The Impact of Armed Conflict on Utilisation of Health Services in North-West Syria: An Observational Study

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Abstract

Background

Armed conflicts are known to have detrimental impact on availability and accessibility of health services. Consequently, utilisation of healthcare is usually affected. However, little is known on the extent of these effects largely due to challenges facing research in such settings. This study examines whether exposure to war incidents affected utilisation of key health services in conflict affected areas of north west Syria between 1 October 2014 and 30 June 2017.

Methods

The study is an observational study using routinely collected data in 8 health facilities in north west Syria and a database on conflict incidents. Longitudinal panel data analysis was used with fixed effect negative binomial regression for the monthly analysis and distributed lag model with a lag period of 30 days for the daily analysis.

Results

The study found strong evidence for a negative association between bombardments and both consultations and antenatal care visits. The monthly Risk Ratio was 0.95 (95%CI: 0.94-0.97) and 0.95 (95%CI: 0.93-0.98) respectively; and the cumulative daily RR at 30 days was 0.19 (95%CI: 0.15 - 0.25) and 0.42 (95%CI: 0.25 - 0.69) for consultations and antenatal care respectively.

Explosions were found to be associated with an increase in the number of deliveries and C-sections. The data provides evidence that each one unit increase in explosions in a given month in a given village was associated with about 20% increase in deliveries and C-sections; RR was 1.22 (95%CI: 1.05-1.42) and 1.96 (95%CI: 1.03-3.74) respectively.

Conclusion

The study found that access to healthcare in affected areas in Syria has been limited. The study also provides evidence that conflict incidents were associated negatively with the utilisation of health services. Based on this evidence, health actors in conflict settings need to adopt strategies that ensure availability and accessibility of health services such as decentralisation and outreach health services.

Introduction

The detrimental impact of armed conflict on health is not limited to trauma deaths, injuries and disability; conflict also bears indirect health effects through a variety of risk factors. Attacks on healthcare and other disruptions to health systems reduce access to curative and preventive services.\(^1\) Current wars tend to be protracted and increasingly take place in urban settings, which can amplify their health consequences.\(^2\) It is estimated that armed conflicts kill around 133,750 people every year,\(^3\) but this estimate does not
account for indirectly attributable mortality. Warring parties may deliberately seek to damage and curtail access to civilian health services, or may do so collaterally due to their military tactics. In either case the laws of war are contravened, but, aside from deaths and damage directly resulting from attacks on health services, the full effects of such actions are not easily quantifiable. Stronger evidence could better illuminate the scale of the problem, support memorialisation of wars, inform civilian protection as potentially aid prosecution of war crimes.

Almost ten years of conflict in Syria has had a devastating impact on civilians, infrastructure and services, with more than half a million deaths\(^4\) and half of the entire population displaced either internally or to neighbouring countries.\(^5\) What started as peaceful demonstrations in March 2011 has turned into a proxy war with complex regional and international dimensions,\(^6\) dividing the country into areas controlled by the Assad regime (Damascus and most central and southern areas), Kurdish armed groups (north east) and opposition armed groups in the north west, the latter with a population of approximately 3.5 million as of the time of writing.\(^5\)

In opposition-controlled areas, attacks on healthcare have been a pre-eminent war tactic.\(^7\) As of November 2019, some 588 attacks on 350 health facilities, most perpetrated by the Government of Syria (GoS) and its allies, had been recorded,\(^10\) and 27% of Syrians lived in areas where health services are completely absent or destroyed.\(^7\)

Between 2014 and 2017, the charity Save the Children International (SCI) supported a network of eight health facilities in north west Syria in partnership with two Syrian Non-Governmental Organisations (NGOs), Syria Relief and Shafak.

We analysed service data from this project, in combination with population and conflict incident data, to quantify the association of attacks and military operations on health service utilisation.

## Methods

### Study population and period

The SCI project consisted of seven Primary Health Care (PHC) facilities providing outpatient consultations, first aid, dressing and suturing, the Minimum Initial Service Package (MISP) for reproductive health, referrals, and Basic Emergency Obstetric Care (BeMOC); and one maternity hospital offering Comprehensive Emergency Obstetric Care (CeMOC). The project had a theoretical catchment population of about 250,000, spread across a large portion of Idleb governorate, rural areas of western Aleppo governorate and northern Hama governorate. This analysis covers the period October 2014 to June 2017.

