

Suicide Bombing Terrorism

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Abbreviations:

CTM: Counter-Terrorism Medicine
GTD: Global Terrorism Database
FI: Fatal Injuries
NFI: Non-Fatal Injuries
NSBA: Non-Suicide Bombing Attacks
SBA: Suicide Bombing Attacks

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Abstract

Introduction: While suicide bombings in the context of warfare have existed throughout history, there was an exponential rise in such attacks in the decade following the initiation of the War on Terror. The health care implications of such attacks are a growing concern across the emergency response sector, and this study is an epidemiological examination of all terrorism-related bombings sustained from 1970–2019, comparing the rates of fatal injuries (FI) and non-fatal injuries (NFI) between suicide bombing attacks (SBA) versus non-suicide bombing attacks (NSBA).

Method: Data collection was performed using a retrospective database search through the Global Terrorism Database (GTD). The GTD database was downloaded and searched using the internal database search functions for all events that occurred from January 1, 1970 – December 31, 2019. Bombing/explosion as a primary “attack type” and explosives as a primary “weapon type” were selected for the purpose of this study, and events were further sub-classified as either “suicide attack” or “non-suicide attack.” Results were exported into an Excel spreadsheet (Microsoft Corp.; Redmond, Washington USA) for analysis.

Findings: There were 82,217 bombing/explosion terrorist attacks using explosives documented during the study period with 135,807 fatalities and 352,500 NFI.

A total of 5,416 events (6.59% of all events) were sub-classified as SBA causing 52,317 FI (38.52% of all FI) and 107,062 NFI (30.37% of all NFI).

Mean SBA FI was 9.66 per event and mean SBA NFI was 19.77 per event compared to a mean NSBA FI of 1.09 per event and mean NSBA NFI of 3.20 per event.

Conclusion: Suicide bombing attacks are a unique terrorist methodology that can inflict wide-spread psychological damage as well as significantly higher death and injury tolls when compared to more traditional NSBA. They have been increasing in popularity amongst terrorist organizations and groups, and Counter-Terrorism Medicine (CTM) specialists need to be aware of the unique injury patterns and potential risk mitigation strategies associated with SBA depending on the target type, location, and gender of the perpetrator.

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Introduction

Theories laying out why terrorists use suicide bombings as an attack methodology are complex and literature on this topic is diverse with some of the most prominent hypotheses receiving mixed empirical support.^{1,2} A suicide bombing can simply be defined as an attack in which an individual knowingly takes their own life with the intention of killing others, while deploying an explosive device.³ Suicide bombings share some universal fundamental characteristics: depending on the type of bomb and attack type, they can be inexpensive and effective, requiring little expertise and few resources to cause significant damage, and can be logistically relatively uncomplicated with guaranteed media coverage while showing a commitment to the cause.^{4–6}

While suicide bombings in the context of warfare have existed throughout history, the first modern suicide bombing targeted the Iraqi Embassy in Beirut in December 15, 1981.⁷ The tactic gained traction after Hezbollah targeted the US Marine Barracks and French Paratroopers in 1983, killing over 300. During the *Al Aqsa Intifada*, Palestinian groups used suicide bombings effectively, increasing the number of suicide bombings world-wide. There was an exponential rise in such attacks in the decade following the initiation of the War on Terror.⁸ After the 2001 suicide terrorism attacks in the US on 9/11, and the subsequent military invasion in Afghanistan and Iraq, these events systematically transformed this once unique tactic of political violence into a prominent attack methodology for terrorist groups.^{9,10} The health care implications of terrorist attacks are a growing concern amongst Disaster Medicine and Counter-Terrorism Medicine (CTM) specialists.¹¹

	Number of Events (Explosives)	Number of Fatal Injuries	Mean Fatal Injuries	Number of Non-Fatal Injuries	Mean Non-Fatal Injuries
Suicide Bombing	5,416 (6.59%)	52,317 (38.52%)	9.66	107,062 (30.37%)	19.77
Non-Suicide Bombing/Explosion	76,801 (93.41%)	83,490 (61.48%)	1.09	245,438 (69.63%)	3.20
Total Bombing/Explosion	82,217	135,807	1.65	352,500	4.29

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Table 1. Fatal Injuries and Non-Fatal Injuries by Bombing/Explosion

This study is an epidemiological examination of all terrorism-related bombings sustained from 1970-2019, comparing the rates of fatal injuries (FI) and non-fatal injuries (NFI) between suicide bombing attacks (SBA) versus non-suicide bombing attacks (NSBA).

