The Effect of Cancer on Suicide among Elderly Holocaust Survivors

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Jewish-Israelis of European origin with cancer have higher suicide rates relative to their counterparts in the general population. We investigated whether this effect results from the high proportion of Holocaust survivors among them, due to vulnerabilities arising from the earlier traumas they sustained. The study was based on all Jewish-European persons with cancer, 60 years and over, diagnosed in Israel between 1999 and 2007. The standardized incidence ratios were not significantly different between the exposed and nonexposed groups (men: 0.90, 95% CI 0.60–1.19; women: 0.95, 95% CI 0.55–1.37). Past exposure to maximum adversity did not increase the suicide risk among persons with cancer.

During the disease trajectory, persons with cancer are at risk for psychiatric conditions, including suicide. Approximately, one-third develops mood and anxiety disorders resulting from the dreaded diagnosis, treatment side effects, pain, and mutilation (Levav, 2010; Massie, 2004; Miovic & Block, 2007; Mitchell et al., 2011; Singer, Das-Munshi, & Brahler, 2010). Studies have also identified increased suicide risk (Bjorkenstam, Edberg, Ayoubi, & Rosen, 2005; Innos, Rahu, Rahu, & Baburin, 2003; Tanaka et al., 1999), especially following the cancer diagnosis (Fang et al., 2012). The suicide risk varies as a result of clinical factors (e.g., cancer stage and site) and sociodemographic and cultural variables (e.g., gender, degree of negative cultural sanctions, and religiosity) (Massie, 2004; Miovic & Block, 2007; Nakash, Barchana, Lipshitz, Keinan-Boker, & Levav, in press). In this inquiry, we investigated the effect of early-life exposure to maximum adversity on the suicide risk among elderly persons with cancer.

In Israel, European-American Jews have both a higher incidence of cancer (Keinan-Boker, Vin-Raviv, Lipshitz, Linn, & Barchana, 2009) and a higher rate of suicide than other ethnic groups (Nakash et al., in press). Also, suicide standardized incidence ratios (SIR) were higher among the former subjects when affected with cancer relative to the rates among their counterparts in the general population (men: 1.96, 95% confidence interval [CI] 1.62–2.30; women: 2.03, 95% CI 1.51–2.56). In contrast, no significant differences were noted among other groups, for example, Jews...
of Asian-North African origin (Nakash et al., in press). Although factors contributing to these ethnic differences in suicide rates were not fully ascertained, possible reasons may include the degree to which suicide is more (Europe-America) or less (Asia-North Africa) silently tolerated by the cultural group (Innos et al., 2003; Levav & Aisenberg, 1989). Persons affiliated with groups with higher risk (Jews of European American origin) may have their suicidal behavior facilitated when facing cancer, in contrast to groups with lower risk (Jews of Asian-North African origin) (Horton, 2006; Levav & Aisenberg, 1989). Also, differences in social support (stronger among Asian-North Africans, Bjorkenstam et al., 2005) and religiosity (higher among Asian-North Africans, Tanaka et al., 1999) may operate as protective factors (Litwin & Abramowitz, 1993).

Most Europe-born Jews who immigrated to Israel early after World War II were Holocaust survivors. This group has been exposed to a combination of severe and protracted personal assaults (e.g., psychological, physical, and religious; Levav, 1998). To some of those assaults that may have taken place singly or, more often, in combination were imputed the higher rates of cancer compared with their Europe-born counterparts who were not directly exposed to the Holocaust (Keinan-Boker et al., 2009). For example, the relative risk (RR) of all-site cancer among exposed individuals who were born between 1940 and 1945 compared with nonexposed was higher for men, RR = 3.50, 95% CI 2.17–5.65, and for women, RR = 2.33, 95% CI 1.69–3.21 (Keinan-Boker et al., 2009).

Is the observed increased suicide risk among European Jews who have cancer a result of the high proportion of Holocaust survivors among the members of this group? This hypothesis emerges from this group’s combination of past maximum adversity with a recent major fateful stressor. Indeed, research has found that elderly Holocaust survivors were at increased risk of less adaptive coping with subsequent stressors, such as the one elicited by missile attacks on Tel Aviv during the first Gulf War (Hantman, Solomon, & Prager, 1994).

