UNIT 3 INVESTIGATION OF AN OUTBREAK

Structure

3.1 INTRODUCTION

I keep six honest serving-men: (They taught me all I knew) Their names are What and Where and When and How and Why and Who.

—Rudyard Kipling (1865-1936)

These words of Rudyard Kipling provide keys to identify factors responsible for disease occurrence and distribution . You might have heard about disease outbreaks off and on from several parts of the world e.g. cholera, dengue, chikungunya, zika virus etc. Such outbreaks of disease often pose a major public health problem in the affected areas. It necessitates a prompt action by health department to contain the disease outbreak. This requires active participation of the health functionaries like you. They play an important role in the identification of the diseased individuals, the source of outbreak, providing health care, management of the affected individuals and in instituting preventive and control measures. The idea is that such outbreaks do not occur again. You can also learn this easily. In this unit, we will be discussing the steps in the investigation of disease outbreaks. The term 'surveillance' here means 'keeping a watch'. This means health functionaries

should always remain alert about the disease situation in their area. News papers, TV and other media sources, nowadays also help in keeping us updated on this aspect

3.0 OBJECTIVES

After going through this unit, you should be able to:

- define epidemic;
- describe sources of epidemic;
- list the steps of investigation of an outbreak;
- take measures for preventing further spread of infection;
- prepare and submit a report of the outbreak; and
- carry out investigation of an epidemic.

3.2 STEPS OF INVESTIGATION OF AN OUTBREAK

Let us discuss definition and steps for investigating an epidemic as given below:

Definition of epidemic

An epidemic is defined as "The occurrence in a community or region of a group of illnesses of similar nature, clearly in excess of normal expectancy." It is commonly known as 'disease outbreak' as well. How do we say that disease occurrence is in excess of the expectations? This can be inferred by assessment of records of the previous years. Usually previous three years' average data during similar period (months) can be considered and if the current number exceeds the average by more than two standard deviations from the mean/ average then one can consider it to be an epidemic.

This definition is not applicable for those diseases which have been eradicated or under control. Thus, one case of small pox anywhere in the world would be considered as epidemic and it is a public health emergency to contain the epidemic. This is applicable for polio, guinea worm, yaws etc. which are considered to be eradicated.

Whenever an epidemic happens, it needs to be investigated. It is very important to know the underlying cause of the epidemic so that appropriate preventive measures are applied for controlling the spread of infection at urgent basis. There are some well-established steps of investigation of an epidemic which are discussed in this section. While data is collected regarding causes, time, place, person affected, treatment of affected individuals should be simultaneously undertaken.

Steps in the outbreak investigation are as follows:

Note: Please see the diagrams /news cutting at the end ot this unit for better understanding.

3.2.1 Ensure Existence of Outbreak

This is important since the report of the outbreak may just be a rumor.

Occurrence of unusually a large number of cases in the community should lead us to suspect an outbreak /epidemic. We must bring it to the notice of health authorities.

Sometimes people are not aware of any such phenomenon. But routine records and returns may show a sudden rise in number of cases due to particular disease.

> **Remember:**
>
> Increase in number of cases beyond expected number in case of those diseases, which are endemic can be considered as an outbreak.

Thus, we can say that in case of endemic diseases like diarrhoea and acute respiratory tract infections, it is expected that there will be some cases throughout the year. Keep a watch for sudden increase in the number of cases due to these diseases in your region. Season specific watch should be kept. Also we should be ready to tackle it accordingly, e.g. in summers…for diarrhoea (keep ORS ready), vector borne diseases like malaria, dengue, chikungunya.

3.2.2 Confirm Diagnosis

It is vital, since once the diagnosis is clear, our response will be more systematic & effective.

When there are large number of cases occurring simultaneously in the community, it may not be possible to take a detailed history and clinical examination for each and every case. Since signs and symptoms of the disease are similar, "a working case definition" can be made based on symptomatology and clinical signs of the disease.

> **Note:** Symptoms are subjective criteria and are based on what the patient feels or on his/her experiences. For example, loose stools, pain in abdomen or vomiting etc. for diarrhoeal diseases. On the other hand, clinical signs and laboratory tests gives objective criteria for diagnosis e.g. signs of dehydration based on presence of dry tongue, less urine output, slow skin pinch etc.

