

## Original Research

**Cite this article:** Holleder A (2026). Attacks on Health Care, Personnel, and Patients: From Bad to Worse? An Analysis of the WHO's Surveillance System (SSA). *Disaster Medicine and Public Health Preparedness*, 20, e75, 1–10 <https://doi.org/10.1017/dmp.2026.10339>

Received: 21 October 2025

Revised: 15 February 2026

Accepted: 20 February 2026

### Keywords:

Warfare and armed conflicts; violence; hospitals; health personnel; delivery of health care

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# Attacks on Health Care, Personnel, and Patients: From Bad to Worse? An Analysis of the WHO's Surveillance System (SSA)

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## Abstract

**Objective:** Attacks on health care are war crimes. This study aims to investigate the types, scales, and patterns.

**Methods:** The secondary analysis explores public data from WHO's "Surveillance System for Attacks on Health Care (SSA)" from January 2018 to December 2024.

**Results:** The analysis shows that the attacks on health care and number of affected countries increased strongly. A total of 8,012 attacks on health care were recorded across 22 countries. Just over half of the attacks impacted health care personnel, and almost a quarter affected patients. Attacks can vary widely in type, complexity, and impact, which have regional specificities. The occupied Palestinian territory and Ukraine have suffered the most attacks on health care worldwide. Country-specific attack strategies are identified. Furthermore, the combination of violence with individual and heavy weapons in an attack accumulated the probability of injuries or deaths. Improvements were observed in a few countries. A 2-step cluster analysis reveals that the heterogeneous attacks can be well clustered into approximately 2 halves. It identifies patterns across countries. The most important predictor for clustering of the attacks on health care is violence with heavy weapons, which is frequently observed, for example, in Ukraine.

**Conclusion:** The global trend has worsened dramatically. Prevention and protection are needed.

## Introduction

The Geneva Conventions of 1949 constituted an essential component of international humanitarian law and standardized explicitly the protection of hospitals, staff, and transport.<sup>1,2</sup> The resolution 2286 adopted by the United Nations Security Council in 2016 recalled, "under international law, attacks intentionally directed against hospitals and places where the sick and wounded are collected, provided that they are not military objectives, as well as attacks intentionally directed against buildings, material, medical units and transport and personnel using the distinctive emblems of the Geneva Conventions in conformity with international law are war crimes."<sup>3</sup> It calls upon states and all parties to armed conflict to develop effective measures to prevent and address acts of violence, attacks, and threats against medical and humanitarian personnel.

Despite the international humanitarian law in armed conflict,<sup>4</sup> attacks on health care have continued and even intensified in recent conflicts. A "weaponisation of healthcare"<sup>5</sup> has been observed over the past decade. Weaponization means a "strategy of using people's need for healthcare as a weapon against them by violently depriving them of it."<sup>5</sup> One example of this is the civil war of the Syrian Arab Republic.<sup>5</sup> Another example is Russia's war of aggression against Ukraine. In the first months of the war, the health care system was hit particularly hard in various parts of the country. The targeted air strike on the hospital in Mariupol, for instance, caused an international outcry at the time.<sup>6</sup> In Sudan, 460 patients and companions were killed in a single massacre at the Saudi Maternity Hospital in Al-Fasher on October 28, 2025.<sup>7</sup> The empirical evidence worldwide indicates that attacks on health care services have not decreased, and they are concentrated in conflict areas.<sup>8,9</sup> This mainly affects low- and middle-income countries.<sup>8,10</sup> They have in common that their health care systems are less developed. Health care facilities and programs often had to be suspended.<sup>11</sup> Given the global scope, attacks on health care can be understood as a global public health challenge.<sup>12,13</sup> In this sense, the American Public Health Association called for an end to violent attacks on health services.<sup>14</sup> It urged all public health advocates and organizations to join an international condemnation of attacks on health services.

However, there is limited research available on this topic. A systematic review of the literature on violence against health care in conflict by Haar et al.<sup>15</sup> revealed that much remains unknown about the global scale and types of attacks that occur. Interestingly, a publication bias is observed in the literature and a deficit of studies, especially in the African context. A mapping of the evidence shows the scarcity of primary studies conducted in conflict settings and a lack of funding sources.<sup>16</sup> There are also gaps in the data about the impacts of attacks on health care.<sup>15</sup> There is a general lack of validated standardized reporting tools in the field.<sup>17</sup> This results in an underestimation of the full

extent of impacts across a wide range of domains<sup>11</sup> and a lack of synthesis of these global and longitudinal datasets.

This study aims to address the research deficit by conducting an empirical secondary data analysis. The aims of this study are twofold: firstly, to explore temporal and geographical patterns; secondly, to identify clusters of attacks on health care between 2018 and 2024. The secondary analysis uses public data from the World Health Organization (WHO)'s "Surveillance System for Attacks on Health Care (SSA)." The database was established because the Security Council had previously requested the Secretary-General of the United Nations to provide country-specific reporting.<sup>3</sup> The WHO Assembly called on to provide leadership at the global level in developing methods for the systematic collection and dissemination of data on attacks on health care.<sup>18</sup> The strength of the WHO's Surveillance System (SSA) lies in its ability to close significant data gaps in documentation.<sup>19</sup> The WHO defined an attack on health care in its glossary as "any act of verbal or physical violence, the threat of violence or other psychological violence, or obstruction that interferes with the availability, access, and delivery of curative and/or preventive health services."<sup>20</sup>

## Methods

The WHO's database contains verified attacks on health care, but only a selected part of the data is publicly accessible via [ssa.who.int](https://ssa.who.int). On May 14, 2025, the full list of attacks was downloaded. The public data (Table 1) were exported and prepared for the statistical analyses.

**Table 1.** Items of WHO's "Surveillance System for Attacks on Health Care (SSA)"

| Variables                           | Response options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Country of attack location          | Name with date and time of attack                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Health resources affected by attack | 1. Healthcare facilities;<br>2. Healthcare transport;<br>3. Healthcare personnel,<br>4. Healthcare supplies assets,<br>5. Healthcare warehouse storage,<br>6. Healthcare patients,<br>7. Other<br>(Responses: yes/no/unknown)                                                                                                                                                                                                                                                                                                                                                               |
| Type of attack                      | 1. Removal of personnel;<br>2. Violence with heavy weapons;<br>3. Violence with individual weapons;<br>4. Assault (without weapons);<br>5. Removal of healthcare assets;<br>6. Setting fire;<br>7. Chemical agent;<br>8. Militarization of civilian health facility;<br>9. Armed or violent search of healthcare personnel, facility or transport;<br>10. Obstruction to healthcare delivery;<br>11. Psychological violence/threat of violence/intimidation;<br>12. Sexual assault;<br>13. Criminalization of healthcare;<br>14. Other;<br>15. Unknown<br>(Multiple answers/ticks possible) |
| Removal                             | Number of 1. Abduction; 2. Arrest; 3. Detention of<br>a) Healthcare personnel and b) Patients                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Victims                             | Number of 1. deaths and 2. injuries of victims of<br>the attacks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

The observation period for this study spanned from January 1, 2018, to December 31, 2024. Further details of the WHO's Surveillance System (SSA) are described by Meier et al.<sup>21</sup> Terminology and methodology are documented by WHO.<sup>20</sup>

The research approach employed standard descriptive analyses and conducted Pearson's chi-square test and Fisher's exact test (Monte Carlo method), depending on the distribution and prerequisite. A *P* value of less than .05 was considered statistically significant. A 2-step cluster analysis was conducted using a log-likelihood distance measure based on Schwarz's Bayesian Information Criterion (BIC). By assuming variables to be independent, it is an exploratory data analysis technique that enables identification of clusters using both continuous and categorical variables in large datasets.<sup>22</sup> The silhouette measure of cluster cohesion and separation is shaded to indicate poor, fair, or good results. The interpretation of cluster structures, as outlined by Kaufman and Rousseeuw,<sup>23</sup> forms the basis for this. The order in the data set has been randomized so that the chronological order of the attack dates does not influence cluster analysis. Data analyses were performed using IBM SPSS Statistics version 28.

