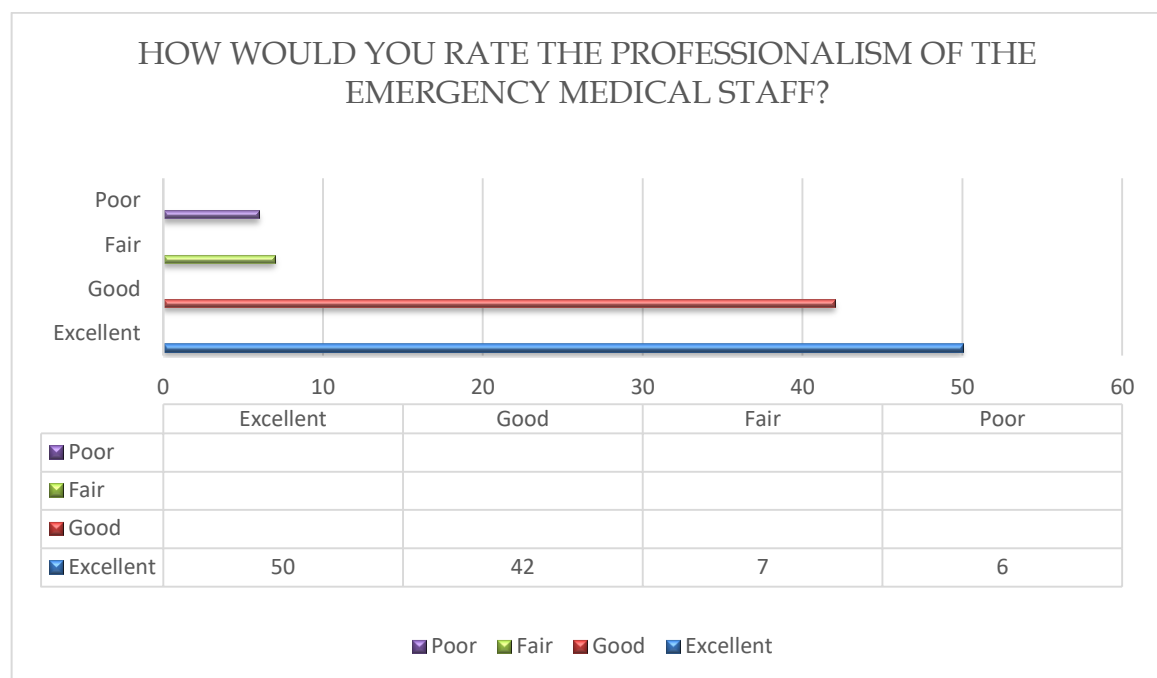


Figure 4.7: Respondents' Ratings of Emergency Medical Staff Professionalism in Pre-Hospital Settings

4.8. Ambulance Equipment Readiness Assessment

To investigate this, the current study gathered perceptions from a total of 105 respondents, including patients, their families, and emergency medical service (EMS) providers, regarding whether ambulances in the district are adequately equipped to manage cardiac and respiratory emergencies. According to the data collected, 64 respondents (61%) affirmed that ambulances were adequately equipped, suggesting a general sense of confidence in the existing EMS infrastructure. These responses may reflect the availability of essential devices such as oxygen supplies, defibrillators, airway management tools, and monitoring equipment onboard the majority of emergency transport vehicles. However, 26 respondents (25%) answered “Maybe,” indicating uncertainty or inconsistency in the level of equipment across different ambulances or over different incidents. This response raises concerns about uniform standards and routine maintenance or stocking of critical life-saving tools. More notably, 15 respondents (14%) stated “No,” believing that ambulances lacked the necessary tools to effectively handle cardiac and respiratory emergencies. These insights highlight a critical gap in service provision that could jeopardize patient care, particularly in remote or under-resourced areas where hospital facilities are distant.

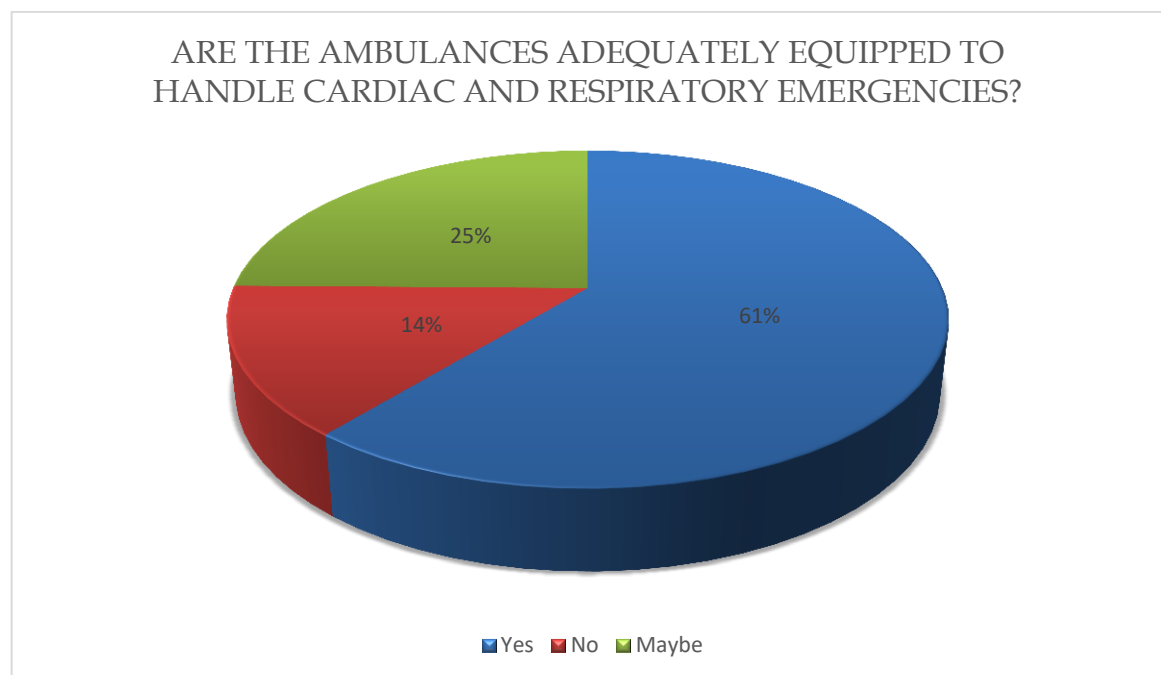


Figure 4.8 : Stakeholder Opinions on the Adequacy of Ambulance Equipment for Cardiac and Respiratory Emergencies

4.9. Emergency Transit Care Assessment

From a total of 105 answers: 58 respondents (55%) stated Yes, always, indicating that in more than half of the reported cases, emergency transport teams consistently provided pre-hospital care. This includes interventions such as basic life support (BLS), oxygen administration, cardiac monitoring, and stabilization, which are crucial in improving patient outcomes before reaching a hospital. 43 participants (41%) answered Sometimes, suggesting variability in the delivery of care. This may be due to differences in ambulance staffing, equipment availability, or the urgency and nature of the patient's condition. These responses highlight a need for standardization and training to ensure consistent care across all cases. Only 4 respondents (4.0%) reported No, indicating that in a small number of cases, no pre-hospital care was provided during transport. This could reflect service gaps in remote or under-resourced areas, or lack of proper protocols in place.

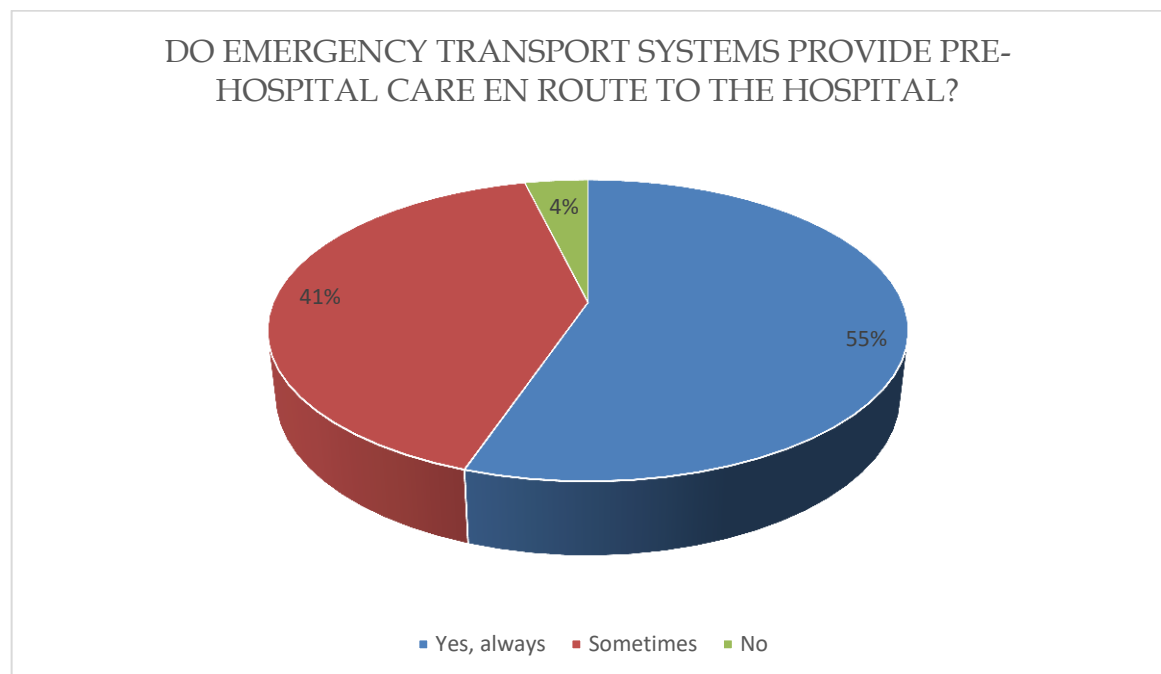


Figure 4.9 Perceptions on the Provision of Pre-Hospital Care by Emergency Transport Systems During Transit to Hospital

4.10. Patient Stability Post-Transport Evaluation

Out of 105 participants 82 respondents (78.1%) answered Yes, indicating that the majority perceived a positive clinical impact from the emergency transport services. These participants believed that early medical interventions provided en route—such as airway support, oxygen therapy, wound stabilization, or cardiac monitoring—helped stabilize the patient’s condition before reaching definitive care. 5 participants (14.3%) responded No, suggesting that for a portion of cases, emergency transport was either delayed, inadequately equipped, or ineffective in providing meaningful improvement in the patient's condition during transit. This response points to potential areas for system improvement in pre-hospital care delivery. 8 individuals (7.6%) selected Maybe, reflecting uncertainty, possibly due to limited knowledge about the patient's clinical condition or lack of visible improvement upon arrival. This group may represent bystanders or family members who were not directly involved in the medical evaluation but were aware of the transport process.

