CBRN Threat from Non-State Actors: A Historical Perspective

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Summary

This article analyses the evolving threat of Chemical, Biological, Radiological, and Nuclear (CBRN) weapons from non-state actors, with implications for modern military strategy. It traces the historical use of biological agents from ancient warfare to Cold War programs. It highlights how advances in biotechnology have lowered the barriers for terrorist groups to acquire and deploy such weapons. Case studies, including the Rajneeshee attack and Islamic State's chemical operations, illustrate how CBRN tools are being adapted for asymmetric warfare. The article also critiques existing international treaties, noting gaps in enforcement and verification. With a focus on India's two-and-a-half-front security challenge from China and Pakistan, the study concludes with recommendations for strengthening military readiness, enhancing inter-agency coordination, investing in early warning and detection systems, and modernising doctrinal frameworks to counter emerging CBRN threats effectively.

1.Introduction:

Throughout history, warfare has progressed not only through advances in weaponry but also through the manipulation of natural elements-air, water, disease, and poison-to cause harm. In ancient India, long before modern microbiology emerged, texts such as the Arthashastra and epics like the Mahabharata demonstrated a basic yet strategic understanding of chemical and biological tools for military and political advantage.

By the 20th century, the development of Weapons of Mass Destruction (WMDs), chemical, biological, and nuclear, became a defining feature of state military power. These weapons, held predominantly by a few nations, represented both deterrence and existential threat on a global scale.

In the 21st century, the threat landscape has evolved dramatically, marked by the convergence of biotechnology and modern warfare. Advances in synthetic biology and genetic engineering have introduced novel risks, such as engineered pathogens, tools increasingly within reach not only of state actors but also non-state groups. The democratisation of biotechnology, combined with open access to scientific knowledge, has significantly lowered the barriers to developing biological weapons. These developments unfold against the backdrop of hybrid warfare, where the boundaries between conventional, cyber, and biological tactics are increasingly blurred. Both state and non-state actors exploit this ambiguity, employing bioweapons covertly to achieve strategic objectives without confrontation. The covert nature of such attacks, coupled with the difficulty of attribution, makes them especially attractive, offering plausible

deniability and complicating timely international response efforts[1].

2. Biological Weapons through the Ages

As warfare evolved, so too did humanity's capacity for biological aggression. Below are key historical milestones illustrating the use of pathogens and toxins as instruments of war

- **Siege of Caffa (1346)**. One of the earliest recorded instances of biological warfare occurred during the Mongol siege of Caffa (modern-day Feodosia, Crimea). Mongol forces reportedly catapulted plague-infected corpses over the city walls, likely contributing to the spread of the Black Death into Europe.[2]

- **Colonial America – Smallpox Blankets (1760s)**. During the Pontiac Rebellion, British forces allegedly distributed smallpox-infected blankets to Native American tribes. This act is considered an early example of biological warfare used for ethnic cleansing.[3]

- **World War I – The First Organised State Campaigns**. The early 20th century marked the beginning of state-sponsored biological warfare. During World War I, German operatives attempted to sabotage enemy livestock and supply lines using pathogens like glanders and anthrax. These covert operations represented the first systematic use of bioweapons in modern conflict.[4]

- **World War II – Industrialisation and Escalation of BW Programs**.

    - **Japan's Unit 731 (1937–1945).** In 1937, Japan constructed the Ping Fan complex near Harbin, Manchuria, where Unit 731 conducted brutal experiments on prisoners, using plague, anthrax, cholera, and other deadly agents. Thousands of Chinese civilians and prisoners of war perished as a result[5]. These experiments were similar to those carried out by the German Dr Josef Mengele, who faced trial and was punished at the Nuremberg Trial. However, General Shiro Ishii (Chief of Unit 731) managed to evade prosecution for essentially similar crimes, as the US struck a secret deal to access Unit 731's research findings. This discrepancy in the level of scrutiny raises essential questions about the global response to war crimes and human rights violations.

    - **British and American Programs.** The UK established a major BW program at Porton Down, focusing on anthrax and botulinum toxin. By 1942, the US joined the effort, building a vast research and production complex at Fort Detrick, Maryland, and producing thousands of anthrax bombs[6].

