Health Services Utilization under Qassam Rocket Attacks

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ABSTRACT: **Background:** The Qassam rocket attacks on southern Israel during the years 2000–2007 created a unique situation of life under a continuous threat. The effect of this unique situation on health services utilization has not been previously examined.

Objectives: To evaluate health utilization patterns in two primary care clinics in southern Israel: one under continuous attacks of Qassam rockets as compared with a similar clinic not under a rocket threat.

Methods: We conducted a retrospective cross-sectional study in two primary care clinics in southern Israel, with 11,630 persons listed in the two clinics during the entire study period. The primary outcome measures were total annual number of visits per person to the clinic and for specific diagnoses, and the number of drug prescriptions issued, emergency room (ER) visits, hospitalization days, cardiac catheterizations and coronary bypass surgeries.

Results: In both clinics there was an increase over time in the mean annual number of visits per person. During the years of severe attacks there was an increase in visits with a chief complaint of depression and anxiety and an increase in the number of anxiolytic prescriptions in the study clinic compared with the control. During the same period there was a decrease in the number of ER visits in the study clinic compared with the control.

Conclusions: The population under continuous life-threatening events showed more depression and anxiety problems. Under severe bombardment, the residents prefer not to leave home, unless necessary.

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Contemporary warfare frequently involves the civilian population. Aside from direct casualties, there are wider psychological and physiological consequences [1]. Studies have shown that exposure to terrorism and war is related to high rates of morbidity, mainly mental disorders, especially post-traumatic stress disorder [2], but other conditions as well, such as asthma [3,4], diabetes mellitus [5] and acute myocardial infarction [6]. Therefore, in times of terrorism and war there could be a genuine increase in morbidity in the civilian population that would manifest in an increased demand for health services.

Studies conducted in Israel after the first Gulf War and after Operation Cast Lead – a warlike operation in the Gaza Strip – clearly showed that war had an influence on the civilian population's pattern of health services use. This influence was reflected in the quantity and quality of visits to primary care physicians and emergency rooms [7,8]. Similar results were observed in studies conducted after the 9/11 World Trade Center attack [9].

The Qassam rocket attacks on southern Israel during the years 2000–2007 created a unique situation. In contrast to a terror attack, which is a one-time event with a transient influence, this was a daily barrage of rocket attacks that the civil population has had to cope with for years. The literature has addressed the issue of health services utilization patterns after a terror attack and war. However, the impact of a continuous situation of life-threatening events with uncertainty as to when and where the attack will occur and the association with health services utilization has not been investigated. The goal of the present study was to evaluate the impact of this unique situation of Qassam attacks on health services utilization.

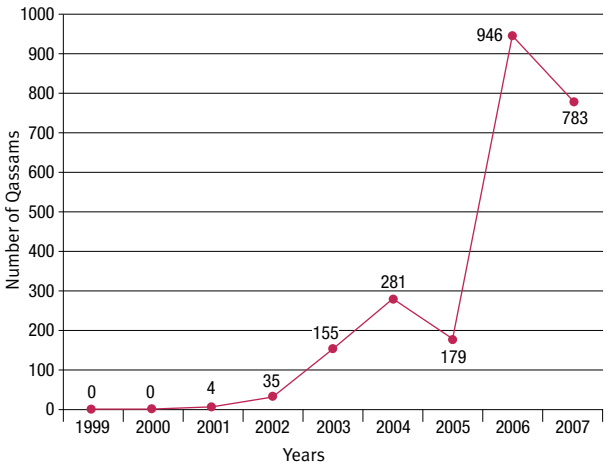
SUBJECTS AND METHODS

The Israeli health system comprises four health management organizations. The 1995 National Health Insurance Law mandates that all citizens pay a progressive tax to the Social Security Institute that allocates the funds to the HMOs according to a capitation formula. The coverage given by all four health funds is similar. Every citizen is allowed to choose his or her HMO of preference, with no limitations. The vast majority of health services are provided by the HMO facilities or by outsourced facilities that are paid for by the HMO.

