



# Relationship of Respiratory Diseases and the Lead Level in Tiran & Karvan Region, Iran

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## ABSTRACT

**Aims** Lead is emerged as one of the most hazardous elements, existing in the air and soil, which can create irreparable outcomes in the human body due to its highly severe damages. the aim of this study was to determine the relationship between Lead level and the respiratory diseases in Tiran & Karvan Region, Iran.

**Instrument & Methods** The research methodology was analytical based on the documents and evidence, and library studies and was performed during 2011 to 2015 in Tiran & Karvan Region, Isfahan Province, Iran. The respiratory diseases statistics regarding the studied area was gathered from the information and statistics of Isfahan University of Medical Sciences and Iran Management Center for Diseases during 2007 to 2009 documents (3215 cases). 110 soil samples and 55 water samples were collected from different positions at Summer 2011, randomly. The variation map of the respiratory diseases and lead spatial distribution for research area were drawn by Arc GIS 10.2 software.

**Findings** The concentration of lead was  $59.4 \pm 7.9$  ppm in soil and  $48.2 \pm 4.1$  ppm in water of the region. The lead variation map showed that the soil in the eastern, northern and western areas consists of a relatively high portion of lead. Also special distribution of the respiratory diseases in Tiran & Karvan showed that the disease variation is in a cluster manner and that the disease follows a special centralization.

**Conclusion** There is a direct relation between respiratory diseases distribution and the existence of lead in Tiran & Karvan Region, Isfahan Province, Iran.

**Keywords** Respiration Disorders; Contamination; Lead; Soil; Water

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## Introduction

The World Health Organization introduced the first main definition of health, considering it as a positive independent entity, in an announcement in 1946. In their definition, Health is referred to an optimum physical, mental and social state and to the absence of any disease or deficit. Such a statement was effectively of special importance both for the situation of the scientists who stated it, and for the governmental goals & programs as well as the research expenses [1]. Although it was not practically useful for offering a standard presentation or for research projects and needs particular characteristics, it showed an ideal and desired state.

The absorption of the heavy metals in the contaminated lands by the plants and particularly by agricultural crops is one of the most important ways of the entrance of these elements in the food chain [2]. Previous studies have shown some of heavy metals, e.g. Fe, Cu, Mn and Zn, essential for human health in trace concentration, but these elements can be harmful in human body in high concentration and accumulation of heavy metals in tissues caused negative interferences in metabolism. As heavy metals are not biologically decomposable, they can be gathered in human body. Main source of gathering are vegetables that grown by polluted water and soil [3-5].

Some heavy metals like mercury and lead are vital elements in trace concentration and have some influences on living organisms, but their accumulation inside the living bodies causes dangerous diseases such as central nervous system disorders and mental retardation [6]. The most usual ways of their entrance into the human body are through contaminated air and underground water [7]. One of the most concerning issues referred to the heavy metals is that they are not metabolized in the body. In fact, after their entrance into the body, the heavy metals don't excrete from the body and they are deposited and accumulated in such tissues and limbs as fat, muscles, bones and joints so it cause several diseases and troubles in the body [8].

The presence of the heavy metals above the defined standards in the environment causes the incidence of environmental problems and troubles for people of those areas and for the ecosystem as well. Recognition of the respiratory diseases from geographical

variation perspective is of importance since it will be effective in their early diagnosis and treatment [9] and it will have considerable effect for the authorities to take true approaches and methods in order to prevent these disasters in their responsibility of accurate management in these areas [10].

One of the prevalent diseases in Tiran & Karvan Region, Iran, is respiratory diseases, which is known as the fourth cause of death in this area. Therefore, the aim of this study was to determine the relationship between Lead level and the respiratory diseases in Tiran & Karvan Region, Iran.

## Instrument & Methods

The research methodology was analytical based on the documents and evidence, and library studies and was performed during 2011 to 2015 in Tiran & Karvan Region, Isfahan Province, Iran. The respiratory diseases statistics regarding the studied area was gathered from the information and statistics of Isfahan University of Medical Sciences and Iran Management Center for Diseases during 2007 to 2009 documents (3215 cases). 110 soil samples and 55 water samples were collected from different positions at Summer 2011, randomly.

10 equal soil samples (50g) were selected from 10cm layer of the soil from different location of each village in polyethylene containers, which was acid washed. These samples were mixed, blended, milled, and then sieved to make homogeny sample. Samples were then divided into 5 parts for wet digestion [11, 12]. Each 100ml water sample collected in acid washed glass tube contains 1ml HNO<sub>3</sub> [13]. Prepared soil and water samples were analyzed for Pb concentration by atomic absorption VARIAN-AA220 [4, 12, 13].