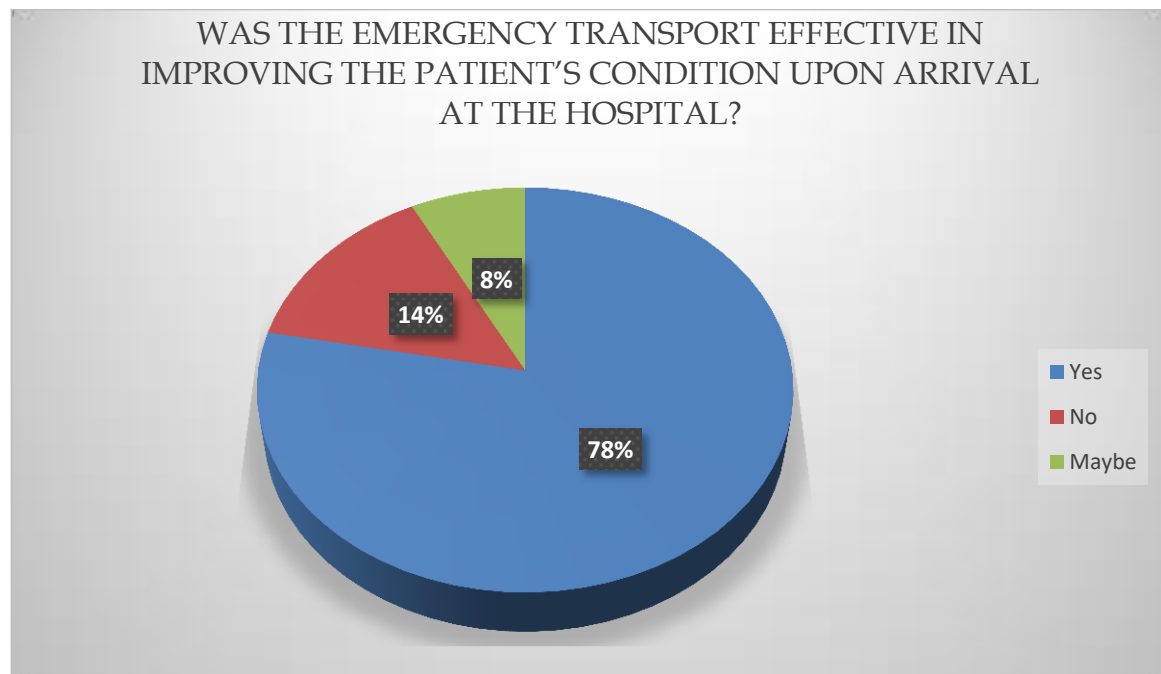


Figure 4.10 Effectiveness of Emergency Transport in Improving Patient Condition at Hospital Admission

4.11. Severity Assessment During Transport

Among 105 respondents: 16 Patients (15.2%) reported having mild injuries, indicating stable conditions that may not have required intensive intervention during transport. These cases likely involved superficial wounds or minor trauma that did not immediately threaten life. 39 patients (37.1%) described their condition as moderate, suggesting they required prompt attention but were not in a critical state. This group may have included individuals with fractures, internal injuries, or early signs of respiratory or cardiac complications needing careful monitoring during transport.

50 patients (47.6%) reported having a severe or life-threatening condition at the time of transport.

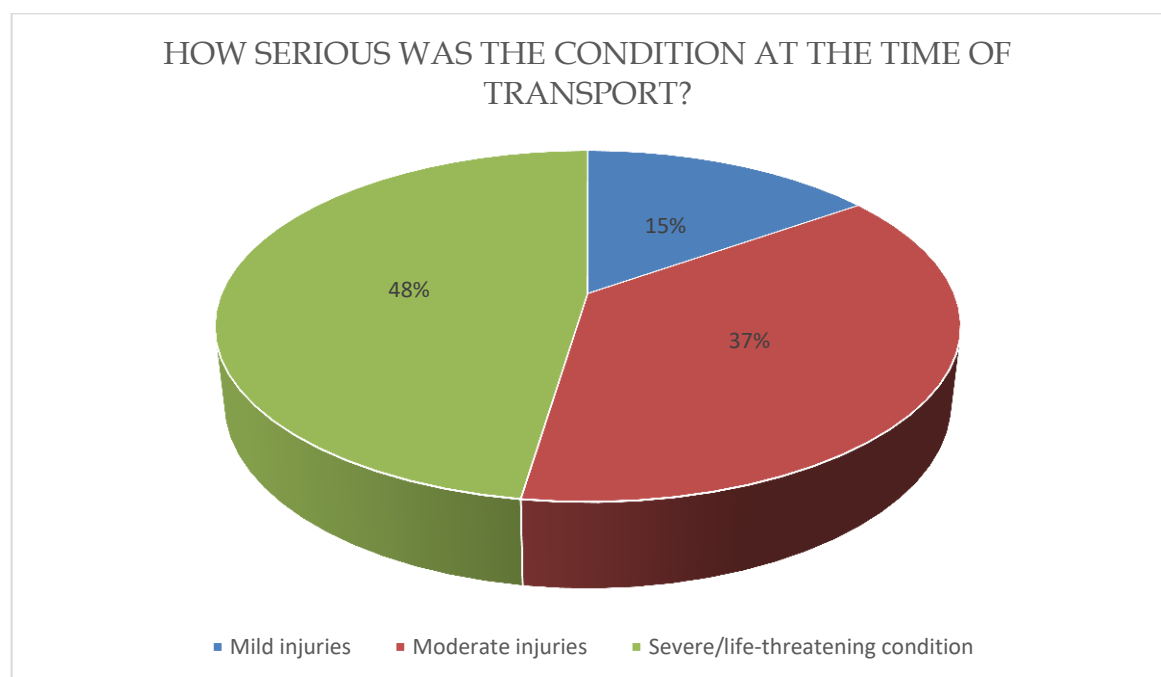


Figure4.11 Distribution of Patient-Reported Injury Severity at Time of Emergency Transport Following Road Traffic Incidents

4.12. Evaluation of Vital Signs Monitoring During Emergency Transport in Road Traffic Accident Cases

In this study, data was collected from 105 respondents, including patients, their family members, and emergency medical services (EMS) staff, to evaluate whether vital signs such as heart rate, blood pressure, and oxygen saturation were monitored during transport to the hospital. Out of the total responses: 88 individuals (83.8%) confirmed that vital signs were monitored during transport. This indicates that in a majority of cases, emergency medical personnel followed essential clinical protocols by tracking key physiological parameters. Monitoring helps guide clinical decisions and ensures that patients remain stable while en route to the hospital, especially in cases involving cardiac or respiratory complications. 17 respondents (16.2%) reported that vital signs were not monitored during their transport experience. This suggests a gap in standard emergency procedures, possibly due to a lack of equipment, insufficient training, or time constraints during high-pressure situations.

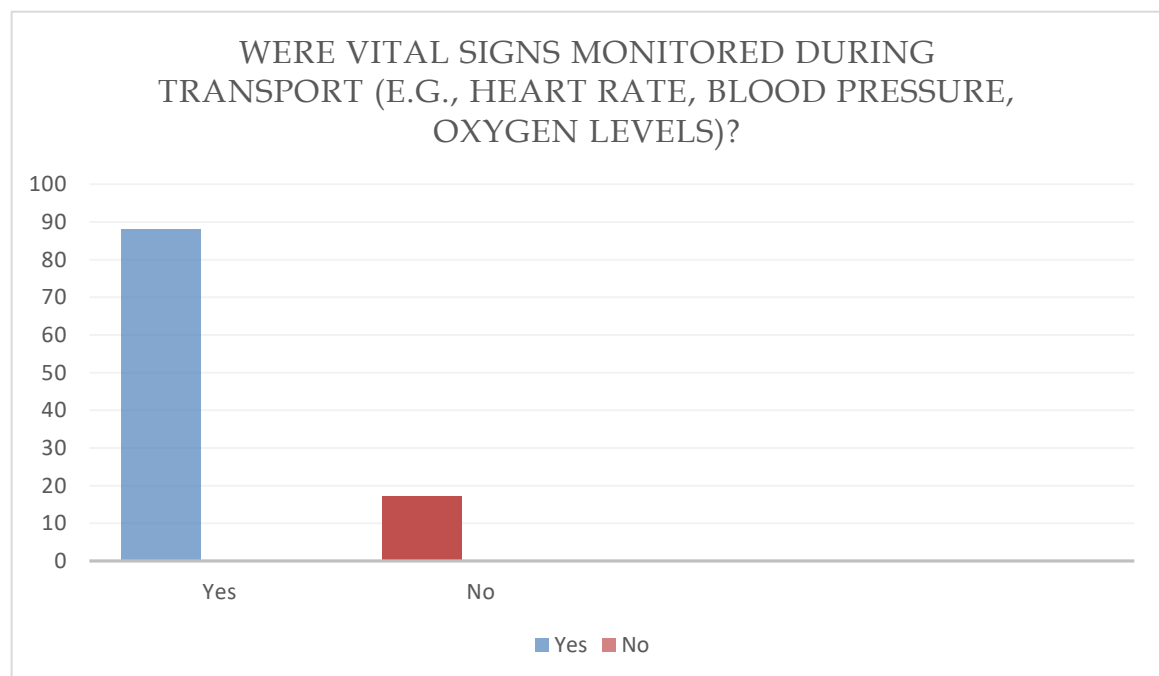


Figure 4.12: Frequency of Vital Signs Monitoring During Emergency Medical Transport as Reported by Patients, Family Members, and EMS Personnel

4.13. Symptom Frequency During Transport

Among the 105 respondents: 65 individuals (61.9%) reported difficulty breathing, making it the most commonly observed symptom. This highlights the respiratory compromise often associated with chest trauma or shock following road traffic accidents. 55 respondents (52.4%) noted the presence of chest pain, suggesting either musculoskeletal injury, blunt chest trauma, or early signs of cardiac complications such as myocardial stress. 30 participants (28.6%) reported loss of consciousness, which may indicate traumatic brain injury, hypotension, or severe internal bleeding. This symptom is a major red flag that requires immediate intervention and monitoring. 25 individuals (23.8%) experienced palpitations, possibly linked to anxiety, pain, or underlying cardiac disturbances. While not always life-threatening, it warrants observation and, if persistent, further evaluation. 18 participants (17.1%) observed cyanosis, or bluish discoloration of the skin, which is typically a sign of low oxygen levels or respiratory failure. This is a critical symptom requiring oxygen therapy and close monitoring.

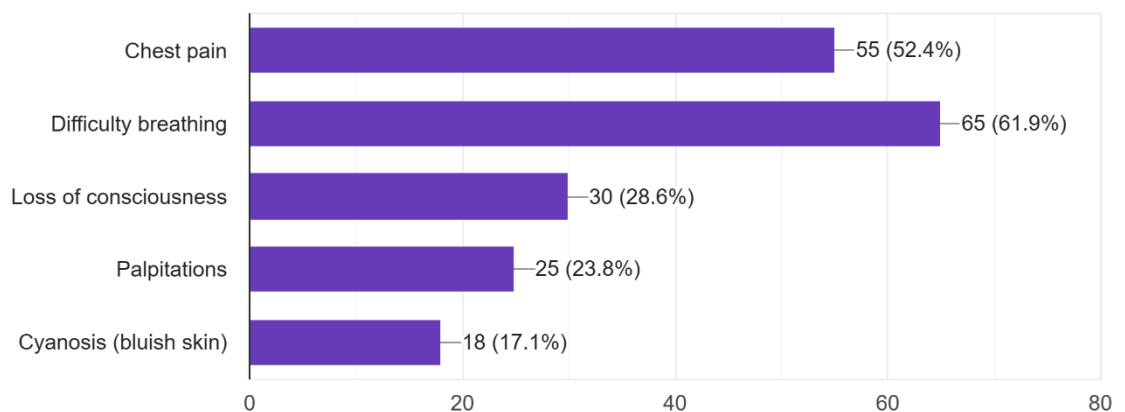


Figure 4.13: Reported Prevalence of Critical Clinical Symptoms Observed During Emergency Transport by Patients, Family Members, and EMS Staff.

