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A STUDY ON WATER-BORNE DISEASESOF PURULIA MUNICIPALITY, PURULIA, WEST BENGAL, INDIA.

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Abstract

Purulia Municipality is one of the upcoming developing Urban Local Bodies (ULBs) of West Bengal and India. The Municipality was established in the year 1876 with a name 'Purulia Municipal Committee'. It is characterized by inhabitants of severely unequal income level. In one side group of entrepreneurs especially from non-bengali castes have high living standards and in other side original inhabitants are mostly living in bad economic condition and health. In this juncture the people of the place experienced the introduction of large growth of markets and corporate business, vertical growth of concretization etc. People outside of this Municipality are also likely to live in the affordable flats in and around a town center where Malls, Bazars, and every possible goods are extended to serve. It is imperative to inform that Purulia is always the place of water scarcity due to its geological condition and hot and dry climate. In addition to this per head water consumption has been continuously decreasing with the development of new colonies in and around the town center. People with high living standards maintain their demand on water by deep boring etc which by and large lowering the sub-surface water level of the place. Moreover one of the commonest urban problems also picks in the form of very bad condition of sea-wage and drainage system. These led to stagnant of water and water borne diseases in and around the locality, which is quite low before such development in the Municipality. Beside

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this,lack of sustainability of water supply is considered as a major issue in Purulia Municipality that accounts for prevalence of waterborne diseases. Diarrhea and Jaundice are common here. In addition, socioeconomic status such as; education, income and occupation are also the other influential factors associated with prevalence of waterborne diseases. Objective: This study aims to assess the association of water and socioeconomic status with the prevalence rate of waterborne diseases and to know the sources of drinking water and to suggest some preventive measures. The entire study is made by collecting data by interviewing people and from Health Department of Purulia Municipality. The entire work is completed with the help of Microsoft Word and Excel. Result: The occurrence of waterborne diseases was mostly found in slum areas due to low quality of water, low level of education etc. It is noted that compared to other waterborne diseases, the prevalence rate of diarrhea was found to be the highest and next jaundice in the wards. Majority of people had primary level education, low income and relied on small industries and as daily labourers, as their occupation, which were significantly associated with waterborne diseases.

1.1. PRELUDE TO STUDY:

1.1.1.INTRODUCTION:

Any diseases that can spread through contaminated water are called ‘water borne diseases’. The contamination can involve bacterial, viral or protozoan organisms. Some examples of water borne diseases include cholera (bacteria), dysentery (bacteria, amoeba), cryptosporidiosis (protozoa), hepatitis A (virus) & giardia (protozoa). Infection can result not only from drinking the water but also from swimming in the water where it can enter the body in other ways such as through broken skin. Many developing countries have limited uncontaminated water supplies so water borne disease is a huge health issue worldwide.

1.1.2. RELEVANCE OF THE STUDY:

“Water-borne Disease” is one of the most important concerned of present day geographers as many people have been suffering from various types of water-borne diseases. Purulia is one of the most backward districts of West Bengal in terms ofeconomic and human development. Water-borne disease is a major problem to them.For this purpose and being interested in this

topic, thepresent paper has been designed to identifythe causes of occurrence of “Water-borne Diseases in Purulia Municipality”.

1.1.3. OBJECTIVES:

The main objectives of this study ware as follows –

i. to assess the interconnection between water availability, socioeconomic status and prevalence of waterborne diseases in Purulia Municipality,
ii. to know the sources of drinking water on which people depend,
iii. to identify the diseases which are mostly occurred in Purulia Municipality and
iv. in fine the paper suggests some preventive measures of water-borne diseases.

1.1.4. METHODOLOGY:

A cross-sectional research design was conducted during mid of October, 2015 to mid of January 2016 on 23 wards of Purulia Municipality. This research design was chosen in order to measure the prevalence of Water-borne diseases occurred in the last one year and the exposure status in a population at a particular point of time.

According to Census 2011, overall literacy rate in Purulia District was 63.2%, whereas in Purulia Municipality it was registered 74.55%. Majority of people in slum areas had a primary level education and are engaged in small industries andas daily labourers.Obviously their socioeconomic conditionis not good. In this study the effort was made to know if any mentioned measures of socioeconomic status have any influence in causing waterborne diseases in the study sites.

Primary data have been collected from the health department of Purulia Municipality and by interviewing either with the head of the family or any adult member of a family in absence of the head of the family. In the interview, people were asked about the number of family members, education, occupation, source of water.Data was entered in Microsoft Excel and the entire work is completed with the help of Microsoft Word and location map has been prepared with the help of RS, GIS Software.

1.1.5. TIME SPAN AND DATA SOURCE:

Thestudy was conducted during mid of October, 2015 to mid of January 2016. Therefore, 3 months were taken to do this work.In addition, secondary data sets have been collected from the Health Department of Purulia Municipality and Statistical Department of Purulia and primary data collected by interviewing people and from internet.

