Life Cycle of Medicine and Vaccine

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PREFACE

We are extremely happy to present this book, the life sciences industry has made immense development in the field of medicines. There is a lot of scope for students opting for life sciences in the near future.

CBSE has introduced Life Sciences as an optional course at secondary and Senior Secondary level.

Scientists today are capable of generating more data in a day than their predecessors 20 years ago could have generated in an entire career. This ability to rapidly generate data has also created a number of new scientific challenges. We are no longer in an era where data can be processed by loading it into a spreadsheet and making a couple of graphs. In order to distil scientific knowledge from these datasets, we must be able to identify and extract nonobvious relationships.

This book is divided into 6 units and each unit has 3 to 4 sessions. All the topics are covered in simple language, with pictures to make it more interesting. As homework, at the end of every unit there is a set of questions, for revision purpose.

The team of authors is thankful to CBSE (Skill Education) for their untiring efforts for bringing out the handbook on time. It is a pleasure for the authors to express their special thanks to the CBSE (Skill Education) advisors and other coordinating staff members.

The book has been made with lot of efforts, still there may be some errors, so valuable suggestions from the readers will be appreciated for further improvement of this handbook in future.

Contents

Unit-1

You and your Medicine

Unit-2

Types of Medicines

Unit-3

Where do medicines comes from

Unit-4

Vaccine-Our Saviour

Unit-5

How a vaccine works

Unit-6

Covid19-A global pandemic

Unit-1

You and your Medicine

Learning Outcome

Location	Learning outcome	Knowledge evaluation	Performance evaluation	Teaching and Training method
Classroom	Students shall be able to explain about the medicine and its usage	Explain the role of medicine, and its categories.	Identify various medicines taken by him for various diseases.	Interactive Lecture: 1. Chalk & talk method. 2. Book Activity: Prepare a list of medicines you and your family have consumed in last one year Identify and name the disease/ailment against which the medicine/s were taken.

Objectives

After attending this session, you should be able to:

- Discuss about the role of Medicine in day-to-day life
- Explain the basic concept of Medicine and its invention
- Explain the various categories of Medicine
- Explain about the usage of Medicine

1.1. Medicine: Free from illness

Hi!! Today we will learn about medicines and its benefits to us. Now I know you all must be thinking medicine and benefits, how can something which is so bitter have any benefits, and we should be given chocolates, pizza, ice cream as cure not these bitter medicines.

When I was a child, I used to think the same way, but do we know how and when was this medicine first invented and by whom? No!! No worries, I am here to clear all the doubts.

Let us know our medicine in brief.

❖ What is medicine?

A medicine is something that is used to prevent, cure, or relive a disease and it can be in a form of pill, or even a liquid.

Fig: A pill

Fig: Liquid syrup

So, now we know what is the definition of medicine and the forms of medicine, that is solid or liquid.

Let us learn about more forms of medicine

❖ Types of medicines

We already learnt about the solid and the liquid form, but do you know there are some other forms too, like the ones mentioned below:

1. Topical Medicines (cream or ointments)
   Topical medicines is the scientific name, these are creams, lotions or ointments applied directly onto the skin. They come in tubs, bottles or tubes depending on the type of medicine.

Fig: Topical medicine

2. Drops

These are mainly used in eyes, ears and nose. They work best when they directly reach the affected part of the body.

Fig: Eye Drop

3.Inhalers

The medicine is released under pressure directly into the lungs. Young children may need to use a ‘spacer’ device to take the medicine properly. Inhalers can be difficult to use at first so your chemist will show you how to use them.

The very famous Vicks inhaler, is also a type of inhaler.

Fig: Inhaler

4.Injections

Injections are given just under the surface of the skin, into a muscle or around the spinal cord.

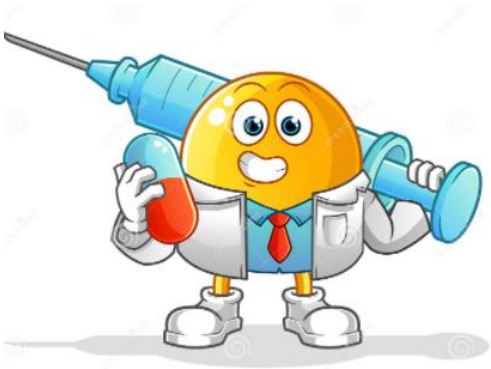


Fig: Injection

1.2. Who and when?

❖ Who is known to be the father of Medicine?

Hippocrates. He is considered to be the “Father of Modern Medicine”, based on his treatment on the observation of clinical signs and rational conclusions.

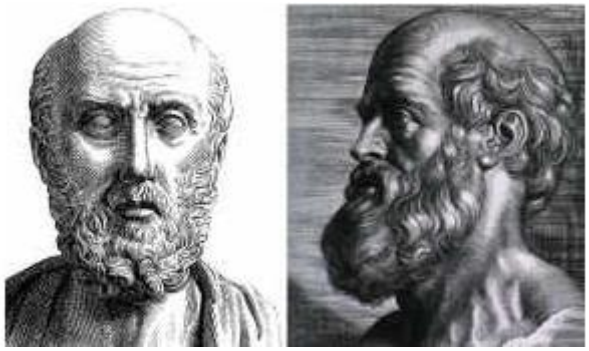


Fig: Hippocrates

❖ When was medicine invented?

The earliest medical prescriptions appear in Sumerian during the Third Dynasty of Ur (c. 2112 BCE – c. 2004 BCE). But the first modern medicine was developed in 1804 by Friedrich Serturner, who was a German scientist.

❖ Who is the father of Ayurveda Medicine?

Maharshi Charaka, he was one of the most important persons who contributed to Ayurveda's ancient art and science, medicine, and lifestyle system.

His renowned work, the 'Samhita Charak', is considered an Ayurvedic encyclopaedia.

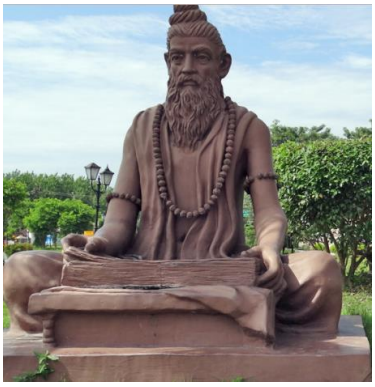


Fig: Charak

1.3. Why is medicine important?

❖ Basic concept of medicine

- A substance that is required to treat patients is the base of any medicine. Nobody takes medicine for taste or because they love having it, but because they want to get rid of the illness.
- It is the science and practice of caring for a patient, managing the diagnosis, prevention, treatment, of their injury or disease, and promoting their health.

❖ Date of expiry of a medicine

Expiry date of a medicine is the date, till which it is good to use by people, as if used after that it would not be effective or might be life threatening.
Listed below are some ways by which you can identify date of expiry of a medicine:

- It can be found printed on the carton or bottle of the medicine
- The expiry date might follow, the initials like EXP. for Example EXP0323, means the month of expiry is March and year is 2023.

❖ My friend in need, my medicine

Now, you all must be thinking, what role a medicine can have in our life.

But it does play an important role in our day to day life, if we are ill our doctor would prescribe us with medicine so that we get well, if we are having a skin problem we would treat it with a gel or other medicine, so that it could be treated, it there was no medicine for illness, then how would it be treated and we have to live with it, and if the disease is fatal, it could also be life threatening, so now you know why it is important to take right medicine at the right time.

1. Prevents disease and injury
2. Promotes and maintains health

3. Relives pain and suffering
4. Curing those with a disease and caring for those who cannot be cured

Fig: Take medicine at right time

Exercise 1:

It was raining and you went out to play in it and came back home all drenched in water and the next day, next day you were sneezing, and coughing, your mother put balm on your nose and neck, still you did not feel better, you were taken to the doctor, he prescribed you with some syrup, identify the type of medicine the syrup and the balm was?

When you went out to the doctor with your mother, there were some other people too, who were ill, they were also being prescribed other medicines by the doctors, for various diseases like cold, cough or fever, identify which type of medicines were prescribed by the doctor to them?

