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RESEARCH ARTICLE

COVID-19

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Abstract

The COVID-19 pandemic, caused by the novel coronavirus SARS-CoV-2, has profoundly affected global health, economies, and daily life since its emergence in late 2019. This article reviews the pandemic's trajectory, public health responses, vaccine development and distribution, and the ongoing challenges in managing COVID-19. It also examines the lessons learned and how these can inform future preparedness for pandemics. Emphasis is placed on the importance of international cooperation, robust healthcare systems, and the role of science and technology in addressing global health crises.

Introduction:

The COVID-19 pandemic represents one of the most significant global health challenges in recent history. Since its identification in Wuhan, China, in December 2019, SARS-CoV-2 has caused widespread morbidity and mortality, disrupting societies and economies worldwide. By mid-2023, the virus had resulted in over 600 million confirmed cases and more than 6 million deaths globally (World Health Organization, 2023). SARS-CoV-2 can be transmitted from human to human by respiratory droplets, close contact with diseased patients, and possibly by fecal-oral and aerosol contact. It was recently shown that airborne transmission is highly virulent and represents the dominant route to spread the disease This article aims to provide a comprehensive overview of the pandemic's impact, the responses implemented to mitigate its effects, and the critical lessons learned to enhance future pandemic preparedness.

Prevalence:

1. Globally

Globally, as of 5:19 pm 21 December 2022, there have been 650,332,899 confirmed cases of COVID-19, including 6,649,874 deaths, reported to WHO.

2. United States Of America

In the United States of America, from 3 January 2020 to 5:19 pm , 21 December 2022, there have been 98,525,870 confirmed cases of COVID-19 with 1,077,129 deaths, reported to WHO.66

3. India

(a) In India, from 3 January 2020 to 5:19 pm, 21 December 2022, there have been 44,676,330 confirmed cases of COVID-19 with 530,680 deaths, reported to WHO. 66
b) Covid-19 cases were highest in September 2020 accounting for 2604518 cases which were the highest in Phase 1, reported by the Ministry of Health and Family Welfare, India

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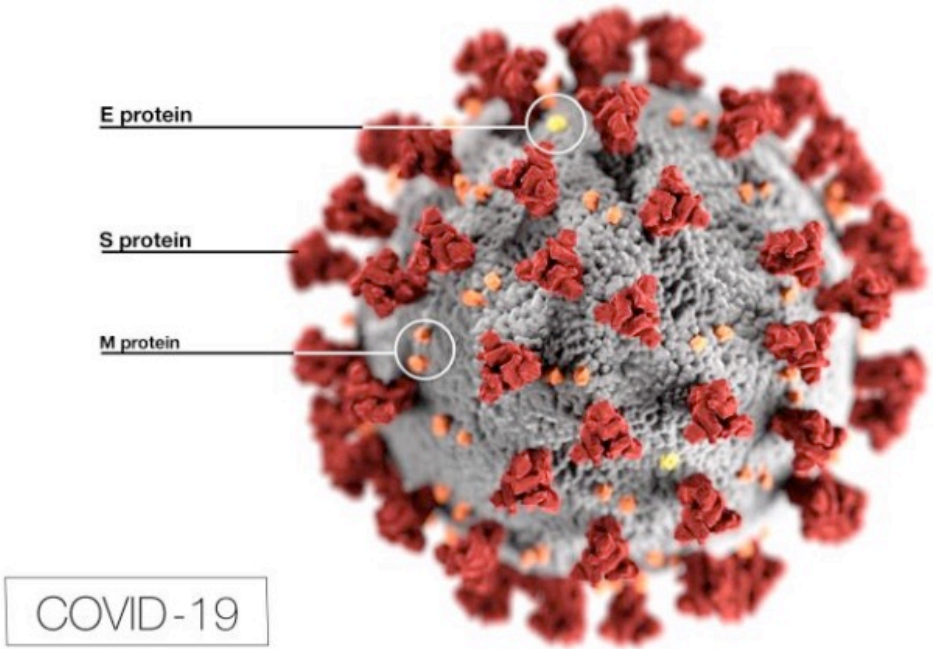