During an epidemic, there could be many individuals affected or only a few individuals affected. If number of cases is small, each and every case can be examined thoroughly and laboratory investigation undertaken for all of them. But if the number of cases is few thousands, it is not possible and also not essential to undertake lab investigations for each and every individual. In such situations, investigations may be carried out on representative sample of the affected cases to confirm diagnosis and find out the important information related to agent, host and environment and mode of transmission of the disease. But it is very important to take few blood or other specimens, as advised by the doctors before medicines are started. Otherwise proper lab. report will not come, since the disease organism will be neutralised by the medicines.

3.2.3 Estimate the Number of Cases

Using the 'working case definition' estimate the number of person affected. Collect relevant data such as age, sex, place of residence of the cases, history of travel, exposure to a suspected case and a detailed history about the symptoms. This information may be collected on 'epidemiological case sheet' from cases as well as from persons apparently exposed but unaffected.

To find out the total population exposed to the risk of infection, sometimes it is necessary to carry out a house-to house survey.

During an epidemic, there can be some overt (clear cut) as well as sub-clinical (hidden) cases. Identification of these sub-clinical cases or carriers is important from the point of view of the spread of the disease. Estimating clinical cases as well as sub-clinical cases is, thus, an important step in investigation of an epidemic.

3.2.4 Analyse the Data in Terms of Time, Place and Person

It is always good to take a paper and a pen to prepare the 'epidemic curve'. It is a simple and clear way to show the relationship between the occurrence of cases and their time of onset.

This can also be shown on the 'spot map' to highlight the affected area/region. It may help to show that the cases of food poisoning occurred close to a sewage treatment plant or its outflow or around a factory letting out toxic fumes/gases.

Calculate the attack rate of the infection. This can be done by considering the population at risk as the denominator and those individual affected as the numerator. Also calculate the attack rate/ case fatality rates for those exposed and those who are not exposed. Fig. 3.1(a) showing 'epidemic curve' of an outbreak of toxic food-poisoning, A single source acting for a brief period. Fig 3.1(b) showing 'epidemic curve' of an outbreak of viral fever starting from a single source and then maintained by case to case infection.

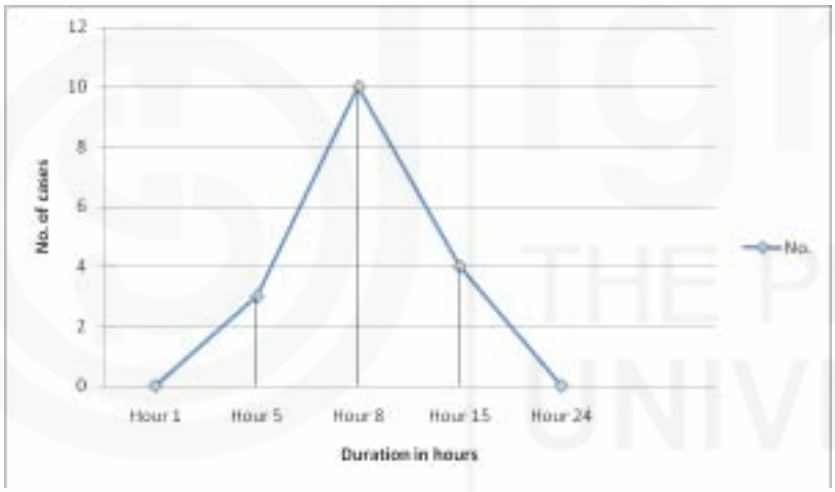

Fig. 3.1(a): 'epidemic curve'of an outbreak of toxic food poisoning, a single source acting for a brief period

