

Cholera Outbreak in Funpur, Winland

Muhammad Nadeem Shah¹, Esra Saleh Haggar², Eva Mertens^{3,4,*}, Hedia Bellali^{5,6}, Elizeus Rutebemberwa^{7,8,9}

* Corresponding author, Email: info@gibacht.org

Institutional affiliation

1 National Emergency Operation Center, Pakistan

2 Sudanese American Medical Association, Sudan

3 Bernhard Nocht Institute for Tropical Medicine Hamburg, Department of Infectious Disease Epidemiology, Bernhard-Nocht-Strasse 74, 20359 Hamburg, Germany

4 Global Partnership Initiated Biosecurity Academia for Controlling Health Threats (GIBACHT), Hamburg (Germany)

5 Epidemiology and Statistic Department, Abderrahmen Mami Hospital, Ariana, Tunisia

6 Medical Faculty of Tunis, Tunis El Manar University, Tunis, Tunisia

7 Programs, African Field Epidemiology Training Network, Kampala, Uganda

8 Makerere University College of Health Sciences, Kampala, Uganda

9 Global Partnership Initiated Biosecurity Academia for Controlling Health Threats (GIBACHT), Kampala, Uganda

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Acknowledgements

We wish to acknowledge the Global Partnership Initiated Academia for Controlling Health Threats (GIBACHT) and their funding body, the German Federal Foreign Office, for their support in developing this case study.

Abstract:

Vibrio Cholera is a category B agent which has moderate to high potential to be used in bioterrorist events. This fictitious case study is based on man-made outbreak investigation and response carried out by disease surveillance and response unit of country Winland. The numbers of acute watery diarrhoea cases (AWDs) were concentrated in city Funpur of country Winland which share international border with Robiland, another country with poor health infrastructure. Regular movement of nomadic population between two countries has additional risk of international spread. This case study is designed for the training of public health students and workers on steps of outbreak investigation, packaging of biological samples, understanding IHR reporting algorithm, understanding difference between biosafety and biosecurity, different categories of bioterrorism organisms and PPE & its zones. This case study can be used as supporting training tool for application of learned concepts to a real situation and can be carried out in 2-3 hours.

Key Words: Man-made Outbreak, Biosafety, Biosecurity, International Health Regulation

How to use the case study:

General instructions:

This case study is a supporting teaching training tool designed for application of learned concepts to a real situation. This Case study is to be used for beginner and intermediate level trainees. During teaching sessions, the trainees can be divided into smaller groups of 5-8 persons and each person can be asked by a facilitator to sub-facilitate a particular section. The facilitator needs to guide the overall discussion and bring discussion back on track, through questions, whenever the group loses the direction. He/She may also use flip charts to explain certain points.

Target Audience:

The study aims to target all public health workers with beginner to intermediate level training. Field Epidemiologists, Environmental Health Officers, Laboratory Scientists, Health Educationists and Epidemiology students are key public health officials to be targeted

Pre-requisites:

Participants need to be aware of disease surveillance and outbreak investigations concepts.

Materials needed:

Pen, Papers, markers and Flip Papers/Charts

Time required:

2-3 hours

Language:

English

Participant's Guide:

Goal of Case Study

To review and simulate a public health response to a man-made outbreak through invented and fictional events

Learning Objectives

At the conclusion of the session, participants will be able to:

- 1) List the steps of an outbreak investigation
- 2) Know the packaging for biological samples & information required to be sent to lab
- 3) Understand IHR reporting algorithm for a disease outbreak
- 4) Understand the difference between biosafety and biosecurity
- 5) Understand categories of bioterrorism organisms
- 6) Understand use of PPE and work on its zones

Section 1: At the office

On September 23rd 2017, 8.45 am.

You are on way to your office. Near Central Square, your mobile phone starts ringing. You look at phone; this was a landline number of personal assistant (PA) to Director General Health of your country. You parked the car on side and picked the mobile up

"Hi! Dr Noor, how are you?" It was Anna (PA to DG Health)

"I am fine, what about you?"

"I am fine too. There is a meeting in main conference room of directorate at 10:00 am today and DG asked you to join it "

The meeting called, was not a planned one so you asked about agenda.

"I think the main discussion will be around acute watery diarrhoea outbreak in Funpur", she replied.

You are the lead of disease surveillance & response unit of country "Winland". There was a report of increased number of AWD (acute watery diarrhoea) in city Funland you received yesterday but due to reported Niegeleria cases from the capital, you ignored this initial report on increased number AWDs in Funpur. Today, news channels & papers used the word "Outbreak" for these cases.