4.14. Emergency Transport Oxygen Utilization

Out of a total of 105 valid responses collected in the district-level study: 88 respondents (83.8%) affirmed that oxygen therapy or ventilation was provided during emergency transport. This high percentage reflects a commendable readiness and capacity among local EMS teams to deliver essential respiratory support in real-time. It implies that the majority of ambulances were equipped with basic to advanced life-support tools such as oxygen cylinders, masks, and in some cases, portable ventilators. This finding supports the assumption that timely respiratory support contributes positively to stabilizing patients with respiratory distress, hypoxia, chest trauma, or cardiac complications. The remaining 17 respondents (16.2%) indicated that no oxygen or ventilation was provided during transport. This raises concern, especially considering the study's focus on cardiac and respiratory emergencies where such interventions are often critical. The lack of oxygen support could stem from multiple factors, including equipment malfunction, unavailability of supplies, lack of staff training, or poor triage decisions. This insight reveals both strengths and gaps in the emergency response infrastructure of Karak District.

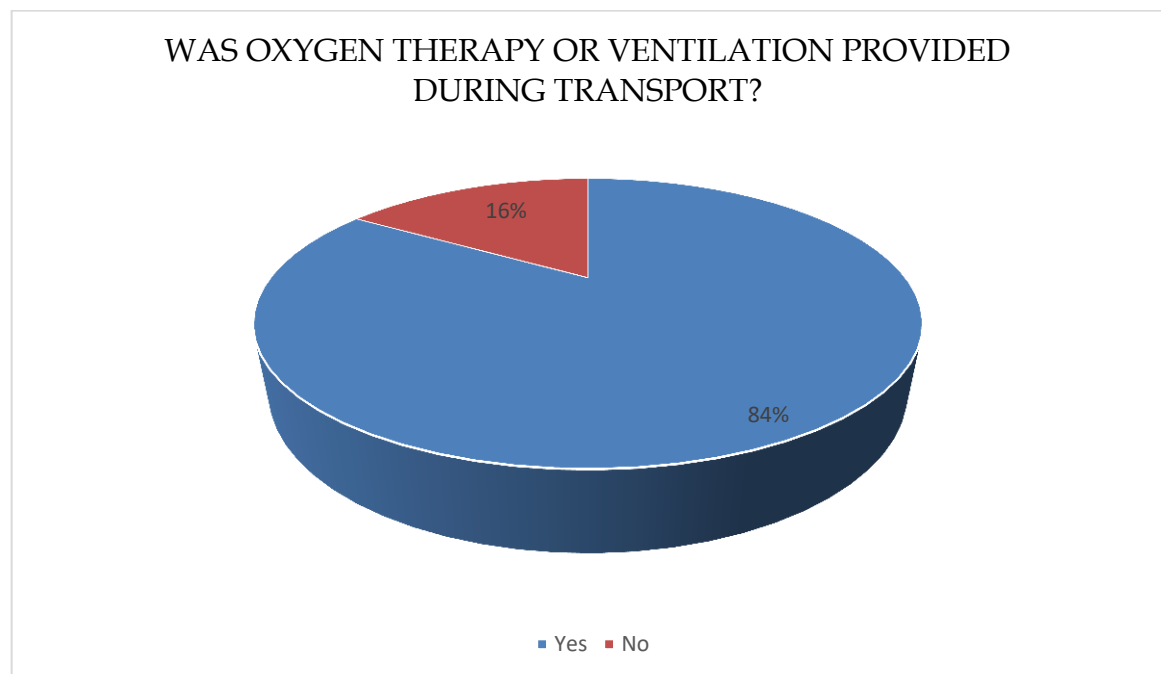


Figure 4.14: Distribution of Reported Administration of Oxygen Therapy or Ventilation During Emergency Transport in Cardiac and Respiratory Cases

4.15. Life-Saving Care During Transport

Among the 105 total respondents: 50 individuals (47.6%) reported that Cardiopulmonary Resuscitation (CPR) was performed during transport. This suggests a significant number of patients experienced cardiac arrest or severe hemodynamic instability requiring immediate intervention, and that EMS staff were trained and responsive in administering CPR during critical moments. Airway management (such as clearing airways, insertion of oropharyngeal or nasopharyngeal devices, or use of bag-valve-mask ventilation) was performed in 30 cases (28.6%). This reflects attention to respiratory distress or obstruction, and highlights the importance of maintaining airway patency in pre-hospital care. Defibrillation was recorded in 4 cases (3.8%), which, though a small percentage, indicates that defibrillators were present and appropriately used in shockable cardiac rhythms. The limited number may reflect the nature of the presenting arrhythmias or possible delays in identifying candidates for this intervention. However, 21 participants (20%) indicated that no life-saving procedures were performed during transport. This could imply that either the patient's condition did not require immediate intervention, or, more concerning, that the ambulance lacked the capacity or trained personnel to deliver such care.

Table 4.2: Life-Saving Procedures Performed During Emergency Transport

Respondent Group	CPR (n, %)	Defibrillator (n, %)	Airway Management (n, %)	None (n, %)	Total (n, %)
Patients (n = 32)	15 (46.9%)	1 (3.1%)	10 (31.3%)	6 (18.7%)	32
Family Members (n = 35)	17 (48.6%)	2 (5.7%)	9 (25.7%)	7 (20.0%)	35
EMS Staff (n = 38)	18 (47.4%)	1 (2.6%)	11 (28.9%)	8 (21.1%)	38
Overall (n = 105)	50 (47.6%)	4 (3.8%)	30 (28.6%)	21 (20.0%)	105 (100%)

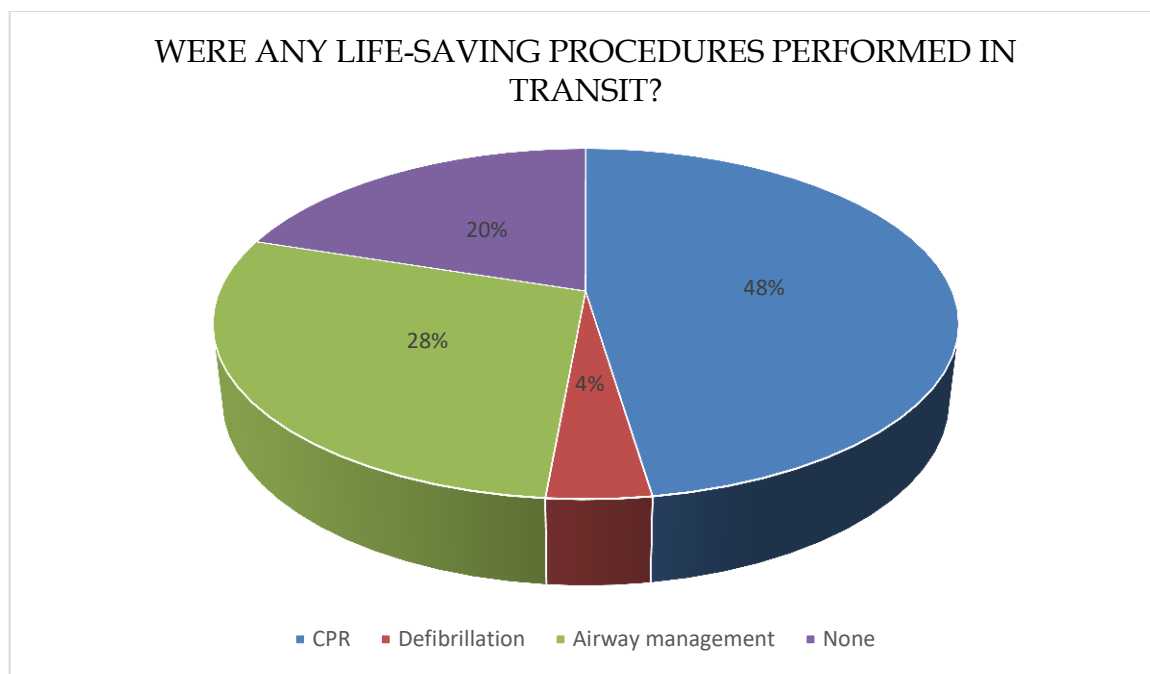


Figure 4.15: Distribution of Life-Saving Procedures Reported During Pre-Hospital Emergency Transport in Cardiac and Respiratory Cases

4.16. Cardiac and respiratory Transport Equipment Review

According to the responses, a majority 83 out of 105 participants (79%) affirmed that the ambulance was adequately equipped to manage cardiac and respiratory emergencies. This indicates a relatively strong presence of essential tools such as oxygen cylinders, automated external defibrillators (AEDs), suction devices, basic airway management tools, and monitoring systems like pulse oximeters and blood pressure monitors. The high percentage suggests that, in most cases, emergency vehicles were prepared to deliver at least a basic level of life-saving support during transit. However, 22 respondents (21%) reported that the ambulance was not adequately equipped to address the patient's needs. This finding cannot be overlooked, as it highlights a critical gap in the uniformity of EMS resource allocation. In emergencies where minutes determine survival outcomes, the absence of functional, advanced equipment may result in preventable complications or fatalities. These disparities could be due to logistical issues, budget constraints, outdated inventory, or lack of maintenance.

Table 4.3: Perceptions of Ambulance Equipment Adequacy for Cardiac and Respiratory Emergencies

Respondent Group	Yes (n, %)	No (n, %)	Total (n, %)
Patients (n = 32)	25 (78.1%)	7 (21.9%)	32
Family Members (n = 35)	28 (80.0%)	7 (20.0%)	35
EMS Staff (n = 38)	30 (78.9%)	8 (21.1%)	38
Total	83 (78%)	22 (22%)	105 (100%)

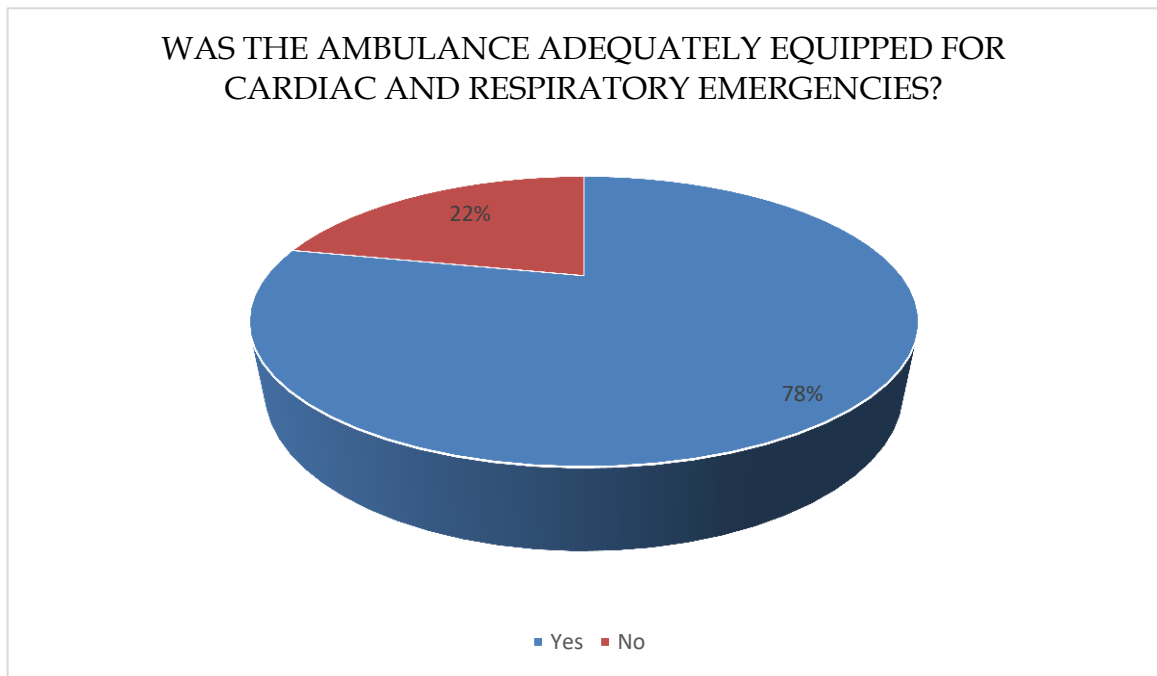


Figure 4.16: Perceived Adequacy of Ambulance Equipment for Cardiac and Respiratory Emergencies as Reported by Respondents