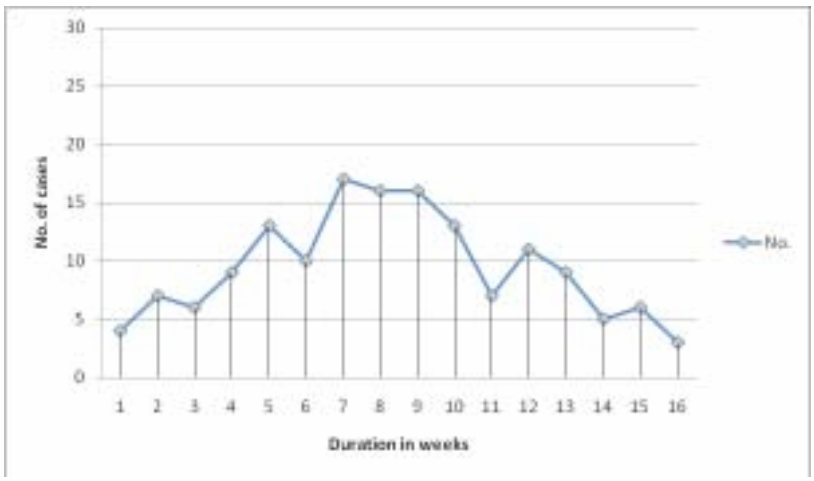

Fig. 3.1(b): 'epidemic curve'of an outbreak of viral fever starting from a single source and then maintained by case to case infection

In the case of outbreak of viral infection, as shown in Fig. 3.1(b), the infection gets prolonged due to multiple sources leading to more and more cases followed by gradual decline over a longer time than the single source outbreak. We can see multiple peaks and declines in the curve.

3.2.5 Determine Who is at Risk of Contracting the Disease

When outbreak occurs it is very important to determine the population at risk. For example, in water-borne disease, when the water supply of the area is contaminated, all the population receiving water from the contaminated source is at risk. Out of this risky population persons with the disease under consideration can be identified. These values of numerator (People with the disease) and denominator (Total population at risk) are essential for calculating incidence rate, prevalence rate, attack rate and case fatality rate.

$$\text{Incidence rate} = \frac{\text{New persons with the disease} \times 1000}{\text{Total population at risk}}$$

$$\text{Prevalence rate} = \frac{\text{Persons with the disease (old and new)} \times 1000}{\text{Total population at risk}}$$

Attack rate is usually the incidence rate used when the population at risk is exposed for a short duration of time during epidemics.

$$\text{Case fatality rate} = \frac{\text{Persons dying from the disease} \times 100}{\text{Number of persons with the disease during the specified time}}$$

When the outbreak is limited to certain population group like food poisoning among those who attended a party or feast etc. suffers infective hepatitis in a particular residential area, the investigation can be focussed on these restricted population groups at risk (who attended the party).

3.2.6 Preparation of Written Report

The most important step is to prepare a written report, which forms the basis for action by health officials. The report should be complete comprising the background information, methodology of investigation, analysis and interpretation of data such as agent, host and environmental factors, mode of spread of the disease. The report will help in preparation and implementation of preventive and control measures so that such outbreaks do not occur in future. Even if the outbreaks occur, it will help in better preparation to face the situation and institute control measures effectively within a short time. The report may also form the basis for reallocation of resources for disease prevention and control measures.

3.3 OUTBREAK OF ACUTE GASTRO-ENTERITIS/ ACUTE DIARRHOEAL DISEASE

Let us study the following case. There has been a report of 35 cases of acute diarrhoeal disease reported from village Barwala, Haryana during July 2016 in the routine outpatient clinic of the primary health centre located at Barwala. During 2013 to 2015, in the month of July, the reported cases of acute diarrhoeal disease in the health centre were 5,4 and 7 respectively.

The average number of diarrhoeal disease during past three years is (5+4+7)/3 =5.3 rounded to five and standard deviation of 1.52. The number of cases reported during first two weeks of July 2016 is 35, which is much more than the expected number of cases reported during past three years in the month of July (if two standard deviations are considered, maximum expected cases is 8.3, rounded to 8). Thus, there is an outbreak of acute diarrhoeal disease in the village which needs investigation.

The common causes of acute diarrhoeal disease are Shigella dysenteriae type 1 and Vibrio cholera. The initial hypothesis can be framed as "There is an outbreak of acute diarrhoeal disease probably caused by Shigella or Vibrio cholera". In order to establish this hypothesis, we must prepare standard case definition for suspecting the two causes of diarrhoeal disease. The sample case definitions are shown below.