Classification of coronaviruses:

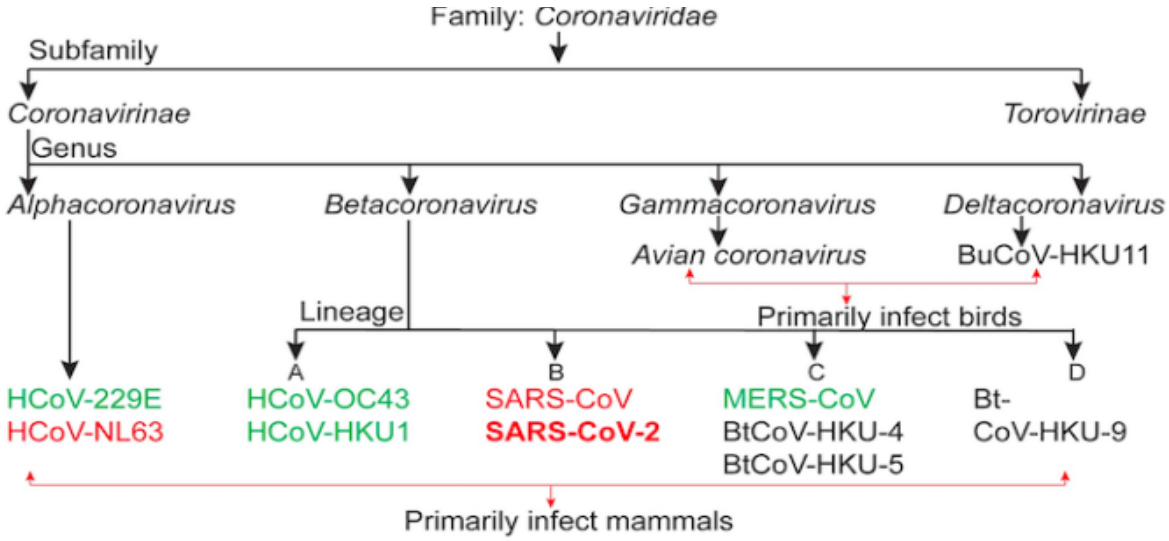

Fig.2:- Classification of coronaviruses: the 7 known HCoVs are shown in green and red. HCoVs in red bind the host receptor ACE2.

Pharmacotherapy:

The efficacy of specific antiviral agents to treat COVID-19 has been shown both in vitro and in animal models, as well as from anecdotal evidence from human patients. These studies are based almost exclusively on experience with SARSCoV and MERS-CoV. A)

A) Antiviral Agents

a. Remdesivir
b. Ribavirin
c. ritonavir (Kaletra)
d. Favipiravir Chloroquine (Aralen)
e. Hydroxychloroquine (Plaquenil)

f. Oseltamivir
g. Umifenovir (Arbidol) IMMUNOMODULATORY AGENTS
h. Tocilizumab (Actemra) Interferons

B) Adjunctive Agents29
a. Azithromycin
b. Corticosteroids

Spread Of Covid 19 Infection In Human Body
1. Cellular Entry And Viral Transmission
2. Cytokine And Chemokine Responses

Transmission Of Sars-CoV:
1. Respiratory droplet transmission
2. Airborne transmission
3. Fomite transmission
4. Others

● Fecal-oral transmission
● Mother to neonatal

The Timing Of Covid-19 Transmission

Table 1: Four time intervals that influence control via isolation of symptomatic individuals.