Methods

Data collection was performed using a retrospective database search through the Global Terrorism Database (GTD).¹² This database is open-access, with publicly available data collection methodology utilizing artificial intelligence that identifies events from news media around the world daily, as confirmed by human evaluation of the events by the National Consortium for the Study of Terrorism and Responses to Terrorism (College Park, Maryland USA).¹³ The GTD defines terrorist attacks as: “The threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation.” The GTD database does not include acts of state terrorism. The GTD contains no personal identifiers for victims and links specific events to open-source news articles.

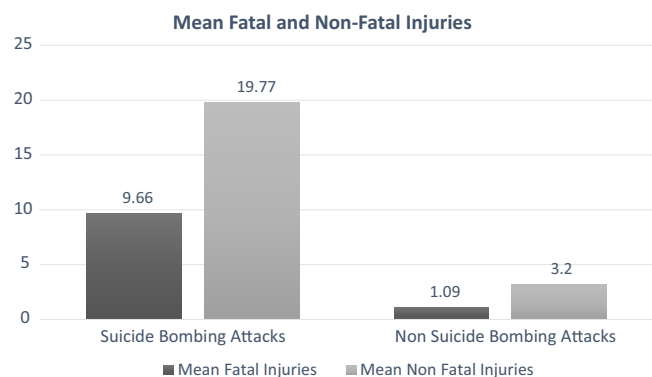
The GTD database was downloaded and searched using the internal database search functions for all events that occurred from January 1, 1970 - December 31, 2019. Years 2020 and 2021 were not yet available at the time of the study. Bombing/explosion as a primary “attack type” and explosives as a primary “weapon type” were selected for the purpose of this study, and events were further sub-classified as either “suicide attack” or “non-suicide attack.” Attack and weapon type classifications were pre-determined by the GTD.

Results were exported into an Excel spreadsheet (Microsoft Corp.; Redmond, Washington USA) for analysis. Attacks met inclusion criteria if they fulfilled the three terrorism-related criteria below, as set by the GTD. Ambiguous events were excluded when there was uncertainty as to whether the incident met any of the criteria for GTD inclusion as a terrorist incident. These criteria were determined within the database and not by the authors:

- Criterion I: The act must be aimed at attaining a political, economic, religious, or social goal.
- Criterion II: There must be evidence of an intention to coerce, intimidate, or convey some other message to a larger audience (or audiences) than the immediate victims.
- Criterion III: The action must be outside the context of legitimate warfare activities (ie, the act must be outside the parameters permitted by international humanitarian law, particularly the admonition against deliberately targeting civilians or non-combatants).

Results

There were 82,217 bombing/explosion terrorist attacks using explosives documented during the study period with 135,807



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Figure 1. Suicide versus Non-Suicide Bombing Attacks: Mean Fatal and Non-Fatal Injuries.

fatalities and 352,500 NFI. The mean FI was 1.65 per event and mean NFI was 4.29 per event (Table 1).

Suicide bombings attacks inflicted higher FI and NFI counts than NSBA (Figure 1; Table 1).

A total of 5,416 events (6.59% of all events) were sub-classified as SBA causing 52,317 FI (38.52% of all FI) and 107,062 NFI (30.37% of all NFI). Mean SBA FI was 9.66 per event and mean SBA NFI was 19.77 per event (Figure 1).

A total of 76,801 events (93.41% of all events) were NSBA causing 83,490 FI (61.48% of all FI) and 245,438 NFI (69.63% of all NFI). Mean NSBA FI was 1.09 per event and mean NSBA NFI was 3.20 per event (Figure 1).

Target Types

Private citizens and property (26.8%) were the most common target types in NSBA, followed by business (15.1%), police (12.3%), and government entities (10.0%; Table 2).

Conversely, SBA most commonly targeted police (21.9%), followed by private citizens and properties (20.6%), military (12.2%), and government (10.9%; Table 3). While police were most commonly targeted, the mean FI and NFI inflicted on private citizens and properties (31.49 and 91.42, respectively) were over three-times higher in comparison (Table 3). The highest mean FI (49.04) and NFI (166.61) in SBA were related to attacks on transportation modalities.

Regional Breakdown

A total of 26,126 NSBA were recorded in the Middle East and North Africa, followed by 18,996 events in South Asia, 8,542 events in South America, and 7,645 in Western Europe (Table 4). A total of 2,859 SBA were recorded in the Middle East and North Africa, followed by 1,643 events in South Asia, 747 events in Sub-Saharan Africa, and 77 events in Eastern Europe (Table 5).