3.3.1 Case Definitions

Standard case definitions for suspected case of acute diarrhoeal disease are:

In an area where the disease is not frequent and a patient aged five years or more develops loose stools with dehydration or dies from acute watery diarrhoea.

In a cholera endemic area, a patient aged five years or more develops acute watery loose stools, with or without vomiting.

A confirmed case of Vibrio cholera 01 or 0139 in a patient suffering from loose stools/ diarrhoea. Bacillary dysentery can be suspected if there is acute onset of diarrhoea with visible blood in stool.

Shigella dysenteriae type 1:

The symptoms include loose stool, abdominal cramp, fever, and rectal pain. Less frequent complications include sepsis, seizures, renal failure, and haemolytic / uraemic syndrome.

Vibrio cholera 01 and 0139:

The characteristic features are: rice watery stool with or without vomiting.

3.3.2 Confirming the Outbreak

The identified cases using the standard case definitions should be confirmed by clinical history, examination and laboratory testing of the stool samples which should also include determining antimicrobial sensitivities.

3.3.3 Case Finding and Estimating Geographical Distribution

The next step is identification of cases using the standard case definitions in the community. For this, we need to prepare an epidemiological case sheet which incorporates little important information for case detection, identification characteristics, and probable source of infection. The epidemiological case sheet should have the following information.

Table 3.1: Epidemilogical Case Sheet

Identification No.
Date and time:
Name:
Age:
Sex:
Address: Residence, workplace separately
Contact no:
Symptoms present, Date and time of onset:
Source of water supply:
Tap, hand pump, well, river, ponds, natural water body, etc.
History of travel outside:
History of intake of food items outside house, items taken:
Any medication taken and names if records available, where shown:
Any laboratory investigations: check and note based on available records:
Family members list with age, sex, any family member suffering from the infection, their onset day and time:

In areas where cholera and bacillary dysentery are endemic, cases occur every year with seasonal peaks usually during rainy season such as monsoon. Thus, one should be prepared to assess the occurrence of acute diarrhoeal diseases to find out whether there is a spurt in the cases and that too more than the usual expected number of cases during the season. If there is a spurt in the cases, one should go for active case finding to assess the magnitude of the outbreak using the case definitions. The cases should also be line listed on the basis of daily reporting and occurrence. Further, a spot map should be prepared to find out the geographical distribution of the cases.

An example of line listing of cases of acute diarrhoeal diseases in a Barwala village, Haryana is shown in Table 3.2. This includes information on signs, symptoms, source of water supply, travel history collected by rapid epidemiological case sheet.

Table 3.2: Line listing of cases of acute episode of diarrhoea in Barwala, during July 2016

						Signs and symptoms						
S.N	Date	Name	Age	Sex	Area	Loose stool	Pain abdomen	Fever	Vomiting	Dehydration	Water source	Travel outside
1	03-Jul	Raja	23	m	Sakurbasti	yes	no	No	no	yes	well	yes
2	04-Jul	Neeta	21	f	Sakurbasti	yes	no	No	yes	yes	well	no
3	04-Jul	Ritu	18	f	Sakurbasti	yes	yes	No	no	yes	well	no
4	04-Jul	Manu	24	m	Sakurbasti	yes	no	No	yes	yes	well	no
5	05-Jul	Santosh	23	m	Sakurbasti	yes	no	no	no	yes	well	no
6	05-Jul	Bhola	26	m	Sakurbasti	yes	no	no	no	yes	well	no
7	05-Jul	Jaydeep	21	m	Sakurbasti	yes	yes	yes	no	yes	well	no
8	05-Jul	Cheetu	28	f	Sakurbasti	yes	no	no	no	yes	well	no
9	05-Jul	Premchand	24	m	Sakurbasti	yes	no	no	yes	yes	well	no
10	06-Jul	Ishan	30	m	Sakurbasti	yes	no	no	no	yes	well	no
11	06-Jul	Purshottam	28	m	Sakurbasti	yes	no	no	yes	yes	well	no
12	06-Jul	Janki	25	f	Sakurbasti	yes	no	no	no	yes	well	no
13	06-Jul	Raghav	27	m	Sakurbasti	yes	no	no	no	yes	well	no
14	06-Jul	Chetan	26	m	Sakurbasti	yes	no	no	no	yes	well	no
15	06-Jul	Billo	45	f	Kumhargali	yes	no	yes	no	yes	handpump	no
16	06-Jul	Manav	37	m	Sakurbasti	yes	yes	no	yes	yes	well	no
17	06-Jul	Anjum	60	m	Sakurbasti	yes	no	no	no	yes	well	no

