Emergencies on the train and railway stations managed at a railway station emergency care center

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Abstract

Background: With the increasing focus on setting up emergency care centers in railway stations across India by the government, there are no baseline data in India, or the world, about the profile of patients presenting with emergencies on the trains and at the railway stations. Materials and Methods: This retrospective study included all people who presented with any medical emergency to the Emergency Care Center (ECC), Katpadi Railway Station in South India, between January 2017 and December 2017. Details were obtained from the register maintained by the emergency nurses stationed at the ECC. Results: Among 1076 patients who presented to the ECC during the study period, the mean age was 37 years (standard deviation: 19.01) with two-thirds (66.1%) being males. A quarter (23.4%) were trauma-related and 76.6% were medical emergencies. Sharp force injuries [58.8% (151/252)] was the predominant mode of trauma, while laceration [57.1%] (144/252) was the predominant type of injury sustained. Common nontrauma presenting complaints included fever (27.5%), headache (17.9%), nausea/vomiting (17.9%), and abdominal pain (15%). The maximum number of cases was in the summer months of May–June with heat-related symptoms, while the maximum number of fever cases was recorded during the monsoon season. The majority (905/1076; 84.1%) were able to continue their journey further, and 13.9% required referral to a nearby hospital. During the 1-year study period, 2 patients with trauma and 18 with various medical conditions died at the railway station or at a hospital after resuscitation at the ECC. Conclusions: Trauma, fever, headache, and vomiting are the most common emergencies among patients traveling by rail and at the railway stations. Establishing well-equipped ECCs across the country to handle trauma and other medical emergencies during travel is part of primary care provided and is the need of the hour.

Keywords: Emergencies, Indian Railways, railway station, train, trauma

Introduction

The Indian Railways is the largest rail network in Asia and carries approximately 23 million people every day around India connecting more than 8000 stations.10 This is equivalent to transporting the entire population of Australia between the 29 states of India. Any means of travel, by road, air, or rail, carries with it a danger of major or minor trauma and unexpected medical emergencies. Incidents and news reports of passenger accidents and diseases and emergency conditions, which require immediate first aid and medical attention, are on the rise over the past few years. With a recent growing public concern of the emergency health facilities at public spaces, governments around the world have been forced to cater to this demand. This has led to public outcry over deplorable health facilities at public places such as railway stations and bus stand. Setting up emergency healthcare centers at these places of need is akin to setting up primary healthcare centers and would boost the healthcare of the traveling public. In October 2011, our hospital at the request of the Indian Railways set up an Emergency Care Center (ECC) at a major railway station (Katpadi junction) in Tamil Nadu which witnesses a daily traffic of about 18,000 passengers,
11 originating trains, and 67 passing through trains. This ECC has since catered to passengers as they travel in the blistering heat of Indian summers and erratic monsoons with innumerable health adversities and accidents.

There are very little published data on medical emergencies and trauma occurring on the trains and railway stations in India. Most studies from the West describe a cohort of patients who presented to the emergency department (ED) hospitals. Hence, we undertook this study to describe the profile of patients with both major and minor medical emergencies managed at the ECC, on the trains and on the platform of a railway station. To the best of our knowledge, there is no similar study on this subject from India.

**Materials and Methods**

**Design**

We conducted a retrospective descriptive analysis of adult patients presenting with medical emergencies and trauma to the ECC between September 2016 and August 2017.

**Setting**

This study was conducted at the ECC set up by our hospital at the Katpadi Railway Station in South India. A trained emergency care nurse was stationed at the ECC in three 8-h shifts daily. They responded to any health condition, emergency, and accident that were informed by the respective train guard or the ticket-collector or the station master at the platform. Vital signs and temperature recordings were measured only for triage priority 1 and 2 patients and in a few others when indicated, but not for everybody. Emergency first aid care was delivered either at the platform or within the train, before such individuals were managed definitively. The first aid measures included dressings and splinting for trauma and administration of analgesics, anti-pyretics, antacids, anti-emetics, and so on. After administering first aid, the passengers, if deemed fit, were allowed to continue their travel. Otherwise, they were referred to higher centers for definitive care. A register was maintained of all such patients by the ECC staff and this has been the primary source of data for our study.

**Participants**

All train travelers to and from Katpadi junction and visitors at the Katpadi Railway Station who presented with a medical emergency or trauma during the study period were included in the study.