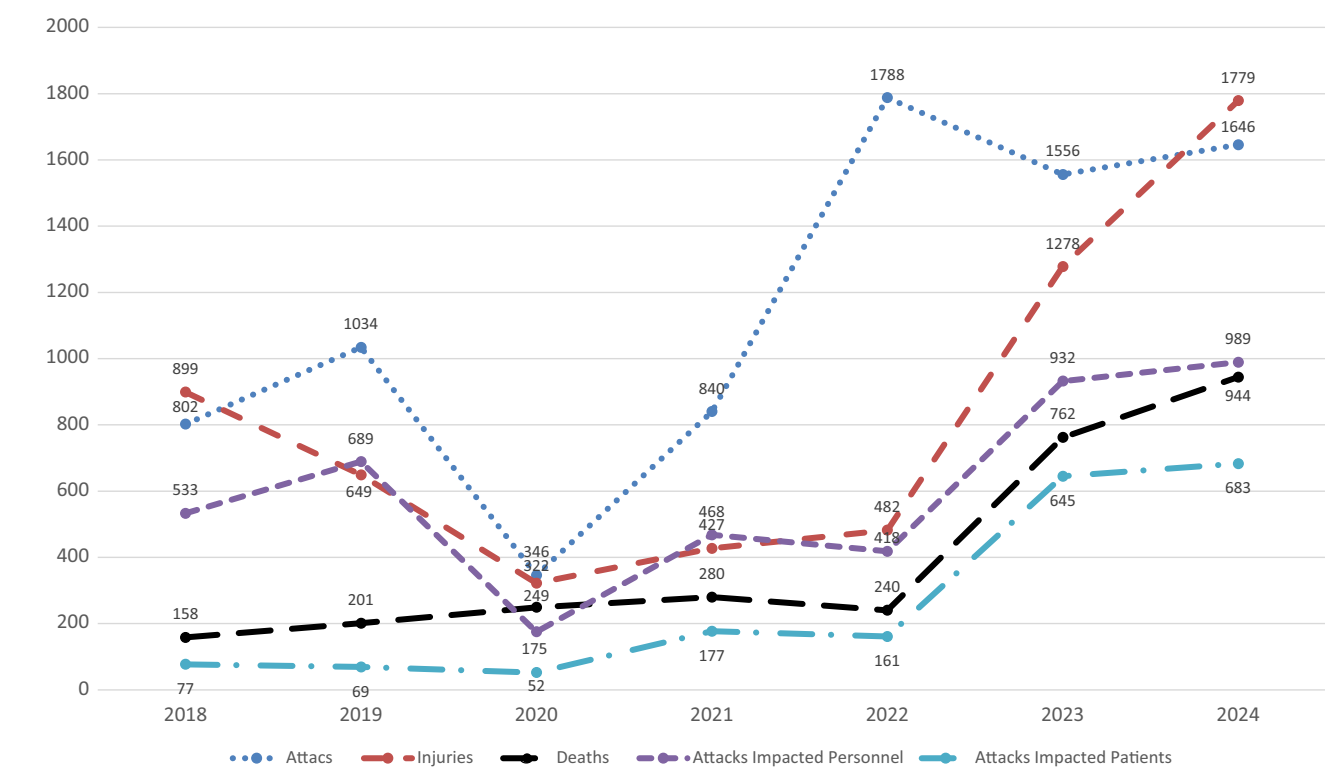
## Results

During the observation period, the number of countries affected by attacks on health care had increased from 12 in 2018 to 19 in 2023, then decreased slightly to 16 in 2024. A total of 8,012 attacks on health care in 22 countries were verified during this period by WHO's "Surveillance System for Attacks on Health Care (SSA)." Figure 1 illustrates the strong growth of health care attacks on an annual average between 2018 and 2024. With the onset of the COVID-19 pandemic, the attacks on health care had decreased to a very low point in 2020. Due to the military coup in Myanmar in 2021<sup>24</sup> and the Russian Federation's invasion of Ukraine in 2022,<sup>25</sup> the number of attacks on health care increased sharply. Since October 2023, the occupied Palestinian Territory has been subject to military assaults, while attacks on health care have persisted in Myanmar, Ukraine, and other countries. Health care workers have been assaulted and obstructed from delivering care. During the period under investigation, 52.5% of all reported attacks impacted health personnel, while 23.3% impacted patients. Both of them were often affected at the same time; 85.5% of attacks on patients also harmed health care personnel. However, there is a huge regional hot spot: 53.2% of the attacks impacted health care personnel, and 70.1% of the attacks that impacted patients were carried out only in the occupied Palestinian Territory.

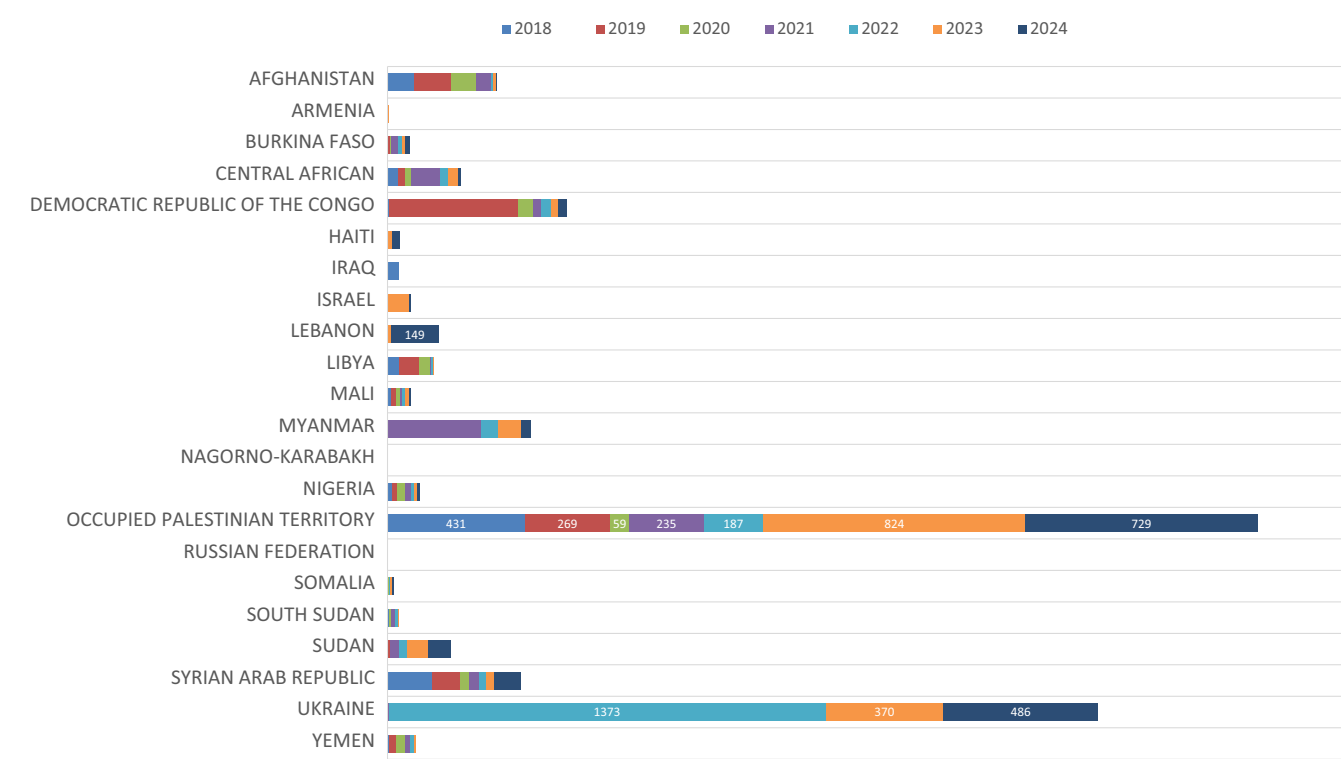
Since 2023, the number of health care workers, as well as patients, who have been wounded or killed by attacks has risen. A comparison of the 2018 annual data with 2024 presented in Figure 1 reveals a 2.1-fold increase in attacks on health care facilities, accompanied by a doubling of injuries and a sixfold increase in deaths.

