

Clinical Cases Seen in Tsunami Hit Banda Aceh – From a Primary Health Care Perspective

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Abstract

The 2004 Indian Ocean earthquake and tsunami caused catastrophic damage to many cities on the rim of the Indian Ocean. Banda Aceh in Sumatra, Indonesia was particularly badly hit due to its close proximity to the epicenter. The Singapore Armed Forces Medical Team was one of the earliest medical teams to arrive in Banda Aceh, providing primary health care to the survivors. In the first 17 days of its operation, more than 2000 injured and sick were seen by the Medical Team at 2 locations within Banda Aceh. Approximately one-third of the patients suffered from infected superficial wounds on their limbs and faces. Many developed deep-seated necrosis of the skin tissue, requiring repeated wound dressing and debridement. Another one-third suffered from respiratory tract infection, some due to aspiration of sea water. There were relatively few major trauma and fracture cases seen, and there were a few cases of compression barotrauma of the tympanic membranes resulting from underwater immersion in the sea water. The casualty patterns seem consistent with those reported in other tsunami disasters, which differ distinctly from those seen in a pure earthquake disaster.

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Introduction

Earthquakes and tsunamis can cause massive destruction over large areas, affecting the lives of many in areas hit by such disasters. The local health care system often gets disrupted and the health and well-being of the survivors may depend on disaster relief organisations from within the country as well as from foreign sources. Medical teams involved in such efforts should be prepared and equipped to manage the types of injuries and diseases that are prevalent after a particular type of disaster. This article highlights the experience gained by the Singapore Armed Forces (SAF) Medical Team at Banda Aceh after the 2004 Indian Ocean earthquake and tsunami, focusing on the observations noted at the primary health care service in the early part of the post-disaster relief activities.

The Boxing Day Disaster

At 7:58 am local time (8:58 am Singapore time) on 26 December 2004, a major earthquake measuring 9.3 on Richter Scale struck off the north western coast of Sumatra, Indonesia. The epicenter was about a hundred kilometers off the west coast of Aceh, the northern-most province of Sumatra, Indonesia. The tremors were great enough to

cause damage to the buildings in nearby cities such as Banda Aceh and Meulaboh.

However, the subsequent disaster was magnified many-fold when the momentary uplifting of the seabed displaced a vast amount of sea water above it, forming a tsunami. A series of concentric waves spread out from the epicenter, striking various coastal countries of the Indian Ocean within minutes and for hours afterwards. The waves travelled to both sides of the Indian Ocean, stretching as far as the east coast of Africa, leaving miles of damage along the coastal areas.

Being the closest land mass, Sumatra was badly hit by the earthquake as well as the tsunami. A ground survey carried out by the Japanese Earthquake Research Institute revealed evidence of waves reaching heights of up to 35 metres in the coasts of Aceh, with water surging far inland, over small hills and knolls. In the northern coast of Banda Aceh, water surged almost 4 km inland from the coast. The extent of the disaster was slowly revealed as communication was interrupted in many remote areas of Sumatra. As the recovery activities intensified, casualty figures rapidly inflated from tens, to hundreds, and then to thousands. It was obvious that there was a shortage of immediate medical

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and disaster relief aid and Singapore responded by mobilising its military assets to some of the worst-hit areas.

SAF Medical Team in Banda Aceh

The SAF deployed its first medical team to Banda Aceh from 29 December 2004 to 15 January 2005. This was one of the multi-pronged disaster relief efforts carried out by the SAF, which included the deployment of aircraft, naval vessels and soldiers to assist in the immediate consequence management of the disaster. The relief effort lasted until late February 2005 when the services were handed over to civilian agencies and non-governmental organisations (NGOs). The data presented in this paper were obtained from clinic operations by the first medical team from 31 December 2004 to 15 January 2005.

