Patterns of surgical workload and trauma injuries in a Gaza hospital

Mo'men Alasarr[1], Mahmoud Awad[1], Emadalddin AO AbuZaida[1], Mubashir Cheema[1], Tahseen Chaudhry[1], Fouad Youssef[1] and Hany Bsaiso[1]

[1]Children Not Numbers (Correspondence to Mubashir Cheema: mubashircheema@yahoo.co.uk).

Abstract

Background: Providing healthcare in an active war zone is very difficult, especially with the considerable surge in workload.

Aim: To describe the surgical workload at Al Aqsa Martyrs Hospital, one of the hospitals in Gaza Strip, during the first year of the October 2023 war.

Methods: We reviewed available records of patients admitted to the hospital between October 2023 and September 2024 to identify the surgical caseload and details of their management, including the types of emergency cases, distribution of injuries, types of shock at arrival, and infection rates.

Results: At least 2000 surgical patients were seen during the period. Approximately one-quarter of these were traumatic cases, and the abdomen was the most common region affected. There was nearly 50% mortality among patients with Class 4 hypovolemic shock. Infection rate continues to increase.

Conclusion: Penetrating abdominal trauma was the most common injury and it required significant operative resources. Infection rates have increased considerably in the recent months due to various factors. This situation is alarming and requires urgent attention and action by the global medical and humanitarian community.

Keywords: surgery, workload, trauma, hypovolemic shock, Gaza

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Introduction

Providing healthcare in austere environments is very challenging, especially if the healthcare facility is in an active war zone. Al Aqsa Martyrs Hospital, a small hospital in the middle of the Gaza Strip, became one of the most important hospitals in Gaza, and it has faced significant challenges since the beginning of the current war in October 2023. Following the attacks on numerous healthcare facilities across Gaza, it has been one of the few hospitals that remained functioning for the most part of last year and has been a vital lifeline for many patients. Al Aqsa Martyrs Hospital has been subject to deadly military attacks, restrictions and frequent stockouts on fuel and critical supplies during the last year. Despite the stress the hospital facilities and staff have faced, the clinical staff have been committed to meeting the needs of ill and injured patients, to the best of their abilities. This report documents some of their experiences and describes the pattern of surgical workload at the hospital.

Methods

The authors accessed and reviewed available patient records in the hospital for the period October 2023 to September 2024 to identify the types of emergency cases (trauma vs non-trauma), distribution of injuries, types of shock at arrival, and infection rates. Given the severe limitations in keeping track of all data in an active war zone, we note that the numbers given in this paper do not include every case presented to the hospital. It however provides a proportion of the various injuries, which will help in understanding the surgical workload at the hospital during the period.

Findings

During the one-year period, at least 2000 surgical emergency cases were admitted to the Al Aqsa Martyrs Hospital (Table 1). Approximately one-quarter of these were war-related traumatic injuries (e.g. due to explosives or gunshots) and the other three-quarters were non-traumatic surgical cases (e.g. incarcerated hernia, empyema, intestinal obstruction). This means that there were at least 500 traumatic injuries, of which 100 were predominantly chest trauma, 300 were predominantly abdominal trauma, 50 were combined chest and abdominal trauma, and the rest were other injuries (Table 2).

Table 1. Gross surgical workload (n = 2000)

Type of emergency	No. of patients	%
Non-traumatic	1500	75
Traumatic	500	25
Total surgical workload	2000	100

In total, over 300 laparotomies were performed on injuries due to explosives and more than 200 patients had significant bowel injuries. At least 60 of these had end-to-end anastomoses performed (full thickness, hand sewn, 2-layer anastomosis in each case). There was less than 2% incidence of anastomotic leak.

Of the 500 traumatic injury cases, approximately 50 patients were brought in with Class 4 hypovolemic shock. Tragically, the mortality rate was nearly 50% in these cases (including intra-operative and postoperative mortality). In this cohort of 50, 10 patients survived after damage control surgery (for chest, abdominal or vascular injuries) followed by prolonged stay in the intensive care unit. Two hundred cases of traumatic injury arrived the hospital in Class 3 hypovolemic shock, with approximately 5% mortality. No mortality was recorded in patients who had Class 1 or 2 hypovolemic shock on arrival at the hospital (Table 3).

In the first 2 months of the data, infection rates in traumatic cases were approximately 10%, however, these rates increased steadily during the last 10 months to about 70% due to the decline in sterility caused by severe shortages of every medical consumable and clean or sterile water. This compares to 500 cases of non-trauma emergency surgery performed, which had <5% infection rate in the first 2 months, but increased to around 30% (Table 4).

