THE EFFECT OF CHERNOBYL ACCIDENT ON TURKEY

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Abstract: In this study, human health effects and the physical consequences of the Chernobyl accident on Turkey were investigated. After the Chernobyl reactor accident, Eastern Black Sea coast was one of the heavily contamined regions of Turkey. The radioactive fall-out which occured two weeks after the Chernobyl accident over the North-east region of Turkey had an impact on the tea plantations along with tobacco and hazelnut plantations. The intervention level of radioactivity taken by the Turkish Atomic Energy Authority was sufficiently drastic only for pregnant women and to children of less than one year of age, but for all population of Turkey.

Keywords: Chernobyl accident, , Turkey, nuclear power plant, radioactive contamination.

1. Introduction

The accident occured in Unit 4 at the Chernobyl nuclear power plant in Ukraine on 26 April 1986. The explosions completely destroyed the reactor, sheared all pressure tubes and water coolant channels, and dislodged the upper biological shield weighing 1,400 tonnes. The resulting damage is shown in Figure 1.1 (Fairlie et al, 2006).

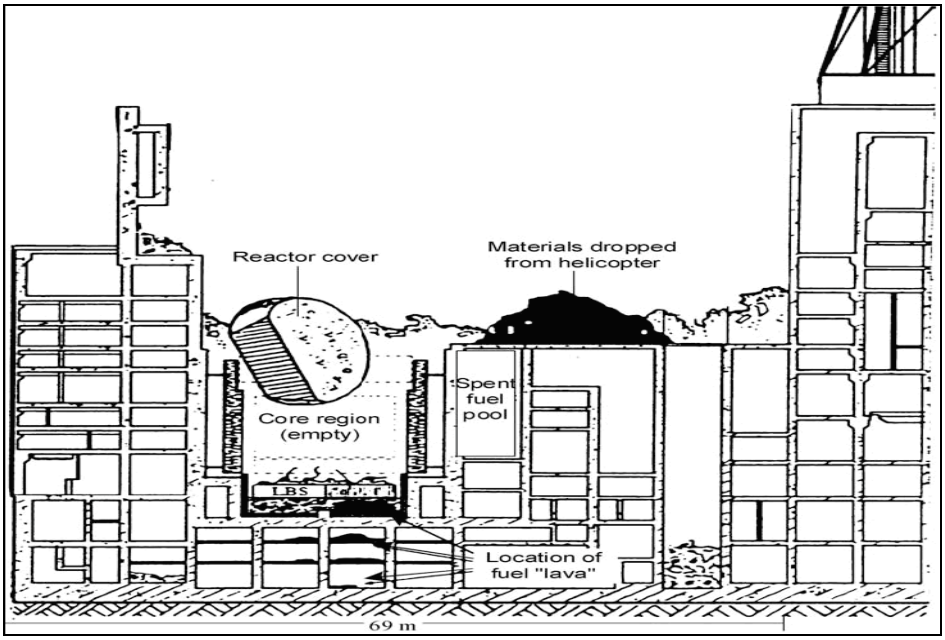

Figure 1.1 Cross-section view of Chernobyl Unit 4 reactor

The Chernobyl accident caused the deaths of 30 power workers and firemen within a few days or week, brought about the evacuation of about 116,000 people from areas surrounding the reactor during 1986. The large amount of radioactive materials was released into the atmoshere at the end of the Chernobyl accident. Regions affected by

radioactive fall-out included not only Ukraine itself but also Belarus, Russia, Georgia, Poland, Sweden, Germany, Austria, Hungary, Finland, Norway, Turkey and others. Even such distant countries as the USA and Japan received measurable amounts of radiation (Emral et al., 2003).

The most important radioisotopes released by the Chernobyl accident were caesium-137 and iodine-131. Radiation exposures to humans from Chernobyl occurred via four main pathways

(i) External exposures by the Chernobyl plume as it passed overhead
(ii) Inhalation of nuclides in the plume
(iii) Continuing external radiation from nuclides deposited on the ground
(iv) Ingestion of contaminated food

At the time of the accident, pathways (i) and (ii) were very important, especially (ii) for thyroid doses. Twenty years later, pathways (iii) and (iv) are the main contributors to dose (Fairlie and Sumner, 2006) .

