BMJ Global Health

# Fragmented geographies and trauma pathways in the Middle East

Mac Skelton ,[1,2] Ghassan Abu Sittah,[3] Zahi Abdul Sater,[3,4] Anas Ismail ,[5,6] Hannah B Wild,[7] Rasheed M Fakhri,[8] Gemma Bowsher,[2] Richard Sullivan ,[9] Craig Jones [6]

**To cite:** Skelton M, Abu Sittah G, Sater ZA, *et al*. Fragmented geographies and trauma pathways in the Middle East. *BMJ Glob Health* 2026;**11**:e021217. doi:10.1136/bmjgh-2025-021217

**Handling editor** Mark G Shrime

Received 8 July 2025
Accepted 4 April 2026

© Author(s) (or their employer(s)) 2026. Re-use permitted under CC BY. Published by BMJ Group.

[1]Institute of Regional & International Studies, American University of Iraq, Sulaimani, Iraq
[2]Centre for Conflict and Health Security, King's College London, London, UK
[3]Global Health Institute, American University of Beirut, Beirut, Lebanon
[4]College of Public Health, Phoenicia University, Zahrani, Lebanon
[5]Population Health Sciences Institute, Newcastle University, Newcastle upon Tyne, UK
[6]School of Geography, Politics and Sociology, Newcastle University, Newcastle upon Tyne, UK
[7]University of Washington, Seattle, Washington, USA
[8]Médecins Sans Frontières, Paris, France
[9]Institute of Cancer Policy, Kings College London, London, UK

**Correspondence to**
Craig Jones;
craig.jones@newcastle.ac.uk

## ABSTRACT

Enduring and interlocking conflicts across the Middle East over the last 25 years have generated injuries on a large scale. While civilian injuries in the region have been widely documented, very little is known about civilian trauma pathways—the system designed to manage patients from the moment of injury through to rehabilitation. Military trauma pathways are premised on rapid evacuation, coordinated referral and timely access to treatment, but replicating these systems for civilians, under conditions of active and ongoing conflict, presents many challenges. Civilians can be injured almost anywhere—far away from hospitals, without access to ambulances, emergency and other services—and in absence of a clear trauma pathway, their care trajectory in the weeks and years after sustaining injury is highly inequitable and geographically fragmented. This analysis examines some of the problems posed by the geographical fragmentation of civilian trauma pathways and reflects on what might be done to rebuild and improve them.

## SUMMARY BOX

⇒ While civilian injuries in the the Middle East have been widely documented, very little is known about civilian trauma pathways.

⇒ Civilians can be injured almost anywhere—far away from hospitals, without access to ambulances, emergency and other services—and in the absence of a clear trauma pathway, their care trajectory in the weeks and years after sustaining injury is highly inequitable and geographically fragmented.

⇒ This analysis examines some of the problems posed by the geographical fragmentation of civilian trauma pathways and reflects on what might be done to re-build and improve them.

## FRAGMENTED GEOGRAPHIES AND TRAUMA PATHWAYS IN THE MIDDLE EAST

Enduring and interlocking conflicts across the Middle East over the last 20 years have generated injuries on a large scale. While civilian injuries in the region have been widely documented,[1–3] very little is known about civilian trauma pathways—the system designed to manage patients from the moment of injury through to rehabilitation.[4 5] Military trauma pathways are premised on rapid evacuation, coordinated referral and timely access to treatment,[6] but replicating these systems for civilians, under conditions of active and ongoing conflict, presents many challenges.[7] While militaries operate within defined geographical areas and with clear trauma pathways, civilian trauma pathways are much more fragmented. Civilians can be injured almost anywhere—far away from hospitals, without access to ambulances, emergency and other services[8 9]—and in the absence of a clear trauma pathway, their care trajectory in the weeks and years after sustaining injury is highly inequitable and geographically fragmented.