Time interval	From		To
Incubation period	infection	→	onset of symptoms
Generation time	infection	→	transmission (secondary)
TOST	onset of symptoms	→	transmission (secondary)
Serial interval	onset of symptoms	→	onset of symptoms (secondary)

Symptoms Of Covid-19:
The disease may be classified into mild, moderate, severe, and critical

Mild Disease
- Dry cough
- Mild fever
- Nasal congestion
- Sore throat
- Headache
- Muscle pain
- Malaise

Moderate Disease
- These patients present with respiratory symptoms
    - Cough
    - Shortness of breath
    - Tachypnea However

Severe Disease
- Patients with severe disease present with:
    - Severe pneumonia

- Acute respiratory distress syndrome (ARDS)
- Sepsis, or septic shock

Other Less Common Symptoms Are:

- Irritability
- Confusion
- Reduced consciousness (sometimes associated with seizures)
- Sleep disorders
- Anxiety

More severe and rare neurological complications such as strokes, braininflammation, delirium and nerve damageconsciousness

Diagnosis:

The routine clinical diagnosis of COVID-19 is primarily based on a variety of laboratory detection methods, including computed tomography (CT) scan, nucleic acid amplification test amplification test (NAAT), and serological techniques . For early screening or diagnosis of SARS-CoV-2 infection, specimens such as nasopharyngeal and/or oropharyngeal swab, bronchoalveolar lavage fluid, sputum, bronchi- al aspirate, or blood are generally recommended

1. Nucleic Acid Amplification Test

1. Reverse transcriptase real-time polymerase chain reaction
2. Reverse transcription loop-mediated isothermal Amplification
3. Crispr-based diagnosis
4. Cartridge-based nucleic acid amplification test and Truenat

2. Computed Tomography

Serological Assay

1. Enzyme-linked immunosorbent assay
2. Lateral flow immunoassay
3. Chemiluminescence immunoassay

Preventive Measures:

By Government

On the evening of 24 March 2020, the Government of India ordered a nationwide lockdown for 21 days, limiting movement of the entire 1.38 billion (138 crore) population of India as a preventive measure against the COVID-19 pandemic in India. Measure includes:

1. Janata curfew
2. Lockdown

By Individuals

1. Wash hands frequently and carefullyavoid touching your face
2. Stop shaking hands and hugging people–for now
3. Don’t share personal items: do not share personal items like:
4. Cover mouth and nose when coughing and sneezing
5. Clean and disinfect surfaces
6. Social Distancing
7. Do not gather in groups
8. Avoid eating or drinking in public places
9. Wash fresh groceries
10. Wear a mask
11. Self-quarantine and isolation if sick

12. Keep up to date on the latest information from trusted Sources
13. Social Distancing
14. Quarantine

● The quarantine of persons is the restriction of activities of or the separation of persons who are not ill but who may been exposed to an infectious agent or disease, with the objective of monitoring their symptoms and ensuring the early detection of cases

Table.:-Quarantine and other measures.

Quarantine	Other measures:
Voluntary quarantine (self-quarantine)	Avoiding crowding
Mandatory quarantine o Private residence o Hospital o Public institution o Others (cruise ships, etc)	Hand hygiene
	Isolation
	Personal protective equipment
	School measures/closures
	Social distancing
	Workplace measures/closures

Personal Protective Equipment

A. Mask41

1. N-95(four layer)is recommended by WHO
2. Surgical mask
3. Clothes mask

B. Gloves

1.PPE Kit

2. Eye protector(goggles or shield)

Epidemiology and Impact:

COVID-19 spread rapidly across the globe, exhibiting high transmissibility and variable clinical outcomes, ranging from asymptomatic cases to severe respiratory failure. Age, comorbidities, and socioeconomic status significantly influenced disease outcomes. The Centers for Disease Control and Prevention (CDC) identified that "older adults and people with certain underlying medical conditions are at higher risk for severe illness from COVID-19" (CDC, 2022). The pandemic highlighted disparities in healthcare access and the need for equitable resource distribution. Blumenthal et al. (2020) noted, "The COVID-19 pandemic has exacerbated pre-existing health disparities, disproportionately affecting marginalized communities."