Let us see what you have learnt, answer few questions

1. Ria got an acne on her face, she went to the skin doctor, he prescribed her with a tube, what type of medicine is it?

a. Tablet

b. Capsule

c. Ointment

d. Injection

2. Raj went to a chemist shop, as his nose was blocked, what would the chemist provide him with?

a. Syrup

b. Inhaler

c. Drops

d. Ointment

3. Shreya, had severe pain in her ear, she went to ENT, he prescribed her with a bottle with nozzle, which type of medicine it could be?

a. Drops

b. Ointment

c. Tablet

d. Capsule

Unit-2

Types of Medicines

Learning Outcome

Location	Learning outcome	Knowledge evaluation	Performance evaluation	Teaching and Training method
Classroom	Students shall be able to explain about various medicines available and treatments.	Explain forms of medicines and ayurvedic, ayush treatments	Identify various medicines	Interactive Lecture: 1. Chalk & talk method. 2. Book Activity: Identify and mention the type of medicine in the list of medicines prepared by you Speak to your parents and understand the system of medicine that you have taken. Mention the same in the list prepared by you

Objectives

After attending this session, you should be able to:

- Explain the various types of medicines such as tablet, capsules, liquid etc.
- Discuss about the various systems of treatments such as Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy (AYUSH) and modern medicine/Allopathy

2.1. Types of medicines

We already have learnt about different types of medicines in the previous unit, now let us learn about it in detail.

1. Liquid

- The active part of the medicine is combined with a liquid to make it easier to take or better absorbed.
- A liquid may also be called a 'mixture', 'solution' or 'syrup'
- Many common liquids are now available without any added colouring or sugar.

Fig: liquid

2. Tablet

- The active ingredient is combined with another substance and pressed into a round or oval solid shape.
- There are different types of tablets, soluble or dispersible tablets can safely be dissolved in water.

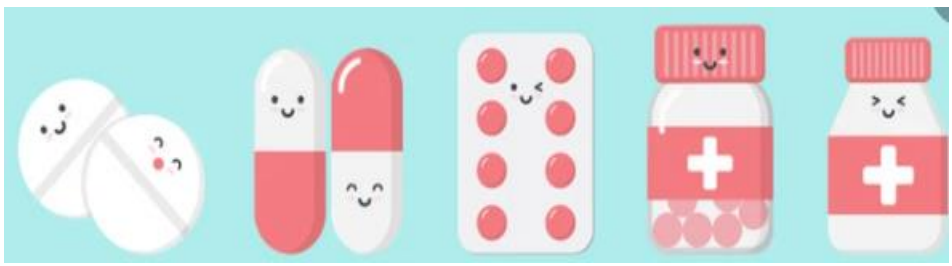


Fig: tablets

3. Capsules

- The active part of the medicine is contained inside a plastic shell that dissolves slowly in the stomach.
- You can take some capsules apart and mix the contents with your child's favourite food.
- Others need to be swallowed whole, so the medicine isn't absorbed until the stomach acid breaks down the capsule shell.

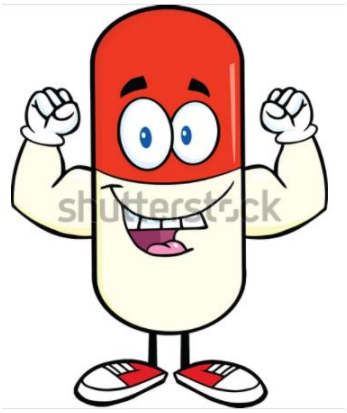


Fig: Capsules

Some other type of medicines

1. Topical Medicines (ointment or cream)

- A topical medication is a medication that is applied to a particular place on or in the body
- Most often topical medicine mean application to body surfaces such as the skin
- Applying medication to the skin or mucous membranes allows it to enter the body from there.
- It can also be used to treat pain or other problems in specific parts of the body.
- It can also be used to nourish the skin and protect it from harm.

Fig: Topical Medicines

2. Suppositories

- A small, round or cone-shaped object that you put in your body, often into your bottom. Once it's inside, it melts or dissolves and releases its medication.
- The active part of the medicine is combined with another substance and pressed into a 'bullet shape' so it can be inserted into the bottom.
- Suppositories mustn't be swallowed.

How to give suppositories?

1. Sit your child on the toilet to see if they need a poo.
2. Wash your hands
3. Before unwrapping the suppository, warm it in your hands for a minute
4. Remove the foil or plastic wrapping
5. Get your child into any of these positions to give the suppository:

- Squatting down
- Laying on one side with the lower leg straight and the upper one bent
- Standing up with one leg raised

6. Holding the suppository with the rounded end upwards, gently but firmly push it into your child's bottom as instructed.
7. Push it in far enough that it does not slip out again
8. Ask your child to close their legs and clench their buttocks together for a few minutes – you might need to hold them together.
9. Wash your hands again
10. If your child needs a second suppository, wait until the first has dissolved before inserting the second one.

3. Drops

- These are often used where the active part of the medicine works best if it reaches the affected area directly. They tend to be used for eye, ear or nose.
- Always check the expiry date of the medicine before giving it to your child.
- Keep the bottle or spray tightly closed in a cool, dark place according to the label.
- Read the instructions on the label and only use the drops or spray in the affected area

Fig: Ear Drops

4. Inhalers

- The active part of the medicine is released under pressure directly into the lungs.
- Young children may need to use a ‘spacer’ device to take the medicine properly.
- They are used to treat asthma and other lung diseases
- These devices cause fewer side effects than medicine taken by mouth or injection.

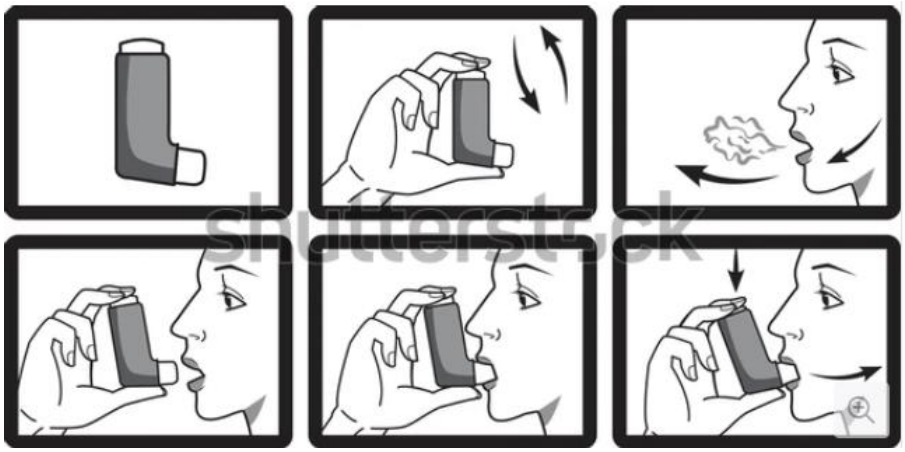


Fig: Inhaler

5. Injections

- An injection is another word for a shot.
- Nobody likes getting shots, but they sure come in handy when it comes to keeping you healthy.
- An injection is when the doctor uses a needle to put medicine or a vaccine into your body.
- Kids who have diabetes may have to give themselves injections of a medicine called insulin.

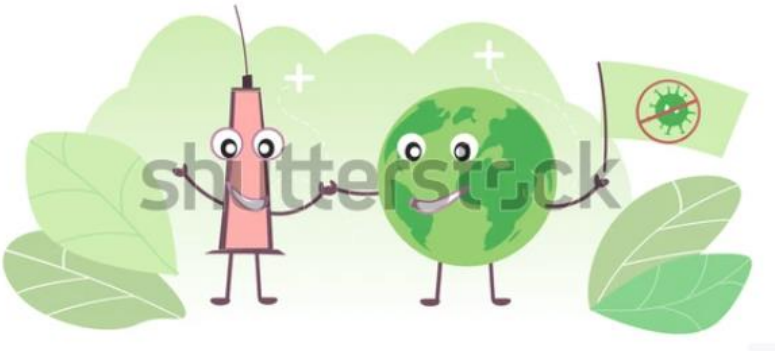


Fig: Injection

6. Tablets you don't swallow

- These look like normal tablets or liquids, but you don’t swallow them
- Buccal (related to cheeks) medicines are held in the cheek, so the mouth lining absorbs the active ingredient.
- Sublingual (under the tongue) medicines work in the same way but are put under the tongue
- Buccal and sublingual medicines tend only to be given in very specific circumstances

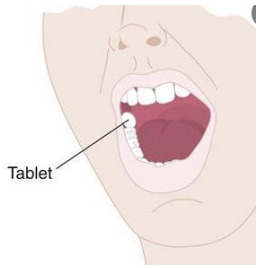


Fig: Buccal medicine

Fig: Sublingual medicine

Now, do the activity number 1, to get more information about the medicines you have used till now.