The first medical team consisted of 1 team leader, 4 medical officers, and 8 paramedical staff, including a nursing officer. Its primary objective was to provide primary health care and outpatient treatment care to the casualties of the disaster. The medical stores were configured to allow the team to be deployed as a mobile clinic to remote areas of the town. During the second week of deployment, the team's treatment capabilities were reinforced with an addition of 2 surgeons (a general surgeon and an orthopaedic surgeon), 2 anaesthetists and 3 OT nurses with minor surgery equipment and stores.

In the first few days of the disaster, much of the local coordination and communication network was crippled due to loss of personnel and damage to infrastructure. It took a few more days before the local authorities were re-established and started to have overall control of the situation. The United Nations (UN) also came to assist in the early phase but it took awhile before it could get a full picture of the situation on the ground and to coordinate the large number of governmental agencies and NGO groups that were deployed in town. The SAF Medical Team worked closely with the Indonesian authorities to identify the needs of the population and insert the team to a suitable location. It was also integrated into the UN working framework to be part of the consolidated effort in managing the aftermath of the disaster.

Disaster Situation in Banda Aceh

Banda Aceh is the capital city of Aceh province, located at the northern tip of the island of Sumatra. Its estimated population of 300,000 was housed in built-up areas along the coast, stretching several kilometres inland. The main city area is densely populated with low level housing concentrated near the coastline, surrounded by mountains and tall hills. The main access routes to the city include the airport, sea port and the coastal roads leading to other coastal towns. We were told that there were at least 6

government clinics providing primary health care services to Banda Aceh before the tsunami, of which at least 3 were destroyed. At least two of the major hospitals were severely affected by the earthquake and tsunami, and even in those that survived, shortage of manpower and supplies was seen especially in the early phase of the disaster (Fig. 1).

The effects of the tsunami were evident up to almost 4 km inland from the coast. Many of the buildings within 2 km of the coastline were washed away and demolished. Further inland, there was evidence of a large amount of water sweeping and washing through the houses and roads. Rubble and debris of demolished houses, cars and ships were piled up along the roads, making many of them impassable. The fatalities in Banda Aceh were estimated to be over 30,000 and almost 18,000 people were internally displaced during the early post-disaster period (Fig. 2).

At the time of our arrival, most of the human remains along the roads had been removed, but the interior of the houses had not yet been cleared or surveyed. As most of the affected houses were uninhabitable, a large proportion of the population was displaced to the IDP (Internally Displaced People) Camps and households of relatives and friends in many other parts of Aceh (Fig. 3).

Clinical Profiles at Ulee Kareng

During the first week of deployment, the SAF Medical Team carried out its duties in Ulee Kareng in the northeast sector of Banda Aceh. Ulee Kareng is a heavily populated district of Banda Aceh which was spared from the direct effects of the Tsunami due to its distance from the coast. An open space within a nearby mosque compound was converted into an IDP camp housing about 1000 survivors. Next to the mosque was a government clinic which was spared from the damage and destruction. However, its 20 odd staff was reduced to 1 doctor and 4 nurses. The Team operated a primary health clinic and wound management clinic in this compound for 9 days to cater to the needs of the people in Ulee Kareng (Fig. 4).

A total of 1021 patients were seen over the 9 days, an average of 113 patients per day. About one-quarter of these were of paediatric age, i.e., 12 years or less. Most of the patients were ambulatory although some had non-disabling injuries and wounds on their limbs. A smaller number of non-ambulant patients were brought in by their own means of transportation.

Most of the conditions were self-limiting and did not require further management. Only a small number of cases visited the clinic more than once. An evacuation protocol was established to use the local ambulance to transfer severely ill patient to a local general hospital. This was only required once during the week of clinic operations when an elderly man who presented with aspiration pneumonia was