Public Health Responses:

Governments worldwide adopted various strategies to contain the virus, including lockdowns, travel restrictions, social distancing, and mask mandates. These measures, while effective in reducing transmission, had significant economic and social repercussions. Hale et al. (2021) stated, "The introduction of stringent policies, such as stay-at-home orders, significantly reduced mobility and human interactions, thereby slowing the spread of the virus." The rapid implementation of testing, contact tracing, and isolation protocols proved crucial in controlling outbreaks. Gostic et al. (2020) emphasized the importance of these measures, stating, "Effective testing and contact tracing are critical components of any strategy to control COVID-19."

Vaccine Development and Distribution:

WHO Approved Covid-19 Vaccines

1) The pfizer/biontechcomirnaty vaccine, 31 december 2020.
2) The sii/covishield and astrazeneca/azd1222 vaccines, 16 February 2021.
3) The janssen/ad26.cov 2.s vaccine developed by johnson& Johnson, 12 march 2021.
4) The moderna covid-19 vaccine (mrna 1273), 30 april 2021
5) The sinopharm covid-19 vaccine, 7 may 2021.
6) The sinovac-coronavac vaccine, 1 june 2021.
7) The bharat biotech bbv152 covaxin vaccine, 3 november2021.
8) The covovax (nvx-cov2373) vaccine, 17 december 2021.

The development of COVID-19 vaccines within a year of the virus's emergence was a scientific triumph. Vaccines based on mRNA technology (e.g., Pfizer-BioNTech and Moderna), viral vectors (e.g., AstraZeneca and Johnson & Johnson), and inactivated viruses (e.g., Sinopharm and Sinovac) received emergency use authorization and have been pivotal in reducing severe disease and mortality. Polack et al. (2020) reported, "The BNT162b2 mRNA Covid-19 vaccine showed 95% efficacy in preventing COVID-19." Despite these successes, vaccine distribution highlighted global inequities, with low- and middle-income countries facing significant challenges in accessing doses. So and Woo (2021) noted, "The unequal distribution of COVID-19 vaccines is a stark reminder of the persistent global inequities in access to health resources."

Ongoing Challenges:

Despite vaccination efforts, several challenges remain in managing COVID-19. Variants of concern, such as Delta and Omicron, have demonstrated increased transmissibility and potential vaccine resistance. The World Health Organization (2021) stated, "Variants of concern continue to pose a threat to global public health due to their potential for increased transmissibility and resistance to existing vaccines." Long COVID, characterized by persistent symptoms following acute infection, poses a long-term health burden. Nalbandian et al. (2021) highlighted, "Post-acute COVID-19 syndrome, or long COVID, includes a wide range of symptoms that persist for weeks or months after the initial infection." Additionally, vaccine hesitancy, driven by misinformation and distrust, continues to impede public health efforts. Solís Arce et al. (2021) found that "vaccine hesitancy remains a significant barrier to achieving widespread immunity, particularly in low- and middle-income countries."

Lessons Learned:

1. **Global Collaboration:** The pandemic underscored the necessity of international cooperation in surveillance, data sharing, and resource allocation. Organizations like the World Health Organization (WHO) play a critical role in coordinating global responses. Kickbusch et al. (2020) noted, "The COVID-19 pandemic has highlighted the importance of global solidarity and cooperation in addressing public health emergencies."
2. **Healthcare Infrastructure:** Strong healthcare systems with surge capacity and flexible response plans are essential. Investment in public health infrastructure and workforce training must be prioritized. Kluge et al. (2020) emphasized, "Robust healthcare systems are the cornerstone of effective pandemic response, enabling rapid adaptation to emerging threats."
3. **Science and Innovation:** Rapid advancements in biotechnology, such as mRNA vaccine platforms, demonstrated the potential of science to address emergent threats. Continued support for research and development is vital. Lurie et al. (2020) stated, "The speed and efficacy of COVID-19 vaccine development underscore the critical role of scientific innovation in public health."
4. **Equity:** Ensuring equitable access to healthcare resources, including vaccines, is crucial for effective pandemic management. Addressing social determinants of health can mitigate the disproportionate impact on vulnerable populations. Bambra et al. (2020) argued, "Addressing health inequities requires a multifaceted approach that considers the broader social determinants of health."
5. **Communication:** Transparent and consistent communication from health authorities is vital in managing public perception and compliance. Combating misinformation through education and outreach is necessary to foster public trust. Malecki et al. (2021) stated, "Effective communication strategies are essential for maintaining public trust and ensuring compliance with public health measures."