2.2. Systems of treatments

India has six recognized systems of medicine in this category. They are-Ayurveda, Siddha, Unani, Yoga, Naturopathy and Homoeopathy (AYUSH), and modern medicine/Allopathy.

Let us know about these in little detail:

1. Unani

- Unani or Yunani medicine is Perso-Arabic traditional medicine as practiced in Muslim culture in South Asia and modern-day Central Asia
- The term Yūnānī means "Greek", as the Perso-Arabic system of medicine was based on the teachings of the Greek physicians Hippocrates and Galen
- The Unani system of medicine has its origin in Greece.
- The Unani System of Medicine offers treatment of diseases related to all the systems and organs of the human body
- Unani doctors are called “hakims”

2. Ayurveda

- Ayurveda is an alternative medicine system with historical roots in the Indian subcontinent
- It is a natural system of medicine, originated in India more than 3,000 years ago
- The term Ayurveda is derived from the Sanskrit words ayur (life) and veda (science or knowledge). Thus, Ayurveda translates to knowledge of life.
- Those who practice Ayurveda believe every person is made of five basic elements found in the universe: space, air, fire, water, and earth.

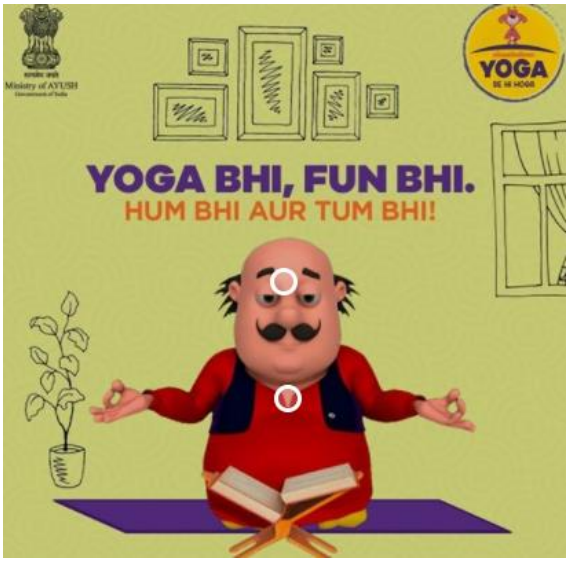
3. Yoga and Naturopathy

- Yoga & Naturopathy is based on various drugless treatments like Acupuncture, acupressure, Yoga, and meditation, fasting therapy, Diet and nutrition, mud therapy, hydrotherapy, exercise, and lots more.
- Naturopathy is a form of healthcare that combines modern treatment with traditional methods.
- Naturopathy focuses on the body's capacity to heal itself, preventing health problems.
- Yoga helps achieve a peaceful body and mind and manage stress and anxiety to keeps you relaxing.
- Yoga asanas build strength, flexibility, and confidence

4. Siddha and Homeopathy (AYUSH)

- AYUSH is an acronym for Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy.
- Shripad Naik, is the founder of AYUSH.

- Siddha system of medicine is an ancient traditional system of medicine that originated in South India
- Siddha is one of the earliest traditional medicine systems in the world which treats not only the body but also the mind and the soul.
- Apart from Government and Private Medical colleges in Tamil Nadu and Kerala, Siddha medicine is also taught in two universities of Sri Lanka.
- The word 'Homeopathy' is derived from two Greek words hómoios (similar) and páthos (suffering) means in Homeopathy natural diseases are treated with substances that produce effects similar to the suffering.
- Homeopathic remedies are used by the public for viral diseases, different forms of allergic conditions, skin disorders, behavioural problems, and several chronic long-term diseases.



5. Modern Medicine/Allopathy

- Modern medicine has done much in the fields of infectious diseases and emergencies to aid cure.
- Modern medicine, or medicine as we know it, started to emerge after the Industrial Revolution in the 18th century.

Now, let us do some exercise it would help you to know which category medicine till now you have taken.

Exercise 1:

Now, you might remember that, when you were coughing, after you came back playing in rain and got scolded, the medicine your mother gave you was a cough syrup, which means a liquid medicine, now that in previous activities, you have list down many medicines that cure various disease, let us identify their form.

Exercise 2:

There is a boy named Vicky, he is suffering from a skin problem, he tried various treatments to cure it, allopathy, homeopathy. Different people tell him different medicines he should take to cure it. You also must have heard such medicines from many people, so identify and mention the type of medicine in the list of medicines prepared by you and speak to your parents and understand the system of medicine that you have taken. Mention the same in the list prepared by you

Time to test what you have learnt in this unit:

1. Reha is a diabetic patient, she is prescribed a medicine by the doctor, what type of medicine is it?

a. Injection

b. Ointment

c. Inhaler

d. Drops

2. A health mind lives in a healthy body, what can we do to keep ourselves healthy?

a. Do yoga

b. Eat junk food

c. Watch Tv

d. Play mobile games

3. Ram is suffering from a severe lung disease, which medicine should be chosen from the following?

a. Allopathy

b. Homeopathy

c. Ayurvedic

d. Unani

Unit-3

Where do medicines comes from

Learning Outcome

Location	Learning outcome	Knowledge evaluation	Performance evaluation	Teaching and Training method
Classroom	Students shall be able to explain about how medicine is invented	Explain the cause to create medicine, what are the procedures that take place before medicine come in the market.	Identify the steps how much time it takes for a medicine to come in market	Interactive Lecture: 1. Chalk & talk method. 2. Book Activity: When you get to know about the medicine why and when was it created, search for it little bit more as to how the clinical trial went, were they successful or not how much time did it take to reach the consumers in the market.

Objectives

After attending this session, you should be able to:

- Explain in brief about the various phases of medicine development
- Explain how a medicine is discovered
- Explain what clinical trial is and why it is important

3.1. Discovery of a medicine

Anything that is discovered has a reason behind it. So, whenever a medicine is discovered, it also has some reasons, like for example, in the current situation, vaccination for Corona Covaxin or Covishield were discovered to protect us from the virus.

Let us, understand it through a story,

Long-time back a disease came to a town, let us say the town name was Maniar. Initially people were not aware of it, but gradually, the disease started spreading from one person to another, and the doctors of the town became concerned about this situation, they did not know what they should do? As every second a patient with the same condition was coming to their clinic or hospital. The symptom was common like fever and diarrheal. They gave same medicine as they gave in common flu, for some the medicine was working, but for others it was not, and it became deadly too.

This disease started to spread in the nearby towns too and then to the cities and it took over the whole country. It became the major cause of concern for everyone, as nobody knew what to do?

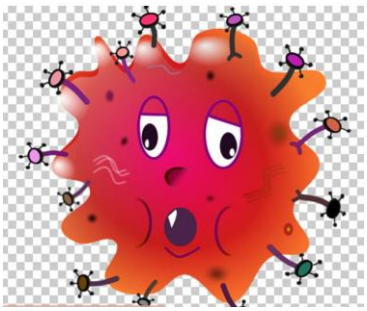
Everyone was just scared; news channels were showing the news as how deadly this disease was and how fast it was spreading across the country.

Eventually, the scientists of the country started to research on this disease and worked day and night in the laboratories, to know the root cause of it.

So, from here till now, we get to know that the first step of Medicine Development is **Research and Development,** it means medical research and development scientists work in laboratories and apply their expert scientific knowledge to develop a better understanding of illnesses and other medical problems.

