

Ionizing Radiation and Human Gender Proportion at Birth: A Concise Review of the Literature and A Complementary Analysis of Historical and Recent Data

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Dear Editor,

This letter considers an article by Scherb et al. entitled "Ionizing radiation and the human gender proportion at birth: A concise review of the literature and a complementary analysis of historical and recent data" published in *Early Human Development* (DOI: <http://dx.doi.org/10.1016/j.earlhumdev.2015.10.012>) [1]. The authors of this challenging paper have reviewed the literature regarding the effect of exposure to ionizing radiation on gender ratio at birth. Scherb et al. have stated that above-the-background levels of ionizing radiation may alter the gender ratio at birth: "*We are of the strong opinion that gradually increasing the level of background radiation poses an increased genetic risk to humans and creature and that more research should be initiated in this respect. This has implications for the nuclear power industry, and emphasizes the importance of finding safe methods for processing and storing nuclear waste*". They also claimed that the data they presented confirm the existence of an impact of ionizing radiation on human secondary sex.

This paper bears a very basic shortcoming. We know that at present, the level of natural background radiation varies on Earth at least two orders of magnitude [2]. Mortazavi et al. have previously published reports on the health effects of exposure to elevated levels of natural ionizing radiation in HBNRAs of Ramsar [2-6]. While radiation level in Ramsar is up to 260 mSv y⁻¹ (the highest background radiation levels known among inhabited areas, up to 13 times higher than the recommended dose limit for radiation workers in Iran that is 20 mSv y⁻¹), people living in high background radiation areas of Ramsar show no observable detrimental effect. It is worth mentioning that if a radiation dose of a few hundred mSv per year has adverse health effects and causes genetic abnormalities or an increased risk of cancer, it should be evident to the residents of these hot areas [6]. Moreover, the residents had a similar sex ratio as that of unexposed urban areas in the same province. Furthermore, Indian researchers have recently addressed the sex ratio at birth (SRB) in high background radiation areas of Kerala, India. These researchers reported that the SRB in the high background radiation areas of Kerala was around 1050 males for every 1000 females, and concluded that this ratio was comparable to the global average. In this light, they confirmed that their study did not indicate any impact of elevated levels of natural radiation on SRB [7].

Addressing the issue of occupational exposure, a study that was performed on 621 radiation workers (336 females and 285 males) who worked in hospitals/clinics, Mortazavi et al. could not find a link between parents' exposure and the gender ratio of their children. In this study, the boy/girl ratios in children born to male and to female radiation workers were 1.10 and 1.03, respectively [8]. We hope that these comments will be useful in the better understanding of the challenging issue of ionizing radiation and the human gender proportion at birth.

Best Regards

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