Lake Urmia Drying and People’s Health: Attitudes of Locals and Health Service Providers around the Lake

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Introduction
Lake Urmia is the name of a lake located in north-west Iran. Based on country provincial divisions the Lake has been located between East and West Azerbaijan provinces. In summer; 2015 the Lake covered 6000 square meters and was ranked as 25th biggest lakes in the world. It is the biggest lake in Iran and the second Salt Lake in the world. The Lake is the cradle of natural wildlife for about 212 bird species, 41 reptile species, 7 amphibious species, and 27 mammals spesious including Iranian yellow deer. This wildlife has been internationally recorded as a protected area by the UN, UNESCO. Iranian Department of Environment has recognized most parts of the Lake as national parks [1, 2].

By the middle of the 2000s, the Lake started to dry up and now it is in danger of complete drying and vanishing. The study of satellite images revealed that in 2015, about 88% of the Lake has lost its coverage [3]. Several reasons are proposed for its drying including draught, building a highway on the Lake and overuse of water sources. A more recent study by several scholars in North America suggested that draught is responsible for only 5% of the decrease in rainfalls around the Lake while...
other ambitious human-made projects along with 15 km highway across the Lake with only 1.2 km bridge on it has led the Lake into a critical situation. Up to the year 2012, more than 2000 dams were built, completed, and utilized on the rivers that nourished the Lake [4].

Most environmental experts and authorities believe that Lake Urmia Drying (LUD) has irreparable effects not only on neighboring provinces but also on neighboring other countries [5]. An increase in the amount of salt and chemical particles, changed seasonal timings, shortened farming seasons and irreparable financial losses are among the possible consequences of LUD [6]. Water shortage inside the Lake decreased the number of visiting tourists and reduced the financial revenue of the locals around the Lake that finally led to the migration [7]. Emergence and prevalence of diseases in humans, animals, and plants, infertile farms, imbalance in quality and quantity of underground water resources, and irreparable financial losses are other consequences [8]. The blowing particles toward cities and villages, rapid decrease in the level of underground water sources, peoples’ migration from villages and cities around the lake to other parts of the country are among emerging challenges from the present condition of the Lake. On the other hand, Lake drying brings salt particles to neighboring provinces and countries exactly similar to drying lakes and wetland that caused dust phenomenon in Iran and neighboring countries [9].

Prevalence of respiratory diseases, cancers, hypertension, eye and skin diseases, psychological disorders and abortion is only a small number of consequences of lakes drying on people’s health living around the lakes or even further [10-14].

In recent years, despite different studies on environmental matters, credible investigations with a high level of evidence about LUD and its effect on people’s health have not been carried out that left adequate data in this regard to be at rare. To conduct comprehensive and credible studies it is helpful to know about the attitudes of residents and health service providers about the linkage between LUD and outbreak of different diseases. Therefore, the present study was conducted to qualitatively study the attitudes of locals and health service providers around Lake Urmia about the relationship between its LUD and health problems.

Methods

The investigation was in a type of a qualitative study with the grounded theory approach. It was aimed to scrutinize locals and health service providers’ attitudes living in the region about the linkage between LUD and people’s health. The reason behind choosing qualitative methodology was its potentials to go inside participants’ thoughts and bring to the surface their experiences, and silent knowledge[15, 16].The total participants were 70 people including 30 local residents (18 women and 12 men), 30 social workers (18 women and 12 men) and 10 family doctors (8 women and 2 men). Within Iranian primary health care system, health house is the most natural and to-the-point sites to present health services to villagers (1500 people from each health home) that cover one or more villages (orbiting villages) based on geographical situations. A person who works in health home is called social worker who is trained in social workers training centers. Medical training centers of villages are the only kind of state-running medical centers that exist in villages and are managed by general doctors and cover population range of 6000 to 9000. This unit watches over the activities of health homes and their staff and sends its covered population to other specialty centers in cities if needed (Figure 1) [17].

Researchers selected villages from 3 cities of Azarshahr, Shabestar, and Oskou in East Azerbaijan province on the east side of the Lake. The reason behind the selection was their highest exposure to the dangers of LUD (Figure 2). In the selection, it was tried to choose those located in the lake coasts and were exposed to the Lake winds.
facilitator individual. Texts of group discussion were listened several times by researchers after the end of each session and they were recorded in Microsoft Office Word.

Content analysis was used to analyze data. By nature; it is a way to identify, analyze, and report existing themes inside the text and has many applications in qualitative studies [19]. Data coding was done by two researchers. The steps taken for data coding and data analysis were: getting familiar with data (several times reading jotted down texts, data immersion) identification and extraction of primary data (identifying and extracting more relevant data with primary codes) theme identification (placing primary extracted data in related theme) revising and completing identified themes, naming and defining and getting insured of codes and themes reliability (agreement between the two encoding researchers and filling the gaps through discussion).