1.1.6. LIMITATIONS:

In spite of all efforts, the study and report is not free from limitations. Therefore, the study has its own limitations which are as follows:

i. Data that was collected from the Health Department of Purulia Municipality and from household survey has not been analyzed properly.

ii. It could not be shown properly how socio-economic aspects influence in causing water-borne diseases because of lack of time.

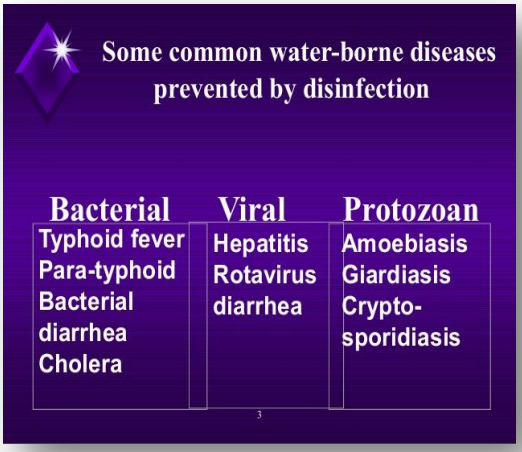
iii. The trends of water-borne diseases for last 4-5 years of the wards have not been shown due to insufficient data.

iv. Non-availability of the map of Purulia Municipality of 23 wards with coordinates, that's why the map of 22 wards is showed.

2.1. CONCEPTUAL ASPECTS:

2.1.1. WATER-BORNE DISEASES:

The infectious diseases spread primarily through contaminated water, are termed as water borne disease. These diseases can spread either by flies or filth, since water is considered to be the chief medium of it and hence they are named as water borne diseases.Most of the intestinal diseases are transmitted through fecal waste. Pathogens that include virus, bacteria, protozoa, and parasitic worms – are disease producing agents found in the faces of infected people. These diseases are prevalent in areas having poor sanitary system.These pathogens travel through water, to the food and drinking water of the people. These diseases are highly contagious, so the people who nurse such people should take care of the hygiene of the people.Hepatitis, diarrhea, cholera, dysentery and typhoid are the more common water borne diseases that affect large population in an area (Fig.1 and 2).



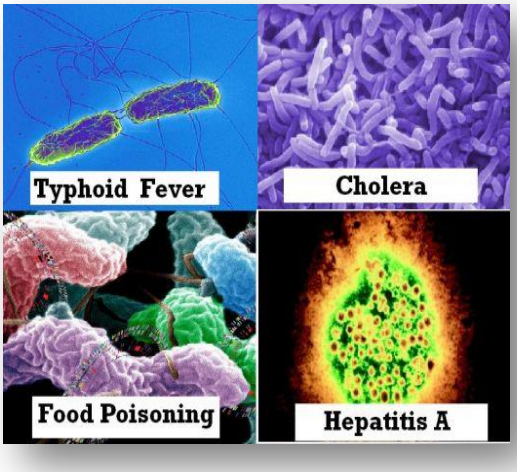


Fig.1 and 2: Common water-borne diseases

2.1.2. SYMPTOMS OF WATER-BORNE DISEASES:

Most waterborne diseases cause common symptoms and characteristics of each symptom depend on the bacteria, viruses, or pathogenic microorganisms. These symptoms include:

- abdominal discomfort or cramping;
- fever;
- vomiting;
- diarrhea to bloody diarrhea and
- loss of weight and fatigue may accompany several of the viral illnesses etc.

2.1.3. MICROORGANISMS ASSOCIATED WITH WATER-BORNE DISEASES:

The following groups of microorganisms have been linked with the occurrence of waterborne disease. As each pathogen is isolated and identified as a threat to water quality.

Bacteria: Bacteria are the most widely distributed life forms. Pathogenic bacteria range in length from approximately 0.4 to 14 □ m (a □ m or "micrometer"equals one onethousandth of a millimeter) and 0.2 to 1.2 □ m in width. Key bacterial pathogens responsible for waterborne disease include Legionella, Salmonellatyphi, Shigella, and Vibrio cholerae.

Viruses: Viruses are inactive when outside of a livinghost cell. Viruses linked to waterborne disease haveprotein coats that provide protection from environmentalhazards and range in size from 0.02 to 0.09 m. Unlike bacteria and protozoa, they contain onlyone type of nucleic acid (RNA or DNA). Keypathogens include hepatitis A and Norwalk virus.

Protozoa: Protozoa, common in bodies of water, aremuch larger than bacteria and viruses. To surviveharsh environmental conditions, some species cansecrete a protective covering and form a resting stagecalled a "cyst." Encystment can protect protozoa fromdrinking water disinfection efforts and facilitate the spread of disease. Key protozoa being studied as agents of waterborne disease include Giardia and Cryptosporidium.

