



DR. SANTOSH KR.MISHRA EDITOR-IN-CHIEF

The outbreak of corona virus disease (Covid-19) posed a global threat of this century to public health and impacted economically and socially all the countries and also give a indication to re think about our present developmental model. Emergency lockdowns in initial sate of this disease have been started in different countries across the globe and the effect of this pandemic on health, businesses, social, education system and other aspects of daily life are felt among societies as well as individuals. At present no effective pharmacological interventions or vaccine available. Till date physical distancing, sanitization, use of mask and habits which boosts our immunity there is no other alternative to avoid infection from this virus.

Scientific community and medical professionals are facing this challenge in two way i.e. detection and treatment of patient suffering with covid-19 and prevention of healthy persons to get infected. Nearly 70 drugs are being used for treatment of patients suffering with Covid-19 depending on the medical conditions of the patients. However no drug gives a complete assurance in the treatment of this pandemic disease. Whole words are eying in the vaccine development and are hopeful to get some positive news from scientific community. The great hope in the control of infectious diseases is always a vaccine.

A recent report of the World Health Organization (WHO) stating that there are nearly two dozen corona virus vaccine prototypes across the world, that have been approved for human clinical trials. An important update regarding the vaccine candidate being developed by the University of Oxford, AstraZeneca pharmaceuticals, and IQVIA which is leading in vaccine development research. In this special issue of Biovision biotechnology professional summarizes and gives insight towards drug development, diagnosis and vaccine development status. We are expecting that pandemic situation also provided great opportunities to our young scientist and engineers towards development of new and powerful India. Hopefully this issue may provide valuable information to our young readers.

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ABOUT THE DEPARTMENT

The Department of Biotechnology was established in the year 2002 with a clear vision of educating students with latest technology in the growing field of Biotechnology as an undergraduate course. Now the department is NBA accredited and also offers postgraduate program (M.Tech). Since its inception, the Department has continuously grown and taken initiatives to impart quality education and inculcate research aptitude in Biotechnology students. The department is actively engaged in research activities in various areas of Biotechnology and related fields. It is also an authorized research center for Ph.D. program through AKTU, Lucknow. The department has consciously taken a decision to strengthen research activity in various areas of Biotechnology with a view to develop practical solutions to problems faced by industries. The department is unique in having established expertise across a broad range of scientific disciplines, thereby encouraging innovative approaches to teaching and research.

Our expert faculties in various disciplines also provide research consultancy in Environmental Biotechnology with a view to develop practical solutions to environmental problems faced by industries and the municipalities. Major Departmental Highlights include-

- Highly qualified faculties with extensive experience in industry, research and teaching
- 10 State-of-the art laboratories including Genetic Engineering, Fermentation Technology, Bioprocess and Computational Biology etc
- International internship at University of Louisville, KY, USA
- Advanced R&D in areas of Cancer Biology, Recombinant DNA Technology, Drug Discovery and Herbal Product Formulation
- Average 20 research papers published annually in peer-review journals by Faculty and Students
- Consistent 90% placement record in Core Biotechnology companies

VISION OF DEPARTMENT

Tobe a Centre of Excellence in field of Biotechnology education, research, training and entrepreneurship guided by sound scientific principles, quality teaching and thrust for improvement.

MISSION OF DEPARTMENT

1. To develop a strong Biotechnology Engineering program based on quality education, research and training.

2. To impart quality education to the students and enhance their skills which will make them globally competitive.

3. Todevelop trained biotechnology professionals who can contribute to the continuous improvement of biotechnological services and products.

4. Todevelop scientific and/or technical resources as per biotechnology industry demands.



ABOUT GEMS SOCIETY

GEMS (Genetic Engineers and Molecular Scientists), the professional society of Biotechnology department was established in the year 2008. The aim of this society is to encourage students for various professional as well as social activities. These activities of this society provide students a platform where they can excel their talent in the area of science and technology with better understanding of their professional & social responsibilities. It also helps students to show leadership skills well as team work culture in among students Faculties of department constantly providing guidance necessary support students for organizing various activities of societies. GEMS Society is constantly working to organize various techno-cultural events for overall development of students. Every semester this society organizes events like Guest lecture from experts, Seminars, Innovative idea presentation, Biofiesta (Annual techno-cultural event), Plantation of herbal plants etc. Expert from industry and research institutes like CDRI, BIBCOL, Dabur Research foundation, Sun Pharmaceutical Industries, Codon Biotech, Envirotech etc. delivered invited talk in the various activities organized by GEMS society. The structure of this society is as follows:-

President	: Prof. Rashmi Chandra (HoD, BT)
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http://www.imsec.ac.in/biotechnology.htm



HERD IMMUNITY AGAINST COVID -19

Dr. NARENDRA KUMAR (Associate Professor)

Here a high percentage of the population is immune against an infectious agent in a given population that lowers the spread infection in other susceptible populations. As the person recovering from a clinical infection develops a long term immunity or short term immunity that protects it from re-infection from the same pathogen. This situation helps to lower the chances of the spread of infection among the other susceptible population for the same pathogenbut doesn't yet have immunity.

If the individual develops the long term acquired immunity that will protect an individual for their whole life due to the formation of memory cells against the pathogen and does not allow the pathogen to cause any disease on re-infection. When an individual develops short term immunity, it will protect an individual for a shorter duration because of the formation of antibodies against the pathogen remain for 1-3 months within the body. To establish herd immunity among the population, the immunity generated must prevent onward transmission to other susceptible populations. In the case of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the clinical symptoms are a poor indicator of disease transmission and the asymptomatic individual can act as highly infectious and responsible for spreading the disease. After reaching the threshold of herd immunity, the strength and duration decided the efficacy of herd immunity.

Those pathogens develop lifelong immunity, develop highly effective herd immunity, and can prevent the spread of infection within a population like case of measles vaccination or infection. If the immunity develops in a

populations is uneven then the clusters of susceptible hosts may frequently come in contact with one another and the situation may remain thesame.

The herd immunity against SARS-CoV-2 is completely based on assumption that on subsequent infection in the population will generate protective immunity but it is unclear to what extent the protective immunity is generated in humans against SARS-CoV-2 at present. In a recent study that was conducted on rhesus macaques to analyze the possibility of SARS-CoV-2 re-infection found that the reinfection was not able to occur 1 month after the first viral challenge that suggests that it develops short term immunity in animals. So to develop effective immunity among the population there is a need to inject an effective vaccine to develop long term immunity. So while we can rely on herd immunity to protect us in the long run, especially after we have an effective vaccine, we still have a long way to go to rid ourselves of the virus – if at all.

Still, there are many open questions related to spreading, asymptomatic infection, immunity develops against COVID-19, and the regular updates released by WHO. We are still not in a situation to understand the recovery from this pandemic will look like. There are lots of vaccines are in a trial at different stages and hope for the best to be implemented to use for the general public for vaccination. But still, we need to strictly implement public health measures and practice physical distancing for now.



EVOLUTION OF COVID-19

TAHOOR AHMAD, AMAN SRIVASTAVA, AYUSH SINGH

An Analysis of genome sequence data obtained from SARS-CoV-2 and other related virus had found that the COVID-19 Originated through a Natural Process.

he novel SARS- CoV-2 corona virus that emerged in the city of Wuhan, China on December,2019 and rapidly spread in more than 200+ countries due to the huge reservoir of carrier in last 3-4 months is the product of natural evolution according to the findings of researchers and scientists.

COVID-19 caused by the corona virus called SARS-CoV-2 (SARS- one of the largest family of corona virus). CoV-2 generally depends upon the host for replication and is a single stranded RNA virus. Corona virus is the large familyof viruses that can causes illness ranging widely in severity. Sources say that the virus generally circulate among the handful animals, from there they evolved to infect humans.

- The First case with corona virus was recorded in humans in mid-1960.
- In 2002-03, an severe illness epidemic began in China caused by Corona virus as Severe Acute Respiratory Syndrome (SARS).
- The next epidemic caused by Corona virus began in Saudi Arabia with the Middle East Respiratory

Syndrome (MERS) in 2012.