For data rigor, we used peer checks and data immersion. To follow ethical issues, we obtained informed consent from participants. They were also allowed to give up and leave the study at will. Moreover, we initially explained to the participants about the aims of the study.

Results

Analyzing the contents of focused group discussions, we finally extracted 4 main themes and 15 sub-themes (Figure 3).

Indirect affecting factors on health

Very natural phenomenon, besides its possible direct effects on health, has indirect and silent effects on people’s health. the in the revenues of locals. The agricultural collapse was an important issue pointed out by all participants when talking about the decline in revenues. One social worker said: “well, most of the people here and in all provinces are farmers and their main source of income has been annihilated’. Reduced level of tourism was another focal point to which most of the participants pointed. “Long before when tourists where visiting here from other cities, our husband with our children were selling our farm products, milk, butter and others”, one resident said. Reduce indirect revenues from the Lake is another important issue in terms of reduced revenues. Of important issue in this regard was hunting. A resident said: “there were plenty of animals when the Lake was loaded with water and we could earn money by hunting”.

Changed agricultural patterns are also another highlighted indirect issues affecting health according to participants. The symbol for these changes can be the use of more pesticides due to water shortage and dust caused by LUD. One resident mentions: “I am a farmer and now and since the Lake has been dried I have to use more pesticides though I know harmful but I have to”. Migration was another highlighted issue mentioned by social workers and doctors. They believed that the main reason behind rural young people’s migration to large cities was mostly due to the present situations. It made the elderly remain alone and so the population and especially elderly people are indirectly affected by the issue. A participating doctor would say:’’ most young people are migrated to larger cities and left elderly people alone. Nobody is there to protect and care them’’. Unemployment was another subject matter. It has been increased since the lake started to be dried up. It has affected people primarily on psychological grounds and secondly in physical health. A resident explained that:’’ formerly, there was farming and most people were busy at working. They were healthier physically and psychologically. But now, most of them are unemployed and psychologically disturbed and due to their inactivity I think they are physically patient’. Or another social worker said:’’ people previously had more physical activities. But now most of them are inactive and diseases are prevalent’’.

Diseases prevalence

Participants mentioned that some diseases got more prevalent due to LUD. Locals, doctors, and social workers all supported the idea that the prevalence of some diseases increased as the Lake started to dry ( indeed there was a controversy between doctors and social workers in one hand and local on the other hand over the confusing factors of the subject that will be
explained later on).

Respiratory problems were the most prevalent disease according to locals, doctors, and social workers. Almost all participants referred to the problem and mentioned coming dust from the dried basin as the reason. A resident said: “when the winds get stronger we can easily sense the taste of saltiness on our lips…., this goes into our lungs and cause asthma or respiratory issues”. A social worker explained that: well, we expect increase in respiratory problems when salty dusts rise from lake bed".

Another mentioned disease was cancers. Yet, not to be concerned about the linkage, doctors and social workers confirmed that most types of cancers are increased after the Lake started to dry, however, they suggested further studies. Of the most seemingly increased types of cancers are gastrointestinal, lung, and breast cancers. One local man said: “we had previously one or two cases but now they are many like gastric and breast cancers”. “Recorded numbers of cancers are frequent now, but it does not seem to be Lake’s fault. As friends said we had great number of gastrointestinal, lung, and breast cancers and also many of others” a social worker noted.

Believed by the participants, another prevalent disease was anemia. Mostly doctors and social workers referred to the issue. The reason could be people’s unawareness and disease intangibility. A social worker mentioned: “anemia is prevalent as I think and also reports show. It can be due to iron deficiency caused by Lake drying”. Or another doctor thought: I think nutritional problems caused by Lake drying is the reason for anemia, as statistics reflect”.

Other notified issue figured out by both social workers and doctors to be indirectly related to the LUD was mental disorders. It has been indirectly made people mentally upset by degrading sources of revenue and has brought economic pressure on families. A resident said: “my husband formerly had good earnings. He had a job. But now he is busy on 2 or 3 jobs and earns less money. Well… this is caused mental upsets” or another resident said:” oh… in past years the Lake was a pretty natural scene, with pretty waves, you know!! . Green farms or things like that. We were glad you know!! But now it is only salt and dust, a great desert that makes us depressed”. A social worker in this regard explained:” due to economic hampers coming from Lake drying, people are depressed and stressed. Of course they are disappointed about the future”.

Confusing factors
As formerly mentioned, there is an agreement between the effects of LUD on people’s health among social workers, doctors, and residents. But both doctors and social workers were not completely certain to link disease prevalence in the region and LUD and they declared that further studies should be taken and more time is needed. Most doctors and social workers and also a small part of residents believed that issues other than LUD have affected people’s health and increased disease prevalence. They are presented under the umbrella term of “confusing factor” in this study.