Civilians injured across the Middle East must contend with often-opaque and difficult-to-navigate trauma pathways. Some civilians are able to access care locally, while others seek care across international borders.[10] This analysis examines some of the problems posed by the geographical fragmentation of trauma pathways and reflects on what might be done to rebuild and improve them.

## THE REGIONAL BURDEN OF CONFLICT-RELATED INJURY

The conflict in Gaza since 7 October 2023 has resulted in more than 72 200 fatalities and over 171 800 injuries as of 16 March 2026.[11] Recent studies estimating mortality from traumatic injury after 9 months[12] and after 15 months[13] have suggested that the figures provided by the Gaza Ministry of Health under-report by 41% and 34.7%, respectively. According to a WHO estimate in September 2024, approximately 25% of those who have been injured in Gaza will have acute and ongoing rehabilitation needs—with approximately 15 000 extremity injuries, 3000–4000 amputations, over 2000 major head and spinal cord injuries and over 2000 casualties

BMJ Global Health: first published as 10.1136/bmjgh-2025-021217 on 4 May 2026. Downloaded from https://gh.bmj.com on 26 May 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

with major burns.[14] Other conflicts in the region have also generated significant injury burdens. Israel's military operation in Lebanon in October/November 2024 resulted in approximately 4047 civilian deaths and 16 638 injuries.[15] In Syria, 14.9% of households reported at least one violence-related disability, annually, between 2011 and 2020.[16] Between 2011 and 2016, over a quarter of barrel bomb injuries among civilians were children, with a quadrupling in the number of conflict-related deaths among women.[17] During the first decade of conflict in Baghdad since 2003, 39% of conflict-related injuries resulted in death and 56% resulted in life-changing disability.[1] At the time of writing (March 2026), a major conflict between the US and Israel and Iran has spread across the Middle East which will only add to the regions' already significant burden ofinjury.[18]

A high burden of injury characterised by successive mass casualty events can present challenges even in well-resourced healthcare systems during peacetime.[19] These challenges are significantly exacerbated across the Middle East not only because violent conflict is ongoing but also because conflict has directly and indirectly damaged, destroyed and otherwise incapacitated care provision, including the destruction of hospitals and killing of healthcare workers.[20–22] Previously functional and effective national health systems have been degraded through conflict, sanctions, siege and other forms of insecurity such that healthcare systems are significantly under-resourced and understaffed precisely at the time they most needed.[23 24]

## CONFLICT INJURIES 'ON THE MOVE'

New regional geographies of care have emerged across the region in response to conflict. This regional geography is characterised by mass displacement and migration, referral of patients out-of-country and by civilians seeking safety, care and better life and livelihoods abroad.[25 26] During the US-led invasion and occupation of Iraq (2003–2011), as well as the ISIS conflict of 2014–2017, injured Iraqis travelled to private hospitals in Lebanon and Jordan for advanced surgical care.[25] In Gaza, a small percentage of injured Palestinians have been granted travel permission to neighbouring countries[27] including Egypt, UAE, Qatar, Turkey, Jordan, Lebanon and Iraq as well as to European countries,[28] but the WHO says a further 14 000 require medical evacuation from Gaza.[29] Similar cross-border dynamics have been documented in the wake of the conflict in Libya.[30] These cross-border geographies make managing and tracking patients across the trauma pathway even more challenging.

## RIGHT TO HEALTH: INEQUITIES AND BARRIERS

Inequitable access, political violence and restrictions on movement constitute significant barriers to the right to health during armed conflict.[31] Access to healthcare and health outcomes are determined not only by injury patterns but also by a broad range of factors including demographic characteristics, politics and geography.[32] Being a soldier versus being a civilian can mean the difference between receiving care across a highly organised and well-resourced trauma pathway, including forward deployed emergency medical teams and casualty evacuation protocols and having to improvise one's own care in informal and fragmented ways.[33 34] The 'golden hour' after sustaining injury described for military casualties rarely exists for civilian conflict casualties.[35] Each checkpoint, permit denial or other impediment to mobility elongates the time from point of injury to reaching surgical care, with unquantified implications for preventable death and disability.[36] Ongoing research by authors Skelton and Jones on civilians injured in the 2016–2017 Battle for Mosul shows that place and time of injury, residence location and educational status—among many other factors—have significant bearing on access to and quality of care across the trauma pathway. These disparities along the trauma pathway raise fundamental questions of equity and the right to health under both international humanitarian law and international human rights law.