**Variables**

Patient data were obtained through the ECC register database. Details of history and physical examination findings and demographic details were recorded on a standard data collection sheet. Details of their emergencies were noted, these being broadly categorized into medical (nontrauma) and traumatic conditions (like those following accidents). The variables included age, sex, vital signs, presenting complaints, mode and type of trauma sustained, and triage priority which is defined as follows:

i. Triage priority 1: hemodynamically unstable patients, those with airway, breathing or circulation compromise, or head injury with Glasgow Coma Scale (GCS) <8
ii. Triage priority 2: hemodynamically stable patients requiring urgent medical attention, patients with stable airway, breathing and circulation with long bone injuries, dislocations, stable abdominothoracic injuries, and head injury with GCS 9 or more
iii. Triage priority 3: hemodynamically stable patients and those with minor trauma.

**Outcome variables**

The outcome variables included the percentage of patients who were able to continue travel, those who required referral to a hospital, and the mortality rate.

**Bias**

All consecutive patients who were seen and managed by the ECC were included in the analysis.

**Sample size calculation**

As we wanted to study the seasonal pattern in the various emergencies, we included all patients over a 1-year duration.

**Statistical analysis**

The data were entered into Microsoft Excel (version 15.12.3) and analyzed using Statistical Package for Social Sciences (IBM Corp. Released 2015; Version 23.0, IBM SPSS, Armonk, NY, USA). Continuous variables are presented as mean (standard deviation). Categorical and nominal variables are presented as percentages. Patient confidentiality was maintained using unique identifiers, and the register was ensured access to only members of the group involved in the entry of the data. The Institutional Review Board (IRB Min No. 11026) approved this study on 06.12.2017.

**Results**

During the 1-year study period, the ECC attended to 1076 medical emergencies at the Katpadi Railway Station. The strobe diagram is shown in Figure 1. The mean age of these patients...
was 37 years (standard deviation: 19.1), with two of every three patients being male. While most of the cases were categorized as triage priority 3 (72%), but a significant 12% were categorized as triage priority 1 conditions. The baseline characteristics of the 1076 patients are shown in Table 1.

Trauma patients comprised a quarter (23.4%) of all cases. Sharp force injuries [58.8% (151/252)] was the predominant mode of trauma, while laceration [57.1% (144/252)] was the predominant type of injury sustained. The mode of injury and type of injury sustained by the patients are shown in Table 2. There were two instances of amputation of a limb and two of crush injury under the railway tracks in the period following a railway accident at the site. The latter two succumbed to their injuries. Patients with medical symptoms comprised 76.6% (824/1076) of all patients. Table 3 shows the common presenting symptoms, the most common being fever (27.5%), headache (17.9%), nausea/vomiting (17.9%), and abdominal pain (15%). Among the others, the significant symptoms which could herald significant disease included chest pain (2.0%), unresponsiveness (4.2%), breathing difficulty (2.5%), and seizures (1.8%).

We studied the seasonal pattern of the common presenting complaints. The peak incidence of cases was in the summer months of May–June with heat-related symptoms, while the maximum number of fever cases was recorded during the monsoon season [Figure 2].

While the majority (905/1076; 84.1%) did not require referral for their complaints and were managed at the clinic, the remainder was referred to nearby health centers [Table 4]. These included primarily a tertiary care hospital (11.0%) and a secondary hospital (2.9%), both of which are within a 10-km radius from the station. During the study period, 18 of the patients who were found unresponsive had a cardiac arrest and cardiopulmonary resuscitation was initiated at the railway station and transferred to a secondary/tertiary care hospital by an ambulance. However, none of them could be revived. The mortality rate was 1.8% (2 trauma and 18 nontrauma cases).

**Discussion**

The Indian Railways, being the largest rail network in the world, carries an astounding number of passengers daily. Compared with road traffic accidents, the incidence of rail-related emergencies may be much lesser. However, rail-related accidents and emergencies too are associated with significant morbidity and more worryingly grossly underreported. That was the void in literature our study aimed to fill.

