# Environmental Impact Assessment & Incidence of Occurrence of Disease among the Public Health in East Kolkata Wetland Area

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**ABSTRACT**

The wetland of the east Kolkata is spread over 12,500 hectares and comprises a large number of water. In Calcutta many poor people depend on the vegetable and fish produced here for their living. The sewage of Kolkata has got a new meaning because of a huge number of farmers and fisherman who used the city waste products as a useful resource for the traditional practice of fisheries and agriculture instead of harming the public. The objective of this study is to conduct a survey and collect databases regarding the lifestyle and disease of local people. It was an observational study done in February 2019, around the slums of East Kolkata Wetland. A schedule was prepared including an observational checklist for assessing different aspects. According to this report there are five major police stations under EKW area and this includes total 264 bheris. Maximum people depend of fish cultivation for their survival having monthly income range from 1000-10000 rupees per month. Maximum number of people are literate up to primary level and the rate is very low when it comes to higher secondary education. According to our survey maximum people said to have fever or cholera or diarrhea or other related issues. And the percentage is very high for fever. The present study found that the slum people around EKW is very much dependent on the wetland for their living and income and they are very prone to wetland related diseases.

**Keywords:** Survey, Literacy, Income, Disease, Bheris, East Kolkata Wetland, Correlation

Kolkata has been known as an ecologically balanced city for its two special geographical features. One is the existence of the River Hoogly on the west and the other one is the vast low lying area on the east known as east Kolkata wetland. Wetlands are basically transitional lands between terrestrial and aquatic systems where the water level is at or near the surface and the land may be covered by shallow water (Dasgupta *et al.* 2014). These wetlands can maintain the food chain, ecological balance and absorbs pollution, treats sewage and also fulfills the requirement of fishes. The wetland of the east Kolkata is situated at 22°27′ N, 88°27′E which is spread over 12,500 hectares and comprises a large number of water bodies distributed throughout the districts of South and North 24 Parganas (Majumder 1965; Mahapatra *et al.* 2014). Previously the area was like an uncultivable ground but as fresh drainage water came out of Calcutta it became suitable for raising fish and other vegetables. Currently, this wetland contains nearly 300 fish farms and ponds which cover a total area of 3,500 hectares and some individual ponds of 70 hectares. 13,000 tons of fish are produced per day annually in this wetland. It also

has 264 sewage-fed fisheries with large biodiversity (Kundu *et al.* 2008; Show *et al.* 2018). The geographical location of Kolkata also provides a hot and humid atmosphere throughout the year. The tropical climate along with average rainfall makes the area a natural incubator for a diverse group of microbes, thus making it a biodiversity rich place. The EKW area is one of a large recycling places and many solid and liquid wastes, industrials wastes gets discharged into it. So, the water quality of jhils and bheris and the soil of agricultural lands may also have some effects of it (Dutta *et al.* 2016;

Nandi *et al.,* 2013; Bhattacharyya *et al.* 2008; Roy *et al.* 2015). The Kolkata Municipal Corporation (KMC) generates around 600 million litres of sewage per day (Ghosh *et al.* 2007; Roy *et al.* 2012). The waste water is led to the pumping stations by underground sewers and pumped into open channels. There are six terminal pumping stations in KMC area which are used for pumping the wastewater into the open channel, which is then fed into the fisheries of EKW, where detention leads to biodegradation of the organic compounds in the sewage and waste water. Organic loading rate in the ponds ranges between 20-70 Kg per hectare per day (in form of BOD). The cumulative effects of all these activities in the present study site have resulted in the gradual lowering of DO and deterioration of water quality with the passage of time (Samal *et al.* 2011; Banerjee *et al.* 2017).

From a very long time there has been an association between wetlands and infectious diseases. Due to the addition of water resource system projects, weather events and agricultural productions there has been a rapid increase in infectious and water-borne diseases This is because of the lack of preventing contamination, providing adequate sanitation etc. According to FAO at present there has been a considerable reference of diseases such as schistosomiasis, lymphatic filariasis, onchocerciasis, and malaria. The main factor causing the disease can be microorganisms and invertebrates found in the wetland. Understanding the complexities of wetland and the relationship between environmental, microbiological and human factors which lead to the

infectious diseases is therefore the main of this work (Dey *et al.* 2013; Horwitz *et al.* 2012).

