RAMAKRISHNA MISSION RESIDENTIAL COLLEGE

NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: Nitrogen cycle and its importance for living beings

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YEAR: 2020

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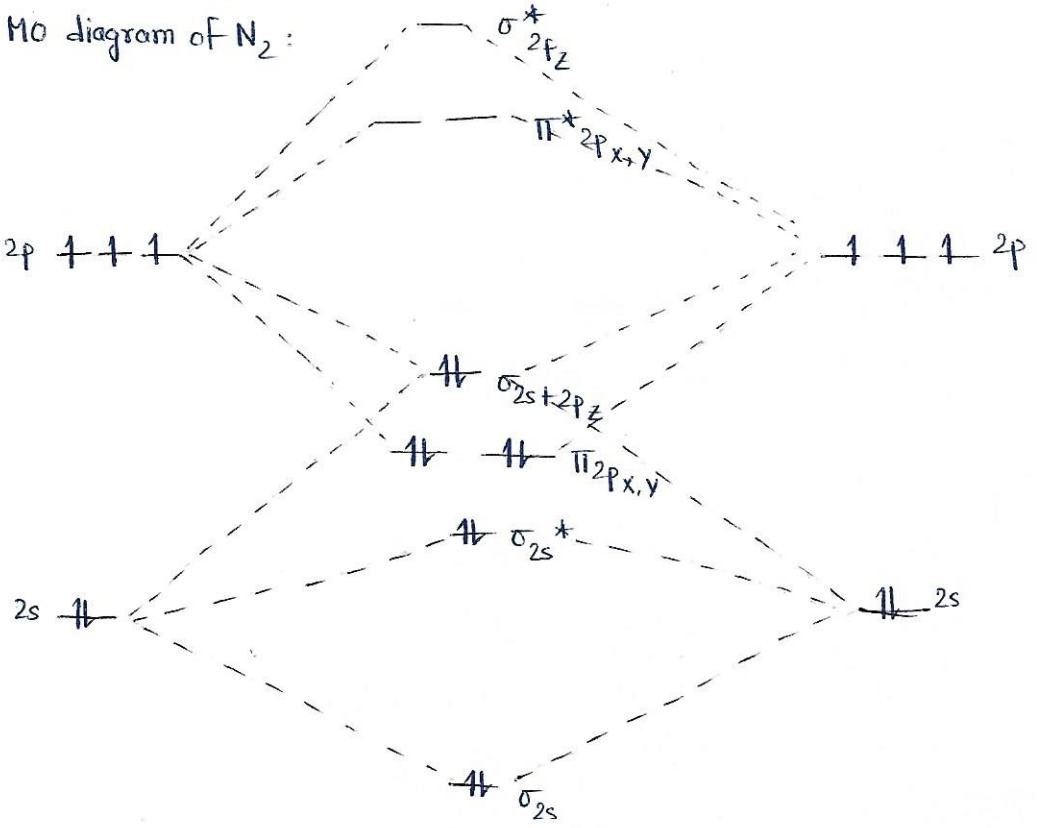
Though dinitrogen comprises 78% of the earth's atmosphere, it is not a very abundant element in the earth's crust. Nitrates are all very soluble in water so they are not widespread on the earth's crust, though deposits are found in a few desert regions. The largest is a 450 mile long belt along the coast of northern Chile where $NaNO_3$ (Chile salt petre) is found together with small amounts of KNO_3, $CaSO_4$ and $NaIO_3$ under a thin layer of sand and soil. This provided the main source of nitrates for industrial use prior to World War I, when synthetic processes were developed for the manufacture of nitrates from atmospheric dinitrogen. A major deposit of salt petre KNO_3 occurs in India.

Nitrogen belongs to group XV of the periodic table. The elements of this group all have five electrons in their outer shell. Nitrogen exhibits a very wide range of oxidation states: -3 in ammonia NH_3, -2 in hydrazine N_2H_4, -1 in hydroxylamine NH_2OH, 0 in dinitrogen N_2, $+1$ in nitrous oxide N_2O, $+2$ in nitric oxide, $+3$ in nitrous acid HNO_2, $+4$ in nitrogen-dioxide NO_2, $+5$ in nitric acid HNO_3.

The N_2 molecule contains a triple bond $N \equiv N$ with a short bond length of 1.09 Å. This bond is very stable and the dissociation energy is consequently very high (945.4 kJ/mole). Thus N_2 is inert at room temperature. At elevated temperature N_2 becomes increasingly reactive.

Electronic configuration of N : $[He]\,2s^2\,2p^3$

MO diagram of N_2 :

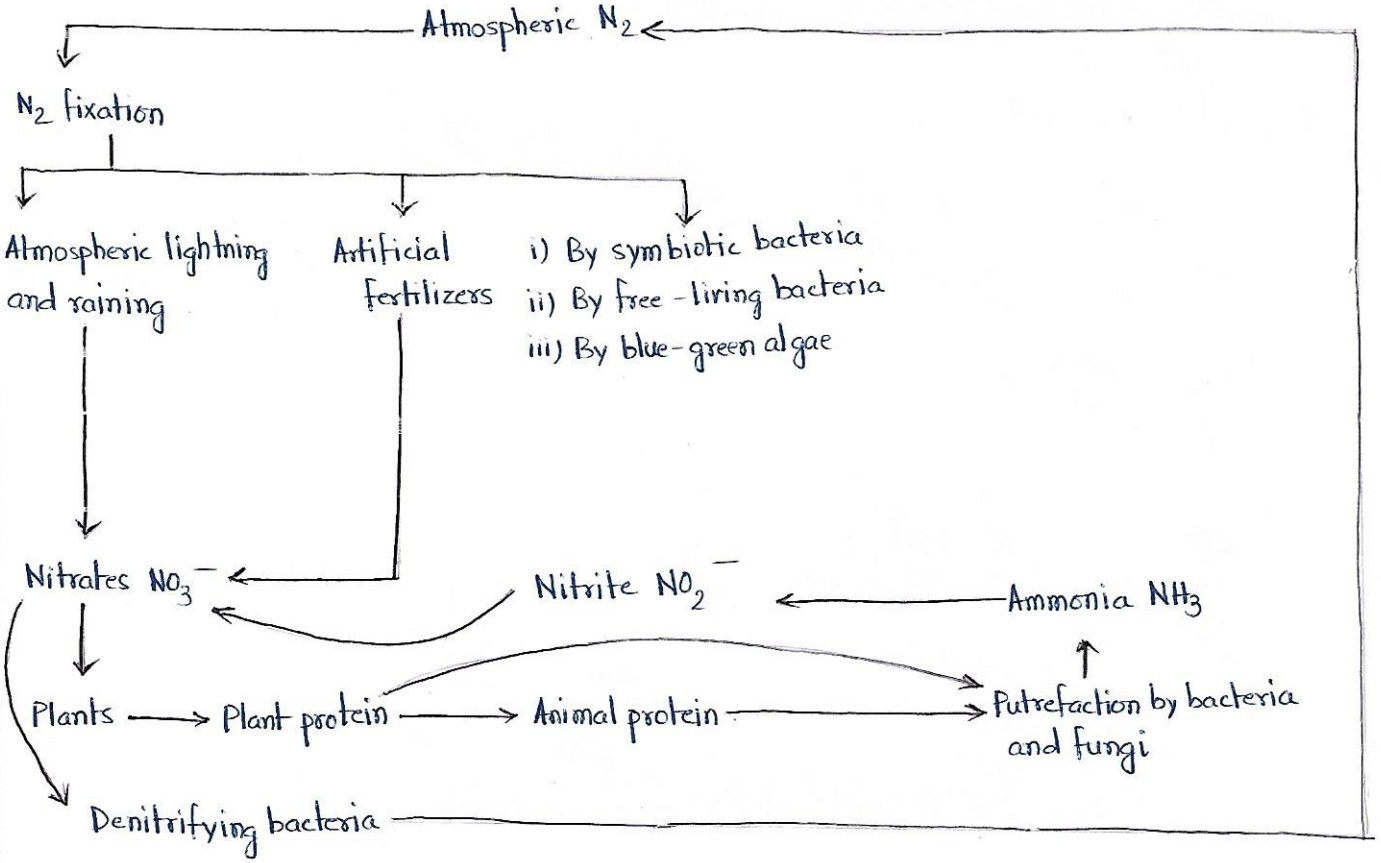


The bond order of dinitrogen is thus 3. Since electrons occupy the bonding molecular orbitals, the molecule is very stable and unreactive.

There is a large amount of N_2 gas in the atmosphere but plants are unable to utilize this because N_2 gas is so stable and unreactive. Fertile soil contains combined nitrogen mainly in the form of nitrates nitrites, ammonium salts or urea $CO(NH_2)_2$.

Inside the plants, nitrate is first changed into ammonium form before being incorporated into various nitrogen containing compounds eg. amino acids, purine, pyrimidine, ATP, proteins, enzymes, hormones, vitamins etc. Besides nitrogen is also component of coenzymes, cytochrome, chlorophyll, RNA, DNA, alkaloid, latex etc.

The complete series of cyclical events by which circulation of nitrogen occurs amongst the living organism reservoir pools in the atmosphere and the cycling pool in the lithosphere is known as nitrogen cycle.



Plants obtain nitrogen from the following sources :

i) atmospheric N_2 : Higher plants cannot utilize it directly. Few groups of lower plants can only utilize N_2 and the process is known as biological N_2 fixation.

ii) Nitrates, nitrites, ammonia in the soil : Among these nitrate is the chief form of nitrogen taken up by the plants from the soil.

iii) Amino acids in the soil : Many soil microorganism make use of this form of nitrogen Sometimes it may also be taken up by higher plants Commonly available forms are glycine, alanine, arginine etc.

iv) Organic nitrogenous compounds in the bodies of insects : Insectivorous plants fulfill their nitrogen requirement by trapping small insects and digesting them.

Release of nitrogen compounds from organic matter :

i) Decomposition and ammonification : Proteins of dead bodies, nitrogenous excretions, wastes are acted upon by decomposer micro-organisms like Bacillus ramosus, B. vulgaris, Actinomycetes, clostridium species. They hydrolyse proteins and other complex substances. Amino acids and other simpler substances are formed Amino acids are deaminated to ammonia and other organic acids. Ammonia does not exist in the gaseous state in the soil, it immediately combines with H^+ to form ammonium ion NH_4^+.

Proteins $\xrightarrow{\text{hydrolysis}}$ $RH(NH_2)CO_2H$ (amino acid)

Amino acids $\xrightarrow{\text{deamination}}$ NH_3 + organic acid

$NH_3 + H^+ \longrightarrow NH_4^+$ (ammonium ion)

Some amount of NH_4^+ can be absorbed by plant roots. The remaining is converted to nitrate by micro-organisms by the process of nitrification.

ii) Nitrification : It is performed in two steps.

→ Nitrite formation : A number of micro-organisms like Nitrosomonas sp., Nitrococcus sp. oxidises ammonium ion to convert to nitrite, energy is released in the process.

$$NH_4^+ + 2O_2 \longrightarrow NO_2^- + 2H_2O + \text{energy}.$$

→ Nitrate formation : Nitrite is oxidised to nitrate by a number of micro-organism like Nitrobacter sp., Nitrocystis sp.

$$2NO_2^- + O_2 \longrightarrow 2NO_3^- + \text{energy}$$

iii) Nitrate assimilation : Nitrate is the most important source of nitrogen to plants. It can accumulate in the cell sap of several plants and take part in producing osmotic potential. However it cannot be used as such by plants. It is first reduced to the level of ammonia before being incorporated into organic compounds.

Reduction of nitrate occurs in two steps

i) Reduction of nitrate to nitrite :

$$NO_3^- + NADPH + H^+ \xrightarrow[FMN/FAD]{\text{nitrate red.}} NO_2^- + NADP^+ + H_2O$$

ii) Reduction of nitrite to ammonia :

$$NO_2^- + 6e^- (Fd_{red}) + 8NADPH + H^+ \xrightarrow{\text{nitrite reductase}} NH_4^+ + 8NADP^+ + 6(Fd_{ox}) + 2H_2O$$

The NH_4^+ produced is metabolised by both reductive amination or catalytic amidation .

Synthesis of amino acids : Ammonium ions are rapidly incorporated into amino acids or amides . There are two major processes by which majority of amino acids in plants are synthesised

→ Reductive amination : In this process ammonium ion directly combines with α-keto glutaric acid and forms glutamic acid in the presence of enzyme glutamate dehydrogenase .

→ Catalytic amidation : In presence of enzyme glutamine synthetase and ATP, ammonium ions combine with glutamic acid to form amide glutamine . Glutamine transfers one of its amino group to α-ketoglutaric acid in presence of reduced coenzyme to form two molecules of glutamic acid . The process is repeated .

Glutamic acid is the main amino acid from which other 17 amino acids are formed through transamination

Nitrogen fixation : It is the conversion of inert atmospheric nitrogen ($N \equiv N$) into utilisable compounds of nitrogen like nitrate, ammonia, amino acids etc .

i) Natural nitrogen fixation : $H_2O \xrightarrow{\text{lightning}} H^+ + OH^-$

$$O_2 \xrightarrow{\text{lightning}} 2O$$

$$N_2 + 2OH^- + 4O \longrightarrow 2HNO_3 \text{ (nitric acid)}$$

On ground the nitric acid reacts with alkali metals to form nitrites and nitrates which are water soluble . These are absorbed by plants through roots .

ii) Industrial nitrogen fixation : In the fertilizer industry molecular nitrogen and hydrogen are made to combine at a temperature of 300 - 400°C and pressure of 35-100 MPa (Haber-Bosch process) .

iii) Biological nitrogen fixation : Conversion of atmospheric nitrogen into inorganic or organic usable form by the agency of living organisms is called biological nitrogen fixation .

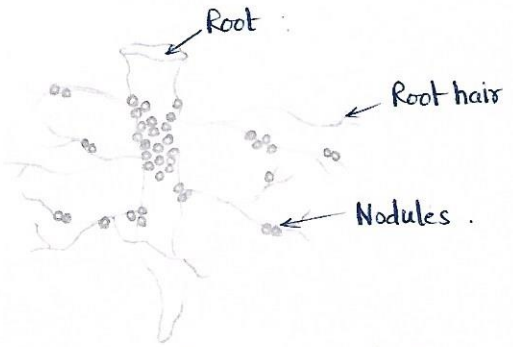
→ By free living nitrogen fixing bacteria : i) Aerobic – eg. Azotobacter sp. , Beijerinckia sp .

ii) Anaerobic – eg. Clostridium sp .

→ Free living nitrogen fixing blue green algae : eg. Anabaena sp., Nostoc sp.

→ Symbiotic nitrogen fixing bacteria : Rhizobium – legume root association is the most common example of symbiotic N_2 fixation. Rhizobium lives in soil and forms root nodules in plants of family leguminosae.

Nodules contain vascular bundles which transport the compounds produced due to N_2 fixation in nodule to the host plant body and carbohydrates from the host to the nodules. Oxidation of those carbohydrates provides the energy for bacterial respiration.



Nodules in the root of leguminous plant

There is a considerable research interest into finding transition metal catalysed systems which will absorb dinitrogen and produce ammonia for fertilisers cheaply without the necessity of high temperature or pressure. The first dinitrogen complex, the pentaammine dinitrogen ruthenium cation was made in 1965 by reducing ruthenium trichloride with hydrazine.

The formation of this stable complex led to studies with other metals. Complexes with titanium are the most promising.

$$Ti(OR)_4 \xrightarrow{Na} Ti(OR)_2 + 2NaOR$$

$$Ti(OR)_2 + N_2 \longrightarrow [Ti(OR)_2N_2]$$

$$[Ti(OR)_2N_2] \xrightarrow{\text{reduce}} [Ti(OR_2)N_2]^{6-}$$

$$[Ti(OR_2)N_2]^{6-} \xrightarrow{H^+} 2NH_3 + Ti(OR)_2$$

Biochemical process of N_2 fixation :

Reaction : i) Nitrogen is reduced into ammonia by nitrogenase. $NADPH_2$, $FMNH_2$ and ATP are required here. It also requires a receptor compound for the ammonia.

$$\underset{\text{dinitrogen}}{N \equiv N} \xrightarrow{\text{nitrogenase}} \underset{\text{diamide}}{HN = NH} \xrightarrow{\text{nitrogenase}} \underset{\text{hydrazine}}{H_2N - NH_2} \xrightarrow{\text{nitrogenase}} 2NH_3$$

($2H^+ + 2e$ at each step)

Ammonia is never released as it exerts high toxicity even at very low level. The nitrogen fixing microbes survive by synthesizing various amino acids with ammonia.

ii) $NH_3 + \alpha$-keto glutaric acid + $NADH \longrightarrow$ glutamic acid + $NAD^+ + H^+$

The symbiotic N_2 fixing microbes supply the fixed nitrogen to the host in exchange of food and shelter, free living microbes never transfers N_2 to the soil. The N_2 present within their body is released only after their death and enters into the N_2 cycle.

Denitrification : Under anaerobic conditions some micro-organisms use nitrate and other oxidised ions as the source of oxygen. In the process nitrates are reduced to gaseous nitrogen. Gaseous nitrogen escapes from the soil. Common bacteria causing denitrification are Pseudomonas denitrificans, Thiobacillus denitrificans, Micrococcus denitrificans

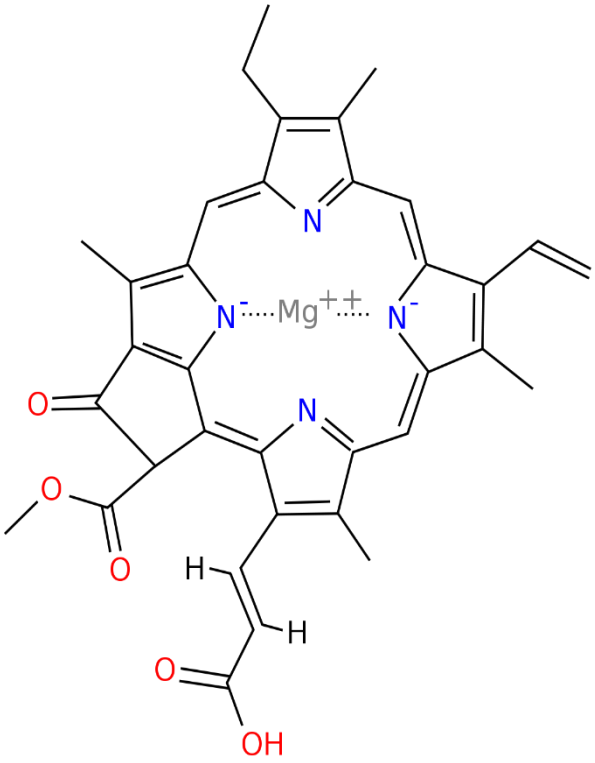
$$2NO_3^- \longrightarrow 2NO_2^- \longrightarrow 2NO \longrightarrow N_2O \longrightarrow N_2$$

Importance : Nitrogen is essential for plants to grow and survive, without proteins some as structural units, others as enzymes - plants die. Nitrogen makes up a part of chlorophyll which plants need for photosynthesis. Nitrogen also forms a part of energy transfer compound such as ATP which lets cell conserve and use energy released via metabolism. Plants also need nucleic acids such as DNA, RNA to grow and reproduce.

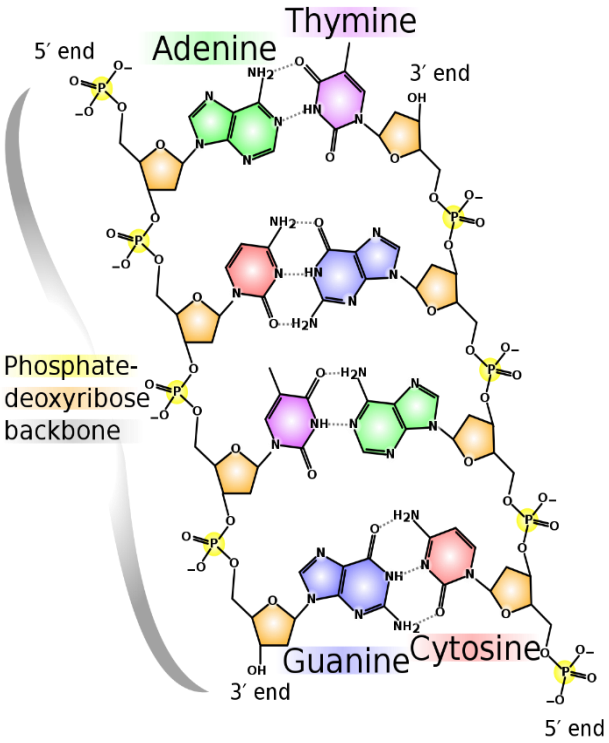
Normal growth, cell replacement, tissue repair in animals require nitrogen, various metabolic processes requires proteins in the form of enzymes. Nitrogen is continually recycled from amino acids, breaking amino acids not used for protein synthesis into components including nitrogen for energy. Nitrogen also makes up non-protein compounds such as heme in haemoglobin.

Free living microbes fixes 5 kg of N_2 per hectare soil per year. Thus the N_2 fixing microbes like Anabaena sp., Azotobacter sp. are directly used as biofertilizer. Aulosira fertilisima, a blue green algae is used as a N_2 fixing biofertilizer in the paddy fields of West Bengal.