Our country needs to improve its healthcare system, mainly at the community level where healthcare facilities are far and few in number with limited access. The traveling public constantly face this problem and many common emergencies are addressed late. Setting up ECCs at major railway junctions and bus stations would boost the emergency needs of the community. With railway transportation being a significant mode of transportation in developing countries like India, Turkey, and South Africa, it is important to know and understand the spectrum on emergencies and the associated mortality and morbidity. According to the open government data on train-related accidents, there were 47,814 fatalities due to train-related incidents in India between 2003 and 2015.[8] In contrast, the United states encounters 1200 fatalities and 18,000 injuries every year due to railway-related accidents.[8] The fatality rate is about 60 per 100 million passengers per year in South Africa while Mehmet et al. reported a figure of 2133 deaths per year per 100 million passengers in Turkey.[8] A 10-year evaluation of train accidents from an ED in Turkey showed a mortality rate of 16%.[7] Literature from London and New York describes morbidity and mortality among patients

| Table 1: Baseline characteristics of the patients presenting to the ECC |
|---------------------------|-----------------|-----------------|
| Male sex                  | Number          | Percentage      |
|                           | 708             | 66.1            |
| Trauma cases              | 252             | 23.4            |
| Nontrauma cases           | 824             | 76.6            |
| Triage priority status    | (n=1076)        |                 |
| Priority 1                | 129             | 11.9            |
| Priority 2                | 168             | 15.7            |
| Priority 3                | 779             | 72.4            |
| Examination findings      |                 |                 |
| Pulse rate (n=277)        |                 |                 |
| Tachycardia (>100 bpm)    | 67              | 24.2            |
| Bradycardia (<60 bpm)     | 33              | 11.9            |
| Blood pressure (n=216)    |                 |                 |
| Hypertension (SBP>140 mmHg) | 31          | 14.3            |
| Hypotension (SBP <90 mmHg) | 36              | 16.7            |
| RR (n=164)                |                 |                 |
| Tachypnea (RR >20 breaths per minute) | 93 | 56.7 |
| RBS levels (n=37)         |                 |                 |
| Hypoglycemia (RBS <50 mg/dL) | 3               | 8.1             |
| Hyperglycemia (RBS >200 mg/dL) | 11            | 29.7            |

ECC=Emergency Care Center, SBP=systolic blood pressure, RR=respiratory rate, RBS=random blood glucose

| Table 2: Details of trauma sustained (n=252) |
|--------------------------------------------|
| Number | Percentage |
| Sharp force injury                         | 151          | 58.8 |
| Blunt force injury                         | 66           | 29.8 |
| Musculoskeletal sprain                     | 29           | 11.5 |
| Burns                                      | 6            | 2.4  |
| Laceration                                | 144          | 57.1 |
| Abrasion                                   | 38           | 15   |
| Musculoskeletal pain (sprain)              | 29           | 11.5 |
| Hematoma                                   | 20           | 7.9  |
| Fracture                                   | 6            | 2.4  |
| Burns                                      | 6            | 2.4  |
| Puncture wound                             | 5            | 1.9  |
| Amputation                                 | 2            | 0.8  |
| Crush injury                               | 2            | 0.8  |
traveling in the underground trains. Virdee et al. described a 11-years data of train-related injuries at a major trauma center in London. However, most of the above studies have been done in the EDs of hospitals where only the patients with significant injuries tend to report to seek treatment. Our study differs from the existing literature in that it was carried out at a railway station and included all patients with both major and minor ailments, both trauma and nontrauma.

The common modes of train-related trauma include train–train collisions, train derailment, train–motor vehicles/pedestrian collisions, stepping off a train, and falling down a speeding drain between the train and the platform. Because our study was done on the patients at the platform of a railway station, only the injuries and medical conditions occurring during travel among trains arriving at the station were captured.

In our study cohort, three-thirds of the patients sustained a minor injury like a laceration or an abrasion. Many of these injuries probably occurred as a result of poor infrastructure in trains leading to accidents, such as falling window shutters on hands of passengers. Second, casual and improper travel among passengers, such as sitting at the foot board during travel and alighting or getting onto a running train often result in more serious injuries. Two such patients sustained lethal crush injuries, while two others had an amputated lower limb as a result of falling between a running train and the platform. Such fatalities would not occur in most developed countries where the infrastructure is designed to have inadequate space for a person or a limb to fall between the train and the platform. This calls for urgent safety modifications to minimize the train–platform interface of most of the platforms in India.