On December 10th, 2019 Wake Kushan of Wuhan China recorded the infection in both the lungs and was resistant to anti-flute drugs. On December 27th, Wuhan learnt a new strain of corona virus. On December 31st, (with new 27 cases) Chinese government alerted the World Health Organization (WHO) of an spread of new strain of corona virus causing severe illness which was named as SARS-CoV-2 (which was related in sequence with the SARS-CoV, 2003). As the epidemic began, The Chinese scientists and authorities detected that the number of cases of Corona Virus have been rapidly increasing due to Human to Human transmission after a single point. In order to determine the nature and its evolution, Collaboration of several Research institute analyzed the key characteristics of the virus in which genetic template of virus spike protein was the main focus

The corona virus structure consists of spherical shell made of lipidmembrane encompassing core that contain virus Granular mass. The spike protein is attached to the host cell and fuse with them. Genomic Data reveal that SARS-CoV-2 binds and fuse to the host cell wall as a result of change site that activated by the enzyme Furin (present in Human's Liver, Lungs and small Intestines

Researchers have believed that SARS-CoV-2 spiked protein are so effective at bindings to human cells and hence concluded that this was the result of natural selection and not the part of laboratory engineering. This evidence for Natural Evolution has been supported by data on SARS-CoV-2's backbone and its overall structure. The Mutation in the Receptors Binding Proteins portion of spike protein andits distant backbones features doesn't support Laboratory origin of the virus" Said Andersen, an associate at Scripps Research. The Covid-19 appeared to be substantially different in structures from existing known human viruses. It mainly bear resembles to several similar viruses found in bats, pangolins and armadillo (mammal found in Africa and Asia. Based on the genomic sequencing analysis, Researchers concluded that the most likely origins for SARS-CoV-2 can be followed one of2 possibilities.

In first possibility, the virus evolved through Natural process in an animal host and then migrated to humans who were supported by previous outbreak of corona virus that have direct human exposure to civets (SARS) and camels (MERS). In recent theory, the researchers believed that bats as one of the most likely reservoir for SARS-CoV-2 as its sequence is very similarto a bat corona virus. There are no cases which can relate direct bat to human transmission. So, there could be a possibility of an intermediate between bat and human.



In second possibility, a non-pathogenic virus from an animal host enters into humans and then evolved to its pathogenic version within the human population. For example, mammals found in Asia and Africa (pangolins and armadillo) have Receptors Binding Protein structure which is very similar to that of SARS-CoV-2. A virus from a pangolin could be possible that have been transmitted to a human, through an intermediate host such as civets and ferrets.

References:-

1) Kristian G. Andersen, Robert F. Garry, Edward Holmes and Andrew Rambaut (The Proximal Origin of SARS-CoV-2). https://www.nature.com/articles/s41591-020-0820-9

2) International Journal of Biological Science,2020. www.ijbs.com



DIAGNOSIS OF COVID-19

SHREYA VERMA, HIMANGI GUSAIN, SAFALTA SHARMA

The COVID-19 outbreak has put emphasis on proper diagnosis and screening of the virus by the labs. This article presents various diagnostics methods and issues currently present and challenges to overcome.

Pre-analytical Issues:-

Initial diagnosis begins with onset of symptoms and screening of pneumonia in the suspected individual. It has been observed that high viral load is present in upper and lower respiratory tracts. Hence collection of upper respiratory tract specimen is done through nasopharyngeal (NP) swab and/or an oropharyngeal(OP)swab. Mainly some Nasopharyngeal (NP) swab is preferred more due to the convenience of the patients and is safe for the operator. Alternative method is self-collected saliva specimen.

After collection of samples they are transported in viral transport medium under refrigerated conditions to the respected labs.

There are chances that detection through saliva/NPs/OPs may miss the early signs of the infection. The infection may shift to lower respiratory tract and repeated specimen may be taken.

In screening of COVID-19 we need to Rule out other respiratory viral pathogen. Late detection: late detection and monitoring of patients with severe COVID-19 pneumonia consist of the collecting sputum or bronchoalveolar lavage (BAL) fluid. In more advance cases rectal swab and real-time RT-PCR is recommended. Processing of the specimens should be done in class-Il biological safety cabinet. If nucleic acid extraction is being done before real time RT-PCR, the sample should be transferred to the lysis buffer containing detergents.

All the specimen collections should be done carefully by medical personnel in appropriate protective gear.

Analytical Issues:-

1) Assay selection

For rapid detection of SARS-CoV-2 antigens or antibodies immunoassays are required.

There are already lateral flow assays available which cater to fast time results and low-cost detections but there is need of high throughput immunoanalyzer for large level screening as 6



these assays have poor sensitivity due to less viral loads or sample variability and may fail to detect during early infection. Serological methods have proven to be useful for Covid-19 but they're only used to affirm late cases or to determine the immunity of health care workers.

2) Molecular detection of SARS-CoV

To comprehend future mutations of SARS-CoV-2, (NGS) next generation sequencing and meta-genomic nextgeneration sequencing will be vital. Currently real time RT-PCR is being used for diagnosis. Loop-mediated isothermal amplification, multiplex isothermal amplification followed by microarray detection, and CRISPR are some other molecular diagnostic method being refined for future use.

3) Target selection for real-time RT-PCR assays

Genes encoding structural proteins, including envelope glycoproteins spike (S), envelope (E), transmembrane (M), helicase (Hel), and nucleo-capsid (N) are some of the molecular targets of coronaviruses. RNA-dependent RNA polymerase (RdRp), hemagglutininesterase (HE), and open reading frame 1a (**ORF1a**) and (**ORF1b**) are some other proteins encoded by speciesspecific accessory genes. It was found that real-time RT-PCR assays targeting the RdRp/Hel, S, and N genes had the lowest limit of detection in vitro and higher sensitivity and specificity.

Post Analytical Issues:-

1) Interpretation of molecular level

Initially in US two targets in CDC assay is considered among which if both are positive for nucleocapsid proteins (N1, N2) then case is defined as positive for COVID-19.Cycle threshold (Ct) is another measure by which viral load can be determined. If Ct < 40: case is defined positive, Ct \geq 40: negative case, Ct for one is <40 but for another is >40: patient should be retested.

2) Test of cure and test of infectivity

Subsidy of pathogen state is must to know because if a patient is discharged then there may be chances of shedding viable coronavirus, so 1-month selfquarantine is suggested. A Renal swab is another approach for the test of cure, if renal swab testing is positive in RT-PCR then the patient is carrying SARS-COV-2 infection.

3) Serology of COVID-19

Serological method detect serum antibody against spike (s) protein which has two subunits (S1: responsible for receptor binding& S2: responsible for fusion) and E protein responsible for receptor binding. N protein is another structural component that has an antigenic site and play important role in viral pathogenesis, replication and RNA packaging. The serological methods can confirm the diagnosis ofCOVID-19.



DIAGNOSIS OF COVID-19 : ANTIGEN & ANTIBODY BASED INCLUDING RT-PCR

SIFA KHAN

OVID-19 affects different people in different ways. Mostly infected people develops moderate illness with common symptoms like fever, cough, aches, sore throat, diarrhoea etc.

In response to rapidly growing pandemic and symptoms the question arises is "How to diagnose covid19?". Rapid detection kits which are easy to use, are manufactured by pharma companies and launched in the market by undergoing validation procedures with adequate number of true detection tests.

Diagnostic tests are validated on the basis of sensitivity and specificity which gives us true positive rate and true negative rate respectively.

Rapid diagnostic kits available in the market are based on -

Antigen Detection:-

It detects presence of viral protein (antigens) which are expressed by covid-19 virus in the sample from respiratory tract of a person. If target antigen is present in the sufficient concentration in the sample, it will bind to specific antibodies which will generates a visually detectable signals. These antigens are detected only when the virus is actively replicating. Therefore, these kits are used to identify the acute infection. WHO (World Health Organization) does not recommend the use of rapid diagnostic tests based on antigen. Because more than half of the population could be missed resulting false detection due to various reasons like - stage of infection, concentration of virus in the sample, quality of the specimen and false binding of antigen with human coronaviruses which causes common cold. This affects sensitivity to vary from the range 34-80%.

Antibody Detection:-

It detects presence of antibodies in the blood of people who are believed to be infected by covid-19. Antibodies are produced over two weeks after infection with the virus. The strength of antibody response depends upon several factors like- age, severity, nutritional status, medications and infections like HIV that suppresses the immune response. Patient develop antibody response in the second week after onset of symptoms, therefore diagnosisbased on antibodyresponse 8



can only be done in the recovery phase of the patient.

These kits can also cross react to other pathogens like human coronaviruses and give false positive results. Hence, these kits are used for development of vaccine and supports in understanding the extent of infection.

Reverse Transcriptases Polymerase ChainReaction (RT-PCR):-

It is considered gold standard test for detecting viruses. In this test, the sample is collected from the parts of body where the coronaviruses gathers such as the person's nose or throat. Then the sample is treated with several chemical solutions like salts, bromide and lipases that removes substances like proteins and fats from the sample and let us extract only RNA.

