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Medical Geology as a New Field of Study in Medical Sociology

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Abstract: Geography and the geological structure of a region are among the most important factors that determine inhabitants' health and disease. From this aspect, geological structure of a country also shapes the basic needs of people such as water, food, respiration, and shelter. Geological factors like rocks, elements, mines, minerals contact people directly or indirectly, so health and disease conditions may vary according to different geographical regions. Medical geology, as a branch of science, examines positive or negative effects of the geological environment on the health of people, animals, and plants. It tries to determine the interaction between the geographical factors on health and disease. Moreover, the air surrounding us, the water we drink, the soil we step on, the food we eat, and even the wood, brick, and metal-like things around us greatly affect our health. Medical geology provides "vital" knowledge about the etiology of diseases by examining the factors in the living area. Therefore, interdisciplinary studies should be carried out between medical geology and other related disciplines to solve the problems associated with geology that negatively affect human health. The limited number of research, which have been started to be carried out on the axis of geology in Turkey for about fifteen years and dealing with the relationship between geological structure and health and disease, are not sufficient in terms of the accumulation of medical geology literature. In this study, the subject of medical geology, which has not been studied sufficiently in the field of medical sociology in Turkey, will be discussed and it will be tried to contribute to the literature by drawing attention to the subject of medical geology.

Keywords: Medical geology, Public health, Preventive medicine, Medical sociology

Introduction

Health: It is a concept that meets the basic social needs of people from the past to the present, such as family, education, economy, politics and religion, and is also closely related to these social institutions. The World Health Organization (WHO) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (Piyal, 2011). This definition emphasizes that physical, mental, and social factors are important in determining health, and that these three factors complement each other. On the other hand, when looking at health epistemology, it is seen that "social factors", which are accepted as one of the basic parameters, are mostly ignored.

Modern medicine has both changed the meaning attributed to the concepts of health and disease and provided the rapid transformation of health systems. These transformations have also changed the way societies view health institutions. Until recently, health and disease topics were generally associated with key concepts such as hospital, doctor, nurse, medicine and first aid cabinet. However, today, health and disease has transformed into a health system shaped around new concepts such as healthy foods, organic foods, vitamin drugs, alternative medicine, health clubs, sports, aerobics, walking, diet, weight loss, aesthetics, therapy, psychological counseling, and health checks (Kasapoğlu, 1999). In addition, studies dealing with many macro and micro issues in the field of medicine and sociology of health have revealed that social factors are very important in the construction of health and disease. Among these studies, the following issues can be counted: Urbanization, malnutrition, stress, water and air pollution, insufficient infrastructure, access to health services, low number of

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health workers, changes in social institutions such as family, religion, economy, unhealthy working conditions, and habits of leisure times, sleep times, social policy inadequacies of governments.

In this study, the subject of medical geology, which is a fairly new subject for the fields of health sciences and health sociology, will be discussed in the theoretical framework. It is because medical geology has become an important social determinant of health and disease in today's societies. In other words, the geological structure has a direct or indirect effect on many of our needs, from our nutrition to the water we drink, from our clothes to the materials we use (Can, 2019). Medical geology aims to examine the extent to which these materials affect human and animal health. In this context, in this study, it will be tried to draw attention to the conceptual discussions on this field by including some medical geology research made in Turkey. In addition, through some examples, it will be emphasized how the geological structures and the materials obtained from these structures negatively affect the health and disease of the society. In fact, this study aims to bring the subject of medical geology, as an important social factor determining health and disease, to the attention of both health and social sciences and policy-making relevant government institutions.