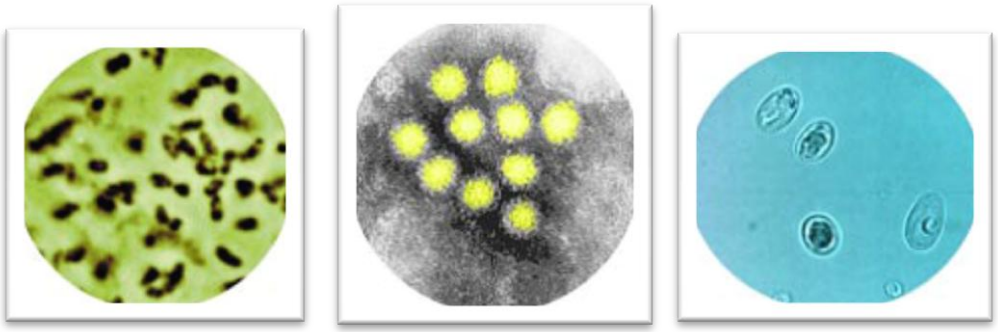


Fig.3: Images of Bacteria, Virus and Protozoa (from the left)

2.1.4. COMMON WATER-BORNE DISEASE CHART:

i.PROTOZOAN DISEASES:

Table No.:1

Disease and Transmission	Microbial Agent	Sources of Agent in Water Supply	General Symptoms
Amoebiasis (hand-to-mouth)	Protozoan (Entamoeba histolytica) (Cyst-like appearance)	Sewage, non-treated drinking water, flies in water supply	Abdominal discomfort, fatigue, weight loss, diarrhea, bloating, fever

Cryptosporidiosis (oral)	Protozoan (Cryptosporidium parvum)	Collects on water filters and membranes that cannot be disinfected, animal manure, seasonal runoff of water.	Flu-like symptoms, watery diarrhea, loss of appetite, substantial loss of weight, bloating, increased gas, nausea
Giardiasis (fecal-oral) (hand-to-mouth)	Protozoan (Giardia lamblia) Most common intestinal parasite	Untreated water, poor disinfection, pipe breaks, leaks, groundwater contamination.	Diarrhea, abdominal discomfort, bloating, and flatulence

ii. VIRAL DISEASES:

Table No.:2

Disease and Transmission	**Microbial Agent**	**Sources of Agent in Water Supply**	**General Symptoms**
Hepatitis A	Hepatitis A virus (HAV)	Can manifest itself in water (and food)	Symptoms are only acute (no chronic stage to the virus) and include Fatigue, fever, abdominal pain, nausea, diarrhea, weight loss, itching, jaundice and depression.

iii. BACTERIAL DISEASES:

Table No.:3

Disease and Transmission	Microbial Agent	Sources of Agent in Water Supply	General Symptoms
Cholera	Spread by the bacterium Vibrio cholerae	Drinking water contaminated with the bacterium	In severe forms it is known to be one of the most rapidly fatal illnesses known. Symptoms include very watery diarrhea, nausea, cramps, nosebleed, rapid pulse, vomiting, and hypovolemic shock (in severe cases), at which point death can occur in 12–18 hours.
E. coli Infection	Certain strains of Escherichia coli (commonly E. coli)	Water contaminated with the bacteria	Mostly diarrhea. Can cause death in immunocompromised individuals, the very young, and the elderly due to dehydration from prolonged illness.
Dysentery	Caused by a no. of Shigella and Salmonella with the ing Shigella dysenteriae	Water contaminated with the bacterium	Frequent passage of feces with blood and/or mucus and in some cases vomiting of blood.
Leptospirosis	Caused by bacterium of genus Leptospira	Water contaminated by the animal urine carrying the bacteria	Begins with flu-like symptoms then resolves. The second phase then occurs involving meningitis, liver damage (causes jaundice), and renal failure

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Salmonellosis	Caused by many bacteria of genus Salmonella	Drinking water contaminated with the bacteria. More common as a food borne illness.	Symptoms include diarrhea, fever, vomiting, and abdominal cramps
Typhoid fever	Salmonella typhi	Ingestion of water contaminated with feces of an infected person	Characterized by sustained fever up to 40 °C (104 °F), profuse sweating; diarrhea may occur. Symptoms progress to delirium, and the spleen and liver enlarge if untreated. In this case it can last up to four weeks and cause death. Some people with typhoid fever develop a rash called "rose spots", small red spots on the abdomen and chest.