Discussion

Clinical practice in conflicts and austere environments is one of the most challenging undertakings. With an increasing understanding of the importance of this challenge, austere environments (rural, offshore, high altitude) have been well studied, and relevant support is increasingly available *(1)*. However, delivering healthcare in a war zone continues to be a challenge, especially for civilians.

The war in Gaza is unique because the territory is one of the most densely populated areas in the world *(2)*. Healthcare in the Gaza Strip was challenging prior to the current war because the supply chain for medical equipment and consumables had been choked due to 16 years blockade imposed by Israel *(3)*. The total bed capacity across hospitals in Gaza was 3500 before the current war, but this has reduced to between 1400 and 2300 since October 2023 *(4,5)*, and the hospitals are dealing with cases several times their maximum capacity.

Al Aqsa Martyrs Hospital was established in 2001 and had approximately 220 beds before the outbreak of violence in October 2023. This was expanded to 660 due to the forced closure of bigger hospitals, including Al Shifa and Al Rantisi Children Hospital. It is based in the Deir al Balah area of the Gaza Strip, part of the Occupied Palestinian Territories (Figure 1). It has been targeted 7 times by the Israeli forces in the last year *(6)*. The data presented in this paper represents a snapshot of patients seen and for whom relevant information was available

Pattern of injuries

One important thing to note is that the presence of war does not stop routine non-traumatic surgical emergencies from presenting to the hospital. Al Aqsa Martyrs is not a military hospital, it is a civilian healthcare facility that has had to cope with not just the routine surgical emergencies but also a continuous influx of large number of trauma casualties over the one year period.

Among the traumatic injuries, penetrating abdominal trauma was the most common. Horrifically, this likely reflects the fact that penetrating injuries to the head and neck or to the chest are likely to be fatal on scene or in-transit due to the inherent problems in delivering timely first aid and transportation to victims in an active war zone (especially when medical personnel and medical vehicles are repeatedly targeted) *(7)*.

Penetration of the bowel by high speed projectiles may result in immediate exsanguination. If the victim survives, the injuries sustained may be catastrophic with bowel perforations at multiple places, which causes contamination of the peritoneal cavity with bowel contents. Such patients need urgent laparotomy for exploration, identification of damage, washout of peritoneal cavity, resection of involved segments of the gut, and either a primary re-anastomosis or a stoma formation. Delays are often fatal because overwhelming sepsis can rapidly develop. Sometimes these patients need a repeat operation as well. Each of these operations take many hours in the best of situations but human resource shortage, ineffective surgical equipment, and intermittent electricity supply can make the operations even more challenging. Therefore, these 300 cases of

Table 2. Pattern of traumatic injuries (n = 500)

Location	No. of patients	%
Chest	100	20
Abdomen	300	60
Chest and abdomen	50	10
Others	50	10
Total	***500***	***100***

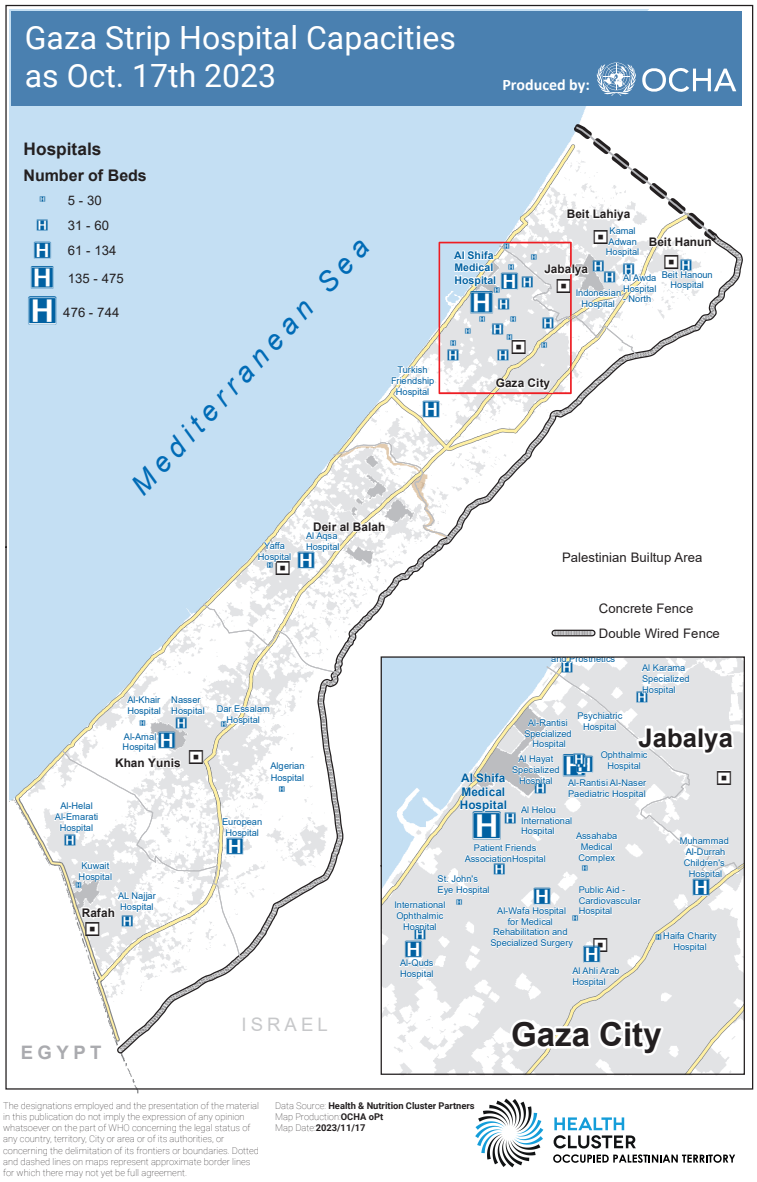
Table 3. Mortality in different presentations of hypovolemic shock (n = 500)