Structures of Chlorophyll, DNA, nucleobases (all contain nitrogen)

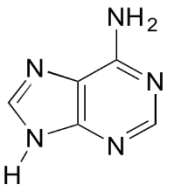


Structure of Chlorophyll

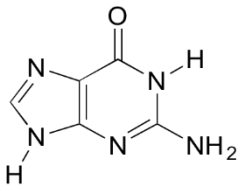


Structure of deoxyribonucleic acid

purine bases

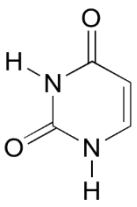


adenine (A)

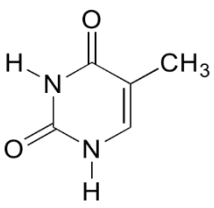


guanine (G)

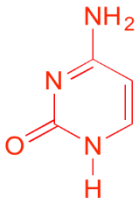
pyrimidine bases



uracil (U)
(RNA)



thymine (T)
(DNA)



cytosine (C)

Structure of nucleobases

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ENVIRONMENTAL STUDIES

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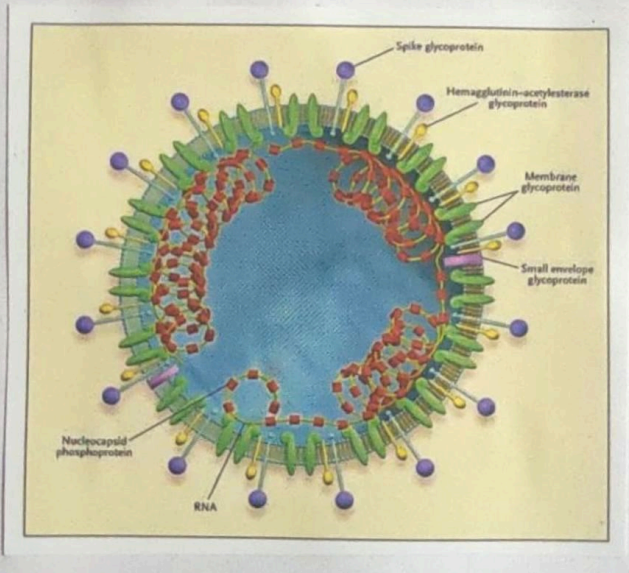
SIGNATURE	: Swarnendu Sarkar

∴ Overview :-

corona virus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. Most people infected with the COVID-19 virus will experience mild to moderate respir-atory illness and recover without requiring special treatment. Older people, and those with underlying medical problems like cardivascular disease, diabetes, chronic respiratory disease and cancer are more likely to develop serious illness.

The best way to prevent and slow down transmission to be well informed about the COVID-19 virus, the disease it causes and how it spreads. We should protect ourself from infection by hands or using an alcohol based rub frequently and not touching one's face.



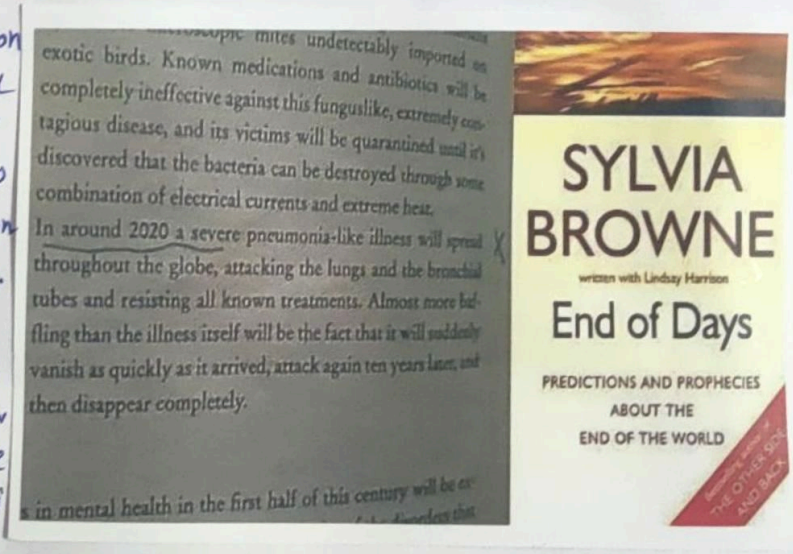
The COVID-19 virus spreads primarily through the droplets of saliva or discharge from the nose when an infected person coughs or sneezes.

• Etymology :-

The name "coronavirus" is derived from Latin corona, meaning "crown" or "wealth", itself a borrowing from Greek κορώνη korōnē, "garland, wreath". The name was coined by June Almeida and David Tyrrell who first observed and studied human coronaviruses. The word was first used in print in 1968 by an informal groups of virologists in the journal Nature to designate the new family of viruses. The scientific name coronavirus was accepted by a genus by the International Committee for the Nomenclature of viruses (later named International Committee on Taxonomy of Viruses) in 1971. The common name coronavirus is used to refer to any member of the subfamily of Orthocoronavirinae. As of 2020, 45 species are officially recognised.

• Prediction about corona virus :-

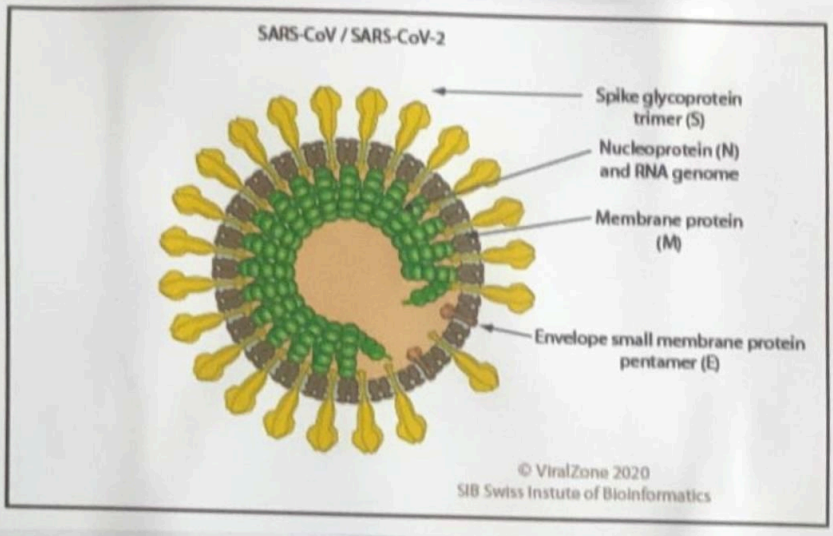
Amidst widespread confusion and panic over the viral infection, several mind blogging conspiracy theories have been doing rounds on social media platforms. From books, movies to the prophetic writers of 'Simpsons,' here is the low down of creepily accurate predictions of the respiratory illness.



- Almost 16 years ago, in an episode titled 'Bart to the Future', it was shown that Donald Trump will be the president of US. In the Simpsons, the viral flu is seen to be originating from Japan and not 'China' as the workers ship the Osaka Flu to Springfield.
- In a 1981 crime-thriller novel, titled 'The Eyes of Darkness', by Dean Koontz, a virus called Wuhan-400 is mentioned. It was created as a bio-weapon in a laboratory.
- Author Sylvia Browne, wrote a book titled "End of Days: Predictions and Prophecies about the End of the World." This book predicted the highly infectious corona virus in the year 2008.

- **Virus classification :-**

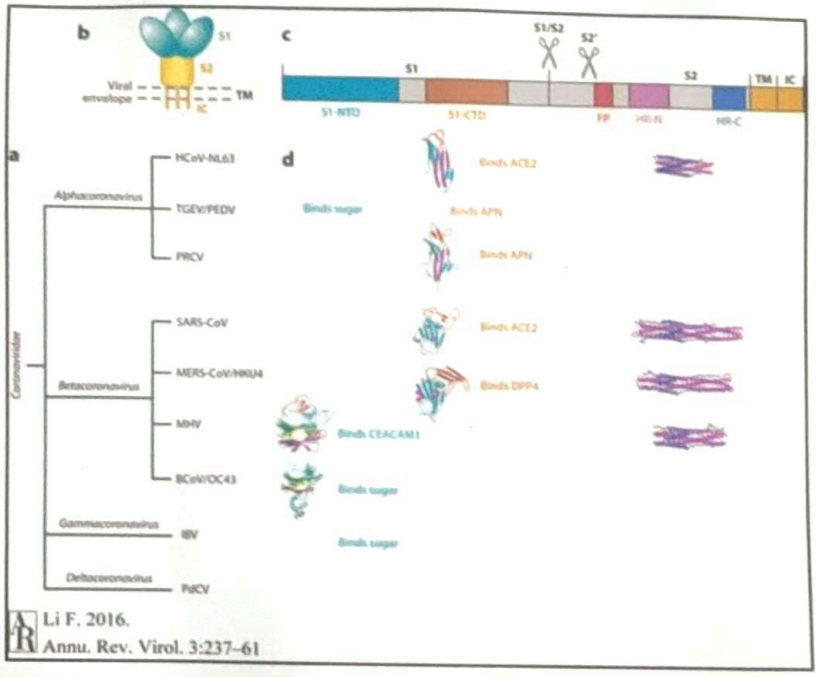
(Unranked) : Virus
Realm : Riboviria
kingdom : Orthornavirae
Phylum : Pisuviricota
class : Pisoniviricetes
Order : Nidovirales
Family : coronaviridae
Subfamily : Orthocoronavirinae



- **Genera :**
- Alphacoronavirus
- Betacoronavirus
- Gammacoronavirus
- Deltacoronavirus

• Structure :-

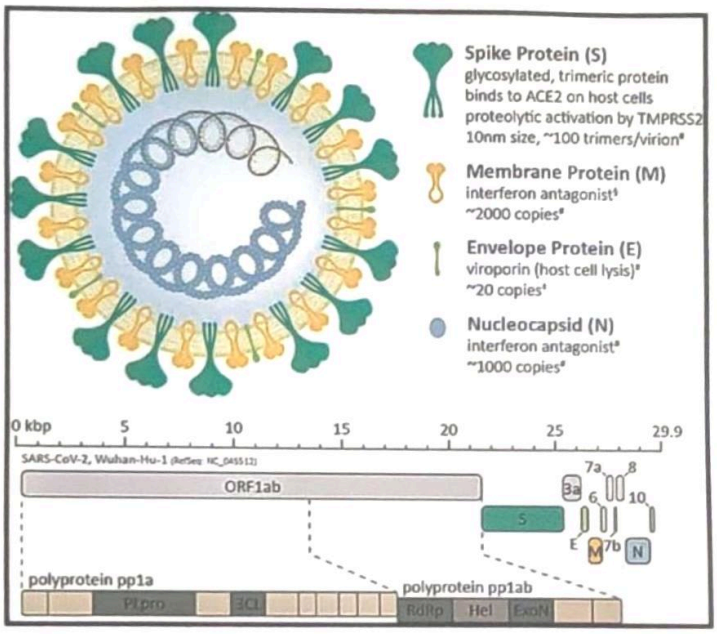
Corona viruses constitute the subfamily Orthocoronavirinae in the family Coronaviridae, order Nidovirales, and realm Riboviria. They are enveloped viruses with a positive-sense single-stranded RNA genome and a nucleocapsid of helical symmetry. The genome size of corona viruses ranges from approximately 26 to 32 kilobases, one of the largest among RNA viruses. They have characteristic club-shaped spikes that project from their surface, which in electron micrographs create an image reminiscent of the solar corona, from which their name derives.

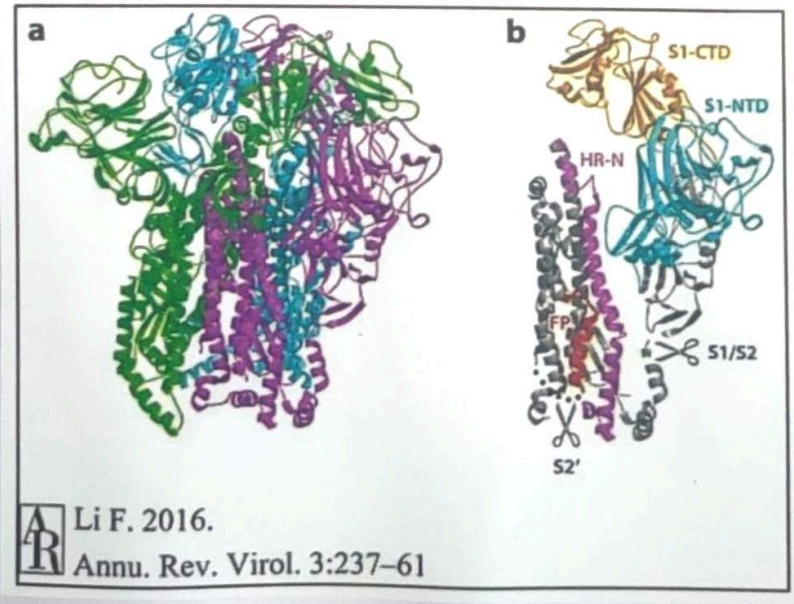


The envelope glycoproteins are responsible for attachment to the host cell and also carry the main antigenetic epitopes, particularly the epitopes recognised by neutralizing antibodies. OC43 also possesses a haemagglutin.

- **How does it work:**

It first binds to a receptor on the host cell surface through its S_1 subunit and then fuses viral and host membranes through its S_2 unit. Two domains in S_1 from different corona virus recognise a variety of host receptors, leading to viral attachment. The spike protei -n exists in two structurally combinations, prefusion and post fusio -n. The transition from prefusion to post fusion conformation of the spike protein must be triggered, leading to membrane fusion.

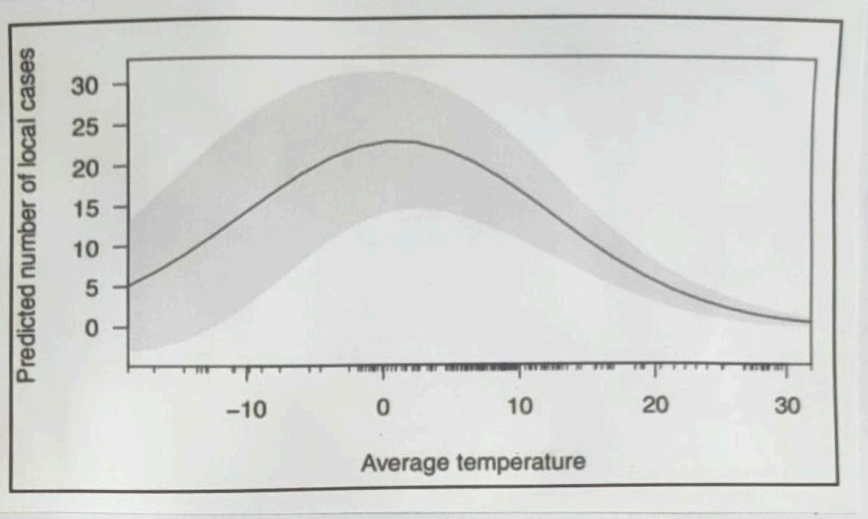




- A recent review of survival of human coronaviruses, on surfaces found large variability, ranging from 2 hours to 9 hours.

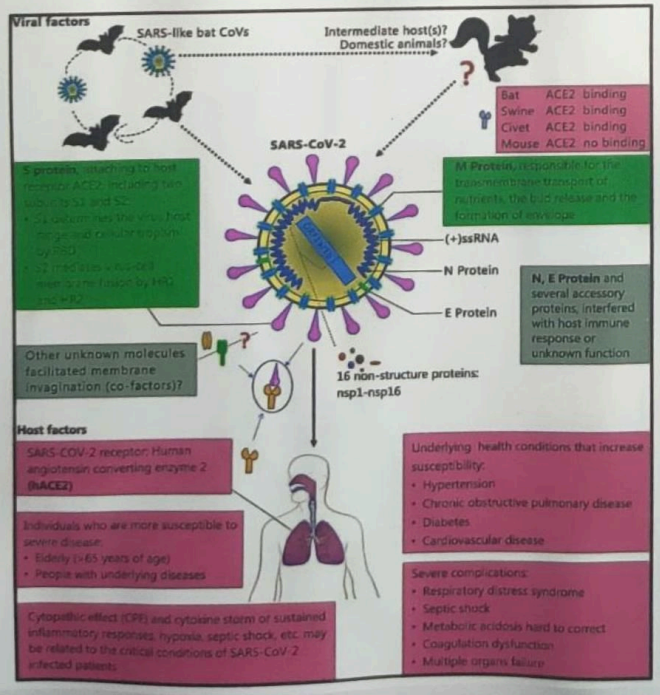
⊙ **Factors for the survival time:-**

i) type of surface
ii) temparature
iii) humidity
iv) specific strain of virus



- **Health information:** Most common symptoms: (i) fever (ii) dry cough (iii) tiredness

Less common symptoms: (i) aches and pains (ii) sore throat (iii) diarrhoea (iii) conjunctivitis (iv) headache (v) loss of taste or smell (vi) rash of skin (vii) discolouration of fingures and toes (viii) asthma



- generally mild:

(i) Human coronavirus OC 43 (HCoV-OC 43) β-CoV
(ii) Human corona virus HKU1 (HCoV-HKU1) β-CoV
(iii) Human corona virus 229E (HCoV-229E) β-CoV
(iv) Human corona virus NL63 (HCoV-NL63) α-CoV

- potentially severe:

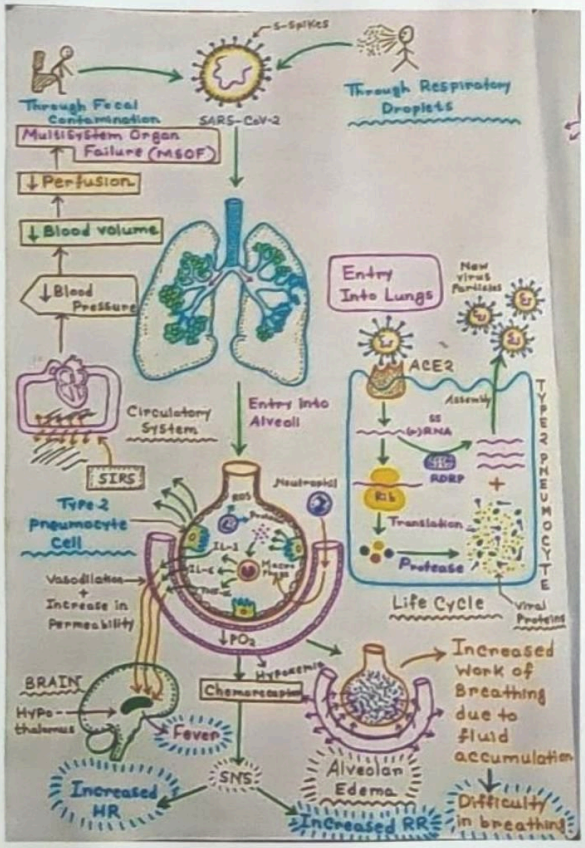
(i) MARS-CoV, β-CoV
(ii) SARS-CoV, β-CoV
(iii) SARS-CoV-2, β-CoV

• What COVID-19 does to human body:

According to WHO, most people who contract COVID-19, only experience mild flu-like symptoms, Occasionally though, the infection can cascade into a severe case of pneumonia that can be lethal, especially for the older people and those with underlying medical conditions.

■ **Infection:** The virus officially named SARS-CoV-2 enters the body - generally through the mouth or nose. From there, the virus makes its way down into the air sacks inside lungs, known as alveoli.

Once, in the alveoli, the virus spreads by using its distinctive 'spike proteins' to hijack cells. The primary genetic programming of any virus to make copies of itself, and COVID-19 is no exception



Once the virus RNA has entered the cell, new copies are made and the cell is killed in the process, releasing new viruses to infect neighbouring cells in the alveolus.

■ **Immune Response:**

The process of hijacking cells to reproduce causes inflammation in the lungs, which triggers and immune response. As this process unfolds, fluid begins to accumulate in the alveoli, causing a dry cough and making breathing difficult.

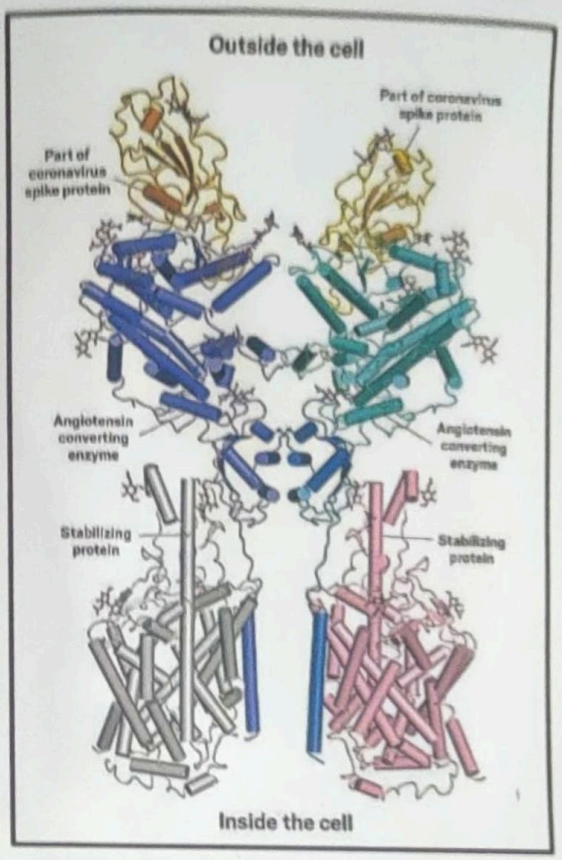
For 80-85% people infected by COVID-19, these symptoms will run their course much as they would with a case of the flu.