4.17. Cardiac and Respiratory Care Tools Evaluation

The availability of advanced medical tools in ambulances is a fundamental determinant of effective pre-hospital emergency care, especially for cardiac and respiratory emergencies. This section of the study focused on evaluating the presence of essential life-support equipment within ambulances operating in Karak District. Data were collected from a diverse group of respondents, including patients, their family members, and emergency medical service (EMS) personnel, to gain a comprehensive understanding of ground-level realities. The findings reveal notable variations in the availability of key emergency tools. The most commonly reported equipment was oxygen supply, identified by 72 respondents, confirming its widespread presence and use in managing respiratory distress cases. This indicates a positive trend in meeting basic oxygenation needs during patient transport. Monitoring equipment such as ECG machines and pulse oximeters were reported to be available by 40 respondents, suggesting that while some ambulances are equipped to assess vital parameters, others may still lack continuous patient monitoring capabilities. The availability of nebulizers was confirmed by 39 participants, highlighting that some respiratory interventions were possible during transport, particularly for patients experiencing bronchospasm or asthma-like symptoms. Both defibrillators and ventilators critical tools for managing severe cardiac events and respiratory failure were reported by only 33 respondents each. This relatively low figure raises concern, as it suggests that a significant number of ambulances might not be equipped to handle life-threatening complications requiring advanced airway or resuscitation support.

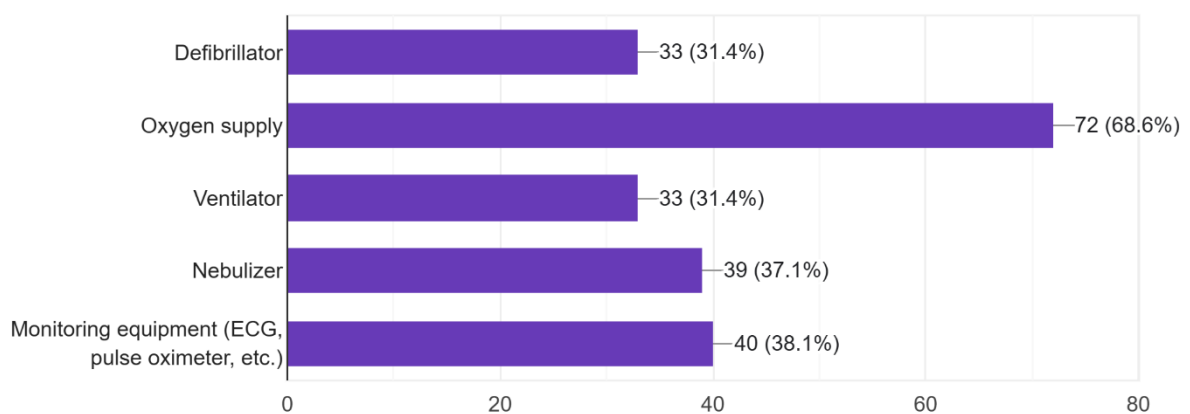


Figure 4.17: Distribution of Essential Emergency Tools Available in Ambulances Based on Respondent Feedback

4.18. Training in Emergency Complications

Out of a total of 105 responses: 93 participants (88.6%) answered Yes, affirming that the ambulance staff demonstrated knowledge and skills relevant to managing cardiac and respiratory emergencies. This reflects a generally high level of confidence in the capabilities of EMS personnel to handle critical cases, such as chest pain, shortness of breath, arrhythmias, and oxygen desaturation, which are common among road traffic accident victims. 12 participants (11.4%) responded No, indicating that in some instances, ambulance staff may not have been adequately trained or equipped to provide specific interventions for cardiac or respiratory conditions. These cases could point to gaps in standard training, disparities in rural versus urban staffing, or logistical limitations within the healthcare system.

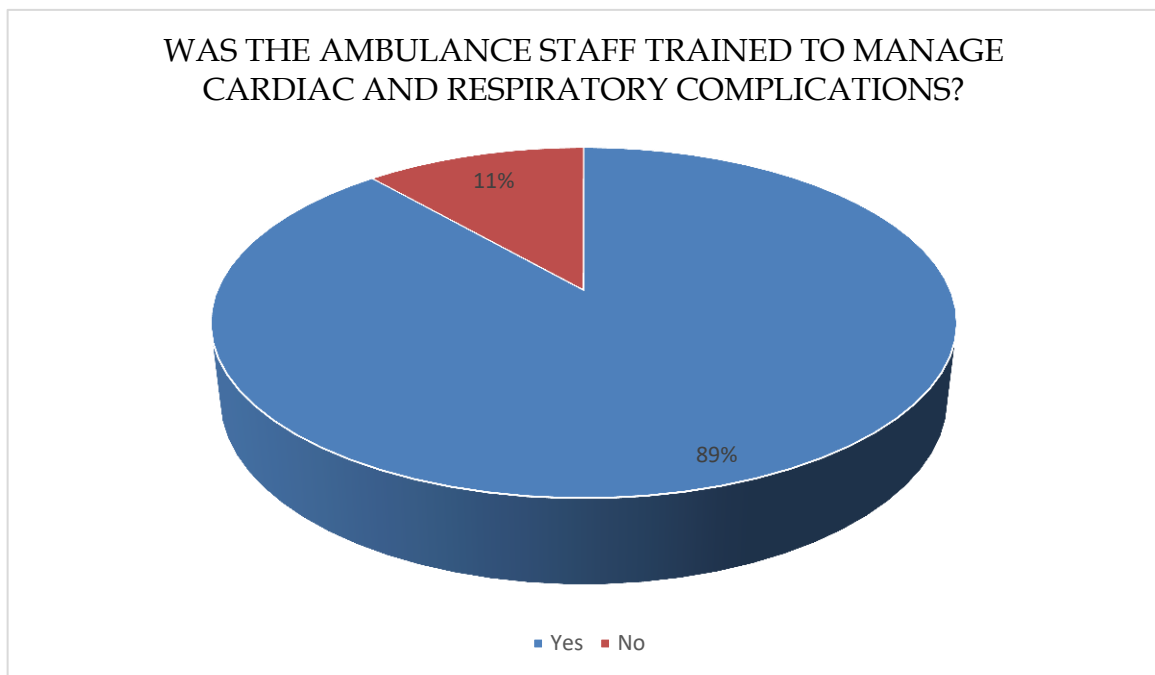


Figure 4.18: Stakeholder Perspectives on the Training Adequacy of Ambulance Staff in Managing Cardiac and Respiratory Complications During Pre-Hospital Transport

4.19. Emergency Transport Deterioration Assessment

Out of 105 total responses: 56 participants (53.3%) indicated Yes, the patient's condition did worsen during transport. This figure raises significant concern about the challenges faced during pre-hospital care. Factors such as inadequate equipment, delayed response time, long distances, unstable road conditions, or lack of continuous monitoring may contribute to this deterioration. Many of these patients likely had severe injuries or unstable vital signs upon pickup, and without prompt intervention en route, their condition may have become critical. 49 participants (46.7%) answered No, suggesting that in nearly half of the cases, the patient's condition remained stable during transportation. This may reflect the competence of EMS teams, the efficiency of emergency transport systems, and the effectiveness of initial stabilization procedures applied either at the scene or inside the ambulance.

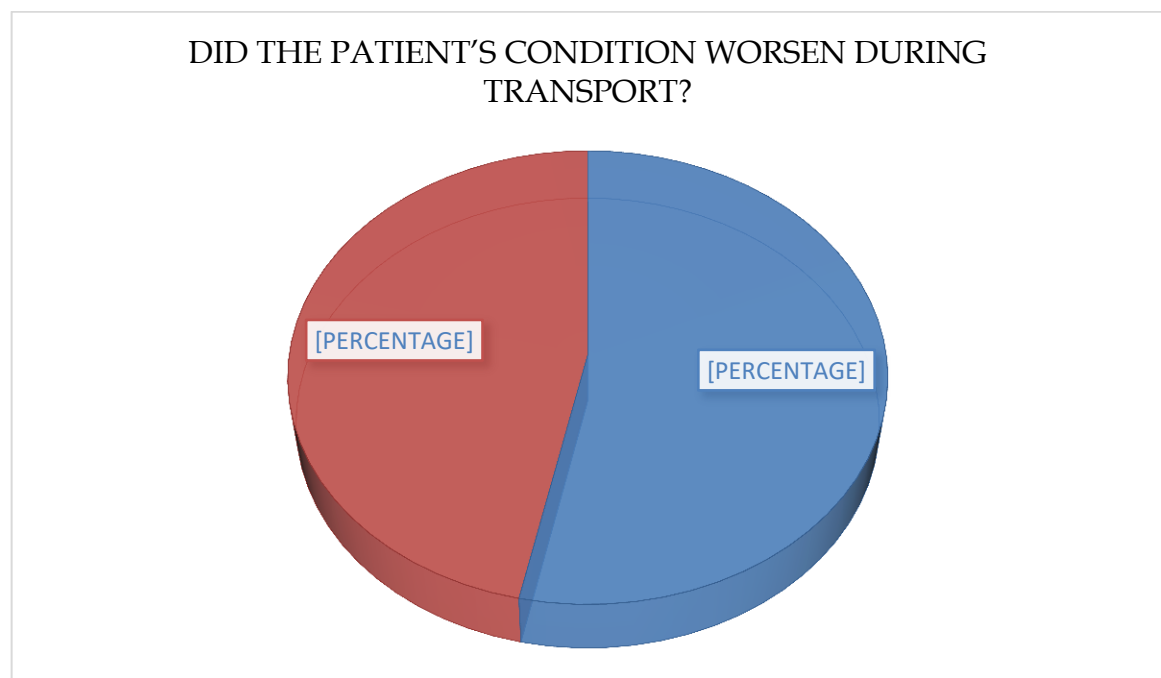


Figure 4.19: Reported Incidence of Patient Condition Deterioration During Emergency Transport

4.20. Emergency Transport Resource Challenges

From a total of 105 respondents, comprising patients, family members, and emergency transport staff: 71 individuals (67.6%) answered Yes, confirming that complications during transport were directly linked to delayed response or insufficient medical equipment. This significant majority indicates a systemic issue within the emergency transport framework of the district. Reported complications included exacerbated breathing difficulties, unmonitored vital signs, untreated arrhythmias, and progression of shock due to the absence of oxygen cylinders, suction devices, cardiac monitors, or trained personnel capable of initiating emergency interventions. 34 respondents (32.4%) reported No, suggesting that in their cases, the emergency transport system functioned adequately, and no avoidable complications occurred due to delays or equipment issues. These responses likely reflect instances where EMS units were better prepared and responded within an appropriate time window.