### Data sources
The SCI project developed a bespoke Health Management Information System (HMIS) using a Microsoft SQL server, used to collect, manage and archive individual electronic patient-provider contact records. Four authors (AE, YHA, and HA) were involved in managing this project and developing the HMIS. Unique identifiers were deleted after data aggregation. We excluded records prior to October 2014 as these were collected using a preliminary version of the HMIS, and considered data up to 30 June 2017. The analysis dataset comprised 637,824 patient-provider contacts.

No consolidated database of conflict incidents at the community level was readily available for the study period. We thus constructed such a dataset by systematically consulting two main sources: “Shaam News Network” and “Ugarit News”: both are local news agencies that feature daily narrative field reports summarising all war incidents in Syria. We verified incidents with casualties by triangulating the information with three other sources: the Syrian Observatory for Human Rights, Al Jazeera and BBC news. More than 1500 daily reports were reviewed for the period between 1 October 2014 and 30 Jun 2017. We extracted meta-data (date, location, type, number of people killed) on all (n = 11,396) war incidents taking place within the project catchment area.

Lists and spellings of settlements (e.g. village names) patients originated from were matched against a master geographic dataset maintained by the United Nations Office for Coordination of Humanitarian Affairs. We excluded from analysis 296/882 'settlements' mentioned on the patient database that could not be matched to this master dataset (these may in fact have been neighbourhoods or streets). We also computed line-of-sight- distances between settlements and their closest health facility based on both locations’ coordinates: 332 settlements > 15 Km away from any health facility were also excluded based on average walking distance to access health facilities as per UNHCR standards for primary health care coverage, and based on authors’ experience of travel time limits to realistic accessibility in the Idlib context. In practice, the above exclusions only reduced the total number of patient records from 637,824 to 583,781, as the excluded settlements accounted for very few patients, suggesting most were outside the effective catchment area of the SC project. Lastly, settlements were allocated to the catchment of the health facility to which they sent most patients.

Lastly, the National Population Monitoring (NPM) surveys were used as population denominators. The NPM was a joint initiative by the International Organization for Migration and OCHA in which the populations of most communities in Syria were estimated on a monthly basis starting from December 2015, adjusting for displacement. In the absence of displacement data before this period, the first available (December 2015) estimate was also applied to the period from October 2014 to November 2015.

**Study outcomes**

The primary outcome we looked at was new outpatient consultations. Antenatal care visits, in-facility deliveries and caesarean sections were secondary outcomes. The choice of these outcomes was mainly
opportunistic based on data availability.

**Exposures: Conflict incidents**

War incidents were classified as (i) bombardment, defined as any bombing or shelling, either aerial or ground; (ii) explosion, defined as any explosion, detonation or burst caused by explosive devices, cars or remnants; (iii) clashes, defined as any active fighting or clash between any of the warring parties.

**Patient and Public Involvement**

The study is an observational study for a previously collected health data, and hence patients were not involved in the study. However, the organisations that were running the included health facilities; Save the Children, Syria Relief and Shafak Syria; were all consulted at the initial design stage of the study. They all agreed on the importance of the study question and its policy and advocacy implications.

The published paper will be shared with these organisations and a dissemination plan will be developed accordingly.

**Statistical analysis**

The statistical analysis started with an exploratory and descriptive analysis, data integrity checks, and trend analysis followed by two causal modelling:

- Monthly analysis (village – month panel data): A negative binomial regression for longitudinal panel data (monthly outcomes grouped by village).

- Daily analysis (village – day panel data): A negative binomial distributed lag model for longitudinal panel data (daily outcomes grouped by village) with a lag period of 30 days.

Some other regression models, such as Poisson and Zero Inflated Negative Binomial, were explored and excluded using Likelihood Ration Tests and multicollinearity checks. The model approach took into consideration that data is a count data over time clustered by village, and the data is dispersed and skewed to the right with a high proportion of zero values. Both models used fixed effects, an offset of the estimated population of each village and the following predictors:

- The three exposures (bombardment, explosions and clashes)

- Whether the day/the month falls within Ramadan

- Which season the day/the month falls within

- Distance from the closest health facility, initially as a linear term
- For the daily model: whether the day is Friday

We used fixed effect models with the assumption that the observations are independent between and within villages. This assumption was based on direct observations during the period of data collection which indicate frequent and massive changes of the study population with relation to population movements and displacement, areas of military control, road accessibility, and availability of health services. All these factors contributed to a greater variation between villages and even within villages leading us to assume independence of the observations.

For confounders, the authors’ own medical work inside Syria suggested that healthcare utilisation decreases during Ramadan. Warring parties also tend to reduce hostilities during the holy month. The same applies for extreme weather, either in summer or winter when both seeking health services and hostilities decrease. On the other hand, distance to closest health facility would affect healthcare seeking; and also, remote villages far away from any vital infrastructure are less likely to witness war incidents.

