CHAPTER 1

AN OVERVIEW OF HEAVY METAL POLLUTION IN WATERS

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The health status of the person is determined according to the interaction between the genetic structure and the biological, social and physico-geochemical components. It is reported that every born baby is born with hundreds of tons of mineral, metal and fuel needs according to the socioeconomic status of the countries. That is why we know that physico-biochemical environmental elements are necessary for the continuation of our lives. However, environmental pollutants are mentioned with the accumulation of some organic and inorganic chemical substances in the physicogeochemical environment, which endangers the health of human and other organisms. While some of these environmental pollutants can be found in the normal range in non-hazardous amounts, the increased amount of them releasing into the environment may arise from human activities [1-6].

Pollutants that enter the body in various ways may cause organ and cell damage according to their organic or inorganic formation [1-5]. Therefore, environmental disease burden studies, in which quantitative assessment of environmental risk factors are carried out to determine the level of disease in the population, is important [4-8]. Thus, we can say that the environment may prepare the ground for diseases, may be the cause of the disease directly, may facilitate the spread of diseases or may affect the outcome of the diseases.

In general, approximately 9% of the total disease load can be attributed to environmental pollution. However, this rate is significantly higher in developing countries. In this case, one of the unsafe sources is seen as water exposure. Achieving safe drinking water is still a global issue for the rural population dependent on irregular water. In 2015, the World Bank identified that 46% of the world's population (3.4 billion) as rural and reported that 15% of the population did not have adequate access to water. It is estimated that the amount of water per capita will be

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REFERENCES

1. Briggs D. Environmental pollution and the global burden of disease. Br Med Bull 2003;68:1-24.
2. World Bank. The World Bank: Data. Available at: http://data.worldbank.org/indicator.
3. World Health Organization; The United Nations Children's Fund. 25 Years Progress on Sanitation and Drinking Water: 2015 Update and MDG Assessment; World Health Organization: Geneva, Switzerland, 2015; p. 90, ISBN 978-92-4-150914-5.
4. Wu X, Cobbina SJ, Mao G, Xu H, Zhang Z, Yang L. A review of toxicity and mechanisms of individual and mixtures of heavy metals in the environment. Environ Sci Pollut Res Int 2016;23(9):8244-59.
5. Ford L, Bharadwaj L, McLeod L, Waldner C. Human Health Risk Assessment Applied to Rural Populations Dependent on Unregulated Drinking Water Sources: A Scoping Review. Int J Environ Res Public Health 2017; 14(8): 846-68.
6. Filippini T, Cilloni S, Malavolti M, Violi F, Malagoli C, Tesauro M, et al. Dietary intakeof cadmium, chromium, copper, manganese, selenium and zinc in a Northern Italy community. J Trace Elem Med Biol 2018; 50: 508-517
7. Prüss-Ustün A, Wolf J, Corvalán C, Neville T, Bos R, Neira M. Diseases due to unhealthy environments: An updated estimate of the global burden of disease attributable to environmental determinants of health. Journal of Public Health 2016;39(3):1-12
8. Naujokas MF, Anderson B, Ahsan H, Aposhian HV, Graziano JH, Thompson C, et al. The broad scope of health effects from chronic arsenic exposure: update on a worldwide public health problem. Environ Health Perspect 2013;121, 295-302.
9. Progress on drinking-water, sanitation and hygiene, 2017: Infographics Available at: https://www.who.int/water_sanitation_health/monitoring/coverage/slide-1-gif.gif?ua=1.
10. Tchounwou PB, Yedjou CG, Patlolla AK, Sutton DJ. Heavy Metals Toxicity and the Environment. NIH-PA-EXS. 2012; 101: 133-164.
11. Song Y, Li H, Li J, Mao C, Ji J, Yuan X, et al. Multivariate linear regression model for source apportionment and health risk assessment of heavy metals from different environmental media. Ecotoxicol Environ Saf. 2018;165:555-63.
12. Yadav VB, Gadi R, Kalra S. Clay based nanocomposites for removal of heavy metals from water: A review. J Environ Manage. 2018;5;232:803-817
13. Balakrishnan A, Ramu A. Evaluation of Heavy Metal Pollution Index (HPI) of Ground Water in and around the Coastal Area of Gulf of Mannar Biosphere and Palk Strait. Journal of Advanced Chemical Sciences 2(3) (2016) 331–333.
14. Saleh HN, Panahande M, Yousefi M, Asghari FB, Oliveri Conti G, Talaee E, et al. Carcinogenic and Non-carcinogenic Risk Assessment of Heavy Metals in Groundwater Wells in Neyshabur Plain, Iran. Biol Trace Elem Res. 2019; 190(1):251-261.
15. Güler Ç. Çevre Sağlığı, çevre ve ekoloji bağlantılarıyla. Güler Ç, Vazioglu SA.Özel Risk değerlendirmeleri, Yazıt yayım, 2012, syf:190-95.
16. Özbolat G , Tuli A. Effects of Heavy Metal Toxicityon Human Health. Archives Medical Review Journal. 2016; 25(4):502-521
17. 2018 Edition of the Drinking Water Standards and Health Advisories Tables. Available at: https://www.epa.gov/sites/production/files/2018-03/documents/dwtable2018.pdf
18. Ravinder Mamtani. Metals and Disease: A Global Primary Health Care Perspective. J Toxicol 2011; 2011: 319136.
19. Rehman, K.,Fatima, F., Waheed, I., Akash, M.S.H. Prevalence of exposure of heavymetals and their impact on health consequences. J Cell Biochem 2018. 119(1),157-184.
20. Brraich OS, Jangu S. Evaluation of Water Quality Pollution Indices for Heavy Metal Contamination Monitoring in the Water of Harike Wetland (Ramsar Site), India. International Journal of Scientific and Research Publications, 2015; 5(2).
21. Ghaderpoori M, Jafari A, Ghaderpoury A. Heavy metals analysis and quality assessment in drinking water-Khorramabad city, Iran. Data Brief 2018. 16:685–692.