## MATERIALS AND METHODS

It was an observational study done from November 2018- March 2019. The present study was done in a slum area around East Kolkata Wetland, West Bengal, India. It has thousands of households who depend on this wetland for their living. A schedule was prepared including an observational checklist for assessing different reports. The data was collected by door to door survey and The questionnaire were prepared in a multiplechoice format. The data was collected based on the following criteria - Monthly income on the basis of occupation, Literacy rate of the slum people and Diseases occurring (KEIP, 2013).

**Sample size:** A total no of 589 local people were asked about the information regarding their literacy level, occupation, income and the most common diseases which occurs frequently according to the questionnaire prepared (Satyasai *et al.* 2019).

**Statistical analysis:** All analysis were conducted using IBM SPSS 22 software. Pearson's correlation co-efficient to determine the significance correlation between data collected. In correlation matrix the P value should be ≤ 0.05 for the test to significant and the test is not significant if the P value is ≥0.05. The results were concluded according to this (Sanyal *et al.* 2015; Mould *et al.* 2010).

## RESULTS AND DISCUSSION

### Geographical aspects

According to the survey report EKW area has a huge number of ponds and bheris and sewage fed fisheries. In 1930's farmers used a domestic sewage for large scale fish cultivation to meet the growing demand for fish of this populated city. The technique is considered to be unique system in the world to convert waste to consumable products.

As per the table 1 a total number of 264 bheris expanded through the East Kolkata Wetland area, where the Sonarpur Police Station constituency

consist of the maximum number (104) followed by tiljala (77) shown in Table 1 resulting in higher rate of fish production. In this work all the data were collected from the areas falling under the jurisdiction of the mentioned police station.

**Table 1:** No. of Bheris in East Kolkata Wetland

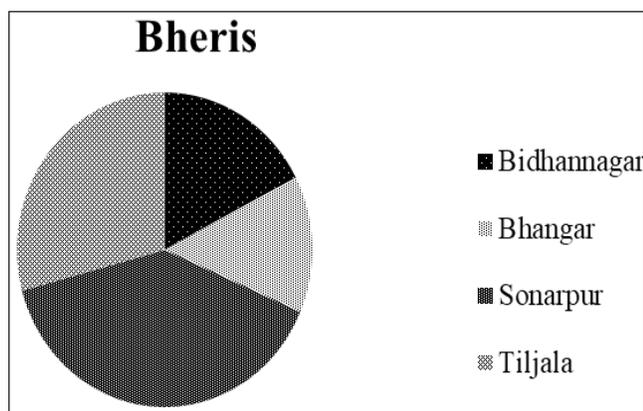| Police Station | Bheris |
|---|---|
| Bidhannagar | 46 |
| Bhangar | 37 |
| Sonarpur | 104 |
| Tiljala | 77 |
| **Total** | **264** |



**Fig. 1:** No. of Bheris of East Calcutta Wetland

### Profile of local people

A huge number of people, majority of them are poor depend on this wetland for their survival. These sewage ponds also provided water for growing vegetables for the large scale expansion of sewage fed fish culture system. But in recent years due to the increasing urbanization there has been a huge decrease in the area. As per the survey area covered 62.14% were male and 37.86% were female. There are hundreds of households surrounding the area of EKW and maximum people depend on fish cultivation (46.01%) for their survival. Also a good number of people are involved in rice (14.43%), vegetable production (10.36%) and no good produced (7.81%) shown in Table 2.