RNA left in sample is the mixture of the person's own genetic material and if present, coronavirus's RNA. Sample is then reverse transcribed to DNA using reverse transcriptase enzyme. Towhich

Additional in some short fragments of complementary DNA (oligonucleotides labeled with radioactive isotopes) bind to transcribed viral DNA. This is achieved by monitoring the amplification of reaction using fluorescence, a technique called realtime PCR or quantitative PCR (qPCR). Combined RT-PCR and qPCR are routinely used for analysis of gene expression and quantification of viral RNA in research and clinical settings

These will act as primer for synthesizing new radioactive strand. Now the mixture is placed into the RT-PCR machines. The machine cycles the temperatures that heat and cool the mixtures to trigger specific chemical reaction that create new identical copies of target sections of viral DNA. Each cycle doubles the previous amount of DNA. The standard RT-PCR setup usually goes through 35 cycles which leads to billion copies by the end of reaction which ensures the early stage infection.

Severity of infection can be measured by considering the number of cycles performed. It is highly specific and sensitive with the accuracy of 90% and takes 6 - 8 hours for diagnosis. It has lower potential of contamination as entire procedure is performed in a closed tube. Hence it is recommended by WHO as the most accurate method till now and used universally in this pandemic.

References:-

- 1) https://www.antibioticresearch.org.uk/
- 2) https://www.fda.gov/
- 3) https://www.who.int/

4) https://health.economictimes.india times.com/

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A DYNAMIC METHODOLOGY TO REDUCE TRANSMISSION OF COVID-19

ADITYA RAJ

uring the most recent 5 months, a disastrous pestilence, Coronavirus ailment is been energetically dynamic and widened in all pieces of universes like USA, Spain, France, Italy, Europe and India with beginning phases are being affirmed and distinguished in Wuhan, China. Because of the alarming level of proliferation, severity and inaction on March 11,2020, the chief of WHO, Tedros Adhanom proclaimed it as worldwide pandemic. The beginning of this maladyis described by indication of head and throat torment, dyspnea, fever, shaking chills, running nose. 5% of the patient turned out to be basically sick. The disease is caused by SARS-CoV-2.Covid 19 is a nanostructured. Has various nanostructure which functions can be targeted on, can't withstand heat and has a lipid layer which can be disrupted through responsive oxygen species (ROS).At the point when we breathe in the virus, SARS-CoV2 goes into nose coating that is rich in ACE2 receptors and if the resistant frameworks neglects to clear the infection in the initial stage, SARS-CoV2 experiences the windpipe to assault the lungs.

Detection Methods:-

1) PCR

They are highly sensitive and specific. Viral nucleic acid tests using PCR which indicates the presence of viral material(RNA fragments) during infection. The samples are taken from nose, throat swab, lungs fluids. The main problem with PCR is a long turnaround, complicated, expensive and large number of false negatives. They are highly delicate and explicit. Viral nucleic analyses utilizing PCR which shows the nearness of viral materials (RNA parts) during disease. The examples are taken from nose, throat swab, lungs liquids. The primary issue with PCR is a long pivot time, muddled, expensive and enormous number of bogus negatives.

2) RAPID DIAGNOSTIC TEST (RDT): POINT OF CARE (POC)

It is used for irresistible maladies, with a turnaround time of under 2 hours, which are most promising devices that could improve persistent consideration, antimicrobial stewardship and contamination counteraction. The samples are taken from prick, saliva samples or nasal swab fluids. These are fast, simple to perform and can be done anywhere.

Serological responses can be applied in two different ways: (1) in the analysis of disease by testing the serum of the patient against known antigens and (2) to recognize an organism (or other antigen) by testing it against known antisera. The serological reaction most broadly utilized is agglutination, precipitation, and complementfixation, the last fundamentally as the Wassermann response. Agglutination is presumably the most widely applied of serological responses. Complementfixation is utilized essentially in the finding of syphilis, as the Wassermann test. It is additionally applied in the finding of interminable gonorrhea and infection sicknesses; in these cases, the general method is like that of the Wassermann test, the central distinction being in the idea of the antigen. Readings are simpler to make if the tubes have been left for the time being in the fridge. The absence of lysis demonstrates a positive, complete lysis a negative, and inadequate lysis a farfetched result.

Treatment Method:-

Given the precarious mortality brought about by the ongoing novel coronavirus (COVID-19) pandemic, there is clear requirement for propels in diagnostics and therapeutics for viral disease. Tissue engineering and convalescent plasma has the potential for basic effect on clinical results in viral disease. Tissue engineers, whenever activated, could assume key jobs as pioneers in the episode, given their capacity to apply building the standards to organic procedures, involvement with communitarian conditions, and inclination for innovative interpretation from bench-top to bedside. these works, which could be applied to the current COVID-19 emergency and future viral disease are featured below.

S.NO	NAME	MECHANISM	
1.	Remdisivir	Evades exonuclease proofreading activity of RNA.	
2.	lvermectin	Ivermectin causes an influx of <u>Cl</u> ions through the cell membrane of invertebrates by activation of specific ivermectin-sensitive ion channels.	
3.	Hydroxychloroquine	The <i>exact mechanisms</i> through which hypnosis works are <i>not known</i> .	
4.	Avigan Tablets	It inhibit the selective inhibition of viral RNA- dependent RNA polymerase.	
5.	Loprinavir - Ritonavir	It's a protease inhibitor	
6.	Chloroquine	Reduces cytokine production	
7.	Monoclonal Antibody	Restrains the authoritative of Interleukin-6 to its receptor.	

1) Lyophilized Convalescent Plasma

Convalescent Plasma treatment is a great versatile immunotherapy which has been applied for the counteraction and treatment of numerous irresistible



maladies for over one century. Over a previous decades Convalescent Plasma treatment was effectively. Utilized in the treatment of SARS, MERS and 2009 H1N1 pandemic with good adequacy and wellbeing. few A examinations which announce that convalescent plasma treatment in COVID-19 contaminated patients has been a counter acting agent treatment to lessen the viral burden. LCP has a long shelf life of 5 years or more and further administration of some few Convalescent Plasma containing neutralizing antibody will decrease sequential organ failure. It give passive support to immune system and beneficial to use in early stages. They are allogenic. One donor can produce up to 4 units of Convalescent Plasma that is 250ml and about 400 ml of plasma can be used to treat two patients. Lyophilized samples could be stored for much longer than untreated sample.

Lyophilized Convalescent Plasma can be accomplished by Lyophilization also known as freeze drying, is a procedure utilized for protecting organic material by withdraw the water from the sample, which includes first freezing the examples and afterward drying it under a vacuum at low temperatures. The cost of the treatment is free in government hospitals and for private hospitals it cost around 5000. LCP is beyond limitations and no restrictions as related to age, sex, pregnancy, renal diseases, dental mellitus and hypertension. The cost for the treatment is free in government hospitals and 5000/- for private hospitals. It's an ideal time to accelerate right now before the ratio get

worsens as the coronavirus recovery rate in India is 59.6%.





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S.NO	CONVALESCENT FORM	LYOPHILISED FORM
1.	Stored in blood banks	Can be stored in Pharmacies
2.	Cold storage needed	Room temperature sufficient
3.	Not readily available	Readily available
4.	Take more than 30 min for reconstitution	Readily reconstituted in normal saline within 10 minutes.

1) Stem Cell Therapy

Its an innovative immune-modulatory therapy which actively support to immune modulation for ARDS and other indications. An ongoing examination revealed excellent results in improved pulmonary functional activity, into seven patients who endured Coronavirus Disease 2019 (COVID-19) after an intravenous organization of clinical- grade mesenchymal stem cell (MSCs). SARS-CoV-2 positive patients, with COVID-19 pneumonia, showed a great improving pulmonary functional activity after an intravenous administration of clinical-grade MSCs. The clinical-grade MSCs, as a cellular product which is an infusion procedure, suspending MSCs in 100 mL of saline solution, and reporting the totalnumber of infused cells was 1×106 cells per kg. The window time frame for cell transplantation has been characterized

as when indications or/signs despite everything were deteriorating. The infusion was performed for around 40 min with a speed of ~ 40 drops every moment. The early stage increases local tissue macrophage and the late stages restore the alveoli and tissue. Stem cell therapy can improve the oxygenation. Each patient of the investigation group got 1.000.000 MSCs/kg body weight and they were watched intently for 14 days. Shockingly, the examination detailed that every pulmonary symptoms subsided 2-4 days later receiving intravenous MSC infiltration without side effects. Phenomenally, the chest CT imaging showed that pneumonia was altogether decreased, and the significant piece of rewarded patients had demonstrated negative results for the SARS-CoV-2 nucleic basic analysis 1.5 weeks average later MSC infusion.