18	07-Jul	Bobby	52	f	Sakurbasti	yes	no	no	no	yes	well	no
19	07-Jul	Dhiren	26	m	Sakurbasti	yes	no	no	no	yes	well	no
20	07-Jul	Chandu	28	m	Sakurbasti	yes	no	no	no	yes	well	no
21	07-Jul	Jacob	25	m	Kumhargali	yes	no	no	no	yes	handpump	no
22	07-Jul	Nutan	23	f	Sakurbasti	yes	no	yes	yes	yes	well	no
23	08-Jul	Pappu	43	m	Sakurbasti	yes	no	no	no	yes	well	no
24	08-Jul	Devendra	34	m	Sakurbasti	yes	no	no	no	yes	well	no
25	08-Jul	Mahender	24	m	Sakurbasti	yes	no	no	no	yes	well	no
26	08-Jul	Reena	26	f	Sakurbasti	yes	yes	no	no	yes	well	no
27	08-Jul	Rajesh	27	m	Sonargali	yes	no	no	no	yes	handpump	no
28	09-Jul	Gopal	32	m	Sakurbasti	yes	no	no	no	yes	well	no
29	09-Jul	Sunita	33	f	Sakurbasti	yes	no	no	no	yes	well	no
30	09-Jul	Jarnal	45	m	Sakurbasti	yes	no	no	yes	yes	well	no
31	10-Jul	Kannu	25	m	Balmikibasti	yes	no	no	no	yes	handpump	no
32	11-Jul	Tanu	35	f	Sakurbasti	yes	no	no	no	yes	well	no
33	11-Jul	Kallu	28	m	Sakurbasti	yes	no	no	no	yes	well	no
34	12-Jul	Birender	25	m	Sakurbasti	yes	no	no	no	yes	well	no
35	13-Jul	Kulwant	34	m	Sakurbasti	yes	no	no	yes	yes	well	no

m= male, f= female

3.3.4 Analysing the Information

Time distribution:

The data collected should be entered in the computer or prepared manually if computer is not available. Excel sheet in computer can be used for this. The above Table 3.2 is an example of entry in the excel sheet of the computer. Manual preparation of this master sheet can also be done. The data can be analysed as per time of onset and number of cases. It can be plotted as a curve as shown in fig. 3.2. There is an increase in the number of cases with the first case reported on 3rd July with a peak of 8 cases on 6th July. Fig. 3.2 showing Line diagram with number of cases of acute diarrhoeal diseases in July.

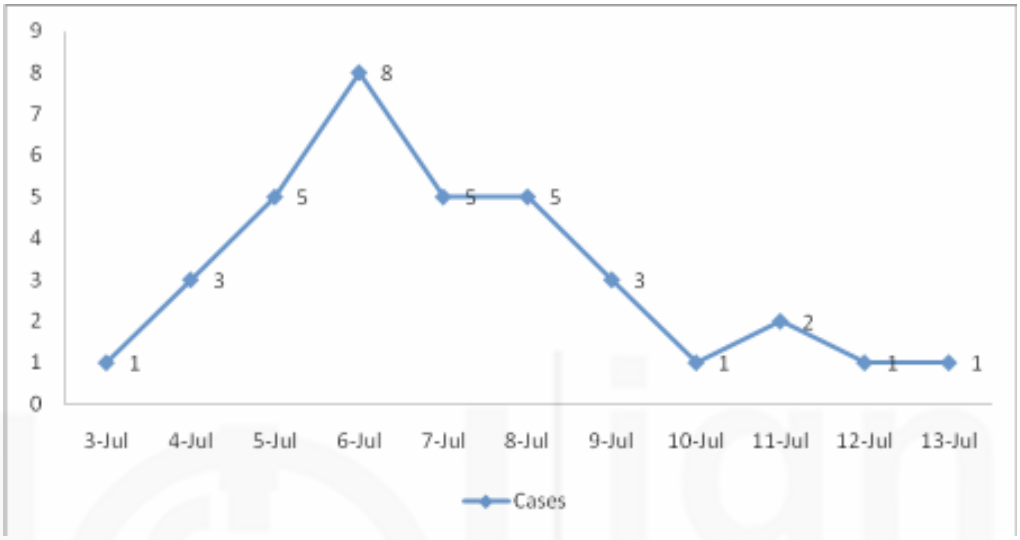

Fig. 3.2: Line diagram showing number of cases of acute diarrhoeal diseases in July