Target Types in Non-Suicide Bombings	Number of Events	Non-Suicide Attack Fatalities	Non-Suicide Attack Non-Fatal Injuries	Mean Fatalities	Mean Non-Fatal Injuries
Private Citizens and Property	20581	15044	29637	0.73	1.44
Business	11605	5287	10727	0.46	0.92
Police	9413	9252	17127	0.98	1.82
Government (General)	7698	5540	13250	0.72	1.72
Unknown	5678	937	352	0.17	0.06
Utilities	5515	226	86	0.04	0.02
Transportation	4204	1289	4215	0.30	1.00
Military	2292	5723	8936	2.50	3.90
Educational Institution	2200	492	1060	0.22	0.48
Religious Figures/Institutions	1828	4925	10287	2.69	5.63

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Table 2. Top 10 Target Types in Non-Suicide Bombing Attacks

Target Types in Suicide Bombings	Number of Suicide Attacks	Suicide Attack Fatalities	Suicide Attack Non-Fatal Injuries	Mean Fatalities	Mean Non-Fatal Injuries
Police	1188	10865	28506	9.15	24.00
Private Citizens and Property	1117	35172	102114	31.49	91.42
Military	662	3994	8766	6.03	13.24
Government (General)	589	4514	15964	7.66	27.10
Unknown	485	2270	2498	4.68	5.15
Business	406	8079	36596	19.90	90.14
Religious Figures/Institutions	317	3785	11696	11.94	36.90
Terrorists/Non-State Militia	199	1497	2308	7.52	11.60
Transportation	145	7111	24158	49.04	166.61
Government (Diplomatic)	113	427	1618	3.78	14.32

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Table 3. Top 10 Target Types in Suicide Bombing Attacks

Region	Number of Events
Middle East and North Africa	26128
South Asia	18996
South America	8542
Western Europe	7645
Southeast Asia	4379
Sub-Saharan Africa	4283
Central America and Caribbean	2843
Eastern Europe	2071
North America	1380
East Asia	269
Central Asia	201
Australasia and Oceania	64
Grand Total	76,801

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Table 4. Regional Breakdown of Non-Suicide Bombing Attacks

Region	Number of Events
Middle East and North Africa	2859
South Asia	1643
Sub-Saharan Africa	747
Eastern Europe	77
Southeast Asia	39
Western Europe	17
East Asia	15
Central Asia	10
South America	5
North America	2
Australasia and Oceania	1
Central America and Caribbean	1
Grand Total	5,416

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Table 5. Regional Breakdown of Suicide Bombing Attacks

Discussion

Suicide bombings provide the perpetrators with strategic and tactical advantages. From a strategic standpoint, groups use suicide bombings as a method of coercion. They can also be used to instill fear within a populace or to gain political concession. A primary

example of strategic gains occurred following the Hezbollah attacks on the US Marine and French Paratrooper barracks in Beirut in 1983, with the US and French pulling their troops from Lebanon afterwards, proving that the tactic was effective in attaining the organization's goals.¹⁴

Suicide bombing attacks are tactically harder to defend against and inflict a higher number of casualties than other forms of terrorism. For example, although suicide bombings accounted for less than one percent of all terrorist attacks perpetrated during the *Al Aqsa Intifada* (Second Intifada), they accounted for fifty percent of the casualties.^{15,16} Suicide bombers are also considered “smart bombs.” They can move, change directions, infiltrate, or change time and location of targets in ways stationary bombs cannot. Furthermore, no exit strategies are needed from a planning perspective. Stationary bombs, if discovered, can be isolated and deactivated, whereas suicide bombers may still be able to detonate on the spot, even if the intended target is not reached, though premature detonation leads to lower victim counts.¹⁷ Additionally, groups may use suicide bombings as a means of targeted assassination, which also may lead to lower victim counts.

By virtue of their ability to carry out attacks where and when they choose and migrate towards large crowds relatively undetected, SBA are more lethal, more efficient, and harder to detect. Furthermore, the unpredictability and methodology of suicide bombings can undermine public morale and inflict psychological damage to the population, far beyond the physical threat or damage it caused.¹⁸

The high rates of fatalities and NFI per SBA targeting transportation modalities indicate the compounding factors of targeting a closed-space (ie, bus or train) and the utilization of a “smart-bomb” that can move, change positions, and aim for an area for detonation with the greatest amount of impact. Similarly, suicide bombers can infiltrate dense crowds and areas where citizens commonly gather, like marketplaces, shops, restaurants, or internally displaced person (IDP) camps for maximum impact, as demonstrated by the high number of FI and NFI per attack on private citizens and properties.

