

PANDEMIC

Introduction

This unit is about diseases that pass from person to person and infect many people right across the world. Pandemics cause the deaths of millions of people. Each death is a tragedy for the person whose life is brought to an early end and who misses out on the good things that life has to offer. It is also a huge blow for their loved ones; their family and friends who will lose someone dear to them and whose lives will be affected by their loss. As fellow human beings we share and feel the pain of others. Out of concern for all humanity we must try to understand the scientific causes of pandemics and find ways to reduce their prevalence and the suffering they cause.

Definitions

Infection: An infection occurs when germs (bacteria, viruses or parasites) invade the body and start to multiply causing disease.

Epidemic: When an infection spreads from person to person causing disease through *a whole community*.

Pandemic: When an epidemic spreads from country to country, *across a continent or worldwide*.

Immune: If a person is immune to a disease, they have antibodies from a previous infection which protect them from getting it again. Immunity can wear off after a time. (eg. Immunity to malaria lasts only a year.)

Susceptible: When a person has no immunity to a disease, they are said to be susceptible, which means they are likely to become ill from it if they become infected.

Major Pandemics

COVID-19 (Started December 2019)– Started in Wuhan in China. Caused by a virus. It is thought the virus came from bats, passed into chickens that ate the bat droppings and then to humans from eating poorly cooked chicken. Once it got into the human population the virus spread quickly from person to person, in droplets in coughs and sneezes.

The virus, which caused the Covid-19 disease, lives for up to 3 days outside the body. So, if a person touches a surface with the virus on it, then touches their mouth or eyes the virus can get into the body and start an infection in them. It is a problem because it is a new virus that all people are susceptible to. The disease spread rapidly across the world, through infected people travelling between countries, and by March 2020 over a half a million people had caught the disease and 30,000 had died through respiratory failure.

To slow the spread of the disease people have used:

Hand washing with soap – the soap kills the virus so long as it is in contact with the virus for 20 seconds.

Social distancing – keeping at least 2 metres from other people reduces the spread of the disease, as this is how far droplets from coughs can travel.

HIV/AIDS (Started 1967) – This disease has killed 36 million people. It started in D.R. Congo in 1976. Today up to 35 million people live with the disease – keeping alive with drugs called antiretrovirals.

FLU PANDEMIC (1918-1920) – A new strain of influenza spread across the world between 1918 and 1920. 500 million people were infected and up to 50 million people died.

THE BLACK DEATH (1346-1353) – This plague killed an estimated 200 million people across Europe, Africa and Asia. At that time, there was no science, and people did not understand the cause of the disease or how to control it. Many believed the Black Death was sent by God to punish the sins of the people, or they blamed people from a different religion to themselves.

In modern times, science tells us that the disease must have been caused by either a bacterium or a virus. For many years people believed it was caused by a bacterium spread by rat fleas carried by ships from country to country. Today, because it spread so quickly from person to person, some scientists think Black Death is more likely to have been caused by a virus like Covid-19.

EBOLA Haemorrhagic Fever (Started 1967) - This another disease which kills a large proportion of the people who catch it, but it has not yet become a Pandemic. It first occurred in 1976, near the Ebola River in Eastern Congo. At first there were two strains of the virus. One killed 53% of those who caught it. The other, more virulent, strain, killed 88%. So, Ebola is a greatly feared disease, with only a small chance of survival. There have been outbreaks in Uganda, in Bundibugyo and in villages around Makerere in Kampala. The good news is that the virus does not spread easily. To catch it you need to actually touch the saliva or bodily fluids of someone suffering from it. The people who most often caught it were those preparing the bodies of victims for burial – usually this would be close family members. In the last outbreak of Ebola in West Africa in 2014 1,427 people died in Liberia, Guinea, Sierra Leone and Nigeria. 14 people died of Ebola in Bundibugyo in 2012.

THE SCIENCE OF COVID-19

Advice from Dr. Nerina Harborne, PhD Biophysics, Biochemistry Lecturer, Mbarara University of Science and Technology.