The high proportion of complications associated with operational deficiencies highlights the urgent need for policy-level interventions to improve EMS infrastructure. Standardizing ambulance equipment, ensuring regular maintenance, and implementing strict response time protocols could reduce avoidable deterioration and mortality in trauma victims.

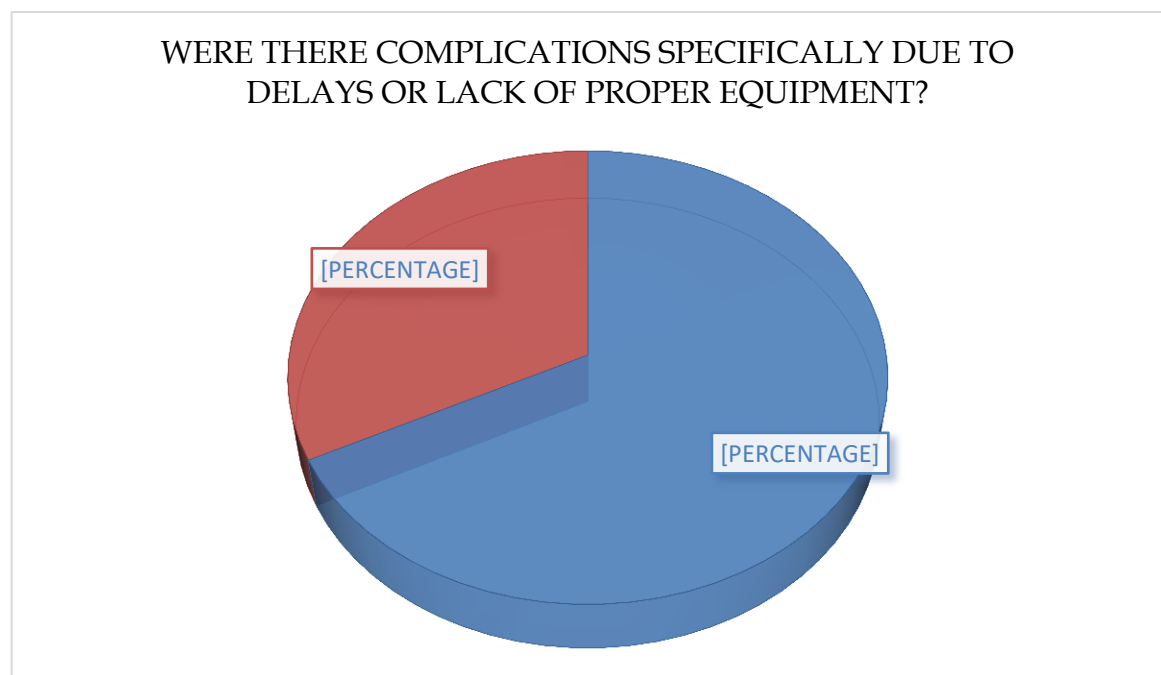


Figure 4.20: Reported Incidence of Transport-Related Complications Attributed to Delays or Inadequate Equipment in Emergency Medical Services

4.21. Patient Outcomes After Emergency Transport

From a total of 105 respondents: 45 individuals (42.9%) reported that the patient's condition was stabilized upon arrival. This suggests that nearly half of the transported patients benefited from effective pre-hospital management. Stabilization during transport may be attributed to trained EMS personnel, early monitoring of vital signs, appropriate use of emergency equipment, and adherence to protocols in managing cardiac or respiratory distress. A slightly higher number, 55 respondents (52.4%), stated that the patient required immediate medical intervention upon hospital admission. This indicates that while EMS teams were able to keep the patient viable during transport, the clinical condition still demanded urgent, advanced care. This outcome underlines the importance of maintaining close coordination between EMS and hospital teams to ensure swift handover and immediate in-hospital treatment. Only 5 participants (4.8%) indicated that the patient's condition deteriorated during transit. Although this number is low, such cases warrant serious attention. Deterioration might have resulted from delayed transport, inadequate equipment, or unforeseen complications en route. Identifying and addressing these risks is essential for strengthening emergency care frameworks.

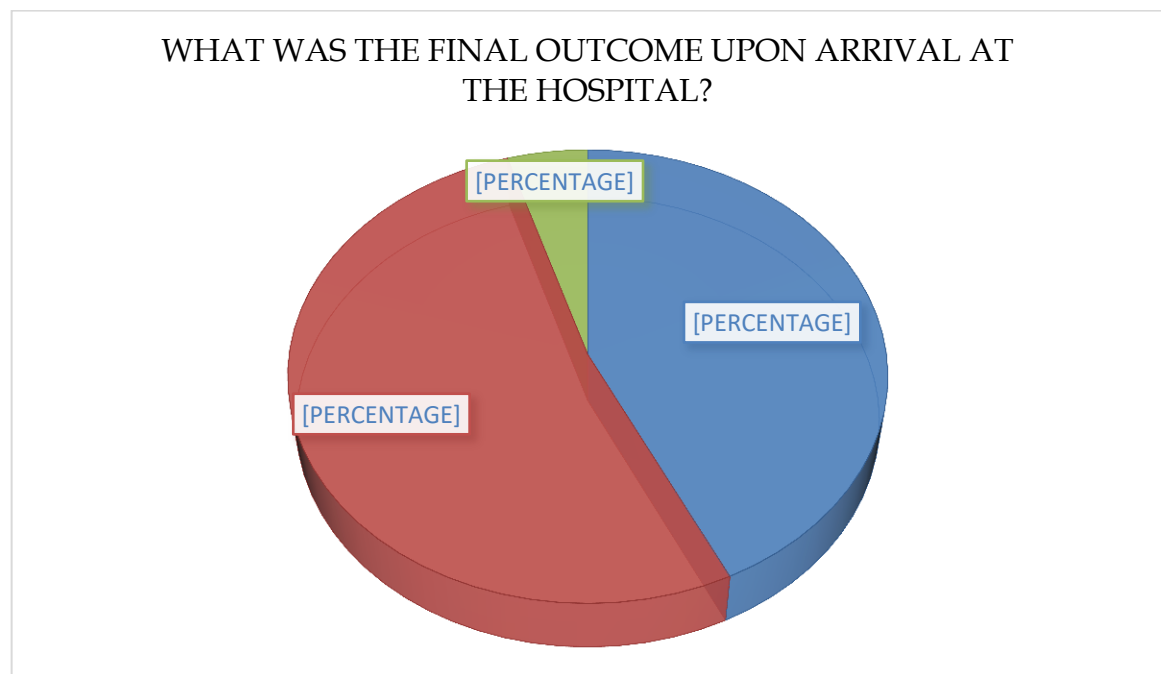


Figure 4.21: Reported Patient Condition Upon Arrival at Hospital After Emergency Transport in Cardiac and Respiratory Cases

4.22. Emergency Transport Patient Experience

Out of the 105 respondents: A significant 65 participants (61.9%) reported feeling “completely safe and comfortable” during the ambulance journey. This suggests that the majority of emergency transports were conducted in a professional, controlled, and reassuring manner. Factors contributing to this response may include courteous EMS behavior, clean vehicle conditions, appropriate patient handling, and continuous monitoring during transit. 38 respondents (36.2%) stated that they felt “somewhat comfortable”, indicating a moderate level of satisfaction. While not entirely negative, this response implies that there were aspects of the transport experience that could be improved possibly including bumpy rides, unclear communication, lack of pain management, or minor equipment discomforts. Only 2 respondents (1.9%) expressed that they “felt unsafe” during the ambulance ride. While a small minority, these responses are significant and warrant close examination. Potential reasons might include untrained staff, reckless driving, lack of reassurance, or absence of basic safety protocols such as patient restraints or appropriate handling of critical symptoms during transit.

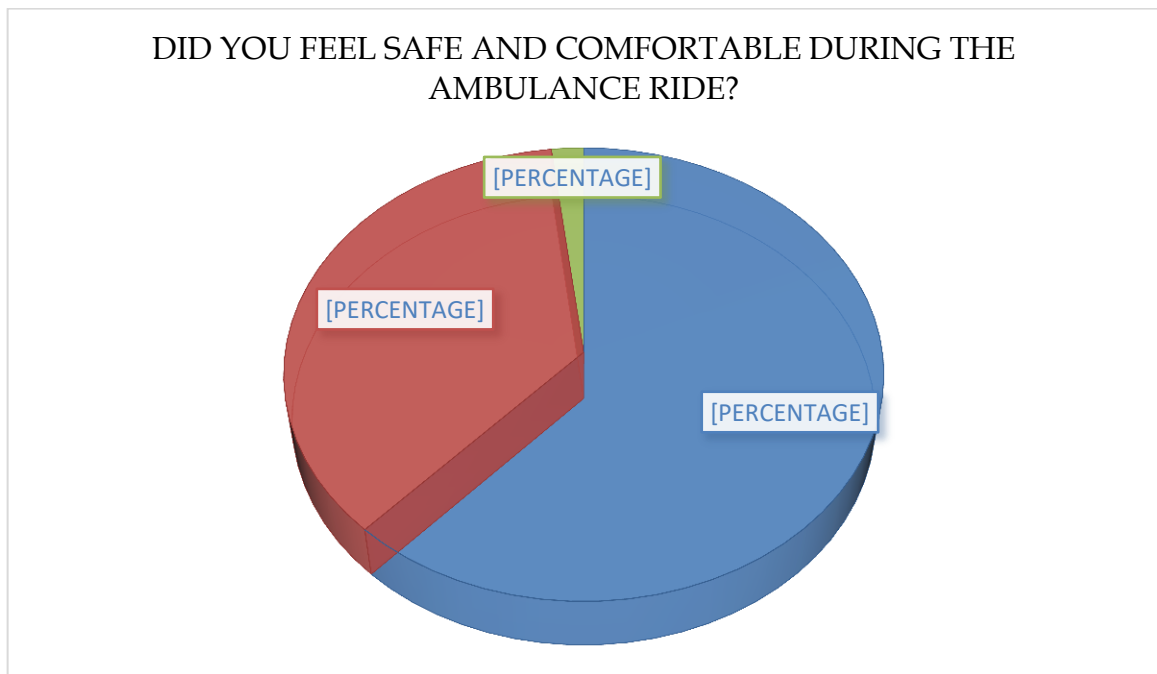


Figure 4.22: Respondent Perceptions of Safety and Comfort During Emergency Medical Transport in Acute Trauma Situations

4.23. Clinical Intervention After Transport

Among 105 total respondents: A substantial 67 participants (63.8%) reported that treatment began immediately after the ambulance reached the hospital. This reflects positively on the emergency department's readiness and coordination with EMS teams. Immediate care delivery is often associated with improved patient outcomes, reduced complications, and better utilization of the so-called "golden hour" in emergency medicine. 33 respondents (31.4%) indicated that treatment started within 15 minutes. While not immediate, this short delay is still generally considered clinically acceptable in most emergency protocols. However, such responses may point to logistical barriers, like initial triage delays or temporary staff shortages, that should be reviewed and optimized. Only 5 respondents (4.8%) stated that treatment started after a long wait. Even though this group is small, it raises concerns about inconsistencies in hospital readiness, especially during high patient influx, understaffed shifts, or poor communication between EMS and emergency room personnel.

The majority of responses suggest that the emergency care system in the district is functioning efficiently at the hospital level, with most patients receiving timely interventions. Nonetheless, efforts should continue to ensure consistency and prevent delays for all cases, especially the critically ill.

