The course of post-disaster health problems of victims with pre-disaster psychological problems as presented in general practice

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Background. Survivors of disaster with pre-disaster psychological problems are believed to be at risk for presenting post-disaster psychological and physical morbidity. Up till now this statement is based on cross-sectional studies with self-reported data and without pre-disaster measurement.

Objective. To monitor post-disaster health care utilization and morbidity presented in general practice after a man-made disaster by victims and controls with and without pre-disaster psychological problems.

Methods. A controlled cohort study with pre-disaster (1 year) and post-disaster (two-and-a-half years) data. Victims (N = 2518) of an exploding fireworks depot in a residential area and matched controls (N = 2512), representing patients in 30 general practices, were included. Main outcome measures were utilization measured by GP attendances, and psychological and physical problems registered by the GP using the International Classification of Primary Care.

Results. Only victims without pre-disaster psychological problems demonstrated a significant increase in utilization in the first half year post-disaster. Victims with pre-disaster psychological problems did not. Being a victim (OR = 6.13; 95% CI = 4.84–7.77) had a greater effect than pre-disaster psychological problems (OR = 4.96; 95% CI = 3.96–6.21) on presenting post-disaster psychological problems. Pre-disaster psychological problems had more effect (OR = 1.93; 95% CI = 1.79–2.08) than the effect of being a victim (OR = 1.25; 95% CI = 1.18–1.32) on the development of post-disaster physical symptoms.

Conclusion. Post-disaster increases in utilization and psychological morbidity were observed. Post-disaster psychological problems were more influenced by the disaster, while post-disaster physical symptoms were more influenced by pre-disaster psychological problems. GPs should concentrate on the pre-disaster health history of victims of man-made disasters in their practices.

Keywords. Disasters, general practice, longitudinal study, morbidity.

Introduction

Victims of a disaster are at risk of developing psychological problems (PPs) in the period following the disaster. This finding is mainly based on cross-sectional studies usually without a pre-disaster measurement.\textsuperscript{1–3} Some other studies described the effect of pre-disaster anxiety or depression on post-disaster PPs. Pre-disaster...
With just one GP, who acts as a gatekeeper to secondary care. As a result, victims of the disaster and their medical histories were already known to their GP in the period prior to the disaster. In this study, data could be collected 1 year prior to the disaster, because all participating GPs already were using a computerized information system.

All 60 GPs in the town of Enschede were asked to participate in this study, of which 44 did. The 16 GPs who did not participate gave three different reasons: 6 expected an increase in workload, 9 had no victims in their practices and 1 did not use an electronic data system.

Patients were informed about their GP’s participation in this study by posters and leaflets in the waiting room and could object to the use of their data (but nobody did). Moreover, announcements of the study were made in the local newspapers and in a paper by the municipality, especially published for the victims. Data collection was performed in accordance with the privacy protection procedures of the Dutch data protection authority. Data anonymously left the practice.

**Patients**

Patients were either marked as a victim by their GP (using zip codes of the disaster area) or by the Information and Advice Centre (IAC) of the municipal authorities. The IAC was an integrated post-disaster facility, where all victims were invited to register themselves. It was implemented immediately after the disaster and acted as one counter for all problems.

The databases of the IAC and the GPs were merged and inconsistencies were corrected. Patients were included as victims if they had both a mark by their GP and were registered at the IAC. Thus a group of 3909 ‘double marked’ victims, including children and the elderly, and a control group (not marked in either of the databases) could be extracted. Only victims between 15 and 65 years old were included in the present study. Furthermore, these victims had to be enlisted in their GP’s practice during the entire study period from 13 May 1999 till 13 November 2002. Ultimately, 2518 victims were included.

The controls were matched for gender, age and health insurance. In The Netherlands, people with lower or middle incomes have public health insurance. As the type of insurance was recorded in the GP’s patient records, the insurance type could be used as an indicator of socio-economic status (SES).

Two victim groups were distinguished: victims with pre-disaster PPs (N = 400, 15.8%) and those without (N = 2118). A victim with pre-disaster PPs had to contact his GP at least once in the year pre-disaster presenting a PP. Similarly, two control groups were formed: one group with (N = 323, 12.8%) and one without (N = 2189) PPs in the period prior to the disaster.

**Methods**

**GPs**

In The Netherlands, every citizen has to be registered with just one GP, who acts as a gatekeeper to secondary health problems post-disaster.
Procedures
In Dutch general practice, the International Classification of Primary Care\textsuperscript{19} is used, which is compatible with ICD-10 and DSM-III-R. Symptoms and diagnoses of both victims and controls registered by the participating GPs during contacts with patients were extracted for this study every 3 months.