As Directorate office was only 5 minutes walking distance from your office, you decided to move from office for the meeting. You reached your office. Miss Simala offered you a cup of tea. She is an internee in your office who just completed her class work of master in health communication. She is hardworking and you always enjoy her "Darsai" style of speaking English.

"There seems some problem in Funpur. Did we receive any further report on this?" You asked Simala.

"No. instead I contacted data room on this. But was told that Mr Raj (senior statistician) is on leave for three days and only key operations are managed by a junior data analyst"

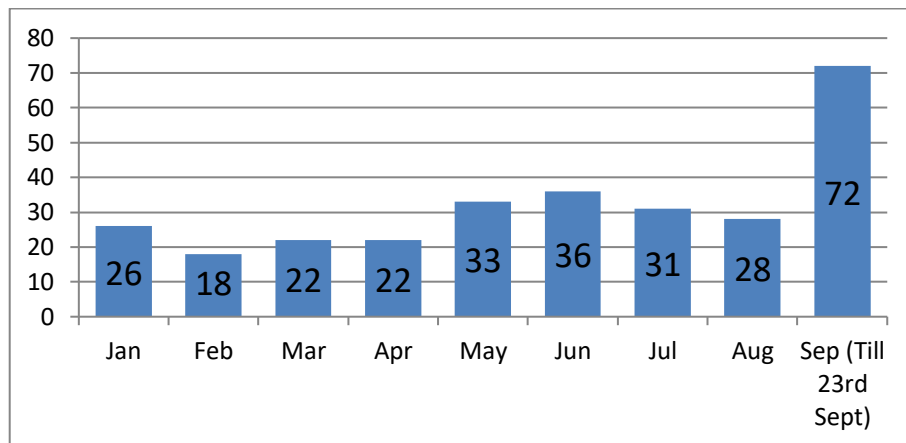
"So that's the reason that we did not receive a full report on this as Mr Raj is on leave"

"Can you please help me collect demographic & geographical details of Funpur as you seem to belong from there?"

"No. My parents are from there. I am from capital but I can speak Darsai. I will collect the required information for you"

You smiled. You moved to meeting. The following graph was the main discussion point.

Number of Acute Watery Diarrheal Cases reported from Funpur-2017



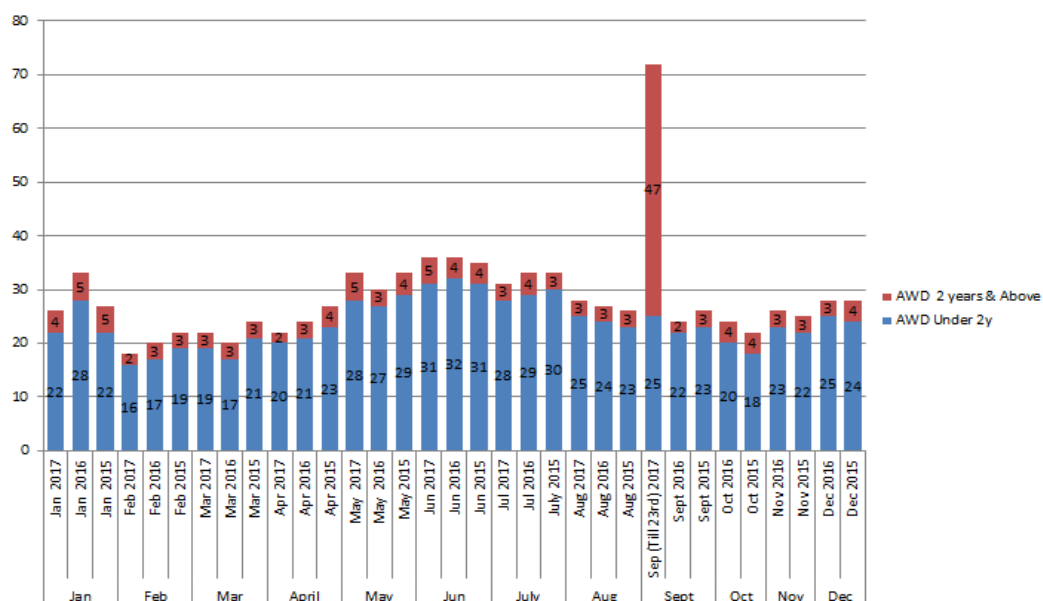
The Director General for Health was a senior officer and was recently appointed to this post due to his seniority but all his previous experience was clinical. Based on above graph, he termed it as outbreak in Funpur and asked you to prepare for its response

Q.1: Do you agree with Director General Statement that the above graph is enough to declare an outbreak in Funpur? If no, what other possible things can it be?