Thereafter, the cases have declined with the last case on 13th July. Thus, the outbreak lasted for 10 days. It seems that there is a common source for the outbreak. To understand the situation better in terms of geographical distribution, a spot map can be prepared. In this, important landmarks, distribution of cases, water supply sources, health centre etc. are mapped. An example for the above cases is shown in Fig. 3.3.

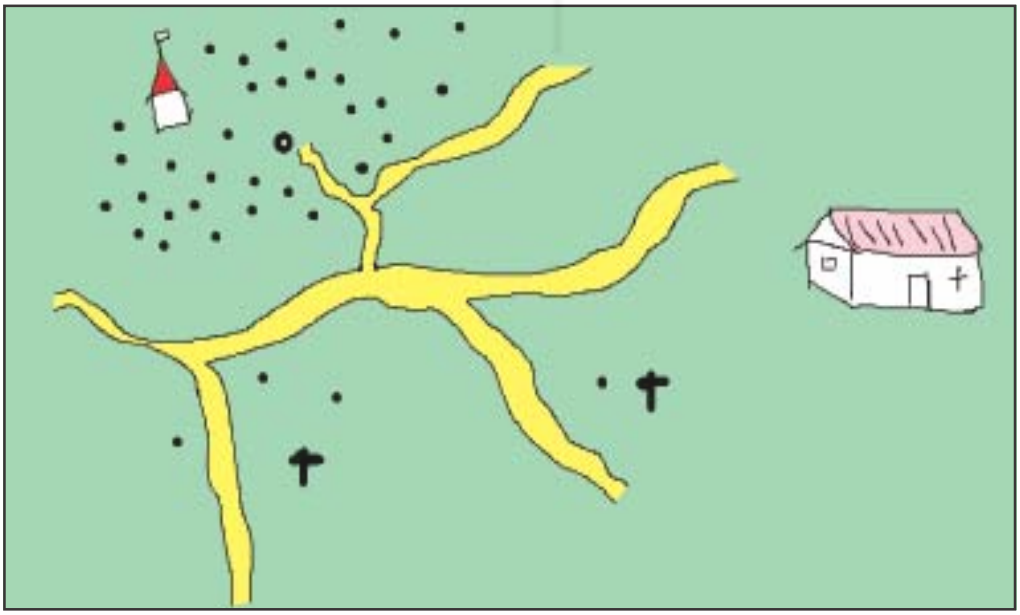

Fig. 3.3: Spot map showing distribution of cases of acute diarrhoeal disease in Barwala

The spot map shows landmarks such as a temple, well, health centre with roads. There are three areas in the village broadly viz. Sonargali, Kumhargali, Balmiki Basti and Sakurbasti. The source of water supply in Sakurbasti is from a well whereas for the other localities is from hand pumps. There is clustering of cases of diarrhoeal diseases in Sakurbasti and few scattered cases in other localities. This indicates probably the well could be the main source for the outbreak.

The next step is estimation of cases by age, sex and by area or locality. For this calculation, the number of cases are arranged by age and sex as shown in Table 3.3.

Table 3.3: Age group wise distribution of the cases of diarrhoeal diseases

Age Group (in years)	Number of Cases	%
Upto 24	9	25.7
25-34	19	54.3
35-44	3	8.6
45 and above	4	11.4
Total	**35**	**100.0**

However, this does not tell which age group was most common but only tells the maximum number of cases. Hence, the distribution should also include the total number of persons surveyed in each age group. Once this is obtained, we can calculate the age specific attack rate of diarrhoeal diseases. Thus, the age specific distribution is shown in Table 3.4. It shows that the attack rate was maximum i.e. 27.1% in 25–34 years age group followed by 18.0% in persons aged up to 24 years.