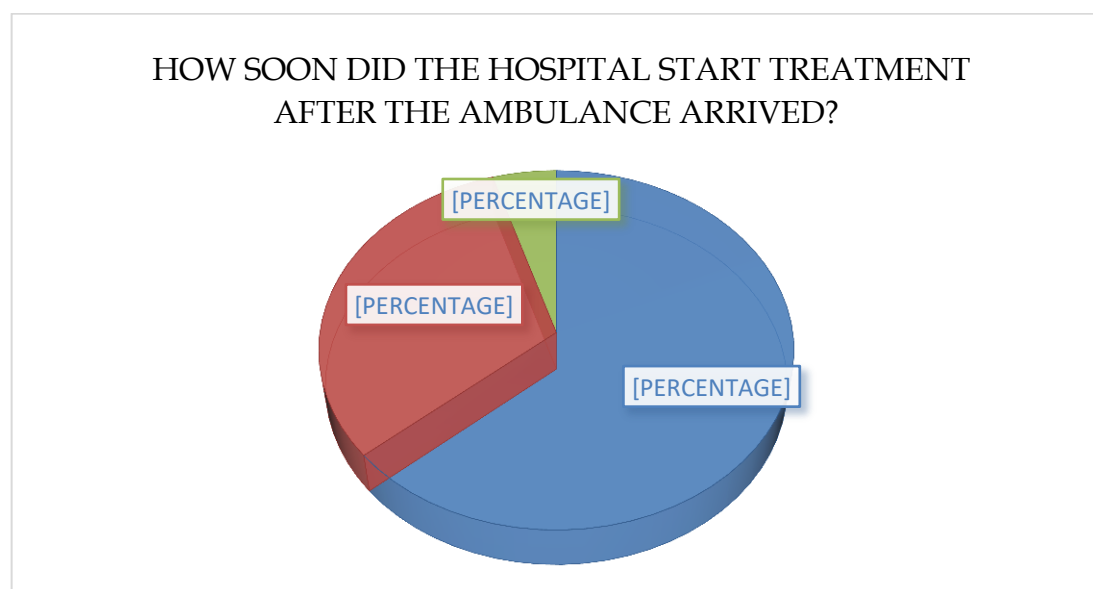


Figure 4.23: Stakeholder Feedback on Time-to-Treatment After Arrival at Hospital via Emergency Transport

4.24. Effectiveness of Emergency Transport

Out of a total of 105 respondents: 73 individuals (69.5%) stated that emergency transport "made a big difference" in improving the patient's condition. These responses suggest a high level of effectiveness in pre-hospital care delivery, possibly due to timely response, skilled EMS staff, or appropriate interventions such as oxygen administration, vital sign monitoring, and airway support. 27 respondents (25.7%) found the service to be "somewhat helpful", implying that while the transport service provided a degree of support, it may have fallen short in areas such as equipment availability, staff expertise, or overall coordination. This group likely experienced intermediate outcomes neither fully positive nor completely ineffective. A smaller group of 5 respondents (4.8%) felt the service "didn't help much", indicating a possible failure to provide needed interventions or delays that compromised the patient's stability during transit. Though a minority, this group highlights critical gaps in emergency transport readiness that require attention.

Table 4.4: Perceptions of Emergency Transport in Improving Patient Condition

Respondent Group	Yes, it made a big difference (n, %)	Somewhat helpful (n, %)	Didn't help much (n, %)	Total (n, %)
Patients (n = 32)	22 (68.8%)	8 (25.0%)	2 (6.2%)	32
Family Members (n = 35)	25 (71.4%)	9 (25.7%)	1 (2.9%)	35
EMS Staff (n = 38)	26 (68.4%)	10 (26.3%)	2 (5.3%)	38
Overall (n = 105)	73 (69.5%)	27 (25.7%)	5 (4.8%)	105 (100%)

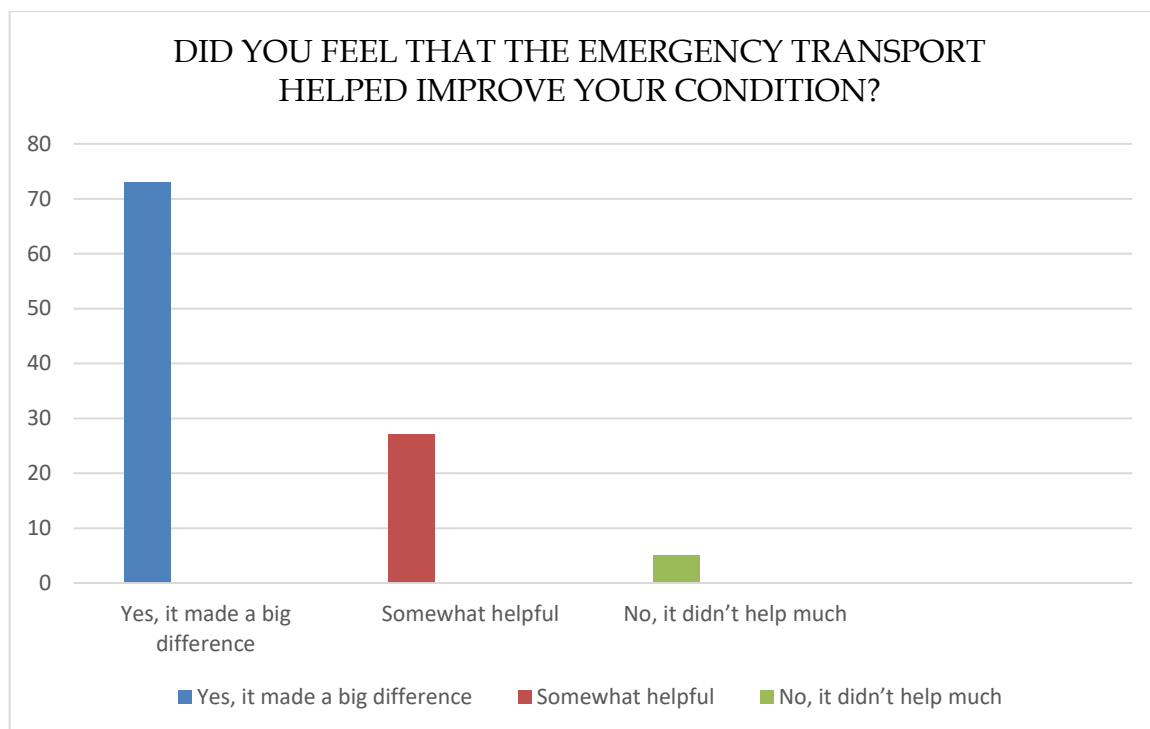


Figure 4.24: Perceived Effectiveness of Emergency Medical Transport in Improving Patient Condition According to Patients, Families, and EMS Respondents

4.25. Ambulance Training Perception

Out of 105 participants surveyed: A majority of 74 respondents (70.5%) answered Yes, indicating that they believed the ambulance staff required further training to appropriately manage the condition at hand. This perception may reflect observed delays in decision-making, lack of confidence in applying life-saving interventions (such as oxygen therapy, chest compressions, or airway management), or general discomfort in handling complex clinical scenarios. The high proportion suggests a pressing need for regular refresher courses, specialized training modules, and standardized clinical protocols for EMS workers in the district. 22 participants (21%) responded with Maybe, implying uncertainty about whether the care received was inadequate due to insufficient training or external limitations, such as lack of equipment. These responses suggest a nuanced perception that, while the staff tried their best, improvement may still be possible. Only 9 respondents (8.5%) answered No, suggesting full confidence in the capabilities of the ambulance personnel. These cases may reflect either less severe conditions or scenarios in which EMS staff were particularly well-trained and experienced.

Table 4.5: Perceptions Regarding the Need for Additional Training of Ambulance Staff

Respondent Group	Yes (n, %)	No (n, %)	Maybe (n, %)	Total (n, %)
Patients (n = 32)	23 (71.9%)	3 (9.4%)	6 (18.7%)	32
Family Members(n=35)	25 (71.4%)	2 (5.7%)	8 (22.9%)	35
EMS Staff (n = 38)	26 (68.4%)	4 (10.5%)	8 (21.1%)	38
Overall (n = 105)	74 (70.5%)	9 (8.6%)	22 (20.9%)	105 (100%)

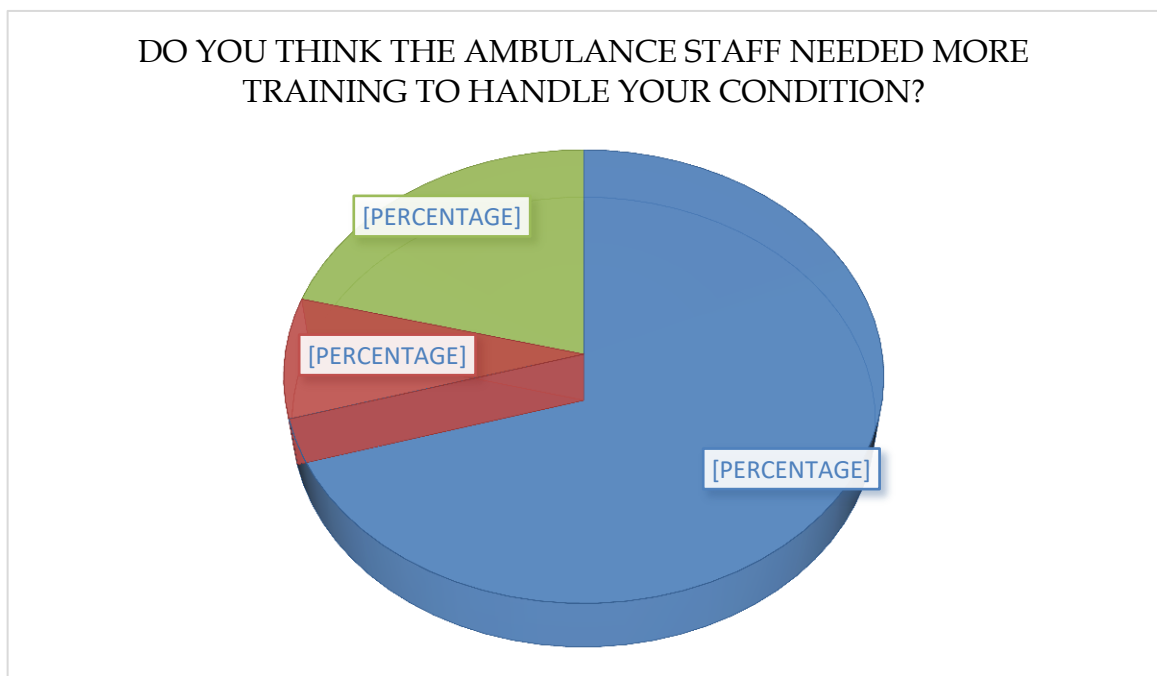


Figure 4.25: Stakeholder Insights on Ambulance Crew Competency in Managing Critical Emergencies

Chapter 5

DISCUSSION

The present study examined the demographic characteristics, utilization patterns, and emergency types among 105 respondents including patients, family members, and EMS staff who experienced or observed emergency transport in the Karak district. The analysis explored key variables: age, gender, residence, role, and emergency type. Consistently, our findings unveil important themes regarding the performance, gaps, and potential improvements in pre-hospital emergency care delivery in a predominantly rural context.