With regard to cancer, studies have documented that Holocaust survivors with cancer report higher psychopathology compared to nonexposed persons with cancer and Holocaust survivors who did not have cancer (Baider, Peretz, & De-Nour, 1993; Hantman & Solomon, 2007; Peretz, Baider, Ever-Hadani, & De-Nour, 1994). Those studies provide credence to the vulnerability hypothesis which submits that exposure to severe past trauma may increase the risk of emotional distress when confronted with new life-threatening stressors (Selye, 1976; Solomon, Garb, Bleich, & Grupper, 1987). The hypothesis is also supported by previous research that has documented higher lifetime and 12-month prevalence rates of anxiety disorders and emotional distress among Holocaust survivors living in the community compared to nonexposed individuals (Levav, 2009; Sharon, Levav, Brodsky, Shemesh, & Kohn, 2009).

The objective of the current research was to explore whether suicide risk in persons with cancer is higher among Holocaust survivors compared with Israeli Jews of European origin who had not been in Nazi-occupied countries.

MATERIALS AND METHODS

The study cohort was based on all Jewish cancer patients aged 60 years and over, diagnosed in Israel in the years 1999–2007, as recorded in the Israel National Cancer Registry (INCR). The INCR, which provided the information on cancer morbidity and mortality, is fed by all medical services in compliance with mandatory reporting. The national identity number enables cumulative entries and linkage to other databases, for example, between the INCR and the National Population Registry, thus enabling retrieval and validation of demographic data.
The data in the INCR include socio-demographic variables (e.g., age, sex, country of birth, dates of birth and death, and year of immigration), primary site and histological type of the tumors according to the Standard International Classification of Diseases for Oncology (ICD-O, third version), and the time of diagnostic confirmation. Also, data from autopsy and death certificates are collected. The INCR completeness is over 93% for solid tumors.

In this study, we included all malignant tumors, also melanoma of the skin and benign central nervous system tumors (ICD-O topography: C00.0-C80.9). The restricted period we covered, 1999–2007, enhanced the study reliability following upgrades made in the system.

Because data on specific exposure to the Holocaust (e.g., ghetto, hiding, labor or extermination camps) were not available, as in other studies (Keinan-Boker et al., 2009), exposure status was ascertained by place of birth and immigration dates from Europe. Subsequently, two groups were identified: Holocaust survivors (Europe-born individuals who immigrated to Israel between the years 1945–1955) and their counterparts not exposed to the Holocaust (Europe-born individuals who immigrated to pre-State of Israel before 1939).

The Central Bureau of Statistics runs the nationwide database of causes of death, which have been recorded according to the ICD (10th ed.) since 1998. The records with causes of death for the studied years were linked with the INCR using the personal identification number and other demographic information.

Confidentiality was strictly observed because the INCR analysts had no access to the personal identification of the deceased, which was removed after linkage.

**Analysis**

We calculated the rates of suicide for the years 1999–2007 in both population groups, Holocaust survivors and their non-exposed counterparts. The expected number of deaths was calculated based on the findings in the group of Europe-born persons with cancer who were not exposed to the Holocaust and applied to the population of the Holocaust survivor cancer patients group. The observed to expected ratios expressed as SIRs and 95% confidence intervals were calculated.

**RESULTS**

Person years were as follows. Holocaust survivors: men, 134,649; women, 143,893; nonexposed European Jews: men, 43,406; women, 50,693. The cancer site distribution for all groups is presented in Table 1.

In total, 30 persons with cancer committed suicide in the reference group—those not exposed to the Holocaust (men, 19; women, 11). In the group of Holocaust survivors with cancer, 55 people committed suicide (men, 35; women, 20). The SIRs were not statistically significantly different between both groups (men: 0.90, 95% CI 0.60–1.19; women: 0.95, 95% CI 0.55–1.37; Table 2).