3.1. LITERATURE REVIEW:

A lot has been said, written, and demonstrated about the water-borne diseasesand its associated problems. According to the Pacific Institute Research Report,Peter H. Gleick August 15, 2002 - The infectious diseases spread primarily through contaminated water, are termed as water-borne disease. These diseases can spread either by flies or filth, since water is considered to be the chief medium of it and hence they are named as water borne disease. Infection can result not only from drinking the water but also from swimming in the water where it can enter the body in other ways such as through broken skin. Many poorer countries have limited uncontaminated water supplies so water borne disease is a huge health issue worldwide.According toOffice of Research andDevelopmentWashington, DC 20460,most of the intestinal diseases are transmitted through fecal waste. Pathogens that include virus, bacteria and protozoa – are disease producing agents found in the faces of infected people. Bacteria are the most widely distributed life forms. Pathogenic bacteria range in length from approximately 0.4 to 14 □ m and 0.2 to 1.2 □ m in

width. Key bacterial pathogens responsible for waterborne disease include Legionella, Salmonellatyphi, Shigella, and Vibrio cholerae.Viruses are inactive when outside of a livinghost cell. Viruses linked to waterborne disease haveprotein coats that provide protection from environmentalhazards and range in size from 0.02 to 0.09 m. Unlike bacteria and protozoa, they contain onlyone type of nucleic acid (RNA or DNA). Keypathogens include hepatitis A and Norwalk virus.Protozoa, common in bodies of water, aremuch larger than bacteria and viruses. To surviveharsh environmental conditions, some species cansecrete a protective covering and form a resting stagecalled a "cyst." Encystment can protect protozoa fromdrinking water disinfection efforts and facilitate the spread of disease. Key protozoa being studied as agents of waterborne disease include Giardia and Cryptosporidium.These pathogens travel through water, to the food and drinking water of the people. These diseases are highly contagious (EPA/640/K-93/001April 1993).

Most waterborne illnesses cause common symptoms and characteristics of each symptom depend on the bacteria, viruses, or pathogenic microorganisms. These symptoms include: abdominal discomfort or cramping, fever, vomiting, diarrhea and loss of weight and fatigue may accompany several of the viral illnesses (HS04-061C ,9-07).

We have got the knowledge about the common protozoan (Amoebiasis, Giardiasis,Cryptosporidiosis etc.), viral (Hepatitis A) and bacterial (Typhoid, Cholera, E coli Infection, Dysentery etc.) infections, their microbial agents, sources of agent in water supply and general symptoms from the thesis-Waterborne Diseases: Linking Public Health AndWatershed Data, Debalina Das, February, 2014.

According to the thesis- Water, Sanitation, Socioeconomic Status and Prevalence of Waterborne Diseases: A Cross-Sectional Study at Makwanpur District, Nepal, PraptiSedhain,May, 2014: Socio-economic conditions such as education, income etc. are the major factors in causing water-borne diseases, which influences in the occurrence and prevalence of any kind of water-borne diseases in an area.Outbreaks of some water-borne diseases mostly occur as the result of low availability of drinking water.

A thesis on, Preventative Measures Against Water-BorneDisease&The Role of Municipalities in Prevention, MajedaAlawneh, December 16, 2007; suggested some preventive measures of water-borne diseases about what people ought to do (drink filtered / boiled water; wash hands properly with soap and water before consuming food; if a person is suffering from loose motions and vomiting, he/she should immediately see a doctor) and what they ought not to do (eating cut fruits, chat and food material from roadside vendors, oily and spicy food should be avoided; empty stomach should be avoided; never do self-medication).

4.1. STUDY AREA:

Purulia came into being as a district of West Bengal in 1956. Purulia is the westernmost district of West Bengal. .Geographically the district is located in between 22˚42'35" and 23˚42'0" north latitude and 85˚49'25" and86˚54'37" east longitude. Purulia has hardly any natural boundary demarcated by streams or hills. Only about ahundred kms of the district boundary follows the Damodar in the north and the Subarnarekha in the west. Theartificial district boundary is mainly an outcome of linguistics regionalization and administrative convenience. Purulia has its boundaries on the east with Midnapore and Bankura districts of West Bengal ; on the northBurdwan district of West Bengal and Dhanbad district of Bihar; on the north west and south west with theHazaribag, Ranchi and Singbhum districts of Jharkhand.

There are 3 Municipalities: Purulia, Raghunathpur, and Jhalda. Purulia Municipality was established in 1876 with the name of 'Purulia Municipal Committee'. It is extending from 23°18'30'' to 23°21'00''N latitudes and from86°21'00'' to 86°23'45''E longitudes. The Purulia municipal town is bounded by Lagda Gram panchayet and Sonajuri Gram Panchayet on the west,Surutia gram Panchayet and palanja Gram Panchayet on the east,Raghabpur Gram Panchayet and Bongabari Gram Panchayet on the north and Simulia Gram Panchayet on the south.

Now, there are 23 wards under Purulia Municipality. The total area is 13.93sq.km. & the number of total population is 121436.