Answer:

You promised the DG of health to proceed on it. Immediately after meeting, you moved to data room and asked a junior data analyst to compare the data according to months for the last two years. You also asked him to segregate this data into under 2 years of age and above 2 years of age. The outcome was a graph shown below.

Comparative Number of Cases reported from Funpur 2015-17 (Till 23rd-Sept 17)



At the same time, you received a WhatsApp message from Simala that two deaths had been reported from Funpur. Based on available data and deaths you started to prepare for investigation. You are now of the view that there is something really going wrong in Funpur which needs your investigation. You immediately decided to respond to it. You need the support of a multi-disciplinary team to respond to this outbreak.

Q. 2: What will be composition of your investigation team?

Answer:

You returned back to your office. Simala handed over a few papers to you with following information.

Funpur is the North West city of your country “Winland” which borders with a neighbouring country Robiland. The climate of this city is hot semi-arid with average annual temperature of 18.5 °C. In July, the average temperature remains 32.0 °C which makes it the hottest month.

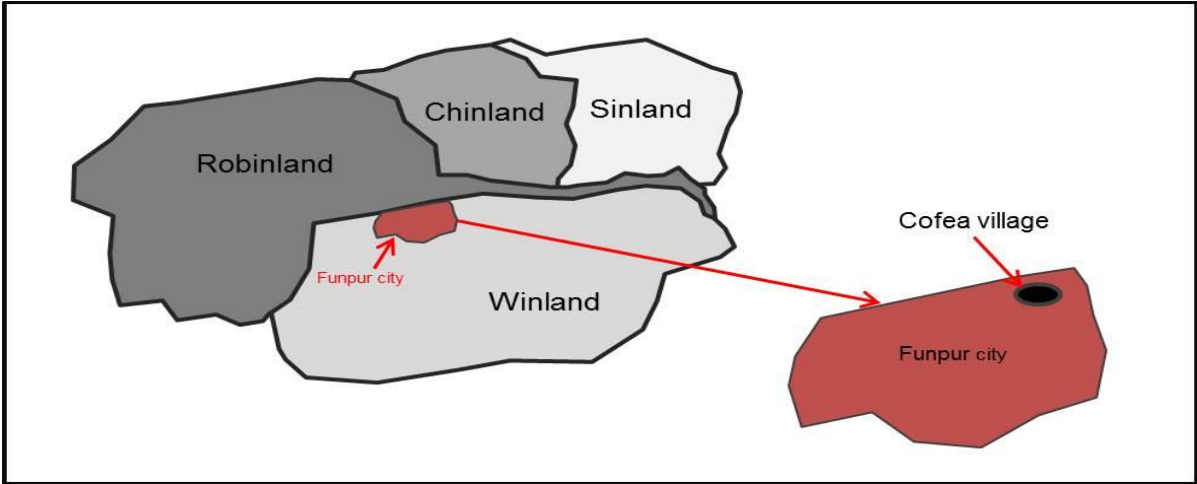
The climate of Funpur favours growth of potatoes, tomatoes and onions in this area which is supplied in other cities of country and also exported to Robinland. But the main unofficial crop remains “Opium poppy culture” in the area which makes this area rich, security compromised, and an abode of criminal elements. In addition, some of the criminal factors have links with a terrorist group “Sandesh” which has roots at both side of borders. Different killings and abductions are often associated and owned by this group.

The total population of this city is only 42000. The language is “Darsai” which is spoken by 98.5% of people. The indicators of this city for health and education are very poor. The literacy rate in 2016 for population over 10 years was only 18% with females at 5%. The people are not only against female education, but they are also against immunisation. The overall percentage of fully immunised children (aged 12-23 months) is only 12% with again boys at 18% and girls at 8%. According to a survey, only 16% of pregnant women had tetanus toxoid and 73% of deliveries are conducted at home, mostly by unskilled attendants. There is one city hospital and two BHUs in the city and one T.B clinic run by an NGO.

Funpur also shares similar tribal, social, cultural and economic norms to adjacent villages on the other side of border. The population of these villages is termed as straddling population as they have strong family and professional connections. Some of people even cross the border on daily basis for professional reasons.

