Bone Mineral Densities in Commercial Airline Pilots: An Issue Ignored

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Abstract

The increased incidence of different types of cancers in commercial pilots has been well known. The National Council on Radiation Protection and Measurements reported in 2009 that air crews have, on average, the highest yearly dose of radiation out of all radiation-exposed workers in the US. This means they receive more radiation exposure than people who work alongside nuclear reactors. Gamma rays and X-rays from solar flares pose another radiation risk for pilots. Despite receiving the highest radiation levels among occupationally exposed groups, no data is recorded and kept regarding the total radiation exposure in the entire career of a particular airline pilot. The effects of radiation on musculoskeletal system following radiotherapy and that in astronauts have been well-studied. Those studies have shown damaging effects of radiation on many different cellular types including osteoblasts and its precursors coupled with activation of osteoclastic activity, thus, causing low bone mineral densities in the long run, which itself, is an important risk factor for development of osteoporosis. Such studies may also create greater awareness regarding healthcare of pilots among airline companies and hence, prevention strategies for osteoporosis can be made at a much earlier stage in vulnerable groups of pilots, which will help to positively impact on their future lives.

Keywords: Bone mineral densities; Osteoporosis; Bone disorders; Pilots

Letter to Editor

Currently it is estimated that almost 200 million people worldwide suffer from osteoporosis. [1] Hence, due to its large prevalence, it is considered a public health concern globally. We are very well-aware of the risk factors which lead to the development of this condition. Increasing age, menopause in women and lifestyle choices are among important factors which are involved in causing osteoporosis in most people.

With regard to the occupation of pilots, it has been well-documented in several studies, the increased incidence of different types of cancers in commercial pilots. [2] All this has been attributed to the effect of cosmic background radiation. These are high-energy particles from the core of atoms, travelling at light-speeds through outer space. Thanks to the Earth's atmosphere and magnetic field, we are all protected from them at the Earth's surface, but far above the ground, the particles are more likely to pass through and hence, can exert their harmful effects. When cosmic rays strike the air, they create showers of ionizing radiation that can penetrate deep inside our bodies. The free radicals generated via that reaction has the potential to damage our DNA, and over time, accumulation of mutated or damaged DNA poses immense risks to our health. [3] Accordingly, the National Council on Radiation Protection and Measurements reported in 2009 that air crews have, on average, the highest yearly dose of radiation out of all radiation-exposed workers in the US. This means they receive more radiation exposure than people who work alongside nuclear reactors. [3] Another radiation risk when flying are the energetic outbursts from the sun, which Earth normally shields people from. This includes gamma rays, X-rays from solar flares. When the sun is very active, there can be several solar particle events per day. The annual exposure for air crews is an estimated 3 millisieverts (mSv). Only astronauts are more exposed. [3] Compare this to 1.3 mSv, which is received by a person on the earth's surface. Unfortunately, despite receiving the highest radiation levels among occupationally exposed groups, no data is recorded and kept regarding the total radiation exposure in the entire career of a particular airline pilot. [4] We know the effect of radiation on different cells of the body. By destroying the DNA and other mechanisms, cells are forced to undergo apoptosis. Other cells may undergo mutations, which causes disturbances in cellular proliferation mechanisms, leading to different types of malignancies.

The effects of radiation on musculoskeletal system following radiotherapy and that in astronauts have been well-studied. Those studies have shown damaging effects of radiation on many different cellular types including osteoblasts and its precursors coupled with activation of osteoclastic activity, thus, causing low bone mineral densities (BMD) in the long run, which itself, is an important risk factor for development of osteoporosis. [5]

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Given that the commercial pilots fly thousands of hours in their careers, with many journeys conducted over long distances, it seems logical, that over a period of many years, these pilots are cumulatively exposed to harmful amounts of different types of radiation as mentioned above, and coupled with the sedentary nature of their job, which exerts less load on their skeletal system, may together exert a negative influence on their BMD's. Unfortunately, our literature search in different databases such as PubMed and Google Scholars showed that to date, not a single study have been conducted assessing connection between BMD's among pilots and their relation with the flying hours, flying routes, etc. Hence, this editorial may serve to make the interested researchers aware towards this issue, as osteoporosis negatively affects the standard of life of suffering people. Likewise, such studies may also create greater awareness regarding healthcare of pilots among airline companies and hence, prevention strategies for osteoporosis can be made at a much earlier stage in vulnerable groups of pilots, which will help to positively impact on their future lives.

Conflict of Interests

All authors disclose that there was no conflict of interest.

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