An Important Factor Determining Health: Medical Geology

One of the most important factors determining health and disease is the geological structure of the geography where societies live on. Thus, the geological structure of the region also shapes the basic needs of people such as water, food, respiration, and shelter. Geological factors such as rocks, elements, mines, minerals directly or indirectly come into contact with people, so health and disease conditions may vary according to different geographical regions. Medical geology is a branch of science that examines the positive or negative effects of the geological environment on the health of human, animals, and plants in a territory. At the same time, medical geology tries to determine the interaction between geographical factors, health, and disease. It is a great shortcoming that studies dealing with this interaction, both in the field of medicine and in the field of sociology of health, have not been conducted in a significant way. The limited number of studies, which have been started to be conducted on the axis of geology in Turkey for about fifteen years, dealing with the geological structure and health/disease relationship, are not sufficient in terms of the accumulation of medical geology literature. It is because these studies are carried out by a limited number of scientists in Turkey. Scientists who have research in this field are names such as Eşref Atabey, Simge Varol, Orhan Kavak. However, geological examination of the geographies or places where societies live on will enable the detection of many diseases and also the prevention of these diseases (Can, 2019). On the other hand, the positive contributions of medical geology research to public health will greatly support the public health policies of governments.

The science of geology, which tried to explain the formation stages of the earth until the 20th century, continued its existence as a science that sought and searched mines in the following periods. However, since the recent period, the study areas of geology have also changed. Today, the science of geology has begun to deal not only with the structure of the lands, but also with the problems of the environment in which people live. One of these problems is the field of "health" (Kavak et al., 2003) because the air surrounding people, the water they drink, the soil they step on, the food they consume, and even the materials such as wood, brick, and metal around them, directly or indirectly affect people's health positively or negatively (Nasr, 2006). Therefore, medical geology provides "vital" knowledge about the etiology of diseases by examining these factors in the living spaces of societies. Interdisciplinary studies between health and geology sciences have created a new field of study called "medical geology" (Kavak et al., 2003). Medical geology is a science that examines the deficiency or excess of various minerals and elements on the earth, the transport, deformation and amount of organic components, and their good or bad effects on human, animal, and plant health. In addition, medical geology is a new science that deals with the problems between natural geological factors and human and animal health, and the effects of ordinary environmental factors in the geographical distribution of these problems (cited in Varol et al., 2009, p. 45). In other words, medical geology examines the effects of geological factors on people's health and diseases and the distribution of these effects according to geographical areas and helps in the differential diagnosis of various diseases (Kavak et al., 2003).

In recent years, medical geology units that serve health scientists under the coordination of geological engineers have begun to be established within some research hospitals in Turkey (Kavak et al., 2003). With the help of these units, Turkey's medical geology was mapped, and it was determined in which regions and cities various minerals and elements that threaten human health are located. In addition, research was carried out on diseases caused by some elements and a risk analysis report was prepared. If needed, some settlements were evacuated, and the local people were informed about the diseases caused by the mentioned minerals or elements.

Medical Geology as a Subject of Medical Sociology

Interdisciplinary studies should be carried out between medical geology and other related disciplines to solve the problems that adversely affect human health and are associated with geology. These studies should include topics such as the geological structure of the regions, drinking water quality, soil quality, water pollution, soil pollution and worker health (Kavak et al., 2003). For example, groundwater, which is one of the study subjects of medical geology, has a great importance in terms of health and disease. It is because water contains important ions that can be transferred to the human body. These ions are calcium, magnesium, sodium, potassium, chlorine, sulfate, carbonate, bicarbonate. The mixing of these ions with the groundwater at different levels by interacting with the geological elements can cause some diseases. Calcium ion can be given as an example for this situation. When the calcium rate exceeds 1000 mg/l in water, it causes atherosclerosis and kidney stones (Varol et al., 2008). In addition, depending on the amount and interaction process of some elements in water, if the limit values are exceeded, it can have a toxic effect. This is also true for elements such as arsenic, cadmium, chromium, lead, mercury, barium, nitrate, fluoride, radioactive materials, ammonium, and chloride (Varol et al., 2008). The following findings have been reached regarding the rate of presence of some elements in water: endemic goiter or hypothyroidism in regions with low iodine content, dental and skeletal diseases in regions with high fluoride content, and Alzheimer's disease in regions with high manganese content. In addition, if the other elements in the water are lower or higher than the values that should be found, the following diseases are seen: Cadmium element causes deterioration in kidney functions, lung and prostate cancer, mercury causes severe damage to nervous system, kidney and brain, nickel causes asthma, nose and throat cancer and allergic skin reactions (Varol et al., 2008).