The study was conducted in two towns in southern Israel: Sderot and Kiryat Gat. Both towns are located in the Negev, a desert region that is scarcely populated. Both are served by the same two hospitals: Soroka University Medical Center, a tertiary 1000-bed hospital which is a 40 minute drive from

HMO = health management organization

Figure 1. Number of Qassam rockets fired at Sderot, by years



both towns, and Barzilai Medical Center, a secondary hospital 30 minutes from both towns. These two hospitals and their emergency departments worked continuously throughout the study period.

The town of Sderot is located about 1 km from the Gaza Strip and has been under Qassam rocket attack since 2000 [10]. During the first 3 years there were no casualties, and the popular view in Israel was that the Qassam rockets were a transient episode. During the years 2003–2005 there was an increase in the number of firing incidents; these were life-threatening events and people were injured and even killed. During the years 2006–2007 the bombardment became an almost daily event and a unique situation was created in Sderot: "life under the threat of Qassams" – a life of continuous fear and assault to the daily routine [Figure 1].

The population of Kiryat Gat, located 30 km from Sderot, served as the control group for the present study due to its socio-demographic similarity to the population of Sderot. According to the Israel Central Bureau of Statistics, in 2009 there were 19,500 residents in Sderot and 47,900 in Kiryat Gat. The population in both towns is characterized by a low socioeconomic level. In 2003, both towns were rated 4 by a socio-demographic index of 1–10 (1 denoting the lowest level and 10 the highest). This index was calculated by the Central Bureau of Statistics using 14 parameters regarding demographics, education, economic level, working population, and needy population. The average salary in both towns was approximately 60% of the average salary in Israel [11].

The study was conducted in two primary care clinics owned by Clalit Health Services: the major clinic in Sderot, which was under the threat of Qassam rockets (the study clinic), and the major clinic in Kiryat Gat, which was not under threat and served as a control. Data were collected from the computerized database of the southern district of Clalit Health Services, the largest HMO in Israel, which insures 60% of the Negev population. The study was approved by the Institutional Review Board of Meir Medical Center.

STUDY POPULATION

The study population included all those listed in both clinics during the entire study period 2000–2007. Only patients continuously enrolled throughout the study period were included in the study. Enrolment status was based on the HMO's registry of basic enrolment payment, regardless of actual health services utilization.

DATA COLLECTION

Data were obtained from the computerized databases of Clalit Health Services for each year and grouped according to the time periods noted above. This database includes data regarding secondary services and drug prescriptions for the years 2000–2007. Primary care visits were reliably recorded as of mid-2002. Therefore, data regarding primary care visits were available for 2002–2007. For 2002, since data for the Sderot clinic (the study clinic) were available only for the second half of the year, they were extrapolated for 12 months to allow comparison with the subsequent years.

VARIABLES AND MEASURES

The frequency of Qassam rockets was defined as the number of Qassam rockets fired each year, as reported by the Home Front Command of the Israel Defense Force. The study period was divided into three sub-periods according to the number of rockets fired per year:

- Mild fire: during the years 2000–2002, only several isolated Qassam shootings
- Moderate fire: during 2003–2005, attacks increased to an average of 205 Qassam rockets per year
- Severe fire: during 2006–2007, attacks further increased to more than 700 rockets per year.

Health services utilization included the following parameters:

- The annual number of visits per person to the primary care clinic during the years 2002–2007
- The annual number of visits per person to the primary care clinic for specific diagnoses: cardiovascular (hypertension, coronary heart disease, stroke), depression and anxiety, headache, asthma, diabetes, non-specific complaints (agitation, fatigue, general weakness, dizziness, insomnia, dyspnea) during 2002–2007
- Utilization of secondary services: annual number of visits to the ER, hospitalization days, coronary angiography and bypass surgery procedures per person during 2000–2007
- The annual number of drug prescriptions per person

ER = emergency room

by pharmacological group: anxiolytics, antidepressants, bronchodilators, and anti-migraine medications during 2000–2007.

STATISTICAL ANALYSIS

Statistical analysis was performed using SPSS for windows, version 17. As health services utilization was non-normally distributed, non-parametric tests were used to compare across strata of independent variables. The Wilcoxon signed rank test was used to compare utilization over time within each clinic. The Mann-Whitney test was used to compare utilization between the two clinics. Chi-square and independent samples *t*-test were used to compare the socio-demographic characteristics. Significance was defined as a two-sided alpha level of 0.05, power = 80%.

