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**Title :** Toxicology and biological monitoring of heavy and trace elements of industrial effluents and its impact on ground water quality and human health in parts of Faridabad (Harayana) and Okhla industrial area of new Delhi, India

### **ABSTRACT**

In the present time the ground water is polluted by the discharge of untreated effluents by some industries in the industrial area. In some parts of these industrial areas residing population drinks the untreated ground water. The untreated effluents mainly consists of high concentration of constituents such as calcium, magnesium, nitrate, fluoride as well as high concentration of heavy metals such as lead, cadmium, chromium, arsenic, mercury, iron and copper. With these increased concentration of these parameters the ground water becomes bad in odor and if consumed by the residing population it may produce various ill effects. The present work consists of study of impact of industrial effluents on the ground water and subsequent study of biomarkers of human exposure such as blood, urine and serum.

The chapter two and three discusses the ground water, aquifers, problems faced, pollution of Delhi and Faridabad area and type of the work done. The chapter describes about the various physicochemical constituents and heavy metals studied in the present study. It also discusses about the guideline values of effluent and ground water as well as guideline values of biomarkers such as blood, urine and serum. Analysis of clinical samples by the use of atomic absorption spectrophotometer and advantages of graphite furnace atomic absorption in analysis of clinical samples over the other techniques such as emission techniques and inductively coupled plasma mass spectrophotometry.

This chapter four consists of study of impact of effluent water on the ground water of Okhla industrial area, New Delhi, India. The physicochemical constituents studied were Ph, total hardness, TDS, chloride, Sulphate, nitrate fluoride, DO, COD and conductivity. Heavy metals like lead, cadmium, arsenic, chromium, copper, iron, zinc, cobalt, mercury, selenium, have been studied in effluent water and subsequently in ground water of this locality. The ground water of the studied area near the Okhla Industrial Area phase-II has been found to be unfit for drinking because fluoride has been detected in all samples above desirable limit. Lead, mercury, chromium, chloride and sulphate has also been detected few samples. The fifth chapter deals with the method development and analysis of total mercury in urine

Chapter five consists of method development and analysis of mercury in urine by the use of cold vapor atomic technique and coupling it with atomic absorption spectrometer. Sample was collected random selection of the residing population near to Okhla industrial area. Accuracy of the techniques was assessed by

running the Bio-Rad control in the same matrix. All the samples analyzed were normal except one near borderline range.

The chapter six deals with the analysis of various physico-chemicals parameters in the industrial effluents of various sectors of Faridabad, Haryana, India and its impact on ground water quality. The physicochemical constituents studied were Ph, total hardness, TDS, chloride, Sulphate, nitrate fluoride, DO, COD and conductivity. The ground water of the studied area near the Faridabad Industrial area has showed mixed trend. The ground water of sector 37 and 24 is unfit to drink high total hardness. The ground water of sector 37, 24 and 15 has TDS more than the desirable limit, chloride is present in sector 55 and 37, sulphate is present in sector 37, 24 10 and fluoride is present more than the desirable limit in sectors 37, 23, 24, 25, 10, 55, 56, 39, 15.

Thus it is seen ground water of the studied locations of Faridabad is unfit to drink directly because of presence of one or more ions in more than the desirable limit. People from that area should drink only treated water. But subsequent review and checking of water should be taken care.

The chapter seven chapter deals with the analysis of various heavy metals in the industrial effluents of various sectors of Faridabad, Haryana, India and its impact on ground water quality. In this paper heavy metals like lead, cadmium, arsenic, chromium, copper, iron, zinc, cobalt, mercury, selenium, have been studied in effluent water and subsequently in ground water of this locality. One or the other metals were detected in all samples therefore the ground water was found to be unfit for the drinking purpose.

The chapter eight deals with the direct analysis of lead, cadmium, chromium in blood and copper and zinc in serum. After calibration and calibration verification by running the matrix appropriate controls blood and serum samples were analyzed with simple dilution. Controls from Bio-Rad and Sero Norway were used to verify the method.