    - **Gruinard Island Tests (1942).** The British military conducted open-air anthrax tests on Scotland's Gruinard Island, contaminating it so severely that it remained uninhabitable for nearly 50 years[7].

    - **Fu-Go Balloon Bomb Campaign (1944–1945).** Toward the end of World War II, the Imperial Japanese Army launched thousands of balloon bombs across the Pacific, some reportedly loaded with biological agents developed by Unit 731, including anthrax. Although only a few reached U.S. soil, this campaign underscored the threat of

intercontinental biowarfare. The strategic fear of biological attacks, alongside other geopolitical factors, contributed to the urgency behind the U.S. decision to deploy nuclear weapons on Hiroshima and Nagasaki[8].

- **The Cold War: Secrecy, Espionage, and the Biological Arms Race**. Following World War II, the ideological and military standoff between the United States and the Soviet Union extended into the realm of biological warfare, catalysing a new chapter in the global arms race. While treaties such as the 1972 Biological Weapons Convention (BWC) attempted to curb bioweapon proliferation, clandestine programs and covert operations flourished behind closed doors[9].

    - **The Soviet Union: Covert Expansion Despite Treaties**. Despite signing the BWC, the Soviet Union covertly maintained and expanded a vast biological weapons initiative called **Biopreparat**. Secret facilities like Aralsk-7 focused on engineering highly virulent strains of pathogens, including anthrax and smallpox. These revelations came to light through post-Soviet disclosures and the testimony of defectors such as Ken Alibek[10].

    - **The United States: Shift from Offense to Defense**. In 1969, President Richard Nixon terminated the U.S. offensive biological weapons program, pivoting to a defensive strategy centred on facilities like Fort Detrick. Research henceforth focused on vaccines, diagnostics, and bio-surveillance[11].

    - **The Peace Paradox**. The BWC, lacking formal verification mechanisms, may have unintentionally fostered greater secrecy. Several nations continued dual-use biological research under the guise of "defensive" programmes, complicating the distinction between legitimate research and treaty violations.

    - **Korean War Biological Warfare Allegations (1950–1953)**. During the Korean War, China and North Korea accused the U.S. of deploying disease-carrying insects against military and civilian populations. Although officially denied, a 1952 report by the International Scientific Commission (ISC) supported the claims[12]. In 2018, the long-suppressed report was released, and in 2020, newly declassified CIA communications suggested possible covert discussions about biological tactics[13].

    - **Operation Mongoose (Early 1960s)**. Operation Mongoose, a covert U.S. effort under President John F. Kennedy, aimed to destabilise Fidel Castro's Cuba. Part of the strategy reportedly included the use of biological agents to damage agriculture, especially sugarcane and livestock. These operations were revealed through declassified files released by the National Security Archive[14].

    - **Sverdlovsk Anthrax Leak (1979, USSR)**. In 1979, a deadly anthrax outbreak in Sverdlovsk (now Yekaterinburg) resulted from a leak at a Soviet military bioweapons facility. The Soviet government initially blamed tainted meat. After the collapse of the USSR, investigations, most notably by

Matthew Meselson, confirmed that the incident was a bioweapons accident[15].

3. The Modern Era: Bioterrorism and Non-State Actors

Speaking at the 53rd Munich Security Conference in 2017, Bill Gates warned: **"...**the next epidemic could originate on the computer screen of a terrorist intent on using genetic engineering to create a synthetic version of the smallpox virus ... or a super contagious and deadly strain of the flu... Whether it occurs by a quirk of nature or at the hand of a terrorist, epidemiologists say a fast-moving airborne pathogen could kill more than 30 million people in less than a year."[16]

Advances in synthetic biology, gene editing (e.g., CRISPR), and the availability of genetic material have significantly lowered the barriers to developing biological weapons. What was once the exclusive domain of state actors is now increasingly accessible to Non-State Actors (NSAs), including cults, terrorist organisations, and lone individuals with radical motives[17]. Below are several significant examples illustrating this evolving threat landscape.