■ **Severe symptoms:** In 15-20% cases, the immune system's response to inflammation in the lungs can cause what's known as a "cytokine storm". If enough alveoli collapse, acute respiratory distress syndrome (ARDS) can occur, requiring a patient to be placed on a ventilator for breathing assistance.

At this stage, the surfactant that helps keep alveoli from collapsing has been diluted, and fluid containing cellular debris is imparing the gas exchange process that supplies O_2 to our bloodstream.

In the most severe cases, SIRS occurs as the protein-rich fluid from the lungs enters the bloodstream, resulting in septic shock and multi-organ failure. This is often the cause of death for people who have succumbed to a COVID-19 infection.

• COVID-19 TEST:



☐ **RT-PCR Tests:** A sample is collected from deep inside nose and the back of throat with a swab. The sample is then treated with chemical solutions that remove proteins and fats, leaving only the RNA present in the sample. The sample is then sent to the laboratory for analysis where an RT-PCR machine is used to detect the virus. While RT-PCR can detect the virus in asymptomatic persons, the tests do present false negative in about 30% of cases. Patients are, therefore tested twice before being confirmed as non-infectious.

☐ **Rapid antibody test:** Rapid anti-body testing involves taking a blood sample from the finger and putting in a testing template. The blood is then examined for two types of antibodies - Ig M antibodies, which are more likely to show up later.

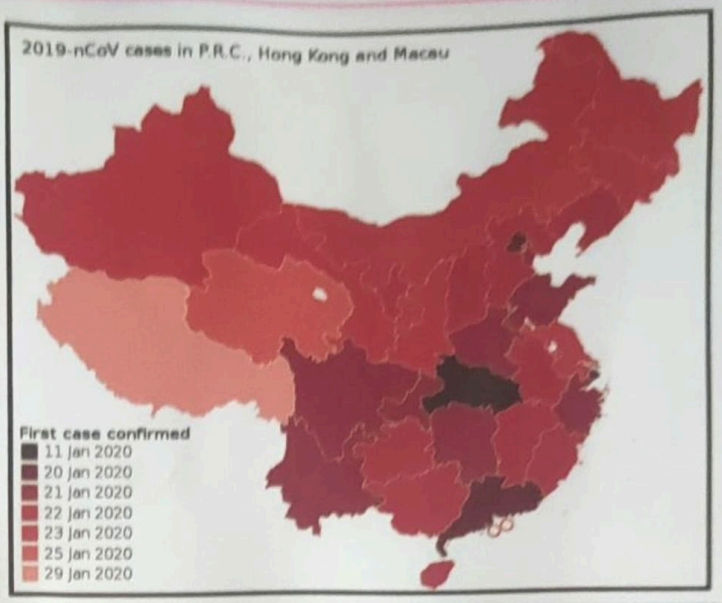
☐ **Rapid antigen test:**

Nasal samples are collected and tested for antigens, which are found in the SARS-CoV-2 virus. It is a virus to be detected by this type of point-care test that is performed outside the conventional laboratory setting, and is used to quickly obtain a diagonistic result.

☐ **Tru Nat Tests:**

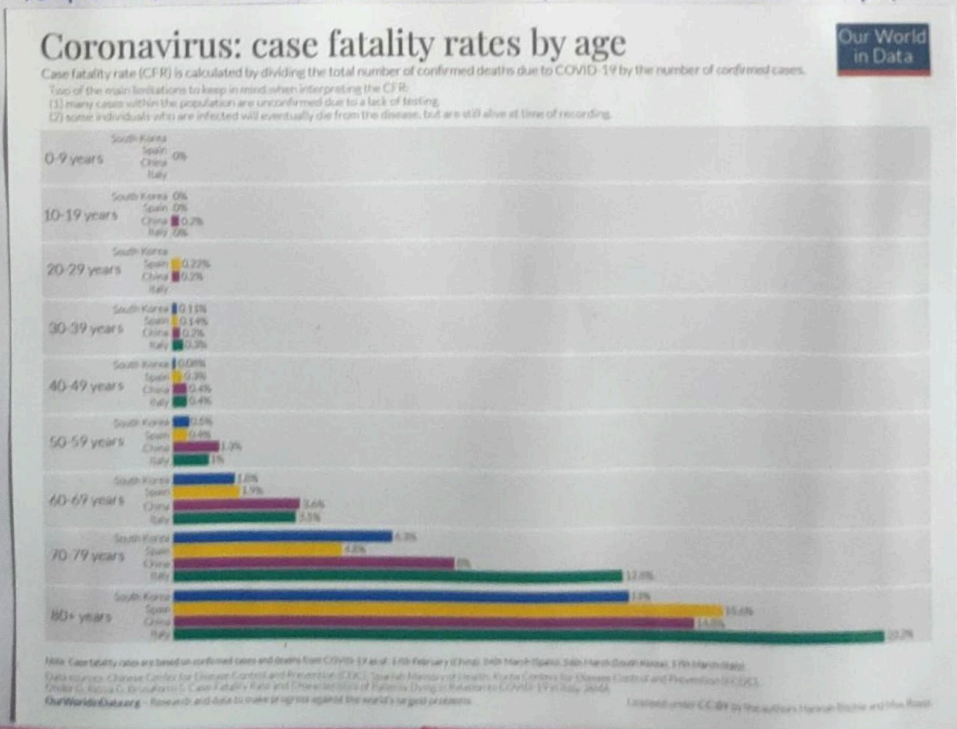
A true Nat machine is chip-based, small and portable, and mostly runs on batteries. It detects the virus in nasal or oral swabs. The machines are equipped to detect the RdRp enzyme found in the virus RNA.

- **Disease:**
  COVID-19
- **Outbreak:**
  2019–2020 pandemic
- **Date of first identified case:**
  December 2019
- **Location of first identified case:**
  Wuhan, China
- **Age Average:**
  56
- **Sex Ratio (M:F)**
  1.6 : 1
- **Confirmed cases:**
  46,937,042
- **Deaths:**
  1,207,284
- **Case fatality rate:**
  2.6%



Fatality Rate (Case fatality ratio or CFR) of the Wuhan Corona virus:

The novel coronavirus' case fatality rate has been estimated at around 2%, in the WHO press conference held on January 29, 2020. A prior estimate had put that number at 3%. Fatality rate can change as a virus can mutate, according to epidemiologists.
Fatality rate of SARS was 10% and for MERS was 34%.



China:

- Coronavirus Cases:
  86,070
- Deaths:
  4,634
- Recovered:
  81,045
- Active Cases:
  391 (Currently infected person)

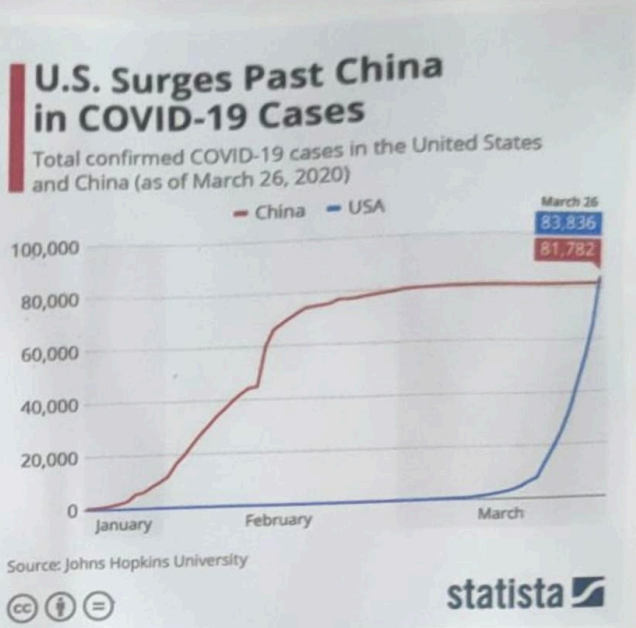
382 (98%) in Mild Condition

9 (2%) Serious or Critical

- Closed Cases:
  85,679
  cases which had an outcome:

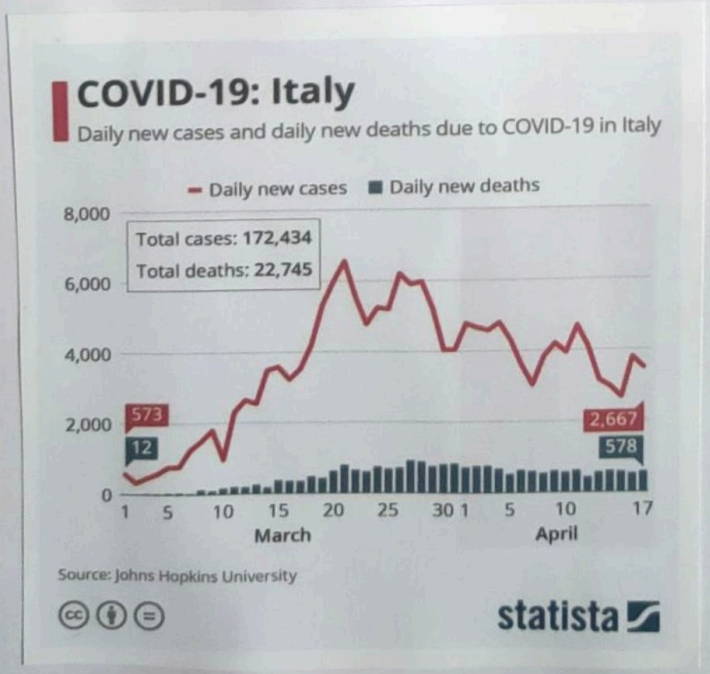
81,045 (95%) Recovered / Discharged

4634 (5%) Deaths



Italy:

- Coronavirus Cases:
  731,588
- Deaths:
  39,059
- Recoveries:
  296,017



- Active Cases:
  396,512
  (currently infected persons)

394,490 (99%) in Mild Condition

2,022 (1%) Serious or Critical

- Closed Cases:
  335,076
  cases which had an outcome:

296,017 (88%) Recovered / Discharged

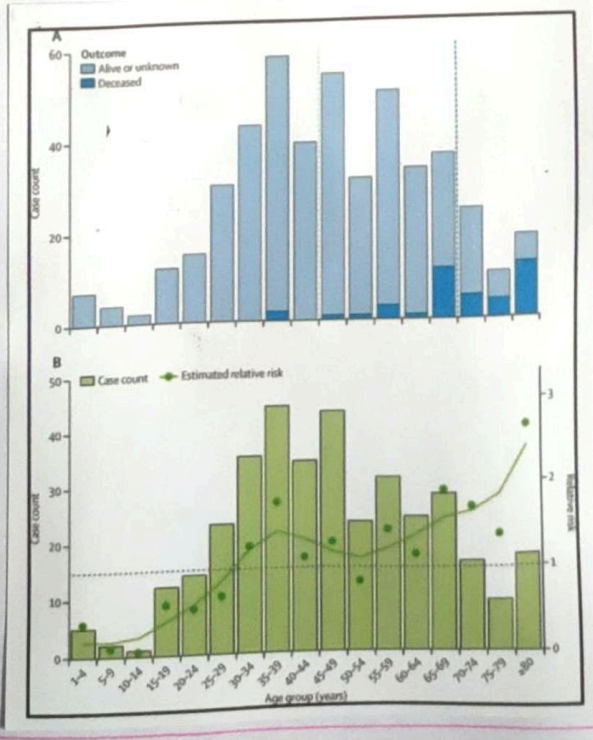
39,059 (12%) Deaths

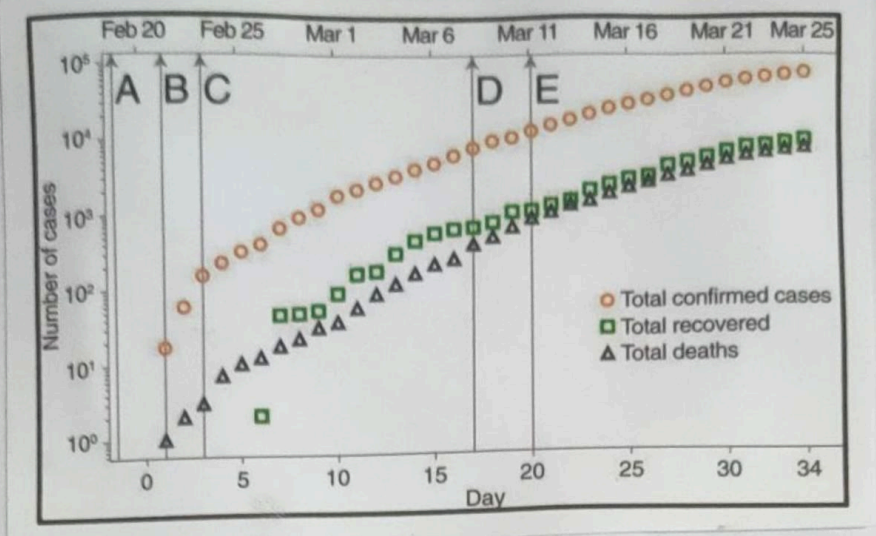
• INDIA:

STATE	CASES	ACTIVE	RECOVERED	DEATHS
Maharashtra	16,87,784	1,19,352	15,24,304	44,128
Karnataka	8,29,690	44,824	7,73,595	11,221
Andhra Pradesh	8,27,882	22,538	7,98,625	6,719
Tamil Nadu	7,29,507	19,504	6,98,820	11,183
Uttar Pradesh	4,85,609	23,035	4,55,498	7,076
Kerala	4,44,268	86,792	3,55,943	1,533
Delhi	3,96,371	33,308	3,56,459	6,604
West Bengal	3,81,608	36,576	3,38,075	6,957
Odisha	2,93,219	12,783	2,79,091	1,340
Telangana	2,42,506	17,742	2,23,413	1,351
Bihar	2,17,277	6,594	2,09,582	1,101
Assam	2,06,982	8,481	1,97,569	932
Rajasthan	2,00,495	15,889	1,82,680	1,926
Chhattisgarh	1,90,513	21,914	1,66,391	2,208
Gujarat	1,74,517	12,678	1,58,114	3,725
Madhya Pradesh	1,72,717	8,298	1,61,954	2,965
Haryana	1,70,446	12,919	1,55,717	1,810
Punjab	1,34,371	4,183	1,25,961	4,227
Jharkhand	1,02,490	5,119	96,485	886
J and K	95,710	6,080	88,140	1,490
Uttarakhand	62,881	3,802	58,050	1,029
Goa	43,954	2,215	41,123	616
Tripura	30,989	1,321	29,318	350
Manipur	19,091	3,568	15,343	180
Meghalaya	9,678	1,009	8,579	90
Mizoram	2,792	444	2,347	1
Nagaland	9,096	1,365	7,689	42
Arunachal Pradesh	14,998	1,722	13,238	38

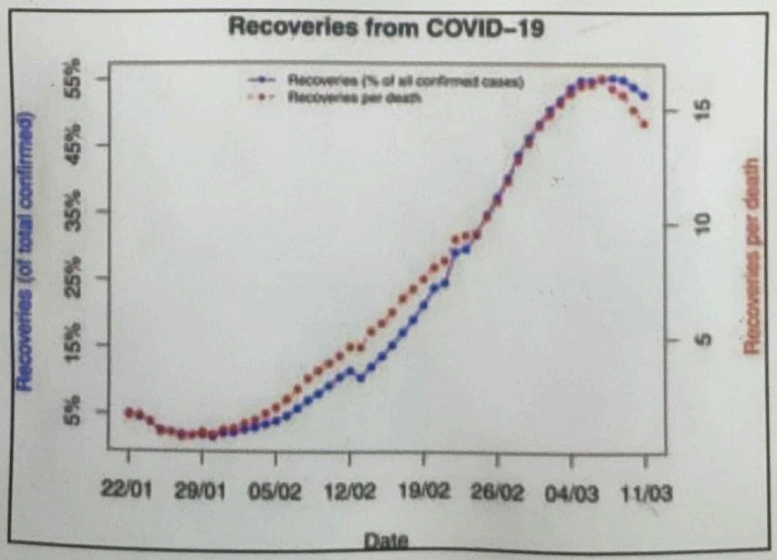
- Throughout the world:

Country	Total Cases	Total Deaths	Total Recovered	Active Cases
USA	9,567,543	236,997	6,171,402	3,159,144
India	8,267,623	123,139	7,603,121	541,363
Brazil	5,554,206	160,272	4,980,942	412,992
Russia	1,673,686	28,828	1,251,364	393,494
France	1,466,433	37,435	119,104	1,309,894
Spain	1,313,087	36,257	N/A	N/A
Argentina	1,183,131	31,623	998,016	153,492
Colombia	1,093,256	31,670	985,796	75,790
UK	1,053,864	46,853	N/A	N/A
Mexico	933,155	92,100	687,420	153,635
Peru	906,545	34,585	830,612	41,348





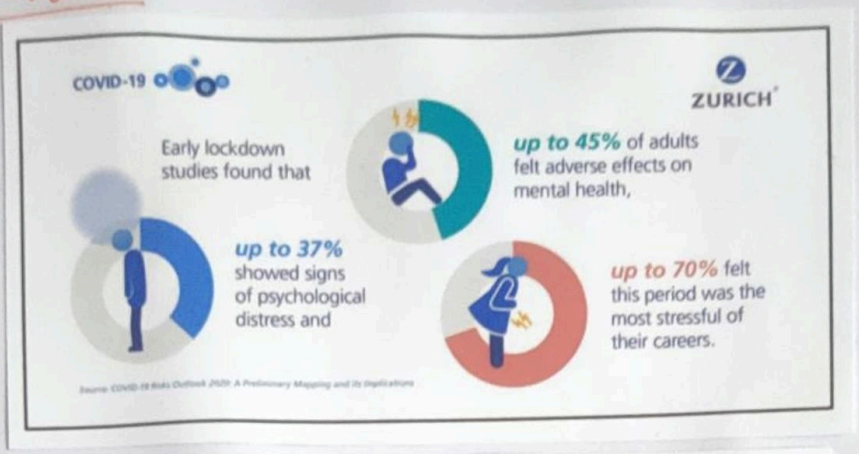
Country	Total Cases	Total Deaths	Total Recovered	Active Cases
Italy	731,588	39,059	296,017	396,512
South Africa	727,595	19,465	657,500	50,630
Iran	628,780	35,738	491,247	101,795
Germany	560,586	10,739	363,100	186,752
Chile	513,188	14,302	489,525	9,361
Iraq	418,701	11,017	405,777	61,907
Belgium	447,355	11,858	25,999	409,498
Indonesia	415,402	14,044	345,556	55,792
Ukraine	411,093	7,532	168,868	234,693
Bangladesh	410,988	5,966	327,901	77,121
Poland	395,480	5,875	154,413	235,192
Phillipines	385,400	7,269	348,830	29,301
Turkey	379,775	10,402	327,007	42,336
Netherlands	368,147	7,463	N/A	N/A
Saudi Arabia	348,037	5,437	334,672	7,928
Pakistan	336,260	6,849	315,946	13,965

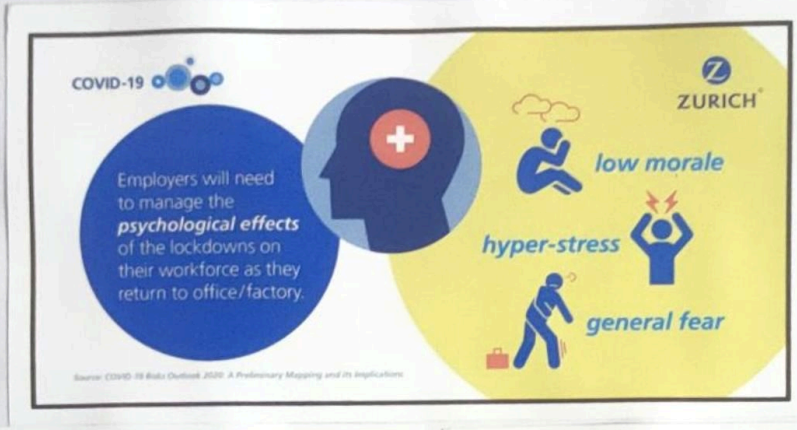


- **Advice for the public:**
  - We should practise social-distancing.
  - We should avoid gatherings such as meets, haats, social functions and religious places.
  - We should stay at home as much as possible if we have dry cough and fever.
  - We should avoid physical contact like hand-shakes, hand-holdings or hugs.
  - We should wear masks and use sanitizer before touching surfaces such as table tops, chairs, door handles etc.
  - We should wash our hands frequently using soap and water.
  - We should use it after coming home from outside or meeting other people especially if they are ill.
  - We should wash our hands after having touched face, coughing or sneezing.
  - We should use it before preparing food, eating or feeding children.
  - Before and after using toilet, cleaning etc.
  - We should cover nose and mouth with handkerchief while coughing or sneezing and wash the handkerchief daily.
  - It is preferable to cough / sneeze into bent elbow rather than palms.
  - We should avoid spaces that are closed, crowded or involve close contact.