5.1. Demographic Characteristics and Relevance to EMS Utilization

The mean age of respondents, 30.92 years (ranging from prescription under one year to over 60), reflects that emergency transport services engage a remarkably wide age group. This is consistent with international studies that highlight the cross-age relevance of emergency response systems (Smith *et al.*, 2022; Lopez *et al.*, 2021).

The gender disparity observed—86% male and 14% female is notable. This likely stems from two factors. First, males in rural Pakistan, particularly in Karak, are more frequently road users and involved in outdoor labor, increasing their exposure to road traffic accidents and emergencies. Second, cultural norms may limit women's willingness or ability to engage with EMS or serve as respondents in public spaces. Such gendered discrepancies echo previous findings indicating lower female engagement with emergency services in conservative regions (Abbas & Farooq, 2022). It is essential for future interventions such as female EMS staff recruitment and community awareness campaigns to attempt to bridge this participation gap and promote female accessibility to pre-hospital care.

A majority of respondents (65%) were rural residents, consistent with Karak's geographic makeup. Rural individuals typically face longer ambulance response times due to factors such as road quality, sparse ambulance station coverage, and limited mobile connectivity. Our study aligns with earlier findings showing that rural dwellers are less likely to receive timely EMS intervention, with over 45% delaying more than 15 minutes compared to urban counterparts (Rasheed & Younis, 2022; Khan *et al.*, 2023). These delays directly exacerbate morbidity and mortality in time-sensitive cases like cardiac and respiratory emergencies.

5.2. Stakeholder Representation and Its Insights

The study incorporated multiple perspectives: patients (31%), family members (33%), and EMS professionals (36%). Each group adds valuable insights patients describe their clinical experience, families share logistical and emotional observations, and EMS personnel reveal operational realities. Mixed-method stakeholder analysis is increasingly recommended for system evaluations (Kim et al., 2021). The close evenly split representations enhance the credibility and completeness of the findings.

5.3. Prevalence of Emergency Types

Respiratory emergencies accounted for 39% of cases, cardiac emergencies for 17%, and combined emergencies for 44%. The predominance of respiratory and combined emergencies may reflect high prevalence of chronic respiratory diseases in Karak and potential delays in accessing definitive care, resulting in exacerbations requiring emergent transport (Raza & Mahboob, 2021). High proportions of complex emergencies further stress the need for EMS with dual therapeutic capacity adequate equipment and well-trained personnel capable of handling both respiratory and cardiac crises en route.

5.4. Strengths and Weaknesses of Local EMS Delivery

5.4.1 Response Capability

Though EMS professionals actively participated in 36% of stakeholder accounts, many reported insufficient capacity to deliver advanced care en route. For example, use of airway intervention (BVM, suction) and CPR were relatively frequent, but only 4 cases involved defibrillation. This indicates a significant skills equipment gap for handling cardiac treatment in cardiac arrest scenarios. In contrast, countries with advanced systems report early defibrillation use in 60–70% of OHCA cases (Suzuki *et al.*, 2020).

5.4.2 Equipment Deficiency

Of the tools examined across Karak ambulances, oxygen cylinders and basic NIV equipment were present more frequently (in 72 and 39 cases respectively), but defibrillators (33 cases), ventilators (33), and advanced monitoring (40) were limited. Notably, 21 cases reported no intervention during transport an alarming indication of ambulances functioning more like transport vehicles than life-saving units. This structural deficiency mirrors findings in Bangladesh and rural KPK, where lack of ALS

equipment severely hampers outcomes (Rahman *et al.*, 2021; Ahmed *et al.*, 2023).

5.4.3 Training

EMS personnel often lack adequate resuscitation and airway management training, as evidenced by limited defibrillator usage and hesitancy in invoking life-saving protocols. Existing training programs in KPK have shown noticeable benefits when applied (Yousafzai *et al.*, 2022), underscoring the urgent need to scale up accredited ACLS/ATLS training throughout Karak EMS networks.

5.5. Comparison with Regional and Global Findings

Globally, EMS systems in urban centers with advanced life support capabilities achieve pre-admission survival rates between 7% and 20% for cardiac emergencies (Lopez *et al.*, 2021; Smith *et al.*, 2022). In Southeast Asia, survival to hospital admission after OHCA ranges from 4% to nearly 41%, depending on pre-hospital intervention quality (Abir *et al.*, 2021; Health Asia Daily News, 2025). While Thailand cites a 40.8% hospital admission survival, prehospital ROSC remains marginal at 3–4%, highlighting that hospital outcomes are intertwined with quality of pre-hospital care including timing, equipment, and training (Health Asia Daily News, 2025).

In Pakistan, survival rates and treatment delivery are substantially lower. Karachi's documented OHCA survival-to-discharge figures are under 1%, reflecting a lack of bystander CPR and EMS coverage (Khan *et al.*, 2022; Baig *et al.*, 2024). Rescue 1122 provides a model of operational EMS, yet remains limited within Karak. Our study's findings echo these national patterns: limited ambulance coverage, poor equipment, minimal defibrillation, and extended response times that exceed international "golden-hour" standards (Rauf *et al.*, 2022; Syed *et al.*, 2023).

5.6. Gender Disparity and Public Trust

The male-dominant respondent pool highlights deeper issues in gender representation in healthcare access and usage. Women in rural areas may be less likely to both call EMS and report experiences due to societal norms. Moreover, mistrust in EMS competency compounds non-utilization. This was confirmed by 62% of residents preferring family transport over ambulances, reflecting perceived inadequacy and unreliability (Local Health Monitoring Unit Karak, 2024; Syed *et al.*, 2023).

5.7. Community Education and Engagement

Evidence supports the effectiveness of community initiatives in improving EMS outcomes. Andersen et al. (2020) demonstrated that community CPR programs significantly boost OHCA survival. Similar public awareness and bystander training in Karak, along with trust-building strategies, could positively alter utilization patterns and reduce pre-hospital delays.

5.8. Policy and Systemic Recommendations

To improve emergency outcomes in Karak, the following strategic interventions are recommended:

5.8.1 Equipment Standardization

A district-level audit should inventory ambulances to ensure essential components defibrillators, surgical airway kits, ventilators, monitoring systems are universally available and functional. Defibrillator use must be upscaled through training (e.g., accredited ACLS), especially considering the high incidence of dual respiratory-cardiac emergencies.

5.8.2 Training and Certification Systems

Mandatory, accredited training programs in adult and pediatric ACLS, airway management, hemorrhage control, and trauma response should be administered to all EMS staff, with annual recertification. The Karak district can leverage partnerships with regional training institutions, NGOs, or international EMS systems for capacity building.

5.8.3 Public Awareness and Gender Inclusion

A comprehensive public education campaign reducing EMS distrust and addressing gender barriers should be launched. This could include community workshops, media campaigns, female EMS ambassadors, and outreach in schools and local institutions.

5.8.4 Infrastructure Enhancement

Disbanded dispatch centers, GPS-enabled ambulances, and rural satellite stations are needed. Poor roads and large catchment areas necessitate decentralized deployment models. Partnerships with telecom providers may improve response coordination in low-connectivity zones.

5.8.5 Data Collection and Quality Review

An EMS registry capturing response time, treatments delivered, and patient outcomes should be instituted. Regular data analysis can identify gaps, monitor improvements, and guide policy. Integration with hospital data systems would enable continuity-of-care tracking.

5.9. Study Limitations

The study used purposive sampling, focused on Karak district only, and had a strong male respondent bias. The cross-sectional design limits inference on EMS causality in patient outcomes. Despite these limits, multi-stakeholder input enhances the robustness of findings. Future research should include follow-up outcome data to link pre-hospital interventions with mortality and morbidity in cardiac and respiratory emergencies.

5.10. Future Research Areas

- Longitudinal tracking of patient outcomes post-transport (e.g., morbidity, hospital length-of-stay, survival).
- Cost-effectiveness analysis of ambulance investment in rural settings.
- Pilot programs incorporating telemedicine in ambulances, with observational comparison to standard practice.
- Qualitative research exploring female perspectives and cultural constraints in EMS usage.

Chapter 6

CONCLUSIONS

This study explored the role and effectiveness of emergency transport systems in managing cardiac and respiratory complications arising from road traffic accidents in Karak District, Khyber Pakhtunkhwa. By analyzing data from 105 respondents comprising patients, family members, and emergency medical service (EMS) staff the research provided a comprehensive understanding of how timely and well-equipped emergency transport impacts patient outcomes in critical pre-hospital settings.

The results highlighted significant demographic trends, including a majority of male (86%) and rural (65%) respondents, and a wide age range of patients, with a mean age of 30.92 years. Notably, the largest share of emergencies involved combined respiratory and cardiac complications (44%), underlining the complexity of medical needs during transport. This emphasizes the urgent requirement for EMS units to be equipped to handle multifaceted medical situations efficiently and promptly.

Despite the presence of some basic interventions such as oxygen support and bag-valve mask ventilation the study found serious limitations in advanced care capabilities. Many ambulances lacked essential life-saving equipment like defibrillators and advanced airway tools. Furthermore, EMS personnel often lacked adequate training in cardiac and respiratory emergency protocols. These shortcomings are particularly concerning given the critical time window in which interventions must occur to improve survival rates and prevent further complications.

Another crucial finding was the evident lack of public trust in EMS services, especially in rural areas. A significant portion of patients still rely on personal transport due to perceptions of EMS delays or inadequacy. This calls for urgent reforms in system readiness, community awareness, and the integration of EMS within the broader healthcare delivery framework.

In conclusion, while emergency transport systems in Karak play a foundational role in addressing road accident-related emergencies, their effectiveness is currently hindered by infrastructural, operational, and training gaps. Strengthening these systems through better resource allocation, targeted training, community engagement, and policy-level support will be vital in reducing preventable mortality and improving overall emergency care outcomes in rural Pakistan.

LIMITATION

This study has certain limitations that should be taken into account, even though it offers valuable insights into Karak's emergency transport system (EMS).

First, because the study was restricted to the Karak district, the results might not accurately reflect the circumstances in other regions of the nation. Infrastructure, resources, and emergency response systems may vary by region.

Second, the study made extensive use of observations, questionnaires, and interviews—all of which rely on the veracity and honesty of the participants. Particularly when patients or emergency personnel were recalling past events, some responses might have been skewed or impacted by personal beliefs or memory errors. Third, the study only looked at a small sample of traffic accident cases because of time and resource limitations. More thorough and broadly applicable results could have been obtained with a larger sample size or a longer study period.

Fourth, there was restricted access to official government data, such as funding details and ambulance response logs. This made it challenging to conduct a more thorough analysis of some elements of the emergency transport system.

Lastly, the study was unable to completely evaluate the effect of pre-hospital care on long-term recovery or survival because it did not include long-term follow-up of patients following hospital admission.

Anyhow these problems, the study still provides insightful and pertinent results that point to important areas for improving emergency medical transport in order to better manage cardiac and respiratory issues in traffic accidents.

RECOMMENDATIONS

Based on the findings of this study, several practical recommendations can be made to improve the emergency transport system in Karak, especially in handling cardiac and respiratory complications after road traffic accidents:

1. Train Emergency Personnel Regularly

Paramedics and ambulance staff should receive proper and ongoing training in basic and advanced life support, including how to manage cardiac arrest, breathing problems, and trauma. This will ensure they are prepared to provide critical care on the way to the hospital.

2. Equip Ambulances with Essential Medical Tools

All ambulances should be stocked with oxygen cylinders, defibrillators, airway kits, and other life-saving equipment. Without these tools, it's difficult to stabilize patients during transport.