Conclusion:-

India has made fundamental strides and safeguards to control the spread of the sickness by opening control rooms around the same time of the flare-up in Wuhan, China and forced Section 144 of the CrPC with a total lockdown till May third. This helped the nation to restrict the loss of life and network spread was kept away from in numerous thickly populated states and chose to direct Convalescent Plasma treatment on more patients in the coming days. In India, multiplex PCR boards were utilized for diagnostics in the beginning of the disease yet now if no pathogen was distinguished the examples were



alluded for a few serological testing. Indian Council Medical The of Research (ICMR) endorsed 176 labs to lead demonstrative tests and the U.S. Food and Drug Administration has endorsed such units for symptomatic testing for COVID-19. The general death rate in India is low contrasted with different nations, for example just 3% and this was accomplished in India by phenomenal measures to contain further transmission of COVID-19. If there should be an occurrence of different states in India, lockdown that was energetically for 21 days which was later stretched out till May second and from every single affirmed case, 26.24% are in Maharashtra. Association Ministry of Health and Family Welfare and its strong observation framework is intently checking more than 9.5 lakh suspected Covid-19 cases the nation over. Additionally, travel history of all patients with respiratory side effects and made any universal travel or even reached with any debilitated individual were analyzed and saved for home isolate or in confinement in clinics paying little mind to a negative test outcome.

References:-

1) Cucinotta D, Vanelli M. WHO de0. clares COVID-19 a pandemic. Acta bio-medica: Atenei Parmensis91 (2020): 157-16 https://pubmed.ncbi.nlm.nih.gov/32 191675/

2) Lipsitch M, Swerdlow DL, Finelli L. Defining the epidemiology of Covid-19—studies needed. New England Journalof Medicine 382 (2020): 1194-1196. https://www.nejm.org/doi/full/10.1056/nej mp2002125

3) Krogstad DJ, Gluzman IY, Kyle DE, et al. Efflux of chloroquine from Plasmodium falciparum: mechanism of chloroquine resistance. Science 238 (1987): 1283-1285. https://pubmed.ncbi.nlm.nih.gov/3317830/

4) Vafaei S, Razmi M, Mansoori M, et al. Spotlight of Remdesivir in Comparison with Ribavirin, Favipiravir, Oseltamivir and Umifenovir in Coronavirus Disease 2019 (COVID-19)

https://papers.ssrn.com/sol3/papers.cfm?a bstract_id=3569866

5)) Van Griensven J, Edwards T, de Lamballerie X, et al. Evaluation of convalescent plasma for Ebola virus disease in Guinea. New England Journal of Medicine 374 (2016): 33-42.

https://www.nejm.org/doi/full/10.1056/nej moa1511812

6) Ye M, Fu D, Ren Y, et al. Treatment with convalescent plasma for COVID-19 patients in Wuhan, China. Journal of Medical Virology (2020).

https://pubmed.ncbi.nlm.nih.gov/3229371 3/

7) Shen C, Wang Z, Zhao F, et al. Treatment of 5 critically ill patients with COVID-19 with convalescent plasma. Jama 323 (2020): 1582-1589.

https://pubmed.ncbi.nlm.nih.gov/3221942 8/

8) GentAdipose-derived stromal stem cells (ASCs) as a new regenerative immediate therapy combating coronavirus (COVID-19)-induced pneumonia by Pietroile.2006;8:166–177 https://www.ncbi.nlm.nih.gov/pmc/articles/P MC7196919/



PROBABLE DRUG CANDIDATES AGAINST COVID-19 SCREENED AND REPORTED

SHUBHAM SINGH AND SHUBHAM TIWARI

OVID-19 has been officially labeled as a pandemic by World Health Organization (WHO) on March 11, 2020. Currently, there is effective proven Drug no or therapeutic agent against SARS-CoV-Current clinical management 2. includes infection management, control measures and supportive care. research and clinical Evolving reported suggest a potential list of possible drugs with an appropriate pharmacological effect for the treatment of COVID-19 patients.

Current TherapeuticsDrugs

At presents, the treatment based on symptomatic condition and mainly repurposing the available therapeutic drugs. Considering ARDS, followed under secondary infections, antiviral theraphy, some antibiotic and antiinflammatory drugs are been used.

Antiviral agent includes 'Remdesivir', 'Hydroxychloroquine and chloroquine', 'Lopinavir-Ritonavir', 'Umifenovir', 'Oseltamivir' etc

Supporting agent including adjunctive therapies are 'ascorbic acid', ' azithromycin', ' epoprostenol', 'sirolimus', 'anakinra'etc. This pandemic has raised too many small and uncontrolled t r a i l s. Researchers and technician rallied in unprecedented ways to defeat the corona virus pandemic. They were retooling laboratories to focus on corona virus. More clinical trailed occur through WHO, FDA and different government faculty. Around world a big number teams involve working together to screen out most potential drug candidate against COVID-19.

Some Probable drugs for SARS-CoV-2: Screened and Reported:-

1) Hydroxyethylamine Analogs against 3CLpro protein target of SARS-CoV-2: Indinavir

Recently, a report published from New Delhi researcher and technological advisor. A report recently may available of crystal structure for main protease (Mpro) of SARS - CoV-2, 3 -

chymotrypsin- like cysteine protease (3CLpro). This data considered similar reported of previous SARS-CoV.

Can it become potential drug? Well through statically report or computeraided drug design (CADD) 13 approved antiviral drugs approaches for initial

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antiviral drugs approaches for initial screening. Molecular docking of 13 antiviral drugs against (3CLpro) enzyme was performed, which 'Indinavir' shows lead drug. A table represents docking score of drug.

S.n o	Drug	Docking score	XP Gscore (Kcal/mol)
1.	Indinavir	-8.824	-9.466
2.	Atazanavir	-7.912	-7.920
3.	Remdesvir	-7.804	-7.804
4.	Amprenavir	-7.747	-7.747
5.	Saquinavir	-7.455	-7.468
6.	Ritonavir	-7.422	-7.422
7.	Lopinavir	-7.041	-7.041

Why Indinavir as a probable drugs? It seems an important pharmacophore, Hydroxymethylamine(HEA) compound. When a 25 new library of HEA compound hits with a docking score more than indinavir score. Compound 16 adhered to drug-like parameter. It's found activity structural relationship to SARS. Molecular dynamics analysis performed and support stability of compound 16 show an efficientbinds. Novel Inhibitors of SARS-CoV-2 main protease 3CLpro



As results, it seems 16 among the listed antiviral drugs bind with domain-I and II. Where II and III linker of 3CLpro protein suggests strong candidate for probable drug against SARS-CoV-2.

2) FDA Approved Drugs: Niclosamide and Ciclesonide

An immediate response required to emerging infection disease since we knew that drug development usually takes around 10 year. FDA-approval drugs provide a safest alternative only, when at least modest antiviral activity achieved. It been seems approx 3,000 FDA and IND approved drugs against SARS-CoV. Since it found almost 79.5% sequence identity between SARS-CoV and SARS-CoV-2. As per reported data 48 drugs were evaluated for study, which 24 drugs showed potential antiviral activities against SARS-CoV-2, with an IC50 value range 0.1 to 10 micrometer. Among 24 drugs, 2 FDA-approved drugs drew more attention to researcher-niclosamideand



ciclesonide. How niclosamide become probable drug candidate? Well from studies, researcher view niclosamide is an anthelminthic drug; it exhibited very potent antiviral activity against SARS-CoV-2 (IC50, 0.28 micrometer). Niclosomide has pharmacokinetic flow of low absorption. Further works enable an effective delivery on target tissue.





Dose-response curve analyzed via immune fluorescence. The blue square represent inhibition of SARS-CoV-2 infection and Red triangles represent cellviability Second ciclesonide another drug candidate; an antiviral potency, which much lower than niclosamide. Usually used to treated asthma and allergic rhinitis. A report of Matsuyama et al. analyses ciclesonide as probable potential drug against SARS-CoV-2. How's it useful? A notify report at Japan where three patients recovery rates faster against S A R S - C o V-2. Ciclesonide shows good results, further investigation may more lead aproacbable drug for COVID patients. Although ciclesonide a potent drug. It can manifest dual roles antiviral and anti inflammatory. This report and data are mention by Korean researcher Sangeun Jeon, Meehyon Ko and his colleague. A works are supported by National Research Foundation of Korea (NRF).

3) Targeting SARS-CoV-2 NSP-16: Avirtual drug repurposing study

In a study, drug discovery of SARS-CoV-2 nsp-16 has been performed by virtual drug repurposing approach. A drug shape-based screening with (FDA approved drugs) a known template of MTase inhibitor, sinefungin was done with high similarities score was selected. Four nucleoside analogs of an (Raltgravir, antiviral Maraviroc, Favipiravir and Prednisolone) drugs were selected for further research. If drug can be developed to inhibitnsp16, the immune system would be able to detect virus and destroyed it. Drug Screeningbased the report, on molecular docking were performed using two different algorithms: AutoDock Vina and blind docking.