Location	No. of patients	%
Class 1 or 2	250	0
Class 3	200	5
Class 4	50	50

Table 4. Infection rate among traumatic and non-traumatic injuries

Location	No. of patients	%
First 2 months	<5	10
Last 2 months	30	70

Figure 1. OCHA hospital capacities, 2023



abdominal trauma represent several thousand hours of operating and surgical time in a resource-constrained environment.

Hypovolemic shock

Hypovolemic shock is classified into 4 types and the principle of management is to stop bleeding and replace the circulatory volume *(8)*. An estimated 50 patients (10%) out of 500 casualties who arrived at Al Aqsa Martyrs Hospital had Class 4 shock. There are unfortunately many reasons for losing so much volume. Firstly, it is obviously a result of the initial injury, but every barrier preventing the patient from reaching the hospital in time also contributes to avoidable continuous bleeding and worsening shock. In Gaza, these factors include lack of ambulances (115 ambulances have been destroyed) *(9)*; lack of paramedic staff (765 healthcare workers have been killed and 990 injured so far, excluding those health care staff who were forced to evacuate for the fear of safety for themselves or their families; difficulty in accessing the patients (as many people were either trapped under the rubble without the necessary machines to lift the collapsed walls encasing them, or the scene was not safe to approach for an extended period of time); and lack of basic first aid equipment for the first responders. All these challenges contribute to the worse possible clinical situation.

Infection rate

Infection rate was higher in traumatic injuries possibly due to multiple shrapnel involved, including dirt, wood and other objects from the environment. The infection rate has continued to increase because, due to restrictions on what is permitted to enter Gaza, the hospital is short on medical supplies, sterile equipment for surgeries and equipment needed to sterilise instruments. These

supply chain issues combined with a constant influx of patients in a hospital that is not designed to cater to a large number of patients with complicated cases daily for nearly one year have contributed to the high infection rates. Overcrowding by internally displaced people seeking refuge in the hospital, which reduces the sterility of environment, and the inadequate amounts of appropriately sterile equipment, contribute to making infection rates very high. This indirect morbidity and mortality are over and above the existing number of "direct" casualties of the war.

Doctors and healthcare workers in Gaza are constantly working under extreme pressure and stress. Like all healthcare workers, the surgical teams work long hours, often with little respite, to manage injuries and cases presenting to the hospital. It is heartbreaking for everyone when a surgical patient suffers significant or fatal consequences due to indirect factors such as infection or critical anaemia due to inadequate supply of blood products for which doctors have no control over.

The limitation of this paper is that the data presented are a fraction of the surgical cases. It is not a complete reflection of the situation in Gaza, either with regard to the background of Israel's blockade and control over entry of goods (including medical equipment and consumables) into Gaza for 16 years or in relation to the situation of the current war. The healthcare infrastructure across Gaza has been targeted and destroyed *(6,7,9,10)*. Al Aqsa Martyrs Hospital, like so many healthcare facilities across the Gaza Strip, has been targeted by military action and strikes several times *(6)*. Hospital staff are working daily in dire conditions and much of the infrastructure supporting the surgical teams have been destroyed. Doctors and other healthcare workers often receive messages ordering them to leave the hospital. The high number of evacuation orders given across the Gaza Strip also means that, in some instances, healthcare workers are required to leave the hospital to care for their own families and to help move them to a safe location. The constant bombing and violent military action means that large numbers of significantly injured casualties can arrive at the hospital at any time of the day or night. This has been happening for over a year and no hospital or healthcare system in the world can sustain such workload pressure.