## Results

### Descriptive analysis

During the period under study, between 1 October 2014 and 30 Jun 2017, 597,675 medical consultations, 68,431 ANC visits, 10,816 deliveries and 4,336 C-sections were attended in the studied eight health facilities in north west Syria. Patients were coming from 11 governorates, 33 districts, 82 sub districts and 882 villages. However, most patients (596,705/597,215: 89·3%) were coming from two governorates, Idleb and Aleppo, where the eight facilities are based. When excluding villages that are more than 15 km away from the closest health facility, the mean distance between villages and closest health facilities was 8·4 km and the median was 8·3 km.

For conflict incidents, our database included information on 11,396 incidents, which took place during the period under study, out of which 10,390 were bombardments, 221 explosions and 785 clashes; and 5849 people were killed in these incidents. These events took place in 515 villages from the same geographical area that is covered by the 8 studied health facilities. 93% of incidents (7,674/8,272) were bombings which have the highest number of people killed (4,184/4,545: 92% of total people killed). 60.8% (5,027/8,272) of the incidents took place in the coverage area of only two health facilities which are the closest ones to front lines. The average number of deaths per incident was 0.55 (ranging between 0 and 104).

When merging the conflict incidents database with the HIS database, only 4,323/38% of the incidents took place in villages that were included in the multivariant analysis. The geographical distribution of the consultations and the conflict incidents is shown on the map in Fig. 1. The trends of the studied health indicators and the war incidents over time are shown in Fig. 2 and Fig. 3.
It is important to mention that all facilities, except the maternity hospital, were closed for a couple of weeks in October 2015 due to security threats faced by Save the Children’s operations inside Syria. This explains the sharp decline of all services during this period. Also, the maternity hospital was hit by an airstrike on 29 July 2016, and it was closed for few weeks following this attack. Consequently, the number of C-sections during August 2016 was the lowest.

Monthly negative binomial model

The study found a strong evidence for a negative association between bombardments and consultations and ANC visits, RR was 0.95 (95%CI: 0.94–0.97) and 0.95 (95%CI: 0.93–0.98) respectively. These associations were found to be significant across all seasons; however they were found to have more magnitude during winter and fall; RR = 0.85 (95%CI = 0.81 – 0.90) for consultations during winter, and RR = 0.89 (95%CI = 0.83 – 0.95) for ANC visits during winter.

The number of explosions was found to be associated with an increase in the number of deliveries and C-sections. The data provides evidence that one incident of explosions in a given month in a given village was associated with about 20% increase in deliveries and C-sections; RR was 1.22 (95%CI: 1.05 – 1.42) and 1.96 (95%CI: 1.03–3.74) respectively. However, these associations were found to be only significant during spring season.

### Table 1

<table>
<thead>
<tr>
<th>Exposure</th>
<th># Consultations Adjusted* RR (95%CI)</th>
<th>P</th>
<th># ANC visits Adjusted* RR (95%CI)</th>
<th>P</th>
<th># Deliveries Adjusted* RR (95%CI)</th>
<th>P</th>
<th># C-Sections Adjusted* RR (95%CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombing</td>
<td><strong>0.95</strong> (0.94–0.97)</td>
<td>&lt; 0.001</td>
<td><strong>0.95</strong> (0.93–0.98)</td>
<td>&lt; 0.001</td>
<td>0.99 (0.96–1.02)</td>
<td>0.644</td>
<td>1.02 (0.97–1.08)</td>
<td>0.376</td>
</tr>
<tr>
<td>Explosion</td>
<td>0.92 (0.82–1.03)</td>
<td>0.152</td>
<td>0.89 (0.78–1.03)</td>
<td>0.218</td>
<td>1.22 (1.05–1.42)</td>
<td>0.008</td>
<td>1.19 (1.02–1.40)</td>
<td>0.026</td>
</tr>
<tr>
<td>Clashes</td>
<td>1.07 (0.98–1.17)</td>
<td>0.118</td>
<td>1.06 (0.95–1.19)</td>
<td>0.273</td>
<td>1.15 (0.99–1.33)</td>
<td>0.075</td>
<td>0.96 (0.78–1.18)</td>
<td>0.697</td>
</tr>
</tbody>
</table>

* RR is adjusted for all other variables in the table, Ramadan, season and distance to closest health facility

Daily distributed lag model
The daily analysis found a strong evidence for an association between bombardment incidents and a reduction in consultations over the following 30 days. This association was found to be significant for both the daily RR and the accumulative one. Whereas both explosions and clashes were associated with an increase in the RR of consultations over the 30 days following incidents. The daily analysis found no other significant associations between the outcomes and the other two exposures.