The results analyzed on the basis of lowest binding energy values. After that Molecular dynamics (MD) simulation were performed to test potential drugs candidate. Flow chart shows drug repositioning approach.



As a results, showed that Raltegravir and Maraviroc among other compound can bind strongly to active site of the protein compared to sinefungin, and can be potent drug candidate to inhibit NSP-16 . The MD simulation results suggested that the Maraviroc and Raltegravir is more effective drug candidate than sinefungin forinhibiting an enzyme. Raltegravir and Maraviroc, thus may be used for treating COVID-19 patients, after In vitro and In vivo studies. A clinical trial required for final confirmation of drug effectiveness. This research and studies provided by Elham Tazikeh-Lemeski, Sajad Moradi and their colleagues. They acknowledge and financial support given by Jahrom University of Medical Science.

4) Bioactive compounds from Glycyrrhiza glabra as possible inhibitor of SARS-CoV-2: spike glycoprotein andNSP-15

At present, Traditional medicine has recommended the use of liquor ice (Glycrrhiza species) for the treatment of SARS-CoV-2 patients. The present investigation was carried out to identify the active molecule from the liquor ice against different protein target of COVID-19 using in-silico approach. The MD simulation carried on 20 compound along with two antiviral drugs- Lopinavir and rivabirin, with help of Autodock Vina software, using spike glycoprotein and NSP-15(non structural protein15).

Virtual screening- the structure based screening is one of crucial step to explore molecular database. In the study, it was taken to find out anti-spoke endoglycoprotein and nsp-1,5 ribonuclease set of 20 from photochemical through molecular docking and MD simulation. Figure show work flow diagram of screening of photochemical. The binding site of SARS-CoV-2 spike glycoprotein was considered Ser325 which reported as active s i te residue and nsp- 15 endoribonuclease binding site selected around co-crystal ligand.

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Through observation binding energy and binding interaction, glyasperin A showed high affinity towards nsp-15 endoribonuclease, while glycyrrhizin acid was found to be best suited for prohibiting the entry of virus into host cell. More Parameter from the MD simulation has substantiated the stability of protein-ligand stability. The binding free energy of glyasperin A and glycyrrhizin acid was calculated from the entire MD simulation trajectory via the MM-PBSA approach, and has high binding affinity towards the protein receptor cavity. Both considered as the best molecule from liquor ice, which

could be probable useful against SARS-CoV-2.

Conclusion:-

Here, an Aim of researcher to contribute to tackle the therapeutic crises arisen due to SARS- Co V- 2, via using commercially available FDA approved Drugs. Bioactive compound, targeting SARS-CoV-2 virtual drugs has been performed. In-silico based approach by using structure based virtual screening of the FDA approved database against nsp-16 and nsp-15 to identify its potent inhibitors. Lots of FDA approved drugs underestimating. A current are therapeutic an antiviral drugs, is appeared as- molecule of hope; for treatment of COVID patients. In this article try to figure out some most probable potential drugs to inhibit SARS-CoV-2, which was screened and reported.

References:-

1) <u>https://www.tandfonline.com/doi/f</u> ull/10.1080/07391102.2020.1779132

2) <u>https://digitalcommons.lmu.edu/ce</u> <u>covid/</u>

3) https://aac.asm.org/content/64/7/e 00819-20#ref-7

4) https://www.tandfonline.com/doi/f ull/10.1080/07391102.2020.1779132



FAVIPIRAVIR A POTENTIAL DRUG FOR TREATMENT OF COVID-19

SHUBHAM VASHISTHA

Ravipiravir is a purine nucleic acid analog & a derivative of pyrazine carboxamide, which is having activity against viruses that possesses RNA as their genetic material. Favipiravir when got converted by the host enzymes to its active form, inhibits th e viral Rna dependent Rna polymerase (RdRp). Generally it is developed as a modified pyrazine form by Toyama Chemical Co. Ltd in Japan and was first approved as a therapeutic agent (Antiviral drug named as Avigan in Japan) for its use in resistant cases of Influenza virus.

It mainly targets RNA-dependent RNA polymerase (RdRp) enzymes that are solely & primarily required for the transcription and replication of viral genomes. Moreover, this antiviral drug is now being tested for resistance against novel corona virus (Covid-19) and was approved for use in some countries like Japan & China and also it is in Phase 3 clinical trial in India and recently approved for treatment against Covid-19 in India as well.

Favipiravir (6-Fluoro-3-hydroxy-2pyrazine carboxamide or T-705) is a broad spectrum antiviral drug, which is an approved antiviral drug in Japan since 2014, for the treatment of Influenza virus [1]. It is a precursor that goes ribosphorylation under and phosphorylation by the host cells (intra-cellularly resulting its conversion active metabolite into an i.e. Favipiravir ribo-furanosyl-5'-triphosphate (T-705-RTP). This metabolite in active form thus formed, mimics with purine nucleotides & hampers the viral replication pathway by getting itself attached to the viral genome, thus ultimately leading direct to the inhibition of RdRp of RNA Viruses.

In terms of inhibitory concentration or dosage concentration of inhibition of the viral replication, the active metabolite T-705-RTP inhibits RdRpof Viral genome like Influenza virus with nearly half maximal inhibitory concentration (IC50) of 0.022 μ g/mL, however, inhibitory concentration of up to 100 μ g/mL does not harms or affects human DNA polymerase α , β , and γ subunits [2]. Favipiravir also shows inhibitory effects to the wide range of viruses such as flavivirus, filoviruses which causes hemorrhagic fever and other few viruses.

During the Ebola virus outbreak started in West Africa in 2014-2015, patients tested and treated with Favipiravir as a 20



part of trials carried out in Guinea, Also patients with Ebola virus disease when given an additional Favipiravir treatment as compared to WHO recommended therapy, showed that there was a quite higher percentage of patients with viral load reduction close to 100 folds [4].

Favipiravir because of its positive results in recent studies is now considered as one of the potential drug candidates for Covid-19 [5]. For validating the safety and effectiveness of Favipiravir, a clinical trial was conducted in Shenzhen with 80 patients [6]. It was found that there was a greater reduction in viral clearance time in patients treated with Favipiravir as compared to patients in control arm (4 days v/s 11 days) while X-ray findings also confirmed a higher rate of improvement (91.43% vs. 62%) in chest imaging in the Favipiravir arm [6]. The time of reduction in fever and relief in the cough also reduced significantly in ordinary Covid-19 patients and patients with other previous disorders like diabetes, hypertension [7].

Taking into the consideration of pharmokinetics of Favipiravir, a study in Japan taking healthy volunteers reported that plasma concentration of favipiravir observed at maximum, was 2 hours post oral uptake and then fall down rapidly with a narrow half time interval of 2-5.5 hours [8].



Fig1: Diagrammatic Representation of mechanism of action of Favipiravir. When Favipiravir got self-incorporate into host cells, thereby converted to its active metabolite form i.e. Favipiravir-RTP, which then leads to the inhibition of the Activity of RNA dependent-RNA Polymerase (RdRp) of Viral RNA (Image Source: Googleimages).

In another comparative experimental open label study conducted in Shenzhen.China which effects the Favipiravir along with aerosol inhalation of interferon α was tested against some other antiviral drug Lopinavir (LPV)/Ritonavir (RTV) for the treatment of Covid-19. It was found that patients treated with Favipiravir (FPV) showed lesser time in viral load reduction as well as improvement/changes in Chest computed tomography (CT) as comparison to patients treated with LPV/RTV. However side effects in terms of elevation of uric acid levels in blood and decreased level of uric acid in excreted urine also



reported, but this effect will be reversed post discontinuation of the drug [9]. Therefore considering above Research Studies that has been conducted to validate the safety & efficacy of Favipiravir, it can be concluded that Favipiravir possess greater potentialtowards treatment of ongoing Covid-19 pandemic or SARS-Cov-2 and could show encouraging effect in the coming months.

Current Status of Favipiravir in India:-



Glenmark Pharmaceuticals becomes the first pharmaceutical company in India to get regulatory approval for Oral Antiviral Favipiravir, for the treatment of Covid-19 patients and named the antiviral as "FabiFlu". FabiFlu is the first oral Favipiravir- approved medication in India for the treatment of Covid-19.