Back to the story,

So, when the scientist worked in the laboratories, they got to know it is an infection, which is spreading from contaminated water, and making people ill.



Disease

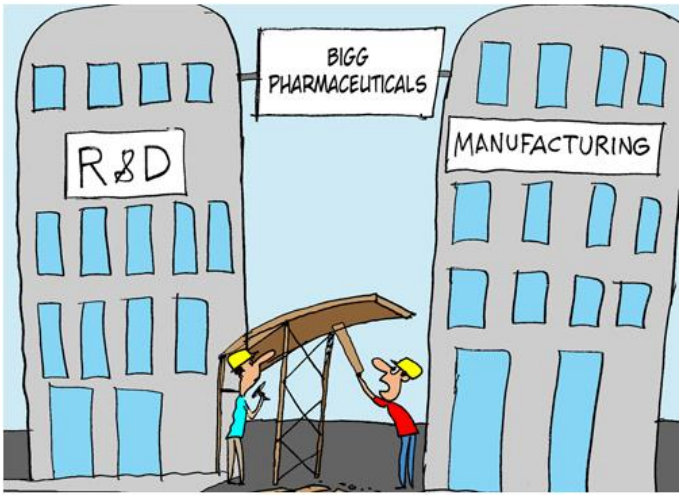
Contaminated water

People getting sick

Research and Development in laboratories

Now when the research and development was done and everyone came to know about the root cause of illness, and development of medicine and API (Active Pharmaceutical Ingredient) used in it, the next step was pre-clinical trial.

Active Pharmaceutical Ingredient (API) is the part of any drug that produces the required effects



So, **Pre-clinical trial** is testing the safety of drugs. Research using animals to find out if a drug, procedure, or treatment is likely to be useful. It is done with all the safety, and then only the medicine is used on human beings.

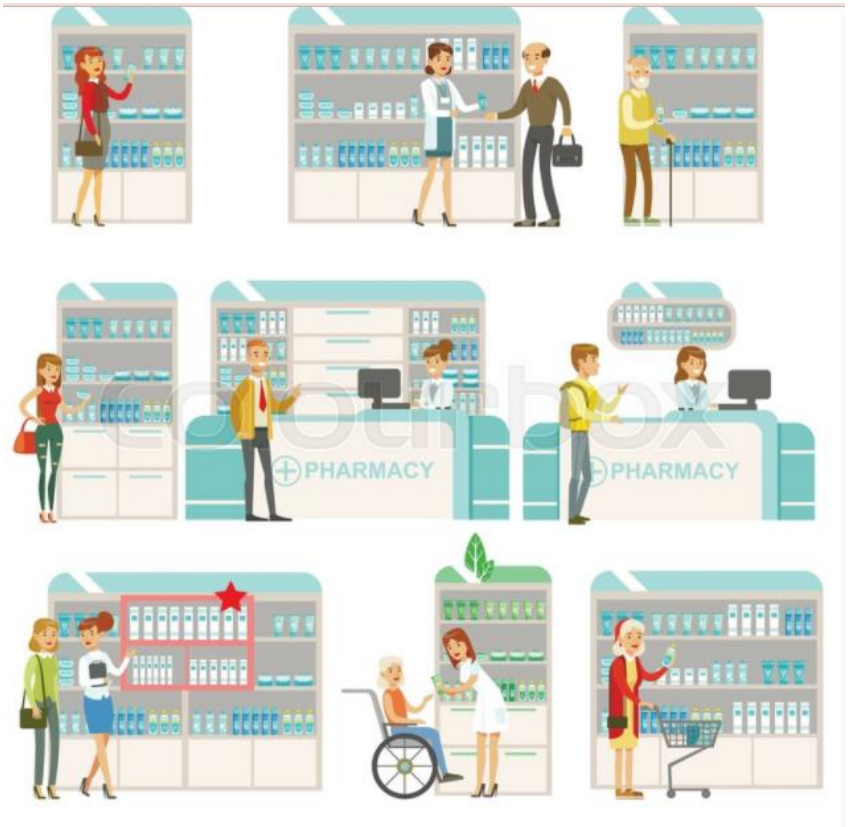
After the preclinical trials were successful the next step was to try the medicine on human beings, so it was the time clinical trials were started. (We would read about clinical trials in next section in detail.)

Clinical trials are a type of research that studies new tests and treatments and tests their effects on human health outcomes.

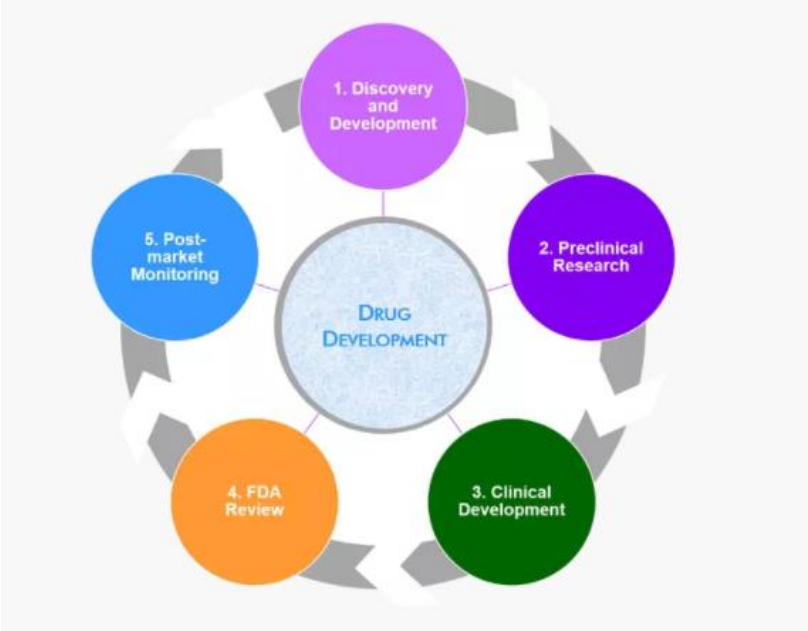
When the scientists and doctors saw that the clinical trials were also successful, they were happy with the results. But now some medicines were there, so for the whole country they had to develop more medicines. And here comes the next step of medicine development that is Production of medicine.

Production of Medicine, since during all the trials the small amount of medicines were prepared, now after the successful completion of trials, medicine would be prepared in bulk for the use of consumers.

After the scientists created medicines for all, now it was time to make it available in the markets as then only it will reach the consumers. Everyone was made available with the medicines, even to the remote areas, and slowly the disease disappeared from the country.



Below in the diagram representation of the stages of medicine development



Exercise 1:

You were given a cough syrup when you got a sore throat and tonsils, so today when you go back home, pick the cough syrup you were given and search for its history as to why and when was it prepared?

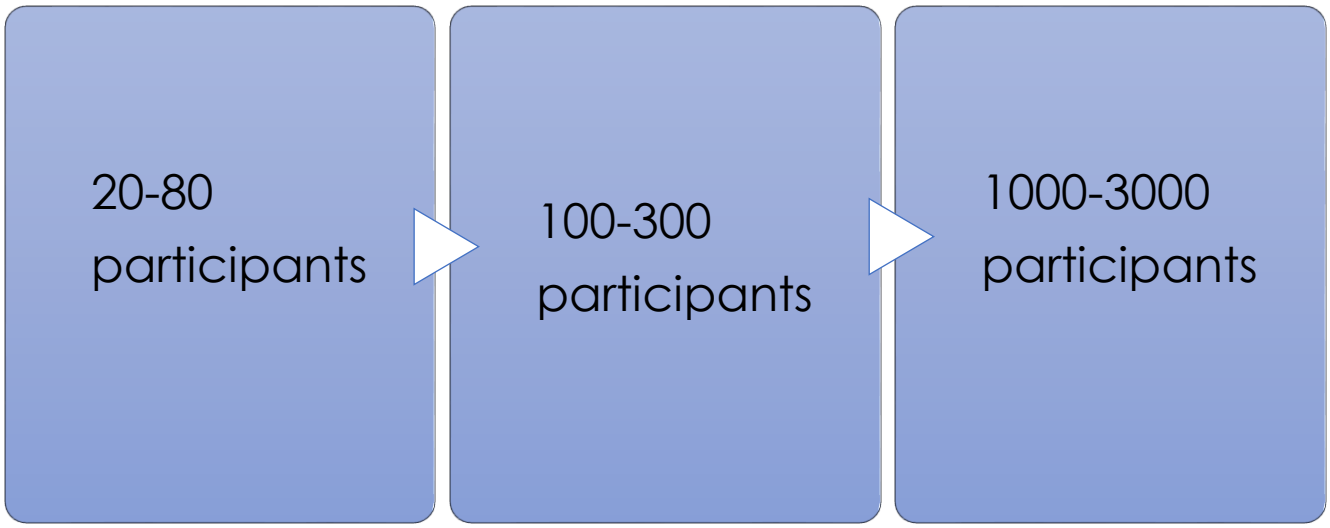
3.2. Clinical trials

Tests performed on people to check new treatment, like a new medicine or diet or medical device, whether it is safe and effective on people.