One of the major impacts of the accident was exposure of the human thyroid (Anonymous, 2006). Fallout of radioactive iodines led to considerable exposure of local residents through inhalation and ingestion of contaminated food stuffs. The thyroid gland accumulates iodine from blood stream as part of physiological metabolism process. It is known to be one of the most susceptible organs to cancer induction by external x- and gamma radiation. Children were found to be the most vulnerable population and a substantial increase in thyroid cancer among those exposed as children was recorded subsequent to the accident (Bennet et al, 2006).

The risk of leukaemia has been shown in epidemiological studies to be clearly increased by radiation exposure. However, no increased risk of leukaemia linked to ionizing radiation has so far been confirmed in children, in recovery operation workers, or in the general population of the former Soviet Union or other areas with measurable amounts of contamination from the Chernobyl accident (Anonymous, 2005).

Most solid cancers have long periods between exposure and appearance of between 20 and 60 years. Now, 20 years after the accident, an average 40% increased incidence in solid cancer has already been observed in Belarus with the most pronounced increase in the most contaminated regions. The 2005 IAEA/WHO reports acknowledge preliminary evidence of an increase in the incidence of pre-menopausal breast cancer among women exposed at ages lower than 45 years.

Two non-cancer effects, cataract induction and cardiovascular diseases, are well documented with clear evidence of a Chernobyl connection. Lens changes related to radiation have been observed in children and young people aged between 5 and 17 living in the area around Chernobyl. A large study of Chernobyl emergency workers showed a significantly increased risk of cardiovascular disease.

It is well known that radiation can damage genes and chromosomes. However the relationship between genetic changes and the development of future disease is complex and the relevance of such damage to future risk is often unclear. On the other hand, a

number of recent studies have examined genetic damage in those exposed to radiation from the Chernobyl accident. Studies in Belarus have suggested a twofold increase in the germline minisatellite mutation 8 rate. Analysis of a cohort of irradiated families from Ukraine confirmed these findings. However the clinical symptoms which may result from these changes remain unclear (Anonymous, 2006b).

2. Result and Discussion

The northeastern part of Turkey was one of the most seriously contaminated regions by this accident. During the emergency, Cekmece Nuclear Research and Training Center performed an analysis of various substances. In their report, it was noted that the surface soil 137Cs activity concentration of the eastern part of the Black Sea mountains was around 4000-4500 Bq/kg at the 0.5 cm soil in the year 1988 and a considerable fallout occured on this area where tea plants had been densely cultivated (Celik et al, 2008; Yaprak et al,2000). Levels of radiocesium in Turkish tea were found to be maximum value of 44000 Bq/kg for the 1986 product by Gedikoglu and Sipahi.

Buyan was investigated the chernobyl nuclear accident and its importance for Turkey. Average rates of thyroid dose in Turkey are considerably lower tha the rates of the countries most affected by the accident. However, it was considered that doses of persons who mostly consumed locally-produced food of animal origin in Trakya and Eastern Black Sea and who had been in infanthood or childhood during the accident could be higher than averages of country.

Aslani et al reported the Buyuk Menderes Basin has an anomaly in radiocesium concentration during the period of sampling. Whereas the north side of the basin has high concentrations (~20 kBq/kg), lower concentrations were found on the other side. The measured radiocesium activity is the sum of the Chernobyl accident contribution and the residual activity of pervious contamination.

Emral et al (2006) found that it is difficult to conclude that Turkey was affected by the Chernobyl nuclear power station accident. The study was designed as a sectional, area study, between October 2000 and March 2001, in two different regions of Turkey (Rize and Beypazarı). The results, at least the significant differences on goiter prevalence between the groups, may be caused by the different iodine status of the selected regions. As a result of iodinized salt prophylaxis in Turkey, the iodine status of the regions has been changed. However, a striking result of the present study was that iodine deficiency and endemic goiter are still present and constitute an important health problem, despite 2 years of iodinized salt prophylaxis in Turkey.

3. Conclusions

Effects of atmospheric dispersion on Turkey started to be observed after May 1st, 1986 and it varied from one region to another according to the movement of the radioactive cloud and amount of precipitation. Although there was a slight increase in nodule prevalence and thyroid antibody-positive subjects i, it is hard to conclude that Turkey was affected by the Chernobyl accident (Emral et al, 2006).

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