4.1.1.LOCATION MAP OF THE STUDY AREA:

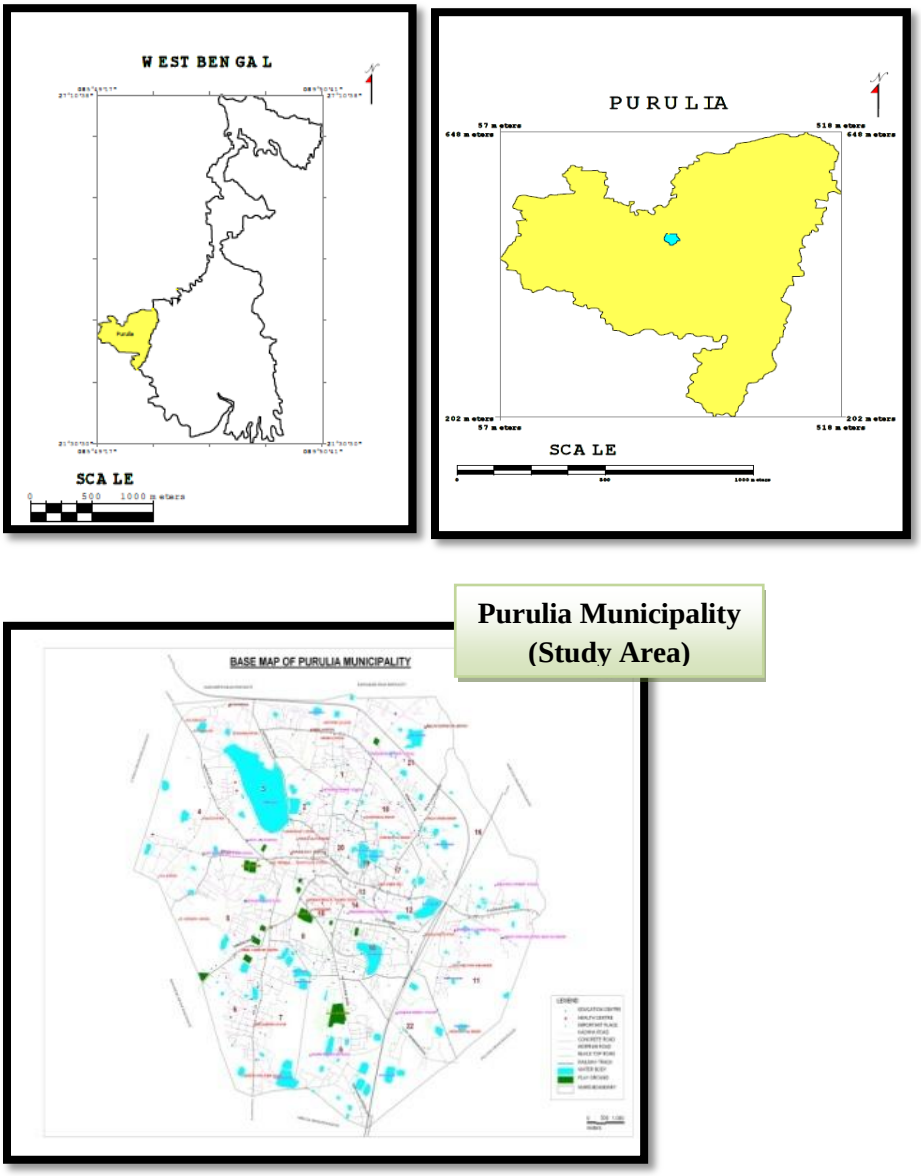


Fig.:4: Location map

4.1.2. GENERAL GEOGRAPHY:

a.<u>Geology</u>: Due to undulated topography nearly 50% of the rainfall flows away as runoff. The district is covered by mostly residual soil formed by weathering of bed rocks.

b.<u>Soil</u>: Purulia soil is red and it is said that the soil has the most iron in it compared to other soil in India.

c. <u>Climate</u>: Purulia is basically a drought prone area. It has a sub tropical climate nature and is characterized by high evaporation and low precipitation. Temperature is very high in summer

and low in winter which varies from 2.8 degrees in winter to 52 degrees in summer thus causes dryness in moisture. Record highest temperature is 54 degrees in 2011, which is the second highest temperature ever recorded in Asia, following Jacobabad's record 55.7 degrees.

d. Rainfall: Rainfall defines the climate of the district. South west monsoon is the principal source of rainfall in the district. Average annual rainfall varies between 1100 and 1500 mm. The relative humidity is high in monsoon season, being 75% to 85%. But in hot summer it comes down to 25% to 35%.

e. Rivers and lakes: Several rivers flow across Purulia. Among these Kangsabati, Kumari, silabati(silai), Dwarakeswar, Subarnarekha and Damodar are the important ones. Although several rivers flows across the district, 50% of the water run off due to the undulated topography.There are also several Small dams like Murguma, Pardi, Burda, Gopalpur, which are mainly used for irrigation of agriculture field.Saheb Bandh is one of the popular and famous waterbodies of Purulia. It is located in the heart of the purulia town. It is a shelter of the migratory birds which comes from Bangladesh, Burma, Pakistan, Baluchistan during December to March.

4.1.3. DEMOGRAPHY:

a. Population: Total population of Purulia Municipality is 121436, where male population is 62519 and female population is 58916, out of which 39% is slum population.