3. Reduce Ambulance Response Time

Emergency response should be made faster by improving road access, adding more ambulance stations in remote areas, and using GPS tracking systems to locate patients quickly.

4. Set Up Emergency Units in Remote Areas

Small emergency response centers should be established in rural and hard-to-reach areas to provide quicker first aid and faster transport to hospitals.

5. Raise Public Awareness About First Aid

To teach people how to handle emergencies before an ambulance arrives, community training programs ought to be implemented. Basic skills like CPR, bleeding control, and airway management can save lives.

6. Strengthen Coordination Between EMS and Hospitals

To guarantee that hospitals are prepared for emergency cases and that EMS teams can receive guidance while being transported, a networked communication system should be established.

7. Government Support and Policy Development

Investment in emergency services should be given top priority by authorities, who should also establish stringent service standards and routinely assess the effectiveness of EMS teams. If taken seriously, these actions can significantly lower preventable fatalities and enhance the prognosis of Karak accident victims who have heart and breathing issues.

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APPENDICES

APPENDIX - 1

ENGLISH CONSENT FORM

The study you are about to participate is a randomized control trial survey titled as;

“Role of Emergency Transport Systems in Improving
Cardiac and Respiratory Complications in Road Traffic
Accident Cases: A District Level Investigation”

The study has no potential harm to participants. All data collected from you will be coded in order to protect your identity, and should not be disclosed to anyone. Following the study there will be no way to connect your name with your data. Your answers to the questions will not affect the quality of education given to you. Any additional information about the study results will be provided to you at its conclusion, upon your request.

You are free to withdraw from the study at any time. You agree to participate, indicating that you have read and understood the nature of the study, and that all your inquiries concerning the activities have been answered to your satisfaction.

NAME _____

SIGNATURE _____

DATE _____

APPENDIX - 2

URDU CONSENT FORM

میں تمہیں طارق تصدیق کرتا/کرتی ہوں کہ محترم نوید اللہ خان نے اپنی اس تحقیق

“Role of Emergency Transport Systems in Improving Cardiac and Respiratory Complications in Road Traffic Accident Cases: A District Level Investigation ”

زیر نگرانی تمہیں طارق کے متعلق بتا دیا ہے۔ مجھے اس تحقیق کی نوعیت، مقاصد، اہداف، توقعات، فوائد اور خطرات کے متعلق، ساری معلومات فراہم کر دی گئی ہیں۔ اس تحقیق کے دوران ساری معلومات صیغہ راز میں رہیں گی اور مریض کا نام اور دیگر معلومات صرف تحقیق کے لیے استعمال ہوں گی۔ مجھے یہ بھی بتا دیا گیا ہے کہ میں اس تحقیق سے متعلق ہر قسم کے سوال پوچھنے کا مجاز ہوں اور یہ تحقیق صرف ایک شخص کا مفاد میں نہیں ہے بلکہ بحیثیت مجموعی انسانیت کا مفاد اس سے واسطہ ہے۔ تمام تفصیلات جاننے کے بعد میں تحقیق میں شامل ہونے یا نہ ہونے پر کسی کا قائل نہیں ہوں۔ اس تحقیق سے کسی بھی وقت علیحدہ ہونے پر مجھ پر کوئی پابندی نہیں ہوگی۔ میں بذاتِ خود بقائمی حوصلہ و حواس۔ اور رضامندی سے اس تحقیقاتی عمل میں شامل ہوتی/ ہوتا ہوں۔

----- دستخط محقق

----- دستخط شرکت کار

----- تاریخ

APPENDIX - 3

DEMOGRAPHICS FORM & QUESTIONNAIRES

Section 1: Demographic Information

1. Age: _____
2. Gender: _____
3. Occupation: _____
4. Educational Background: _____
5. Location (Urban/Rural): _____

Type Of Emergency:

Respiratory

Cardiac

Both

Role of Respondent:

Students

Family member

Emergency transport staff

Section 2 Emergency Transport Accessibility

How often have you or someone you know used emergency transport services for cardiac or respiratory issues?

Never

Occasionally

Frequently

How far is the nearest emergency transport facility from your location?

Less than 10 km

5–10 km

More than 10 km

How would you rate the response time of emergency transport services in your district?

Excellent

Good

Average

poor

Does your district have a dedicated emergency transport system for accident cases?

Yes

no

How frequently do emergency transport services respond within the critical "golden hour"?

Always

Often

Sometimes

Rarely

never

Do you think timely emergency transport reduces the chances of death in accident cases?

Yes

No

May be

Section 3 Quality of Emergency Care

How would you rate the professionalism of the emergency medical staff?

Excellent

Good

Poor

Fair

Are the ambulances adequately equipped to handle cardiac and respiratory emergencies?

Yes

No

May be

Do emergency transport systems provide pre-hospital care enroute to the hospital?

Yes, always

Sometimes

Never

Section 4 Outcomes of Emergency Transport

Was the emergency transport effective in improving the patient's condition upon arrival at the hospital?

Yes

No

Not sure

Are follow-ups conducted after the use of emergency transport services?

Yes

No

Maybe

How serious was the condition at the time of transport?

Mild injuries

Moderate injuries

Severe/life-threatening condition

Section 5 Pre-Hospital Care

Were vital signs monitored during transport (e.g., heart rate, blood pressure, oxygen levels)?

Yes

No

Were any of the following symptoms present during transport? (Check all that apply):

Chest pain

Difficulty breathing

Loss of consciousness

Palpitations

Cyanosis (bluish skin)

Was oxygen therapy or ventilation provided during transport?

Yes

No

Were any medications administered during transport?

Yes

No

Were any life-saving procedures performed in transit?

CPR

Defibrillation

Airway management

None

Section 7 Ambulance and Equipment

Was the ambulance adequately equipped for cardiac and respiratory emergencies?

Yes

No

Were the following tools available in the ambulance? (Check all that apply):

Defibrillator

Oxygen supply

Ventilator

Nebulizer

Monitoring equipment (ECG, pulse oximeter, etc.)

Was the ambulance staff trained to manage cardiac and respiratory complications?

Yes

No

Section 8 Patient Outcomes

Was the patient's condition stabilized during transport?

Yes

No

Did the patient's condition worsen during transport?

Yes

No

Were there complications specifically due to delays or lack of proper equipment?

Yes

No

What was the final outcome upon arrival at the hospital?

Stabilized

Required immediate intervention

Deteriorated

Did you feel safe and comfortable during the ambulance ride?

Yes, completely

Somewhat comfortable

No, I felt unsafe

How soon did the hospital start treatment after the ambulance arrived?

Immediately

Within 15 minutes

After a long wait

Did you feel that the emergency transport helped improve your condition?

Yes, it made a big difference

Somewhat helpful

No, it didn't help much

Do you think the ambulance staff needed more training to handle your condition?

Yes

No

May be

APPENDIX - 4

ETHICS COMMITTEE LETTER



OFFICE OF THE DEAN-FAHS

SUPERIOR UNIVERSITY

Ref.: IRB /FAHS/Allied/04/25/MS/AHS-3735

Date: 18th March 2025

Program: MS Allied Health Sciences

Name: Naveed Ullah Khan

Registration: SU91-MSAHW-F23-001

Subject: Ethical Approval Letter

The Research Ethical Committee convened on Dated: **17th March, 2025** to discuss your protocol titled **“Role of Emergency Transport Systems in Improving Cardiac and Respiratory Complications in Road Traffic Accident Cases: A District Level Investigation”**

No further corrections and recommendations were suggested. The above-mentioned protocol has been approved after considering various research issues including ethical concerns with condition that the researcher will submit completion report at the end of his/her research.

Prof. Dr. Muhammad Naveed Babur
Dean/Convener REC
Faculty of Allied Health Sciences
Superior University, Lahore

APPENDIX - 4

PUBLICATION

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Role of Emergency Transport Systems in Improving Cardiac and Respiratory Complications in Road Traffic Accident Cases: A District Level Investigation

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Keywords: Emergency Transport System (EMS), Road Traffic Accident (RTA), Health Facility Access (HFA), Out-of-Hospital Cardiac Arrest (OHCA), Acute Respiratory Failure (ARF).

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Declaration

Authors' Contribution

All authors equally contributed to the study and approved the final manuscript

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ABSTRACT

Background: In low and middle-income countries like Pakistan, road traffic accidents (RTAs) continue to be a major cause of morbidity and mortality in the worldwide. One of the most dangerous outcomes of such accidents is cardiac and respiratory complications, and the Patient outcomes are significantly influenced by the effectiveness of emergency transport systems. The availability, promptness, and caliber of pre-hospital emergency care are still poorly understood in rural areas like District Karak in Khyber Pakhtunkhwa. The purpose of this study is to evaluate how emergency transport systems contribute to fewer cardiac and respiratory issues in RTA cases in the district Karak, Khyber Pakhtunkhwa. **Objective:** The role of emergency transport systems in improving cardiac and respiratory complication in road traffic accident cases. **Methodology:** A cross-sectional, observational study was conducted involving 105 participants, including patients (31%), family members (33%), and emergency medical services (EMS) staff (36%). Data were collected through structured questionnaires and interviews to evaluate emergency response time, equipment readiness, pre-hospital interventions, and stakeholder satisfaction. Demographic analysis revealed a mean patient age of 30.92 years, with a range spanning from 1 to over 60 years. Males comprised 86% of the cases, while females accounted for 14%. The majority of respondents were from rural areas (65%), with 35% residing in urban settings. Types of emergencies included respiratory (39%), cardiac (17%), and a patient having a both complication (44%). **Results:** Results specified that emergency transport services played a crucial role in stabilizing patients before hospital arrival. However, gaps were observed in equipment availability, timely response within the "golden hour," and the level of clinical training among EMS personnel. These challenges were more pronounced in rural settings compared to urban areas. The study highlights how effective pre-hospital treatment significantly improves patient survival and recovery, but it also highlights how urgently underserved areas need to invest in EMS infrastructure, training, and resource allocation. **Conclusion:** The emergency transport systems, mostly in resource-limited districts like Karak, can greatly improve the outcomes of cardiac and respiratory emergencies following RTAs. Representatives and health administrators must prioritize improvements in EMS delivery to reduce preventable deaths and complications during the critical pre-hospital phase.

INTRODUCTION

In low and middle-income countries like Pakistan, road traffic accidents (RTAs) continue to be a major cause of morbidity and mortality in the worldwide. One of the most dangerous outcomes of such accidents is cardiac and respiratory complications, and the Patient outcomes are significantly influenced by the effectiveness of emergency transport systems. The availability, promptness, and

caliber of pre-hospital emergency care are still poorly understood in rural areas like District Karak in Khyber Pakhtunkhwa(1).

The transport systems in Karak primarily consist of basic ambulances often lacking advanced life support (ALS) capabilities, which are crucial for managing severe trauma cases. Furthermore, the absence of structured pre-hospital care exacerbates the severity of complications



APPENDIX - 5

PLAGIARISM REPORT

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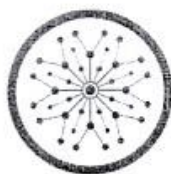
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APPENDIX - 6

PLAGIARISM CERTIFICATE

September 2, 2025



PLAGIARISM CERTIFICATE

For MPhil and PhD

This is certified that the thesis entitled: **Role Of Emergency Transport System In Improving Cardiac And Respiratory Complication In Road Traffic Accident Cases: A District Level Investigation.**

Student Name: Naveedullah Khan

Reg /Roll No: SU91-MSAHW-F23-001

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