## Attacks on Health Care by Country

As illustrated by the country comparison in Figure 2, the occupied Palestinian Territory and Ukraine have suffered the most attacks on health care worldwide. No consistent temporal patterns or normal distributions of the attacks were apparent from the bar chart. There are countries whose health care systems were massively attacked at the beginning of the initial phase of the war. Figure 2 and the literature<sup>6,25,26</sup> demonstrate that the Russian Federation intensively



**Figure 1.** Attacks on health care worldwide and impact from year 2018 to 2024.  
Data source: WHO’s “Surveillance System for Attacks on Health Care (SSA)”<sup>48</sup>; own calculation.



**Figure 2.** Attacks on health care by country.  
Data source: WHO’s “Surveillance System for Attacks on Health Care (SSA)”<sup>48</sup>; own calculation.

attacked the health care of Ukraine in the first year of the war. The highest density of attacks was also registered in Myanmar at the beginning of the military coup. In contrast, the violence against health care was always present in the occupied Palestinian Territory in the observation period (Figure 2), but the situation became more radical after Hamas assaulted Israel on October 7, 2023. Afterward, the attacks on health care have increased strongly over time. Overall, phase models cannot be identified in the data as an explanatory approach to how attacks on health care begin or end. Attacks on health care follow the course and intensity of the conflict

in a context-related manner. In most countries, the attacks on health care have not been isolated incidents but have occurred over several years. Major improvements can be observed in a few countries according to Figure 2.

Table 2 differentiates the attacks on health care, whether weapons were used, and if so, whether they were individual or/and heavy weapons (columns 1 to 3). According to the WHO glossary, violence involving heavy weapons requires “more than one person to use such as firearms, tanks, missiles, bombs, mortars”.<sup>20</sup> If no weapons were used, column 4 of Table 2 summarizes the other

**Table 2.** Attack types on health care by country in the period from 2018 to 2024

|                                  | Violence with individual weapons | Violence with heavy weapons | Violence with individual and heavy weapons | Other attack types (without weapons) | Total    |
|----------------------------------|----------------------------------|-----------------------------|--------------------------------------------|--------------------------------------|----------|
| Afghanistan                      | 84                               | 63                          | 2                                          | 194                                  | 343      |
|                                  | 24.5%                            | 18.4%                       | 0.6%                                       | 56.6%                                | 100.0%   |
| Armenia                          | 1                                | 2                           | 0                                          | 0                                    | 3        |
|                                  | (33.3%)                          | (66.7%)                     | (0.0%)                                     | (0.0%)                               | (100.0%) |
| Burkina Faso                     | 17                               | 4                           | 5                                          | 43                                   | 69       |
|                                  | 24.6%                            | 5.8%                        | 7.2%                                       | 62.3%                                | 100.0%   |
| Central African                  | 88                               | 0                           | 2                                          | 139                                  | 229      |
|                                  | 38.4%                            | 0.0%                        | 0.9%                                       | 60.7%                                | 100.0%   |
| Democratic Republic of the Congo | 203                              | 18                          | 35                                         | 307                                  | 563      |
|                                  | 36.1%                            | 3.2%                        | 6.2%                                       | 54.5%                                | 100.0%   |
| Haiti                            | 11                               | 4                           | 0                                          | 23                                   | 38       |
|                                  | 28.9%                            | 10.5%                       | 0.0%                                       | 60.5%                                | 100.0%   |
| Iraq                             | 9                                | 2                           | 0                                          | 25                                   | 36       |
|                                  | 25.0%                            | 5.6%                        | 0.0%                                       | 69.4%                                | 100.0%   |
| Israel                           | 19                               | 29                          | 19                                         | 5                                    | 72       |
|                                  | 26.4%                            | 40.3%                       | 26.4%                                      | 6.9%                                 | 100.0%   |
| Lebanon                          | 3                                | 154                         | 1                                          | 2                                    | 160      |
|                                  | 1.9%                             | 96.3%                       | 0.6%                                       | 1.3%                                 | 100.0%   |
| Libya                            | 39                               | 52                          | 5                                          | 50                                   | 146      |
|                                  | 26.7%                            | 35.6%                       | 3.4%                                       | 34.2%                                | 100.0%   |
| Mali                             | 32                               | 15                          | 1                                          | 24                                   | 72       |
|                                  | 44.4%                            | 20.8%                       | 1.4%                                       | 33.3%                                | 100.0%   |
| Myanmar                          | 66                               | 60                          | 5                                          | 319                                  | 450      |
|                                  | 14.7%                            | 13.3%                       | 1.1%                                       | 70.9%                                | 100.0%   |
| Nagorno-Karabakh                 | 0                                | 1                           | 0                                          | 0                                    | 1        |
|                                  | (0.0%)                           | (100.0%)                    | (0.0%)                                     | (0.0%)                               | (100.0%) |
| Nigeria                          | 74                               | 1                           | 7                                          | 18                                   | 100      |
|                                  | 74.0%                            | 1.0%                        | 7.0%                                       | 18.0%                                | 100.0%   |
| occupied Palestinian Territory   | 971                              | 470                         | 207                                        | 1086                                 | 2734     |
|                                  | 35.5%                            | 17.2%                       | 7.6%                                       | 39.7%                                | 100.0%   |
| Russian Federation               | 0                                | 2                           | 0                                          | 0                                    | 2        |
|                                  | (0.0%)                           | (100.0%)                    | (0.0%)                                     | (0.0%)                               | (100.0%) |

(Continued)

Table 2. (Continued)

|                      | Violence with individual weapons | Violence with heavy weapons | Violence with individual and heavy weapons | Other attack types (without weapons) | Total         |
|----------------------|----------------------------------|-----------------------------|--------------------------------------------|--------------------------------------|---------------|
| Somalia              | 5                                | 10                          | 0                                          | 4                                    | 19            |
|                      | 26.3%                            | 52.6%                       | 0.0%                                       | 21.1%                                | 100.0%        |
| South Sudan          | 22                               | 0                           | 0                                          | 13                                   | 35            |
|                      | 62.9%                            | 0.0%                        | 0.0%                                       | 37.1%                                | 100.0%        |
| Sudan                | 91                               | 40                          | 5                                          | 62                                   | 198           |
|                      | 46.0%                            | 20.2%                       | 2.5%                                       | 31.3%                                | 100.0%        |
| Syrian Arab Republic | 52                               | 264                         | 0                                          | 104                                  | 420           |
|                      | 12.4%                            | 62.9%                       | 0.0%                                       | 24.8%                                | 100.0%        |
| Ukraine              | 54                               | 1936                        | 13                                         | 230                                  | 2233          |
|                      | 2.4%                             | 86.7%                       | 0.6%                                       | 10.3%                                | 100.0%        |
| Yemen                | 30                               | 40                          | 1                                          | 18                                   | 89            |
|                      | 33.7%                            | 44.9%                       | 1.1%                                       | 20.2%                                | 100.0%        |
| <b>Total</b>         | <b>1,871</b>                     | <b>3,167</b>                | <b>308</b>                                 | <b>2,666</b>                         | <b>8,012</b>  |
|                      | <b>23.4%</b>                     | <b>39.5%</b>                | <b>3.8%</b>                                | <b>33.3%</b>                         | <b>100.0%</b> |

Data source: WHO's "Surveillance System for Attacks on Health Care (SSA)"<sup>48</sup>; own calculation.

attack types. Violence against health care is most frequently performed with heavy weapons in 43.4% of the attacks. The percentage has increased significantly during the observation period.