An important confusing factor mentioned by social workers was an active recording of diseases and patients screening. Substantial changes in the management of the primary care system have occurred in recent years and there is a growing focus on active patient screening and disease reporting by primary care services providers. This fact has made the diagnosed and recorded cases to be severely increased. In this regard, one doctor noted that:” I think such increase in the prevalence of diseases can go back to patient screening and active recording of diseases in recent years. These diseases may exist before but not recorded and screened”. Another social worker believed that:”the sudden increase in the prevalence of diseases is due to identification, recording and reporting of diseases in recent years” (at this moment she hands over reporting sheet and explained that by changes in managing and initiation of active patient screening program, the prevalence of diseases has substantially increased. Even those diseases that remained unrecorded before are recorded at the present moment).

Another confusing factor mentioned by almost locals and care providers was the active industries and powerhouses. In recent years, factories, powerhouses, and telecommunication racks and industrial centers are increased in the region. A doctor said in this regard: “in a region that I have been since years ago, there is a powerhouse and I guess it has the role”. Or another resident believed that most pregnancy complications became more prevalent in recent years and they come from telecommunication racks:” beside the Lake, I think this rack in our village has brought difficulties for our pregnant women, these problems did not exist before”.

A highlighted confusing factor that referred to, by social workers and doctors, was people’s oversensitivity and anxieties. They believed that due to lack of notification and informing, rumors, and inefficiency of the national broadcasting system in showing the reality about diseases and health problems, away from their approval, has made people attribute diseases to the LUD. A social worker explained in this regard: “well you know, people are highly concerned they think the Lake is responsible for everything. Our TV officials should explain about the facts. Nothing has been confirmed yet, but they believe the Lake is responsible”. Another local with angry and sarcastic tone indirectly point out the subject matter: “thanks God our reports are top secret!!!! They don’t tell the truth, and now, I don’t know whether the Lake is responsible or not?!”

Need for more evidence
As social workers and doctors pointed out, it cannot be certainly said that LUD is responsible for disease prevalence and it needs more evidence.

One important issue frequently mentioned by social workers and doctors was the need for comprehensive and systematic studies. A social worker discussed: “I think it is too soon to make the Lake in charge of diseases prevalence. It needs further systematic and field studies to prove that. Universities have to do a lot”.

Establishing a system of data recording was another to be focused on issue mentioned by social workers and doctors. A participant said “unfortunately, data about pre-drying period are not at hand. So we cannot have a comparative study and declare that the Lake is responsible. We must gather data over the time
and scrutinize the changes. Then we should show the diagrams”. The other controversial issue was providing scientifically credible evidence to be presented to the people. A participant explained accordingly: “I think more scientific content should be produced. People should read about it. They should not learn about it from untrusted sources. TV and radio must help much”!!!

Discussion

By the analysis of focus group discussions, we finally extracted 4 main themes: indirect affecting factors on health, disease prevalence, confusing factors, and need for more evidence. We also extracted 15 sub-themes.

Almost all participants believed that disease prevalence is high in the region. It was a difference between the way residents think in one hand and doctors and social workers on the other hand. Locals thought the reason was LUD but on the contrary, social workers and doctors said they were uncertain about the linkage between Lake present condition and disease prevalence, and more evidence is needed.

Respiratory problems were an important issue referred to by participants frequently. Love et al. (1982) in the United States tried to study emerging respiratory problems caused by Great Salt Lake drying on 250 families who lived in the vicinity. They showed that there was no relationship between air pollution caused by Great Salt Lake drying and respiratory problems [20]. Moreover, the results by Bennion et al [21] in Uzbekistan on respiratory problems among 1499 kids who lived around Aral Lake did not find any strong relation between Lake drying and respiratory problems like asthma [10]. However, the results of Gomez et al. (1992) study in Canada on the linkage between Old Wives Lake drying and prevalence of respiratory problems on 300 participants who lived around the Lake showed that alkaline winds increased respiratory complications [22]. Another study by Kunii et al (2003) in Uzbekistan on 337 with respiratory problems around Aral Lake showed that respiratory complications in children living around Aral lake was reported to be more prevalent when compared to the other parts [23].

The prevalence of many cancers was another issue mentioned by participants. The issue was even more emphasized by locals. Mamyrbayev et al. (2016) in Kazakhstan studied all types of pediatric cancers among children who lived around Lake Aral in 2004-2011. They conducted a retrospective study with a control group and showed that the prevalence of pediatric cancers around the Lake was higher when compared to the other parts; hence it was not significantly different from national rate [24]. In another retrospective study with the control group by the same authors (2016) in Kazakhstan about all types of cancers around Aral Lake they showed that increase in mortalities by cancers in the region went back to frequent inhalation of Ni and Cad [25]. Also, another retrospective investigation with the control group by Bilyalova et al. in Kazakhstan that scrutinized all cases of breast cancers around Aral Lake in 1999- 2009 explained that air pollution by Lake drying can be a probable reason for the increase in the prevalence of breast cancer [26].

