Applied Journal of Hygiene 9 (2): 45-50, 2020
ISSN 2309-8910

DOI: 10.5829/idosi.ajh.2020.45.50

Assessment of the Farmers Risk Perception Towards the Effects of Industrial Waste Water on Animal Health in and Around Dukem, Central Ethiopia

Dejene Getachew Deme, Bune Tarecha Edae and Martha Ararsa Hora

Wolmera District Livestock and Fishery Resource Development Office, Holeta, Ethiopia

Abstract: A cross sectional study was conducted from mid-October 2017 to mid-March 2018 in and around Dukem. Data from 100 individuals chosen randomly from farmers in the area and residents near the releasing sites were collected using questionnaire. Descriptive statics were employed by SPSS version 20 software for analysing of the farmers risk perception towards the effect of industrial waste water on animal heal. Accordingly all respondents (100%) have perceived that industrial waste has an effect on the health of their animals (via drinking water). About 38% of the respondents (farmers) were observed the effects of waste water on their animal such as death, illness and production loss. Similarly 25%, 18% and 6% of the respondents had lost one, two and three different species of animals respectively. Concerning the number of animals dead, a minimum of four animals (6% respondents) and a maximum of 26 animals (1% respondents) were recorded in the study area. Generally a total of 177 different species of animal were dead due to drinking of the industrial waste water as perceived by the respondents. In this study the farmers that resides surrounding the industry are affected directly or indirectly by discharges released out from the industry. It is recommended that there should be strict legislations and enforcement to implementation of laws, improve and enforce Environmental Impact assessment (EIA) among polluters and decision makers in order to reduce risk from hazardous.

Key words: Dukem · Farmers · Industrial Waste Water · Risk Perception

INTRODUCTION

Ethiopia is one of the countries in Africa with huge livestock potential and heavily depending on agriculture sector which, the back bone of economy by employing about 78% of the work forces in the country. Among the agricultural sectors, livestock is the one which is ranked first in Africa and tenth in the world [1-4]. Ethiopia has 60.39 million of cattle; 30.7 million of sheep, 30.2 million of goat population and this livestock sector has a significant role in socioeconomic activities of the country and contributes to much the national economy [5, 6]. Livestock provides a livelihood for 65% of the total population and 80% of the rural population of the country and contributes 15-17% of Gross Domestic Product (GDP) and 35-49% of agricultural GDP and 37-87% of the household incomes [7]. The Domestication of animals and plants is considered to be one of the most important developments in history and one of the prerequisites for the rise of human civilizations. In this situation, the main driver of animal have been the desire to secure the availability of foods with the potential of some domesticated species to provide support to crop farming, or as pack and riding animals [8].

Climate change influences the emergence and proliferation of disease hosts or vectors and pathogens and their breeding, development and disease transmission. Consequently, it affects distributions and host–parasite relationships and its assemblages to new areas. Higher temperatures resulting from climate change may increase the rate of development of certain pathogens or parasites that have one or more life cycle stages outside their animal host. This may shorten generation times and, possibly, increase the total number of generations per year, leading to higher pathogen/ parasite population sizes [9].

Corresponding Author: Dejene Getachew Deme, Wolmera District Livestock and Fishery Resource Development Office, Holeta, Ethiopia. Tel +251913490974/+251916858009.

The fact that economic development in Africa is not being driven by structural changes and deepening manufacturing means it has been lacking in driving employment growth and overall provident in human and social development. The impressive economic performance on the continent has not resulted in generating the much-needed jobs and income to curb high unemployment levels (including rising youth unemployment) and poverty [2].

The first transformation to an industrial economy from an agricultural one, known as the Industrial Revolution, took place from the mid-18th to early 19th century in certain areas in Europe and North America; starting in Great Britain, followed by Belgium, Germany and France [10].

Industrialisation or industrialization is the period of social and economic change that transforms a human group from an agrarian society into an industrial society, involving the extensive re-organisation of an economy for the purpose of manufacturing [11]. Neo-Marxists believe that the natural industrialization process of Africa (just as the rest of the Third World) was historically destroyed all together through slavery, colonization and neo-colonization [12].

The environmental variable that affect animals heat stress seems to be the intriguing factor making animal production challenging in many geographical locations in the world. All animals have a range of ambient environmental temperature termed as thermo neutral zone and temperature above or below this thermo neutral range of the animal create stress condition in animals [13].

Pollution is release of harmful environmental contaminants resulting from technological development and increase in population density. Pollution is a negative/undesirable change in the environment; usually the addition of something hazardous or detrimental [14].

Waste is an inevitable by-product of most human activities and People have been generating and discarding materials since hunter-gatherers threw bones and vegetable remains outside their caves. This definition provides a real condition of objects and its possibility of discard resulting in pollution and contamination also provides a frame work to minimize or eliminate the waste [15].