Kofea is a village of Funpur with about 2500 population. It has a 10 km border with “Shaki” village of Robiland.

Figure 1: Map specifying the location of Funpur City, Winland



You also decided to add Simala in your team. As this was her first outbreak as an investigator so you asked her to list down steps of an outbreak investigation.

Q. 3. Can you help Simala to list down the steps of an outbreak investigation?

Answer:

Your team left for Funpur in a flight at 5:30 pm

Section 2: In the field - Funpur

2.1 Introduction

On September 23rd 2017, 7:30 pm.

You reached Funpur. As advised by DG Health, you contacted Deputy Commissioner (DC) of Funpur who was still working in his camp office (camp office is office of DC within his residence mainly used in evenings) so he asked if you could join him there. He also called District Health Officer (DHO) of Funpur. You reached camp office in 25 minutes. Deputy Commissioner (DC) was a young officer and was administrative head of Funpur. All major departments of district including health and law enforcement agencies were under his command. DHO said that there is an addition of 9 cases in hospitals since morning. He added that they have established a separate “diarrheal treatment centre” in hospital in one of its underutilised wards. He also told you that they have maintained “basic details” of these patients which is available both at hospital & his office. He told you that doctors are managing these cases and an emergency is declared in the hospital. After DHO brief, Deputy Commissioner looked at you. You briefed him your plan for carrying out the investigation and control of outbreak. He assured you of his full support. Based on the security situation, he deployed few police officers along with you. He has given you his personal mobile number where he could be contacted at any time. At the end of meeting, you asked DHO:

“May I know what case definition are we using for capturing patients?”

“Well, we have it as “all acute watery diarrhoea patients from Funpur in children up to age 10 years and males above 10 years of age”, he replied:

“And why adult females are not included in this case definition?” You inquired:

“Well, no adult female has reported to us with these symptoms”, he replied:

“Have you searched patients within community?”

“No, we have not done it yet”

You looked at your team. You knew that what is visible could only be a “tip of iceberg”. You requested DHO to modify case definition. He asked you to provide a case definition.

<p>Q4. What Case definition based on available information will you propose? Answer:</p>
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And you also have an idea that there are many unreported cases in community.

<p>Q.5 What would you do to find additional cases? Answer:</p>
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This was a busy day. You reflected on overall activities of day with your team and planned visiting Taluka hospital and village “Kofea” on the next day. You also designed a questionnaire for interviews with patients.

2.2 Sampling, Packaging & Labelling

September 24th 2017, 8:30 am

There was a real emergency in City hospital. Sleepless nights were evident on faces of staff. The Medical Superintendent of Hospital gave you a brief. He told you that there were 6 more cases admitted in hospital the previous night. No female had yet reported to hospital. He provided you basic details of cases which were like a line list. You reviewed all the basic details of these cases. 80% of cases were from “Kofea” village, 16% cases of cases were from “Hedia” village and the remaining 4% were from a nomadic population at a 3 Km distance from Kofea village. You divided your team into three, one to stay at hospital and interview the cases, the second to move to Kofea village and the third to move to Hedia village. They were expected to actively search for cases in the community and interview them. You, yourself, decided to go to the nomadic population for the same purpose.

You were about to leave for nomadic population, but the medical superintendent of hospital raised a query that they are effectively managing the patients as “suspected cholera” but a definite diagnosis is still lacking at their end. He said that staff is so fearful that nobody wants to collect sample. He requested you to help them in this regard.

Q6. What sample will you collect from these patients for diagnosis of the outbreak?

Answer:

Q7. What safety measures will you take to collect samples?

Answer:

Samples were collected and you asked the Medical Superintendent to send it through courier to National Lab in proper packaging and required information.

“But we never sent a sample to National Lab so we do not know what is “proper packaging” and “required information”? Medical Superintendent said to you

Q8. What kind of package is necessary to prepare these samples for transport?

Answer:

Q9. What kind of information should be included with the samples sent to the laboratory to ensure appropriate testing?

Answer:

2.3 International Health Regulation (IHR)

September 24th 2017, 11:45 am

You visited the nomadic settlement. One of the DHO staff was with you. These were the seasonal migrants who came there in June of 2017 not only from Robinland but also from Chinland & Sinland. You found seven more cases of AWD in this population. Two of these were adult females who use to work in opium poppy field of Kofea village. After interviewing them, you referred these patients to hospital but they refused to follow your suggestion. They said that they will be travelling back to their respective countries in next two days. You tried to counsel them but they refused. Their leader pointed in the sky and said:

“Stars are telling us to move now to our own mountains”.