- **R.I.S.E (1972, Chicago, Illinois, USA)**. A group named R.I.S.E. attempted to contaminate the Chicago water supply with pathogens such as *S.* enterica, Shigella sonnei, and C. botulinum. The plot failed due to internal whistleblowing. Key members were arrested; one died in a Cuban prison, and another returned to the U.S. and served a prison sentence[18].

- **Dark Harvest Commandos (1981, UK)**. This group delivered soil from anthrax-contaminated Gruinard Island to locations including the Porton Down research facility and the Conservative Party Conference. Although the contamination was minimal, the symbolic act raised biosecurity concerns[19].

- **Rajneeshee Bioterror Attack (1984)**. In **Oregon**, followers of the **Rajneeshee cult** apparently contaminated salad bars with Salmonella typhimurium in an attempt to influence local elections. The attack sickened over 750 people and remains the **most significant bioterror attack in U.S. history**[19].

- **Aum Shinrikyo and Failed Bio-Attempts**. The **Aum Shinrikyo** cult is most infamous for its **1995 sarin gas attack** on the Tokyo subway, which resulted in 12 deaths and over 1,000 injuries[19]. Less known are the group's attempts to weaponise **anthrax and botulinum toxin** in the early 1990s. Despite technical failures, these efforts demonstrated a serious intent to deploy biological weapons.

- **Goiania Accident (1987)**. Though not a deliberate attack, the **Goiânia incident** in **Brazil** involved the accidental release of **caesium-137** from an abandoned radiotherapy clinic. Four people died, and hundreds were exposed, underscoring the dangers posed by unsecured radiological materials[20].

- **Liberation Tigers of Tamil Eelam (LTTE)**. In **1990**, the LTTE reportedly deployed **chlorine gas** during an assault on an army base in **East Kiran, Sri Lanka**, marking one of the earliest uses of chemical agents by a non-state group in combat[21].

- **Red Army Faction (Mid-1990s, France)**. Botulinum toxin was found in a Paris safe house. Although never deployed, the incident underscored the risk posed by

ideologically motivated groups acquiring lethal agents[19].

- **Chechen Separatists (1994–2002)**. Between **1994 and 2002**, **Chechen militants** conducted at least four fatal attacks using chemical agents and toxins. They also repeatedly threatened to use **"dirty bombs"** involving radioactive materials[19].

- **Anthrax Letters in the U.S. (2001)**. Shortly after the **September 11** attacks, letters laced with **anthrax spores** were mailed to multiple individuals in the United States. Five people died, and 17 others were infected. The perpetrator, a U.S. Army scientist, acted alone. The incident highlighted the **psychological and economic impact** of even small-scale bioterrorism[22].

- **Chlorine Bombings in Iraq (2007)**. In **2007**, insurgents in **Iraq** used **vehicle-borne improvised explosive devices (VBIEDs)** filled with chlorine gas. Though tactically inefficient, these attacks caused deaths, injuries, and widespread psychological distress.

- **Islamic State and Chemical Weapons (2014–2017)**. Between **2014 and 2017**, the **Islamic State (IS)** carried out between **41 and 76 chemical attacks**, using agents such as **chlorine and sulfur mustard** across **Iraq and Syria**. These marked the **first large-scale chemical weapon deployments** by a non-state Islamic group, demonstrating a disturbing escalation in terrorist capabilities[23].

- **Bangalore Ricin Incident (2017)**. A **ricin-laced envelope** discovered at a technology company in **Bangalore[24], India**, revealed the reality of bio-chemical threats even in regions not traditionally targeted, proving that even India faces real threats from lone-actor chemical or biological terrorism.

- **IS's Radiological Ambitions (2017)**. In **Indonesia**, authorities thwarted a **plot by a pro-IS cell**[24] to construct a **radiological dispersal device** using **uranium-233**. This incident underscored the group's ambitions to develop weapons of mass disruption beyond chemical agents.

These cases collectively demonstrate the growing accessibility and intent among non-state actors to acquire and use CBRN weapons. As biotechnology becomes increasingly democratised and geopolitical instability rises, the threat landscape continues to evolve, necessitating heightened global vigilance and preparedness.

