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EFFECTS OF THE HOLOCAUST ON LONG-TERM HEALTH OUTCOMES IN THE SURVIVORS AND THEIR OFFSPRING

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Statement of the Problem: The effects of the Holocaust on the survivors have been studied extensively with respect to behavioral and mental aspects, but not somatic morbidity. Previous studies in non-Jewish populations showed that severe hunger during pregnancy in World War II (WWII) or the Chinese great famine resulted in low birth weight of the neonates and in higher susceptibility to metabolic morbidity in the offspring's adult life. Jewish Holocaust survivors (HS) were exposed to extreme circumstances on WWII. Therefore we reviewed the literature regarding the potential implications of these exposures on the health of the survivors and their offspring.

Methodology & Theoretical Orientation: We review the available literature, including studies conducted by the authors, regarding long-term somatic outcomes in both HS and offspring of HS (OHS).

Findings: HS were at a higher risk compared to population-based controls for conditions such as chronic pain, fibromyalgia, functional gastrointestinal complaints, osteoporosis and cancer. Unpublished data also disclosed higher prevalence of dyslipidemia, hypertension and diabetes. The unique group of HS that were born during WWII (1940-1945) and thus were exposed to the Holocaust both directly (first generation) and indirectly through maternal exposure (second generation) showed higher prevalence of components of the metabolic syndrome as well as cardiovascular diseases and cancer. The few available studies on OHS born after WWII disclosed higher prevalence of dyslipidemia and hypertension. Epigenetic studies suggest a mechanism for these transgenerational effects.

Conclusion & Significance: HS and OHS may be at a higher risk for certain chronic conditions, mostly metabolic diseases. Health caretakers of these high-risk groups should be aware of the current body of evidence and offer HS and especially OHS opportunities for primary prevention and early detection of chronic morbidity. Additionally, there is urgent need to replicate

and consolidate these findings, preferably using longitudinal study designs.

Recent Publications

1. Keinan-Boker L, Vin-Raviv N, Liphshitz I, Linn S and Barchana M (2009) Cancer incidence in Israeli Jewish survivors of World War II. *Journal of the National Cancer Institute* 101(21):1489-1500.
2. Keinan Boker L (2014) The mothers have eaten unripe grapes and the children's teeth are set on edge: the potential inter-generational effects of the Holocaust on chronic morbidity in Holocaust survivors' offspring. *Israel Journal of Health Policy* 3(1):11.
3. Bercovich E, Keinan-Boker L and Shasha S M (2014) Long-term health effects in adults born during the Holocaust. *Israel Medical Association Journal* 16(4):203-207.
4. Keinan-Boker L, Shasha-Lavsky H, Eilat-Zanani S, Edri-Shur A and Shasha S M (2015) Chronic health conditions in Jewish Holocaust survivors born during World War II. *Israel Medical Association Journal* 17(4):206-212.

Biography

Lital Keinan Boker, MD, PhD, MPH, has her expertise in Cancer Epidemiology, particularly Breast Cancer. She is involved in etiological research, as well as early detection and long-term outcomes of cancer survivors. In addition to that, she is also involved in the research of long-term physical health outcomes in Holocaust survivors, and now started studying about the second generation of Holocaust survivors. Her research work is done within her capacity as both the Deputy Director of the Israel Center for Disease Control in the Israel Ministry of Health, and her position as an Associate Professor in the School of Public Health, University of Haifa.

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