Overall, you have the perception that the outbreak can spread beyond the borders.

Q10. Do you think this event need to be reported to IHR focal person of your country? If yes, why? (Refer Annex 1)

Answer:

Section 3: Analytic Part

September 24th 2017, 5:30 pm

Your team is back. There were 69 more cases in the community. 95% of these were adult females and 83% were from Kofea village. 17% of remaining cases were from Hedia village. It seemed that outbreak was limited only to these places (Kofea, Hedia & nomadic settlement). The overall culture was against hospitalisation of females or their treatment by male doctors. Luck favoured till now as there was no deaths in these females even though most of them were severely dehydrated. You and Simala went to community elders and convinced them to allow establishment of a “temporary diarrheal treatment centre” in Kofea village for females. You assured them only lady doctors and staff will be treating these patients. Initially, community elders refused to do so but your respectful and trustful behaviour convinced them. A temporary diarrheal treatment centre was established with help of DHO and lady doctors and staff were deployed there.

You reviewed data of all cases and found that most of cases were linked to drinking water from “canal” having downward flow from Hedia village to Kofea village. You decided to assess the hypothesis that the consumption of water from the canal was the source of this outbreak.

Q11. What study design would you choose to test your hypothesis? Why?

Answer:

Q12. What will be your choice of selecting 'control" & why?

Answer:

Following are odds ratios for different risk factors documented by your investigation team.

Risk Factors	Matched Odds ratio	95% Confidence interval	P-values
Drinking water from wells	0.25	(0.7 – 2.4)	0.8
Drinking water from canal	3.05	(1.12-5.17)	0.02
Eating food at marriage ceremony three days back	1.3	(0.2 – 3.7)	0.89
Washing hands after using the toilets	0.79	(0.3-2.56)	0.45
Washing hands before eating	0.9	(0.2-3.2)	0.5

Q13. Based on above tabulated data, which risk factor is most likely a contributing factor to ongoing outbreak?

Answer:

Section 4: Biosafety/Biosecurity

You asked villagers of Kofea to avoid canal water and use well water instead. Your analysis was telling that the same canal water was not source of outbreak in Hedia village. So, in your view, the source of contamination was in between these two villages. You moved with team to track the source of contamination. You found nothing except a “fort like building” which was situated half km distance from Kofea village.

“Can this building be a source of contamination”, you asked yourself

You can't ignore this building. You wanted to inspect this building but you were told that this is very difficult as this building belongs to “Sandesh”. You returned back to Kofea and met with community elders there. Fear was evident in their eyes. They told you that they received a letter from same group one month back asking them to leave the area.

“But this is our land, how can we leave it. We prefer deaths on this”. Said the eldest community leader.

You asked them to show the letter. They showed you the letter. (Annex-2)

“Sometimes we have perception that all these diseases are caused by Sandesh but how can man cause disease?”, said another person in the group

“There was a foul smell with black smoke originating from this building few days back which also created some breathing problem in us”, first person added.

Q14. Do you think that an outbreak can be caused by man/or group of people? What does the term bio-security imply?

Answer:

Q15. What are different agents which can be used for harmful purpose and in how many categories are they divided?

Answer:

Considering the factor of biosecurity event, the situation becomes complex. You called deputy commissioner and briefed him about overall situation. He, himself reached there with additional security. Police surrounded the building and some of them entered into it. The main door was opened by police in an hour. There was no body in the building except two security guards. Police searched every room. They found different weapons and bags of opium in these rooms. There was one big room in the basement which seemed a laboratory to them. Police was afraid of entering in it without protective equipment. They were not aware of exact protective measures. They requested you to help them in this regard and accompany them to search that laboratory. You agreed to it.

Q16. What exactly is PPE? And what type of PPE will you use before entering the lab?

Answer:

Q.17. What is biosafety? And how does it differentiate from biosecurity?

Answer:

You selected most experienced team member for applying PPE. Before applying PPE, different zones were established. Simala was new to all these so she asked you

Q 18. What are different work zones? In which work zone PPE is donned? What would be your answer?

Answer:

Q 19. What is donning and doffing of PPE?

Answer:

You searched the laboratory. You also took different samples from there which were sent to National Lab in proper packaging.