Soft targets like civilians and systems frequently utilized in the daily life of citizens (ie, transportation, religious institutions, and businesses) are more vulnerable to SBA than traditional hard targets, such as police and the military. Higher FI and NFI counts with SBA as a methodology are likely to gain the attention of a wider audience, spread fear into the direct victims of the attack and those who may feel vicariously victimized abroad, and cause wide-spread psychological distress within the community. Furthermore, research suggests that women are potentially more effective in their attacks than men because of their ability to covertly infiltrate dense civilian areas and hit targets where groups of people generally gather, and are therefore seen as a methodology with a perceived tactical advantage by terrorist organizations.^{19–22} The sharpest increase in female suicide bombers has been seen in the Sub-Saharan Africa region, Nigeria in particular, with some estimates placing women at over one-half the number of bombers.²³ Given the high impact of female bombers and their ability to blend in well with soft targets, it is possible that other groups will increase the utilization of females. It would therefore be beneficial for CTM specialists and first responders to be aware of “hot spots” of female suicide bombers as part of their risk assessment strategies.²⁴

The approach to victims of SBA leans on the guidelines for trauma victims in general, though special considerations should include the large number of victims, the combined effects of penetrating trauma, blast injury, and burns, the numerous penetrating wounds sustained by each victim, and the need for mass blood transfusions and burn management.^{17,25}

Bombs may be composed of a variety of sources, including camping fuel, Ammonal, Semtex, petrol, jet fuel, and dynamite,

and loaded with nails, nuts, bolts, glass, or other “frags,” inflicting secondary blast injuries along with any glass, concrete, or wood from surrounding structures or environments.^{26,27}

Studies have suggested injuries to four or more body areas, and specific types of injuries such as facial and skull fractures and peripheral vascular injury, can herald severe trauma and the need for intensive care unit admission.²⁸ This has led to calls to incorporate these injury parameters into trauma triage protocols, given the potential bottleneck of intensive care availability.

Beyond conventional mass-casualty care, special considerations unique to suicide bombing such as the implantation of biological material from the suicide bombers themselves (also known as “human remains shrapnel”) need to be taken into account.²⁹

Forensic documentation, preservation of evidence, suspect tissue identification and viral status, victim counselling, and post-exposure prophylaxis are also important considerations.³⁰

Blast injuries unique to terrorism that require complex and often prolonged critical care with input from various sub-specialties present a therapeutic challenge to clinicians and a resource challenge to hospitals and health care systems.^{31–33} Terrorist attacks are also unique in their intentionality to kill or damage compared to other man-made disasters, and CTM specialists aim to better understand the health care repercussions of such events in order to streamline prioritization of immediate treatment, patient evacuation, and hospital care.^{34,35} Furthermore, health care responders and hospitals are themselves vulnerable to terrorist attacks and risk reduction strategies should be considered.³⁶

Addressing the health care complexities within CTM requires collaboration among specialists and experts in Disaster Medicine, counter terrorism, tactical medicine, and law enforcement to ensure streamlined, coordinated strategies in dealing with future attacks.³⁷

Limitations

The GTD is a comprehensive record of global events. It is maintained by the National Consortium for the Study of Terrorism and Responses to Terrorism, and is the basis for other terrorism-related measures, such as the Global Terrorism Index (GTI). Reliance wholly on the GTD is partially mitigated by confirmation with other lay sources, and searches for other online searches, but if there are incidents not reported in the GTD, this could limit the veracity of the findings. One of the main limitations of the GTD dataset is their Criterion III, which removes all suicide bombings that occurred within the context of war. Another classification in the GTD dataset “Doubt Terrorism Proper” will exclude cases based on five alternate designations. The two most relevant to suicide bombings are “insurgency/guerrilla actions” and “intra/inter group conflicts,” which may have terrorist attacks attached to these but will not be counted for the purposes of the GTD dataset. Although publicly available datasets, such as Chicago Project on Security and Threats (CPOST; Chicago, Illinois USA), report on a greater number of suicide bombings, they do not collect datasets on other terrorist events. Therefore, for comparative purposes, using the GTD was the publicly available dataset. Furthermore, injuries and fatalities were cross-matched with news records rather than formal hospital or coroner reports, so rely on the completeness and accuracy of these sources.

Conclusion

Suicide bombing attacks are a unique terrorist methodology that can inflict wide-spread psychological damage as well as

significantly higher death and injury tolls when compared to more traditional NSBA. They have been increasing in popularity amongst terrorist organizations and groups, and CTM specialists

need to be aware of the unique injury patterns and potential risk mitigation strategies associated with SBA depending on the target type, location, and gender of the perpetrator.

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