ORIGINAL ARTICLE

Emergency blood transfusion services after the 2005 earthquake in Pakistan

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Background: On 8 October 2005, an earthquake measuring 7.6 on the Richter Scale struck the Himalayan region of Kashmir and Hazara divisions, killing an estimated 73 000 people. Soon after, a situation and response analysis of the emergency blood transfusion services was carried out in the affected areas to ascertain specific needs and suggest appropriate measures to assist in the disaster plan.

Method: A semistructured questionnaire, complete with a checklist and participatory observation method, was used to collect data between 12 and 20 October 2005. Study sites were Abbottabad, Mansehra and Muzaffarabad in Pakistan, and interviewees were surgeons and blood bank personnel.

Results: Of the seven major hospitals in the area, 3 (43%) had a functional blood transfusion service. Although supply of voluntary blood was abundant, shortage of individual blood groups was noted at each centre. Quality assurance standards were either non-existent or inadequate. Only three blood banks had refrigerators, but with limited storage capacities. A complete breakdown of infrastructure coupled with frequent power failures posed a serious threat to safety of the blood. The continued aftershocks added to the problems. Although initial estimates of blood requirement were high, actual demand noted later was much lower.

Discussion: Timely establishment of blood banks in disaster areas, is a challenging task. Mobile blood banks can be advantageous in such situations. Organisation at a national level for blood transfusion services and development of a minimum standard of quality assurance in normal times should ensure safe emergency blood transfusion services when disaster strikes.

On 8 October 2005, an earthquake measuring 7.6 on the Richter Scale struck the beautiful valley in the Himalayan region of Kashmir and Hazara divisions, taking an unprecedented toll on human life, killing an estimated 73 000–74 000 people and rendering millions of people homeless after entire towns and villages were wiped out. Its epicentre was located near Muzaffarabad, the capital of Pakistan-administered Kashmir, 60 miles north-northeast of Islamabad, Pakistan.¹

By 3 November 2005, the death toll had risen to 73 276 and the number of seriously injured people had soared to 69 260 (<http://www.dawn.com/2005/11/03/top1.htm>). It was, by far, the biggest natural disaster in this country's history of 58 years. A country having a mere 25% record of voluntary blood donation, compared with 62% through replacement donations and 13% blood donations from commercial blood donors,² it was indeed heartening to witness unprecedented long lines of voluntary blood donors.

Soon after the devastating temblor, we carried out a situation and response analysis for emergency blood transfusion services in the affected areas to ascertain specific needs and suggest appropriate measures to assist in the disaster plan.

METHOD

By means of both quantitative and qualitative research methods, data were collected from Abbottabad, Mansehra and Muzaffarabad in Pakistan between 12 and 20 October 2005. A semistructured questionnaire was used to interview surgeons and blood bank personnel to assess the state and need of existing blood transfusion services. A checklist was used to observe the state of blood bank inventories, consumables and basic equipment. A participatory observation method was used to ascertain the state of affairs, need and quality assurance standards of blood transfusion services.

Blood transfusion services of the following hospitals were included in the situation and response analysis:

- Ayub Medical Complex, Abbottabad
- District Headquarters Hospital, Abbottabad
- Combined Military Hospital, Abbottabad
- District Headquarters Hospital, Mansehra
- Makeshift relief hospital in Mansehra's Government College, Mansehra
- Combined Military Hospital, Muzaffarabad
- Abbas Institute of Medical Science, Muzaffarabad

RESULTS

Of the seven major hospitals in this area, only three (43%) had functional blood transfusion services—namely, two hospitals in Abbottabad (the Ayub Medical Complex and the Combined Military Hospital) and the District Headquarters Hospital in Mansehra. The Combined Military Hospital in Muzaffarabad along with the Azad Jammu and Kashmir blood transfusion service was completely annihilated. The makeshift relief hospital in Mansehra's Government College lacked any blood transfusion services. The District Headquarters Hospital, Abbottabad, for want of technical staff, and Abbas Institute of Medical Science, Muzaffarabad, for want of power supply, had non-functional blood banks.

The blood bank of Abbas Institute of Medical Science remained non-functional for seven complete days as a result of a complete breakdown of power supplies. The generators supplied could not be made operational because of an absence of technical staff.

At the same time the Ayub Medical Complex, Abbottabad, the only tertiary care hospital in the affected area, was receiving the highest number of casualties. Thus, it needed increased blood

supplies. Unfortunately, its original blood bank was damaged by the earthquake, and the makeshift one was too small, just enough to hold one blood donor couch and two technicians to stand and perform serological procedures and store blood.