You successfully investigated and controlled the outbreak. Your own department and administrative department appreciated your work. Patient sample and samples collected from "Sandesh lab" showed El Tor V. Cholera and vaccine strain of anthrax was additionally found in one of sample collected from "Sandesh lab". Many eyes and hearts were thankful to you. But DG wanted something more from you. He said:

"This is first biosecurity event of Winland so we must work on National guidelines of bio-safety and bio-security". He asked you to draw basic sketch of this guideline

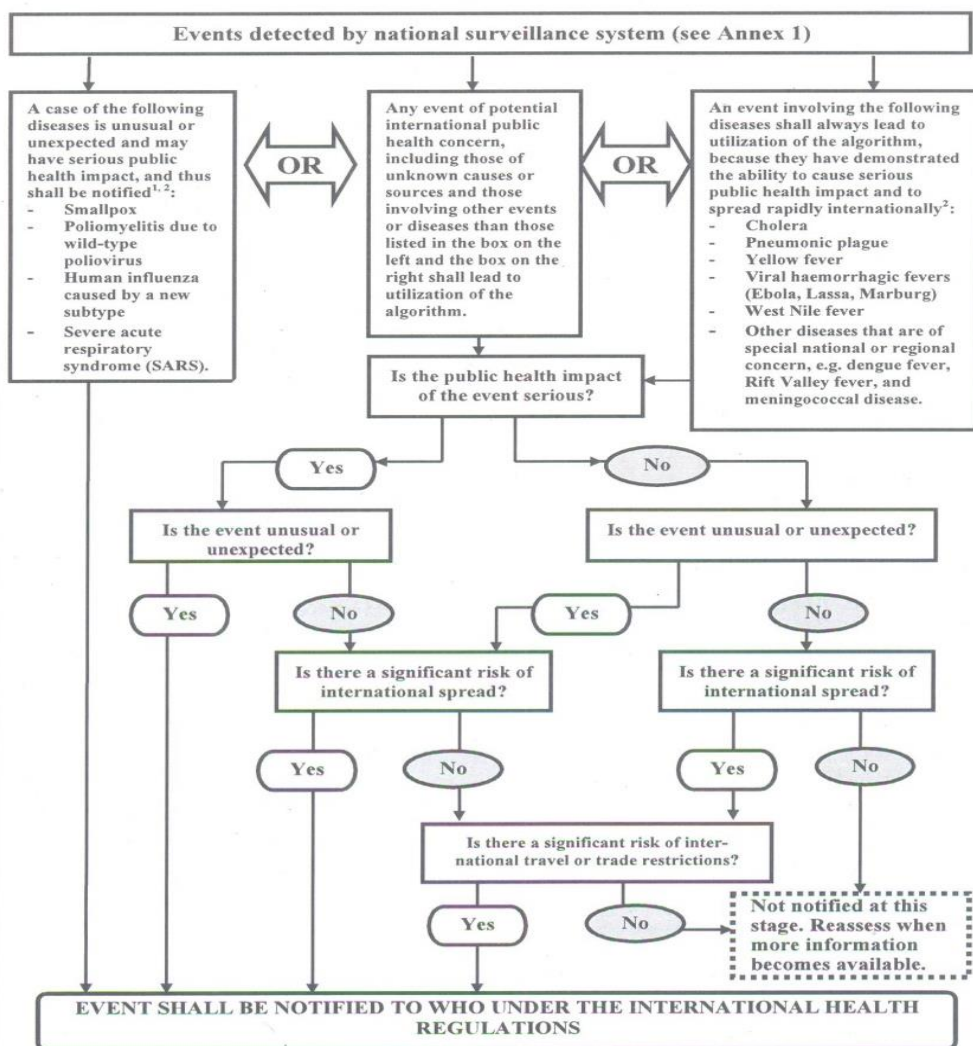
Q. 20 What components will you like to cover in this guideline?

Answer:

Part 3: Annexes

Annexure-1

ANNEX 2
DECISION INSTRUMENT FOR THE ASSESSMENT AND NOTIFICATION OF EVENTS THAT MAY CONSTITUTE A PUBLIC HEALTH EMERGENCY OF INTERNATIONAL CONCERN



¹ As per WHO case definitions.

² The disease list shall be used only for the purposes of these Regulations.

[1]

Annexure-2

Sandesh



The life is precious, but something is there which is more important than life. This place is selected for a great purpose so it's better for you to leave this place. If you leave, you will be saved. Otherwise, there will be deaths, famines and disasters. You have only one month to do so. Death will be your destination, if you do not choose any destination.

References

1. World Health Organization, *International Health Regulations (2005)*. Third ed. 2016, Geneva: WHO Press.