The Covid-19 Pandemic, which started in Wuhan in China in December 2019, is caused by the SARS-CoV-2 virus. This is a mutant strain of the virus which caused the SARS pandemic of 2002-3.

A virus is a non-living collection of molecules that are packed up together, just like the sort of package we may send to each other.

The CONTENTS of the “package” are the instructions to make more viruses. These instructions are written in the language of RNA. This is the same language used by our own human cells to carry instructions. This means that our human cells can read the instructions and carry them out.

The WRAPPING on the “package” is made of lipid, or fat. The viral particles get these fats from the wrapping of our own human cells. The GOOD THING is that this wrapping is easily broken open, by detergents, such as we use in soap or washing powder, or by alcohol, such as is in hand sanitiser. Then the contents spill out, the address label falls off, and the viral package is destroyed!

The ADDRESS LABEL on the package is a protein (called "Spike Protein") on the outside of the viral particle. This address label directs the package to a human cell and allows it to "deliver" its contents into the cell.

So, when the package is delivered, our human cells follow the instructions inside the package. The instructions tell them to make MORE viral packages, and then release them outside the cell, to be delivered to other cells!

All this is happening inside the cells of our nose and throat (upper respiratory tract).

So, when we cough or sneeze, all these little viral packages get caught up in the tiny water droplets that come out of our body (cough onto a mirror and you will see these tiny drops of water as they steam up your mirror!). These can hang around in the air for a short time, before slowly falling to the ground or other surfaces.

So other people can become infected by breathing in the droplets with virus packages while they are in the air, or by picking up the ones that have fallen out of the air onto surfaces by touching them with their fingers, and then touching their mouth, nose or eyes and so getting the packages where they can be delivered to more human cells.

- So - the advice to WASH YOUR HANDS WITH SOAP is to break open the packages and stop them from being delivered.
- The advice to NOT TOUCH YOUR FACE is to keep the packages away from your own cells, which could follow the instructions to make more viral packages.

- The advice to COVER YOUR FACE WHEN YOU COUGH OR SNEEZE is to stop water droplets carrying viral packages being delivered to someone else.
- The advice to KEEP 2M DISTANT FROM OTHER PEOPLE is to make sure that any droplets you are breathing out do not reach the other person (and that theirs don't reach you!).

WHY ARE SOME PEOPLE VERY ILL WITH COVID-19, BUT OTHERS LESS SO?

When the virus packages get inside a human body and are delivered to the cells inside the nose and throat, these cells start to follow the instructions inside the packages. They make more virus packages and put them outside the cells ready to be delivered.

Some of these packages get caught in water droplets, and are coughed, sneezed or breathed out, ready to be delivered and infect another human.

But some more of the packages stay inside the person already infected.

It's what happens inside this person's body that makes the difference to how ill the person becomes.

Our human bodies have a way of fighting off things from outside that can make a person ill. It's called the Immune System, and it has LOTS of different weapons! The immune system can DETECT and DESTROY invaders.

So, if a person has a STRONG and HEALTHY immune system, it can use all its weapons to destroy the virus packages. The virus stays in the cells of the nose and throat and causes symptoms such as a sore throat and dry cough and a runny nose, a fever, and coughing and sneezing. Some people have such a strong immune system that they can destroy the virus packages before even getting these mild symptoms. However, these people with mild or no symptoms ARE STILL MAKING VIRUS PACKAGES AND BREATHING, COUGHING AND SNEEZING THEM OUT. They can still infect other people. Which is why we should ALL keep SOCIAL DISTANCING. We don't know who is infected. We might be passing the virus to our friends. Our friends might be passing the virus to us.

Statistics show that about 80% - 8 out of every 10 - of infected people have mild or no symptoms. If you are young and strong, you will probably not become very ill if you are infected. BUT YOU MIGHT STILL PASS YOUR VIRUS PACKAGES ON TO OTHER PEOPLE WHO ARE NOT YOUNG OR STRONG.