References:-

1) Furuta, Y. et al. Mechanism of action of T-705 against influenza virus. Antimicrob. Agents Chemother. 49, 981–986 (2005) https://pubmed.ncbi.nlm.nih.gov/15728892/ **2)** Furuta, Y., Komeno, T. & Nakamura, T. Favipiravir (T-705), a broad spectrum inhibitor of viral RNApolymerase. Proc. Jpn. Acad. Ser. B Phys. Biol. Sci. 93, 449–463 (2017).

https://pubmed.ncbi.nlm.nih.gov/28769016/

3) Sissoko, D. et al. Experimental treatment with favipiravir for Ebola virus disease (the JIKI trial): a historically controlled, singlearm proof-of-concept trial in Guinea. PLoS Med. 13, e1001967 (2016).

https://journals.plos.org/plosmedicine/arti cle?id=10.1371/journal.pmed.1001967

4) Li, G. & Clercq, E.D. Therapeutic options for the 2019 novel coronavirus(2019-nCoV). Nat. Rev. Drug Discov. 19, 149–150 (2020). https://pubmed.ncbi.nlm.nih.gov/32127666/

5) Cai, Q. et al. Experimental treatment with Favipiravir for COVID-19: an open-label control study.

https://www.ncbi.nlm.nih.gov/pmc/article s/PMC7185795/

6) Ch en, C.et al. Favipiravir versus arbidol for COVID-19: a randomized clinical trial. bioRxiv preprint.. https://www.medrxiv.org/content/10.1101/ 2020.03.17.20037432v4

7) Madelain, V. et al. Ebola virus infection: review of the pharmacokinetic and pharmacodynamic properties of drugs considered for testing in human efficacy trials. Clin. Pharmacokinet. 55, 907–923 (2016). https://pubmed.ncbi.nlm.nih.gov/26798 032/

8) Mishima, E., Anzai, N., Miyazaki, M., & Abe, T. (2020). Uric Acid Elevation by Favipiravir, an Antiviral Drug. The Tohoku Journal of Experimental Medicine, 251(2), 87-90.

https://www.jstage.jst.go.jp/article/tjem/2 51/2/251_87/_article



CURRENT VACCINE SCENARIO WORLDWIDE DEVELOPED VACCINES AND THEIR STATUS

SHIVANGI VERMA

Few months back. We all were living a healthy and normal life. We have never ever realized that we have to undergo a lockdown for months. And follow social distancing and preventative measures in order to save our lives as well as of others. From SARS (severe acute respiratory syndrome) COV-2.



SARS COV-2 breakout started from Wuhan city of China and spread across world. According to the latest reports U.S.A is having the largest number of corona patients. While, Brazil is at second and India is at third. WHO has said if there will not be any vaccine made available till the end of 2020. Then almost 26 million people are going be affected from this virus. The graph of corona virus cases worldwide shown below:-



The graph of India is increasing day by day. Till now

Scientists has that SARS COV-2 has similar symptoms like Influenza such as dry cough, high body temperature. The person who are at higher risks are of age above 40 and suffering with other diseases like blood pressure, diabetes etc. Around 20% of population is at risks while remaining 80% are having



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mild symptoms.

India has reached to its peak. As we look towards the history of corona virus SARS COV-2 is less lethal as compared to SARS COV-1, MERS COV-1 and MERS COV-2.

Brief history of corona virus is shown below:-

S.NO.	NAME OF THE VIRUS	YEAR OF Occurrece	AFFECTED Area	MOTILITY Rate
1	SARS COV-1	2003	China	10%
2	MERS COV-1.	2012	Arabian Peninsular Region	20-30%
3	MERS COV-2	2015	Korean republic	20-30%
4	SARS COV-2	2020	China and spread across the world	2-3%

Till now there is no vaccine has been developed against COVID-19. As we know that SARS COV-2 has positive single stranded R.N.A as a genetic component. And mutate so fast that it is causing more difficulty in development ofvaccine against it. Current state of vaccine development around the world is asfollows:-

1) India's status in vaccine development

Indian scientists are working round a clock to develop a vaccine which can be protect us from fast mutating Virus. Recently, DCGI gave permission to Bharat biotech company to go for Human trial of Biovaxin .Apart from it there are 30 other candidates are working well for vaccine development. It has been said by ICMR that the vaccine will be available till the end of this year.

2) "GlaxoSmithKline's "vaccine

Researchers said that this vaccine is will boost our immunity in order to fight with the novel corona virus. They have said that this vaccine has passed all those trials which has been tried so far. It might get launched by the 2021.

3) NVX Cov2373vaccine

The biotech company of America is working has recently said that they have started human trials. This vaccine has given positive results in previous trials. They have said that this vaccine directly work on immune response of humans There motto is to produce around 1 billion vaccine by next year.

4) mRNA1273 vaccine:

They are among the top candidates in vaccine development. They are undergoing phase 2 and phase 3 trials after they it has shown positive results. Vaccine development by Oxford University: As we know that people of age 40 above are at higher risks keeping that in mind Oxford has developed a vaccine" ChAdOx1cov-19". And as per the reports there are getting good results from the trials. It is said by them that this vaccine could be ready as early as September.

Conclusion:-

Advances in bio/nanotechnology and progressed nano/fabricating combined with open announcing and information sharing establish the framework for fast improvement of creative antibody innovations to have an effect during the COVID-19 pandemic. Inside 40 days of introductory basic and genomic reports of SARS-CoV-2, the primary antibody applicant went into the clinical improvement pipeline and starting at 1 June 2020, there are as of now 16 immunization up- and- comers in clinical preliminaries, numerous in Phase II and even one in Phase III. While any immunization is still months-to-years from clinical reality, the equal and fast endeavors from scholastic labs and industry give plan to progress. A plenty of nanotechnology stages are being rotated against SARS-CoV-2; while exceptionally encouraging, huge numbers of these might be quite a longwhile awayfrom

organization and in this way might not affect the SARS-CoV-2 pandemic. In any case, as destroying as COVID-19 seems to be, it might fill in as an impulse for established researchers, financing bodies. and partners to submit progressively engaged endeavors toward improvement of stage advances that support the readiness for future pandemics. A few nanomaterials bear the cost of stage innovations that are amiable to versatility, solidness, compactness, circulation and gadget self-organization. joining for Additionally, a few stage innovations portrayed in this may fill in as fitting and-play advancements that can be customized to occasional or newstrains of coronaviruses. To be sure, COVID-19 harbors the possibility to turn into an occasional infection; underscoring the requirement for proceeded with interest in coronavirus immunizations. SARS and MERS immunization applicants didn't make it to advertise because of absence of budgetary motivating force given the low contamination numbers, and in light of the fact that the danger of a worldwide pandemic from a recently developed infection were generally overlooked.

On concluding I will say that all the doctors and researchers are trying hard to get vaccine against covid-19. More dangerous than covid-19 is pandemic fatigue. So avoid the over thinking and inculcate new hobbies and take all the preventative measures.



COVID-19 IMPLICATIONS ON PRESENT AND A CHALLENGE FOR FUTURE

RICHA TIWARI & SANSKRITI SAXENA

oronavirus a gigantic social event have a spot with RNA contamination .It ranges from sickness to serious illnesses while progressively deadly assortments can cause SARS, MERS, and COVID -19.An irresistible ailment causing an incredible harm all inclusive and making a tremendous effect on total populace now days is COVID-19. It is brought about by serious intense respiratory disorder (SARS-CoV-2).It was first recognized in the month of December 2019 in WUHAN, CHINA which has made a pandemic condition in entire world.COVID-19 isn't just maladies, it has become an image of financial effect all around, mentally has caused individuals mind in pressure and caused them to feel, alone, depressed in their own considerations and socially it has caused different obstruction before total populace and monetarily made world precarious.

SOCIAL IMPACT:-

1) Impact On Politics

This pandemic affected the political space of various countries causing closure of legitimate activities, going of d i ff e r e n t a d m i n i s t r a t o r s, a n d rescheduling of races due to fears of spreading the contamination. The general effect is that if there should be an occurrence of any pandemic n umerous social equality are suspended, for example, free business exercises free development of regular folks with the goal that pandemic don't spread in the public eye. To check the increased level of Covid-19 according to rules of W.H.O and legislature of different nations the regular citizens exercises are denied for certain occasions and individuals faceshortage of food and different enhancements .In such circumstance job of political arrangement assume a significant jobin giving fundamental things and to appease the inquiries of general individuals.

Due to pandemic enormous no of laborers started moving with one district then onto the next inside a nation, coming about a segment change around there and at last influence the political arrangement of that region. Some universal connection has been upset because of interest of certain assistance among the nations. There has been different analysis confronted distinctive political pioneer as they can't deal with the circumstance. In numerous nations political decision has been delayed because of pandemic.



Different nations are confronting national level development on the grounds that the political arrangement can't deal with the circumstances.

2) Education Impact

Education is the fundamental column for a nation, each creatingnation need to have best instruction framework and many of them have too. Because of COVID-19 everything is disturbed. The pandemic has made all universities, college, school terminations. The framework has been corrupted by this. It has influenced 1.5 billion under studies across the nation .There is an incredible hazard for their occupations and business.