**Table 2:** Distribution by Occupation

| Occupation | No. of people | Percentage |
|---|---|---|
| No good produced | 46 | 7.81 |
| Rice | 85 | 14.43 |
| Vegetables | 61 | 10.36 |
| Fish | 271 | 46.01 |
| Garbage | 44 | 7.47 |
| Car Driver | 13 | 2.21 |
| Kolkata Municipal corporation | 34 | 5.77 |
| Stonemasons | 21 | 3.56 |
| Electricity work | 9 | 1.53 |
| Rickshaw driver | 4 | 0.68 |
| P.W.D staff | 1 | 0.17 |

### Monthly Income Rate

Maximum number of people have their monthly income range from 1000-10000 rupees per month and majority of them comes under the range of 1000-5000 per month as shown in Fig. 2.
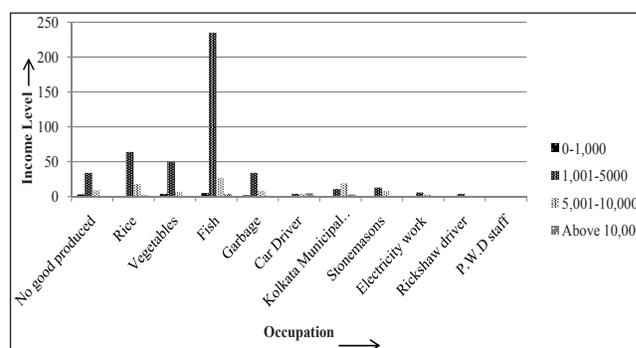


**Fig. 2:** Monthly income rate in respect to occupation

According to the survey report from the sample size used in this work 471 people comes under the income range of 5000 per month and 103 comes under the income range of 5000 to 10000 per month. So, it can be said that their standard of living is very low in respect to population shown in Table 3.

### Literacy Rate of Local Population

The EKW area is not so developed in respect to literacy rate shown in Fig. 3. This area only has some

**Table 3:** Monthly income with religion according to different types of occupation

| Occupation | Religion | | | Monthly Income | | | |
|---|---|---|---|---|---|---|---|
| | Hindu | Muslim | Others | 0-1,000 | 1,001-5000 | 5,001-10,000 | Above 10,000 |
| No good produced | 38 | 8 | 0 | 3 | 34 | 9 | 0 |
| Rice | 74 | 11 | 0 | 1 | 64 | 18 | 2 |
| Vegetable | 60 | 1 | 0 | 4 | 50 | 7 | 0 |
| Fish | 268 | 2 | 1 | 5 | 235 | 27 | 4 |
| Garbage | 36 | 7 | 1 | 2 | 34 | 8 | 0 |
| Car driver | 13 | 0 | 0 | 0 | 4 | 4 | 5 |
| Kolkata municipal corporation | 34 | 0 | 0 | 1 | 11 | 19 | 3 |
| Rajmistri | 21 | 0 | 0 | 0 | 13 | 8 | 0 |
| Electricity Work | 9 | 0 | 0 | 0 | 6 | 3 | 0 |
| Riksha Driver | 4 | 0 | 0 | 0 | 4 | 0 | 0 |
| P.W.D | 1 | 0 | 0 | 0 | 0 | 0 | 1 |

municipal schools up to primary level and some to secondary level.

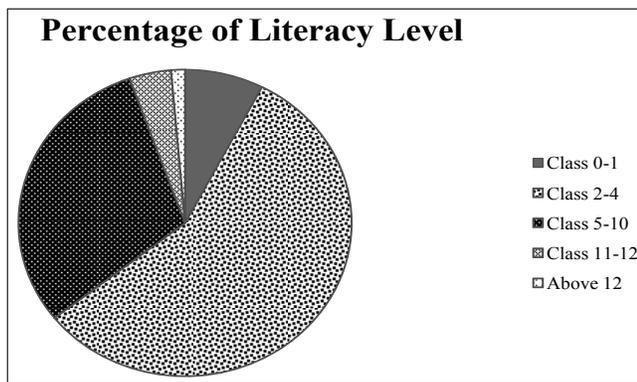### Percentage of Literacy Level



**Fig. 3:** Percentage of literacy rate

From the following reports it can be easily observed that maximum number of people (94.58%) are literate up to primary level and the rate is very low (5.42%) when it comes to higher education as shown in Table 4.