In other people, the immune system is not so strong. People with weaker immune systems are often older people. Like so many parts of our bodies, the immune system gets tired and worn out after many years of life! People who have other medical problems also often have a weaker immune system, as it has used up a lot of its weapons in dealing with these other problems.

In these people, the virus packages are not destroyed quickly enough, and stay inside the body, being delivered to more and more cells. As the person breathes, the virus packages that were inside the nose and throat get carried down into the lungs.

In the lungs, the body continues to try to fight and destroy the virus packages. But in the lungs, the weapons that the immune system can use can also make it difficult for the person to breathe.

One weapon is to make sticky mucous (phlegm), to trap the virus packages. But this also sticks inside the lungs and makes it difficult for the air to get into the body.

Another weapon is for the body cells to let out lots of water, to try to wash away the virus packages. When this happens in the cells of the nose, it makes a runny nose. When it happens in the lung cells, the water stays in the lungs, rather like breathing in water and drowning.

So, the person with this infection feels very ill, and finds it difficult to breathe. They gasp for air, pulling lots of air into their bodies, but the oxygen in the air that our body needs can't get past the mucous and water.

If this person is taken to hospital, the doctors will give them air with more oxygen ("put them on oxygen"). This helps the body to get enough oxygen by using the parts of the lungs which are still working.

If this is not enough, the doctors will use a machine to force oxygen into the lungs ("put them on a ventilator").

Using oxygen or ventilators gives the ill person more time for their immune system to fight and destroy the virus packages. We have not yet discovered any other drugs or medicines that will help to destroy SARS-CoV-2, although many doctors and scientists are working very hard to find some.

Sadly, for some people, the battle is lost. Their lungs stop working completely before their immune system can destroy all the virus packages and stop them from damaging the lungs. This is what causes people to die from Covid-19 infection. This seems to be between 1 and 4% of infected people.

Summary

80% of people who are infected with SARS-CoV-2 virus will have MILD or NO symptoms of Covid-19 disease. But these people are still infectious and can give the disease to other people.

16% of infected people will have SEVERE symptoms, of which the most important one is difficulty in breathing. Some of these people will need help from doctors in hospital to help them to breath.

4% of infected people will become CRITICALLY ILL. Some will die. These are mostly older people, or people with other medical conditions.

PANDEMIC: Activities

Possible Learning Outcomes

1. Knowledge of infection, epidemic and pandemics and of Covid-19 in particular; the difference between being immune and being susceptible; some major past pandemics: HIV/Aids, Flu Pandemic (1918-20), The Black Death/Bubonic Plague (1346-1353).
2. Knowledge of how to prevent the spread of a disease like Covid-19.
3. Knowledge of key spellings and definitions.
4. Cooperation in following the rules of games. Learning through physical exercise and playground games.
5. Hygiene and disease control through thorough hand washing and increasing social distance.
6. Simulating the investigative and writing activities of a journalist.
7. Creative writing and storytelling.
8. Applying the skills and procedures of formal debating to a pressing national health and social issue: national management of a pandemic.

FOR YOUNGER CHILDREN

Activity 1 – Spelling and defining

Teacher writes on chalk board the following words and their definitions and gives the class a day to learn them.

In – Infection

Ep – Epidemic

Pa – Pandemic

Im – Immune

Su - Susceptible

At the end of the day the board is cleaned and the next day there is a class test.

1. The teacher writes one of the following on the chalk board: In, Ep, Pa, Im and Su
And asks the class to put up their hands if they know the word, e.g. Epidemic for Ep.
2. A child is chosen and asked to say the word.
3. Once they get the word right, then the child can nominate another child to spell the word.
4. If that child gets the spelling right, they nominate a third child to give the definition.
5. You then continue to the next word. If a child gets something wrong, it passes to someone else to have a go.

Activity 2 – Covid-19 Infection Game

The aim of this game is to show how infections like Covid-19 spread from person to person. The more people you make contact with the faster the virus spreads.

Stage 1 One Contact per Person

Get your group of children together in an open space with boundaries marked.

The teacher notes the start time. One child (the one with the infection) chases the other children until they catch one by touching them and shouting Covid-19 – then two are infected.