When the human body is examined, it has been stated that it contains more than forty trace elements and nine of them (iron, zinc, copper, manganese, cobalt, chromium, selenium, molybdenum, iodine) are necessary for human health to be maximum (Kavak et al., 2003). It is because the waters at different depths of the underground are in constant contact with the rocks of different composition in their location. Depending on the degree of solubility of these rocks in water, more or less dissolved matter mixes with groundwater. It is necessary to know the physical, chemical, and bacteriological properties of water, which is of vital importance for people to live healthy and maintain their lives, the standard properties of water should not exceed certain limits in accordance with the purposes of use, and especially drinking water should be free from microorganisms that can cause disease and harmful effects (Varol et al., 2008).

Excessive or low intake of these elements together with drinking water may cause the formation of several diseases. As a result of research, various health problems occur due to deficiencies of various elements in the human body. Due to copper deficiency, defective melanin production (the pigment that gives the skin its color), defective keratinization (skin hardening), cardiac hypertrophy (heart enlargement), demyelination (lack of nerve sheath) and anemia can be seen. Due to zinc deficiency, anorexia (a special type of loss of appetite), parakeratosis/hyperkeratosis (excessive thickening of the skin) may occur. It has been found that tooth decay is increased in children younger than 12 years old due to the lack of fluoride in water. In fact, fluoride, which is found in drinking water at a rate of 1 mg/l, protects the teeth from decay. If the fluoride ratio is higher, it can be harmful to the teeth. Iodine deficiency in soil and drinking water causes endemic goiter as the primary factor. The prevalence of cardiovascular diseases, on the other hand, is in a negative correlation with drinking water hardness (Kavak et al., 2003).

Medical Geology and Health-Disease Relationship

One of the basic study subjects of medical geology is the elements. When the elements are used disproportionately, they can cause significant harm to human health. Mineral and mineral powders that such as asbestos, erionite, crystal quartz, silicosis, pumice, perlite, diatomite, volcanic ash, siderosis, talc dust and talcosis, beryl and berylliosis, manganous, aluminosis, baritosis, anthracosis, mica, chromite, olivine, corundum, vermiculite, and kaolin cause many diseases, especially cancer (Atabey, 2016). These minerals, which are used in all areas of life, are substances that are inhaled, touched, and then cause diseases without being aware of it.

Asbestos, which is one of the minerals that medical geology works on, and that people use in many areas in daily life, affects human health negatively. Asbestos is a natural mineral that affects human health in various ways. There is a close relationship between exposure to asbestos and some types of cancer, especially mesothelioma (lung membrane cancer) because asbestos is used extensively in many areas of life, especially in the paper and textile industry (Kavak et al., 2003). In addition, asbestos has been frequently used as a waterproof material on the roofs of houses in rural areas, as a filling material used in road construction, and as a

substance used in plastering and whitewashing of houses. In fact, asbestos is used extensively in industry. The reason why asbestos is widely used in industry is that it is resistant to pressure, heat, acids and has a high strength. Asbestos is widely used in roofing, cement products, cement pressure pipes, sewer pipes, flowerpots, insulating and fireproofing sheets, rugs and fabrics, upholstery, tablecloths, hair dryers, washing and toasters, refrigerators and vacuum cleaners, brake pads of automobiles and motorcycles and many other tools and equipment (Atabey, 2016). On the other hand, according to the provision published in the Official Gazette on January 25, 2013, in Turkey, the extraction, processing, sale and import of all types of asbestos, the production and processing of asbestos products or products with added asbestos have become prohibited (Atabey, 2016). This provision is a very important decision taken in the name of public health in terms of medical geology.