4. Global CBRN Treaties: Key Shortcomings.

While the international treaty framework for CBRN control is extensive and covers all major weapon types, many agreements suffer from critical limitations. These include the absence of enforcement mechanisms, the lack of universal ratification, and the difficulties in regulating dual-use technologies. As the nature of warfare and the capabilities of non-state actors evolve, these treaties must be modernised and reinforced to address emerging global threats effectively. Certain important treaties and their shortcomings are discussed below:-

- **Geneva Protocol (1925)**. While the protocol prohibits the use of chemical and biological weapons in warfare, it does not restrict their development, production,

stockpiling, or transfer. Moreover, it permits retaliatory use if a state is first attacked with such weapons. Many major powers at the time reserved the right to retaliate, significantly weakening the protocol's deterrent effect and overall effectiveness.

- **Nuclear Non-Proliferation Treaty (NPT, 1968)**. The NPT seeks to balance two goals: preventing the spread of nuclear weapons and promoting peaceful nuclear energy. However, these objectives sometimes conflict, and the treaty's ambiguous language has allowed for loopholes to emerge. Enforcement is relatively weak, relying on the IAEA's oversight, and several nuclear-capable countries remain outside the treaty framework.

- **Biological Weapons Convention (BWC, 1972)**. The BWC outlaws the development, production, and stockpiling of biological weapons, but it lacks a formal mechanism for verification or enforcement. Compliance depends largely on voluntary measures and periodic review conferences. The treaty's limitations have become more apparent with rapid advancements in biotechnology and dual-use research.

- **Basel Convention (1989)**. The Basel Convention aims to control the transboundary movement of hazardous waste, particularly to developing nations. However, enforcement is weak, and loopholes allow waste to be reclassified or misdirected. The influence of industrialised countries and the non-ratification by major waste-producing nations, such as the United States, has diminished its effectiveness.

- **Chemical Weapons Convention (CWC, 1993)**. The CWC has achieved considerable success in eliminating most declared chemical weapons stockpiles and features a robust verification system. Nevertheless, challenges remain. Some stockpiles have yet to be destroyed, and the dual-use nature of many industrial chemicals complicates enforcement. Additionally, certain widely used toxic substances are not explicitly listed under the treaty.

5. Global Distribution of CBRN Incidents

An analysis of the VNSA CBRN Event database (1990–2022), maintained by the Unconventional Weapons & Technology Division of the National Consortium for the Study of Terrorism and Responses to Terrorism (START), reveals a total of **565 recorded events** involving chemical, biological, radiological, and nuclear (CBRN) agents[25]. Of these, **334 events** involved **chemical agents** (63%), **123** involved **biological agents** (23%), **57** involved **radiological agents** (11%), and **18** involved **nuclear agents** (3%)—ref Fig 1.

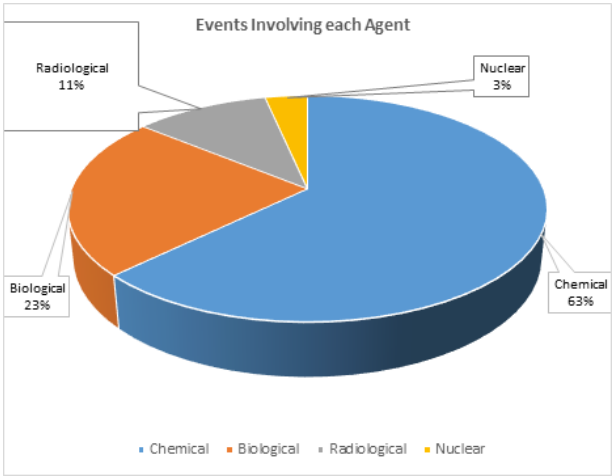

Fig 1: Breakdown of CBRN Events (1990-2022)

Out of the total events, **386 incidents (68.3%)** occurred in ten countries (see Figs. 2 and 3). The United States leads with **118**

events (20.9%), followed by Russia (**49; 8.7%**), Iraq (**43; 7.6%**), Japan (**40; 7.1%**), the United Kingdom (**30; 5.3%**), Afghanistan (**25; 4.4%**), China (**24; 4.3%**), Israel (**22; 3.9%**), Cambodia (**19; 3.4%**), and India (**16; 2.8%**). Collectively, these countries accounted for **537 fatalities (54.8%)** and **6,612 injuries (86.4%)**. Cambodia had the **highest fatality per attack rate** at 12.0, while Iraq recorded the **highest injury per attack rate**, at 46.74.