Under conflict conditions, triage can be governed by procedures that are opaque and highly politicised.[37] In Gaza, the vast majority of patients requiring care abroad have been prevented from leaving, with some exceptions made for reasons that are neither transparent nor well understood.[27] According to the Norwegian Refugee Council, restrictions imposed on Yemen's airspace by the Saudi-led military coalition have blocked the medical evacuation of at least 32 000 Yemeni patients in need of life-saving treatment.[38] Restrictions on mobility and access to healthcare occur within as well as across borders.[39 40] Such restrictions lead to significant supply issues, including essential medical supplies and even amputations conducted without anaesthesia.[41 42] Spatial fragmentation in acute care inevitably resurface years later as increased demand for revision surgery, mobility aids and psychosocial support.[1 43]

## REBUILDING TRAUMA PATHWAYS

The spatial fragmentation of trauma pathways across the Middle East will persist long after specific conflicts end. Narrow and local clinical interventions and innovations are vital but insufficient. Any sustainable solution must grapple with the difficult political realities of health financing because trauma pathways must be resourced. Understanding the centrality of patient mobility is an essential first step in creating a regional fund to support patients on their journeys. At present the burden falls disproportionately on patients and their families.[30 44] Despite the enormous financial burden on families, cross-border care and fragmentation will thrive so long as specialist care is not available locally, emphasising the importance of equipping and reintegrating specialists into local public health systems as well as encouraging the return and integration of qualified specialists in diaspora.[45] The WHO's Regional

BMJ Global Health: first published as 10.1136/bmjgh-2025-021217 on 4 May 2026. Downloaded from https://gh.bmj.com on 26 May 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Trauma Initiative, established in the Eastern Mediterranean in 2020 offers a promising model in providing technical and operational assistance and capacity-building and should be a priority for financing. The Initiative has supported the response to more than 200 mass casualty incidents across five conflict-affected settings with an estimated reach of 800 000 injured patients[46]

The killing and displacement of doctors and healthcare workers across the region remains a serious challenge and any sustainable solution must include the rebuilding and training of human resources for health. Successful programmes have already demonstrated the viability of such approaches, including the training of hundreds of Palestinian specialists in Qatar.[47] Such partnerships are an excellent way to decrease dependence on cross-border healthcare and provide one example of building sustainable trauma pathway solutions even in a region where conflict is once again afoot.

The spatially fragmented trauma pathways described in this commentary represent not only a clinical challenge but a systemic vulnerability to health governance across the Middle East. These complex dynamics of injury and mobility demand coordinated regional action grounded in equity and the right to health. Without sustained commitment and dedicated financing, the cycle of injury and poor health outcomes will continue to deepen across the Middle East.

## REFLEXIVITY STATEMENT

The authors are clinicians and social scientists who have worked for many years in conflict settings across the Middle East, including Iraq, Syria, Lebanon and Palestine. Our engagement with this topic emerges from a combination of clinical collaboration, ethnographic research and policy work with local health professionals, humanitarian actors and patients navigating trauma care during and after conflict.

**Collaborators** not applicable.

**Contributors** MS and CJ: conceptualisation, data analysis, writing—original draft and writing—review and editing. GAS and ZAS: conceptualisation, writing-review and editing. AI, HW, RMF, GB and RS: writing-review and editing. CJ is the guarantor.