Variables that were significant ($P < 0.05$) in the univariate analysis were entered into a multivariate analysis. Since the dependent variable (each visit type) was count data that do not distribute normally, a generalized linear model, negative binomial regression with log link was constructed for each visit type. Each model included the possible confounders: age, gender, place of birth, and duration of residence in Israel.

RESULTS

Among the 18,208 enrollees listed in the Sderot clinic during these years, 7695 (42.1%) were continuously enrolled throughout the study period. Among the 9691 listed in the Kiryat Gat clinic (the control clinic), 3935 (40.4%) were continuously enrolled. The mean age was 43.5 ± 21.8 in Sderot and 46.1 ± 23.8 in Kiryat Gat. Table 1 depicts the study population's socio-demographic characteristics. While many differences are statistically significant, this is probably due to the large sample size in both groups.

Table 1. Socio-demographic characteristics of the study population

	Sderot clinic, continuously enrolled (N=7695)		Kiryat Gat clinic, continuously enrolled (N=3935)		
	N	%	N	%	*P* value
Gender					
Male	3613	47.0	1774	45.1	0.056
Female	4082	53.0	2161	54.9	
Age (yr)					
‹ 20	1874	24.4	813	20.7	‹ 0.001
21–50	2718	35.3	1357	34.5	
51–65	1730	22.5	943	24.0	
66-75	784	10.2	376	9.6	
76+	589	7.7	446	11.3	
Country of birth					
Israel	3410	44.3	1466	37.3	‹ 0.001
Europe/North America	2459	32.0	1100	28.0	
Asia/Africa	1659	21.6	1223	31.1	
Year of immigration to Israel					
Before 1989 or Israeli born	5484	71.3	2991	76.0	‹ 0.001
After 1990	2211	28.7	944	24.0	

During the study period there were 727,162 visits in both clinics. The Sderot clinic had 478,050 visits, of which 296,713 (62.1%) were by women and 66,956 (14%) by children (age 0–20 years). The Kiryat Gat clinic had 249,112 visits, of which 152,100 (61.1%) were by women and 23,027 (9.2%) by children. There was an increase over time in the mean annual number of visits per person in both clinics.

Visits due to anxiety and depression were less frequent in the Sderot clinic than in the Kiryat Gat clinic during the period of mild fire, becoming more frequent in Sderot during severe fire. Visits due to cardiovascular complaints and to headaches were less frequent in Sderot during mild fire, but the differences diminished as the firing increased in severity. A general increase (to a similar extent) was seen in both clinics for diabetes-related visits, while a decrease was seen for visits due to asthma and for non-specific complaints [Table 2].

Regarding secondary services, the number of ER visits was higher in the Sderot clinic during mild fire, but the difference diminished as the firing severity increased. A general rise in the number of hospitalization days was seen in both clinics. No clear pattern was seen for coronary angiography and coronary bypass procedures [Table 2].

The number of prescriptions for anxiolytics was lower in the Sderot clinic during mild fire, but this difference diminished as firing severity increased. A similar rise was seen in both clinics regarding prescriptions for antidepressants. No clear pattern was seen for bronchodilators and anti-migraine medications.

We compared the data for primary care visits by men and women. In general, patterns seen in men and women were similar. The total number of visits was higher among women. Among men, the annual number of visits was lower in the Sderot clinic than in the Kiryat Gat clinic throughout the study period (mild fire 7.8 ± 7.3 vs. 8.5 ± 8.7, $P = 0.82$; severe fire 10.9 ± 11.7 vs. 11.7 ± 12.6, $P = 0.04$), Among women, the annual number of visits was lower in the Sderot clinic than in the Kiryat Gat clinic during the period of mild fire (9.3 ± 8.1 vs. 9.9 ± 9.0, $P = 0.12$) but higher than in the Kiryat Gat clinic during severe fire (15.0 ± 14.0 vs. 14.0 ± 13.2, $P = 0.004$). Visits due to depression and anxiety were more common in women. Among men, there was a similar number of visits in both clinics (mild fire 0.03 ± 0.30 vs. 0.04 ± 0.30, $P = 0.01$; severe fire 0.03 ± 0.37 vs. 0.03 ± 0.46, $P = 0.585$). For women, while the number of visits due to depression and anxiety was lower in the Sderot clinic in the period of mild fire (0.05 ± 0.40 vs. 0.07 ± 0.37, $P = < 0.001$), the opposite was true for the period of severe fire (0.09 ± 0.67 vs. 0.05 ± 0.42, $P = 0.02$).