Table 2 discloses that there are significantly large differences in attack types between the countries (Fisher's exact test = 4,739.61;  $P < .001$ ). For instance, heavy weapons were used in 86.7% of attacks on health care facilities in Ukraine. In contrast, in the occupied Palestinian Territory, 17.2% of attacks on health care have been perpetrated with heavy weapons, but attacks with individual weapons (35.5%) and other attack types (39.7%) have occurred more frequently.

In total, 26.8% of the 8,012 attacks in the period from 2018 to 2024 resulted in injuries and deaths. In line with expectations,<sup>8</sup> violence (only) with individual weapons causes remarkably more injuries or deaths than attacks with heavy weapons (49.1% vs. 23.6%). However, the combination of the 2 types in an attack accumulated the danger and led to injuries or deaths in 67.9% of these attacks. This association is statistically significant (Pearson's chi-square = 1,124.83;  $df = 3$ ;  $P < .001$ ).

A third (33.3%) of attacks on health care are acts of violence that do not involve the use of individual or heavy weapons. The frequency of occurrence varies considerably between the countries (column 4 of Table 2). As illustrated in Figure 3, the remaining attack types (excluding those involving weapons) primarily comprised obstruction to health care delivery (41.0%), psychological violence (32.4%), removal of health care assets (19.2%), and removal of health care personnel or patients (18.1%). The aforementioned forms of attacks exert an indirect impact on health service delivery, availability, and accessibility. Psychological violence is defined as emotional abuse, which may include insults, belittlement, humiliation, intimidation, or threats of violence.<sup>20</sup> Figure 3 also demonstrates that other attack types are often carried out in combination with the use of individual weapons.

The attacks with heavy weapons often targeted the health infrastructure. Among the attacks with heavy weapons recorded, 77.9% affected health care facilities, 18.6% health care transport, and 19.3% health care supplies assets. However, if they affect people, the impact can be dramatic. The attacks with heavy weapons are

responsible for approximately two-thirds (68.5%) of injuries and deaths in the period from 2018 to 2024.

Figure 4 illustrates the attacks with injuries or deaths by country. Almost half (47.8%) of these attacks took place in the occupied Palestinian Territory and caused 43.4% of all recorded deaths or injuries in the period from 2018 to 2024. In the ranking, follow Ukraine, the Syrian Arab Republic, and Lebanon.

In the majority of the countries, attacks with the removal of health care personnel or patients were observed; however, the extent varies significantly (Fisher's exact test = 699.00;  $P < .001$ ). It is striking that more than half of the attacks involving the removal of persons occurred only in two countries, the occupied Palestinian Territory and Myanmar. These two countries have an exceptionally high number of arrests and detentions for both health workers and patients.

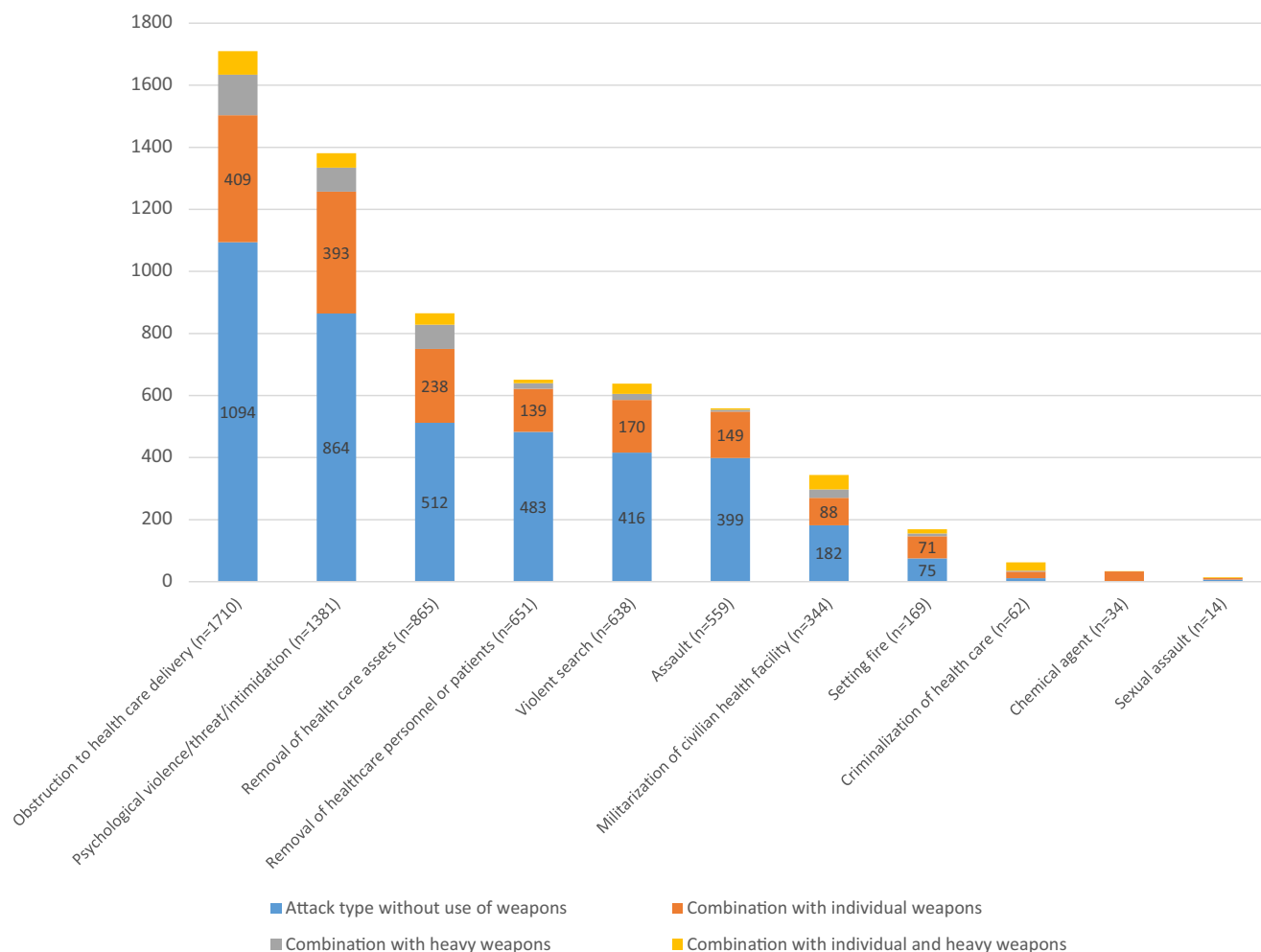
In Myanmar, the civil resistance against the military coup has been supported peacefully by health workers and health care has become the target of perfidious attacks by Myanmar security forces.<sup>24</sup>

Figure 4 shows country-specific attack strategies against health workers and patients. However, no removals of personnel were reported in five of the 22 countries. Removal of personnel was comparatively rare in Ukraine, as well. In contrast, in Ukraine, health care facilities were most frequently affected (44.7% of all attacks against health care facilities worldwide).

As suggested by Figure 3, an act of violence can be committed subtly. During the observation period, 1,381 (17.2%) attacks on health care were classified as psychological violence, threats of violence, or intimidation. Notably, the Democratic Republic of the Congo has been the most affected by this type of violence (412 of the 563 attacks; 73.2%).