❖ 3 Phases

There are 3 phases of clinical trials.

Phase I is the earliest ones and the Phase III trials are the later phase trials.



❖ First phase

- In this phase researchers test a new medicine on a volunteer who is healthy.
- In the first phase 20-80 participants participate.
- The aim of this phase is to test the safety of new medicine before it proceeds for the next phase.

❖ Second Phase

- This phase is larger than phase I
- There may be 100 or more people taking part
- The aim of this phase is to tell doctors more about how safe the treatment is and how well it will work.

❖ Third Phase

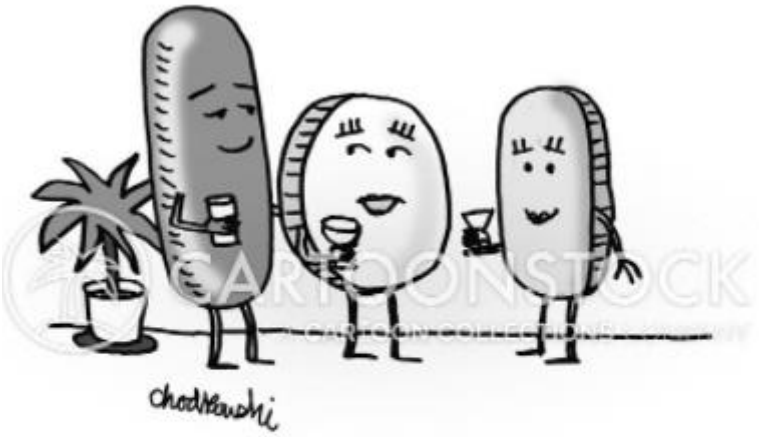
- This has 1000 to 3000 volunteers
- It tests the side effects caused over time by the new treatment after approval.

❖ Why do we need clinical trials?

1. For discovering new treatments of diseases

2. For detecting new ways, diagnosis, and reducing chance of developing diseases

3. It helps researchers in detecting what works and what does not work on human beings, that cannot be learnt through animals in laboratories



"Well of course, he's still in clinical trials. But he looks very promising."

Exercise 2:

Say, you were given the syrup named ABC, now we know why this medicine was prepared, but what about the trials, how many trials it took to come in market to be used by consumers, were initial trials successful, or not, search for the same.

Unit-4

Vaccine-Our Saviour

Learning Outcome

Location	Learning outcome	Knowledge evaluation	Performance evaluation	Teaching and Training method
Classroom	Students shall be able to explain about vaccine and its usage	Explain the role of vaccine, its invention, and types	Identify various vaccines for various diseases	Interactive Lecture: 1. Chalk & talk method. 2. Book Activity: Match the vaccines against the diseases they can prevent or cure

Objectives

After attending this session, you should be able to:

- Explain the basic concept of Vaccine and its invention
- Discuss about the various types of Vaccines
- Explain about the uses of vaccination

4.1. Vaccine: Scary or Saviour

Vaccination, many of us are afraid of this word, as it is a needle which goes in our body and gives pain. Seriously, speaking even I am afraid of it, but we all know it is mandatory and saves us from various diseases, like nowadays, Covid vaccination for Corona.

Vaccines are products that are usually given in childhood to protect against serious, often deadly diseases. It is given usually by injection to increase protection against a particular disease.

Vaccines protect against many dangerous diseases. Each country has a schedule of vaccinations, usually given for free. It is better to take your children to the nearest health centre to be vaccinated while they are healthy than to take them for treatment when they are sick or dying

Now that we know what vaccination means, let us move on to the person who invented it first.

❖ Founder of vaccinology

Who might it be who invented such painful thing? Think!

It was Edward Jenner. He invented vaccination in the West in 1796.

In 1798, the first smallpox vaccine was developed.

❖ Why is it important to get vaccinated?

- It is safe way to build your immune system.
- Vaccinations are known to boost your immune system by teaching your body how to fight threats.
- Many consider vaccinations as a way to build up your immune system
- It protects you from many serious and potentially deadly diseases
- Help stop diseases spreading to people

❖ Basic concept of getting vaccinated

We all are now aware about the importance of getting vaccinated, let us know about its basic concept to get to know more about our vaccination.

Vaccines were introduced in the UK, diseases like smallpox, polio and tetanus that used to kill or disable millions of people are either gone or seen very rarely. Vaccine prevents up to 3 million deaths worldwide every year. Other diseases like measles and diphtheria have been reduced by up to 99.9% since their vaccines were introduced.

if people stop having vaccines, it's possible for infectious diseases to quickly spread again.

The World Health Organization (WHO) has listed vaccine delay or refuse vaccination as one of the biggest threats to global health.

4.2. Types of vaccinations

There are types of vaccine in clinical trials:

1. Whole virus
2. Protein subunit
3. Viral vector
4. Nucleic acid (RNA and DNA)

1. Whole virus

Whole virus vaccines use a weakened or deactivated form of the pathogen (a bacterium, virus, or other microorganism that can cause disease) that causes a disease to trigger protective immunity to it.

2. Protein Subunit

Protein subunit vaccine consist of small pieces of protein and/or a carbohydrate (e.g., starch, cellulose, or glycogen) from pathogen which has been carefully studied as to which combination of the molecules would produce a strong and effective immune response.

3. Viral Vector

Viral vector vaccines use a modified version of a virus that is different from the virus being targeted to deliver important instructions to our cells.

4. Nucleic Acid (RNA and DNA)

This is a relatively new technology. Nucleic acid vaccines use genetic material from a disease-causing virus or bacterium (a pathogen) to stimulate an immune response against it.

Now it is time to do an activity to learn more about vaccination:

Exercise 1:

Ram was afraid of injections, he always skipped going to school when it was vaccination day, one day while he was playing outside his house he got in an accident with a iron rod which cut his leg, it was not major but he was bleeding, he did not tell this to anyone, washed the injury and covered it, but after some days he developed septic, as he did not go to the doctor on time to get vaccinated, so for various disease there are types of vaccines, now match the vaccines against the diseases they can prevent or cure

Question Answer time

1. Why is it important to get vaccinated?

a. It fights diseases

b. It builds immune system

c. None of the above

d. Both

2. Which type of vaccine consists of parts of protein?

a. Whole virus

b. Viral Vector

c. Nucleic Acid

d. Protein Subunit

3. Which type of vaccine uses deactivated pythogen?

a. Protein Subunit

b. Viral Vector

c. Nucleic acid

d. Whole virus

Unit-5

How a vaccine works

Learning Outcome

Location	Learning outcome	Knowledge evaluation	Performance evaluation	Teaching and Training method
Classroom	Students shall be able to explain about immunization and its importance	Explain the role of immunization.	Learn about immunization card.	Interactive Lecture: 1. Chalk & talk method. 2. Book Activity: Ask your parents about your immunization card and see how many vaccines you have taken since birth

Objectives

After attending this session, you should be able to:

- Explain in brief what is immunization
- Discuss about the process of immunization
- Introduction to immunization card

5.1. Define Immunization

Immunization, or immunisation, is the process by which an individual's immune system becomes fortified against an infectious agent.