6. Factors Contributing to the Threat.

Several key factors have contributed to the increasing threat of CBRN (Chemical, Biological, Radiological, and Nuclear) weapons by non-state actors (NSAs):-

- **Increased Accessibility**. Advances in technology and globalisation have reduced barriers to acquiring CBRN capabilities. The proliferation of dual-use materials, online knowledge repositories, and DIY instructions has enabled even rudimentary actors to gain critical know-how once restricted to states[26].

Fig 2: Global Distribution of Attacks and Fatalities (1990-2022)

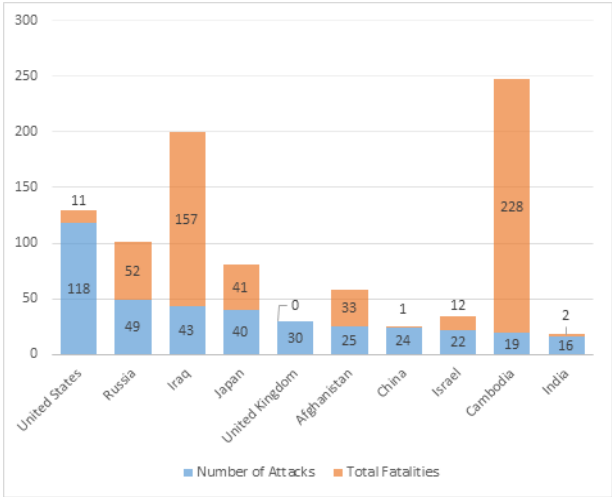

Figure 3: Global Distribution of CBRN Events

- **State Weakness and Conflict Zones**. Fragile or failed states create ungoverned spaces where NSAs can obtain materials or conduct CBRN-related activities with impunity. War zones also serve as testing grounds; for example, in Syria, both regime forces and Daesh have employed chemical agents like sarin and chlorine.

- **Changing Nature of Conflict**. Modern warfare increasingly features asymmetric strategies. Non-state groups facing conventionally superior forces often turn to unconventional weapons, including CBRN, to maximise impact and psychological disruption.

- **Emerging Technologies.** Tech advancements in biotechnology, synthetic biology, nanotechnology, and unmanned systems have introduced new dimensions to the CBRN threat landscape. Tools such as 3D printing, drones, and even large language models (LLMs) can assist in the development and delivery of CBRN agents[26].

7. Indian Context: A Growing CBRN Concern

India faces a **unique "two-and-a-half-front" challenge** from China and Pakistan, both of which have advanced military capabilities and State-sponsored terrorism, particularly from groups operating in and around its borders. **Key concerns include:-**

- **China-Pakistan Collusively.** The deepening military and technological collaboration between China and Pakistan especially in areas like drone warfare, genetic research, and bio-weaponry poses strategic concerns for India[2].

- **Terrorist Group Intentions**. Groups such as Lashkar-e-Taiba (LeT), Jaish-e-Mohammed (JeM), and Indian Mujahideen (IM) have historically carried out large-scale conventional attacks. While these groups have not yet used CBRN weapons, their motivations and capabilities indicate a credible threat of future escalation into the CBRN domain.

- **Potential CBRN Use in Urban Centres**. Urban India, with its high population density and critical infrastructure, presents attractive targets for CBRN terrorism. Even a limited-scale attack using radiological materials (e.g., "dirty bombs") or chemical agents could result in mass panic and disruption far exceeding the actual casualty figures.

A robust CBRN response mechanism coordinated at the apex level would ensure seamless interagency coordination. Therefore, an agency must be designated as the lead agency to handle such eventualities. Equipping all stakeholders for such situations (internal and external threats) should be evaluated, analysed, and processed.

Awareness among the public should also be created, and regular drills will help mitigate the effects.

Thus, India must remain vigilant and proactive in addressing both covert and overt CBRN threats. Strengthening detection, intelligence sharing, response capabilities, and public awareness are crucial components of a comprehensive CBRN defence strategy.

Endnotes:

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