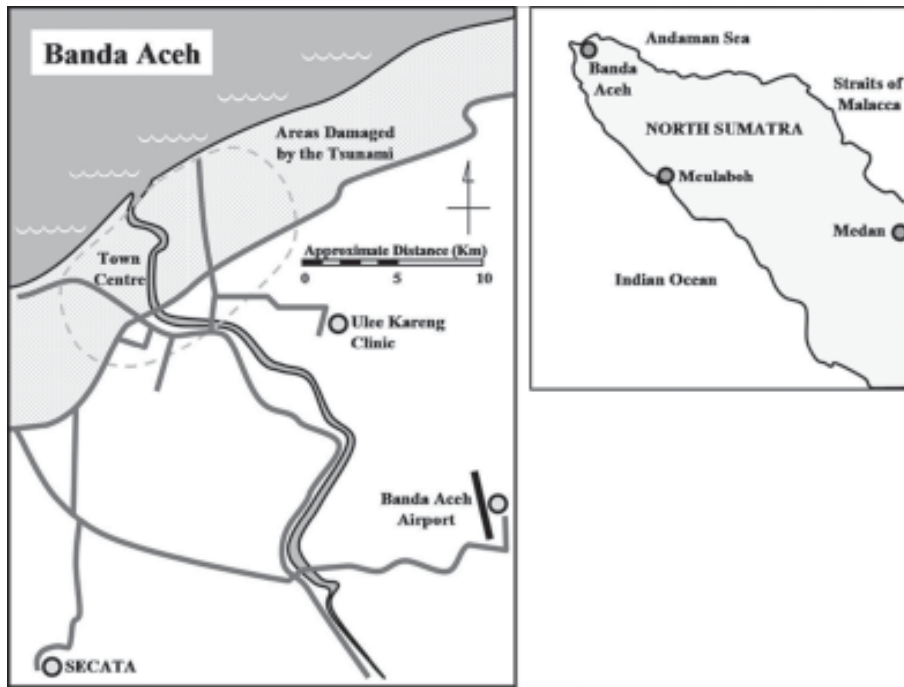


Fig. 1. Schematic map of Banda Aceh and North Sumatra.



Fig. 2. Banda Aceh town centre. Many of the houses were flattened into rubble.



Fig. 3. The roads were slowly cleared to allow access by vehicles.

transferred to the hospital for further management (Table 1).

Thirty-two per cent of all patients had chief complaints of upper respiratory tract infection with mild cough and sore throat. A small number of them had symptoms suggesting bronchitis and pneumonia requiring antibiotic treatment.

Another quarter had moderate-to-severe wounds to the skin and soft tissue, resulting in sloughing and necrosis of the skin and tissue bed. Most of the wounds were sustained when the victims were caught in the waves of the tsunami and were struck against underwater objects and debris,

such as cars, trees and buildings. The wounds were relatively superficial and small at first, but due to the lack of medical attention and the heavy contamination by seawater, the majority suffered from severe infections with necrosis of the superficial tissue. Many of these responded well to repeated wound dressing and antibiotic cover. About 10 to 15 patients returned everyday to receive daily dressing and wound care management.

A few of the patients also presented with hearing impairment secondary to ruptured tympanic membranes. It is postulated that those patients could have suffered



Fig. 4. The Medical Team conducting its primary health care clinic at Ulee Kareng.



Fig. 7. Multiple wounds on the lower limbs of a young girl.



Fig. 5. Minor surgery conducted at Sekolah Calom Tamtama (SECATA).

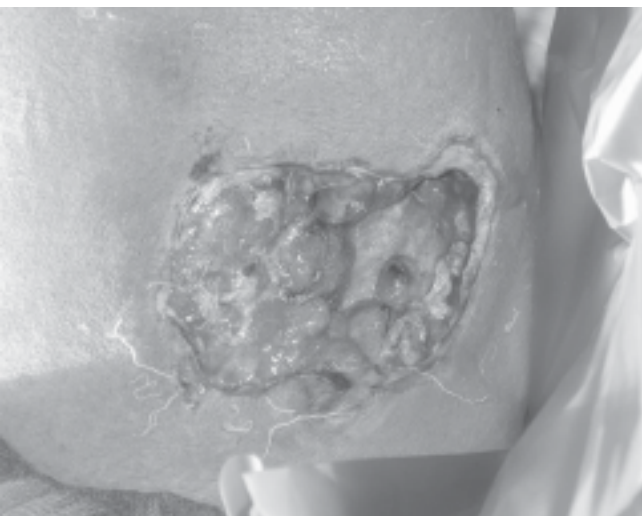


Fig. 6. A deep infected wound in the medial aspect of the thigh of a young lady.

