Psychological Impact of Nuclear Disasters in Children and Adolescents

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KEYWORDS

• Nuclear disasters • Psychological impact • Children • Safety systems
• Radiation exposure

KEY POINTS

- There is a need for further investigation not only of the impact of nuclear disasters on children but also of whether the consequences are a direct result of the disaster, radiation exposure, or the psychosocial disruptions resulting from the disaster.
- Nuclear disasters are unique because they are man-made and represent a failure of the safety systems put in place to contain exceedingly dangerous radioactive materials.
- An increase in anxiety is observed in children immediately following the disaster and dissipates with time.
- Cancer and birth deformities can result from direct radiation exposure and may result in secondary psychological distress, although specific literature regarding this outcome is not available.
- There is a high level of resilience in children and it is important to treat parental anxiety in order to reduce the psychological impact on children.

INTRODUCTION

Nuclear disasters are devastating in several ways. The psychological impact is 2-fold: the direct impact of the disaster and the impact of any physical changes as a result of exposure to nuclear radiation. Overall, the rates of psychological impairment range from 25% to 75%, depending on the population under study, the timing of the assessments, the perceived or actual magnitude of the exposure, and the degree of direct involvement with the accident.

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Abbreviations

CBCL	Child Behavior Checklist
EEG	Electroencephalogram
GAD	Generalized anxiety disorder
ICD-10	International Classification of Diseases and Related Health Problems, Tenth Revision
IQ	Intelligence quotient
MDD	Major depressive disorder
OR	Odds ratio
PCL-S	PTSD Checklist Stressor Specific
PTSD	Posttraumatic stress disorder
RR	Risk ratio
TMI	Three Mile Island

Three of the largest nuclear disasters, namely Three Mile Island (TMI) Chernobyl, and Fukushima, which occurred in the United States, western Soviet Union (now Ukraine), and Japan respectively, are described in this article. This article reviews the literature and assesses the psychological and physical impact of these disasters on children and adolescents.

REVIEW OF MAJOR NUCLEAR DISASTERS

TMI is the worst nuclear disaster reported in the United States and it occurred at a plant near Harrisburg, Pennsylvania, in March 1978. Cooling water contaminated with radiation drained into adjoining buildings because of valve failure. Although no deaths were reported, approximately 140,000 people evacuated the area. There is controversy over whether there have been increased rates of cancer and infant mortality secondary to the incident. The Pennsylvania Department of Health maintained a registry of more than 30,000 people who lived within 5 miles of TMI at the time of the accident for 18 years. The state's registry was discontinued in 1997, without any evidence of unusual health trends in the area.[1] The Chernobyl incident is one of the worst disasters in history and occurred in April 1986 in Ukraine. An explosion and fire at the nuclear power plant released large quantities of radioactive particles into the atmosphere, which spread over much of the western Soviet Union and Europe. Thirty-one people died and more than 500,000 workers were exposed. Around 150,000 residents had to be evacuated and relocated.

The Fukushima Daiichi nuclear disaster occurred in March 2011 in Japan. An 8.9-magnitude earthquake led to a tsunami that then caused a series of equipment failures, nuclear meltdowns, and release of radioactive materials at the Fukushima nuclear power plant in eastern Japan. Around 300,000 people evacuated the area, thousands of people died because of the earthquake and tsunami, and thousands more died secondary to the evacuation conditions, such as living in temporary housing and hospital closures. In addition, contaminated water spread to the surrounding environment and the food supply. It was the largest nuclear disaster since the Chernobyl disaster.

Nuclear disasters are unique because there is an acute incident and then a period of contamination that can have a prolonged so-called silent exposure period, leading to both physical and psychological health effects. As Carl Sagan[2] describes in *Billions and Billions*, the exponential nature of the decay prolongs the remnant effects of radiation significantly. However, most studies do not quantify the radiation dosage of the exposure when assessing the psychological impact.