At the same time, the supply of voluntary blood was abundant at all centres. However, owing to a lack of coordination among the blood transfusion services, a shortage of individual blood groups was noted at each centre. Some volunteers who had collected blood by organising blood donation camps throughout the country and transported the same to the affected areas were found insisting surgical staff to maximise blood transfusion requests so the collected blood could be timely used. Some international donor agencies were found using blood imported from their respective countries. Several voluntary blood donor organisations were maintaining a blood supply line, leading to much duplication and undue competition. In all the flurry, no documentation was available from blood donor organisations that gave evidence of adoption of protocols used for donor selection and methods used for processing, screening and transportation of blood. As a routine, blood banks in the affected areas were not checking blood bags for any obvious signs of haemolysation or contamination. An inspection of one consignment of 50 units of blood after 24 h quarantine showed five haemolysed blood bags. The three blood bank establishments had blood bank refrigerators, but with exceedingly low storage capacity. Almost all had resorted to using domestic refrigerators to store blood. In the face of frequent power failures and a dearth of electrical technicians, the banks were using whatever available electrical equipment that they could lay their hands on. The woes of the personnel were further aggravated by frequent aftershocks.

A few other glaringly evident issues were as follow:

1. Most of the blood available in the banks was whole blood, and none of the facilities had fresh frozen plasma, cryoprecipitate and platelet concentrate, although demand for fresh frozen plasma was noted during the study period.
2. Blood grouping on tile was the only test performed before transfusion.
3. No arrangement was made for screening of blood.
4. Documentation, for compatibility testing and issue, was either non-existent or quite sketchy
5. Blood request slips carried minimum patient information.
6. At one place, bags were found on the counters to keep the "blood warm" before transfusion.

The overall estimation of blood requirement was 2 units for every major operation by most of the surgeons, but the actual utilisation of blood for major surgery carried out during that period could not be ascertained because of inadequate documentary evidences of admission pattern, surgical procedures followed, and blood transfusion requests made. However, the actual utilisation of blood noted later was quite low. The patient admission pattern, reported by several surgeons working in these areas, was in three waves. In the first wave, which lasted for the first 3–5 days, patients with crush injuries were admitted more often. Requirement of blood was high, but availability was limited. In the second wave, after road links were opened and other rescue work was established, patients with soft-tissues injuries and fractures were admitted from distant areas. Blood transfusion was mainly carried out in those receiving major surgery, and by then availability of blood from the blood transfusion services had improved markedly. The third wave started when field hospitals were established, referral systems were developed, and seriously ill patients were airlifted to tertiary healthcare facilities throughout the country. The overall requirement of blood by then had reduced markedly.

After technical staff had been appointed, support in the form of Rh-negative blood, glassware, antisera, blood transfusion sets, desktop centrifuge machines and blood bank refrigerators were the often repeated requests.

DISCUSSION

Heavy workload, collapsed infrastructure, failure of basic amenities and loss of technical human resources made relief efforts, including blood transfusion services, a gargantuan task, particularly in worst affected areas, such as Muzzafarabad.

The need for blood transfusion services was high but services were limited in the first few days after the earthquake, as most of the patients were suffering from crush injuries. However, later, when the blood transfusion services had improved, requirement had decreased because of the changing pattern of admission. It was recognised that, before establishing any emergency blood transfusion services in the early phase of disaster, it was crucial to meet the demand for appropriate infrastructure, provision of basic amenities and organisation of the healthcare services. In all such situations, a network of mobile blood banks equipped with a good stock of safe blood, equipment and technical staff can provide timely, effective and safe blood transfusion services. These mobile blood banks can be positioned at any place of choice.³ They also increase the safety of the personnel and blood bank procedures in the wake of severe aftershocks and frequent power failures.

Quality and safety of blood was another major topic of concern in the quake-affected area. Blood donor organisations were concerned more with the quantities than with the safety of the procedure. In the face of a disaster of such enormity, a committee coordinating field blood transfusion services, mobile blood banks and voluntary blood donor organisations must be set up. This would help improve the efficiency of the services and save staff, material and blood and blood product resources. It would considerably reduce the duplication that results in mismanagement of services. A national organisation of blood transfusion services and development of minimum standards of quality assurance in normal times would ensure safe blood transfusion services during an emergency.⁴ Therefore, to develop any disaster plan for emergency blood transfusion, it is imperative to first organise the national and regional blood transfusion services.

The initial estimate of 2 units of blood for every major operation by most of the surgeons interviewed may be due to the high proportion of patients with crush injuries among those admitted in the first wave of admissions, but the lower requirement of blood transfusion in the later days may be attributed to a change in the admission pattern. These findings are consistent with other global experiences.⁵

Overwork, emotional and physical exhaustion, frequent changes in volunteering surgical staff, poor documentation and overall disorganisation of the healthcare services were some of the limitations to carrying out this study. Compounded with these were factors such as a study design that was not well structured; data collection tool that was not well developed, particularly the questionnaire; a poorly defined term "major surgery"; and poorly defined criteria for selection of and interviewing surgical staff. All these posed limitations to validating the findings collected through different resources.

Having said that, this study will nevertheless generate results and concepts that can be generalised to all emergencies of such magnitude, especially in those parts of world where overall blood transfusion services are not so well organised and national response is generally fragmented. The findings of our study should help national governments and international donor agencies to develop emergency blood transfusion disaster plans in developing countries, keeping in mind the aforementioned limitations.

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