In addition to asbestos, erionite minerals also affect health negatively. In regions where erionite minerals are concentrated, especially around Nevşehir, lung cancer cases are more common than in other regions (Atabey, 2007). Undoubtedly, besides asbestos and erionite minerals, many mines and minerals directly affect our health. However, since evaluating the effects of these minerals would exceed the limits of this study, it will be tried to describe the geology-health/disease relationship by giving only a few examples. The effect of erionite minerals can be expressed as follows through the examples of some mines or minerals found in Kütahya, Konya, Eskişehir, Uşak and Isparta.

The most well-known among these examples is the boron reserve in the vicinity of Kütahya Emet and the effect of this boron operation. There are high levels of boron, arsenic, sulfur, and strontium in the tuffs, tuffite, limestones and clays that make up the geology of this region. The waters used were brought to the Emet district center from an arsenic-rich geological unit for years. In another village very close to the boron deposit, drinking water is still obtained from arsenic-rich rocks, and skin disorders (keratosis) on the palms of the hands and soles of the feet have been observed in the villagers. Another example is the water leaking from an abandoned mining operation in Konya Sızma, mixing with the surface and ground waters, causing iron, copper, arsenic, mercury, and sulfate pollution (Varol, 2010). Heavy metal pollution has caused extraordinary animal deaths in the region and problems such as deafness and blindness among the villagers. The most common example in medical geology studies is the effect of fluorine in drinking water. It has been determined that the high level of fluorine in drinking water because of the interaction of volcanic rocks with rock-water has negative effects on human health. Kızılcaören village of Beylikova district of Eskişehir, Güllü village of Eşme district of Uşak, the Center of Isparta and the surrounding of Tendürek volcano are the regions with high fluorine content. For example, the stained structure on the teeth, which is common in Isparta province, is caused by the fluorine in the water. In addition, recent studies on fluoride have proven that apart from stains on teeth, this element also causes cardiovascular and endocrinological diseases (Varol, 2010).

Discussion and Conclusion

It is seen that studies on medical geology have started to be carried out since the early 2000's in Turkey. These studies, in which the effects of rocks, mines and minerals on human health are discussed, also deal with elements such as asbestos, erionite, boron, fluorine, chlorine, iron, zinc, copper, manganese, cobalt, chromium, selenium, molybdenum. However, human life, especially with the development of technology, has caused many mines or minerals used in daily life to enter our lives. In other words, medical geology should also investigate new mines or minerals that have a negative impact on human health, apart from the mines and minerals mentioned above. Moreover, metals and stones such as iron, cement, lime, gypsum, marble, granite, which are used extensively in the construction of the houses we live in, as well as tools and equipment such as pots and pans used in kitchens affect human health negatively. In addition, synthetic and petro-chemical products such as polyester, acrylic, nylon, fiber, caustic, soda, acetic acid, which are used in clothes, carpets, and upholstery, are also objects to be studied. In addition, electronic devices such as refrigerators, washing machines and dishwashers, televisions and hair dryers used in homes and workplaces should be researched in terms of medical geology in terms of their harmful effects such as the radiation they emit to the environment. In particular, petroleum and petroleum products, which are a basic substance used in human life, from clothes to the bottle of water we drink, should be included in these studies because plastic and similar products obtained from petroleum and petroleum products are used as "indispensable" objects in the daily lives of societies.

As a result, it is useful to make the following suggestions that may contribute to the medical geology literature and research in Turkey:

- With the establishment of Medical Geology Research Centers within universities, the number of scientific studies and research in this field can be increased.

- By developing a software for research hospitals, the disease and regional concentration of the patients who applied to the hospital can be recorded.
- Whether there is any correlation between the geographical region and the diseases can be determined by the statistical information obtained by the software.
- When signs of disease originating from rocks, mines and minerals are detected in areas where people live, necessary health interventions can be performed.
- Inspection of vital necessities such as drinking water, food, clothing, petroleum products and electrical equipment in terms of medical geology can be provided.
- Studies can be increased about chemical products such as cement, lime, ceramics, paint, used in the construction of the places we live in, to contain any element harmful to human health.

Scientific Ethics Declaration

The author declares that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the author.

Acknowledgements or Notes

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