□ Side-effects of lockdown during 2020:

● Bad effects:





- misery of homeless men increases

- poverty increases for having no chance to earn money

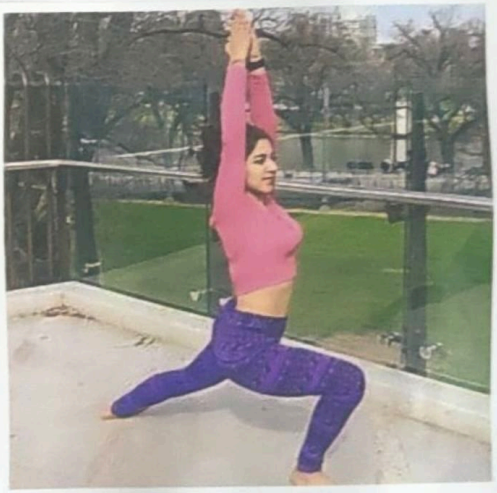
- crowd increases in case of transportation system

• good effects of lockdown:

People having a get together and having so much fun. We have much time to spend with our family and enjoy.

Artists showing his creations. Their territory of thinking is enriched during this period.

People cooking and sharing it with the other members of family. We have much time to learn how to cook.



People do yogas and be healthy and fit.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE

NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: Air pollution in cities and measures to control it.

NAME : Soumayan Pal

COLLEGE ROLL NO : PHUGr/193/19

DEPARTMENT : Physics

YEAR : 2020

SIGNATURE : Soumayan Pal

Index

Air Pollution in cities

Definition :- Air pollution means the presence in the atmosphere of substances that are not present naturally or present naturally but are in much lesser concentrations and that may harm living organisms directly.

Sources of air pollution :-

1. **Emissions from industrial chimney :-**

There are many industries which act as the major sources of air pollution. Among those petroleum refineries are the major sources of SO_2 and NO_2. Stone crushers and hot-mix plants also create a menace, the SPM (suspended particulate matter) is five times more than the safety limits. smokes of fertilizers and food factories emit various poisonous gases. Similarly dusts releasing from cement factories cause health hazards.

2. **Thermal power stations :-** Both normal and superthermal plants are present in our country and coals are used as fuels in these plants. The fly-ash, SO_2 and other gases and hydrocarbons are regularly released in the

air and these make the air polluted and unhealthy.

3. Automobile exhaust :- Toxic exhaust of automobiles is a source of considerable air pollution (60%). It contains CO, SO_2, NO_2, CO_2 and other toxic substances.

4. Radioactive elements :- Radioactive elements like ^{235}uranium, ^{226}Radium, etc., are now being used in research and medical science. After their use, the residues are not always disposed off with care. All these radioactive elements pollute the environment.

Types of air pollutants and their effects :-

A. Primary air pollutants :-

1. Suspended particulate matter (SPM) :- Except pure water, any particle having the dimensions ranging from 0.001 μm to 100 μm are called as suspended particles. It may include dusts of various types, soot, flyash, smoke or even natural substances like fur, hair, spores, etc. Smoke contains suspension of carbon and other particles given off due to burning of organic matter. Some of their effects are —

a) The smoke and dust particles deposit on plants and

clog stomata and also enter our respiratory tract and produce allergies, asthma.

b) Emissions from iron mill, flour mill, mines, cement, cause emphysaema, pheumoconiosis etc.

c) ~~Sometimes~~ Tolerable SPM standards in industrial areas is 500 $\mu g/m^3$ but has increased to 1200 $\mu g/m^3$ causing severe effects on human.

2. Carbon ~~monoxide~~ monoxide :- Incomplete combustion of organic matter and metallurgical activities are main producers of carbon monoxide. Automobiles release CO at a high rate. In closed rooms or congested area, if coal or any fuel is burned, CO is produced which is extremely harmful as it may diffuse into blood and react with haemoglobin to form carboxy haemoglobin. CO can convert 7.5% of haemoglobin into carboxyhaemoglobin (COHb) within 8 hours at 50 ppm. COHb hinders oxygen transport causing headache, dizziness, cardiovascular malfunction etc.

3. Carbon dioxide :- The major green house gas. Increasing concentration of CO_2 is posing a great problem of global warming.

4. H_2S :- Main source of H_2S gas is the treatment plants of sulphur ores, refineries etc. It can affect the plants by causing chlorosis and defoliation. While in humans it can cause eye irritation, throat irritation and nausea,

5. Sulphur oxides :- The main form of oxides of sulphur is SO_2. It is produced during smelting of metallic ores and burning of fossil fuels. SO_2 when present in excess amount in the air, combines with rain water and forms acid H_2SO_3, causing acid rain.

Some harmful effects are :

a) It can cause chlorosis and necrosis in plants even at low concentrations as 0.032 ppm.

b) Humans beings are affected at concentrations above 1 ppm. It can cause eye irritation and respiratory disorders like bronchitis, emphysema. SO_2 is proved also to be a potent mutagen,

c) It also cause deterioration of buildings through discolouration and corrosion of paints and sculptures. The wonder of world Tajmahal, made up of white marble, is facing threat of corrosion and yellowing due to SO_2 emission from the nearby refinery at Mathura

f) SO_2 can even corrode metals like iron and zinc thus posing threat to the metallic structures like bridges.

6. Nitrogen oxides (N_2O, NO, NO_2, N_2O_4, N_2O_5) :-

Several sources are there which emit nitrogen oxides viz., electric storms, high energy radiations, solar flares, combustion in industries, automobiles, incinerators and nitrogen fertilizer plants. Effects include:

a) Chief constituents forming peroxyl acyl nitrates or PAN.

b) Can cause photochemical smog.

c) Can corrode metals in presence of moisture.

d) Cause discolouration of textiles.

e) In plants, cause necrosis, lesions, defoliation and finally death.

f) Cause lung edema, blood congestion, dilation of arteries in human. Also has some mutagenic properties.

7. Fluorides :- Refineries are the main source of emission of fluorides. Fluorides can cause ~~Chlorosis~~ Chlorosis and necrosis in plants and finally abscission. In animals, causes abnormal calcification of bones and teeth, weak bones, gastrointestinal and neuromuscular disorders.

8. Volatile organic carbons (VOC) :- These are produced naturally like marsh gas or by man made products like paints, emulsions etc. Chemically they contain polynuclear aromatic hydrocarbons (PAH) and ~~formal~~ formaldehyde causing severe lung disorders, respiratory congestion and even cancer.

9. Chlorofluoro carbons :- They are used as coolants in refrigerators, propellants, air conditioners etc. It is released by jet aeroplanes as aerosols while flying at great heights. It is the main cause of ozone depletion. By reacting with nitrogen oxides it causes hole in the ozone layer of our atmosphere. UV rays penetrate through this hole and cause harm to human, animals and even plants.

10. Other pollutants :- Mercury through burning of coal, phosgene through pesticides and dye manufacturing industries, methyl isocyanate from pesticide manufacturing plants and lead through burning of commercial petroleum are added to atmosphere hazards causing huge to the nature and its beings.

B. Secondary pollutants and their effects :-

1. Ozone : It is an extremely strong oxidant and has the ability to destroy the chlorenchyma and produce necrosis in plants. It can damage textiles and cause severe corrosion of marble statues and buildings. In human, it can cause haemorrhages and eye irritation.

$$NO_2 \xrightarrow{UV} NO + [O] \quad | \quad O_2 + [O] \longrightarrow O_3$$

Nitrogen dioxide — Nitric oxide — Nascent oxygen | (oxygen) — Nascent oxygen . — (Ozone)

2. Peroxy acyl nitrate (PAN) :- They are formed when hydrocarbons react with nitrogen oxides present in the atmosphere. It can cause silvering, bronzing and necrosis of leaves of plants by damaging, chloroplasts, inhibiting electron transport system and cellular metabolic enzymes.

$$NO + HC + O_2 \longrightarrow NO_2 + PAN$$

Measures of air pollution :-

Different kinds of air pollutions can be controlled by modern technology. Emissions from factories and power plants can be made free from gaseous pollutants by three methods.

1. Combustion technique :- Only oxidisable pollutants can be removed by this method. Emissions are burnt at very high temperature. This process is applied in petrochemical and paint industries.

2. Absorption techniques :- Here, scrubbers with packing materials are used to absorb gaseous pollutants. A fine spray of water is applied that dissolves NH_3, SO_2 etc. Sometimes a bed of lime is also employed to absorb SO_2.

3. Adsorption techniques :- Activated charcoal, a chief adsorption material, is employed in this technique. It can adsorb toxic vapours, gases and other harmful matters.

Following steps have to be taken to control pollution at source as well as after the release of pollutants in the atmosphere.

1. Prevention and control of vehicular pollution :

i) Curbing the pollutant emission from vehicular exhaust by using various devices, such as positive crankcase, ventilation valve and catalytic converter. Catalytic convertors consist of metals like palladium, platinum and rhodium as catalysts. The exhaust gases, when

passed through, unburnt hydrocarbons are oxidised to produce CO_2 and water, CO converted to CO_2 and nitrogen oxides are converted to nitrogen gas.

$$2NO_x \longrightarrow N_2 + 2O_2 \qquad xCO + O_x \longrightarrow xCO_2$$

$$HC + O_x \longrightarrow CO_2 + H_2O$$

ii) Control of evaporation from fuel tank and carburetter by several mechanical and chemical processes.

iii) Filters can be used to capture and recycle the hydrocarbons from the engine.

iv) Leaded petrol should be avoided, instead, unleaded petrol and low sulphur diesel should be used,

v) Periodic checking of vehicles for pollution control.

vi) Increased use of CNG can lower the amount of pollutants.

2. Prevention and control of industrial pollution :-

i) Removal of particulate matter :

a) cyclone collector : This is used for centrifugation of waste gas containing particles. Cyclone collectors can remove upto 70% of the particles.

b) Electrostatic Precipitators : To remove the suspended particles form gas stream, the electrical forces are applied within the chamber in the precipitator. It can remove 99% of the particulate pollutants from the chimney exhaust.

It works very efficiently in power plants, paper mills, carbon black plants, cement mills etc. Sometimes bag filters or fabric filters are used for better result. Further, tall chimneys are used for vertical dispersion of air pollutants.

ii) Removal of gaseous pollutants:

a) Wet systems: These are used in washing towers in which alkali fluid circulates continuously. This liquid reacts with SO_2 to produce a precipitate.

b) Dry systems: Here the gas pollutants are allowed to react with an absorbent under a dry phase, Lime (CaO), lime stone ($CaCO_3$) are placed in the way of the flowing gas (SO_2, SO_3). This process is very less expensive and effective.

c) Wet-dry systems: Here water in the absorbent reacts with the acid components. The absorbent $Ca(OH)_2$ slurry is spread into the hot gas stream in the form of small droplets. Calcium hydroxide reacts with SO_2 and the hot gases cause the water to evaporate simultaneously. The end product is a dry powder containing mostly fly ash and salts.

Acknowledgement

I would like to express my special thanks of gratitude to my environmental science teacher Mr. Narayan Chandra Maity for his guidence and support in completing my project.

Soumayan Pal
PHUG/193/19

Date:
12/11/2020

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE

NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Air Pollution in Cities and measures to control it

NAME	: Subhrangsu Bhunia
COLLEGE ROLL NO	: STUG/029/2019
DEPARTMENT	: STATISTICS
YEAR	: 2020
SIGNATURE	: Subhrangsu Bhunia

Introduction :-

Air pollution is the introduction into the atmosphere of chemicals, particulates, or biological materials that cause discomfort, disease or death to humans, damage other living organisms such as food crops, or damage the natural environment or built environment.

A substance in the air that can be adverse to humans and the environment is known as an air pollution. Pollutants can be in the form of solid particles, liquid droplets or gases. In addition, they may be natural or man made. Pollutants can be classified as primary or secondary. Usually, primary pollutants are directly produced from a process, such as ash from a volcanic eruption, the CO gas from a motor vehicle exhaust or sulphur dioxide released from factories. Secondary pollutants are not emitted directly. Rather, they form in the air when primary pollutants react or interact. An important example of a secondary pollutant is ground level ozone - one of the many secondary pollutants that make up photochemical smog. Some pollutants may be both primary and secondary, that is, they are both emitted directly and formed other primary pollutants. Major primary pollutants are - Sulphur oxides, nitrogen oxides, Carbon oxides, Carbon monoxide, volatile organic compounds, particulates, CFCs, Ammonia, Radioactive pollutants and the secondary pollutants are- particulates (smog), Ground level ozone (O_3)

Causes : Factors responsible for air pollution

Air pollution can result from both human and natural actions.

a) man-made causes :-

- "Stationary sources" include smoke stacks of power plants, manufacturing facilities (factories) and waste incinerators, as well as furnaces and other types of fuel-burning heating devices. In developing and poor countries, traditional biomass burning is the major source of air-pollutants; traditional biomass includes wood, crop waste and dung.
- "Mobile Sources" include motor vehicles, marine vessels, aircraft and the effect of sound etc.
- Chemicals, dust and controlled burn practices in agriculture and forestry management. Controlled or prescribed burning is a technique sometimes used in forest management, farming, prairie restoration or greenhouse gas abatement. Fire is a natural part of both forest & grass.

land ecology and controlled fire can be a tool for foresters. Controlled burning stimulates the germination of some desirable forest trees, thus renewing the forest.

- Fumes from paint, hairy spray, varnish, aerosol sprays and other solvents.
- Waste deposition in landfills, which generate methane. Methane is highly flammable and may from highly flammable and may from explosive mixture with air.
- Military, such as nuclear weapons, toxic gases, germ warfare and rockertry.

b) Natural Sources :-

- Dust from natural sources, usually large areas of land with few or no vegetation.
- Methane, emitted by the digestion of food by animals, for example Cattle.
- Radon gas from radioactive decay within the Earth's Crust. Radon is a colorless, odorless, naturally occurring radioactive noble gas that is formed from the decay of radium. It is considered to be a health hazard. Radon gas from natural sources can accumulate in buildings, especially in confirmed areas such as the basement and it is the second most frequent cause of lung cancer, after cigarette smoking.

- Smoke and Carbon monoxide from wildfires.

- Vegetation, in some regions emits environmentally significant amounts of VOCs on warmer days. These VOCs react with primary anthropogenic pollutants - specifically NO_x, SO_2 and anthropogenic Organic Carbon Compounds - to produce a seasonal haze of secondary pollutants.
- Volcanic activity, which produce sulfer, chlorine and ash particulates.

A lack of ventilation indoors concentrates air pollution where people often spend the majority of their time. Radon (Rn) gas, a carcinogen, is exuded from the Earth in certain locations and trapped inside houses. Building materials including carpenting and plywood emit

H_2CO gas. Paint and solvents give off volatile organic compounds (VOCs) as they dry. Lead paint can degenerate into dust and be inhaled. Intentional air pollution is introduced with the use of air fresheners, incense and other scented items. Controlled wood fires in to the stoves and fireplaces can add significant amounts of smoke particulates into the air, inside and out. Indoor pollution fatalities may be caused by using pesticides and other chemical sprays indoors without proper ventilation.

Carbon monoxide (CO) poisoning and fatalities are often caused by faulty vents and chimneys, or by burning of charcoal indoors.

Consequences: Effect of air pollution :-

Health effects:- Air pollution is a significant risk factor for multiple health conditions including respiratory infections, heart disease, and lung cancer, according to the WHO. The health effects caused by air pollution may include difficulty in breathing, wheezing, coughing, asthma, and aggravation of existing respiratory and cardiac conditions. These effects can result in increased medication use, increased doctor or emergency room visits, more

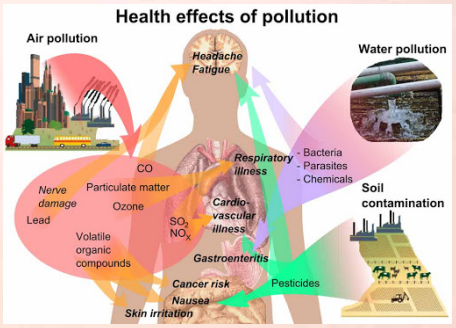
hospital admissions and premature death. The human health effects of poor air quality are far reaching, but principally, affect the body's respiratory system and the cardiovascular system. Individual reactions to air pollutants depend on the type of pollutant a person is exposed to, the degree of exposure, the individual's health status and genetics.

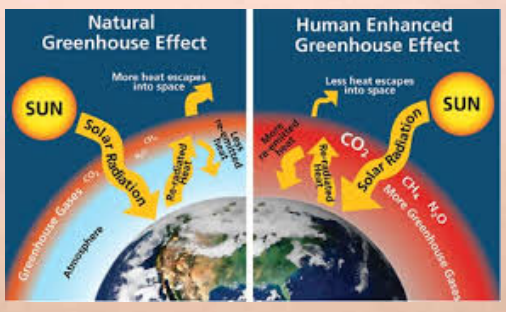
Environmental Effects :-

Poisonous air pollutants (toxic chemicals in the air) can form acid rain. It can also form dangerous ground level ozone. These destroy trees, crops, forms, animals and continue to make water bodies harmful to humans and animals that live and depend on water.

Economical Effects :-

The effect of air pollution on the economy may be a desired one. In simple language, the economy thrives when people are healthy, and business that depends on cultivated raw materials and natural resources are running at full efficiency. Air pollution reduces agricultural crop and commercial forest yields by billions of money each year. This in addition to people staying off work for health reasons can cost the economy greatly.





Control: Measures to reduce air pollution:-

Solution efforts on pollution are always a big problem. This is why prevention interventions are always a better way of controlling air pollution. These prevention methods can either come from government (laws) or by individual actions. In many big cities, monitoring equipments have been installed at many points in the city.

a) Government level prevention:-

- Govt.s throughout the world have already taken action against air pollution by introducing green energy. Some

Govts are investing in wind energy and solar energy, as well as other renewable energy, to minimize burning of fossil fuels, which cause heavy air pollution.

- Goverments are also forcing companies to be more responsible with their manufacturing activities, so that even though they still cause pollution, they are lot controlled.
- Companies are also building more energy efficient cars (EVs) which pollute less than before.

6) Individual level action / prevention :-

- Encourage your family to use the bus, train or bike when commuting. If we all do this, there will be fewer cars on road and less fumes.
- Use energy (light, water, boiler, kettle and fire woods) wisely. This is because lots of fossil fuels are burned to generate electricity, and so if we can cut down the use, we will also cut down the amount of pollution we create.
- Recycle and re-use things. This will minimize the dependence of producting new things. Remember manufacturing industries create a lot of pollution, so if we can re-use things like shopping plastic bags, clothing, paper and bottles, it can help.

Some facts and statistics about Air pollution :-

- Air pollution affects kids more than adults due to higher concentrations of polluted air in their system per body size.
- India is the country with the worst air quality in the world.
- The European union would save 161 Billion Euros a year if death caused by air pollution were diminished.
- In large cities, over 80% of fatal pollutants that cause lung damage come from cars, buses, motor cycles and other vehicles on the road.
- According to WHO, there are as many deaths (1.3 million per year) in the world due to air pollution as

there are deaths due to car accidents.

- The average adult breathes 3,000 gallons of air everyday
- The great smog of London in 1952, was one of the worst air pollution events in history with over 8,000 deaths.
- The largest cause of air pollution in Europe is road transportation with over 5,000 people dying each year from lung cancer and heart attacks caused by vehicle exhaust fumes.

Conclusion :- Air pollution can be prevented only if individuals and business stop using toxic substances that cause air-pollution in the first place. This would require the cessation of all fossil fuel-burning processes, from industrial manufacturing to home use of air conditioners. This is an unlikely scenario at this time. However, we have to make rules which set stringent regulations on industrial and power supply manufacturing and handling. The regulations are to be designed to further reduce harmful emissions into the Earth's atmosphere.

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I would also like to extend my gratitude to my friends or classmates for helping me to complete my project.

Date- 11/11/20

Subhrangsu Bhunia
1st year, statistics.