In order to study the course of health symptoms and problems of victims and controls, with and without pre-disaster PPs four clusters were chosen: PPs, all physical symptoms, digestive symptoms and musculoskeletal symptoms. These clusters were chosen, as they demonstrated a relation to the firework disaster in a previous study (Soeteman JH, Yzermans CJ, Kerssens JJ, Dirkzwager AJE, Donker GA, ten Veen PMH, van den Bosch WJHM, van der Zee J, manuscript submitted).\textsuperscript{20}

Analysis
Analysis started 1 year before the disaster occurred and lasted two and a half years post-disaster. Mean numbers of contacts per patient, victims and controls with and without pre-disaster PPs, were calculated in seven 26-week periods. An overall $F$-test from the MANOVA with repeated measurements was executed to analyse differences between groups and time periods and followed by paired $t$-test between time periods within groups. The period November 1999 to May 2000 was compared with May 2000 to November 2000 to study short-term effects and the period May 2000 to November 2000 was compared with May 2002 to November 2002 to study long-term effects. An independent $t$-test was calculated in order to compare two groups within a time period.

Prevalence rates of victims and controls with and without pre-disaster PPs were calculated as the number of patients visiting their GP in periods of 13 weeks divided by the total number of persons in that specific group.

Four logistic regression analyses were executed to analyse trends in the post-disaster period of the four clusters of health problems. Odds ratios (ORs) with 95% confidence intervals (CIs) were obtained (as well as various other statistics) to determine the effect of pre-disaster PPs and/or being a victim. Time was measured in 10 periods of 13 weeks. The time variable ‘Immediately’ applies to the first 13-week period after the disaster and ‘Trend’ is concerned with trends over the entire post-disaster study period. Interaction variables were included to test whether the course of post-disaster health problems differed between victims and controls (with or without pre-disaster PPs).

Results
More than half of the victims and controls were male, on average the victims and controls were 40 years old, and about 77% had a low or medium SES (Table 1).

About 16% of the victims presented psychological health problems before the disaster compared with 13% of the controls ($P < 0.001$). A small proportion (2.1% victims, 3.8% controls, $P < 0.001$) did not contact their GP in the entire study period of three and a half years.

Victims with pre-disaster PPs and their utilization
An overall $F$-test from the MANOVA with repeated measurements revealed statistically significant differences between groups and time periods ($F = 22.3$, d.f.1 = 6, d.f.2 = 10 050, $P < 0.001$). The utilization of persons with pre-disaster PPs is about twice as high compared with persons without pre-disaster PPs in all time periods. This applied to victims and controls (Table 2).

In the first months post-disaster the victims without pre-disaster PPs showed a small but non-significant increase immediately post-disaster. Two-and-a-half years later utilization was at the same level compared with immediately post-disaster, but still higher than the utilization of comparable controls ($P < 0.001$). Victims with pre-disaster PPs showed a small but non-significant increase in utilization immediately post-disaster, where after utilization decreased. In the last period, 2–2.5 years post-disaster, utilization was significantly lower ($P < 0.01$).

Controls with pre-disaster PPs showed a significant decrease in utilization immediately post-disaster ($P < 0.01$). This post-disaster level hardly changed during the rest of the study period. Controls without pre-disaster PPs demonstrated no difference immediately post-disaster.

Victims and controls both with pre-disaster PPs had a higher utilization during the entire study period than victims and controls without these problems.

Victims with pre-disaster PPs and their post-disaster morbidity
Psychological problems. Post-disaster PPs were examined. Victims with and without pre-disaster PPs presented many problems in the first months post-disaster (Fig. 1), especially victims with these

\begin{table}[h]
\centering
\begin{tabular}{lll}
\textbf{Groups of patients} & \textbf{Victims ($N = 2518$)} & \textbf{Controls ($N = 2512$)}
\hline
Mean age in years & 39.6 & 39.6 \\
Male (%) & 54.7 & 54.8 \\
Low/middle SES (%) & 76.8 & 77.7 \\
Pre-disaster PPs (%) & 15.9* & 12.9 \\
Without GP contacts (%) & 2.1* & 3.8 \\
\end{tabular}
\caption{Characteristics of victims and controls, 15–65 years of age, registered on their GP’s list between May 1999 and November 2002.}
\end{table}
Both groups of victims showed a moderate decline of the problems. Controls with pre-disaster PPs showed an abrupt decrease in PPs in the first period post-disaster. Subsequently, their PPs stayed at this level, lower than before the disaster but still higher than victims without pre-disaster PPs.