**Table 4:** Literacy Level of local population

| Class | Frequency | Percentage |
|---|---|---|
| 0-1 | 45 | 7.65 |
| 2-5 | 334 | 56.71 |
| 6-10 | 178 | 30.22 |
| 11-12 | 24 | 4.07 |
| Above 12 | 8 | 1.35 |

### Life threatening Diseases around East Kolkata Wetland

Because they are not so very educated and also their cost of living is not so high they depend on local municipal corporations or health care center for their health related issues as shown in Table 5.

**Table 5: Total Incidence of Disease**

| Disease | No. of incidents | Percentage |
|---|---|---|
| Typhoid | 17 | 2.89 |
| Jaundice | 33 | 5.60 |
| Skin Disease | 48 | 8.15 |
| Cholera | 51 | 8.66 |
| Diarrhea | 57 | 9.68 |
| Cancer | 153 | 25.98 |
| Fever | 230 | 39.04 |

According to our survey diseases like typhoid (2.89%), jaundice (5.60%), skin diseases (8.15%), cholera (8.66%), diarrhea (9.68%), fever (39.04%) and cancer (25.98%) are the most common where maximum number people said to have fever or cholera or diarrhea or other related issues and the percentage is also very high for cancer shown in Fig 4 (Nandi *et al.* 2012).
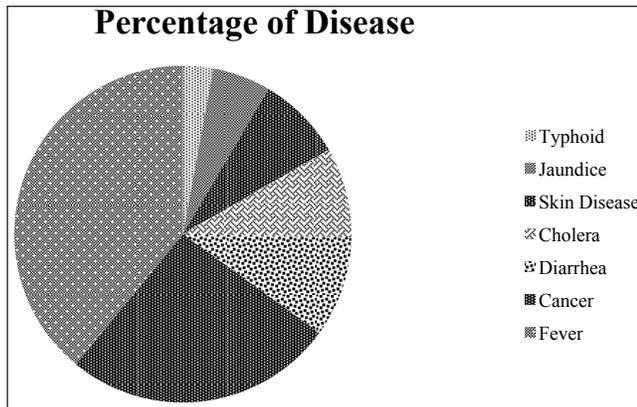
**Fig. 4:** Percentage of diseases

## STATISTICAL ANALYSIS

The IBM SPSS statistics 22 software was used to get the following correlation matrix of the data collected. In correlation matrix the P value should be ≤ 0.05 for the test to significant and the test is not significant if the P value is ≥0.05. In the above observed Pearson's correlation there are some values with both positive and negative significance with each other.

According to the Pearson's correlation significant relationships were observed between literacy level and diseases. A positive significant correlation was observed between Typhoid and literacy rate of above 12 at 0.05 level. Also a positive correlation at 0.01 level was observed between Jaundice, skin disease and literacy rate of class 11-12 shown in Table 6. From this statistical analysis it can be said that the diseases are dependent on their literacy level as well.

The importance and the benefits of wetlands to human and to the society is very known to us. From the goods they provide on regular basis in terms of vegetables and fishes to the help in flood control, heavy metal absorption and waste management, wetlands are great contributors of our society. Despite the positive impacts they provide there are also some negative impacts of these wetland which cannot be ignored. In many parts of the world, human health is directly affected by wetland-associated diseases. Wetlands provide potential habitat for disease vectors or intermediate hosts of parasites causing diseases. Malaria, diarrhea, including cholera, are globally the worst diseases in terms of their human impact. According to some reports there are about 1.3 and 1.8 million deaths respectively in 2002 due to these diseases. It is also causing disability and suffering in many millions. Globally the vast majority of these diseases are seen in children under five years old, particularly in Africa, Asia, and parts of the Americas. Some parasitic diseases such as schistosomiasis, lymphatic filariasis, onchocerciasis, and malaria are now a days given more importance by the World Bank because these diseases are difficult to control once they become widespread or endemic; and also the illness lasts a long time causing high rate of death. Other than the mosquito-borne disease, pathogens, enteropathogens associated with heavy metals and chemical pesticides or insecticides are also causing the negative health impacts on humans and can poses a health risk particularly when human populations and their activities encroach on the habitats. Worldwide parasitic and infectious communicable diseases (including all water related diseases) caused 32% of all deaths in 1993, resulting in the loss of 16.5 million lives; 99% of reported cases occurred in developing countries. In these countries, parasitic and infectious communicable diseases cause 41.5% of all deaths (WHO). In this study also by oral communication with the local people residing near the east Kolkata wetland area the following information were collected about the disease related issues and observed that they should be more educated and serious when it comes to the knowledge about diseases and some awareness programme need to be conducted.