**Funding** Craig Jones receives funding from UK Research and Innovation (MR/X035794/1).

**Competing interests** None declared.

**Patient consent for publication** Not applicable.

**Ethics approval** Not applicable.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** There are no data in this work.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution 4.0 Unported (CC BY 4.0) license, which permits others to copy, redistribute, remix, transform and build upon this work for any purpose, provided the original work is properly cited, a link to the licence is given, and indication of whether changes were made. See: https://creativecommons.org/licenses/by/4.0/.

**ORCID iDs**
Mac Skelton https://orcid.org/0000-0002-0302-5209
Anas Ismail https://orcid.org/0000-0003-1912-660X
Richard Sullivan https://orcid.org/0000-0002-6435-1825
Craig Jones https://orcid.org/0000-0002-3603-3467

## REFERENCES

1 Lafta R, Al-Shatari S, Cherewick M, *et al*. Injuries, Death, and Disability Associated with 11 Years of Conflict in Baghdad, Iraq: A Randomized Household Cluster Survey. *PLoS One* 2015;10:e0131834.
2 Hutaif M, Al Moaish A, Soliman M, *et al*. The hidden toll of war: a comprehensive study of orthopedic injuries in Yemen. *Confl Health* 2023;17:55.
3 McIntyre J. Syrian Civil War: a systematic review of trauma casualty epidemiology. *BMJ Mil Health* 2020;166:261–5.
4 World Health Organization Regional Office for the Eastern Mediterranean. Emergency Trauma Response to the Gaza Mass Demonstrations 2018-2019. World Health Organisation; 2019. Available: http://www.emro.who.int/images/stories/palestine/documents/who_emergency_trauma_response_to_gaza_demonstrations_2018_2019.pdf?ua=1&ua=1
5 Jones C. Gaza and the Great March of Return: Enduring violence and spaces of wounding. *Trans Inst British Geog* 2023;48:249–62.
6 Biswas S, Turan H, Elsawah S, *et al*. The future of military medical evacuation: literature analysis focused on the potential adoption of emerging technologies and advanced decision-analysis techniques. *J Def Model Amp Simul* 2025;22:279–308.
7 Garber K, Kushner AL, Wren SM, *et al*. Applying trauma systems concepts to humanitarian battlefield care: a qualitative analysis of the Mosul trauma pathway. *Confl Health* 2020;14:5.
8 Mowafi H, Hariri M, Alnahhas H, *et al*. Results of a Nationwide Capacity Survey of Hospitals Providing Trauma Care in War-Affected Syria. *JAMA Surg* 2016;151:815–22.
9 Wild H, Stewart BT, LeBoa C, *et al*. Epidemiology of Injuries Sustained by Civilians and Local Combatants in Contemporary Armed Conflict: An Appeal for a Shared Trauma Registry Among Humanitarian Actors. *World J Surg* 2020;44:1863–73.
10 Baatz RK, Ekzayez A, Meagher K, *et al*. Cross-border strategies for access to healthcare in violent conflict - A scoping review. *J Migr Health* 2022;5:100093.
11 MOH Gaza. MOH Gaza Daily Statistics- 16 March 2026. 2026. Available: https://www.facebook.com/MOHGaza1994/posts/pfbid02t5BcYuznbnbB7CNyqqLiGfDEXKNUN2QSYamwconYTTRZFdaUFBXAUos5A4tdyFWWl
12 Jamaluddine Z, Abukmail H, Aly S, *et al*. Traumatic injury mortality in the Gaza Strip from Oct 7, 2023, to June 30, 2024: a capture–recapture analysis. *The Lancet* 2025;405:469–77.
13 Spagat M, Pedersen J, Shikaki K, *et al*. Violent and non-violent death tolls for the Gaza conflict: new primary evidence from a population-representative field survey. *Lancet Glob Health* 2026;14:e552–9.
14 WHO OPT. Estimating Trauma Rehabilitation Needs in Gaza using Injury Data from Emergency Medical Teams, 2024. Available: https://www.who.int/publications/m/item/estimating-trauma-rehabilitation-needs-in-gaza-using-injury-data-from-emergency-medical-teams
15 Al-Hajj S, Harb H, Barakat S, *et al*. Injury morbidity and mortality during conflict: evidence from the 2024 war on lebanon. *Confl Health* 2025;19:91.
16 Alrashid Alhiraki O, Fahham O, Dubies HA, *et al*. Conflict-related excess mortality and disability in Northwest Syria. *BMJ Glob Health* 2022;7:e008624.
17 Guha-Sapir D, Schlüter B, Rodriguez-Llanes JM, *et al*. Patterns of civilian and child deaths due to war-related violence in Syria: a comparative analysis from the Violation Documentation Center dataset, 2011-16. *Lancet Glob Health* 2018;6:e103–10.
18 Godwin Y. The PMFA Journal. An epidemic of lower limb gunshot injuries; 2020. Available: https://www.thepmfajournal.com/features/features/post/an-epidemic-of-lower-limb-gunshot-injuries
19 Khan T, Quintana L, Aguilera S, *et al*. Global health, global surgery and mass casualties. I. Rationale for integrated mass casualty centres. *BMJ Glob Health* 2019;4:e001943.
20 Haar R, Rayes D, Tappis H, *et al*. The cascading impacts of attacks on health in Syria: A qualitative study of health system and community impacts. *PLOS Glob Public Health* 2024;4:e0002967.
21 Perugini N, Gordon N. Medical Lawfare: The Nakba and Israel's Attacks on Palestinian Healthcare. *J Palest Stud* 2024;53:68–91.
22 Sowers JL, Weinthal E, Zawahri N. Targeting environmental infrastructures, international law, and civilians in the new Middle Eastern wars. *Secur Dialogue* 2017;48:410–30.
23 Ismail A, Salah M, Gilbert M, *et al*. Rebuilding Gaza's health system: A qualitative study of healthcare workers' experiences and lessons