### Cluster Analysis

A cluster analysis is used to identify groups that are similar. This is a prerequisite for further, in-depth investigations regarding the different effects of attack types on health care. Five factors provide the best fit in the public data set of the WHO's Surveillance System (SSA). The cluster analysis includes the 3 categorical variables



**Figure 3.** Other attacks on health care from the year 2018 to 2024.

Data source: WHO's "Surveillance System for Attacks on Health Care (SSA)"<sup>48</sup>; own calculation.

country, violence with individual weapons (yes/no or unknown), and violence with heavy weapons (yes/no or unknown), as well as 2 continuous variables with numbers of injuries and deaths.

Two-step cluster analysis yields groups, with a distribution of 43.5% for Cluster 1 ( $n = 3,485$ ) and 56.5% for Cluster 2 ( $n = 4,527$ ). This represents a suitable ratio of size of 1.3. The cluster quality is good according to a silhouette measure of cohesion and separation of 0.7. The most important predictor variables are 1. violence with heavy weapons, and 2. country. Violence involving individual weapons ranks third in terms of predictor importance. The number of injuries and, in particular, the number of deaths are hardly statistically significant for this clustering. All attacks with heavy weapons belong to Cluster 1, while most of the attacks with individual weapons (85.4%) were assigned to Cluster 2.

Figure 5 provides an overview of the relationships found between the countries, categorized dichotomously as strong and weak. In the 2-step cluster analysis results, Cluster 1 is most intensely affected by attacks in Ukraine (1,949 relationship count) and Cluster 2 by attacks in the occupied Palestinian Territory (2,052 relationship count). These 2 relationships are rated as strong. The smaller the nodes are, the weaker the influences. All thin connecting lines represent a weak relationship, which is not further differentiated in Figure 5. Almost all countries have relationships with the 2 clusters. Figure 5 exhibits the majority cluster assignment by

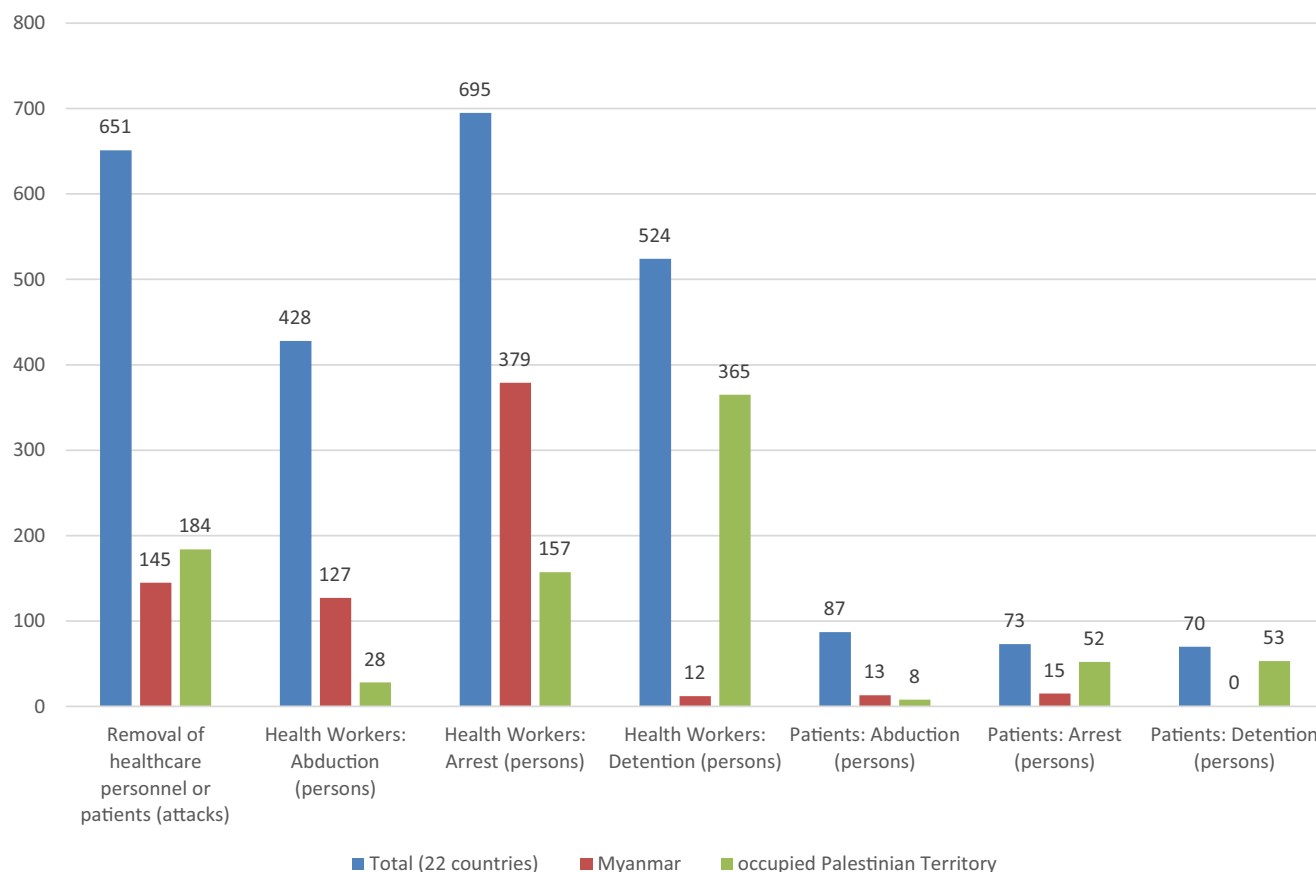
country in parentheses. Regional trends are recognizable. For example, all African countries are assigned to Cluster 2 rather than Cluster 1, except Somalia.

Cluster 2 is characterized by the use of individual weapons, but also by violence with other attack types. 87.1% of all other attack types excluding the use of weapons have been carried out in Cluster 2 countries. For example, 93.1% of the attacks with the removal of personnel or patients occurred in Cluster 2 countries.

### Limitations

Prior to the discussion of the results, it is important to point out the limitations of the research method:

1. **Underreporting:** It is worth noting that the WHO's Surveillance System (SSA) underreports the worldwide attacks on health care personnel and patients for the following reasons. In general, recording attacks on health care requires dedicated human resources. Access to information in conflict zones is often severely restricted. There are numerous practical challenges to documenting attacks.<sup>15</sup> In particular, 2 former comparisons<sup>27,28</sup> with the Security in Insecurity Insight's Numbers Database (SiND) revealed that the WHO's Surveillance System (SSA) systematically underestimated attacks on health care,