22. Jafari A, Kamarehie B, Ghaderpoori M, Khoshnamvand N,Birjandi M. The concentration data of heavy metals in Iranian grown and imported rice and human health hazard assessment. Data Brief 2018. 16:453–459.
23. Huang L, Wu H, van der Kuijp TJ. The health effects of exposure to arsenic-contaminated drinking water: a review by global geographical distribution. Int J Environ Health Res 2014;3: 1-21.
24. Rim KT. Occupational cancers with chemical exposure and their prevention in Korea: a literature review. Asian Pac J Cancer Prev 2013; 14: 3379-91.
25. Dogan, M., Dogan, A. U., Celebi, C., Baris, Y.I. Geogenic arsenic and a survey of skin lesions in Emet Region of Kutahya, Turkey. Indoor Built Environment 2005; 14(6), 533-536.
26. Arikan I, Namdar ND, Kahraman C, Dagci M, Ece E. Assessment of arsenic levels in body samples and chronic exposure in people using water with a high concentration of arsenic: a field study in Kutahya. Asian Pac J Cancer Prev 2015;16(8):3183-8.
27. Dogan M, Dogan AU, Celebi C, Baris YI. Geogenicarsenicand a survey of skin lesions in Emet Region of Kutahya, Turkey. Indoor Built Environment 2015; 14(6): 533-536.
28. Basu N, Horvat M, Evers DC, Zastenskaya I, Weihe P, Tempowski J. A State-of-the-Science Review of Mercury Biomarkers in Human Populations Worldwide between 2000 and 2018. Environ Health Perspect 2018;126(10):106001.
29. Goldfrank L, Bresnitz E, Howland M, Weisman R. Mercury. In: Goldfrank L, Flomenbaum N, Lewin N, editors. Goldfrank's Toxicologic Emergencies. Norwalk, Conn, USA: Appleton & Lange; 1990; 641–648.
30. Aoshima K. Epidemiology of renal tubular dysfunction in the inhabitants of a cadmium-polluted area in the Jinzu River basin in Toyama Prefecture. Tohoku J Exp Med. 1987;152(2):151-72.