According to the above table maximum number of people (62.48%) are dependent on local municipal corporations for their treatment and a very less percentage of people go to the private hospitals (7.98%). Shockingly in this century also 19.35% of people are dependent on their homemade medicines from different plants shown in Table 7.

The local people were also asked about the following questions during the survey as shown in Table 8 and the percentage of frequency is also mentioned.

**Table 6:** Pearson's correlation chart between different disease and their qualification of local people

| | | Typhoid | Jaundice | Skin disease | Cholera | Diarrhea | Cancer | 0-1 | 2-5 | 6-10 | 11-12 | Above 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Typhoid | Pearson Correlation | 1 | .052 | .150 | -.134 | -.357 | -.836 | .330 | .555 | .131 | .136 | **.929*** |
| | Sig. (2-tailed) | | .933 | .810 | .830 | .556 | .077 | .587 | .332 | .834 | .827 | **.022** |
| | N | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | **5** |
| Jaundice | Pearson Correlation | .052 | 1 | **-.977\*\*** | .859 | -.739 | -.327 | .096 | .720 | .561 | **.987\*\*** | -.114 |
| | Sig. (2-tailed) | .933 | | **.004** | .063 | .154 | .591 | .878 | .171 | .325 | **.002** | .855 |
| | N | 5 | 5 | **5** | 5 | 5 | 5 | 5 | 5 | 5 | **5** | 5 |
| Skin disease | Pearson Correlation | .150 | **-.977\*\*** | 1 | -.848 | .639 | .186 | .038 | .603 | .599 | **.938*** | .279 |
| | Sig. (2-tailed) | .810 | **.004** | | .070 | .246 | .764 | .951 | .282 | .286 | **.018** | .649 |
| | N | 5 | **5** | 5 | 5 | 5 | 5 | 5 | 5 | 5 | **5** | 5 |
| Cholera | Pearson Correlation | -.134 | .859 | -.848 | 1 | -.524 | -.005 | .418 | .635 | .635 | **.880*** | -.422 |
| | Sig. (2-tailed) | .830 | .063 | .070 | | .365 | .993 | .484 | .249 | .250 | **.049** | .479 |
| | N | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | **5** | 5 |
| Diarrhea | Pearson Correlation | -.357 | -.739 | .639 | -.524 | 1 | .310 | -.352 | .437 | .114 | -.798 | -.217 |
| | Sig. (2-tailed) | .556 | .154 | .246 | .365 | | .612 | .561 | .462 | .855 | .106 | .726 |
| | N | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Cancer | Pearson Correlation | -.836 | -.327 | .186 | -.005 | .310 | 1 | .099 | .753 | .278 | -.332 | -.841 |
| | Sig. (2-tailed) | .077 | .591 | .764 | .993 | .612 | | .874 | .142 | .651 | .586 | .074 |
| | N | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 0-1 | Pearson Correlation | .330 | .096 | .038 | .418 | -.352 | .099 | 1 | .239 | .142 | .244 | .000 |
| | Sig. (2-tailed) | .587 | .878 | .951 | .484 | .561 | .874 | | .698 | .820 | .692 | 1.000 |
| | N | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 2-5 | Pearson Correlation | .555 | .720 | -.603 | .635 | -.437 | -.753 | .239 | 1 | .690 | .741 | .351 |
| | Sig. (2-tailed) | .332 | .171 | .282 | .249 | .462 | .142 | .698 | | .197 | .152 | .562 |
| | N | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 6-10 | Pearson Correlation | .131 | -.561 | .599 | -.635 | -.114 | .278 | .142 | .690 | 1 | -.497 | .254 |
| | Sig. (2-tailed) | .834 | .325 | .286 | .250 | .855 | .651 | .820 | .197 | | .394 | .680 |
| | N | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 11-12 | Pearson Correlation | .136 | **.987\*\*** | **-.938*** | **.880*** | -.798 | -.332 | .244 | .741 | .497 | 1 | -.071 |
| | Sig. (2-tailed) | .827 | **.002** | **.018** | **.049** | .106 | .586 | .692 | .152 | .394 | | .910 |
| | N | 5 | **5** | **5** | **5** | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Above 12 | Pearson Correlation | .929* | -.114 | .279 | -.422 | -.217 | -.841 | .000 | .351 | .254 | -.071 | 1 |
| | Sig. (2-tailed) | .022 | .855 | .649 | .479 | .726 | .074 | 1.000 | .562 | .680 | .910 | |
| | N | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