Table 3.4: Age specific distribution of the cases of diarrhoeal diseases

Age Group (in years)	Number of Cases	Out of	Attack Rate (%)
Upto 24	9	50	18.0
25-34	19	70	27.1
35-44	3	40	7.5
45 and above	4	45	8.9
Total	**35**	**205**	**17.1**

Similarly, we can also calculate the attack rate according to sex difference. This is shown in Table 3.5. It shows that attack rate was 23.8% among males as compared to 10% females.

Table 3.5: Sex specific distribution of the cases of diarrhoeal diseases

Sex	Number of Cases	Out of	Attack Rate (%)
Male	25	105	23.8
Female	10	100	10.0

We can also find out the attack rates in different localities or areas of the village. This is shown in Table 3.6.The attack rate was maximum in Sakurbasti (44.3%) as compared to other localities thereby suggesting that some factor specific to Sakurbasti was responsible for the diarrhoeal outbreak. Since diarrhoeal diseases are transmitted faeco-orally the probable cause could be contamination of water supply. This can be supported by studying the source of water supply in the localities.

Table 3.6: Locality wise distribution of the cases of diarrhoeal diseases

Locality	Number of Cases	Out of	Attack Rate (%)
Sakurbasti	31	70	44.3
Balmikibasti	1	50	2.0
Kumhargali	2	40	5.0
Sonargali	1	45	2.22
Total	**35**	**205**	**17.1**

On analysing the water supply source from Table 3.2, we can see that all the cases from Sakurbasti had water supply from the well. This is shown in the spot map at Fig. 3.2. This gives an indication that well water was contaminated. Hence water samples from the well as well as from the hand pumps in the other localities should also be collected for microbiological testing in order to find out the aetiological agent for the diarrhoeal disease. In addition, stool samples from the patients should be collected for microbiological testing of the agents. However, it should be noted that those patients who have already taken treatment with antibiotics will not yield positive tests for the microbial agents and hence their stool samples should not be collected. Few contacts mostly the family members can be contacted for taking rectal swabs for assessing the carrier state of the microbial agent. The results will determine the causative agent responsible for the outbreak.

In order to arrive at the probable diagnosis, the clinical features of the cases should also be analysed in terms of the presenting signs and symptoms. This can be compared with the case definition and presumptive diagnosis based on the clinical picture can be made. The summary of the signs and symptoms of the cases is sown in Table 3.7.

Table 3.7: Distribution of signs and symptoms of the diarrhoeal disease cases

Signs and Symptoms	Number of Cases	Per cent (n=35)
Loose stool	35	100.0
Pain in abdomen	4	11.4
Fever	3	8.6
Vomiting	8	22.9
Dehydration	35	100.0
Blood/mucous in stool	0	0.0

3.3.5 Clinical Presentation

Based on the Table 3.6 the common signs and symptoms of the diarrhoeal disease cases are loose stools without blood or mucous, with dehydration followed by vomiting and pain in abdomen. The presentation seems to be more likely that of bacterial origin probably Vibrio cholera since the area was prone for cholera based on earlier outbreak reports. Further, on enquiry of the nature of the loose stools, in 50% cases the nature was rice watery stool suggestive of cholera. In this manner, the presumptive clinical diagnosis can be made. It can be corroborated with the microbiological reports of stool samples and water sample tests.

3.3.6 Case Fatality

The severity of the outbreak can be assessed by calculating the case fatality rate. In this example, two cases have reportedly died. Thus, the case fatality rate is $2/35 \times 100 = 5.7\%$. If the case fatality rate is higher, it indicates the severity of the outbreak which could be related to the virulence strain of the microbe, and or the availability of facility or lack of effective medications for treatment of the cases. These factors should be brought out during the analysis for further recommendations.