Ramakrishna Mission Residential College, Narendrapur

B.Sc Semester 4 exam 2020

Subject : value education

Paper : iV

Full marks : 25

Name : Toufique Jamal Molla

Reg. No. : A03-1142-0072-18

Roll No. : CHUG/028/18

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2) (a) মন যত শুদ্ধ হবে মনঃসংযমের কার্য ততই সহজ হবে :

স্বামী বিবেকানন্দের উক্তি :

মন যত পবিত্র হবে, উহা সংযত করাও তত সহজ হবে। মন সংযত করতে হলে মনের পবিত্রতা অপরিহার্য... সুনীতি সুনীতি-পরায়ন হওয়া মনঃসংযমের প্রথম ধাপ। যে ব্যক্তি সুনীতি পরায়ন তার অন্য সাধনার প্রয়োজন নেই, সে মুক্ত।

মনঃসংযম মনের পবিত্রতার উপর নির্ভর করে। আমাদের মন অশুদ্ধ হয়ে রয়েছে, সেই জন্য আমরা তাকে দমন করতে পারছি না। যদি আমরা কোনোরূপ জীবনযাপন করি যা আমাদের মনকে আরও বেশি অশুদ্ধ করে তোলে তাহলে যতই মনঃসংযমের জন্য অক্লান্ত পরিশ্রম করি তবে সেই শ্রমে কোনো লাভ হবে না। আবার যদি আমরা (বর্তমানের) এই অশুদ্ধ মনকে শুদ্ধ করার কোনো চেষ্টা না করেই মনঃসংযম করার চেষ্টা করি তবে তাতেও সফল হবে না। যাদের মন প্রথম থেকে

শুদ্ধ ভাবের দ্বারা আলাদা, মনকে নিয়ন্ত্রণ করতে আমাদের এমন একটি পদ্ধতি দিতে হবে যা আমাদের মনের অপবিত্রতা নির্মূল করবে।

মনের এই অপবিত্রতা আসলে হল কামনা ও আবেগ যা পরশ্রীকাতরতা, ঘৃণা, ক্রোধ, ভয়, ঈর্ষা, কাম, লোভ, অহংকার, মোহ ইত্যাদি রূপে প্রকাশ পায় আর এদের জন্ম হয় রজোগুণ ও তমোগুণ থেকে। এরাই মনের মধ্যে রাগ ও দ্বেষ সৃষ্টি করে, মনকে বিক্ষুব্ধ করে এবং মনের প্রশান্তি নষ্ট করে।

1) a) মনকে বশ মানাতে ইচ্ছাশক্তিকে কিভাবে দৃঢ় করা যায়:

এ কথা বলা ঠিক নয় যে, মনকে বশ মানাবার ইচ্ছা আমাদের নেই, বরং আমাদের প্রত্যেকের ভিতর সর্বদাই যুদ্ধ চলছে এবং সকলেই অনুভব করছে যে, আমাদের ইচ্ছা রয়েছে; কিন্তু বেশিরভাগ ক্ষেত্রেই এই ইচ্ছা শক্তিশালী নয়।

যতক্ষণ পর্যন্ত না আমাদের জীবনের বাসনাগুলির অন্যতম ইন্দ্রিয়সুখের লালসাকে বিচারপূর্বক বিরুদ্ধে ত্যাগ করছি, ততক্ষণ পর্যন্ত মনকে দমন করার শক্তি আমাদের দৃঢ় হবে না। দুর্দান্ত ঝড়ের মতো ইন্দ্রিয়সুখের

লালসা আমাদের শুভ ইচ্ছার জীবনী শক্তিকে গ্রাস করে।

যে মন দিয়ে আমরা ইন্দ্রিয়সুখের খোঁজ করি এবং সেই সুখ উপভোগ করি, সেই মনকে কখনোই আমরা দমন করতে পারব না, যতক্ষণ না ইন্দ্রিয়সুখের লালসা ত্যাগ করছি।

সুখ ভোগের ইচ্ছা ত্যাগ মানে পরমানন্দ লাভের ইচ্ছা ত্যাগ করা তা নয়। সুখ কথাটির মানে হল ইন্দ্রিয়সুখ বা শ্রীরামকৃষ্ণের ভাষায় 'কাঁচা আমি' থেকে যে সন্তুষ্টি লাভ। এ দুটিই পরমানন্দ লাভের পথে বাধা। সুখ-দুঃখের পারে গিয়েই জীবনের একমাত্র উদ্দেশ্য, পরমানন্দকে লাভ করা যায়। এই পরমানন্দ লাভের কামনা ত্যাগ করার প্রশ্নই উঠতে পারে না, কারণ আমরা সৎ-চিৎ-আনন্দ-স্বরূপ — আর আনন্দই আমাদের অস্তিত্ব সত্তা।

আমাদের অনেকেরই মনে দ্বন্দ্ব আছে ও যার পরিণাম হলো মনঃসংযোগে আপ্রাণ এবং অসফল প্রচেষ্টা। অসফল প্রচেষ্টাগুলি আমাদের দুর্বল ইচ্ছাশক্তি ও মনঃসংযমের ক্ষেত্রে যথার্থ জ্ঞানের অভাবেরই ইঙ্গিত। তার থেকে গুরুত্বপূর্ণ কথা হল এই যে, আমাদের ইচ্ছাশক্তিকে এমনভাবে সুদৃঢ় করতে হবে যে, বারবার পরাজয়ের মুখেও আমরা ভেঙে পড়ব না; বরং প্রত্যেক পরাজয় আমাদের নতুন ভাবে উৎসাহিত করবে। মনকে দমন করতে আবার উদ্যমী হবে।

মনকে বশে আনার ইন্দ্রিয়কে শক্তিশালী— করার উপায় হলো যে সমস্ত বিষয় আমাদের ইন্দ্রিয়শক্তিগুলো দুর্বল করে দেয় সেগুলি থেকে বিরত থাকুন এবং যেগুলি ইন্দ্রিয়শক্তির অনুকূল সেগুলিকে নিজেদের জীবনে আনো।

আমাদের মধ্যে এমন অনেকেই আছেন যারা মনকে নিয়ন্ত্রন করার প্রয়াস বহুবার করেছেন এবং পরাজিত হয়েছেন এবং তারা ধরে নিয়েছেন যে মনের নিগ্রহ সম্ভব নয়। মানসিক এই দুর্বলতার কারণ হলো আমরা অনেকক্ষেত্রে দেখেছি দোষ না যে এই সময় হলে সবকিছুই কী জানি। যদি এরকম আমূল বেঁচে থাকার স্বাভাবিক ~~অভিমুখেই~~ প্রবৃত্তিই আমাদের মনকে জয় করার ইন্দ্রিয়শক্তিকে দুর্বল করতে বাধ্য করে।

তবে হেরে যাওয়ার কিছু নেই কারণ মনকে সম্পূর্ণ নিয়ন্ত্রন করা মোটেই সহজ কাজ নয় এমনকি অসাধারণ (বিশেষ) ব্যক্তিদের পক্ষেও নয়। যেহেতু চঞ্চলতাই মনের প্রকৃতি।

গীতাতে শ্রীকৃষ্ণ বলেছেন -

"বিচরণশীল বায়ু যেমন জলনিমগ্ন নৌকাকে ইতস্ততঃ বিক্ষিপ্ত করে, সেই রূপ স্ব স্ব বিষয়ে বিচরণশীল ইন্দ্রিয়গণের মধ্যে মন অনুসরণ করে, সেই ইন্দ্রিয়টি অসংযত ব্যক্তির আত্মবিষয়ক বিবেক বুদ্ধি হরণ করে ও তার মনকে বিষয়াভিমুখী করে।"

বুদ্ধদেব বলেছেন -

"যদি কেউ যুদ্ধক্ষেত্রে সহস্র ব্যক্তিকে জয় করেন - তাঁর থেকেও শ্রেষ্ঠ যোদ্ধা তিনি, যিনি নিজেকে জয় করেছেন।"

এর থেকে আমরা বুঝতে পারি যে, মনকে দমন করাই জগতের মধ্যে কঠিন কাজ, সবচেয়ে দুরূহ কাজ। অতএব মনকে দমন করার চেষ্টা করে আমরা যদি আংশিক বা বারংবার পরাজিত হই তবুও আমরা ভেঙে পড়ব না। বরং পরাজয়ের কঠিন আঘাতে আমরা আরও বেশি দৃঢ়প্রতিজ্ঞ, সহনশীল ও ধী-সম্পন্ন শ্রেয়োর উৎসাহী হব। হতাশ হওয়ার কোনো কারণ নেই, মহাপুরুষদের আশ্বাসবাণী রয়েছে আমাদের সঙ্গে - তাঁরা বলেছেন, মনের পরিপূর্ণ সংযম সম্ভব, নিশ্চয়ই সম্ভব। অতএব সমস্ত প্রকার বিপরীত চিন্তাকে আমাদের নিঃশেষে পরিত্যাগ করতে হবে।

১৭ক) মনঃসংযোগের গুরুত্ব এবং সাধনের উপায়

মনঃসংযোগের এই পদ্ধতির উপর শ্রীরামকৃষ্ণ এবং শ্রীমাসারদাদেবী খুব গুরুত্ব দিয়েছেন। শ্রীরামকৃষ্ণ বলেছেন —

যাদের মন বিষয়ে আসক্ত তাদের পক্ষে দ্বৈতভাব অবলম্বন করা খুব সোজা আর 'নারদপঞ্চরাত্র'র উপদেশ মতো উচ্চৈঃস্বরে ঈশ্বরের নাম কীর্তন করা।

আবার অন্য এক সময়ে তিনি ভক্তদের উদ্দেশ্যে বলেছেন —

ভক্তি-পথেতে অন্তরিন্দ্রিয়ের নিগ্রহ আপনি হয়। আর সহজে হয়। ঈশ্বরের উপর যত ভালোবাসা আসবে, ততই ইন্দ্রিয়সুখ আলুনী লাগবে।

"যে দিন সন্তান মারা গেছে, সেই শোকের উপর স্ত্রী-পুরুষের দেহ সুখের কি দিকে দিক মন যেতে পারে?"

একজন ভক্ত — তাঁকে ভালোবাসতে পারছি কই?

শ্রীরামকৃষ্ণ — তাঁর নাম করলে সব পাপ কেটে যায়! কাম, ক্রোধ শরীরের সুখ ইচ্ছা, এসব পালিয়ে যা

একজন ভক্ত — তাঁর নাম করতে ভালো লাগা চাই কি
লাগে?

শ্রীরামকৃষ্ণ — ব্যাকুল হয়ে প্রার্থনা কর, যাতে তাঁর নামে রুচি হয়, তিনিই মনোবাঞ্ছা পূর্ণ করবেন... আক্রান্তে অরুচি! বিকারে যদি অরুচি হল, তা হলে আর বাঁচার আশা থাকে না। যদি একটু রুচি থাকে, তবে বাঁচার খুব আশা। তাই নামে রুচি। ঈশ্বরের নাম করতে হয়: দুর্গানাম, কৃষ্ণনাম, শিবনাম, যে নাম বলে ঈশ্বরকে ডাক না কেন? যদি নাম করতে করতে অনুরাগ দিন দিন বাড়ে, যদি আনন্দ হয় তাহলে আর কোনো ভয় নেই, বিকার কাটবেই কাটবে। তাঁর কৃপা হবেই হবে।

ঠিক এমনই মত শ্রীমা সারদাদেবীর জীবন ও বাণীর মধ্যে সমান শক্তিতে ধ্বনিত হয়েছে —

মা তাঁহার তক্তপোষের উপর বসিয়া আছেন, আমি আমি ভক্তদের জপ করিয়া শুনাইতেছিলাম। পরে লিখিয়াছে মনস্থির হয় না ইত্যাদি। মা এই সকল কথায় যেন একটু উত্তেজিত হইয়া বলিলেন, "হাজার বারেও বিনা হওয়ার করে জপ করতে পারে তখন হয়। আমি দেখেছি বাস্তবিক হয়। আজ করুক, না হয়, তখন বলবে। তবে একটু মন দিয়ে করতে হয়। তা তো নয়, কেউ করবে না; কেবল বলে — কেন হয় না?"

মনঃসংযোগের জন্য যে পদ্ধতির কথা শ্রীমা বলেছেন তার চেয়ে সহজ অথচ শক্তিশালী উপায় আর কোনটি নেই,

তবে সরল হৃদয়ে ওষুধটি মেনে নিতে হবে এবং অভ্যাস করতে হবে।

একটি ব্যাপারে সাবধান থাকা দরকার। সাধনার শুরু শুরুতেই প্রতিদিন কুড়ি হাজার জপ করা উচিত নয়। সামান্য ভাবে শুরু করে গুরুর নির্দেশ মতো জপের সংখ্যা বাড়াতে হয়। যেটা গুরুত্বপূর্ণ তা হচ্ছে পরে করব এ ভাব ত্যাগ করে এখনই সাধন লক্ষ্যে কাজ শুরু করে দেওয়া।

প্রতিদিন নির্দিষ্ট সময়ে ঈশ্বরের কাছে সৎ প্রবৃত্তি ও পবিত্রতার জন্য কাতরভাবে প্রার্থনা করলে মনঃসংযমের খুব সাহায্য হয়। শ্রীরামকৃষ্ণ বলেছেন, আন্তরিক ভাবে প্রার্থনা করলে তার ফল অবশ্যই পাওয়া যাবে।

প্রার্থনা করার অভ্যাস যত তীব্র হবে তার একটি ফল আমাদের দৃষ্টিগোচর হবে। আমাদের প্রার্থনার প্রকৃতিগত পরিবর্তন হচ্ছে - প্রথমে যা ছিল বস্তুকেন্দ্রিক ধীরে ধীরে তা ঈশ্বরকেন্দ্রিক হয়ে যাচ্ছে।

সুতরাং মনঃসংযোগ কেমন ভাবে করা যায়?
প্রকৃতির সঠিক উত্তর হচ্ছে - ঈশ্বরকে ভালোবাসা।
কিন্তু যদি আমাদের ঈশ্বরে বিশ্বাস না থাকে?
তবে নিজের আত্মাকে বিশ্বাস কর। নিজের ইন্দ্রিয়শক্তির সাহায্যে, নিজের চেষ্টায় সত্ত্ব, রজঃ, তমঃ ইত্যাদি গুণগুলিকে অতিক্রম কর। এক্ষেত্রে মনঃসংযম অর্জন করা যাবে।

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B.Sc. Semester II Examinations, 2020

Subject: 2nd sem UG1 ENVS Project

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Registration No.: A03-1112-0160-19

INDEX

Introduction :

COVID-19 is a viral fever and the virus that is causing the disease is named as Severe Acute Respiratory syndrome corona virus-2 (in shorts SARS-CoV-2). Before the nomenclature it has been provisionally called as ,, 2019 Novel corona Virus (2019-NCoV). It originites from Wuhan city of china in December.

SARS-CoV-2 is a particular ~~genus~~ strain of virus that belongs to the huge family of virus named as Corona virus [It is a beta corona virus (a particular genus of the family)]. Primary conception about the virus was that it came from bats but this ~~concp~~ thought was discarded by the scientists.

• Symptoms ⇒

COVID-19 affects different people in different ways.

Most common symptoms

1) fever, 2) dry cough, 3) tiredness

Less common symptoms

1) aches and pains, 2) sore throat

3) diarrhoea, 4) headache, 5) loss of taste & smell

Serious symptoms:

1> difficulty breathing or shortness of breath

2> Chest pain or pressure

3> loss of speech or movement.

Nature of Corona virus:

As we ~~are~~ have mentioned, SARS-CoV-2 is a particular strain of virus that belongs to the huge family of virus named as Corona Virus. Other infectious corona virus causes respiratory infection or diseases mostly during seasonal change, but some strains also cause severe diseases like MERS (Middle East Respiratory Syndrome) and SARS (Severe Acute Respiratory syndrome). Covid-19 is one new name in the list of severe diseases caused by this family of virus.

SARS-CoV-2 is the seventh coronavirus known to infect humans; SARS-CoV, MERS-CoV and SARS-COV-2 can cause severe disease, whereas HKU1, OC43 are associated with mild symptoms. RNA viruses generally have very much high mutation rates compared to DNA viruses because Viral RNA polymerases lack the proof reading ability of DNA polymerases. This is one reason why it is difficult to make effective vaccines to prevent diseases caused by RNA viruses.

Corona Outbreak :

Considering the potential threat and the contagious nature of the Covid-19 pandemic, lockdown have been implemented worldwid to stop the spread of this novel virus.

Before going to the detail description, we need to aware the difference between the terminologies "Endemic", "Outbreak", "Epidemic", "Pandemic".

- Endemic is something that belongs to a particular people or country.
- AN OUTBREAK is a greater than anticipated increase in the number of endemic cases.
- An pandemic is an epidemic that's spread over multiple countries or continents.
- An epidemic is a widespread occurrence of an infectious disease in a community at a particular time.

Corona virus belong to the virus with subfamily coronavirinae within coronaviridae family and are deemed as possible agents of respiratory diseases with symptoms such as flu, fever, cough, pneumonia, lung infection. In December 2019, a novel coronavirus disease orginated in Wuhan, Hubei province, China and soon sprouted across the globe. By February 2020, the daily number

of Covid-19 Cases outside china had increased drastically, with Italy, USA, Spain, Germany, South Korea, Japan, Iran being the new major epicentres. Based on the alarming levels of spread and severity, on 11 March 2020, the world health organization (WHO) characterized the Covid-19 Situation as a pandemic, and by the end of March 2020, Europe emerged as the new hotspot and was declared as the world's major epicentre. As of 14 July, the covid-19 disease has spread to more than 200 countries and Union Territories, with over 13,177,855 confirmed cases and over 574,793 confirmed deaths worldwide. As this global pandemic hits more than 200 countries, the virus besides taking a huge toll on public health has completely hijacked the rhythm of our daily lives, hit the global economy, and forced the countries to shut the borders. Data released by European Space Agency (ESA) and National Aeronautics and Space Administration (NASA) indicates that pollution in some of the epicenters of covid-19 such as Wuhan, USA, Spain,

and Italy has decreased by up to 30%. With the USA, Spain, UK, Italy among the worst-hit countries interms of infection and deaths, India is also facing the heat, and the figures too are no less devastating. Corona virus outbreak took a complete image of pandemic within 4 months. All these data are clearly visible from the graphs.