Anemia, as most participants believed, was another prevalent disease in the region. Mostly social workers and doctors highlighted the issue. Two studies by Hashizume M et al. in 2003 and 2004 in Kazakhstan about anemia in children around Lake Aral showed that iron deficiency was the main reason [27, 28].

Psychological issues were another problem mostly mentioned by social workers and doctors to be indirectly related to Lake drying. Crighton et al (2003) in Uzbekistan who scrutinized psychological disorders among 1118 participants over 18 years around Aral Lake showed that environmental problems caused by Lake drying brought psychological complications besides physical problems [29]. An important issue to be notified about the effects of LUD on health is that almost all studies in the field were cross-sectional and retrospective [30]. Despite the fact that these type of scientific investigations have their role and position in epidemiological studies but there have not strong level of evidence in determining the cause and effect relationship between risk factor and diseases prevalence. None of the studies used-acceptable statistical indexes such as attributable risk or odds ratio for instance. Of highly efficient epidemiological studies that easily demonstrate cause and effect relationship between risk factors and diseases prevalence are cohort or prospective studies. These longitudinal studies (a type of observational) have many applications in medicine, social sciences, statistics, and ecology. Cohort studies deals with the investigation of risk factors and take a number of healthy people as control group. They use relations along with correlations to demonstrate risk level of risk factors. The merit of obtained results through these types of experiments is that they can be effective in the identification of risk factors in a newly emerged disease [31]. Cohort studies provide researchers with a series of longitudinal observations that are carried out by individual person over a period of time. These, can significantly lessen probability of error in research. Obtained results from long term cohort studies are highly qualitative. Cohort studies are mainly focused in achieving authentic results from comprehensive and broad observations that cover a wide range of exposures and diseases [32-34]. It is, therefore suggested that policymakers and scholars use well-designed and well-structured cohort studies with long term periods.

The main issue regarding indirect effective factors of Lake Urmia drying on the health of locals is a decline in the amount of produced agricultural products, tourism, and more use of pesticides. In fact, the main indirect health problem caused by drying is agriculture. This issue can be solicited by changing the patterns of cultivation and watering. In terms of cultivation there is more need to cultivate species with less sensitivity to salt and use less water like pistachios or rapeseed and etc. Drip irrigation instead of immersing in watering is another solution that lessens water usage and increase efficiency in agriculture. However, and fortunately in recent years people and other related organizations have used above mentioned methods around the Lake. However, it seems not quite enough and more planning and efforts are needed. Pesticides use also can be lessened by changes in cultivation and watering patterns. With necessary counseling and guidance agricultural and health experts can encourage farmers to decrease pesticide use.

Patients’ screening, active recording of data, and industrial and producing complexes are among the most highlighted confusing factors. But the most highlighted confusing factor
from the perspectives of political and economic issues is people’s oversensitivity. This factor was frequently mentioned and pointed out by social workers and doctors. The researchers also understood the issue during the investigation but they did not point out the subject in sessions due to the nature of qualitative researches. One of the main reasons behind oversensitivity was a malfunction of relevant organizations and authorities to inform people on Lake drying. By adequate informing of people, they can prevent intentional and unintentional rumors that widespread in society.

As doctors and social workers also figure out, it cannot be certainly declared that Urmia Lake drying is related to diseases prevalence. They suggested that more evidence is needed in this regard. With the vast global experiences about lakes drying including Lake Urmia in Iran, Lake Aral in central Asia, Salton Lake and Owens Lake in California, and Great Salt Lake in Utah [9, 13, 24, 35-41]. We still do not have any strong, clear cut and enough evidence about the effects of lakes drying on human health and it needs further studies with systematic and strong methodologies. Other reasons for the absence of such studies is the existence of other interfering factors on human health, time-consuming of effecting the process of lakes drying on human health, looseness in controlling environmental confusing factors, existing problems in designing and conducting clinical trials and expensiveness of long-term studies with big sample sizes.

Like other qualitative studies, the results obtained by present studies have lower generalizability to the other geographical parts. However, and by recruiting participants from broader geographical regions, it was tried to collect more credible and efficient findings for policymaking and planning.

Conclusion

As participants believed, Lake Urmia drying can have indirect effects on human health by lowering down the level of locals’ revenue and changing agricultural and farming patterns. Participants also believed that some diseases became more prevalent in the region with the locals strongly declared that the reason is Lake Urmia drying. But other participants including social workers and doctors were less certain about the claim saying that it is too soon to confirm that disease prevalence is due to the Lake drying while so many confusing factors still exist and further future comprehensive and trusted studies are needed.

Conflict of interests

The authors declare that there is no conflict of interest.

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