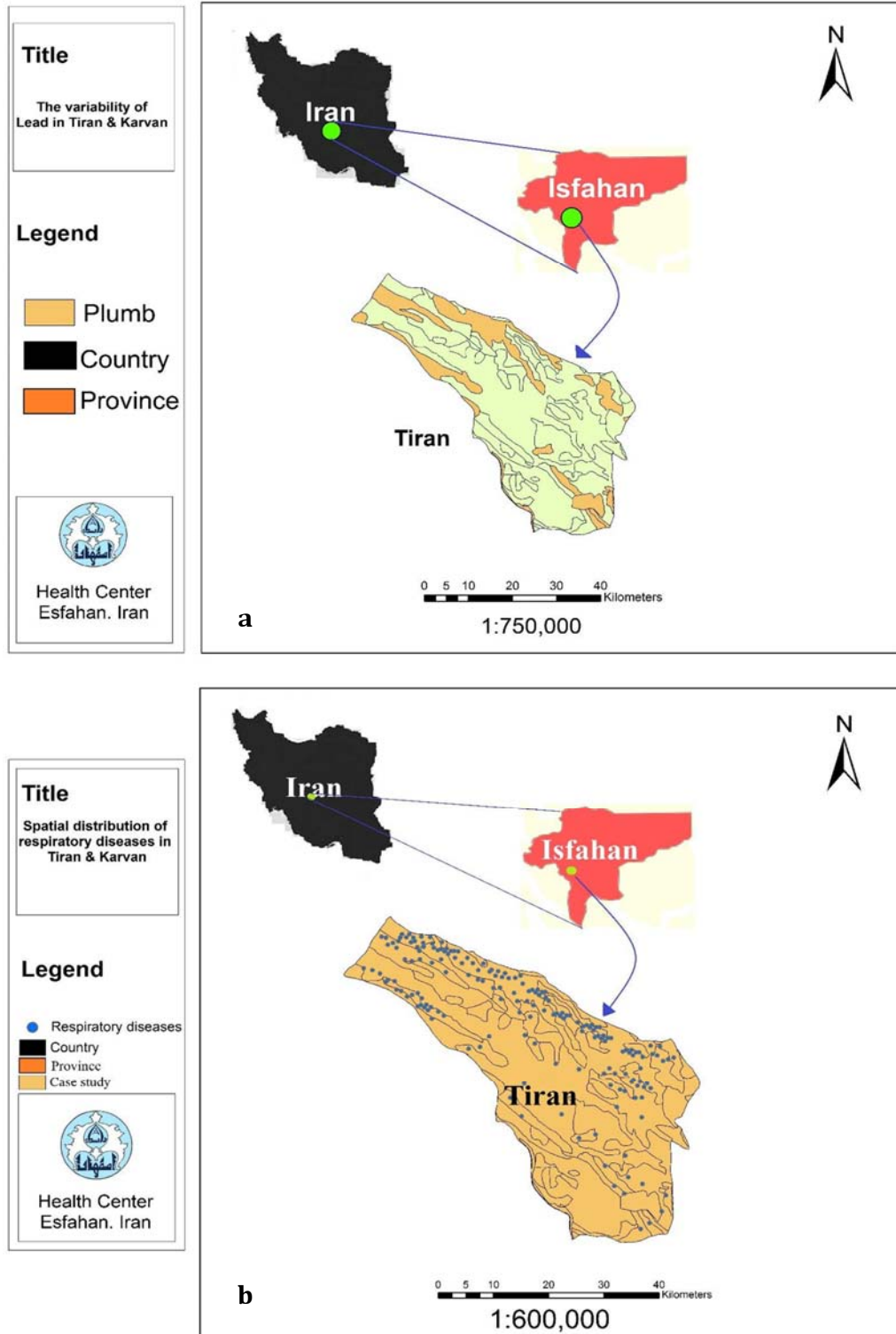
The variation map of the respiratory diseases and lead spatial distribution for research area were drawn by Arc GIS 10.2 software.

## Findings

The concentration of lead was 59.4±7.9ppm in soil and 48.2±4.1ppm in water of the region. The lead variation map (Figure 1a) showed that the soil in the eastern, northern and western areas consists of a relatively high portion of lead. Also special distribution of the

respiratory diseases in Tiran & Karvan (Figure 1b) showed that the disease variation is in a

cluster manner and that the disease follows a special centralization.



**Figure 1)** The variability map of lead concentration (a) and spatial distribution of respiratory diseases (b) in Tiran & Karvan Region, Iran

## Discussion

This study investigated that respiratory diseases in the areas with lead possess high statistics. Therefore, the geographical factors and conditions, common in the centers of these diseases (affecting the people's lives) must be examined. The extent of infection with respiratory diseases in northern, western and eastern areas under study was high and the most variation of lead belonged to these areas.

Lead (Pb) is a grey-blue colored metal that can destroy red blood cell as fast as anemia. Metabolism of Pb is similar to Calcium especially about saving and moving among bones. For instance increasing amount of calcium and Lead in blood leads to bone cancer. Pb can play an important role in cell growing and exact response to environmental factors (genotoxic) [14] and it may causes interference in self-repairing of DNA in response to motivating of genotoxic. Pb and histones connection has shown that decreasing of DNA support in people who have large amount of Pb in their blood, may cause enhancing the number of death by lung cancer or other cancers. According to epidemiologic studies done among exposing people to inorganic Pb, number of esophageal cancer is 7 times more than people who have 30mg/db Pb in their blood [15]. There are wide spread of sources for Pb entrance to the environment. Thus, it is essential to prevent its irregular entrance into the environment [16].

3 million people in the world pass away because of the effects of the contaminated environment annually, among whom, 90% people live in the developed countries. This death rate is specifically related to diseases such as Asthma, Bronchitis, Dyspnea, heart attacks and the different breath allergies. Lead causes the neurobehavioral disorders in children [17] and hypertension in adults [18]. Moreover, it influences the cardiovascular system and causes more deaths among the cardiovascular patients [19].

Lack of cooperation in governmental sections in the case of declaration of disease and statistics, lack of history in analyzing heavy metals in the area, and lack of referenced professional laboratory were the limitations of the study. Regarding the above-mentioned dangers of the existence of lead, security

policies must be adopted in order to reduce the effects of this contaminating element in the areas with it.

## Conclusion

There is a direct relation between respiratory diseases distribution and the existence of lead in Tiran & Karvan Region, Isfahan Province, Iran. The northern, western and eastern parts of the studied region have high statistics of respiratory diseases.

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