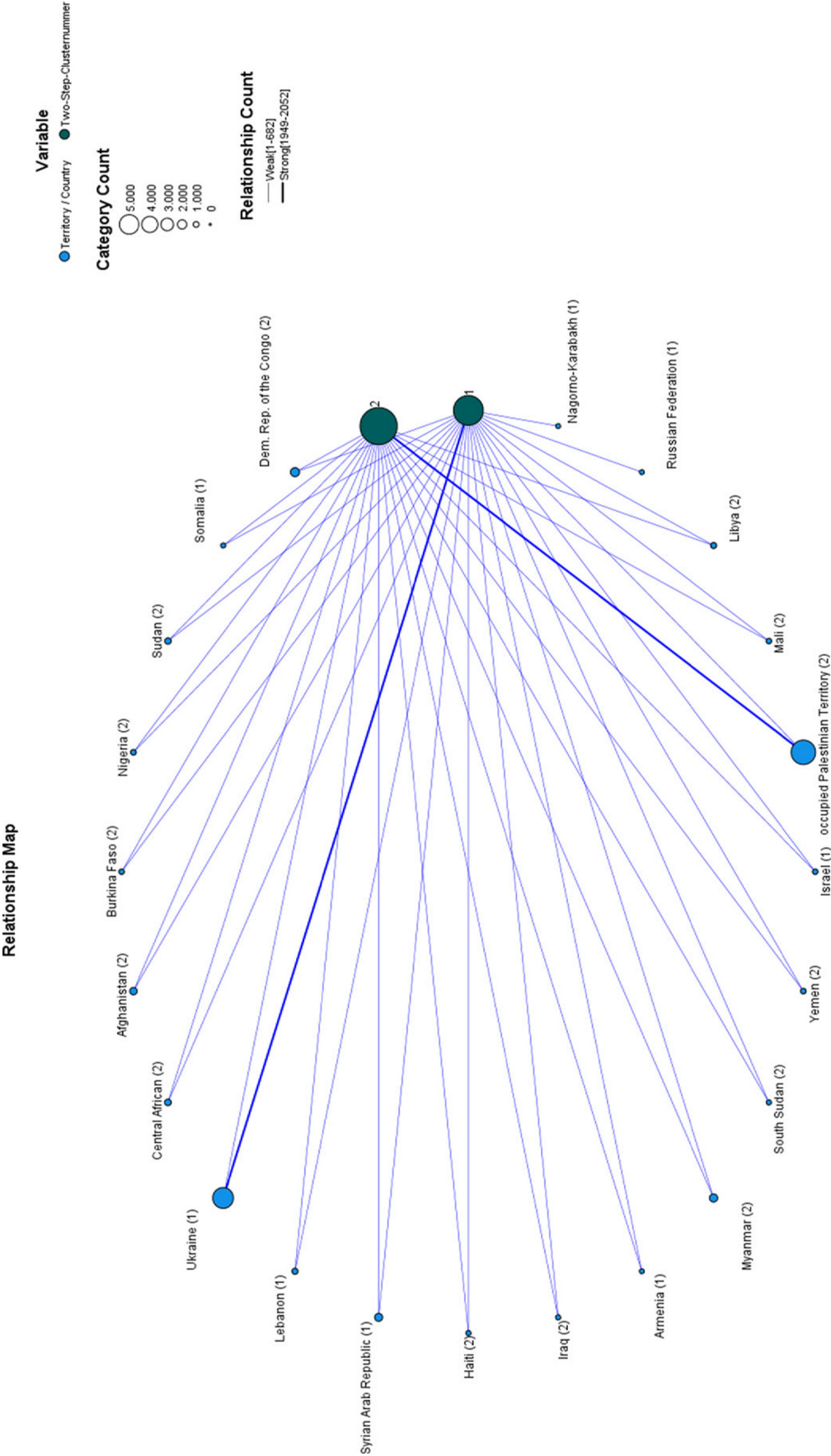
**Figure 4.** Attacks on health workers or patients from the year 2018 to 2024.  
Data source: WHO's "Surveillance System for Attacks on Health Care (SSA)"<sup>48</sup>; own calculation.

- because the WHO is concentrated on fewer countries, but in an emergency context. The inclusion criteria of the WHO's Surveillance System (SSA) ensured the internal validity, but pre-selected the datasets.<sup>27</sup> Furthermore, it is remarkable that the current attacks on health care in Ethiopia are entirely absent from the WHO's database. They are well documented in the international literature,<sup>29–32</sup> and are ongoing.
2. Lack of validation: The WHO's Surveillance System (SSA) is a limited source of data due to its primary function, which is to monitor emergency situations on a global scale. The system is not designed to generate a validated research instrument for a more extensive range of applications. From a scientific perspective, this questionnaire of the WHO's Surveillance System (SSA) has not yet been validated. This potential lack of validation may result in bias during the preselection and categorization of data.
  3. Availability of data: Geographic point location is unavailable due to anonymization and protection of the victims of an attack. Therefore, analysis of public data does not permit the identification of recurrent attacks on the same health care facility, which could be indicative of underlying intentions. Repeated attacks on hospitals have been documented, for example, in Ukraine<sup>33</sup> and other regions. Furthermore, demographic data regarding the affected health care personnel (e.g., sex) and especially their health profession would be desirable. In addition, there is no information about the perpetrator in the database.

4. Health outcomes: The WHO's Surveillance System (SSA) recorded only impact data and short-term health effects of attacks on health personnel (injuries and deaths). There is a paucity of the medium- and long-term consequences for health personnel regarding both physical and mental health deterioration.
5. Gap of denominator data: The number of attacks on health care must be considered in relation to the size of the population and the number of health care facilities or health care professionals. The WHO's Surveillance System (SSA) is currently lacking these indicators. The WHO stated in May 2025 that "at least 94% of all hospitals in the Gaza Strip are damaged or destroyed"<sup>34</sup>, for example. The implementation of such indicator sets would facilitate a more comprehensive approach to monitoring and research at the national level. There is potential for data linkage with the WHO's health reporting databases and health reports.<sup>35</sup>

## Discussion

The question raised by the title was "From bad to worse?" During the period under review, the global trend showed that the worldwide situation, as well as the number of attacks on health care and victims, had worsened dramatically. According to the WHO's Surveillance System (SSA), which has recorded a high number of 22 impacted countries, the danger of attacks on health care becoming "the new normal"<sup>10</sup> is growing.



**Figure 5.** Relationship map for 2-step cluster analysis (majority cluster assignment 1 or 2).  
Data source: WHO's "Surveillance System for Attacks on Health Care (SSA)"<sup>48</sup>; own calculation.

There are different attack strategies which can be identified in an international comparison between countries. This analysis provides new insights by country and an approach typing of attacks on health care depending on the use of individual or/and heavy weapons. The results of the cluster analysis with the most important predictor “violence with heavy weapons” can be useful for a still-pending categorization of the attacks. The results indicate that a two-cluster solution best fits the data of WHO’s Surveillance System (SSA). It identifies patterns across countries depending on the type of warfare and helps to explain cross-country differences. Interestingly, the number of injuries and number of deaths had little statistical influence on this cluster analysis. The importance and use of explosive weapons affecting health care have increased.<sup>36</sup>

The analysis shows that some of the attacks on health care combined different types of attacks. The use of both individual and heavy weapons accumulated the probability of injuries or deaths. In warfare and armed conflicts, attacks on health care can be intentional or accidental. The combination of types of attacks indicates a higher level of planning and is more likely to be intentional.

In a cross-country comparison, the occupied Palestinian Territory stands out due to its strikingly high number of attacks on health care, with the most injuries and deaths. Over half of all attacks that affected personnel and over two-thirds of attacks that impacted patients from 2018 to 2024 occurred in the occupied Palestinian Territory alone. This is in line with previous country-specific analyses.<sup>8,37–41</sup> The deterioration is not only an attack on health care, but also on the health of the population. It results in a loss of health personnel and facilities, which exerts a long-term impact on health care systems.<sup>11</sup> The rebuilding alone will take many years.<sup>42</sup>

Ukraine suffered the second-highest number of attacks on health care, with 2,233 incidents in the observation period. It was exposed to a high degree of violence involving heavy weapons. Russia’s war of aggression against Ukraine contravenes international humanitarian law,<sup>43</sup> but vice versa, notably, only 2 attacks on health care in the Russian Federation were reported in the WHO’s database during the same period (with no affected personnel). This contrast discloses the “weaponisation of health care.”

Many aggressors disregard health care’s neutrality, but regional improvements can be observed in some countries within the WHO’s Surveillance System (SSA), particularly when conflicts are pacified (Figure 2).