We also examined differences in patients in the various age groups. In general, the patterns were similar in all age groups. In patients older than 50 years, the number of visits was lower in the Sderot clinic during mild fire (11.1 ± 9.2 vs. 12.8 ± 10.3, $P < 0.001$), but the difference disappeared during severe fire (18.2 ± 15.6 vs. 17.8 ± 14.7, $P = 0.99$). In patients under age 20,

the number of visits for asthma was lower in the Sderot clinic during mild fire (0.09 ± 0.50 vs. 0.15 ± 0.80, $P < 0.001$), but the difference disappeared during severe fire (0.05 ± 0.40 vs. 0.03 ± 0.30, $P = 0.36$). Similarly, among these young patients, a pattern of diminishing differences between the Sderot and Kiryat Gat clinics was seen for the number of hospitalization days (0.19 ± 1.10 vs. 0.14 ± 0.60, $P = 0.001$ during mild fire, and 0.13 ± 0.70 vs. 0.13 ± 1.1, $P = 0.078$ during severe fire).

The results of the generalized linear model supported the results of the univariate analysis. After controlling for confounders, the number of visits due to anxiety and depression showed the same inversion in trend. A pattern of diminishing differences between the clinics was seen in the number of cardiovascular visits and the number of visits in general. The patterns of differences between the clinics in different time periods, after controlling for potential confounders, are shown in Table 3.

Table 2. Patterns of health care utilization in the Sderot and Kiryat Gat clinics by firing severity: mean annual number of visits per person

	Variable	Firing severity	Sderot clinic	Kiryat Gat clinic	*P* value
Primary care visits	All visits to primary care clinic	Mild	8.6 ± 7.8	9.3 ± 8.9	0.315
		Moderate	12.7 ± 10.7	12.7 ± 10.1	0.345
		Severe	13.2 ± 13.2	13.0 ± 13.0	0.612
	For cardiovascular complaints	Mild	0.23 ± 1.12	0.32 ± 1.22	< 0.001
		Moderate	0.13 ± 0.87	0.16 ± 0.95	0.135
		Severe	0.24 ± 1.33	0.27 ± 1.27	0.001
	For depression/ anxiety	Mild	0.038 ± 0.351	0.055 ± 0.342	< 0.001
		Moderate	0.006 ± 0.166	0.006 ± 0.171	0.629
		Severe	0.064 ± 0.552	0.038 ± 0.433	0.031
	For asthma	Mild	0.053 ± 0.427	0.128 ± 0.781	< 0.001
		Moderate	0.038 ± 0.494	0.067 ± 0.691	0.002
		Severe	0.039 ± 0.428	0.073 ± 0.819	0.013
	For diabetes	Mild	0.16 ± 0.94	0.17 ± 0.87	< 0.001
		Moderate	0.14 ± 0.79	0.17 ± 0.92	0.018
		Severe	0.23 ± 1.12	0.28 ± 1.28	0.101
	For headache	Mild	0.013 ± 0.172	0.021 ± 0.234	0.002
		Moderate	0.007 ± 0.160	0.005 ± 0.152	0.298
		Severe	0.008 ± 0.190	0.012 ± 0.210	0.206
	For non-specific complaints	Mild	0.08 ± 0.47	0.12 ± 0.52	< 0.001
		Moderate	0.01 ± 0.24	0.03 ± 0.33	< 0.001
		Severe	0.04 ± 0.40	0.07 ± 0.61	0.029
Secondary services	Hospitalization days	Mild	0.40 ± 1.73	0.38 ± 1.59	0.012
		Moderate	0.45 ± 2.19	0.49 ± 1.83	0.261
		Severe	0.59 ± 4.93	0.65 ± 2.66	0.054
	ER visits	Mild	0.22 ± 0.41	0.17 ± 0.43	< 0.001
		Moderate	0.16 ± 0.37	0.15 ± 0.39	0.093
		Severe	0.16 ± 0.37	0.16 ± 0.40	0.289
Medication	Anxiolytics	Mild	0.38 ± 1.70	0.52 ± 2.24	< 0.001
		Moderate	0.47 ± 1.96	0.61 ± 2.41	0.001
		Severe	0.55 ± 2.22	0.63 ± 2.37	0.902
	Antidepressants	Mild	0.13 ± 0.90	0.17 ± 1.08	0.001
		Moderate	0.22 ± 1.30	0.32 ± 1.51	< 0.001
		Severe	0.35 ± 1.81	0.45 ± 1.94	< 0.001
	Bronchodilators	Mild	0.24 ± 1.39	0.39 ± 2.43	< 0.001
		Moderate	0.23 ± 1.52	0.38 ± 2.45	< 0.001
		Severe	0.25 ± 1.72	0.38 ± 2.47	0.039