General Industrial Waste Classification: Waste is classified into solid, gases and liquid as follows:

Industrial Solid Waste: In some developing country the composition of solid wastes may include: paper, plastic, packaging and bulky wastes with increasing trend toward waste generation [16]. Generally, there are about 43 industrial solid waste divided into 5 major classifications: i. Drugs and food. ii. Apparel includes clothes, leather boundary trade. Iii. Materials as paper, steel, rubber. iv. Chemicals. v. Energy (coal processing, steam power, nuclear). Industrial gas waste: Includes both organic and inorganic compounds in the form of particulate vapour and powder such as carbon, nitrogen, sulphur and lead [12].

Increasing population, urbanization and modernization are posing problems of sewage disposal and contamination of surface waters like lakes. Natural water gets contaminated due to weathering of rocks, leaching of soils and mining processing, etc. Various types of problems in lake which cause nutrient enrichment in lake have been reviewed. Land use change and longer growing seasons could increase the use of fertilizers with subsequent leaching to watercourses, rivers and lakes, increasing the risk of eutrophication and loss of biodiversity. Water quality can be assessed by various parameters such as BOD, temperature, electrical conductivity, nitrate, phosphorus, potassium, dissolved oxygen, etc. Heavy metals Such as Pb, Cr, Fe, Hg, etc. are of special concern because they produce water or chronic poisoning in aquatic animals [17].

Industrial Liquid Waste (Sewage): Sewage may be of domestic, commercial industrial or agricultural origin or a combination of all. The sewage usually contains some of the following: 1. Organic and inorganic compounds. Organic materials need more dissolved oxygen Inorganic materials usually degrade slowly and cause blockage. 2. Toxic compounds, which may accumulate and cause drastic chemical effects. 3. Suspended solids: usually contain a complex range of solids, some in solution and some in suspension and this gives rise to turbidity and indicates the presence of various chemicals and microbiological pollutants. 4. Pathogenic micro-organisms. 5. Oils [18].

The Effect of industrial waste product: Environment pollution is a worldwide problem and it's potential to influence the health of animal and human populations are great [9]. Human and animal exposure to pollution is believed to be more intense now than at any other time in human and animal existence [19]. There is no doubt that

excessive levels of pollution are causing a lot of damage to human & animal health, plants & trees including tropical rainforests, as well as the wider environment [20]. Air Pollution: The air we and animal breathe is an essential ingredient for ours and animal's wellbeing and a healthy life. Unfortunately polluted air is common throughout the world [21].

Even though Industrialisation has advantage for one country but it has also disadvantage for one country especially for the farmer that are dwelling around the industry area. It affects those farmers by waste disposal that released from industry into resident areas and then in to the river which is untreated form. Because of this many farm animal such as cattle, sheep, goat, equine, canine, feline and etc. are subjected to death by drinking of contaminated of water that is released from industry. It also causes damages to the crop that are produced around the industry area by the chemical that are released out by mixing with waste water from an industry.

Therefore, the objective of this study is to assess farmers risk perception towards the effect of industrial waste water on animal health in and around Dukem, central Ethiopia.

MATERIALS AND METHODS

Study Area: The study was conducted from mid-October 2017 to mid-March2018 in and around Dukem town, which is one of the industrial zones in Ethiopia. This town is located in Special zone surrounding Addis Ababa, in Oromia Regional State, in central Ethiopia. It is located at 9°N of latitudes and 40°E of longitude.

Which is found at 34 km in southeast of Addis Ababa. Altitude of 1950 m.a.s.l and mean annual rainfall is 839 mm and the mean annual temperature is 18.1°C. [22].

Study Design and Sampling Method: A cross-sectional study was implemented from mid-October to mid-March to collect data on farmers risk perception towards the effect of industrial waste water on animal health with random sampling technique. The required number of population to be sampled was calculated using the formula given by Ashraf (2010) [23].

$N = 0.25 / SE2,$

where N = sample size, S = standard error, 5%. Accordingly, the required sample size was 100.

Study Methodology and Sample Size: A structured questionnaire was used to collect the data from farmers. Accordingly a sample of 100 respondents representing more than 10% of the total residential population of the study area was selected. These respondents were selected randomly.

Statistical Analysis: The information that was gathered through questionnaire survey was coded and entered in to Microsoft Excel spread sheet. Descriptive statics were employed by SPSS version 20 software for analysing of the farmers risk perception towards the effect of industrial waste water on animal heal

RESULTS

It was observed that the factories released their waste in its way from the production site to the residing site of farmers without any precaution or safety measures. This causes a series of problems on animal health. The ideal management is to have a clean product that goes through many operations before its disposal. For example the soap factories generate chemicals that should be subjected to treatment in many septic tanks before they are discarded as clean harmless water.

Demographic Data of the Respondents: About 13% and 87% of the respondents were females and males respectively. Majority (70%) of the respondents were illiterate and about 2% of them were preparatory and above as depicted in Table (1) below.

Farmer's Perception Towards the Effect of Industrial Waste Water on Animal Health: Frequency of problems observed on their animals (perceived impact).

The results of the perceived impacts of industrial waste water on their animals are described in Table (2) below.

Death of Different Species of Animals Observed: Due to drinking of waste water released from different industries in the study area the farmers had observed different production loss and death of many animals' species as depicted in Table(3) below.