Grave violations of international humanitarian law and human rights (still) remain unpunished. Resolution 2286 adopted by the Security Council affirms the need for States to ensure “that those responsible do not operate with impunity, and that they are brought to justice, as provided for by national laws and obligations under international law.”<sup>3</sup> It is a prerequisite for change. Therefore, the WHO’s Surveillance System (SSA) has an important function for the preservation of evidence, so that those responsible for war crimes can be sentenced or sanctioned. As shown in Figure 2, the attacks on health care have been perpetrated by certain states over many years. This demonstrates the failure of the international community, specifically of the United Nations Security Council, in contemporary history, when members such as the Russian Federation violate their own resolutions, e.g., resolution 2286.<sup>3</sup>

## Conclusions

Due to the growing number of attacks on health care and affected countries during the observation period, there is a great lack of prevention and protection. Good practice approaches<sup>44</sup> against attacks on health care promote resilience but do not prevent the

attacks. The results show that attacks on the health care system occurred throughout the entire observation period in the occupied Palestinian Territory. For the protection of the right to health and health care, Brennan et al.<sup>45</sup> recommended (a) strengthening accountability mechanisms, (b) enhancing awareness, (c) building resilience and preparedness, and (d) fostering improved engagement, advocacy, and diplomacy at global, national, and regional levels. These strategies may need to be specified in regional conflict areas, and the cluster analysis could be helpful in anticipation of different attack patterns.

International solidarity could honor the victims<sup>46</sup> and be combined with own health emergency preparedness.<sup>47</sup> The analysis reveals that attacks occurred on a huge scale in some regions, particularly in the initial phase of war.

In summary, the global trend has worsened in regard to the regional spread, scale, and impact on health care personnel and patients. The WHO’s “Surveillance System for Attacks on Health Care (SSA)” is an important global monitoring system that can provide public data for international comparative analyses and health services research. The validation of reporting tools and further development are recommended. Health systems worldwide need to focus more on the universal human rights to health and health care, as well as to make greater efforts to condemn, prevent, and protect against attacks on health care.

**Availability of data and materials.** The datasets analyzed during the current study are available in the WHO’s repository “Surveillance System for Attacks on Health Care” via [ssa.who.int](https://ssa.who.int).<sup>48</sup>

**Competing interests.** None.

## References

1. **International Committee of the Red Cross.** *Geneva Convention Relative to the Protection of Civilian Persons in Time of War*; 1949. <https://www.icrc.org/sites/default/files/external/doc/en/assets/files/publications/icrc-002-0173.pdf>. Accessed February 14, 2026.
2. **International Committee of the Red Cross.** *Protocols Additional to the Geneva Conventions of 12 August 1949*. 2010.
3. **Security Council UN.** *Resolution 2286 (Protection of Civilians)*; 2016. S/RES/2286 (2016). <https://digitallibrary.un.org/record/827916?ln=en>. Accessed February 14, 2026.
4. **Office of the United Nations High Commissioner for Human Rights.** *International Legal Protection of Human Rights in Armed Conflict*. [https://www.ohchr.org/sites/default/files/Documents/Publications/HR\\_in\\_armed\\_conflict.pdf](https://www.ohchr.org/sites/default/files/Documents/Publications/HR_in_armed_conflict.pdf). Accessed February 14, 2026.
5. **Fouad FM, Sparrow A, Tarakji A, et al.** Health workers and the weaponisation of health care in Syria: a preliminary inquiry for The Lancet-American University of Beirut Commission on Syria. *Lancet*. 2017;**390** (10111):2516–2526. doi:10.1016/S0140-6736(17)30741-9
6. **Kim H-J, Bruni E, Gorodetska G, et al.** Typology and implications of verified attacks on health care in Ukraine in the first 18 months of war. *PLOS Glob Public Health*. 2024;**4**(5):e0003064. doi:10.1371/journal.pgph.0003064
7. **World Health Organization (WHO).** *WHO Condemns Killings of Patients and Civilians Amid Escalating Violence in El Fasher, Sudan*. Press Release. 29 October 2025. <https://www.who.int/news/item/29-10-2025-who-condemns-killings-of-patients-and-civilians-amid-escalating-violence-in-el-fasher-sudan>. Accessed February 14, 2026.
8. **Tekin FC, Selcen Öcal F.** Attacks on Health Care Worldwide: 5-year Review. *Eurasian J Emerg Med*. 2023;**22**(4):211–215. doi:10.4274/eajem.galenos.2023.42223
9. **Insecurity Insight.** *Ineffective Past, Uncertain Future: The UN Security Council’s Resolution on the Protection of Health Care*. [A Five-year Review of Ongoing Violence and Inaction to Stop It]; 2021. <https://insecurityinsight.org/wp-content/uploads/2021/05/Ineffective-past-Uncertain-Future-A-Five-Year-Review-2016-2020.pdf>. Accessed February 14, 2026.