Considering the foregoing, support from the international medical and humanitarian community is needed to improve healthcare provision in Gaza. Interventions to allow entry of medical supplies and evacuation of injured victims through all available routes will be a welcome first step towards any such improvement.

Conclusion

The data presented in this paper offer a snapshot of trauma surgical workload seen in a moderate size hospital in Gaza over a period of one year. The hospital continues to see a large number of casualties, in addition to non-traumatic surgical emergencies. Penetrating abdominal trauma has been the most common injury and has had good results from bowel surgery. However, no hospital in the world has been designed for, or is able to deal with, such high casualty numbers for such a long time. Due to many factors, the infection rates are now increasing and the situation is alarming, requiring urgent action by the global medical and humanitarian community to provide routine and essential treatment for sick and injured patients.

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Competing interests: None declared.

Profil de la charge de travail chirurgicale et des traumatismes dans un hôpital de Gaza

Résumé

Contexte : La prestation de soins de santé dans une zone de guerre active s'avère très difficile, notamment en raison de l'augmentation considérable de la charge de travail.

Objectif : Présenter la charge de travail chirurgicale à l'hôpital des Martyrs d'Al-Aqsa, situé dans la bande de Gaza, au cours de la première année de la guerre d'octobre 2023.

Méthodes : Nous avons passé en revue les dossiers disponibles des patients admis à l'hôpital entre octobre 2023 et septembre 2024 afin d'identifier la charge de travail chirurgicale et les détails de leur prise en charge, notamment les différents cas d'urgence, la répartition des traumatismes, les types de choc à l'admission et les taux d'infection.

Résultats : Au moins 2000 patients chirurgicaux ont été pris en charge pendant cette période. Environ un quart de ces cas étaient traumatiques, l'abdomen étant la région la plus fréquemment affectée. La mortalité a atteint près de 50 % en raison du choc hypovolémique de classe 4. Le taux d'infection continuait d'augmenter.

Conclusion : Les traumatismes pénétrants de l'abdomen représentaient les blessures les plus fréquentes, nécessitant d'importantes ressources opératoires. Les taux d'infection ont considérablement augmenté au cours des derniers mois en raison de divers facteurs. Cette situation est alarmante et nécessite une attention ainsi qu'une action urgente de la part de la communauté médicale et humanitaire mondiale.

أنماط عبء العمل الجراحي في أحد مستشفيات غزة

مؤمن الأعصر، محمود عوض، عماد الدين أبو زايدة، مبشر شيمة، تحسين شادري، فؤاد يوسف، هاني بسيسو

الخلاصة

الخلفية: إن توفير الرعاية الصحية في منطقة تتأجج فيها نيران الحرب لهو أمر صعب للغاية، لا سيما مع الزيادة الملموسة في عبء العمل.

الأهداف: هدفت هذه الدراسة الى وصف عبء العمل الجراحي في مستشفى شهداء الأقصى، أحد مستشفيات قطاع غزة، خلال السنة الأولى من حرب أكتوبر/ تشرين الأول 2023.

طرق البحث: استعرضنا السجلات المتاحة للمرضى الذين أُدخلوا إلى المستشفى في الفترة بين شهري أكتوبر/ تشرين الأول 2023 وسبتمبر/ أيلول 2024 للوقوف على عدد الحالات الجراحية وتفاصيل علاجهم، بما في ذلك أنواع الحالات الطارئة وتوزيع الإصابات وأنواع الصدمة عند الوصول إلى المستشفى ومعدلات العدوى.

النتائج: استقبل المستشفى على أقل تقدير 2000 مريض خضعوا لعمليات جراحية في غضون الفترة المذكورة. وكان ربع هذه الحالات تقريبًا حالات ناتجة عن اصابات، وكان البطن أكثر المناطق تضررًا. ويرجع ما يقرب من 50% من الوفيات إلى صدمة نقص حجم الدم من الفئة 4. ولا يزال معدل العدوى في زيادة مستمرة.

الاستنتاجات: كانت اصابات البطن النافذة أكثر أنواع الإصابات شيوعًا، وكانت تتطلب موارد جراحية كبيرة. وقد زادت معدلات الإصابة زيادة ملحوظة في الأشهر الأخيرة بسبب عوامل مختلفة. وهذا الوضع باعث على القلق، ويتطلب اهتمامًا مُلحًا وإجراءات عاجلة من المجتمع الطبي والإنساني العالمي.

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