<table>
<thead>
<tr>
<th>Exposure</th>
<th># Consultations Cum. RR (95%CI)</th>
<th># ANC visits Cum. RR (95%CI)</th>
<th>#Deliveries Cum. RR (95%CI)</th>
<th># C-Sections Cum. RR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombing</td>
<td>0·19 (0·15–0·25)</td>
<td>0·42 (0·25–0·69)</td>
<td>0·12 (0·04–0·41)</td>
<td>0·00 (0·00–0·09)</td>
</tr>
<tr>
<td>Explosion</td>
<td>106·75 (26·66–427·48)</td>
<td>464·58 (26·34–8195·32)</td>
<td>109·48 (0·18–65414·85)</td>
<td>0·49 (0·00–11326499·73)</td>
</tr>
<tr>
<td>Clashes</td>
<td>28·25 (4·45–179·23)</td>
<td>1·45 (0·03–66·77)</td>
<td>3·58 (0·00–3981·40)</td>
<td>1367·95 (0·01–213578839·48)</td>
</tr>
</tbody>
</table>

**Discussion**

Our study provides original evidence on the negative impact of conflict on utilisation of healthcare. This could be caused by either decreased availability of health services, blocked access to health facilities, or changes in the attitude of seeking healthcare by affected population. These findings are in line with various qualitative studies that note a negative link between conflict and utilisation of health services.\(^{15–18}\) Although, the number of quantitative studies on this topic is limited, we found few studies that reached to similar conclusions to our study. A study in Nepal found a negative correlation between the number of antenatal care check-ups and incidents of conflict-related violence. They found that women are less likely to access ANC during high intensity conflict.\(^{19}\) Similarly, three other studies in northeast Nigeria, northern Uganda and Liberia found a reduced utilisation of maternal health care services in the areas with high intensity of conflict incidents.\(^{20–22}\) Another study in Mexico found a decrease in accessing emergency obstetric care while most births were occurring at home during the Zapatista armed conflict.\(^{23}\) Similar negative correlation was found in a nested case-control study that investigated the utilisation of mental health services before, during and after the Israeli-Lebanese war in 2006. The study found a decline in primary health consultations as well as the utilisation of mental health services during the war.\(^{24}\) However, most these studies are context-specific and rely either on relatively small sample sizes or on a national level health data such as Demographic and Health Surveys (DHS) with no unique identifier for each patient/consultation.

In this study, we have estimated the coverage of eight health facilities in north west Syria in the period between 1 October 2014 and 31 Jun 2017. The catchment area was found to be overstretched and extended to remote communities which, in stable conditions, might not seek healthcare in these facilities.
Because of the ongoing conflict in Syria, access for healthcare has been limited. People in affected areas, had to travel long distances to access healthcare. These findings are consistent with several reports from medical organisations and personnel in Syria stating that lack of access to healthcare as a key need in the Syrian crisis.\textsuperscript{25,26} Reasons behind this lack of access include the collapse of the health system in the opposition-controlled areas and the ongoing targeting of health infrastructure in Syria.\textsuperscript{7,27–30} These findings suggest that the health humanitarian response in Syria do not meet the minimum standards required for humanitarian interventions as set out by relevant guidance such as the Sphere Guidelines on the “Humanitarian Charter and Minimum Standards in Disaster Response” and the UNHCR emergency handbook.\textsuperscript{13,31}

Regarding the war events, 93\% of incidents were bombardments. This is because most villages included in the study are not on the frontlines, and thus, are exposed to aerial bombardments more than other types of conflict incidents. Relaxing the geographical distance criteria would have resulted in inclusion of comparatively more frontline communities experiencing a higher incidence of war events (47.7\% of conflict incidents occurred in communities excluded as being too distant to the health facilities under study).

The study provides evidence for associations between several types of war incidents and the utilisation of key health services. Bombardments incidents were associated with decreased consultations and ANC visits. This could be due to a decreased access to healthcare during and following bombing incidents. Some of the SCI-supported health facilities were closed during intensified bombardments. Two of these facilities were hit by airstrikes in the period under study and were closed in the subsequent days. By contrast, explosions were found to be associated with increased deliveries and C-sections. One explanation might be related to the psychological trauma associated with explosions which could induce labour.\textsuperscript{32} Moreover, explosions, and other types of war events, might make women worried about the timings of their deliveries. In such cases, women might prefer to have a planned C-section to avoid unpredictable war conditions during their labour.