3) Inequality

Low earning peop0le are suffering a lot in this crisis. They have to leave their job, they don't have shelter and they are forced to go to their origin place. They don't have proper money, knowledge, how to fight against this pandemic they have no idea. Theworld seems tobe unfair for them.



4) Domestic Violence

In fact in some Asian regions and African nations the report has been recommended during this social disconnection aggressive behavior is seen at home. There is an elevate found in measure of animosity at home, the maltreatment has expanded cozy accomplice viciousness has been seen in this situation.

5) Religious Impact

In each nation there are blend of different strict practices where everybody some place down have faith in some heavenly force .However that force has additionally got debilitated before this pandemic. Wherever pandemic has impacted so much that no love heavenly places are open for scratch-off of different heavenly visits. Different temples, mosque, churches are closed down and have offered live stream venerated.

6) Health Facilities

Significant job is being played by wellbeing framework and well- being laborers in the present pandemic conditions. All over world the fundamental shaft which has made a nation stand and caused individuals to accept that nation to can defeat this pandemic, with the help of well-being offices. There is enormous no of screening is done all over world. Understanding who have side effects or who don't have however is suspected mitted to the medical clinic.



In certain nations like India which has enormous populace there is some issue being looked by wellbeing framework. Clinical gear, apparatuses, specialists, bed and different offices are less in number is contrast with populace. Leaving regardless of thing specialists and clinic staff is confronting parcel of challenges, their life is in danger, they are just serving for their nation.

7) People Issues

Populace request association, development, social affairs however shockingly it couldn't occur due to covid-19.People can't meet appreciates and collaborates. Simultaneously Elderly individuals are at high hazard, their invulnerable framework is not solid and they are encouraged to remain inside home.

PSYCHOLOGICAL IMPACTS:-

Many countries have asked their people to get quarantine and have applied lockdown during this pandemic for last few months which had left some negative psychological impacts on people.

1) Impacts on people of different age groups

Probably a very important but seemingly underrated issue is the Psychological impact of COVID-19 on children and adolescents. As already known that environmental factorsfaced during the growth of a child are crucial for their emotional and psychological skills development. But due to the closure of schools, parks and markets has disorganized children's usual schedule and lifestyle due to which they have been facing psychological issues like annoyance, irritation, etc. Also they have been on screens for a very long duration of the day because of their online classes which is having an adverse effect on their eyesight as well as their mental health. Not only children but also the old age people are suffering a lot because of their disrupted schedule. Usually old age people are advised to take fresh air, have walks and they have inculcated this in their routines. But due to lockdown they are unable to do so and because of this they are facing irritability or a feeling of stress.



Image Source-Elsevier

2) Frustration

It is a feeling of being annoyed. The most affected age group are the

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teenagers as they are the ones who enjoys their life the most and suddenly all their enjoyment have come to halt. As a source of entertainment they are binge watching web shows and movies leading to a more annoyed mental state.

3) Negativity

Undoubtedly the current scenario is having a lot of negativity within itself. As a human we have a innate tendency to interact with some or other people to survive. But these days we are going through loneliness despite of being all together with our families after a considerable time, as we have different preferences and we instead of sitting together and chattering with our family members we prefer to chat online with our friends. And when we do not find someone free whom we want to chat we feel alone leading to negativity as we have also heard our elders sayingmany times that emptymind is a devil's house

4) Insomnia

A sleep disorder in which we have trouble in falling or staying asleep. As we know that we have a body clock that maintains our sleep-wake cycle along with other things. But as our schedules have been affected all of a sudden, our sleep-wake cycle has also been affected. Staying indoor all day, lying in our beds doesn't let our bodies get tired leading to insomnia. In extreme cases this can lead to complete loss out also.

Conclusion:-

Comprehensively this pandemic has made an extraordinary and exceptional effect. Regardless of whether it is social or monetary effect there is a colossal wrecking just as barely any constructive perspectives taken everywhere throughout the world .Covid-19 should be viewed as more viably and individuals with the administration need to cooperate and figure how we can beat this. There is an incredible emergency occurring , an extraordinary errand to be relieved in present. This pandemic has made such an effect which has become challenge for the individuals to make it right and make all the things complete as it was earlier. COVID-19 has genuinely affected the world.

References:-

1) Psychosocial impact of COVID-19 Diabetes Metab Syndr. 2020 September-October; 14(5):779–788. Published online 2020 May 27 Souvik Dubey, Payel Biswas and Carl J. Lavie.

https://www.ncbi.nlm.nih.gov/pmc/arti cles/PMC7255207/

2) The socio-economic implications of the coronavirus pandemic (COVID-19): A review Int J Surg. 2020 Jun; 78: 185–193.Published online 2020 Apr 17. Maria Nicola, Zaid Alsafi and Riaz Agha.

https://www.ncbi.nlm.nih.gov/pmc/arti cles/PMC7162753/



SURVEYING THE COVID-19 PANDEMIC AND ITS IMPLICATION OF MACROECONOMIC CONSEQUENCE

PRASHANT SINGH

he COVID-19 outbrust was caused by the SARS-CoV-2 virus. This outburst was triggered in December 2019 in Wuhan city of China and this time more than 200 countries are affected by this virus and have reported more than 1 billion confirmed cases and more than 5 lakh peoples has been passed away. The WHO Director-General, Dr Tedros Adhanom Ghebreyesus, declared the novel coronavirus (2019- n Co V) outbreak a public health emergency of international concern (PHEIC) on 30 January 2020. The COVID-19 pandemic is not only the health crisis even it is more far than it. It's impact can be seen on social ordersand economies of the world at their center. It is the most economically costly pandemics in recent decade. In the wake of coming t his pandemic worldwide are experiencing heaps of issue like expanding in the quantity of cases in home savagery, expanding joblessness, that is prompting destitution. Schools, open spot like films, visitor place, lodging, salon has been shut.

Impact on Global Economy:-

"There are decades where nothing happens, and there are weeks where decades happen." — Vladimir Lenin The outburst of covid-19 can be seen on globally. Still no effective treatmenthas been found of covid-19 so many countries allow to lockdowns. It's impact not only on religious, social, political even on economical and financial structures also, of the world. World's largest economic countries such as USA, Russia, China, UK, Germany, Japan and many more are facing economical issue. Public demands reduced in this pandemic, reduced in number of consumers to purchase the goods and services available in the global economy. Global economy is reduced around 3% in 2020. Is is the slowest growth since 1930. Advance economies are grow by -6.1%, Emergingmarketand developing economies are grow by -1% and worlds economy are now growing by -3%...World trade shrink by 13% to 32% in 2020.



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World trade shrink by 13% to 32% in 2020.As all government announced lockdown in their countries, restricting public gathering and ban travelling. It impact on demand on oil globally. In the first quarter of 2020 it decline 0.7%. Travelling and tourism industries are most affected worldwide .Loss in global business travel and tourism is \$810.7 billion. European continent most affected by this pandemic, decreasing from \$211.972 million to \$124.209 million. Most of airlines companies reduce their staff and their number of flights to reduce their expenses. More than hundreds millions of people have lost their jobs due to this pandemic. In G7 countries it is vary widely, from 30 million in USAto 1.76 million in Japan.

In the US 30 million people are unemployed. Private sector reduced 20 million workers in April. A prediction said that 15% of people unemployed by the end of third quarter of this year. In Canada unemployment rate is 13%, in Japan it is 2.5% with 1.76 million unemployed, in UK it is about 2 million unemployed, in France more than 5 million, in Germany 5.8%, in Italy it is 8.4%.

Impact on Indian Economy:-

"Economist are expecting that the fiscal year that began in April will see the worst economic in four decades."

The coronavirus pandemic is having deep impact on Indian economyand has

an unprecedented collapse in economic activities over the last few month.

An industrial survey, almost 72% of the respondents said that the present situation is having a "high to very high" level of impact on their business. As many industry are said that they are looking to reduction in worker in their respective companies over the coming month. It is the direct signal to increase in unemployment. Unemployment increases from 7.7% to 23.5% . Urban a r e a s a r e m o s t a ff e c t e d i n unemployment as compared to rural areas. Unemployment rate in urban areas is 23.22% while in rural areas it is 22.69%..



India is an important trading partner with many countries ,so impact of COVID-19 can be also seen on it,s import and export goods. Provisional data provided by ministry of commerce, for March exports reveals a bad situation. According to provisional data exports of India during march (\$21.4) is declined, despite promising



performance in previous month(\$25.2). As compared to previous year March 2019 it is fall approximately 35% (\$32.72) year on year. Most affected commodities are textiles, jewelry, meat, cereals, plastic and chemicals. It is declined approximately 30% to 40%.