Table 1. Breakdown of Disease by Systems Seen at Ulee Kareng

Type of cases*	No.	%
Respiratory	325	32
Trauma (requiring wound treatment)**	254	25
Musculoskeletal	111	11
Gastrointestinal	106	10
Dermatological	105	10
Neurological	23	2
Cardiovascular	2	-
Psychiatric	1	-
Others	94	9
Total	1021	

* Classification was based on primary presenting complaint

** Wounds requiring dressing, sutures or desloughing, includes repeat visits

Table 2. Breakdown of Disease by Systems Seen at SECATA

Type of cases*	No.	%
Respiratory	394	39
Gastrointestinal	151	15
Musculoskeletal	136	13
Dermatological	116	11
Others	133	13
Trauma (requiring wound treatment)**	48	5
Minor surgery (requiring OT procedures)***	37	4
Total	1015	
Unclassified (Day 1)****	147	-
Grand Total	1162	

SECATA: Sekolah Calom Tamtama

* Classification was based on primary presenting complaint

** Wounds requiring dressing, sutures or desloughing, includes repeat visits

*** Wounds treated under surgical procedures, with anaesthetic support

**** Data on the first clinic day were not classified by disease systems

underwater barotrauma due to the effect of pressure from the turbulent water flow. While there is insufficient data to determine the prevalence of this condition, casualties who were immersed underwater may require closer examination of the tympanic membrane as a routine.

Clinical Profiles at SECATA

In the second week of deployment in Banda Aceh, the Medical Team moved on to SECATA (Sekolah Calom Tamtama), a basic military training facility run by the Indonesian Army. It was located on the southwestern outskirts of Banda Aceh, near the foot of a mountain range. Soon after the disaster struck, this camp was opened up to serve as a makeshift IDP camp housing about 3000 evacuees. Many large tents were erected on the open areas and training grounds to house the evacuees as well as reinforcement soldiers who were brought in from other parts of Indonesia to assist in the recovery process.

Prior to the disaster, the medical centre of the camp was run by a civilian medical doctor seconded to the military from the local health authority. She was assisted by a few army medics and carried out routine sick calls and treatment in a medical centre within the camp compound. With the inflation of the camp population by several thousands, resources were soon overwhelmed by the surge in patient load. The SAF Medical Team was allocated additional space in the camp compound to augment the function of the existing medical centre (Fig. 5).

A total of 1162 patients were seen by us over our first 8 days of operation in SECATA, an average of 145 patients per day. Again, about one-quarter (23%) of these were of paediatric age. During this same period, 628 people (mainly children) were vaccinated against measles, as part of the WHO Measles Vaccination Program (Table 2).

Thirty-nine per cent of the patients had chief complaints of upper respiratory tract infection with mild cough and sore throat.

Gastrointestinal, dermatological and musculoskeletal complaints each made up between 10% and 15% of reported complaints each day. There were relatively fewer cases of severe skin wound cases reported in SECATA.

Minor surgery was carried out using a field surgery set-up. Most of these were cases with larger wounds requiring regional anaesthesia for better management. A small number of patients returned daily for wound management.

Clinical Profiles of Cases in the Two Locations – Uniquely Tsunami?

The patients in Ulee Kareng came from an open population base whereby there was no clear demarcation of where they were from or how far they had travelled to come to the clinic. It is likely that some may have travelled farther

distances. The cases there seemed to be more severe in the degree of injuries and conditions, compared to SECATA. This is perhaps due to the fact that the community is located close to the area most affected by the disaster and the relatively severe and less ambulatory cases remained within this part of the city. Also, the SAF Medical Team operated here very soon after the disaster and encountered the cases in the relatively acute stage of the diseases and injury.