Discussion:

The COVID-19 pandemic has been a transformative global event, reshaping the landscape of public health and prompting a reevaluation of preparedness strategies. The lessons learned highlight the importance of solidarity, resilience, and innovation in facing future health crises. Strengthening global health systems, investing in scientific research, and ensuring equity in healthcare delivery will be paramount in navigating the post-pandemic world and preparing for potential future pandemics.

The rapid spread of COVID-19 and its severe impact on health and economies have demonstrated the need for robust and adaptable public health systems. The varying responses to the pandemic have shown that countries with well-prepared healthcare infrastructures and strong public health policies were better able to manage the crisis. This underscores the importance of investing in healthcare systems that can swiftly respond to emergent threats.

Science and innovation have played pivotal roles in the pandemic response. The development and deployment of vaccines in record time is a testament to the potential of scientific advancements in combating global health threats. Lurie et al. (2020) noted, "The rapid development of COVID-19 vaccines was made possible by unprecedented levels of global collaboration and investment in research and development."

However, the pandemic also exposed significant inequities in healthcare access and resource distribution. Ensuring that all populations have access to vaccines and other essential healthcare resources is critical for effective pandemic management. So and Woo (2021) highlighted the urgent need for mechanisms to ensure equitable distribution of vaccines, particularly in low- and middle-income countries.

Effective communication has been a cornerstone of public health strategy during the pandemic. Transparent, consistent, and accurate information dissemination is essential for maintaining public trust and ensuring compliance with public health measures. Malecki et al. (2021) emphasized, "Combating misinformation through clear and consistent communication is essential for managing public perception and ensuring adherence to health guidelines."

The long-term impacts of COVID-19, including the phenomenon of long COVID, present ongoing challenges for healthcare systems worldwide. Nalbandian et al. (2021) identified the need for ongoing research to understand and address the long-term health effects of COVID-19, noting that "post-acute COVID-19 syndrome requires comprehensive strategies for management and rehabilitation."

Covid 19 In Dentistry:

● The most common receptor involved in the virus−cell interaction is angiotensin converting enzyme 2 (ACE-2), which is present at high concentrations in lungs,myocardial cells and kidney, as well as on oral mucosa (especially of the salivaryglands and tongue).
● These structures have been considered as early targets of Sars-CoV-2, with
infection causing a disease in humans known as CoronaVirus Disease 19 (COVID-19)

The Main Infection Pathways Of Sars-Cov-2 In Dentistry

A) Airborne Infection
B) Direct-Contact Infection
C) Saliva

Sars-Cov-2 Transmission Pathways In Dentistry

- Dentists, dental hygienists, dental assistants and patients have always been at highrisk of cross infections because ofTheir exposure to pathogenic microorganisms and viruses derived fromthe oral cavity and airways.
- The presence of bacteria and viruses in the aerosols created by dental instrumentation.
- Aerosol generated by an ultrasonic device can remain suspended in the airfor 30 minutes after the procedure.
- Procedures require close proximity to the patient's mouth.
- Risk of contact with saliva, blood and other biological fluids and involve the use of instrumentation that creates large aerosols.13

Protection Mechanisms To Avoid Infection With Covid-19 InThe Dental Environment

- **Medical History**

Initial evaluation of patients should be mandatory. Preliminary evaluation of patients should consist of body temperature measurement and a brief survey to investigate possible fever, respiratory issues, cough or dyspnea in the past 14 days, as well as contact with individuals who could have been potentially infected

- **Environmental Disinfection**

Potentially contaminated surfaces should be cleaned and then disinfected with hydroalcoholic disinfectants containing an alcohol concentration of >60%.