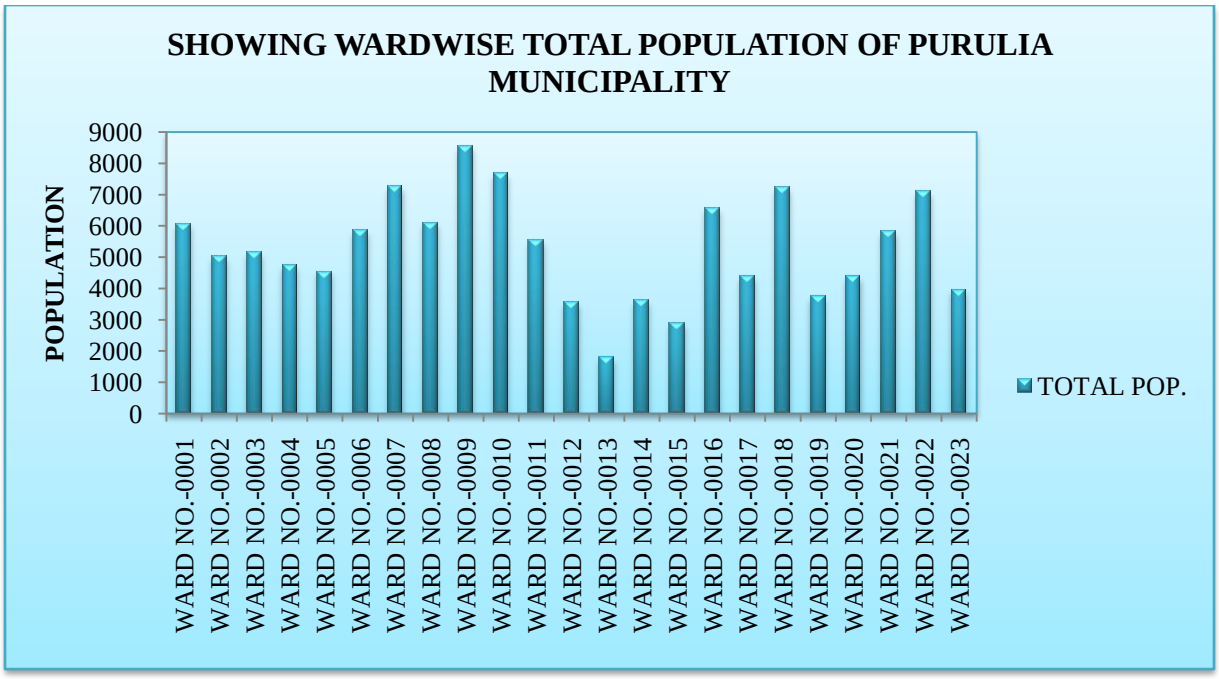
WARD WISE DISTRIBUTION OF POPULATION IN PURULIA MUNICIPALITY:

Table No.:4

WARD NO.	TOTAL POP.	MALE POP.	FEMALE POP.
WARD NO.-0001	6065	3044	3021
WARD NO.-0002	5009	2577	2432
WARD NO.-0003	5156	2648	2508
WARD NO.-0004	4740	2395	2345
WARD NO.-0005	4544	2363	2181
WARD NO.-0006	5856	3040	2816
WARD NO.-0007	7251	3770	3481

WARD NO.-0008	6096	3181	2915
WARD NO.-0009	8534	4479	4055
WARD NO.-0010	7683	3897	3785
WARD NO.-0011	5545	2873	2672
WARD NO.-0012	3535	1729	1806
WARD NO.-0013	1799	918	881
WARD NO.-0014	3616	1875	1741
WARD NO.-0015	2888	1506	1382
WARD NO.-0016	6558	3366	3192
WARD NO.-0017	4369	2252	2117
WARD NO.-0018	7215	3706	3509
WARD NO.-0019	3729	1917	1812
WARD NO.-0020	4374	2247	2127
WARD NO.-0021	5822	3036	2786
WARD NO.-0022	7109	3620	3489
WARD NO.-0023	3943	2080	1863
TOTAL	121436	62519	58916

Source: Statistical Department, Purulia 2018



Source: Statistical Department, Purulia

Fig.: 5

b. Literacy:

Literacy rate in Purulia Municipality is found to be 74.55%. On the other hand, male and female literacy rate is 80.41% and 68.33% respectively. Total numbers of male literates are 50276 and total numbers of female literates are 40258.

5.1. EMPIRICAL OBSERVATIONS:

The temperature of Purulia is very high, so the microbial agents of water-borne diseases died and due to undulated topography nearly 50% of the rainfall flows away as runoff, so the ground water level is very low, so the microorganisms that exist cannot contaminate into the water. Only when leakages are found in the pipes, they get the chance to contaminate into the water.

Diarrhea and Jaundice are the common water-borne diseases in Purulia Municipality.

