National Journal of Multidisciplinary Research and Development
ISSN: 2455-9040
Impact Factor: RJIF 5.22
www.nationaljournals.com
Volume 2; Issue 3; September 2017; Page No. 42-43

Importance of studies on trace element composition in human tissue and organs with special reference to Population of Ajmer Region

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Abstract
In the modern era of urbanization, industrialization and polluted environment in general and also in relation to occupation areas have contributed significantly on human health. The trace elements present in human body plays a vital role in normal functioning, due to external environment, food habits etc. the levels of trace elements are significantly affected, in Ajmer region of Rajasthan past bio-monitoring studies of hairs, nail and scalp have shown significant variation in trace element levels. In correlation with the elemental load on body; correlated studies on blood, urine, serum etc. are also needed, advanced studies taking autopsy samples of major organs can also suggest the level of impact happening on human body.

Keywords: urbanization, industrialization, polluted environment

Introduction
In this modern era of urbanization, the persisting environment with respect to industrialization, changing climate, food habits, life style etc, have strongly affected the human health. The impact of environment in which we live is strongly reflected upon the human body, its physiology and metabolic activity. Trace elements like Fe, Mn, Zn, Co, Cu, Mo, Se, I plays vital role and have been recognized well for their role in growth and development, in the past few decades clinical interest in studying the level of trace elements in human body and their impact on health have sought attention for study. Recently Graves *et al*., (2015) [3] suggested that global differences exist in body composition, ethnicity and age. Variation may be noted for trace elements with respect to age, gender, growth, body composition, genetics, alcohol abuse, infections, diseases, dietary factors. Hence, on a global basis, trace element requirements can vary according to geographical location, food preparation and processing, food accessibility, cultural practices (geophagia) and pollution. So, it becomes imperative to monitor the status of trace elements in the human body with time.

Moreover, local polluted environment enhances the risk of occupational exposure to toxic metals imparting health risks by metal hazard on human body. Ajmer region has been studied in past various researchers Mehra and Juneja (2003) [6], Mehra and Juneja, (2004) [4], Mehra and Juneja (2005) [5], Mehra and Thakur (2010) [7], Sharma *et al*. (2011) [8] for the elemental load on human body parts like hairs, scalp and nails. These studies have shown that in Ajmer region polluted environment contributes to the enhanced level of trace elements in human body surface. The present paper is a brief review on account of the research work carried out in Ajmer region for status of trace elements and its impact and it has also been discussed in line of advance research which is needed to understand the subject in more precise way. Trace elements effect on human body can be studied by observing the elemental status on and in the body. The various approach which can be taken up are mentioned below.

Bio-monitoring
Gil and Hernández (2015) [2] suggested that human bio-monitoring has become an important tool for the assessment of internal doses of metallic and metalloid elements[5]. These elements are of great significance because of their toxic properties and wide distribution in environmental compartments. Although blood and urine are the most used and accepted matrices for human bio-monitoring but other non-conventional samples may have practical advantages and would provide additional information on health risk. Bio-monitoring for elemental load on and in the body can be done by analyzing

- **Hairs or Nails:** The sample studies of hairs and nails can provide the elemental burden on the body affected by the external environment. Mehra and Juneja (2003) [6] studied the hairs Ajmer population exposed to trace/toxic metals at workplace, they found significant correlation between skin diseases, chest pain, hypertension, mental stress, liver problem, indigestion, diabetes, tuberculosis, breathing problem with trace element content. Hairs were used as biomarkers for assessing metal body burden.
- **Blood or Urine:** Sample study of blood and urine can also provide the insight of elemental status in the body at the point of time of assessment. The studies on blood and urine samples on population of Ajmer region is not available.
- **Biopsy samples**: Sample study of human organ can be done, but it's having limitation with respect to sample size and concentration detection.
- **Autopsy samples**: Autopsy sampling of tissue is preferably more accessible for wider range of organs compared to living human subjects. A detailed study of elemental composition in various organs can altogether

lead to detection of status of element in normal humans over a region or location and further association can also be established with certain disease states based on human sample history. In past, Tipton and her associates surveyed extensively population of United States of America and found that chromium depletion is widespread in their country (Tripton *et al*., 1963) [9]. Likewise regional population should be studied from time to time to understand the dynamic changes happening in humans with respect to environment.

Importance of the study

The study of trace elements not only helps to understand the physiological role, but they also provide insight into the dynamism happening within the human body with respect to the environment over location and time. The daily human activity needs air, water and food for survival, but these essential life components are sourced from the existing environment, which might have changed with course of time, and even it may get deteriorated due to pollutions and heavy metals also. A continuous exposure to a polluted environment can alter the human body metabolism and may also affect the elemental concentration at cellular level. These trace elements including heavy metals may cause serious disorders or diseases due to deficiency or toxicity. Study from fluids like blood and urine samples reflects elemental status circulating at the time of sampling, which may sometime be not correlated with degree of exposure. Hair analyses indicate past exposure, but are not strong reflective of body burden but tissue biopsies for elemental analysis can help in the diagnosis of diseases related to contaminated environment exposure (Bush *et. al.*, 1995) [1]. Autopsy sampling of tissue is preferably more accessible for wider range of organs compared to living human subjects. A detailed study of elemental composition in various organs can altogether lead to detection of status of element in normal humans over a region or location and further association can also be established with certain disease states based on human sample history. In past, Tipton and her associates surveyed extensively population of United States of America and found that chromium depletion is widespread in their country (Tripton *et al*., 1963) [9]. Likewise regional population should be studied from time to time to understand the dynamic changes happening in humans with respect to environment.

Regional studies

Special emphasis on Ajmer region of Rajasthan

Ajmer population is exposed to air pollution caused by motor vehicles, industries and other urbanization factors, whereas rural population resides in less air polluted climate. The food habits of rural and urban population also vary. In past, case studies done by Mehra and Juneja (2003) [6], Mehra and Juneja, (2004) [4], Mehra and Juneja (2005) [5], Mehra and Thakur (2010) [7], Sharma *et al*. (2011) [8] and other groups on hair, scalp and nail samples of Ajmer population on trace/toxic metals reports high variation for the trace metals. Hence, it suggests that variation exists in Ajmer population and a detailed study of trace elements at organ level should be done to add more to the understanding with respect to Ajmer population. Further correlation studies with other important factors like age, sex, adaptability conditions of rural or urban area, past disease history etc., can be very much helpful in understanding the present status and importance of trace elements in human health with respect to Ajmer condition in general.

Conclusion

The population residing in and around Ajmer are living in a dynamic environment affected by urbanization day by day, moreover variable life styles also rests due to urban and rural culture of living. Altogether these factors strongly influence the human body, clinical studies on hairs in past on Ajmer population have reported variation of trace elements and their effect on human health. Henceforth these past studies suggest that variation may exist in Ajmer population with respect to trace element in organs. Therefore, advanced studies are required on organ level to know the status of trace element content in major human organs like kidney, liver and lungs which can help us to understand the human health status of the region. These estimates can be correlated with various parameters which are part of human activity to assess the role of environment on human health.

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