**DISCUSSION**

Contrary to our vulnerability hypothesis that suggests that exposure to severe past trauma may increase the risk of psychopathology when confronted with new life-threatening stressors (Selye, 1976; Solomon et al., 1987), the risk of suicide was not significantly different among cancer sufferers exposed to the Holocaust compared with the nonexposed group. Results are partly consistent with other research suggesting that Holocaust survivors are, on the whole, a resilient group (Barel, Van IJzendoorn, Sagi-Schwartz, & Bakermans-Kranenburg, 2010; Leon, Butcher, Kleinman, Goldberg, & Almagor, 1981), including when the subsequent stressful event is the loss of an adult child and the outcome variable is cancer (Kohn, Levav,
The results may provide support for the inoculation perspective, suggesting that recurrent exposure to stress contributes to the development of useful coping strategies over time (Solomon et al., 1987). Some past studies noted that exposure to past severe trauma can either reduce or enhance future coping capacities, depending on the nature of the traumatic experience (Ruch, Chandler, & Harter, 1980) and the degree of available collective support. Our hypotheses were based on a vulnerability paradigm in regard to the Holocaust (Selye, 1976; Solomon et al., 1987); however, there has also been support in the literature for resilience in the face of an equal trauma (c.f., Kim-Cohen, 2007). Indeed, researchers have suggested that Holocaust survivors’ functioning is not homogeneous. Their functioning may differ substantially depending on their pattern of post-Holocaust coping (Danieli, 1982; Hantman & Solomon, 2007): those characterized as “victims” (keep to themselves and worry about the recurrence of another Holocaust) show reduced social adjustment and increased emotional distress, while those characterized as “fighters” are determined to rebuild their lives and do not countenance suicide due to their sense of having survived persecution and attempted murder against all odds during the Holocaust (Hantman & Solomon, 2007).

This study has several limitations. Due to statistical power constraints, the analyses were performed for all malignancies combined, and not by cancer types, which may have concealed differences. In

### TABLE 1
*Cancer Site Distribution among Holocaust Survivors and Nonexposed Europe-Born Israeli Jews by Sex, Years 1999–2007*

<table>
<thead>
<tr>
<th>Cancer Site</th>
<th>Male, n</th>
<th>Female, n</th>
<th>Total N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Holocaust survivors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe born; immigration years 1945–1955</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prostate</td>
<td>9</td>
<td>9</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Colorectal</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>Kidney and bladder</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Leukemia</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Breast</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Stomach and esophagus</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Lung</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Melanoma</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>5</td>
<td>14</td>
<td>26</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>35</td>
<td>20</td>
<td>55</td>
<td>100</td>
</tr>
<tr>
<td><strong>Nonexposed group</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe born; immigration years before 1939</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prostate</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Colorectal</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
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<td>1</td>
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<td>2</td>
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<td>4</td>
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<tr>
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<td>1</td>
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<td>2</td>
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<tr>
<td>Melanoma</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18</td>
<td>10</td>
<td>28</td>
<td>100</td>
</tr>
</tbody>
</table>

### TABLE 2
*Standardized Incidence Ratios (SIR) and 95% Confidence Intervals (CI) of Suicide among Holocaust Survivors with Cancer by Sex Compared with Nonexposed Europe-Born Israeli Jews with Cancer, Years 1999–2007*

<table>
<thead>
<tr>
<th>Group</th>
<th>Sex</th>
<th>Observed suicides, n</th>
<th>Expected suicides, n</th>
<th>SIR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holocaust survivors</td>
<td>Men</td>
<td>35</td>
<td>39.07</td>
<td>0.90</td>
<td>0.60–1.19</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>20</td>
<td>21.04</td>
<td>0.95</td>
<td>0.55–1.37</td>
</tr>
</tbody>
</table>
addition, although our classification methodology is replicated elsewhere (Keinan-Boker et al., 2009), some misclassification may have occurred in exposure status, as it was ascertained indirectly by year of immigration and country of origin. Similarly, working from the national register, we were not able to ascertain the dose effect of the Holocaust exposure (ghetto, hiding, work camp, and extermination camp). Also, the data on suicide rates extend to the years covered in the analysis only. It is possible that significant differences in suicide rates among persons with cancer would have emerged in the years prior to 1999, and closer to the years of exposure to World War II.

Study strengths include an investigation of the effect of exposure to early prolonged and severe stress on risk of suicide among persons with cancer in a national sample of a unique cohort of Holocaust survivors. Results highlight the role played by possible resilience factors when individuals have to face past and current severe traumas.

REFERENCES


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