3.3.7 Assessing Local Response and Immediate Needs

This is an important aspect of investigation of any disease outbreak. Investigation of the outbreak should be continued alongside with institution of treatment of cases, prevention and control measures. This cannot be done by health sector alone but with active participation of the community. Hence, there is a need to assess the community participation. From the health sector side, we should assess whether any steps have been taken by the health officials and ask whether there is any plan of action, standardised reporting procedures, and whether any trained staffs are available to deal with the outbreak. There should be guidelines for management of cases, and ensure the availability of essential drugs such as oral rehydration salts, soap, bleaching powder or chlorine tablets (for chlorination of water at source or at household level). In case of large outbreaks, there is a problem of space for admission of patients in the primary health centre or health facility level. Under such circumstances, a building such as school, community hall etc. can be identified and disinfected for admission of patients temporarily.

From the community or civil society side, the community leaders, panchayat members, ASHA workers, anganwadi workers, volunteers need to be identified and they should help in identification of cases at the household level, educating people about safe water and sanitation, controlling panic among the people, and even in transporting patients in severe cases to the higher health facility. They can also help in reporting and identification of new cases in the community for surveillance.

3.3.8 Local Epidemiological Surveillance

Local epidemiological surveillance is necessary till it is confirmed that no such new cases are occurring in the community. For this, the help of both local volunteers, health staff in the sub-centres, anganwadi workers, ASHA workers, community leaders should work in tandem to report any new case. Further, active alertness on the part of the health staff at the health centres is necessary to suspect any new case using the standard case definition.

3.3.9 Reporting the Outbreak

The final step in outbreak investigation is report writing and reporting to the health authorities. In the above example on outbreak investigation of diarrhoeal diseases, the report should contain information on the background, methods, analysis, whether there was an outbreak, whether the clinical features were confirmed by laboratory test results, the number of cases, deaths, geographical distribution of the cases, the size of the population at risk, whether it was a common source outbreak or transmitted from multiple sources or from person to person, the source of infection, antimicrobial sensitivities, control measures instituted, reporting mechanism both at the national and international level, status of resources available for containment or any lacunae, case management, and recommendations. In addition, newer hypothesis can be put up if no imminent cause and sources cannot be identified. In the above example, we can put this question: how was the water in the well contaminated and how the primary case got the disease ? There is an indication that the first case (Raja) had travelled outside the village and got the disease. And on further enquiry, his family does not have a sanitary latrine and they go outside in the field near the well for defaecation. Probably the well water got contaminated due to open defaecation. Thus, this hypothesis could be put forward for the outbreak and preventive measures should also include provision of sanitary latrines in the community.

3.4 LET US SUM UP

In this unit, we have discussed the steps in the investigation of outbreak/epidemic using epidemiological principles. The example used here is of acute infection and similar method can be adopted for chronic diseases such as diabetes with suitable modifications. The steps in the investigation of an outbreak/epidemic are summarised as follows.

Verify the existence of an epidemic/outbreak, Confirm the diagnosis, Rapid assessment of the magnitude using epidemiological case sheet, spot mapping, determine the risk population, assess time, place and person distribution of cases, may develop a hypothesis for the epidemic/outbreak occurrence, plan a more systematic study, analyse data collected and prepare a report, take control, preventive measures and treat the cases and appropriate referral as per need, propose measures for control and preventive measures.

3.5 KEY WORDS

Epidemic : Occurrence of disease in a community or region that is unusually large or unexpected for the given place and time. It can be ascertained by looking at the data of previous years, usually three or more can be used for estimating the average number of cases and if the number of cases are more than two standard deviations from the mean number of cases, epidemic can be suspected. In areas where no case has been reported or controlled/eradicated, even a single case can be declared as outbreak.

Outbreak : Smaller epidemic in an area is usually referred to as outbreak. This does not create panic among the people as compared to epidemic.

Attack rate : It is an incidence rate, used when the population at risk is exposed to the outbreak for a limited period

Incidence : Number of new cases occurring in a defined population during a specified time period.

Prevalence : Total number of old and new cases existing in a population during a specified time which can be point or period.

Spot map : This is a map drawn to highlight the outline of a place, region, with prominent or specific landmarks, and to show the occurrence of cases which can give an indication about the clustering and source of disease occurrence.

3.6 ACTIVITY

Observe the pattern of disease outbreak during change of season from summer to rainy season/winter to summer as per need, collect information about the various symptoms and document using epidemiological case sheet and analyse data of occurrence of the disease.

3.7 REFRENCES

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