DISCUSSION

This study shows a clear difference in health services utilization in the Sderot clinic under Qassam attacks within the three time periods. An increase in the annual mean number of total visits was observed. The most remarkable difference noted between the two clinics was in anxiety and depression. At the Sderot clinic there was an increase in the annual number of visits per person and in the amount of drug prescriptions that were issued, which was not seen in Kiryat Gat. In addition, a decrease in the number of ER visits and hospitalization days was observed in the Sderot clinic during the years of severe fire as compared with the Kiryat Gat clinic.

This study is the first to depict changes in health care utilization patterns under the continuous attacks of Qassam rockets in southern Israel. Some of the variables studied showed similar trends in the two clinics, implying that there may be other factors responsible for the changes (e.g., diagnoses that physicians became more aware of, new drugs that became more popular, etc.). Since this was a cross-sectional study it was difficult to show a clearer causation.

However, like others, this study demonstrates the association between political environment and health services utilization. Previous studies have shown that concern about war or terrorism, without an actual incident of either, leads to an increase in the number of visits to the family doctor and other primary care givers with the purpose of obtaining help and information about the situation [12,13]. This study reflects the unique political situation in Sderot: paradoxically, although it continued for many years and seemed to become permanent, the threat from the Qassam rockets created a strong sensation of uncertainty since the timing and location of the firing were unpredictable.

The decrease in the number of ER visits and hospitalization days correlates with the findings of Plakht et al. [8]. This decrease can be explained by the sense of uncertainty that the population was forced to deal with. People may have been reluctant to leave town, even for medical care, since it meant leaving their homes and loved ones. It is possible that the increase in the number of visits to the primary care clinic was an expression of their tendency to not leave their home

Table 3. Multivariate analysis of the effect of firing severity on health care utilization (negative binomial regression)

	Mild fire			Moderate fire			Severe fire		
	IRR	**CI**	***P***	**IRR**	**CI**	***P***	**IRR**	**CI**	***P***
All visits	0.65	0.62–0.68	< 0.001	1.06	1.00–1.13	0.064	1.07	1.03–1.11	0.002
Cardiovascular	0.24	0.21–0.27	< 0.001	0.79	0.66–0.95	0.012	1.07	0.94–1.21	0.330
Diabetes	0.22	0.19–0.26	< 0.001	0.85	0.72–1.01	0.057	0.92	0.81–1.04	0.169
Headache	0.09	0.05–0.16	< 0.001	4.13	1.45–11.74	0.008	0.44	0.27–0.72	0.001
Anxiety/Depression	0.77	0.05–0.11	< 0.001	1.24	0.54–2.86	0.615	1.54	1.21–1.96	<0.001
Asthma	0.06	0.04–0.08	< 0.001	0.41	0.31–0.55	< 0.001	0.53	0.42–0.66	<0.001
Non-specific complaints	0.05	0.04–0.07	< 0.001	0.43	0.27–0.70	0.001	0.77	0.61–0.97	0.027

The incidence rate ratio represents the difference between the Sderot and Kiryat Gat clinics for each period, after controlling for confounders (age, gender, place of birth, duration of residence in Israel). Incidence rate ratios < 1 represent a lower value for the study clinic while incidence rate ratios > 1 represent a higher value for the Sderot clinic

IRR = incidence rate ratio, CI = confidence interval

town. Perhaps restructuring health services in these settings, bringing services closer to home, should be considered.