In a logistic regression analysis on the course of these post-disaster PPs (Table 3), the effect of being a victim of the disaster (OR = 6.31; 95% CI = 4.84–7.77) was stronger than the effect of pre-disaster PPs (OR = 4.96; 95% CI = 3.96–6.21). The trend variable indicated that prevalences of victims with (OR = 1.02 × 0.91 × 0.92 = 0.86) or without (OR = 1.02 × 0.91 = 0.93) pre-disaster PPs decreased slowly. Controls without pre-disaster PPs showed no trend (OR = 1.02, not statistically significant), while controls with pre-disaster PPs showed a slightly increasing trend (OR = 1.02 × 1.06 = 1.08).

Physical symptoms. Victims with pre-disaster PPs showed a yearly, seasonal, effect in the cluster of post-disaster all physical symptoms: a trough in summertime and a peak in late winter (Fig. 2A). Controls with pre-disaster PPs showed a decline of physical symptoms in the first 3 months following the disaster. Victims and controls with pre-disaster PPs showed more physical symptoms pre- and post-disaster than victims and controls without pre-disaster PPs.

In a regression analysis of this cluster of all post-disaster physical symptoms (Table 4) pre-disaster PPs demonstrated more effect (OR = 1.93; 95% CI = 1.79–2.08) on presenting post-disaster physical symptoms than just the effect of being a victim (OR = 1.25; 95% CI = 1.18–1.32). The variables ‘trend’ and ‘immediately (after the disaster)’ were not statistically significant indicating that prevalences of physical symptoms remained at stable levels in all groups of victims and controls.

Musculoskeletal and digestive symptoms. Victims and controls with pre-disaster PPs had higher prevalence rates of pre- and post-disaster in both clusters of musculoskeletal and digestive symptoms than victims and controls without these problems (Fig. 2B and C). Again controls with pre-disaster PPs showed a decrease in these two clusters in the post-disaster quarter.

On presenting post-disaster musculoskeletal and digestive symptoms, the effect of pre-disaster PPs was higher than the effect of the disaster (Table 4). In the logistic regression model the variables ‘trend’ and ‘immediately (after the disaster)’ of both musculoskeletal and digestive symptoms were not significant indicating a stable level of these two clusters. These results are similar to those of the cluster of all physical symptoms.

Discussion

The aim of the present study was to explore whether victims with pre-disaster PPs were possibly more...
vulnerable to the effects of the disaster than victims without those problems.

Victims with and without pre-disaster PPs both showed a significant increase of psychological morbidity after the disaster. This was found in a previous study on the firework disaster and in a review. However, only the group of victims without pre-disaster PPs showed a significant post-disaster increase in GP utilization. The assumed, vulnerable, group of victims with pre-disaster PPs showed no effect in utilization due to the disaster.

The effects of the disaster on physical morbidity differed from psychological morbidity: the disaster had a smaller effect on presenting post-disaster physical symptoms and the victims showed no increase in physical morbidity immediately post-disaster.

Controls with pre-disaster PPs showed a decrease in post-disaster utilization and morbidity: PPs, as well as physical symptoms. It looks like these controls, living in the same city, were holding their breath after the disaster occurred. In psychological literature this has been described as downward social comparison. When applied to this study: these controls with pre-disaster PPs tend to downplay their problems comparing their problems with those of victims of which they think they are more distressed. Probably, this effect was not shown if we had chosen controls in another, not affected, area.

The utilization in the pre-disaster period of both groups of victims, with and without pre-disaster problems, was higher than the utilization of the similar control groups. An explanation for this finding is unclear as the control group was stratified for SES, gender and age.

The present study on the course of health problems after a man-made disaster had a strong design with a dataset longitudinally collected pre- and post-disaster. There may be a risk of overrepresentation of presenting disaster-related problems, as the GP knew whether his patient was a victim or not. The risk of overrepresentation could not be excluded for presenting post-disaster problems.