**Table 7:** Disease treatment process followed

| Mode of treatment | No of people | Percentage |
|---|---|---|
| Private Hospitals | 47 | 7.98% |
| Municipal health centre (Kolkata) | 368 | 62.48% |
| Home-made remedies | 114 | 19.35% |
| None of the above | 60 | 10.19% |

**Table 8:** Survey questions and answers of diseases

| Question | Variables | Frequency (%) |
|---|---|---|
| 1. Which type do you prefer? | Allopathic | 396 (67.23%) |
| | Homeopathic | 193 (32.77%) |
| 2. Do you use self- prescribed medicine for yourself? | Yes | 298 (50.59%) |
| | No | ]291 (49.41%) |
| 3. Do you smoke? | Yes | 387 (65.70%) |
| | No | 202 (34.30%) |
| 4. Do you know about the harmful effects of smoking? | Yes | 91 (15.45%) |
| | No | 498 (84.55%) |
| 5. Which type of water do you drink? | Filtered water | 215 (36.50%) |
| | Normal water | 374 (63.50%) |
| 6. Which type of toilet do you use? | Public | 402 (68.25%) |
| | Personal | 187 (31.75%) |
| 7. Do you use any plant for any type of skin disease? | Yes | 365 (61.97%) |
| | No | 224 (38.03%) |
| 8. Which season is very prone to disease? | Summer | 210 (35.65%) |
| | Monsoon | 324 (55.01%) |
| | Winter | 55 (9.34%) |
| 9. Is there any health check-up camp organized on regular basis? | Yes | 472 (80.14%) |
| | No | 117 (19.86%) |
| 10. Is there any waste management system happens on daily basis? | Yes | 365 (61.97%) |
| | No | 224 (38.03%) |

**Awareness for local people:**

- People should be more educated.

- They should have the knowledge about the common diseases

- They should know about the causes and proper treatment process

- Improvements in medical treatment and healthcare systems

- They should always neglect and consult a doctor as soon as the symptoms of any disease occurs

- Last but not the least the wetlands and areas around it should be very well maintained and managed so that to decrease the disease related issues.

**CONCLUSION**

The present study showed that the cost of living

of local people is not so good and thus resulting in occurrence of many life threatening disease like diarrhea, cholera, cancer etc. There are hundreds of households surrounding the area of EKW and maximum people depend on fish cultivation (46.01%) for their survival. Also a good number of people are involved in rice (14.43%) and vegetable production (10.36%), and Maximum number of people having their monthly income range from 1000-10000 rupees per month. This is a result of low literacy rate observed during the survey. 58.49% of the sample size is literate till class 5 and 29.60% till class 10. The percentage is drastically low when it comes to higher education. 0.70% is educated above class 12. In conclusion we can say that the local people living in slums should be provided with better living condition. People should be more educated and made aware of deleterious effects of unhealthy habits on their own health.

## ACKNOWLEDGEMENTS

### Conflicts of interest

There are no conflicts of interest.

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