BMJ Global Health: first published as 10.1136/bmjgh-2025-021217 on 4 May 2026. Downloaded from https://gh.bmj.com on 26 May 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

learned from responding to mass casualty incidents (2018-2021). *PLoS One* 2026;21:e0342654.

24 Dewachi O. *Ungovernable life mandatory medicine and statecraft in Iraq*. Stanford, California: Stanford University Press, 2017.

25 Dewachi O, Skelton M, Nguyen V-K, *et al*. Changing therapeutic geographies of the Iraqi and Syrian wars. *The Lancet* 2014;383:449–57.

26 Skelton M, Mula-Hussain L, Sullivan R, *et al*. Therapeutic geographies of cancer in conflict: cancer care in Iraq. *Lancet Oncol* 2025;26:e414–22.

27 Ismail A, Abu Salmiya M, Salah M, *et al*. The weaponization of medical referrals and evacuations during the genocide in Gaza: a brief report and call to action. *J Egypt Public Health Assoc* 2026;101:8.

28 European Commission. EU organises further medical evacuation from Gaza to European countries - European Commission. 2024. Available: https://civil-protection-humanitarian-aid.ec.europa.eu/news-stories/news/eu-organises-further-medical-evacuation-gaza-european-countries-2024-12-05_en

29 Shurafa W, Khaled F. Ailing kids wait months for Israeli permission to leave Gaza for treatment. Some die in the meantime. AP News; 2024. Available: https://apnews.com/article/gaza-medical-evacuation-israel-children-dead-7ad6294bd10970e57b35e6e26bc6fa7b

30 Rouland B, Jarraya M. From medical tourism to regionalism from the bottom up: emerging transnational spaces of care between Libya and Tunisia. 2020. Available: https://www.tandfonline.com/doi/full/10.1080/1369183X.2019.1597475

31 Rubenstein R. War, Political Conflict, and the Right to Health. *Health and Human Rights* 2020;22:339–41.

32 WHO EMRO. Social Determinants of Health in Countries in Conflict: a Perspective from the Eastern Mediterreanean Region. Cairo, Egypt: World Health Organization Eastern Mediterranean Regional Office; 2008. Available: https://iris.who.int/bitstream/handle/10665/119883/dsa955.pdf

33 Gebregziabher M, Asgedom AA, Abraha HE, *et al*. Civilian death and injury from airstrikes: evidence from the war in Tigray, Ethiopia. *Popul Health Metr* 2025;23:10.

