

Para Seguir Adelante

Investigating the Link Between Chronic Kidney Disease and Drinking Water in Jalisco, Mexico

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Mexico is currently facing a public health crisis in chronic diseases. The Institute for Health Metrics and Evaluation (IHME) most recent data for Mexico (2017) shows that chronic kidney disease (CKD), is the second largest in Disability Adjusted Life Years DALYs (a metric that combines deaths and disability). This trend has held constant since 2007.¹ In 2016, non-communicable diseases (NCDs) were responsible for 80% of the countrywide deaths in Mexico, with diabetes and heart disease accounting for 40% of all NCD related deaths. Chronic Kidney Disease in Mexico causes 25% of deaths related to diabetes and 28% related to heart disease.² Hospital admissions for patients under the age of 25 suffering from CKD have skyrocketed, and in some areas of Mexico, tripled, in the last five years.³

Over-exploitation of Lake Chapala, Mexico's largest freshwater reservoir, has resulted in a serious water crisis. The state and federal water authorities continue to utilize this precious resource for drinking water, agriculture and industry and continue to develop infrastructure in response to increasing urban and agricultural demands.⁹ Lake Chapala provides sixty percent of the drinking water to Guadalajara, a city with a population of over four million.¹⁰ Not only have population growth and agricultural demands depleted Lake Chapala's water levels, in turn lowering water quality, but in addition, the Santiago River, which is fed by Lake Chapala, contains an estimated 1,090 toxic pollutants.⁹ Inhabitants of rural communities such as Mezcala and San Pedro Itzicán, and the small city of Chapala are suffering from epidemic rates of CKD, especially in young adults and adolescent populations. This is highly unusual as CKD typically affects older adults or those with diabetes.

Chronic diseases place a burden on both individuals and healthcare systems and hinder economic growth, highlighting our purpose in investigating all risk factors of CKD including drinking water quality, access, and consumption behavior.¹¹ Under the guidance of Professor Charlotte Smith, we set out to unravel the mystery behind this drastic rise in CKD within the rural and primarily indigenous communities Mezcala and San Pedro Itzicán, as well as Chapala, one of the more prominent cities within the region of the Chapala Lake basin.

Beginning in January 2019, our research team formed a collaborative partnership with the Instituto Tecnológico y de Estudios Superiores de Occidente (ITESO) to develop a mixed methods study to collect preliminary data in Mezcala, San Pedro Itzicán, and Chapala, under the framework of the 6th Sustainable Development Goal, access to safe water as a human right. Over the last five years, ITESO has built extensive and trusted relationships in these three communities mentioned above. With ITESO's expertise in hydrology and engineering, and UC Berkeley's perspective in drinking water exposures and public health, a strong alliance was formed.

Between May and August 2019, we conducted 99 household surveys, 12 key informant interviews, and 6 focus groups regarding perceptions of drinking water, health behaviors, exposure to environmental and occupational contaminants, and relevant disease history. Through 15 key informant interviews with religious leaders, local non-profits, municipal government employees, indigenous leaders, and distinguished academics with knowledge and experience working in this region of Jalisco, Mexico, we gained insight and built the trust which allowed us to return each and every week.

Because chronic disease exposures are more complex than acute diseases like diarrhea, often involving multiple exposures as well as genetic predispositions, we conducted a project to both amplify the local voices who had previously been silenced and ignored, and additionally share collected information to give these vulnerable populations the tools to call for action. Organizing focus groups with volunteer brigade members, youth leadership organizations, fisherman unions, family's suffering the severity of a CKD diagnosis, and the board members of the indigenous community group allowed for us to have extended conversations with diverse groups of people, to hear first-hand of their lived experiences. Elderly participants gazed into the distance with a forlorn look in their eyes, describing a time when as children they swam, drank, bathed, and played in Lake Chapala. When we gazed out into the vast hazy green lake, our research team listened as these same participants described with disgust the decline of the Lake's health over the last 20 years. No one dares to take a swim these days.

Simultaneously, our team collected data on drinking water quality, food consumption, and occupational and lifestyle behaviors. We tested water quality in participating households, measuring levels of arsenic, copper, nitrate, nitrite, total chlorine, free chlorine, and presence-absence of total coliforms and E. coli. Primary drinking water sources included purchased 20-liter garrafones from local manufacturers, tap water, and rooftop water tanks. Water quality testing for environmental and microbial contaminants allowed for comparisons between water quality perceptions and reality. After analysis, members of our research team will return to Mezcala, Chapala, and San Pedro Itzicán to deliver individual participant results, as well as workshops to discuss and interpret the importance and meaning of each and every result.

It was tragic to meet mothers, brothers, sisters, daughters, all who either had, or knew, someone dying of kidney failure. Seeing this first-hand has motivated our research team to continue forward with our project in a way that directly benefits the involved communities. Following the lead of our collaborators at ITESO, we have agreed to assist in the production and content of a documentary to spread awareness through Jalisco, and Mexico, about this public health crisis. We have begun to analyze our dataset using geospatial statistical methods. Preliminary results suggest that inhabitants of the Lake Chapala basin face significant structural barriers to access safe drinking water. We hope that our results from this study will support call for action by local communities during this water crisis. The knowledge gaps surrounding the true CKD burden in tandem with a growing local water crisis and decreasing water quality highlights the need for increased attention in Lake Chapala on the need for access to clean drinking water. The hope is that by synthesizing public health research with community participation, we can provide these vulnerable populations with the strength and confidence to *seguir adelante*.

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