One of the limitations of this study is the time frame resolution, which is in years. Other limitations include the potential miscoding of diagnoses during primary care visits, and the lack of information regarding the reasons for ER visits and hospitalizations. However, these are true for both clinics studied. The cross-sectional design of the study limits the possibility to move from association to causation. Since the patients were not interviewed, the interpretation of trends in utilization patterns remains speculative. The study may be subjected to a selection bias, as only those who were continuously enrolled were included. Nevertheless, this was also true for both clinics and, as shown, the enrolment percentage was similar in the two clinics.

Bearing all this in mind, it is important to recognize the eminence of this large-magnitude study. It depicts changes in patterns of health services utilization in a population that is affected over the long term by ongoing rocket attacks. We believe that additional studies that will use finer time frame resolution, time series analysis, or prospective methods will be able to show a clearer causation.

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References

1. Amital D, Amital H, Shoshat G, Soffer Y, Bar-Dayan Y. Resilience emotions and acute stress reactions in the population of Dimona and the general population of Israel two days after the first suicide bombing attack in Dimona. *IMAJ* 2012; 14 (5): 281-5.
2. Hobfoll SE, Canetti-Nisim D, Johnson RJ. Exposure to terrorism, stress-related mental health symptoms, and defensive coping among Jews and Arabs in Israel. *J Consult Clin Psychol* 2006; 74 (2): 207-18.
3. Fagan J, Galea S, Ahern J, Bonner S, Vlahov D. Relationship of self-reported asthma severity and urgent health care utilization to psychological sequelae of the September 11, 2001 terrorist attacks on the World Trade Center among New York City area residents. *Psychosom Med* 2003; 65 (6): 993-6.
4. Wright RJ, Fay ME, Suglia SF, et al. War-related stressors are associated with asthma risk among older Kuwaitis following the 1990 Iraqi invasion and occupation. *J Epidemiol Community Health* 2010; 64: 630-5.
5. Rubinstein A, Koffler M, Villa Y, Graff E. The Gulf War and diabetes mellitus. *Diabet Med* 1993; 10 (8): 774-6.
6. Meisel SR, Kutz I, Dayan KI, et al. Effect of Iraqi missile war on incidence of acute myocardial infarction and sudden death in Israeli civilians. *Lancet* 1991; 338: 660-1.
7. Nakar S, Kahan E, Nir T, Weingarten MA. The influence of SCUD missile attacks on the utilization of ambulatory services in a family practice. *Med Confl Surviv* 1996; 12 (2): 149-53.
8. Plakht Y, Shiyovich A, Francine L, et al. The emergency department in a region under missile attack: utilization patterns during Operation Cast Lead. *IMAJ* 2011; 13 (2): 69-75.
9. Boscarino JA, Galea S, Ahern J, Resnick H, Vlahov D. Utilization of mental health services following the September 11th terrorist attacks in Manhattan, New York City. *Int J Emerg Ment Health* 2002; 4 (3): 143-55.
10. The Intelligence and Terrorism Information Center. Rockets Threat from the Gaza Strip 2000-2007. 2007. Israel Central Bureau of Statistics. Characterization and Classification of Local Authorities by the Socio-Economic Level of the Population, 2003.
11. Poikolainen K, Aalto-Setala T, Tuulio-Henriksson A, Marttunen M, Lonnqvist J. Fear of nuclear war increases the risk of common mental disorders among young adults: a five-year follow-up study. *BMC Public Health* 2004; 30: 42.
12. Kahan E, Fogelman Y, Kitai E, Vinker S. Patient and family physician preferences for care and communication in the eventuality of anthrax terrorism. *Fam Pract* 2003; 20: 441-2.

"When I feed the hungry, they call me a saint. When I ask why people are hungry, they call me a communist"

Helder Camara (1909-1999), Roman Catholic Archbishop of Olinda and Recife, Brazil, who served from 1964 to 1985 during the period of repression under the military dictatorship