Number of Animals Dead: During the study period a total of 177 animals of different species were dead due to drinking of industrial waste water as perceived by the respondents?.

Table 1: Description of the demography of the respondents

	Educational status				
	Illiterate	Elementary	High school	Preparatory above	Total
Sex:					
Male (n=87)	62	20	3	2	87
Female (n=13)	8	4	1	0	13
Total	70	24	4	2	100
Percentage	70%	24%	4%	2%	100%

Table 2: Perceived impacts of industrial wastewater on animal health by the farmers

Waste water impact	Frequency	Percentage (%)
Death	1	1.00
Illness	1	1.00
Production loss	5	5.00
Death and production loss	38	38.00
Illness and production loss	17	17.00
Death, illness and production loss	38	38.00

Table 3: Death of different species of animals observed in the study area

Number of respondents(n)	Species of animals dead	Proportion (%)
9	Cattle	9
2	Sheep	2
10	Goat	10
8	Equine	8
71	Cattle, Sheep, Goat and Equine	71

Table 4: Summary of number of dead animals observed by respondents

Respondents(n)	Death of animals observed(n)	Proportion (%)
40	0 (No death)	40
25	1	25
18	2	18
6	3	6
6	4	6
1	5	1
1	8	1
1	14	1
1	21	1
1	26	1
Total death	177	

DISCUSSION

The Presence and expansion of industry is good for development of one country especially by processing of raw material that is produced in the country. As it has advantages for one country but it has also disadvantage for farmers which reside around the factory. Because of the factory was releasing unwanted chemical (discharge) by mixing it with water to the society through the valley which were mixed in to the river. Then this was used for drinking purpose of farm animal of the farmers.

During the study period all (100%) the respondents perceived that impacts like death, illness and production loss were due to drinking of industrial waste water. According to Bruijl [24] some point in their life cycle, over 70 % of animal species are dependent upon water. Sewage overflows, legal or not, continue to dump bacteria, parasites and toxic chemicals into waterways. Coastal environments continue to be imperilled by oil spills, killing wildlife and causing millions of dollars in property damage. Unless measures are taken, the very water we and animal drink is in danger. Recently, the risk of water pollution with toxic chemicals not limited to the public health and veterinary public health only but extended and jointed as toxic chemicals causing zoonotic diseases as reported by El-Tras *et al.* [25]. The presence of the metal at a high level in the polluted water have been found to have negative effects on living organisms including the

environment as they can induce cancer, damage the brain, heart, kidney and lung and increase degenerative diseases and ageing [26] According to WHO [27] point out that unmanaged wastewater is a habitat to vector of disease, causing child and calf mortality and reduced labour productivity, but receives a disproportionately low and often poorly targeted share of development aid and investment in developing countries.

The industrial wastes may affect animal and livelihoods such as health through inhalation, ingestion and skin contact with the polluted water or industrial wastes. Health effects as a result of industrial waste discharge include respiratory diseases, skin reactions and allergies, diminution of vision, corneal opacity, abortion and deformity of changes, altered immune response, chromosomal aberrations and cancer [28].

The long term exposure of lower concentration of complex pharmaceutical mixtures on stream living things may result in acute and chronic damages, behavioural changes, accumulation in tissues reproductive damage and inhibition of cell proliferation [17]. The reason for the perceived impacts of waste water on animal health includes freely releasing of the animals (extensive farming system), lack of awareness of the farmers on risk of waste water released from nearby industries, unwillingness of the company to treat the waste, lack of attention or carelessly releasing of the waste to the river.

A total of 177 different species of animals were dead. In the present study about 6(6%) of the people were lost four animals and 1 (1%) of respondents were lost 26 animal species in which farmers lost minimum and maximum number of animals respectively. The reason behind this result is that hazardous waste that may be produced both on a huge scale by major industries and on a relatively small scale by individuals. Many industries create the waste and then released into the society resident areas to store waste and often just discharge waste chemicals into nearby bodies of water such as valley that were connected to the river or in to clean land.

Different chemicals are used in industries. Often, it is difficult and expensive to get rid of these chemicals and to store those in a way that does not endanger animal life Chemicals used for industrial processes often create dangerous forms of waste. The amount of these chemicals has risen heavily in the past, as more areas of the world industrialize and new products are produced. Obviously, not all of these chemicals are dangerous, but many are and they do create serious problems such as death, production loss and illness [12].

CONCLUSIONS AND RECOMMENDATIONS

In this study the farmers that reside in surrounding the industry areas are affected directly or indirectly by discharges released from industries. As the animals are managed under extensive farming system, probably these animals are exposed via drinking of industrial waste water released in to nearby river. As a result about 177 different species of animals were dead.

Based on the above conclusion the following recommendations are forwarded:

- Strict legislations and enforcement to implementation of laws should be done by respective body.
- Improve and enforce Environmental Impact assessment (EIA) among polluters and decision makers in order to reduce hazardous waste effect on the environment in general and on animal health in particular.
- Further studies on the physicochemical analysis of the water released from the industries should be done.

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