- **Dental Environment Sanitation**

Although there is a lack of information concerning environmental sanitation related to coronaviruses, some options are always useful for reducing bacterial and viral loads in dental clinics.79

- **Air depuration systems**

Air depuration system have been developed to filter and recirculate the air of surgical rooms and medical and health clinics.

- **Ozone**

Ozone is a natural gas, and one of the most effective systems for environmental sanitation.

- **UVradiation**

Germicidal ultraviolet (UV) radiation also represents a valid sterilization option: UV light can damage microbial DNA and RNA, thus preventing reproduction of microbes and reducing the harmful effects of infectious organisms.88

- **Airway protection**

Different types of mask have been developed in recent decades; each mask offers a different degree of protection.

- **Eye protection**

In the dental field, eye protection has been consistently indicated to minimize contact of the eyes with mechanical (e.g., slivers and foreign bodies), chemical (e.g., acids and disinfectants) and biological (e.g., saliva, blood, oral fluids) agents.

- **Hand hygiene**

Hand hygiene is considered the most important preventive measure to reduce the risk of transmission of microorganisms between dentists and patients.4

- **Rubber dam**

When handpieces or ultrasonic devices must be used, the use of a rubber dam is indicated as this significantly reduces the amount of aerosol containing saliva and/or blood, providing a 70% reduction of droplets around the surgical field.

Conclusion:-

The COVID-19 pandemic has had a profound and lasting impact on global health, economies, and societies. The experience has underscored the critical importance of robust public health systems, international cooperation, scientific innovation, and equity in healthcare access. The lessons learned from the pandemic must inform future preparedness efforts to ensure a more effective and equitable response to future health crises.

Strengthening global health infrastructure, investing in scientific research, and fostering international cooperation are essential steps in building resilience against future pandemics. Ensuring equitable access to healthcare resources and addressing the social determinants of health will help mitigate the disproportionate impact on vulnerable populations.

Vaccine development and approval will not put an end to the current pandemic. The

imperative will be robust production and distribution policies and protocols to ensure that the vaccine can be administered universally. India lacks effective policies for healthcare rationing in practice as well as required discussions in academia. This pandemic can be used to create greater awareness about the rationing of healthcare resources in a time of crisis

As we move forward, it is imperative that we apply the lessons learned from COVID-19 to enhance our preparedness and response strategies. The importance of solidarity, resilience, and innovation cannot be overstated. By working together and leveraging the advancements in science and technology, we can better navigate the challenges of future health crises and protect global health.

References:-

1. Bambra, C., Riordan, R., Ford, J., & Matthews, F. (2020). The COVID-19 pandemic and health inequalities. Journal of Epidemiology and Community Health, 74(11), 964-968.
2. Blumenthal, D., Fowler, E. J., Abrams, M., & Collins, S. R. (2020). Covid-19 - Implications for the Health Care System. New England Journal of Medicine, 383, 1483-1488.
3. Centers for Disease Control and Prevention. (2022). COVID-19: People with Certain Medical Conditions. Retrieved from https://www.cdc
4. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19- vaccines
5. Checchi V, Bellini P, Bencivenni D, Consolo U. COVID-19 dentistry-related aspects: a literature overview. International dental journal. 2021 Feb 1;71(1):21-6.
6. Khan M, Adil SF, Alkhathlan HZ, Tahir MN, Saif S, Khan M, Khan ST. COVID- 19: a global challenge with old history, epidemiology and progress so far. Molecules. 2020 Dec 23;26(1):39.
7. Pradhan D, Biswasroy P, Naik PK, Ghosh G, Rath G. A review of current interventions for COVID-19 prevention. Archives of medical research. 2020 Jul 1;51(5):363-74.
8. Deo S, Manurkar S, Krishnan S, Franz C. COVID-19 vaccine: development, access and distribution in the Indian context. ORF Issue Brief. 2020 Jul 10;378:16.