13,595,752
Currently Infected Patients

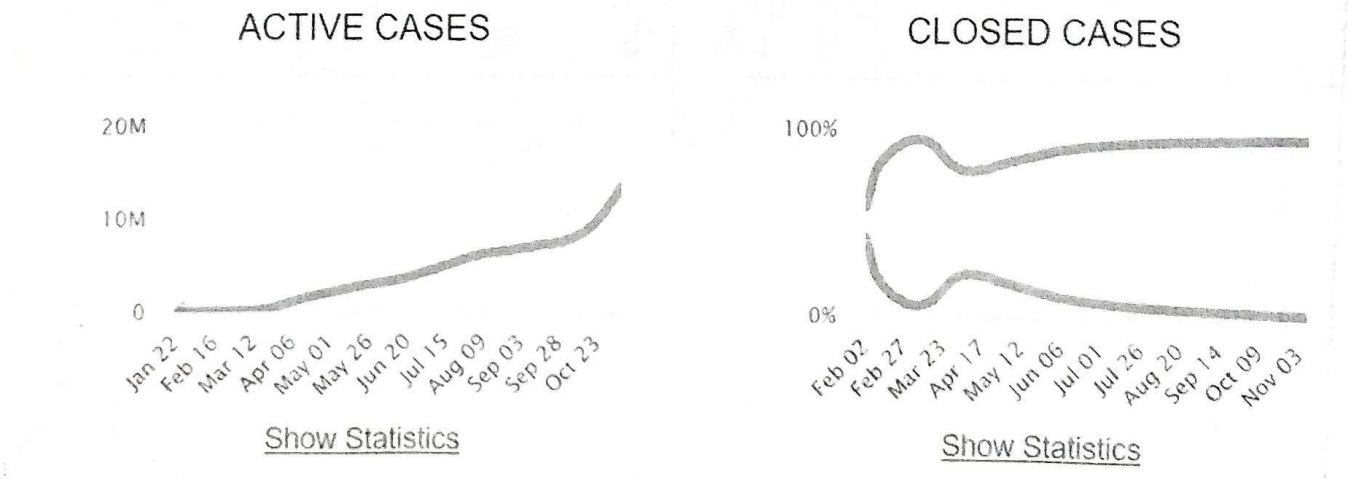
13,503,799 (99%) In Mild condition

92,003 (1%) serious or Critical

36,949,260
cases which had an outcome

35,689,543 (97%) Recovered / Discharged

1,259,717 (3%) Deaths

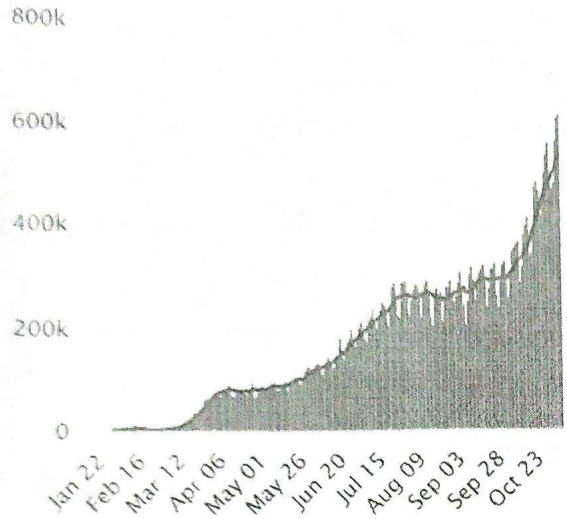


Increasing active cases & closed cases

daily linear logarithmic

Daily New Cases

Cases per Day
Data as of 0:00 GMT+0

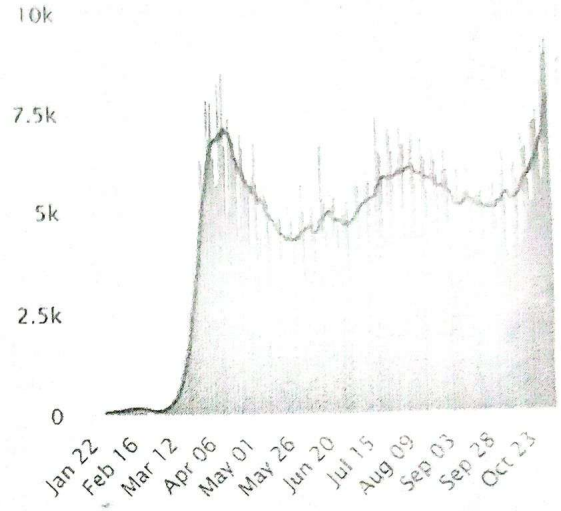


7-day moving average

daily linear logarithmic

Daily Deaths

Deaths per Day
Data as of 0:00 GMT+0

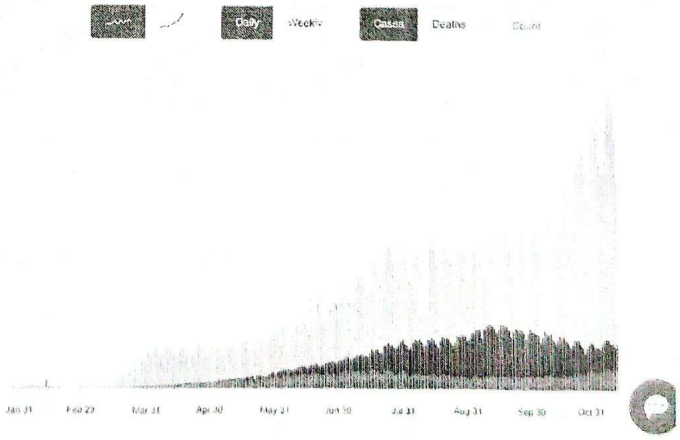


7-day moving average

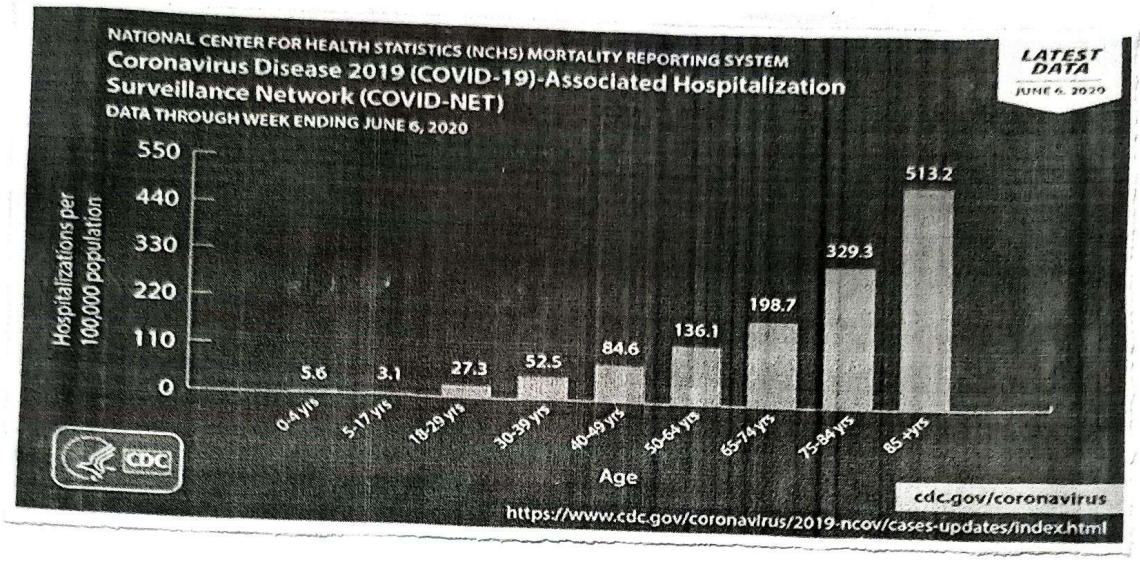
Daily new cases and deaths

Situation by WHO Region

Americas	21,883,813
Europe	13,576,687
South-East Asia	9,797,966
Eastern Mediterranean	3,403,839
Africa	1,368,904
Western Pacific	778,813

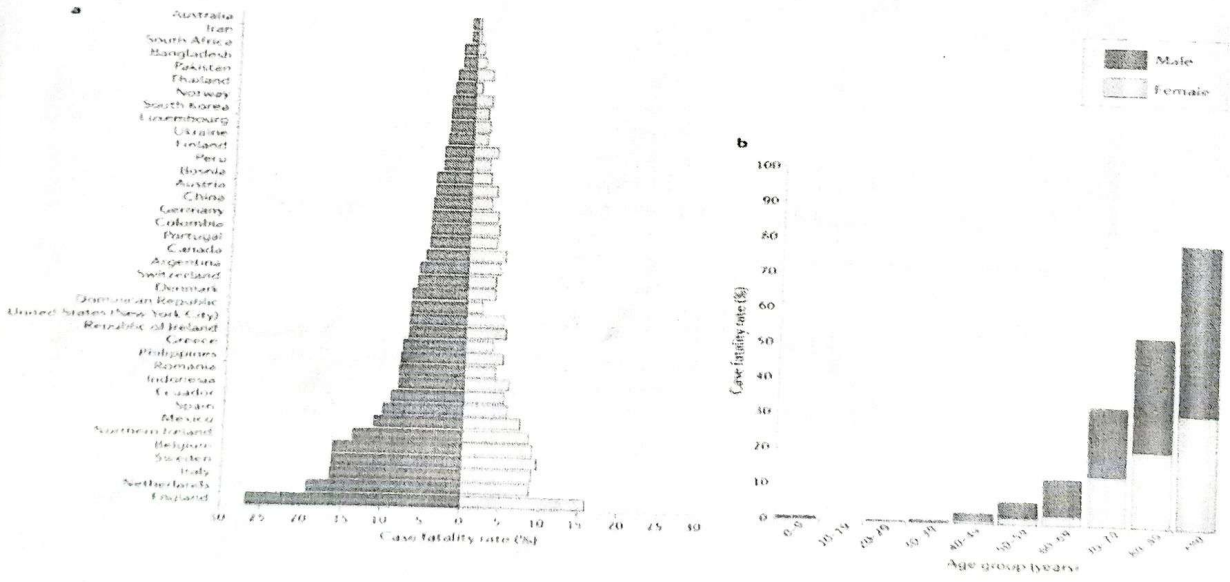


Global situation



Hospitalization Data for Coronavirus

Fig. 1: Comparative analyses of COVID-19 case fatality rates by country, sex and age.



Fatality rates by country, sex and age (comparative analyses)

Role of Government:

This crisis is totally unknown to every human, government. After discussing with scientists, government had published some guidelines to prevent and fight with this pandemic. Some of these are mentioned below-

1) **Strict lockdown** ⇒ For the alarming increase in covid-19 cases, government had imposed world's longest lockdown in India to prevent the rapid increase in cases.

2) **Spreading awareness about SMS**: From the very beginning of lockdown, awareness about social distancing, wearing mask, sanitizing hands are spreading through out the every possible ways.

3) **By stopping planes and trains**: Well wishers were thinking that mass transportation is a dangerous incident that was happend. So government stopped the trains and domestic and International planes.

4) **Closing school, colleges, offices**: To secure the future of our nation, government clossed all private and government schools. Also many offices except the essential commodities related seetors, were closed at that time.

5) Health Infrastructure:

For a long time, ours nation's health system is not up to the mark so it was a great challenge to our government to ~~took~~ ~~some~~ do better and cure the patients. During that days, covid tests, beds in hospital, smart and advanced instruments in both ~~test~~ labs and hospitals were increased as much as possible. New three special labs were opened at Kolkata, Mumbai, Delhi for covid tests.

Damages:

Corona virus is a global crisis and the biggest challenge we have ever faced. Today we have already faced more than 1 million lose of lives worldwide from corona virus.

1) Health system crisis: The Covid-19 pandemic has had a major impact on the capacity of health systems to continue the delivery of essential health services. Countries need to achieve the optimal balance between fighting the COVID-19 pandemic and maintenance of esential health services.

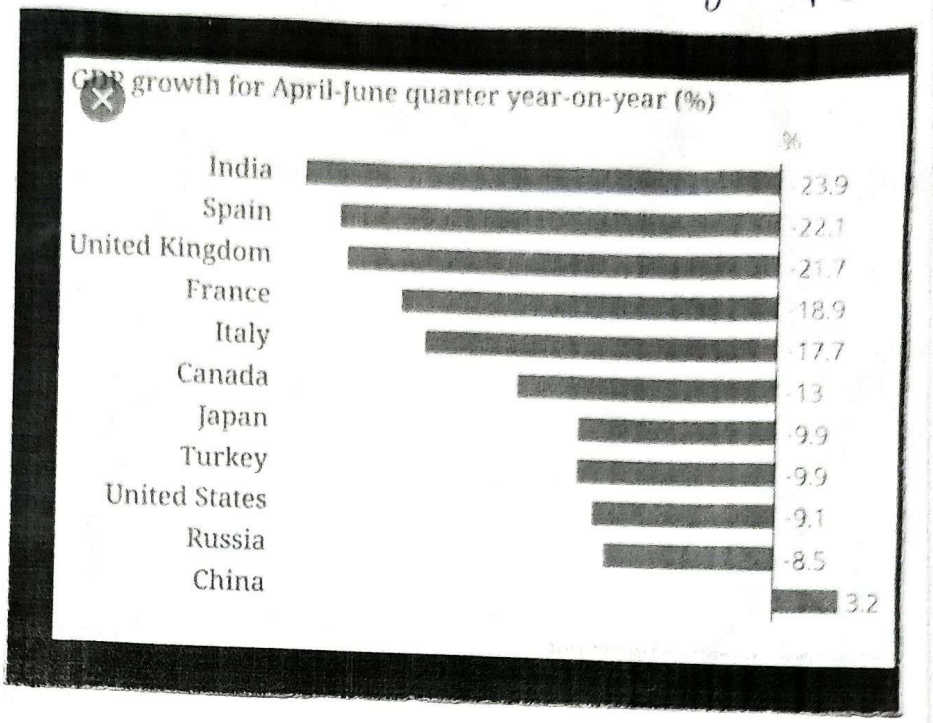
2) social crisis: The main strategy to bring back this covid situtions under control is nothing but

'Social Distancing'. But the main problem in tackling the situation is that the symptoms of COVID 19 may take 5-19 days to appear. So in many cases it may happen that a COVID positive patient has no symptoms and he is roaming freely in the society unknowingly. Hence Social distancing is the only option. But in many cases such social distancing is being hampered intentionally and unintentionally. Proper masks, gloves, shower caps have been made but in many cases people are not conscious enough to wear at least a mask even in this critical situation.

3. Economic crisis: The indirect effect of corona virus pandemic on economy is crucial. During the current pandemic, the economic downturn has greatly affected people from the lower socio-economic stratum (SES). The ~~dressing~~ distressing media visuals of migrant labourers going to their native places from the cities on foot during the lockdown has been critically debated. About $ 139 billion (₹ 1042500 crores) was remitted to low and middle income (LMICs) countries of south asia from countries of work (Gulf countries) in the year 2019. The projected to fall by about 23% in India in 2020. In this situation supply many essential commodities

dropped greately and hence price increased by leaps and bounds.

Shrinking of GDP of developed countries



4) Educational crises: All the schools and colleges and other educational institutes in India were completely closed according to the rules of ~~closed~~ lockdown in March, 2020 during the 1st phase of COVID-19 in India. From the till today the educational institutes are closed. Until now people were totally ignorant of classes on such virtual platform. Respective method was required to be taken in today. Holding proper examination on virtual media is very difficult. Pupils should bear with this situation and should carry on their education as much as possible.

5) Migrant workers problem: Indian migrant workers during covid-19 pandemic have faced multiple hardships. With factories and workplaces shut down due

to lockdown imposed in the country, millions of migrant workers had to deal with the loss of income, food shortages, uncertainty about their future. Thousands of them then began walking back home, with no means of transport due to lockdown. More than 300 migrant workers died due to lockdown, with reasons ranging from starvation, suicides, exhaustion, road and rail accidents etc.

Role of common people:

The overall development, economy, mentality of a country depends on the people of that country and their awareness. In this situation role of common people is vital.

- For himself/herself:

1) While outgoing, maintain at least 1 m distance with others.

2) Wearing mask, gloves is a inevitable part of our life in this situation.

3) Avoid touching own eyes, mouth, nose.

4) Cover mouth with tissue when sneezing.

5) Regularly and thoroughly clean one's hands with alchol based sanitizers.

- For environment:

1) Avoid crowded indoor settings and meet people

outside home.

2. Clean and disinfect surfaces regularly that are regularly touched or used.

3. Ventilate perfectly the environment where one lives.

4. During the long lockdown period, the environment regain her greenery and her old look.

- **If one feel unwell.**

1. One must know the full range of symptoms of COVID-19.

2. One to stay in home isolation even if one have minor symptoms such as- cough, headache, mild fever and need to undergo a COVID test.

3. Don't treat him/her as a untouchable human.

4. One shouldn't panic. These symptoms are common to many other disease and caught by coronavirus never implies death, as it is already said death rate from coronavirus is very low.

Conclusion :

To conclude this project I must mention the other side of the same coin. Due to COVID-19 situation, vehicles plying on road decreased to great extent, international planes, jets were postponed and all the industrial fields were totally closed. The nature had a positive impact for all these reasons. The pollution reduced to a fairly low level. Air pollution reduced too. As long as human being is there on the earth, such new genre of viruses will be coming again and again on earth, and for the first time we felt the importance of the development of the Health system service is above all the Social superstation and ~~pol~~ political ups and downs. We have seen a huge damage to entire mankind brought about by this corona pandemic. Our present generation can take a lesson from this situation that they need to grow their future science more than ever to fight against such upcoming wars.

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The above project is set up based on information which is taken from this sources-

1) en. wikipedia .org

2) economictimes . indiatimes . com

3) www.indiatvnews.com
4) www.frontiersin.org
5) www.healthline.com
6) www.nature.com

Acknowledgement:

The success and the final outcome of this project required a lot of guidance and assistance from many one and I am extremely privileged to have these all along with the completion of my project. I am grateful to Ramakrishna Mission Residential College (Autonomous) for providing me an opportunity to materialize this project. I must mention the assistance and support provided by my friends that helped me in every step from starting to ending.

Thanking you,

Yours faithfully,

Aakash Pal

Department of chemistry,
RKMRC

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE

NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: Pond Ecosystem and food chains

NAME : Abhijnan Basu Majumdar
COLLEGE ROLL NO : H1144/211/19
DEPARTMENT : History
YEAR : 2020
SIGNATURE : Abhijnan Basu Majumdar.

প্রকল্প সম্পর্কিত

সুনির্দিষ্টভাবে কোনো বিষয়ের বিশ্লেষণকে প্রকল্প বলে। প্রকল্প কার্য সম্পাদনের মাধ্যমে কোনো বিষয় সম্পর্কে সম্পূর্ণ অবহিত হওয়া যায়, হাতেকলমে কাজ শেখা যায়। এই প্রকল্পে পুকুরের বাস্তুতন্ত্রে উৎপাদক, খাদক, বিয়োজকের সম্পর্ক, খাদ্যশৃঙ্খল বলতে কি বোঝায় তা তুলে ধরা হলো।

সূচিপত্র

পুকুরের বাস্তুতন্ত্র

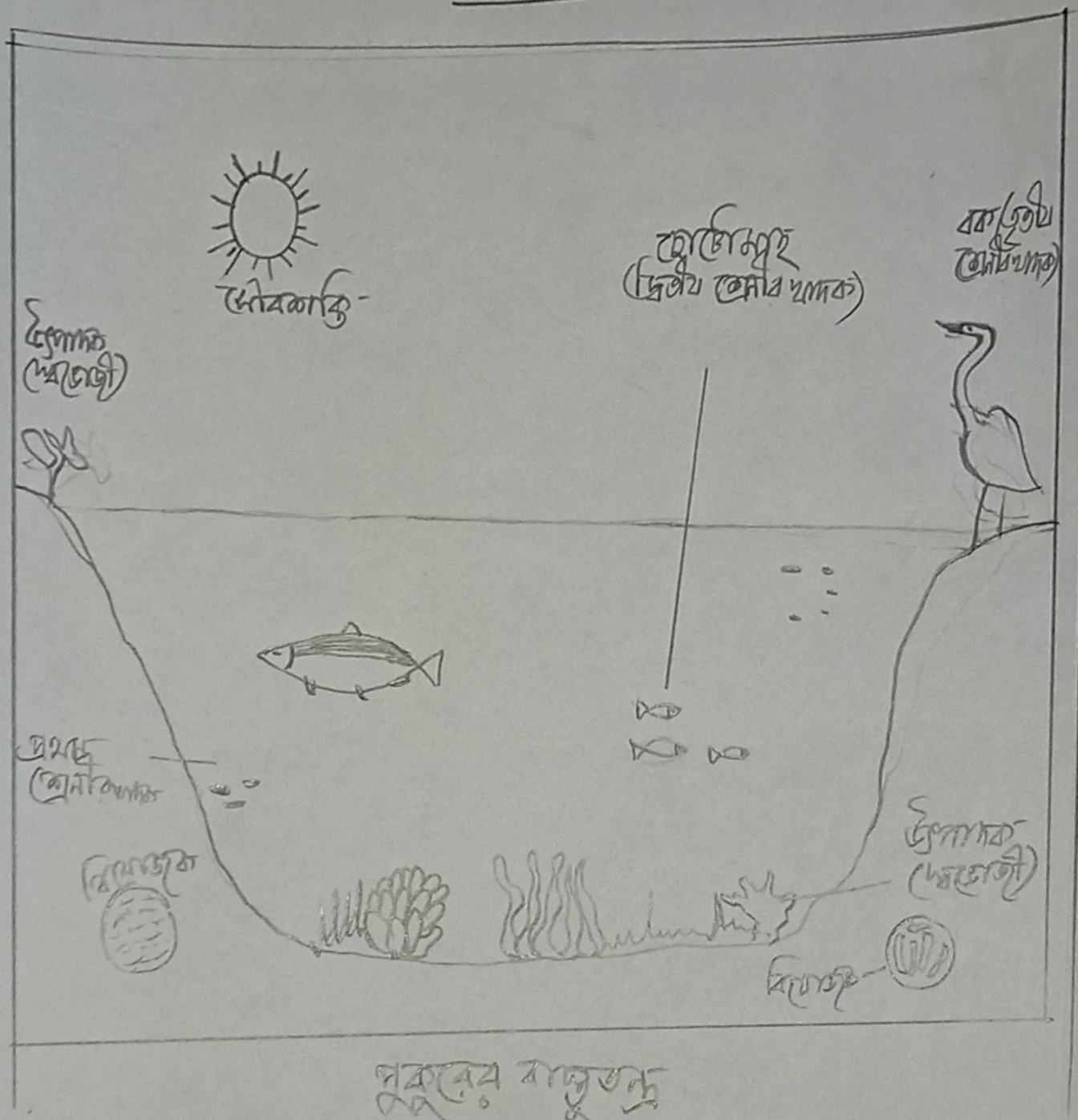
পুকুরের বাস্তুতন্ত্র মূলত নির্জীব ও সজীব উপাদান দ্বারা গঠিত। নির্জীব উপাদানগুলি জল সহ দ্রবীভূত কার্বনডাইঅক্সাইড, অক্সিজেন, নাইট্রোজেন, ক্যালসিয়াম, ফসফেট, অ্যামাইনো অ্যাসিড, হিউমিক অ্যাসিড, কার্বোহাইড্রেট, প্রোটিন, ফ্যাট- দ্বারা গঠিত। জৈব উপাদানগুলি হল উৎপাদক, খাদক ও বিয়োজকের সমন্বয়ে গঠিত।

উৎপাদক: পুকুরের বাস্তুতন্ত্রে উৎপাদক মূলত দুই প্রকার। (a) মাইক্রোফাইটস (b) ম্যাক্রোফাইট [illegible]। মাইক্রোফাইটসদের ফাইটোপ্ল্যাংকটনদের মাইক্রোফাইটস বলা হয়ে থাকে যেমন- ওডোগোনিয়াম, স্পাইরোগাইরা প্রভৃতি। ম্যাক্রোফাইটস হল হাইড্রিলা, ভ্যালিসনেরিয়া, ট্র্যাপা, টাইফা, নিমফিয়া প্রভৃতি। এরা সালোকসংশ্লেষ প্রক্রিয়ায় সূর্যালোক থেকে প্রাপ্ত শক্তিকে রাসায়নিক শক্তিতে রূপান্তরিত করে।

খাদক: পুকুরের বাস্তুতন্ত্রে অ্যামিবা, ড্যাফনিয়া, সাইক্লপস হল প্রাণী প্ল্যাংকটন, এরা প্রথম স্তরের খাদক। শামুক, ছোটো মাছ সমূহ হল দ্বিতীয় স্তর; ব্যাঙ, সাপ, বড়ো মাছ হল তৃতীয় স্তরের খাদক।

বিয়োজকঃ অধিক পরিমাণে দুগ্ধাক ও ব্যাকটেরিয়া জটিল জৈব উপাদানকে ভেঙে সরল অজৈব উপাদানে পরিনত করে। যেমন অ্যামনিয়া, হাইড্রোজেন সালফাইড প্রভৃতি।