34 Mayhew E. *A heavy reckoning: war, medicine and survival in Afghanistan and beyond*. London: Wellcome Collection, 2017:320.

35 Forrester JD, August A, Cai LZ, *et al*. The Golden Hour After Injury Among Civilians Caught in Conflict Zones. *Disaster Med Public Health Prep* 2019;13:1074–82.

36 Wild H, Stewart BT, LeBoa C, *et al*. Pediatric casualties in contemporary armed conflict: A systematic review to inform standardized reporting. *Injury* 2021;52:1748–56.

37 Stanski K. Humanitarian Health Responses in Urban Conflict Zones. *Daedalus* 2023;152:70–82.

38 NRC. Thousands of critically ill patients stranded with sana'a airport closure. 2021. Available: https://www.nrc.no/news/2021/august/thousands-of-critically-ill-patients-stranded-with-sanaa-airport-closure

39 EFE. Doctors call for reopening of Gaza-Jerusalem corridor as 15,000 patients need evacuation. EFE Noticias; 2024. Available: https://efe.com/en/portada-america/2024-12-03/doctors-call-for-reopening-of-gaza-jerusalem-corridor-as-15000-patients-need-evacuation/

40 Elmukashfi ShamsEldin Elobied H, Bushra Masaad Ahmed M, Balla M Ahmed A, *et al*. Healthcare accessibility, utilization, and quality of life among internally displaced people during the Sudan war: a cross-sectional study. *Confl Health* 2025;19:11.

41 Aljadeeah S, Satheesh G, Hafez S, *et al*. Availability of essential medicines in 14 remaining health facilities in Gaza. *The Lancet* 2025;406:1465–7.

42 Mahase E. Gaza: Doctors of the World office destroyed, as medics are forced to amputate without anaesthetic. *BMJ* 2024;384:q429.

43 Humanity and Inclusion. Death sentence to civilians: the long-term impact of explosive weapons in populated areas in yemen. Humanity and Inclusion; 2020. Available: https://www.humanity-inclusion.org.uk/sn_uploads/document/2020-05_Report-YEMEN-Explosive-Weapons-Death-Sentence-to-Civilians_EN_Web.pdf

44 Dewachi O. War and the Costs of Medical Travel for Iraqis in Lebanon. 2013. Available: https://watson.brown.edu/costsofwar/papers/2013/war-and-costs-medical-travel-iraqis-lebanon

45 Bogale B, Scambler S, Mohd Khairuddin AN, *et al*. Health system strengthening in fragile and conflict-affected states: A review of systematic reviews. *PLoS One* 2024;19:e0305234.

46 World Health Organisation. Addressing the increasing burden of trauma in humanitarian settings. 2024. Available: https://www.emro.who.int/media/news/addressing-the-increasing-burden-of-trauma-in-humanitarian-settings.html

47 Qatar News Agency. QRCS: Amiri Specialized Medical Scholarships Program Receives New Batch of Palestinian Doctors. Qatar News Agency; 2026. Available: https://qna.org.qa/en/news/news-details?id=qrcs-amiri-specialized-medical-scholarships-program-receives-new-batch-of-palestinian-doctors&date=13/01/2026


BMJ Global Health: first published as 10.1136/bmjgh-2025-021217 on 4 May 2026. Downloaded from https://gh.bmj.com on 26 May 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.