Immunization is the process of giving a vaccine to a person to protect them against disease, A process by which a person becomes protected against a disease through vaccination.

❖ Are vaccination and immunization the same?

- Vaccination is the term used for getting a vaccine — that is, actually getting the injection or taking an oral vaccine dose.
- Immunisation refers to the process of both getting the vaccine and becoming immune to the disease following vaccination.

❖ Some different names for immunization

a. Injection

b. Jab

c. shot

d. Booster

❖ Why is it important to get immunized?

- When you get a vaccine, your immune system responds. We now have vaccines to prevent more than 20 life-threatening diseases, helping people of all ages live longer, healthier lives.
- Immunization currently prevents 2-3 million deaths every year from diseases like diphtheria, tetanus, pertussis, influenza, and measles.

5.2. Process of immunization

- Immunization is the process whereby a person is made immune to an infectious disease, typically by giving him the correct vaccine
- Active immunisation – body generates its own response to protect against infection through specialised cells and antibodies as stimulated by vaccines
- Passive immunisation – ready-made antibodies are passed directly to the person being immunised.
- Vaccines use dead or severely weakened viruses to trick our bodies into thinking we have already had the disease.
- When you get a vaccine, your immune system responds to these weakened 'invaders' and creates antibodies to protect you against future infection

❖ Types of immunization

There are 5 main types of vaccines:

1. Live-attenuated vaccines
2. Inactivated vaccines
3. Subunit, recombinant, conjugate, and polysaccharide vaccines
4. Toxoid vaccines
5. mRNA vaccines
6. Viral vector vaccines

❖ Vaccines and the disease they prevent

Vaccine	Disease	Symptoms and effects
BCG	Tuberculosis (TB)	TB is an infection that mostly attacks the lungs, but in infants and young children, affects other organs like the brain. A severe case could cause serious complications or death. TB is very difficult to treat when contracted, and treatment is lengthy and not always successful.
Hep B	Hepatitis B	Hepatitis B virus is a dangerous liver infection that, when caught as an infant, often shows no symptoms for decades. It can develop into cirrhosis and liver cancer later in life
Polio	Poliovirus	Polio is a virus that paralyzes 1 in 200 people who get infected. Among those cases, 5 to 10 per cent die when their breathing muscles are paralyzed
DTP	Diphtheria	Diphtheria infects the throat and tonsils, making it hard for children to breathe and swallow. Severe cases can cause heart, kidney and/or nerve damage.
DTP	Tetanus	Tetanus causes very painful muscle contractions. It can cause children's neck and jaw muscles to lock (lockjaw), making it hard for them to open their mouth, swallow (breastfeed) or breathe. Even with treatment, tetanus is often fatal.
DTP	Pertussis	Pertussis (whooping cough) causes coughing spells that can last for weeks. In some cases, it can lead to trouble breathing, pneumonia, and death.

Hib	Haemophilus influenza type b (Hib)	Hib is a bacterium that causes pneumonia, meningitis, and other severe infections almost exclusively in children under 5 years old.
Pneumococcal	Pneumococcal diseases	Pneumococcal diseases are a common cause of sickness and death worldwide, especially among young children under 2 years old.
Rotavirus	Rotavirus	Rotaviruses cause severe diarrhoea and vomiting, which can lead to dehydration, electrolyte imbalance and shock in young children. This can lead to death if treatment, especially fluid replacement, is not immediately started.
MMR	Measles	Measles is a highly contagious disease with symptoms that include fever, runny nose, white spots in the back of the mouth and a rash. Serious cases can cause blindness, brain swelling and death.
MMR	Mumps	Mumps can cause headache, malaise, fever, and swollen salivary glands.
MMR	Rubella	Rubella infection in children and adults is usually mild, but in pregnant women it can cause miscarriage, stillbirth, infant death, or birth defects.

5.3. Immunization Card

Vaccination records (sometimes called immunization records) provide a history of all the vaccines you have received.

This record may be required for certain jobs, travel abroad, or school registration.

❖ How to get record of immunization?

- Check with your doctor or public health clinic
- Keep in mind that vaccination records are maintained at doctor's office for a limited number of years
- Contact your state's health department.
- Some states have registries (Immunization Information Systems) that include adult vaccines.

Exercise 1:

At school, Ria and her class were being taken to the auditorium, they were not knowing what was happening, as soon as they reached there, they got to know they were getting vaccinated, and they were also being provided with a card with sign, name of the student, and stamp. After the vaccination they were told it was an immunization card and they need to keep it safe, so now when you go home Ask your parents about your immunization card and see how many vaccines you have taken since birth

Time to revise

1. Which disease is prevented by vaccination named BCG?

a. Polio

b. Diphtheria

c. Mumps

d. Rubella

2. From where can you get immunization card?

a. Public Health clinic

b. State health department

c. All of the above

3. Hepatitis B us related to infection of which body part?

a. Heart

b. Liver

c. Lungs

d. Kidney

Unit-6

Covid19-A global pandemic

Learning Outcome

Location	Learning outcome	Knowledge evaluation	Performance evaluation	Teaching and Training method
Classroom	Students shall be able to explain about how corona became a pandemic	Explain the role of vaccination, hygiene during pandemic	Importance of hygiene and maintaining social distancing in crowded areas and hospitals.	Interactive Lecture: 1. Chalk & talk method. 2. Book Activity: List down the do's and don'ts during coronavirus time.

Objectives

After attending this session, you should be able to:

- Learn about corona
- Types of vaccines available for corona
- Important helpline numbers

6.1. What is coronavirus?

It is a big family of different viruses; some causes cold in common people. Some also infect animals like bats, cattle, and camel.

It is a large family of viruses that cause illness ranging from common cold to severe diseases.

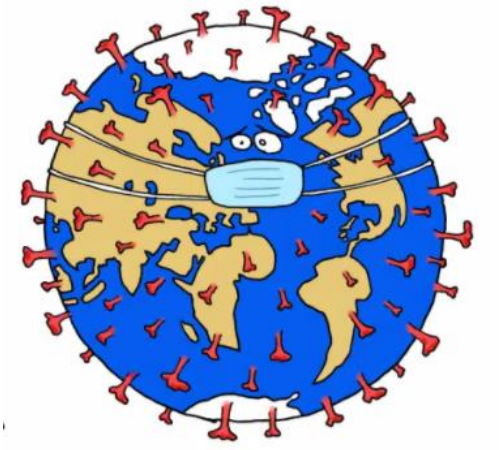
A novel coronavirus (nCOV) is a new strain that has not been previously identified in humans

❖ From where did coronavirus come from?

It was first detected in Wuhan, China in late 2019, which has now become a global pandemic.

Experts say that SARS- CoV-2 originated in bats. It spread in humans through one of the Wuhan's open air wet markets. They are the ones where customers buy fresh meat and fish including animals that are killed on spot.

Some wet markets sell wild or banned species like cobras, wild boars, and raccoon dogs. Crowded conditions can let viruses from different animals swap genes. Sometimes the virus changes so much it can start to infect and spread among people.



Wuhan markets were not selling bats at the time of epidemic, so the suspicion also fell on pangolins, which were sold illegally in the markets of China. Some coronaviruses that infect pangolins are similar to SARS-CoV-2.

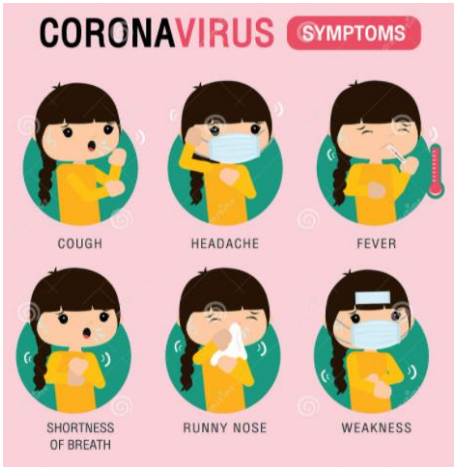
Pangolin

As SARS-CoV-2 spread not just in China but also outside China, it started infecting people who had no direct contact with animals. It started spreading from one human to another, and then across the globe and became a pandemic.