চিত্র



পুকুরের বাস্তুতন্ত্র

খাদ্যশৃঙ্খল

জীবমন্ডলে শক্তির মূলবাহক- সৌরশক্তি যা সূর্য। সবুজ উদ্ভিদ এই সৌরশক্তিকেই সালোকসংশ্লেষ প্রক্রিয়ার মাধ্যমে রাসায়নিক শক্তিতে রূপান্তরিত করে নিজেদের প্রয়োজনীয় খাদ্য উৎপাদন করে। এরপর এই সবুজ উদ্ভিদকে খাদ্য হিসেবে গ্রহণ করে তৃণভোজী প্রাণী- এবং ওই তৃণভোজী প্রাণীদের আবার খাদ্য হিসেবে গ্রহণ করে মাংসাশী প্রাণী।

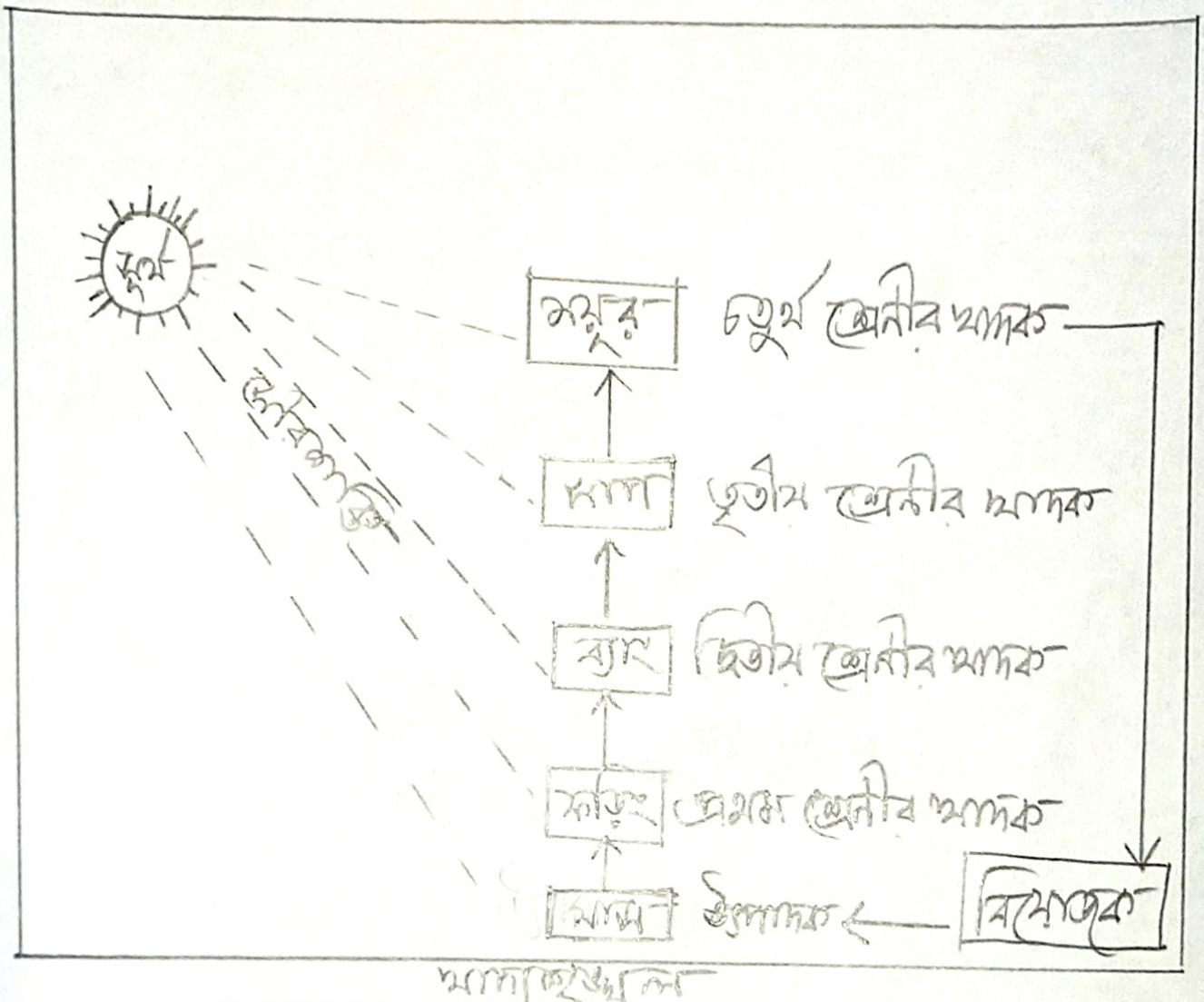
এইভাবে প্রকৃতিতে দেখা যায়, একটি নির্দিষ্ট নিয়মের মাধ্যমে খাদ্য ও শক্তি নিম্ন খাদ্যস্তর থেকে সর্বোচ্চ খাদ্যস্তরে পৌঁছায়। খাদ্যের মাধ্যমে উৎপাদক থেকে সর্বোচ্চ স্তরের খাদক পর্যন্ত বাস্তুতন্ত্রের সব বিভিন্ন জীবই যেন বা কিকলের মতো একটির সঙ্গে আরেকটি যুক্ত থাকে বা যেমন একটি শৃঙ্খলে আবদ্ধ থাকে যার মাধ্যমে তারা পরিবেশের অস্তিত্ব বজায় রাখতে সক্ষম হয়। প্রকৃতিতে উল্লেখ করা যায়, এই শৃঙ্খল যেকোনো সুবিন্যস্তভাবে উৎপাদকের অস্তিত্ব বিলুপ্ত হলে পর্যায়ক্রমে শৃঙ্খলাবদ্ধ সব প্রাণীরই জীবন তথা অস্তিত্ব বিলুপ্ত হতে পারে।

সংজ্ঞা: বাস্তুতন্ত্রে যে পদ্ধতির মাধ্যমে আদ্যশক্তি উৎপাদক থেকে শুরু করে ধারাবাহিকভাবে খাদ্য-খাদক সম্পর্কের ভিত্তিতে বিভিন্ন জীব বা প্রাণীগোষ্ঠী

মধ্যে অর্থাৎ নীচের পুষ্টিস্তর থেকে সর্বোচ্চ পুষ্টিস্তর পর্যন্ত স্থানান্তরিত বা প্রবাহিত হয়, সেই শৃঙ্খলিত ধারাবাহিক খাদ্য ও শক্তির স্থানান্তরকে বা প্রবাহকে খাদ্যশৃঙ্খল বলে।

ওডাম কৃত সংজ্ঞা: বিজ্ঞানী ওডামের মতে, "উৎপাদক থেকে ক্রমপর্যায়ে খাদ্য-খাদক সম্পর্কীয় বিভিন্ন জীবদের মধ্যে খাদ্য ও শক্তি প্রবাহের ধারাবাহিক প্রক্রিয়াকে খাদ্যশৃঙ্খল বলে।"

চিত্র



বৈশিষ্ট্য: খাদ্যশৃঙ্খলের উল্লেখযোগ্য বৈশিষ্ট্য হলো—

i) জটিল প্রক্রিয়া: খাদ্যশৃঙ্খল বাস্তুতন্ত্রের একটি অত্যন্ত জটিল ও গুরুত্বপূর্ণ প্রক্রিয়া। যেসব বাস্তুতন্ত্রে বৈচিত্র্য ও প্রতীবৈচিত্র্য যত বেশী সেখানে খাদ্যশৃঙ্খলের জটিলতাও তত বেশী।

ii) শক্তি ও পুষ্টি পদার্থের একমুখী স্থানান্তর: খাদ্যশৃঙ্খলের মাধ্যমে উৎপাদক থেকে প্রাণীকুলে শক্তি ও পুষ্টি পদার্থের একমুখী স্থানান্তর ঘটে।

iii) সবুজ উদ্ভিদের ভূমিকা: অধিকাংশ খাদ্যশৃঙ্খলের শুরুতে সবুজ উদ্ভিদ থাকে।

iv) বৈচিত্র্য: বৈশিষ্ট্যের খাদ্যশৃঙ্খল সবুজ উদ্ভিদ বা উৎপাদক স্তর থেকে শুরু হয়ে সর্বোচ্চ খাদক স্তরে শেষ হলেও বিভিন্নক স্তর থেকে শুরু হয়ে বড় প্রাণীতে গিয়ে শেষ হয় এমন খাদ্যশৃঙ্খলও আছে।

v) পুষ্টিস্তর: অধিকাংশ খাদ্যশৃঙ্খলে তিনথেকে পাঁচটি খাদ্যস্তর বা পুষ্টিস্তর থাকে।

vi) ক্রমহ্রাসমান শক্তিপ্রবাহ: কোনো খাদ্যশৃঙ্খলে সর্বনিম্নস্তর থেকে সর্বোচ্চ স্তর পর্যন্ত জীবের সংখ্যা ও শক্তিপ্রবাহের পরিমাণ ক্রমশ কমতে থাকে।

iii) অবিচ্ছিন্নতা: খাদ্যশৃঙ্খল একটি অবিচ্ছিন্ন প্রবাহ কারণ, খাদ্যশৃঙ্খলের যেকোনো একটি স্তরের বিলোপ ঘটলে সমগ্র বাস্তুতন্ত্রের ভারসাম্য নষ্ট হয়।

শ্রেণীবিভাগ: খাদ্যশৃঙ্খলকে দুভাবে শ্রেণীবিভাগ করা যায়। i) খাদ্য গ্রহণের ধরন অনুযায়ী ii) খাদ্য-খাদক সম্পর্কের ভিত্তিতে। এগুলি ছকের আকারে দেখানো হল—

বিভিন্ন খাদ্যশৃঙ্খলের শ্রেণীবিভাগ

শ্রেণীবিভাগের ভিত্তি	শ্রেণীবিভাগ	বৈশিষ্ট্য	উদাহরণ
1. খাদ্য গ্রহণের ধরন অনুযায়ী	a) চারণভূমি খাদ্যশৃঙ্খল	এধরনের খাদ্যশৃঙ্খলে খাদ্য ও শক্তি সবুজ উদ্ভিদ থেকে শৃঙ্খলের প্রথমে প্রাণীতে প্রবাহিত হয়।	সবুজ উদ্ভিদ → হরিণ → বাঘ
	b) বিয়োজক খাদ্যশৃঙ্খল	কাঠুরে প্রবাহ বিয়োজক স্তর থেকে শুরু হয়ে বড়ো প্রাণীতে ক্ষয় হয়।	পচাকাঠ → লার্ভা → ছোটো মাছ → বড়ো মাছ
2. খাদ্য-খাদকের সম্পর্কের ভিত্তিতে	a) শিকারি খাদ্যশৃঙ্খল	এধরনের খাদ্যশৃঙ্খলে খাদ্য ও শক্তি উৎসভোজী প্রাণী থেকে ক্রমে ক্রমে খাদ্য-খাদক সম্পর্কের ভিত্তিতে বহুতর মাংসাশী প্রাণীর স্তরে ক্ষয় হয়।	ঘাসফড়িং - ব্যাঙ - সাপ - বাজপাখি
	b) পরজীবি খাদ্যশৃঙ্খল	কাঠুরে প্রবাহ বৃহৎ স্তন্যপায়ী থেকে ক্ষুদ্র প্রাণী হয়ে ক্ষুদ্রতম পরজীবী প্রাণীতে ক্ষয় হয়।	গোরু - কৃমি - ভাইরাস
	c) মৃতজীবি খাদ্যশৃঙ্খল	মৃত ও গলিত জীবদেহ থেকে ক্ষয়কারী জীবাণুর দিকে শক্তি প্রবাহিত হয়।	মৃত ও গলিত প্রাণীদেহ → ছত্রাক → ব্যাকটেরিয়া

গুরুত্ব: খাদ্যশৃঙ্খলের মাধ্যমেই সবুজ উদ্ভিদ তথা উৎপাদক থেকে খাদ্য ও শক্তি সঞ্চারণের খাদক স্তরে প্রবাহিত হয়। অর্থাৎ, যেহেতু খাদ্য-খাদক সম্পর্কের মাধ্যমেই স্বভোজী উদ্ভিদ হতে বাস্তুতন্ত্রের অন্যান্য জীব বেঁচে থাকার জন্য প্রয়োজনীয় খাদ্য ও শক্তি পায়, তাই খাদ্যশৃঙ্খল বিনষ্ট হলে বাস্তুতন্ত্রটির অস্তিত্বই বিপন্ন হয়।

মূল্যায়ন

এই প্রকল্পে পুকুরের বাস্তুতান্ত্রিক গুরু, খাদ্যশৃঙ্খলের প্রকৃতি, প্রকারভেদ সম্পর্কে জানা গেছে। পুকুরের বাস্তুতন্ত্রে নির্জীব উপাদান, সজীব উপাদান, উৎপাদক-খাদক-বিয়োজক সম্পর্ক ব্যাখ্যা করা হয়েছে।

গ্রন্থপঞ্জী

১) রথীন্দ্রনারায়ন বসু: পরিবেশ, কলিকাতাবিশ্ববিদ্যালয়, ২০০১
২) ড. সুজনকুমার বাগ: এনভায়রনমেন্টাল স্টাডিজ, মাইক্রোবুক হাউস, ২০০৩
৩) কাঙ্খুরি আই.এ.এম অ্যাকাডেমী: এনভায়রনমেন্ট, ২০২২

কৃতজ্ঞতা স্বীকার

এই প্রকল্প রূপায়ণে পাঁরবেলাবিদ্যার শিক্ষক মহাশয় শ্রী নারায়ন কুমার মাইতি ও অন্যান্য শিক্ষক মহাশয়দের অসংখ্য ধন্যবাদ ও কৃতজ্ঞতা জানাই। তিনি বিষয়ে ও নির্দেশিকা সম্পর্কে আমাদের অবহিত করেছেন।

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE (AUTONOMOUS)

NARENDRAPUR, KOLKATA- 700 103

- B.A SEMESTER - (II)
- EXAMINATION - 2020
- SUBJECT - ENVIRONMENTAL SCIENCE PROJECT
- REGISTRATION NO - A03-1122-0048-19
- ROLL NO - BNUG/048/19

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I respect and thank prof. N.C. Maity, for providing me an opportunity to do the project work and giving us all support and guidance which made me complete the project duly. I am extremely thankful to him for providing such a nice support and guidance.

I would not forget to remember Swami Shastrajnananda Maharaj for his encouragement and more over their timely support and guidance.

I am thankful to and fortunate enough to get constant encouragement, support and guidance from all teaching staffs of ~~[illegible]~~ Bengali Dept. which helped us all in Sucessfully completing our project work.

Signature

Air pollution →

INTRODUCTION :-

Human population size has grown enormously over the last hundred years. This means increase in demand for food, water, home, electricity, roads, automobiles and numerous other commodities. These demands are exerting tremendous pressure on our natural resources, and are also contributing to pollution.

Pollution is any undesirable change in physical, chemical or biological characteristics of air, land, water or soil. Agents that bring about such an undesirable change are called pollutants. In order to control environmental pollution, The Government of India has passed the Environment (protection) Act, 1986 to protect and improve the quality of our environment (air, water and soil).

Air pollution It is the occurence or presence of any material or gas in the air in such a concentration which is harmful to man, vegetation animals and their environment. Substances and factors which cause air pollution are called air pollutants. Air pollution is both natural and anthropogenic. Anthropogenic pollution comes from both mobile and fixed sources. Air pollutants coming directly from the pollution sources are called primary air pollutants (CO, SO_2, NDx hydrocarbons). Reaction between two or more primary air pollutants gives rise to secondary air pollutants (Ozone PAN).

Causes of Air pollution

1. Smokestack of thermal power plants, Smelters and other Industries release particulate and gaseous air pollutants together with harmless gases such as N_2 and O_2
2. pollutants from automobiles, locomotive, aircrafts and exhausts in cities constitutes the major part of the total air pollution.

③ Incomplete and complete combustion of the carbon content of fossil fuel wood and charcoal produce carbon monoxide and carbon dioxide along with Sulphur dioxide

④ Natural sources include pollen, dust and smoke (from forest fires) and volcanic ash) which are emitted into the atmosphere

Control of Air pollution

Seperation of pollutant from harmless gases.

ⓐ Electrostatic precipitator:-

- It has electrode wires that are maintained at several thousand volts which produce a corona that releases electrons
- It is most effective device to remove over 99% of particulate matter present in the exhaust from a thermal power plant.
- These electrons attach to dust particles giving them a net negative charge.

- The collecting plates are grounded and attach the charged dust particles.
- The velocity of air between the plates must be low enough to allow the dust to fall.

(b) Scrubber :-

The industries which produce SO_2 as a by product must have Scrubbing mechanism installed in them. In this method, effluents containing sulphur dioxide are passed through a slurry of water and crushed limestone ($CaCO_3$). The calcium in limestone combines chemically with the Sulphur to produce calcium Sulphate ($CaSO_4$) which is seperately collected.

(c) Control of Automobile Exhaust

(1) Automobiles are major cause for atmospheric pollution atleast in the metro cities. proper maintenance of automobiles along with use of lead free petrol or diesel can reduce the pollutants they emit.

(11) Catalytic Converters have costly metals like platinum - palladium and rhodium as catalysts. Exhaust gases first pass through catalytic converter. Hydrocarbons which have been left unburnt are oxidised to from CO_2. However nitrogen oxide splits up to form nitrogen gas. Automobiles fitted with Catalytic converter should not use leaded petrol because lead inactivates the catalyst of the converter.

Effects on plants

When some gaseous pollutants enter leaf pores they damage the leaves of crop plants. Chronic exposure of the leaves to air pollutants can break down the waxy coating that helps prevent excessive water loss and leads to damage from diseases, pests, drought and frost. Such expo-sure interferes with photosynthesis and plant growth, reduces nutrient uptake and causes leaves to turn yellow, brown or drop off alto-gether. At a higher concentration of Sulphur dioxide majority of the flower buds become stiff and hard. They eventually fall from the plants, as they are unable to flower.

Prolonged exposure to high levels of several air pollutants from smelters, coal burning power plants and industrial units as well as from cars and trucks can damage trees and other plants.

Image -1.1

Image -1.2

Image 1.3

Image 1.4

Image -1.5

picture List - 1

Effects on human health

Sunburn, cataract aging of the skin and skin cancer are caused by increased ultra-violet radiation. It weakens the immune system by suppressing the resistance of the whole body to certain infections like measles, chicken pox and other viral diseases that elicit rash and ~~other~~ parasitic diseases such as malaria introduced through the skin.

Food production:-

Ultra violet radiation affects the ability of plants to capture light energy during the process of photosynthesis. This reduces the nutrient content and the growth of plants. This is seen especially in legumes and cabbage.

plant and animal planktons are damaged by ultra-violet radiation. In zooplanktons (microscopic animals) the breeding period is shortened by changes in radiation. As planktons form the basic of the marine food chain a change in their number and species composition influences fish and shell fish production.

Air pollution in India

The World health organization (WHO) which rates only mega cities of the world has rated Delhi the fourth most polluted city in the world, However compared to other cities in India. Delhi is not at the top of the list of polluted cities our country has several pollution hotspots. the recent release from the central pollution Control Board (CPCB) parivesh. January 2003 states that Ahmedabad's air is most Noxious flowed by Kanpur, Solapur and Lucknow with Small particulate levels 3-4 times the standard of 60 microgram per cubic meter (mg/m3). The report has ranked 29 cities according to respirable particulate matter (RSPM) levels recorded during the year 2000. This report thus confirms the fact that Indian cities show high particulate pollution with 14 cities hitting critical levels.

Nitrogen dioxide levels in most major cities are generally close to the acceptable annual standard of 60 mg/m3. However sharp increases have been noticed in a few cities With heavy vehicular traffic and density

Image - 2.1

Image - 2.2

Image - 2.3

Image - 2.4

Image - 2.5

picture List - 2

as in a few locations in kolkata and Delhi indicating stronger impact of traffic. The CPCB indicates vehicles as one of the predominant sources of air pollution. However the impact of hard measures implemented in Delhi over the last few years such as introduction of Euro II Standards. lowering the Sulphur content in fuel to 500 ppm and implementing compressed Natural Gas program has succeeded in improving the quality of air. Rapid urbanization of smaller cities especially those situated near the big commercial centers have an enormous increase in traffic load especially in ~~three~~ the most polluted segment such as two and three wheelers and diesel vehicles combined with poor quality fuel contribute to the deteriorating air quality in a big way, It is alarming to note that residential locations in India are fast outpacing industrial locations in air pollution implying that vehicular fumes are responsible for this trend. This Supreme courts Order to April 5.2002 has directed the central Government for an action plan for other polluted cities. Absence of any local initiatives for action and delay in air pollution control measures

Conclusion

The Air (prevention and control of pollution) Act, 1981: The Act deals with the preservation of air quality and the control of air pollution with a concern for the detrimental effects of air pollution on human health and also on the biological world in 1987. important ammentment to Air Act 1981. was made and noise was recognised as an air pollutant.