Medical emergencies which were witnessed at our ECC ranged from minor ailments to life-threatening conditions. The commonly administered drugs were paracetamol, nonsteroidal anti-inflammatory drugs, antiemetics, and antacids. It is quite useful to equip emergency centers with these common medications to provide symptomatic relief to many unprepared weary travelers. These simple measures could alleviate their symptoms and may prevent serious complications during further down travel. However, in the absence of a doctor, our ECC was ill-equipped to directly handle serious medical emergencies such as seizures, dyspnea, and sudden cardiac arrest. There was also no automated external defibrillator (AED) at the ECC or at the railway station. Even though CPR was imitated by the ECC

### Table 3: Medical complaints of patients presenting to the ECC (n=824)

| Presenting complaint          | Number | Percentage |
|------------------------------|--------|------------|
| Fever                        | 227    | 27.5       |
| Headache                     | 148    | 17.9       |
| Nausea/vomiting              | 148    | 17.9       |
| Abdominal pain               | 124    | 15         |
| Musculoskeletal pain         | 85     | 10.3       |
| Diarrhea                     | 62     | 7.5        |
| Giddiness                    | 44     | 5.3        |
| Allergic reactions           | 46     | 5.3        |
| Altered sensorium and unresponsive | 44    | 5.3        |
| Dyspnea                      | 27     | 3.2        |
| Cough                        | 24     | 2.9        |
| Chest pain                   | 22     | 2.6        |
| Seizure                      | 20     | 2.4        |
| Chronic ulcer                | 9      | 1          |
| Others*                      | 67     | 8.1        |

ECC=Emergency Care Center. *Others* includes ear pain, palpitations, tiredness and weakness, psychosis, sweating, ear discharge, skin blisters, acute urinary retention, accidental ingestion of harmful substances, and labor

### Table 4: Outcome of the patients presenting to the ECC (n=1076)

| Outcome                                      | Number | Percentage |
|----------------------------------------------|--------|------------|
| Continued travel                             | 905    | 84.1       |
| Referred to a tertiary care center hospital  | 119    | 11.0       |
| Referred to a secondary care center hospital | 32     | 2.9        |
| Dead                                         | 20     | 1.8        |

ECC=Emergency Care Center

![Figure 2: Seasonal variation in presenting complaints at the ECC](image-url)
team on 18 patients before shifting the patients to a hospital, none could be revived. Many patients categorized as triage priority 1 had to be referred to secondary-level and tertiary-level hospitals.\[12\] Though most airports in the country have AEDs, very few railway stations in our country are equipped with this life-saving device. The need of the hour is equipping public spaces in India with the essential life-saving equipment and a team of trained paramedical staff in managing basic emergencies before referring them to nearby health centers.

In our study, we noticed a seasonal variation in the spectrum of cases through the year. There was an overall increase in the number of patients presenting with emergencies in the months of April and May, which is perhaps related to the sweltering and unrelenting heat encountered in the iron compartments of the trains and on the platforms during the summer of South India.\[13\] Another seasonal trend we noted was a rise in the number of patients with fever during the monsoon season. This corresponds to the season of many vector-borne diseases such as scrub typhus, dengue, and malaria, endemic in this part of the country which usually lasts between August and December.\[14-16\]

Our study has certain limitations. As the study was an out-of-hospital-based study, we did not have the examination findings of all patients. In addition, an etiological diagnosis was not possible as we did not have a laboratory support. Nonetheless, this study provides relatively rare information about a relatively unexplored domain of emergency medical care.

**Conclusions**

Trauma, fever, headache, and vomiting are the most common emergencies among patients traveling by rail and at the railway stations. Setting up well-equipped ECCs across the country to handle trauma and other medical emergencies of the traveling public would boost primary care in our society and is indeed the need of the hour. We hope that this information would help health authorities understand the spectrum of emergencies encountered during rail travel and in establishing well-equipped ECCs.

**Research quality and ethics statement**

The authors of this article declare that this scientific work complies with reporting quality, formatting, and reproducibility guidelines set forth by the EQUATOR Network. The authors also attest that this clinical investigation was determined to require Institutional Review Board/Ethics Committee review, and the corresponding protocol/approval number is IRB Min. No. 11026 dated 06.12.2017. We also certify that we have not plagiarized the contents in this submission and have done a Plagiarism Check.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

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