And the rest we all know, how we got locked up in our own homes. No travelling, shopping, partying, schools, gyms, markets, malls.

❖ Symptoms of coronavirus

It affects people in different ways, it could be mild and can be treated at home, or even severe which needs hospitalization.



Most common symptoms:

fever
cough
tiredness
loss of taste or smell

Less common symptoms:

sore throat
headache
aches and pains
diarrhoea
a rash on skin, or discolouration of fingers or toes
red or irritated eyes

Serious symptoms:

difficulty breathing or shortness of breath
loss of speech or mobility, or confusion
chest pain

- Seek immediate medical attention if you have serious symptoms. Always call before visiting your doctor or health facility.

- People with mild symptoms who are otherwise healthy should manage their symptoms at home.

- On average it takes 5–6 days from when someone is infected with the virus for symptoms to show, however it can take up to 14 days.

Keep calm and stay at home to stop the spread

❖ What should we do to stop the spread of corona?

It is very simple to stop the spread of corona and protect ourselves, our families, and our communities.

- Get a COVID-19 vaccine.
- Wash your hands often with plain soap and water.
- **Cover your mouth and nose with a mask** when around others
- Avoid crowds and practice social distancing (stay at least 6 feet apart from others).
- Do not panic and rush to hospital unnecessarily.

1.Limit contacting with others

People should take care to avoid coming into close contact with others — especially those who are older, unwell, or have symptoms of the virus. If, a person lives within a community where coronavirus is present, the relevant government will likely have additional instructions on how to implement social distancing. These may include:

- staying home from work or working from home
- avoiding contact with anyone who is not a member of the household
- prohibiting large gatherings of people
- closing non-essential services, including bars and restaurants

1. Staying home if unwell

If a person has mild symptoms of COVID-19, they can self-isolate by staying at home and avoiding contact with others. Even if a person is unsure whether they have COVID-19, a common cold, or something else, it is best to stay inside and rest.

❖ Washing hands

Washing your hands is one of the easiest ways to protect yourself and others from illnesses such as food poisoning and flu. You should wash your hands for the amount of time it takes to sing "Happy Birthday" twice (around 20 seconds):

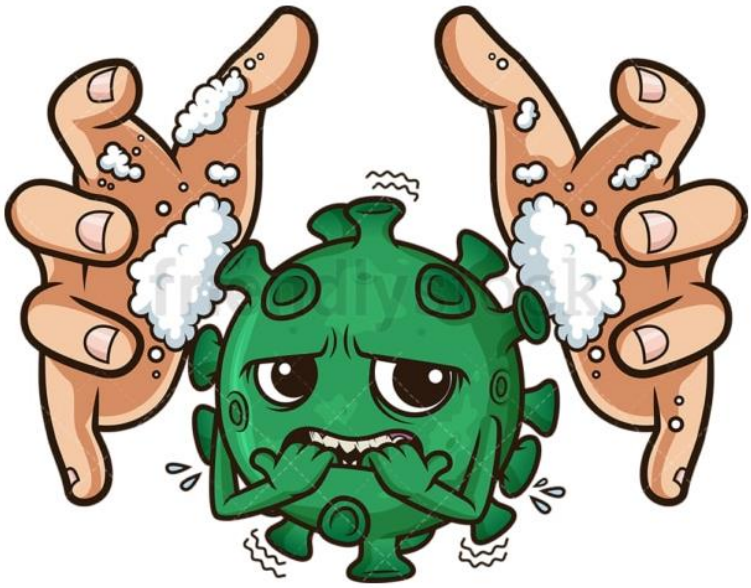
- Wet your hands with water.
- Apply enough soap to cover your hands.
- Rub your hands together.
- Use 1 hand to rub the back of the other hand and clean in between the fingers. Do the same with the other hand.
- Rub your hands together and clean in between your fingers.
- Rub the back of your fingers against your palms.
- Rub your thumb using your other hand. Do the same with the other thumb.
- Rub the tips of your fingers on the palm of your other hand. Do the same with other hand.
- Rinse your hands with water.
- Dry your hands completely with a disposable towel.
- Use the disposable towel to turn off the tap.

❖ When to wash hands?

You should wash your hands:

- After using washroom
- Before and after handling raw food like meat and vegetable
- Before and after eating
- After blowing your nose, sneezing, or coughing
- Before and after treating cut or wound
- After touching animals, including pets, their food, and after cleaning their cages

Washing your hands properly removes dirt, viruses, and bacteria to stop them spreading to other people and objects, which can spread illnesses.

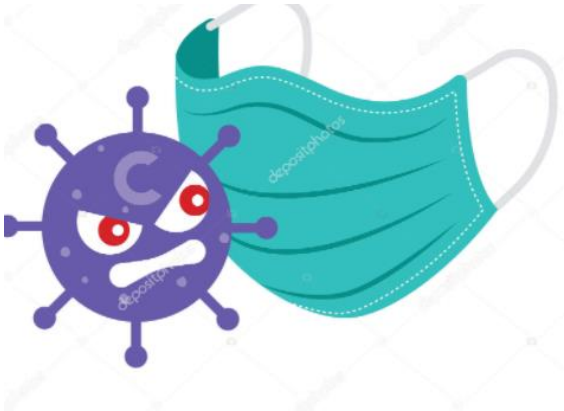


❖ How and when to use face masks?

According to the World Health Organization (WHO), people should wear a face mask in public when it is not possible to maintain at least 1 meter distance from others.

Face masks are only effective if a person uses them correctly. Take the following steps to use and dispose of a face mask correctly:

- Before touching the mask or the face, wash the hands with soap and water for at least 20 seconds.
- Make sure that the mask covers the nose and mouth, with no gaps between the face and the mask.
- While wearing the mask, avoid touching it.
- If a person does touch the mask while wearing it, they should wash the hands again.
- Avoid reusing single-use masks.
- Do not write anything, such as a person's name, on the mask. This damages mask integrity and could allow contaminants to enter.
- Replace a mask if it becomes damp.
- Remove the mask by lifting the string at the back, rather than by touching the front.
- Discard used masks immediately into a closed garbage bin, then wash the hands again.



6.2. Naming coronavirus and virus that causes it

Coronavirus was previously known as 2019 novel coronavirus, and now it is officially named as:

Disease

coronavirus disease

(COVID-19)

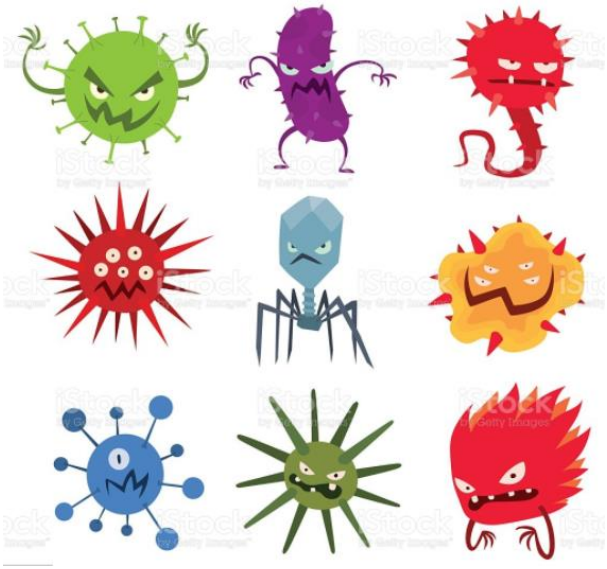
Virus

severe acute respiratory syndrome coronavirus 2
(SARS-CoV-2)

❖ Why do virus and the diseases have different names?

Diseases are named based on their prevention, spread, transmissibility, severity, and treatment. Diseases are officially named by WHO in the International Classification of Diseases (ICD).

Viruses are named based on their genetic structure to help in development of diagnostic tests, vaccines and medicines, virologists and the wider scientific community do this work, so viruses are named by the International Committee on Taxonomy of Viruses (ICTV).