As the data provided by the commerce and industry ministry India's imports also declined by 58.65% in April 2020 from \$41.4 to \$17.12 as compared to same month last year. Most of company registered negative growth in month under review. Organic and inorganic material noted least declined commodities amongst all other commodities, while electronic goods are mostaffected.

India's GDP grew by 3.1% year on year in January to March 2020 (Fiscal year

represents April 19 – March 20).The growth in October-November 2019 stood at 1.2% while in October-December 2019 stood at 4.7% year on year. At the beginning of 2020 India's GDP was 5% but now declined over 9% betweenApril to June. Indian economy has been largely affected by the global and local lockdown. The country went into complete lockdown on 25 March 2020 that was extended until 3 May 2020 restricting 1.3 billion people in the home .It hit hardest to financial sector, real estate and professional services sector.



How have countries survive?

For surveying, every country must have to be support micro, small, medium enterprises and larger businesses for maintaining employment and financial 32



stability.

The more contained you need the novel coronavirus to be, the more you should secure your nation- and the more financial space you will require to alleviate the more profound downturn that will result. The issue for a large portion of the Global South is that policymakers need monetary space even in the best of times.

Most of countries are releasing fund to support him. India rolled out support package 10% of its GDP, Japan is 21%, US 13%, Sweden 12%, Germany 10.7%, France 9.3%.

COVID-19 is assaulting propelled economies, for example, Italy, France, Spain, and the United States. Past the passing and human misery, markets are limiting a calamitous downturn joined enormous defaults, as communicated in the radical repricing of corporate credit chance by money related markets.

As horrendous as this sounds, the circumstance in the propelled economies is probably going to be considerably more kind than what creating nations are confronting, as far as the ailment trouble, yet additionally regarding the financial decimation they will confront. And keeping in mindthat two scholastic networks -general wellbeing specialist macroeconomists.

References:-

1. https://www.statista.com/statistics/ 1103120/india-estimated-impact-ong d p - gro w t h - b y - c oro na vi r us epidemic/

2. https://www.statista.com/statistics/ 1111487/coronavirus-impact-onunemployment-rate/

3. https://tradingeconomics.com/indi a/unemployment-rate

4. https://www.livemint.com/news/in dia/ unemployment- remainedsteady-at-23-5-in-may-2020-cmie-11590970317621.html

5. https://indianexpress.com/article/e xplained/explained-how-has-covid-19-affected-the-global-economy-6410494/

6.https://www.statista.com/forecasts/ 1103431/covid-19-revenue-traveltouris

7. https://www.weforum.org/agenda/ 2020/05/coronavirus-unemplo

8.https://www.wto.org/english/news_ e/pres20_e/pr855_e.htm

9. https://www.imf.org/external/data mapper/NGDP_RPCH@WEO/OE MDC/ADVEC/WEOWORLD



IMPACT OF COVID-19 & CHANGES IN EDUCATION SYSTEM

SHIVANI PANWAR, RITIKA , SAMIKSHA KARN

OVID-19 pandemic that is caused by SARS-CoV2 was an outbreak in the Wuhan city of China. Soon after, it was spread around the world. Countrywide lockdown, sealing of borders, restrictions on gathering. movements and mass temporary closure of schools, colleges universities, etc. were imposed by various countries to break the chain of the spread of this virus which in turn adversely affected the education system worldwide (Sohrabi et al., 2020).

1) Impacts of COVID 19 on School Education:-

As per the estimate of UNESCO 138 countries have decided to the closure of schools nationwide or regional level as part of a physical distancing measure have left more than a billion students out of school and this closure of schools for a long period may have detrimental effect on their mental health and social consequences for children living in poverty. Additionally, it will increase food insecurity and nutritional imbalances in poor school children as various developing nations are implementing schemes like Mid Day Meal(inIndia)tocurbtheir malnutrition problem (Schwartz, and Rothbart, 2020).

COVID-19: Global Impact on the Education Sector



Closure of educational institutes will also widen the learning gap between children from higher and lower-income families. Children from low-income households live in conditions thatmake home schooling difficult. Online learning environments usually require computers and a reliable internet connection. In Europe, a substantial number of children live in homes in which they have no suitable place todo homework (5%) or have no access to the internet (6.9%) (Lancker and Parolin, 2020). Once the school will reopen, most of the children are likely to return their school but quite a few may drop out(Wodon, 2020).

2) Impacts of COVID 19 on Higher Education:-

Impacts of COVID 19 could have seen on institutes of higher education such as colleges, universities, and research institutes. A large number of these institutes across the world have either canceled or postponed all campus activities such as conferences, workshops, sports, and other activities (Sahu, 2020). Parents are not ready to enrol their students for the new sessions due to fear of infection.

COVID-19's Staggering Impact On Global Education

Number of learners impacted by national school closures worldwide



Figures refer to learners enrolled at pre-primary, primary, lower-secondary, and upper-secondary levels of education, as well as at tertiary education levels. Source: UNESCO

> A large number of colleges and universities have not conducted their end term exams yet that caused unbearable stress and anxiety among the students and their parents. Final year students of various engineering

colleges and universities, who got placed in their campus recruitment process have not received their joining letter yet as their final year exams have not been conducted by their respective colleges and universities.



Research priorities have been changed in the COVID 19 era, as most of the research labs are focusing on COVID 19 vaccine development, design of various health care instruments like ventilators, and technical apparels like masks, PPE kits, etc. Additionally, more research funding will be diverted to COVID related research which compromises the research activities of other fields.

Conclusion:-

On the other side, countries immediately opted for online learning. Some faculties recorded and uploaded their lectures online for the students to 35



access and some were even more innovative and used mostly google Classrooms, WebQuest, and other online sites, but a greater majority of faculties are not prepared to deal with the online education system as the faculty members are not having proper digital infrastructure, high-speed internet connectivity that would restrict them to deliver their lecture smoothly. various Universities taking are initiatives to prevent and protect all students and staff members from the highly infectious disease (Toquero, 2020).



References:-

1) Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, et al. World Health Organization declares global emergency: A

review of the 2019 novel coronavirus (COVID19). Int J Surg. 2020 Apr;76:71-6. https://www.ncbi.nlm.nih.gov/pmc/article s/PMC7105032/

2) Sahu, P. (2020). Closure of universities due to Coronavirus Disease 2019 (COVID-19): impact on education and mental health of students and academic staff. Cureus, 12(4). https://www.ncbi.nlm.nih.gov/pmc/article s/PMC7198094/

3) Schwartz, A. E., & Rothbart, M. W. (2020). Let them eat lunch: The impact of universal free meals on student performance. Journal of Policy Analysis and Management, 39(2), 376-410.

https://surface.syr.edu/cpr/235/

4) Toquero, C. M. (2020). Challenges and opportunities for higher education amid the **COVID-19** pandemic: The Philippine context. Pedagogical Research, 5(4). https://www.pedagogicalresearch.com/arti cle/challenges-and-opportunities-forhigher-education-amid-the-covid-19pandemic-the-philippine-context-7947

5) Van Lancker, W., & Parolin, Z. (2020). COVID-19, school closures, and child poverty: a social crisis in the making. The Lancet Public Health, 5(5), e243-e244. https://www.ncbi.nlm.nih.gov/pmc/articles/P MC7141480/

6) Wodon, Q. (2020). COVID-19 crisis, impacts on Catholic schools, and potential responses | Part II: Developing countries with focus on Sub-Saharan Africa. Journal of C atholic Education

https://digitalcommons.lmu.edu/ce_covid/

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Vaccines will be centrally procured, tracked: Panel

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THIS WAS THE FIRST MEETING OF THE NA EXPERT GROUP ON CCINF ADMINISTRATION VID-19 HEADED BY S VK PAUL

The members decided that india would support his key for C.



PLANNING COUNTRY'S RESPONSE The govt, which is developing a road map for providing a Covid-19 vaccine in India, is pinning its hopes on these candidates:

AstraZeneca (UK)	(US)	(India)	ICMR (India)
Name: AZD-1222 Vaccine type: Non-replicating viral vector (viral gene is carried by another non-replicating virus – like a Trojan horse that tricks body into activating an immune response) PHASE 3 CLINICAL TRIALS	Name: mRNA-1273 Vaccine type: RNA (introduces viral genetic material that activates an immune response) PHASE 3 CLINICAL TRIALS	Name: ZYCOV-D Vaccine type: DNA (introduces viral genetic material that activates an immune response in body) PHASE 2 CLINICAL TRIALS	Name: COVAXIN Vacine type: Inactivated (viral particles that have been inactivated, or made non-virulent, are introduced to the body to trigger immune response) PHASE 1-2 CINICAL TRALS

http://www.imsec.ac.in/biotechnology.htm





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