5.1.1. What is Diarrhea?

Diarrhea is a condition that is characterized by the appearance of loose, watery stools or a frequent need to have a bowel movement. It usually lasts a few days and often disappears without any treatment. It may be related to a viral or bacterial infection and is sometimes the result of food poisoning.

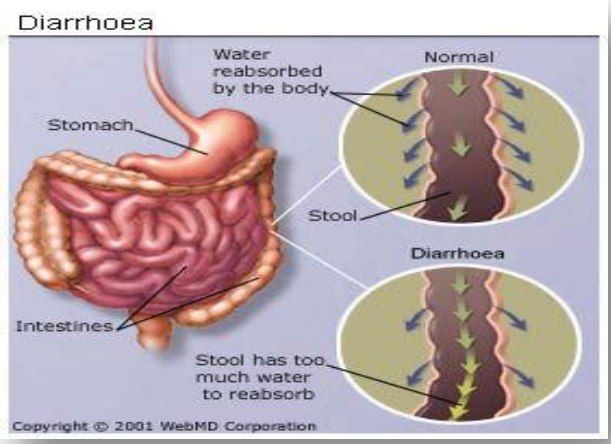


Fig.:6

5.1.2. What is Jaundice?

Jaundice can occur in babies,children and adults. Jaundice is not an illness itself,but a medical condition in which too much bilirubin-a compound produce by the break down of hemoglobin from red blood cells- is circulating in the blood. The excess bilirubin causes the skin,eyes and mucus membrances in the mouth to turn a yellowish colour. Because bilirubin is processed by the liver,the symptoms of jaundice may indicate damage to the liver in adults. If the cause is not identified and treated,it can led to liver failure.

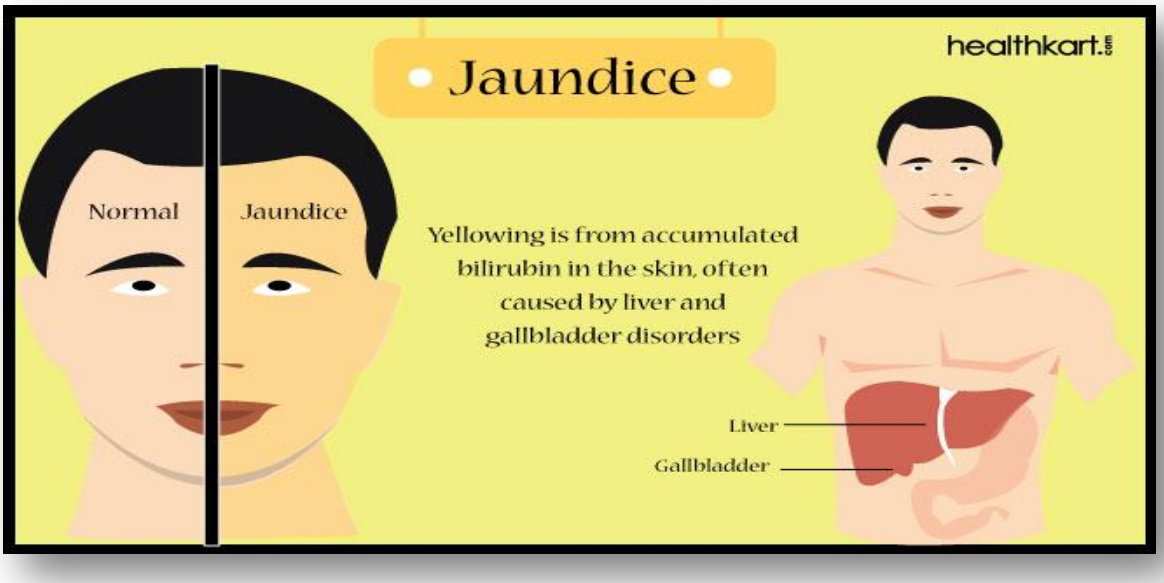


Fig.:7

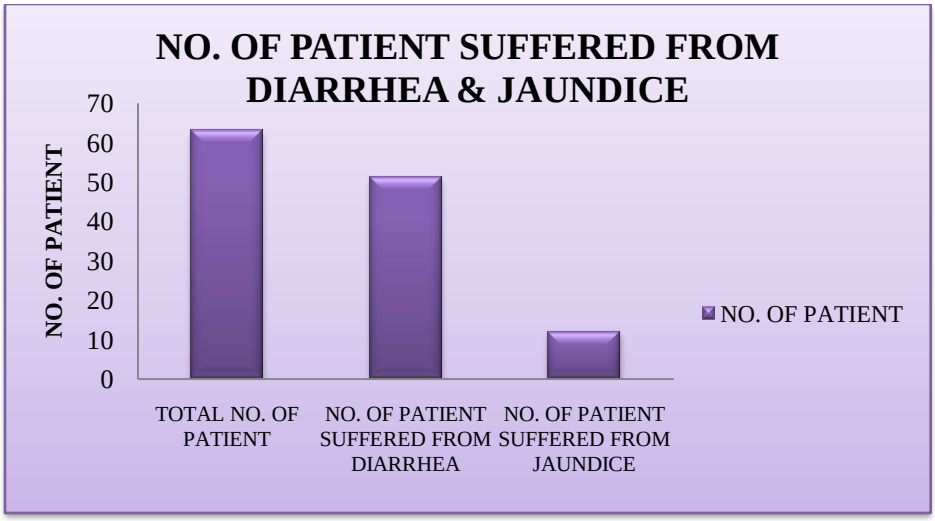
The wards, where these two diseases occurred in the year 2015 are listed below:

5.1.3. LIST OF WATER-BORNE DISEASES, WARDS AND NO. OF PATIENTS OF PURULIA MUNICIPALITY IN 2018:

Table No.:5

WARD NO.	NO. OF PATIENT	SUFFERED FROM		NO. OF VICTIM	
		DIARRHEA	JAUNDICE	CHILDREN	ADULT
Ward no 0001	5	5	0	4	1
Ward no 0003	5	5	0	5	0
Ward no 0004	7	5	2	2	5
Ward no 0005	3	1	2	2	1
Ward no 0006	4	4	0	2	2
Ward no 0008	6	5	1	5	1
Ward no 0016	6	4	2	6	0
Ward no 0018	5	5	0	4	1
Ward no 0019	9	7	2	3	6
Ward no 0021	5	5	0	4	1
Ward no 0022	8	5	3	4	4
TOTAL	63	51	12	41	22

Source: Health Department, Purulia Municipality 2018



Source: Health Department, Purulia Municipality

Fig.:8

5.1.4. SOCIO-ECONOMIC CONDITIONS INFLUENCING IN THE OCCURRENCE OF WATER-BORNE DISEASES:

The literacy rate of Purulia Municipalityis 73.51%, which is not bad but these diseases occurred mostly in slum areas,majority of people had primary level education, low income and relied on small industries and as daily labourers as their occupation. And that'swhy they are not much aware about those diseases. As the income level of majority of people is very low, they are unable to drink purified or filtered water. The main sources of their drinking water are the govt. taps, which are not sufficient for a huge amount of people mainly in summer and so they are compelled to collect their drinking water from the nearer wells, tube wells and ponds. In rainy season, the situation is different. During this time the supply of water is sufficient, but the water is muddy and dirty, which is not safe for health.

Themajor victims are infants and children. Among all the water-borne diseases, Diarrhea and Jaundice are common here. The people have not enough knowledge about the fearful effects of those diseases and so, when they suffer from those diseases, they do not think of to consult with a good doctor and they take only local treatment or go to Sadar Hospital, where patients are not treated carefully.

5.1.5. PREVENTIVE MEASURES:

Jaundice and Diarrhea are the common water-borne diseases in Purulia Municipality mainly in summers and rainy seasons. It is important to take necessary precautions against these diseases. To do this, individuals and their family members should keep the following in mind:

DO's

· Filtered / boiled water should be consumed.

· Wash hands properly with soap and water before consuming food.

· If a person is suffering from loose motions, he/she should immediately see a Doctor and drink ORS (Oral Re-hydration Solution) to prevent dehydration.

· ORS should be continued till loose motions stops.

· If a person is suffering from vomiting, he/she should not eat/drink anything, otherwise the frequency of vomiting will increase. Doctor should be consulted immediately.

· Drinking water container should be washed every day.

· Only warm and fresh cooked food should be consumed.

· Plenty of water and fluids should be consumed before stepping out in the heat.

DONT'S

· Consumption of water, milkshakes and fruit juices from roadside vendors should be avoided.

· Avoid eating cut fruits, Chat and food material from roadside Vendors.

· Oily and spicy food should be avoided.

· Empty stomach should be avoided.

· Do not bite nails with the help of teeth.

· Do not expose food and beverages to flies.

· Never do self-medication. Neither takes medicines directly from chemist shop. Medicines should always be taken after getting proper advice from a qualified doctor.

5.1.6. CONCLUSION:

This study conducted in Purulia Municipality explains the presence of so many water-borne diseases. Compared to other waterborne diseases, the prevalence rate of diarrhea was found to be the highest followed by jaundice in the wards of the Municipality. Most of inhabitants of the Municipality have very low level of awareness about such diseases as they have only basic level of education and most importantly due to lack of awareness programmes from various sources. Life is also very busy to sustain even basic life and living as most of them have very low incomelevel. They are relying on small industries and low daily wagesfor sustenance. These situations even raise the frequency of occurrences of waterborne diseases like diarrhea and jaundice among them.Thus it is imperative to restrict the diseases by bottom-up approach where affected people by generation should aware of the sources of the diseases, capitalize the awareness into daily lives and live long and healthy life. Supply of pure potable water and hygienic condition particularly in the slum areas would benefit the affected people in greater sense. Side by side well equipped health centers and implementation of proper education further help to slow down the rate of growth of waterborne diseases in Purulia Municipality.

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