These 2 each have to catch someone else. When they do 4 are infected.

The 4 catch another 4, until 8 are infected.

The 8 catch another 8 and once all the children have been caught and infected, the game ends and the teacher checks the time and works out how long it has taken for the infection to spread to everyone.

Stage 2 Two Contacts per Person

Repeat the game. Start with 2 children infected. Note the time and say Go. Each of the two infected children have to catch by touching and shouting Covid-19 2 more. So then 6 are infected.

These 6 each catch 2 more – so 18 are infected. The 18 then each catch 2 more, and so on until everyone has the virus. Teacher notes the time taken to infect everyone, which will be less than in stage 1 when each person only infects 1 person.

Moral of the Story: If everybody reduces the number of people they contact, it takes longer and makes it harder for an infection to spread.

Stage 3 Some People are Immune to the disease

- A. Herd Immunity - One child is chosen as the infected one and close their eyes while the teacher points to half of the class who are told (or give a piece of paper with I for Immune or S for Susceptible). If they are an I, then they have some natural immunity. Repeat the stage 2 game. At each stage bring together all those that have been caught. Ask those who are Immune to stand aside and leave the original child and the Susceptible ones, who have now caught it to catch the others. It is now harder for the infected people to find susceptible ones. At the end it is clear that few extra people have been infected.
- B. Virus Vaccine – This time imagine that a vaccine has been developed to protect people from the infection. Now, tell the children that everyone has been inoculated apart from 5 (nobody knows who these 5 are – the teacher must tell them in secret). This time one child has the infection and they have to catch another one and shout Covid-19 to infect them. If the person they catch has been inoculated, the virus does not spread. The virus dies and the game ends.
If, by chance, they catch one of the 5 who haven't been inoculated, then these two try to catch 2 more. It will be obvious that when most of the population has been

inoculated it is very hard for a virus to spread.

Moral of the Story – If there is a vaccine for a disease then make sure you get inoculated. All those who get inoculate become immune to the disease. The more people who are inoculated the harder it is for a disease to spread.

Activity 3 – Hand-Washing Game

Washing your hands well with soap for 20 seconds kills the Covid-19 virus and washes it off your hands. This makes it difficult for you to spread the disease to others by touching them or touching articles that others will use.

Get a bowl of soap and water. Ask each child to wash their hands for 20 seconds. The teacher measures the time and writes it down. Once all 3 have washed their hands, the teacher tells them how long they took. The child closest to 20 seconds is the winner.

Happy Birthday – Choose another 3 children. Ask them to wash their hands, while singing Happy Birthday **twice**: Happy Birthday to you, Happy Birthday to you, Happy Birthday dear (name), Happy Birthday to you. The teacher should time this and the time taken will be about 20 seconds.

Question for Children:

1. When should you wash your hands? (If you have touched someone else's hands, or been to the toilet, and always before eating.)
2. Where should water and soap be placed for handwashing in your school? (By the toilets)
3. How can you make sure that the soap is not stolen? (Trust people, use liquid soap)

Activity – get the children to make hand washing stations around the school – with a can of water and soap.

FOR OLDER STUDENTS

Activity 1 – Medical Newspaper

Ask students to work together to investigate and write articles that could go into a Medical Newspaper or News sheet. Examples of articles they might write include:

- Interviews with families on how their lives were affected by the Corona-19 lockdown. This could include interviews with:
 - o Someone who found it difficult to buy food
 - o Someone who could not sell their produce through the market
 - o A bodaboda rider or some other trader whose business was affected
- Interviews with families who were affected by past epidemics of HIV/Aids or Ebola.
- Information articles to explain to readers about Covid-19
 - o What it is?
 - o How it is transmitted from person to person.
 - o What you can do to avoid catching it or passing it on.

Activity 2 – Creative Writing in English

Write an imaginative short story which shows how coronavirus affects a person or a community.

Activity 3 – School Debate

Organise a formal debate with the motion:

“This house believes that the Uganda Government has handled the corona virus threat well.”