

Bone Cancer - Who are at risk?

Pages with reference to book, From 109 To 109

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The mortality and morbidity due to cancer has increased over the past decades in the developing countries. It could be due to the increased number of diagnosed cases of malignant tumors, which might be partly attributed to the improvement in the diagnostic facilities. Although bone cancer is not a very common type of malignant tumor but its marked variation in frequency and prevalence rate in the different regions provides clues regarding the risk factors. The identification of risk factors is not only vital in the prevention and control of disease but it also helps in the perception of etiology and pathogenesis of that specific disorder.

In Pakistan, a relatively high frequency of bone tumors has been observed in the Northern region as compared to the Southern part of the country^{1,2}. Most of the bone tumor entities like primary osteosarcoma, Ewing's sarcoma, primitive neuroectodermal tumor, mesenchymal chondrosarcoma and primitive sarcoma of the bone are more frequent in children and in young adults³. Childhood and adolescence are sensitive stages of life due to greater proliferative activity of cells, environmental toxicants may have more deleterious effects in this age group as compared to adults. Most cancers result from the interaction of genetics and environment.

The influence of genetics in the development of bone cancer is a known fact. Mutation in retinoblastoma gene, p53 and over expression of MDM2 has been associated with the development of osteosarcoma. Similarly, translocation t (11:22) (q24;q 12) has been detected in about 85% of Ewing's sarcoma and primitive neuroectodermal tumors⁴. According to Knudson's "two hit" hypothesis, first hit (genetic change) is inherited from the affected parents. Before conception, any damage in the germ cells leading to the mutation may be transmitted to the off spring and may contribute in the development of cancer. The possibility of the cancer in the baby may be increased in utero exposure if the mother is working or the family is living near the working place. In a case-control study, an increased relative risk of osteosarcoma has been reported among children whose fathers had ever been employed in farming and animal husbandry⁵. While relative risk for Ewing's sarcoma was high in children whose mothers were employed in agricultural occupation⁵. Similarly in other series, a significantly high risk of Ewing's sarcoma was observed in children whose fathers were in agricultural profession^{6,7}. A relatively high risk of bone cancer may be attributed to exposure to fertilizers, pesticides, herbicides, insecticides and fungicides. Apart from parental exposure, the increased risk of bone cancer could be attributed to direct exposure of carcinogen to the children because most of the families associated with agricultural profession live close to the working place (fields or farms). In one series, six cases of Ewing's sarcoma have been reported within the period of two years in which all cases were dwellers of rural areas and had exposure to farm animals⁸. This observation raises the possibility of infectious etiologic agent transmitted by animals. A possibility of an infectious agent from farming animals can be considered for future research because in animal experiments, bone cancer development due to infectious agent transmission has been demonstrated⁵. An association between childhood bone cancer and other paternal occupations has been reported in the other studies. An elevated risk on bone tumors has been observed in the children whose parents were employed in health care, which include hospitals, maternity clinics, physiotherapy and dental clinics⁹. A possibility of exposure to the drugs, sterilization agents, anesthetics, ionizing and non-ionizing radiation and infections may be attributed to the elevated risk of bone cancer.

Genetic and acquired susceptibility factors influence the body response to the environmental carcinogens. Similarly, the effects of genes are modulated by ethnicity, age, gender, nutritional status

and the extent of exposure to the carcinogens. The detection of environmental risk factors and identification of susceptible population groups has got paramount importance in the control and prevention of the cancer. Based on this knowledge, the strategies can be made to limit the avoidable exposure to the carcinogens through regulations and public education.

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