❖ Vaccination for coronavirus

Back in 2020, nobody thought a vaccination would develop against coronavirus, but now we have vaccines like, Covaxin, Moderna, Pfizer- BioNTech, Johnson & Johnson's Janssen, Sputnik V vaccine, Covishield.

All currently approved or authorized COVID-19 vaccines are safe and effective and reduce your risk of severe illness

But it's not vaccines that will stop the pandemic, it's vaccination. We must ensure that all get the vaccinations and protect their people.

❖ Coronavirus: Teenagers and Youth

Covid can affect anyone, but it is observed that children under the age of 18 years have few deaths compared to other age groups and usually mild disease.

People who have pre-existing medical problems like high blood pressure, heart and lung problems, asthma, diabetes, obesity, cancer, and neurological and developmental conditions are at more danger and it is severe for them.

Even if the symptoms are mild, it can still be spread from one to another.

❖ Who should get vaccinated?

Covid 19 vaccines are safe for most people over 18 years of age. It includes all with pre-existing conditions of any kind like hypertension, diabetes, asthma, pulmonary, liver and kidney disease,

as well as chronic infections (A chronic illness or disability lasts for a very long time) that are stable and controlled.

❖ What to do after getting vaccinated?

1. Stay at the place where you get vaccinated for at least 15 minutes afterwards, just in case you have an unusual reaction, so health workers can help you.

2. Check when you should come in for a second dose – if needed. Most of the vaccines available are two-dose vaccines. Check with your care provider whether you need to get a second dose and when you should get it. Second doses help boost the immune response and strengthen immunity.

3. In most cases, minor side effects are normal. Common side effects after vaccination, which indicate that a person's body is building protection to COVID-19 infection include:

- Arm soreness
- Mild fever
- Tiredness
- Headaches
- Muscle or joint aches

Contact your care provider if there is redness or tenderness (pain) where you got the shot that increases after 24 hours, or if side effects do not go away after a few days.

❖ Precautions after getting vaccinated

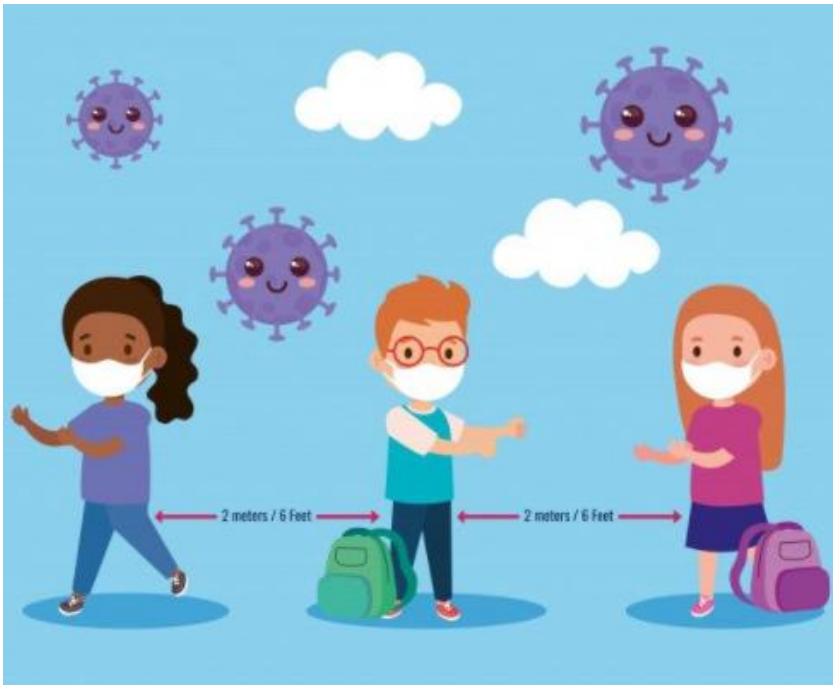
Even, if you are fully vaccinated you still have to take the precautions, as COVID-19 vaccine will prevent serious illness and death, but it is still not known the extent to which it keeps you from being infected and passing the virus on to others. The more we allow the virus to spread, the more opportunity the virus has to change.

Continue to take actions to slow and eventually stop the spread of the virus:

- Keep at least 1 metre from others
- Wear a mask, especially in crowded, closed, and poorly ventilated settings.
- Clean your hands frequently
- Cover any cough or sneeze in your bent elbow
- When indoors with others, ensure good ventilation, such as by opening a window

Doing it all protects us all.

दो गज़ दूरी, मास्क है ज़रूरी



6.3 Aarogya Setu App

An Indian COVID–19 "contact tracing, digital service, primarily a mobile app, developed by the National Informatics Centre under the Ministry of Electronics and Information Technology (MeitY). The app reached more than 100 million installs in 40 days.

It is available in 11 different languages. It is a mobile application, to connect essential health services with the people of India.

You can book your vaccine slots from Aarogya Setu App and download your vaccination certificates from there.

❖ Corona warriors

All the people who were continuously serving the country and people during this pandemic are the warriors, not just doctors but the ward boy of the hospital, the cleaner as if they were not doing their jobs the people in hospital would have died of other disease if not corona, they kept the environment clean.

These people were serving the nation, even when there was complete lockdown

- Defence Services
- Airline Employees.
- Bank Employees.
- District Administration.
- Employees of Pharma Companies/ Research Laboratories.

- Farmers.
- Indian Railways Employees.
- Media Persons.
- Medical Professionals.

Thanking Corona Warriors isn’t enough.

Except these there were some people who helped others who were not able to help themselves in the difficult times, let us look at some stories:

Manzoor Ahmad from Kashmir

As per MyGoV, Manzoor Ahmad is an Asthma patient. However, his medical condition did not stop him from helping others fighting Covid. "Despite being Asthamatic himself, Manzoor Ahmad drives a small truck to refill and deliver oxygen cylinders to Covid patients in need," MyGov says.

Farmers from Gujarat

Farmers of R Gorad farm from Gujarat's Gir will give all the coconuts planted this month to Covid patients at Junagadh Civil hospital for free.

Nina Muniyal From Agra

Nina Muniyal has started an initiative 'Prasad' that provides free home-cooked nutritious meals to over 100 Covid patients daily.

❖ Some important helpline numbers

Corona (covid 19) Helpline: 011-239780046 or 1075

NATIONAL EMERGENCY NUMBER	112
POLICE	100
FIRE	101
AMBULANCE	102
Disaster Management Services	108
Women Helpline	1091
Women Helpline - (Domestic Abuse)	181
Anti-Poison (New Delhi)	1066 or 011-1066
EARTHQUAKE / FLOOD / DISASTER (N.D.R.F Headquarters) NDRF HELPLINE NO:	011-24363260 9711077372
Children In Difficult Situation	1098
ORBO Centre, AIIMS (For Donation of Organ) Delhi	1060

24 HOUR AMBULANCE IN DELHI	
All India Institute of Medical Sciences (AIIMS)	011- 26588776, 26594405, 011-26594706
Centralized Accident Trauma Service (CATS)	102, 1099
Escort Hospital	011- 26825000
Moolchand Hospital	011- 42000000
Batra Hospital	011- 26083747
Rajiv Gandhi Cancer Institute	011- 27051011 to 29
Sir Ganga Ram Hospital New Delhi	011- 25750000, 25757575
Vidyasagar Institute of Mental Health & Neurosciences (VIMHANS) **WEBSITE**	9650725925, 011- 29802980
Max Emergency Ambulance	011- 40554055
National Heart Institute	011- 26441293
Holy Angles Hospital (Vasant Vihar)	011- 6143411, 43357700

Exercise 1:

When during the lock down, you were stuck at home, watching TV, all the news channels were showing news related to coronavirus, what you should do and what you should not, list down what all things we should do to help reduce the spread of coronavirus and things that we should avoid during the pandemic.

Tick the correct choice

1. Who names diseases?

a. WHO

b. ICTV

c. IMF

d. UNICEF

2. Who names viruses?

a. ICTV

b. WHO

c. IMF

d. UNESCO

3. Which number would land the call to an ambulance service?

a. 100

b. 102

c. 108

d. 101