In contrast, the patient profile in SECATA seemed to consist of fewer major trauma and injury cases. The demography in this population was fairly stable as there was no big change in the IDP camp population over those days. Some patients were brought in from beyond the camp boundaries, but these were small in number. It can be speculated that those who had been evacuated to an inland camp such as SECATA were those who were relatively healthy and more freely ambulatory compared to those who had to remain in the small IDP camps nearer to the disaster centre. Also, the SAF team operated in SECATA at a later time than in Ulee Kareng, thus sieving out those who were severely ill and injured.

The injury and disease pattern seen in casualties of tsunami disaster seem to portray a unique pattern, different even compared to those in a pure earthquake, which have been more frequently encountered in recent years in many parts of the world.

In a pure earthquake, most of the casualties suffer from major trauma injuries due to collapsed buildings.^{1,2} There is a large number of limb fractures and crush injuries amongst the survivors in the acute phase of the disaster, many of whom are non-ambulant and require early surgical intervention.

In this tsunami, we noted relatively few cases of massive orthopaedic injuries and trauma. However, there were a high number of ambulant patients with cutaneous wounds developing into deeper wounds with tissue loss. While the wounds were not immediately debilitating, they would have posed threats of severe infection and loss of tissue with scarring and loss of limb function (Figs. 6 & 7).

Underwater compression barotrauma and respiratory infections from near-drowning seemed to be another cluster of conditions that would be common among tsunami survivors. Fortunately, most of the respiratory cases seen by our team was mild to moderate and could be treated in an outpatient setting.

Similar casualty patterns were noted by an Australian medical team which treated patients in the Maldives at about the same time as ours.³ This was also similar to the observation made by the Australian Defence Force, which carried out a relief mission in response to the Aitape Tsunami, which struck the northern coast of Papua New Guinea in July 1998.^{4,5} In the Aitape Tsunami, a large

proportion of surviving casualties were noted to have aspiration pneumonitis and near-drowning. Many of the injuries seen were simple soft-tissue injuries and lacerations, with large proportions complicated by severe infections.

It can be postulated that the majority of those who may have suffered incapacitating injuries during the initial tremors (such as major limb fractures) would have succumbed to the subsequent tsunami attacks as they were unable to free themselves or find refuge on time. The common tsunami injuries consisted of contaminated cutaneous wounds, underwater compression barotrauma and near-drowning injuries. While we made no attempt to critically analyse the prevalence and significance of these conditions, it is worth noting this in the event a medical team needs to respond to a tsunami incident again.

Conclusion

Disasters such as earthquakes and tsunamis generate mass casualty situations within a very short time. This is often accompanied by temporary paralysis of the local emergency response and health care services, making it almost impossible to save the most severely injured victims. In cases of earthquakes, much effort is devoted in the early phases to rescuing victims trapped within collapsed buildings and fallen structures. Many will suffer severe traumatic injuries such as crush syndromes, fractures and haemorrhages. Time becomes a factor which makes or breaks the successful rescue attempt and the retrieval of a surviving casualty. Survival will depend on how quickly the casualty is rescued from the disaster site and how early he or she is brought into a medical facility.

In a situation where the tsunami plays a larger role in destruction and catastrophe, the determinant between life and death shifts to survival from the surging water and rising tide. Many of the casualties suffered from injuries or disease due to immersion in the water and being tossed and

swirled around in the rapidly gushing water. This took the form of respiratory infections including aspiration, infected superficial injuries and barotraumas to the ears. While not immediately life-threatening, they may lead to complications which may lead to death. Therefore, it is important for front-line medical personnel to recognise these conditions and offer suitable treatment at the earliest opportunity.

Very often, the first medical teams arriving at a mass disaster site of this nature consist of military and NGO disaster relief teams. While it is not possible for these medical teams to be totally prepared for all forms of natural (or unnatural) disasters, it is important that some of these unique experiences are shared so that there will be better awareness and readiness amongst individuals who are involved in the planning and execution of these missions in the future.

It is our sincere hope that such disaster is never to be repeated again. However, it is also our responsibility to learn from the past and turn the sadness and sorrow into strength and perseverance.

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