10. **Safeguarding Health in Conflict Coalition.** *Ignoring Red Lines: Violence Against Health Care in Conflict*; 2022. <https://insecurityinsight.org/wp-content/uploads/2023/05/2022-SHCC-Executive-Summary-Ignoring-Red-Lines.pdf>. Accessed February 14, 2026.
11. **Afzal MH, Jafar AJN.** A scoping review of the wider and long-term impacts of attacks on healthcare in conflict zones. *Med Confl Surviv.* 2019;35(1):43–64. doi:10.1080/13623699.2019.1589687
12. **Blanchet K, Rubenstein L, Taithe B, et al.** Have attacks on healthcare become the new normal? A public health call to action for armed conflicts before it is too late. *Confl Health.* 2023;17(1):1–3. doi:10.1186/s13031-023-00555-4
13. **Murray CJL, King G, Lopez AD, et al.** Armed conflict as a public health problem. *BMJ.* 2002;324(7333):346–349. doi:10.1136/bmj.324.7333.346
14. **The American Public Health Association.** *A Call to End Violent Attacks on Health Workers and Health Facilities in War and Armed Conflict Settings.* 2019; Available from: <https://www.apha.org>. Accessed February 14, 2026.
15. **Haar RJ, Read R, Fast L, et al.** Violence against healthcare in conflict: a systematic review of the literature and agenda for future research. *Confl Health.* 2021;15(1):1–18. doi:10.1186/s13031-021-00372-7
16. **Bou-Karroum L, El-Harakeh A, Kassamany I, et al.** Health care workers in conflict and post-conflict settings: systematic mapping of the evidence. *PLoS ONE.* 2020;15(5):e0233757. doi:10.1371/journal.pone.0233757
17. **Haar RJ, Footer KH, Singh S, et al.** Measurement of attacks and interferences with health care in conflict: validation of an incident reporting tool for attacks on and interferences with health care in eastern Burma. *Confl Health.* 2014;8(1):23. doi:10.1186/1752-1505-8-23
18. **World Health Organization.** *WHO's Response, and Role as the Health Cluster Lead, in Meeting the Growing Demands of Health in Humanitarian Emergencies: The Sixty-Fifth World Health Assembly*; 2012; WHA65.20. [https://iris.who.int/bitstream/handle/10665/80494/A65\\_R20-en.pdf?sequence=1&isAllowed=y](https://iris.who.int/bitstream/handle/10665/80494/A65_R20-en.pdf?sequence=1&isAllowed=y). Accessed February 14, 2026.
19. **Patel P, Gibson-Fall F, Sullivan R, et al.** Documenting attacks on health workers and facilities in armed conflicts. *Bull World Health Organ.* 2017;95(1):79–81. doi:10.2471/BLT.15.168328
20. **World Health Organization.** *Attacks on Health Care: Surveillance System for Attacks on Health Care (SSA).* [Methodology Version 1.0]. 2019. [https://www.who.int/publications/i/item/surveillance-system-for-attacks-on-health-care-\(-ssa\)](https://www.who.int/publications/i/item/surveillance-system-for-attacks-on-health-care-(-ssa)). Accessed February 14, 2026.
21. **Meier BM, Rice H, Bandara S.** Monitoring attacks on health care as a basis to facilitate accountability for human rights violations. *Health Hum Rights.* 2021;23(1):55–70. <https://www.hhrjournal.org/2021/06/16/monitoring-attacks-on-health-care-as-a-basis-to-facilitate-accountability-for-human-rights-violations>. Accessed February 14, 2026.
22. **Brosius F.** *SPSS: Umfassendes Handbuch Zu Statistik Und Datenanalyse.* 8th ed. MITP; 2018.
23. **Kaufman L, Rousseeuw PJ.** *Finding Groups in Data: An Introduction to Cluster Analysis.* Wiley; 1990.
24. **Physicians for Human Rights (PHR).** “Our Health Workers Are Working in Fear”: After Myanmar’s Military Coup, One Year of Targeted Violence Against Health Care; 2022. [https://phr.org/wp-content/uploads/2022/01/PHR\\_Report\\_Our-Health-Workers-Are-Working-in-Fear\\_One-year-anniversary-of-the-Myanmar-Coup\\_January-2022-Reduced.pdf](https://phr.org/wp-content/uploads/2022/01/PHR_Report_Our-Health-Workers-Are-Working-in-Fear_One-year-anniversary-of-the-Myanmar-Coup_January-2022-Reduced.pdf). Accessed February 14, 2026.
25. **Barten DG, Tin D, Granholm F, et al.** Attacks on Ukrainian healthcare facilities during the first year of the full-scale Russian invasion of Ukraine. *Confl Health.* 2023;17(1):57. doi:10.1186/s13031-023-00557-2
26. **Dzhus M, Golovach I.** Impact of Ukrainian-Russian War on health care and humanitarian crisis. *Disaster Med Public Health Prep.* 2022;17:e340. doi:10.1017/dmp.2022.265
27. **Parada V, Fast L, Briody C, et al.** Underestimating attacks: comparing two sources of publicly-available data about attacks on health care in 2017. *Confl Health.* 2023;17(1):3. doi:10.1186/s13031-023-00498-w
28. **Usmany J, Barten DG, Goniewicz K, et al.** Attacks on healthcare in conflict-affected countries: a comparison of temporal trends in ongoing conflicts in Lebanon, Myanmar, occupied Palestinian territory, Sudan and Ukraine using WHO SSA and SHCC data, 2018–2024. *Popul Health Metr.* 2025;24(1):5. doi:10.1186/s12963-025-00442-5
29. **Gesese H, Berhane K, Siraj ES, et al.** The impact of war on the health system of the Tigray region in Ethiopia. *BMJ Glob Health.* 2021;6(11):1–7. doi:10.1136/bmjgh-2021-007328
30. **Gesese H, Kebede H, Berhe K, et al.** Perilous medicine in Tigray: a systematic review. *Confl Health.* 2023;17(1):26. doi:10.1186/s13031-023-00524-x
31. **van Reisen M, Medhanyie AA, Mawere M.** *Tigray: War in a Digital Black Hole.* African Books Collective; 2024.
32. **Minwagaw MT, Mulatu K, Motbainor A, et al.** Violence against health-care during the war in the Amhara Region of Ethiopia. *EJTS* 2024;2(1):15–22.
33. **Barten DG, Tin D, Granholm F, et al.** Assessing intent: repetitive strikes on Ukrainian health care facilities. *Prehosp Disaster Med.* 2025;40(2):114–118. doi:10.1017/S1049023X2500024X
34. **World Health Organization.** *Health System at Breaking Point as Hostilities Further Intensify in Gaza, WHO Warns: Press Release.* May 22, 2025. <https://www.who.int/news/item/22-05-2025-health-system-at-breaking-point-as-hostilities-further-intensify-who-warns>. Accessed February 14, 2026.
35. **World Health Organization.** *World Health Statistics 2025: Monitoring Health for the SDGs, Sustainable Development Goals.* 2025.
36. **Insecurity Insight.** *The Effects on Health Care of the Use of Explosive Weapons in 2023; 2024.* <https://bit.ly/2023HealthExplosives>. Accessed February 14, 2026.
37. **Kinik K, Dag N, Caliskan C, et al.** Assault on healthcare in conflict: A critical examination of attacks on medical facilities and personnel in occupied Palestinian territories and Gaza post-October 7 under the lens of international law. *Anadolu Kliniği Tıp Bilimleri Dergisi.* 2024;29(1):1–6. doi:10.21673/anadoluklin.1412404
38. **Salehi M, Bahramnezhad F, Siami Z, et al.** War attacks on medical staff, hospital and healthcare system during 225 days in Gaza: a scoping review and efficiency assessment of the International Humanitarian Law. *JIMC.* 2024;8(1):13–25. doi:10.18502/jimc.v8i1.17056
39. **Aly S, Surapaneni T, Subeh M, et al.** Spatial-temporal patterns and typology of attacks against healthcare in the Occupied Palestinian Territory. *East Mediter Health J.* 2025;31(2):59–67. doi:10.26719/2025.31.2.59
40. **Office of the United Nations High Commissioner for Human Rights (OHCHR).** *UN Experts Appalled by Relentless Israeli Attacks on Gaza’s Healthcare System: Press Release.* August 13, 2025. <https://www.ohchr.org/en/press-releases/2025/08/un-experts-appalled-relentless-israeli-attacks-gazas-healthcare-system>. Accessed February 14, 2026.
41. **Office of the United Nations High Commissioner for Human Rights.** *Attacks on Hospitals During the Escalation of Hostilities in Gaza (7 October 2023 – 30 June 2024): Thematic Report;* 2024. <https://www.ohchr.org/sites/default/files/documents/countries/opt/20241231-attacks-hospitals-gaza-en.pdf>. Accessed February 14, 2026.
42. **Alkhaldi M, Alrubaie M.** Roadmap for rebuilding the health system and scenarios of crisis path in Gaza. *Int J Health Plann Manage.* 2025;40(1):241–253. doi:10.1002/hpm.3861
43. **The United Nations General Assembly.** *Humanitarian Consequences of the Aggression Against Ukraine: Resolution Adopted by the General Assembly on 24 March 2022.* [A/RES/ES-11/2]. <https://docs.un.org/en/A/RES/ES-11/2>. Accessed February 14, 2026.
44. **World Health Organization.** *Prevention and Protection Against Attacks on Health Care: Good Practices.* 2023. <https://www.who.int/publications/i/item/9789240019461>. Accessed February 14, 2026.
45. **Brennan R, Martinez E, Rubenstein L, et al.** *In the Line of Fire: Protecting Health in Armed Conflict;* 2024. [https://cdn.who.int/media/docs/default-source/health-workforce/hwp/in-the-line-of-fire-\(1\).pdf](https://cdn.who.int/media/docs/default-source/health-workforce/hwp/in-the-line-of-fire-(1).pdf). Accessed February 14, 2026.
46. **Bilgrami I, Guy C, Carnegie V, et al.** Physician advocacy, international humanitarian law, and the protection of health care workers in conflict zones. *Med J Aust.* 2025;222(7):331–333. doi:10.5694/mja.252626
47. **World Health Organization.** *10 Proposals to Build a Safer World Together: Strengthening the Global Architecture for Health Emergency Preparedness, Response and Resilience;* 2022. <https://www.who.int/publications/m/item/10-proposals-to-build-a-safer-world-together—strengthening-the-global-architecture-for-health-emergency-preparedness—response-and-resilience—white-paper-for-consultation—june-2022>. Accessed February 14, 2026.
48. **World Health Organization.** *Surveillance System for Attacks on Health Care: Dashboard.* Published February 14, 2026. [ssa.who.int](https://ssa.who.int). Accessed February 14, 2026.