<table>
<thead>
<tr>
<th>Main effects</th>
<th>Regression coefficient</th>
<th>Wald statistic</th>
<th>d.f.</th>
<th>P &lt;</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victims</td>
<td>1.814</td>
<td>225.3</td>
<td>1</td>
<td>0.000</td>
<td>6.13</td>
<td>(4.84–7.77)</td>
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<tr>
<td>Pre-disaster PPs</td>
<td>1.601</td>
<td>194.3</td>
<td>1</td>
<td>0.000</td>
<td>4.96</td>
<td>(3.96–6.21)</td>
</tr>
<tr>
<td>Trend</td>
<td>0.018</td>
<td>0.7</td>
<td>1</td>
<td>0.403</td>
<td>1.02</td>
<td>(0.98–1.06)</td>
</tr>
<tr>
<td>Immediately</td>
<td>−0.535</td>
<td>7.76</td>
<td>1</td>
<td>0.006</td>
<td>0.59</td>
<td>(0.40–0.86)</td>
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<th>Interaction effects</th>
<th>Regression coefficient</th>
<th>Wald statistic</th>
<th>d.f.</th>
<th>P &lt;</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trend victims</td>
<td>−0.100</td>
<td>18.3</td>
<td>1</td>
<td>0.000</td>
<td>0.91</td>
<td>(0.86–0.95)</td>
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<td>Trend pre-disaster PPs</td>
<td>0.058</td>
<td>5.89</td>
<td>1</td>
<td>0.015</td>
<td>1.06</td>
<td>(1.01–1.11)</td>
</tr>
<tr>
<td>Trend victims pre-disaster PPs</td>
<td>−0.081</td>
<td>16.1</td>
<td>1</td>
<td>0.000</td>
<td>0.92</td>
<td>(0.89–0.95)</td>
</tr>
<tr>
<td>Immediately victims</td>
<td>1.551</td>
<td>58.1</td>
<td>1</td>
<td>0.000</td>
<td>4.72</td>
<td>(3.17–7.02)</td>
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<tr>
<td>Immediately pre-disaster PPs</td>
<td>1.001</td>
<td>22.0</td>
<td>1</td>
<td>0.000</td>
<td>2.72</td>
<td>(1.67–4.44)</td>
</tr>
<tr>
<td>Immediately victims pre-disaster PPs</td>
<td>−1.368</td>
<td>27.6</td>
<td>1</td>
<td>0.000</td>
<td>0.25</td>
<td>(0.15–0.42)</td>
</tr>
<tr>
<td>Constant</td>
<td>−3.576</td>
<td>1008.3</td>
<td>1</td>
<td>0.000</td>
<td>0.03</td>
<td></td>
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</table>

**TABLE 3** Results of a logistic regression analysis for post-disaster PPs

**FIGURE 2** (A) Prevalence rates of all physical symptoms for victims and controls with or without pre-disaster PPs in 13 week periods. (B) Prevalence rates of musculoskeletal symptoms for victims and controls with or without pre-disaster PPs in 13 week periods. (C) Prevalence rates of digestive symptoms for victims and controls with or without pre-disaster PPs in 13 week periods.
PPs. However, a significant increase in physical symptoms could not be found, notwithstanding that the GPs had several trainings on recognizing (unexplained) physical symptoms as a side effect of psychological stress by the disaster.

The process of selecting victims and controls with pre-disaster PPs and the post-disaster registration of the same PPs could have a regression to the mean effect in the long term. In this study ORs suggest this phenomenon: on the long run both groups with pre-disaster PPs will show same prevalences of these problems.

The strength of this study was not only the use of a control group, but the availability of pre-disaster base line data as well, which is rather unique in disaster literature. Moreover, the problem of recall bias was avoided by using GPs’ electronic medical records instead of self-reported questionnaires.

In conclusion, victims with pre-disaster PPs presented post-disaster not only more PPs but also more physical symptoms (illness). The PPs are more influenced by being exposed to the disaster, as the physical symptoms are more influenced by a victims’ history of pre-disaster PPs. Thus, the victims’ vulnerability being expressed by pre-disaster PPs is of great importance on post-disaster psychological and physical problems.

Implications

The GP is already known by all his patients in the pre-disaster period, and is therefore well suited for recognizing more complex health problems which are presented after a disaster. Patients with a history of PPs may in fact be expressing their, pre-existing, distress in presenting psychological and physical symptoms to their GP. Every health care professional should concentrate on this phenomenon after a disaster. Selection of victims with pre-disaster PPs can be useful in determining a post-disaster high risk population. In this context, support for victims in the aftermath of a disaster has to focus not only on PPs but on physical symptoms as well.

Declaration

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Ethical approval: in accordance with the privacy protection procedures of the Dutch Data Protection Authority.

Conflicts of interest: none.

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References