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RAMAKRISHNA MISSION RESIDENTIAL COLLEGE

NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Water Pollution
And
Measures to Control It

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YEAR : 2020

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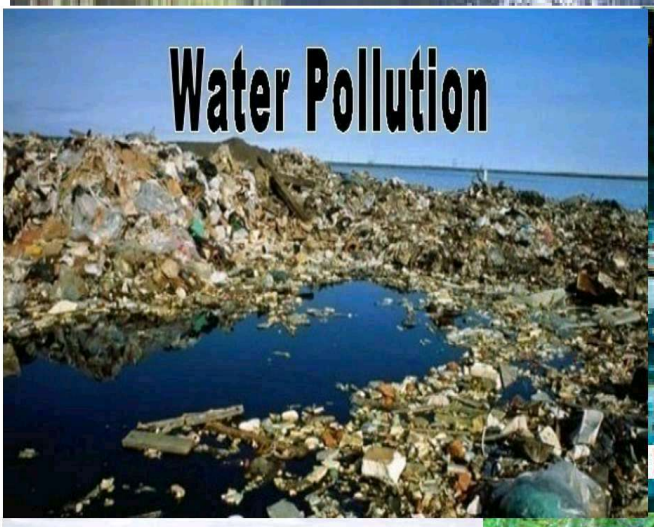
Water Pollution


CONTROLLING MEASURES OF
WATER POLLUTION
STARTUP CITY


Bishnupur
Dasdiha
Nowdapara
Jayanti Mathpara
Harekrishnapur
Jubbar Colony
Chak Khorgachi
Chak Chaitan
Tegharia
Srikrishnapur
Raipur Damospara

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Our liquid planet glows like a soft blue sapphire in the hard-edged darkness of space. There is nothing else like it in the solar system. It is because of water.

— John Todd

Introduction :-

Water is one of the renewable resources essential for sustaining all forms of life, food production, economic development and for general well-being. Water is also one of the most managable natural resources as it is capable of diversion, transport, storage and recycling. All these properties impart to water its great utility of human being. All ground water and surface water resources play a major role in agriculture, hydropower generation, livestock production, industrial activities, forestry, fisheries, navigation, recreational activities. It is impossible to substitute most of its uses, difficult to de-pollute and it is a truly a unique gift to mankind for nature.

Water Pollution :-

Water is considered polluted if some substance or condition to such a degree that the water can not be used for a specific purpose. Olaniran (1905) defined water pollution to be the presence of excessive

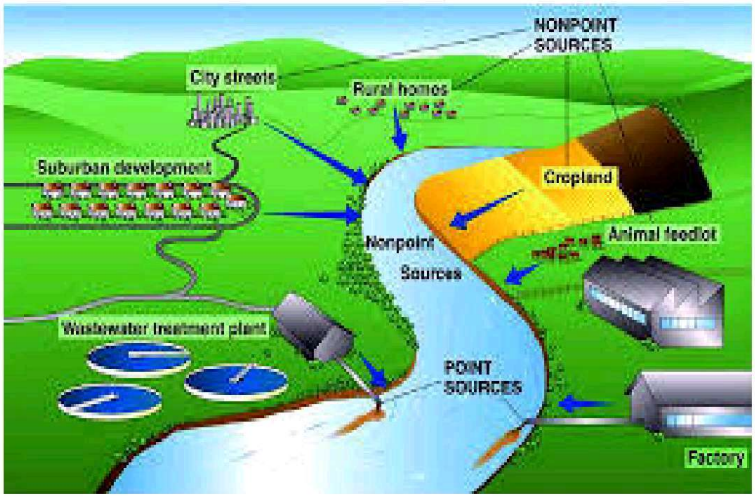
amounts of a pollutant in water in such a way that water cannot be used for drinking, bathing, cooking or other uses. Water pollution has been a research focus of government and scientists.

Therefore, protecting river water quality is urgent because of serious water pollution and global scarcity of water resources. Any change in the properties of water by physical, chemical and biological agents, singly or in combination, that would adversely affect the use of water for general or specific purposes may be broadly termed as water pollution.

Sources of water Pollution :-

Water Pollution can occur from two sources. They are - 1. Point Source & 2. Non-point source.

1. Point Sources :- When a source of pollution can be really & readily identified because it has a definite source and place where it enters the water, it is said to come from a point source.



For example, pipe attached to a factory, oil spill from a tanker, effluents coming out from industries.

2. Non-point source :- When a source of pollution cannot be readily identified, such as agricultural runoff, acid rain etc, they are said to be non-point sources of pollution.

Some of the important sources of water pollution are –

1. Urbanisation
2. Sewage and other oxygen demanding wastes
3. Industrial wastes
4. Agro-chemical wastes
5. Thermal Pollution.
6. Oil Spillage
7. Acid rain pollution.
8. Radioactive waste
9. Climate change.

Water pollution is generally induced by humans. The growth of human population, industrial and agricultural practices is the major cause of pollution. Overcrowding in urban areas result water pollution. Sewage is the water borne waster of society and discharge of untreated sewage causes water pollution. Besides many of the industries are situated along the banks of rivers such as steel and paper industries for their requirement of huge water in manufacturing process and finally their wastes containing

acids, alkalies and other chemicals are dumped and poured down into rivers as effluents. In the agricultural sector, agro-chemical wastes which includes fertilizers, pesticides - herbicides and insecticides, widely used in crop fields to enhance productivity. These make water polluted.

Changes in water temperature adversely affect water quality and aquatic biota. Some sources of thermal pollution are nuclear power, steel melting factories, coal fire power plant etc. Oil discharge into the surface of sea by way of accident or leakage from cargo tankers carrying petrol, diesel pollute sea water to a great extent.

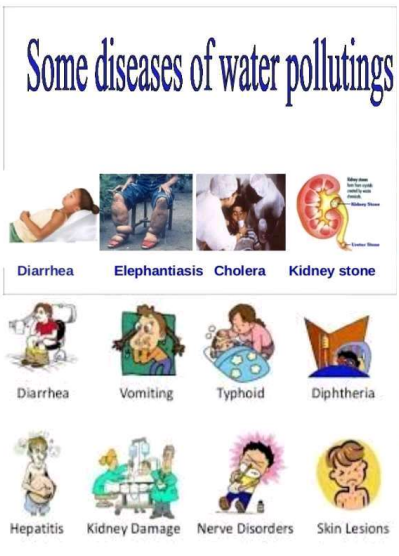
Atmospheric sulphur dioxide and nitrogendioxide emitted from natural and human made resources interact with hydrogen and oxygen to form sulfuric and nitric acids in the air. These acids fall down to earth through precipitation in the form of rain or snow. Water pollution that alters a plant's surrounding p-H value, due to acid. rain can kill or harm the plant. Radioactive pollution is caused by the presence of radioactive materials in water. Global warming has also an impact on water resources through enhanced evaporation, soil mosture, the frequency and severity of droughts and floods.

Effects of Water Pollution :—

Water pollution has a duel effect on nature. It has negative effects on living and also on the environment. The effects of pollution on human beings are many and varied. Water pollution causes approx 14000 deaths per day, mostly due to contamination of drinking water by untreated sewage in developing countries.

1. Effects of water pollution on human-health :-

There is a greater association between pollution and health problems. Disease causing microorganisms are known as pathogens and these are spreading disease directly among humans. Many waterborne diseases are spreading man to man. Heavy rainfall and floods are creating different diseases for developed and developing countries. Some diseases due to water pollution are —



- Pesticides can damage the nervous system and cause cancer because of carbonates that they contain.
- Chlorides can cause reproductive damage.
- Nitrates are especially dangerous to babies that drink formula milk. It restricts the amount of oxygen in the brain and cause the "blue-baby" syndrome.

- Lead can accumulate in the body and damage the central nervous system.
- Arsenic causes liver damage, skin cancer, and vascular diseases.
- Flourides in excessive amounts can make our teeth yellow and cause damage to the spinal cord.
- Petrochemicals even with very low exposure can cause cancer.
- Untreated drinking water and fecal contamination of water is the major cause of diarrea. Fever, abdominal pain, nausea, headache are the major symptoms of diarrea. Good hygenic practices and use of antibiotics can prevent the disease.
- Disease cholera is caused by the contaminated water. Vibrio Cholerae is responsible for this disease. This bacterium produces toxins in digestive tracts. Symptoms are watery diarrhea, nausea, vomiting. Antimicrobial treatment is used to get rid of this disease.
- Hepatitis is a viral disease caused by contaminated water and infects the liver. Jaundice, loss of appetite, fatigue, high fever are symptomps of this disease. Vaccine is available and by adopting good hygenic practice, one can get rid of this disease.
- Besides, poliomyelitis, gastroenteritis are viral diseases. Cryptosporidiosis are a parasitic disease due to effects of water pollution.

— These are the effects of water pollution on human health.

2. Effects of water pollution on plants :-

Water can become polluted by a number of sources, ranging from sewage treatment plants and factories to mining activities, paved roads and agricultural runoff. Water pollution has a wide variety of effects on plant life and on the environment in general. Pollution in water not only harms plant growth but also allows plants to absorb dangerous chemicals from the water and pass them on the animals that rely on them for survival.

• Foliage and Bark damage :- Acid rain contains sulfuric and nitric acid, which can damage tree leaves and bark and hurt the fine root hairs of many plants. Acid rain is the result of the mixing of compounds, eg sulfur dioxide and nitrogen oxides and other chemicals in the atmosphere. Many of the compounds stem from power plants that burn fossil fuels, such as coal, as well as exhaust from buses, trucks and cars.

• Photosynthesis issues :- Water pollution from substances can disrupt photosynthesis in aquatic plants. When water is polluted, the capacity of water to dissolve gases such as CO_2 is negatively affected. Because plants that grow in water depend on photosynthesis for their survival, any interference in the photosynthetic process can kill them.

Control of Water Pollution :—

The key challenges to better management of the water quality in India comprise of temporal and spatial variation of rainfall, uneven geographic distribution of surface water resources, persistent droughts, overuse of ground water and contamination, drainage and salinisation and water quality problems due to be treated, untreated, and partially treated wastewater from urban settlements and run-off from irrigation sector besides poor management of municipal solid waste and annual drug in rural areas (CPCB Report, 2013). Some of the control measures are given below—

1. The Ganga Action Plan and the National River Action Plan are being implemented for addressing the task of trapping, diversion and treatment of municipal wastewater.

2. For the agricultural sector, water and electricity for irrigation are subsidized for political reasons. This leads to wasteful flood irrigation rather than adoption of more optimal practises such as sprinkler and drip irrigation. Optimized irrigation, cropping patterns and farming practises should be encouraged for judicious use of water.

3. There should be ban on washing clothes and laundry alongside the river bank.

4. Industries should install Effluent Treatment Plant (ETP) to control the pollution at source.

5. Rain water harvesting should be practised to prevent the depletion of water table.

6. All towns and cities must have sewage Treatment Plants (STPs) that clean up the sewage effluents.

7. Improper use of fertilizers, herbicides and pesticides in farming should be stopped and organic methods of farming should be adopted. Cropping practises in riparian zone should be banned to protect the riparian vegetation growing there.

8. Religous practises that pollute river water by dumping colourful paints of idols containing harmful synthetic chemicals should be stopped.

9. CPCB has established a network of monitoring stations on aquatic resources across the country. The water quality monitoring and its management are governed at state/union territory level in India. The network covers 28 states & 6 union territories (CPCB report, 2013). Water quality monitoring is therefore a prequisite in order to assess the extent of maintanence and restoration of water bodies.

10. Making people aware of the problem is the first step to prevent water pollution. Hence, importance of water and pollution prevention measures should be a part of awareness and education programmes.

11. Polluter pays principle should be adopted so that the polluters will be the first people to suffer by the way of paying cost for the pollution.

Water (prevention and control of pollution) act of 1974 :-

The Central Pollution Control Board and State Pollution Control Boards composition, terms and condition of service of members are defined in Sections 3-12 of water (prevention and control of pollution) act of 1974.

The Board advises the government on any matter concerning the prevention and control of water pollution. It co-ordinates the activities and provides technical assistance and guidance. This policy sets the standards and penalties for non-compliance for polluting bodies.

The Government has power to restrict any unit and to take samples of effluents and get them analysed in Central or State laboratories.

The Central Board may perform all or any of the following functions, namely —

- advise the Central Government on any matter concerning the prevention and control of water pollution.
- co-ordinate the activities of the State Boards and resolve disputes among them.
- provide technical assistance of the State Boards, carry out and sponsor investigations and research relating to problems of water pollution and prevention, control or abatement of water pollution.

- plan and organise the trainings of persons engaged or to be engaged in programmes for the prevention, control or abatement of water pollution on such items and conditions as the Central Board may specify.
- organise through mass media a comprehensive programme regarding the prevention and control of water pollution.
- Collect, compile and publish technical and statistical data relating to water pollution and the measures devised for its effective prevention and control and prepare manuals, codes or guides relating to treatment and disposal of sewage and trade effluents and disseminate information connected therewith.
- lay down, modify or annul, in consultation with the State Government concerned, the standards for a stream or well.
- plan and execute a nationwide programme for the prevention, control or abatement of water pollution.
- perform such other functions as may be prescribed.

It is also a comprehensive legislation with more than 50 sections. It makes provisions, inter alia, for Central and State Boards, power to declare pollution control areas, restrictions on certain industrial units, authority of the Boards to limit emisson of air pollutants, power of entry, inspection, taking samples and analysis, penalties, offences by companies and Govt and cognizance of offences etc.

Conclusion :—

Water pollution is an environmental problem that is major concern to us. Human contribution to water pollution is enormous by way of defecating, dumping of refuse, industrial wastes and washing of clothes etc. There is more than a billion people in the world who have no access to safe drinking and more than 2 billion people worldwide who don't have proper sanitation systems. Therefore, water pollution is indeed a very serious concern because it not only has an impact on health and but also can have negative effects on various industries and agriculture. The report based on latest data from the ministry of urban development (2013), census 2011 and CPCB estimates that 75-80% of water pollution by volume is from domestic sewerage, while untreated sewage flowing into water bodies including rivers have almost doubled in recent years. It is therefore highly important to devise methods to reduce the level of water pollution that we are currently facing. Water purification is one solution for water pollution. Millions of people worldwide could be saved if people used chlorination, filtration and solar disinfection to treat water at their homes. Apparently, environmental education is of immense importance to use particularly in schools and should have a place in the school curriculam. In this way, they will be less inclined to pollute our waters.

Bibliography

I have taken help from the book "Environment" by Prof. Rathendra Narayan basu and the following websites for my knowledge about Water Pollution and Measures to control it and some associated picture -

① https://en.wikipedia.org/wiki/water_pollution.

② https://byju's.com/Water-pollution-control/biology.

③ http://www.fao.org/tempref/docrep/fao/006/y5051e/y5051e02

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RAMAKRISHNA MISSION RESIDENTIAL COLLEGE

NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: CORONA PANDEMIC AND ROLE OF COMMON PEOPLE TO CONTROL IT

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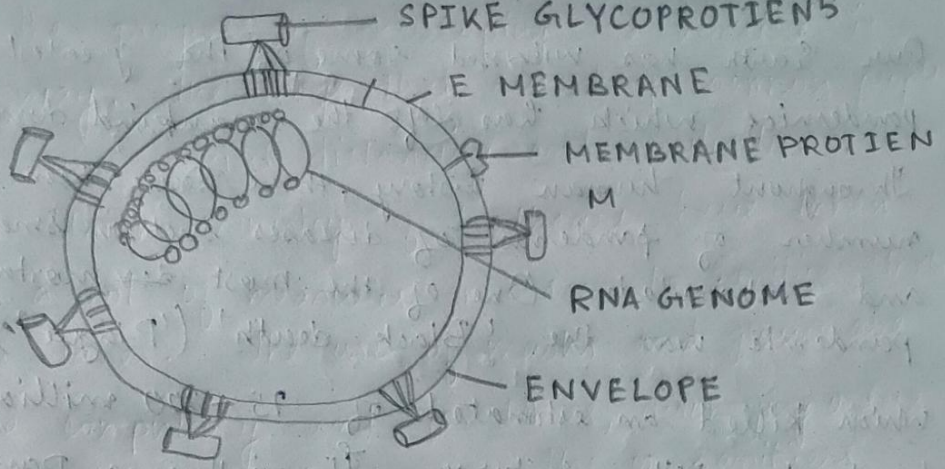
Corona Pandemic and Role of people to control it

Our Earth has witnessed some of the greatest pandemics which has left the mankind dumbstruck. Throughout human history, there have been a number of pandemics of diseases such as smallpox and tuberculosis. One of the most ~~dea~~ mortal pandemic was the 'Black death' ('Plague') which killed an estimated of 75 – 200 million people in 14th century. The influenza pandemic of 1918 ~~was~~ also holds an important place in the history of Pandmaics. The current Pandemic is the Covid-19.

Covid-19 or Corona Virus disease is a contagious respiratory and vascular disease, caused by Severe Acute respiratory syndrome coronavirus 2 (SARS COVID-2). First identified in Wuhan, China, and it is currently an ongoing pandemic.

Covid-19 spreads from person to person mainly by Respiratory Routes. When an infected person ~~Sneezes~~ or coughes, the virus containing particles, get into the nose and mouth of other nearby persons. Respiratory droplets may evaporate into droplet nuclei, which remain suspended in air for prolonged periods of time, causing infection particularly in crowded areas like market, choirs, restaurants etc. The contamination may also spread through touch and other forms of direct contact.



SARS COVID · Vitrion

SARS covid-2 is closely related to original Sars CoV. It is thought to have an animal (zoonotic) origin. Genetic analysis has revealed that coronavirus genetically clusters with the genus Betacoronavirus, in subgenus Sarbecovirus. together with bat derived strains.

WHO published several protocols for testing the diseasease. The standard method for testing is Real-time Reverse Transcription Polymerase Chain Reaction (rRT-PCR). Other tests that are performed are swab tests in hospitals. The infection comes into play within 5-14 days. Nutrition like Vitamin C, Vitamin D play a major role for treatment of covid

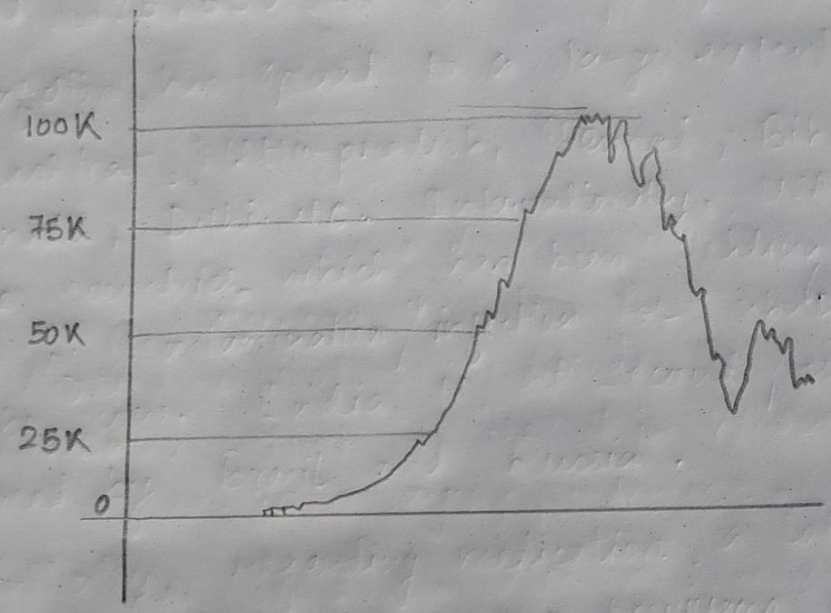
- Most common symptoms of covid-19 are
  i) fever ii) Cough iii) tiredness
  iv) headache v) Loss of taste & smell.

India's total cases surge to 82,67,623 cases with 76,56,478 recoveries. India also suffered 123,650 deaths. Some of states where the infection has spread to a large extent are Maharashtra, Uttarpradesh, Chennai, Bihar, Tamilnadu, Delhi etc. Internationally, USA is one of the countries which has been leading the Chart of contamination / infection for about 4 months now. India is at second position followed by Brazil and Russia.

Initially, regarding medication, a lot of doubt was encounted among physicians as study on the novel Coronavirus was not being in good progress. But with time, as the study of virologists progressed, different ways of fighting the virus was discovered. A lot of countries have taken the forward step in order to develop the vaccine. Many organisation like Moderna, Astrazeneca, Johnson and Johnson have taken the duty of developing the vaccine.

As the progress of developing the vaccine is on way, the things that can keep common people safe are social distancing and sanitization. The Union ministry of healthcare have taken up a lot of measures in order to sanitize streets and lanes. The use of masks and gloves are made compulsory and for likers, disobeying orders can lead to penalisation. Use of sanitizers is important as it kills the virus outside the victim's body. We, the common people can and must follow these orders judiciously and also, we must avoid crowd and gatherings as it can exponentiate the growth of the virus. If the common people follow these rules, then it is promised that the day is not far when covid-19 will be vanished from our vicinity. Some of possible ways for common people is to boost their immunity, by regular exercises, yoga, pranayam etc. Regular exercises can immune a person and will help them to fight the disease.

India seems to have the bent the curve in all key covid parameters including active cases, deaths and positivity rate. However, the country's worst performance has come from one of the largest states. Maharashtra has shown a major rise in corona cases all over.



Daily New Cases

From the above data, we can observe that from 97,065 cases, we have dropped onto about 48,000 cases. This shows that, within the 8 months pandemic, immunity has been gained by our countrymen.