Accordingly, the study findings can inform related policies that concern design of health interventions and allocation of health resources in conflict settings as well as advocacy and accountability measures.

**Limitations**

First, like most natural experiments, the study is prone to lack of ability to control various elements related to the settings and the data quality, such as data collection, the design of the health services in question, and the role of other healthcare providers. The SCI-HMIS has passed through several phases of upgrades, sometimes with different tracked morbidities or different case definitions. This has limited our ability to explore the utilisation of other health services. Furthermore, this HMIS data is limited to only eight health facilities which does not represent all healthcare provided in opposition-controlled areas of north west
Syria. Populations living in in any village in the study might have had access to other health services during the period under study.

Secondly, for the war incidents data, we relied on only two local news agencies, and due to time and resources limitations, we could not strictly verify all incidents. We confined the verification to only incidents with casualties. And as clashes and explosion incidents were less frequent in the study population, the study might have lacked the power to detect associations with clashes and explosions in the final models.

Thirdly, the study might be prone to selection bias as the study population covers the communities that are in the coverage area of the SCI-supported health facilities. Those communities might have better access to healthcare than other villages which did not appear in the HMIS data.

**Conclusion And Recommendations**

The study has found the coverage of the eight studied facilities to be overstretched to cover wide geographical areas. Some patients were coming from remote places located hundreds of kilometres away from the health facilities. This raises the importance of meeting the minimum standards of humanitarian interventions in the Syrian response.

The study provides evidence for the detrimental impact of armed conflict on the utilisation of primary healthcare services. This detrimental impact might lead to interruption of treatments and accordingly to an increased burden of diseases. For example, women who are less likely to visit health facilities to monitor their pregnancy during active exposure to conflict incidents, are at risk of developing pregnancy-related complications. Also, these associations might reflect a reduced access to healthcare due to either lack of availability of health services or changes in the healthcare seeking behaviour among the conflict affected population.

To tackle some of these consequences, the study suggests few considerations for healthcare providers in conflict settings to ensure availability and accessibility of health services in conflict settings. Allocation of health services and mapping of health facilities should be decentralised ensuring the availability of essential levels of health services at the appropriate geographical levels. For example, based on the study findings, BeMOC services should be available in each sub district, while CeMOC services should be available in each district. Also, an appropriate referral system should be put in place between the several levels of healthcare. Another consideration is outreach programming, such as community health workers and mobile clinics, which could be used to address behavioural changes in healthcare seeking attitudes among conflict affected populations as well as addressing key barriers to accessing healthcare.

During the period under study, two of the health facilities were hit by airstrikes and shelling. There is a pressing need to provide more protection for healthcare in conflict settings and to set up additional measures to monitor the adherence and compliance to the relevant legal frameworks such as the Geneva
Conventions and United Nations Security Council Resolution 2286 which condemns attacks on healthcare in conflict.\textsuperscript{33–35}

Finally, there is a large space for further epidemiological research to study conflict impact on health. Such studies can guide the design of health intervention in emergencies, and help to influence the advocacy for human rights, international humanitarian law and protection of civilians during conflict.

\textbf{Declarations}

\textbf{Ethical approval and consent to participate:}

The study consisted of secondary data analysis of health service utilisation data collected as part of routine project monitoring, and was approved by the Ethics Committee of the London School of Hygiene and Tropical Medicine (ref: 13884). Additional permission letters were received from both Save the Children International and their implementing partners (Syria Relief and Shafak), authorising the use of the data under the condition of anonymising all patients’ names.

\textbf{Consent for publication}

Not applicable

\textbf{Availability of data and material:}

The authors had written consents to use the Health Information Management System (HMIS) from both Save the Children International and from their implementing partner (Syria Relief).

\textbf{Competing interests:}

The authors declare that they have no competing interests.

\textbf{Funding:}

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\textbf{Authors' contributions:}
The study design, access to data, literature search, data management, statistical analysis, initial drafting of the article, multiple rounds of edits, and producing the final manuscript were carried out by AE. YHA and GH contributed to access to data, data management, context analysis and interpretation of findings. FC oversaw the project, contributed substantially to study design, literature review, and interpretation of findings. All authors read, edited and approved the manuscript.

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References


Figures
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Distribution of the consultations and war incidents across sub districts
Figure 2

Trends of the outcome variables during the period under study
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Trends of the exposure incidents during the period under study
Figure 4

Association of 1 Bombardment on consultations over 30 days