COVID-19

Mr.Bade Krushna S.

Ms.shinde Pratiksha A.

HSBPVT's Parikrama Diploma in Pharmaceutical Sciences, Kashti, Tal- Shrigonda

Dist- Ahmednagar, Maharashtra, India.

ABSTRACT-

Corona virus disease 2019 (COVID-19) first appeared in December 2019 and has since spread to other nations, affecting over 90,000 patients and posing a threat to public safety worldwide. The direct touch is one of the transmission channels. as well as droplet and perhaps aerosol transfers. Owing to the distinctiveness in dentistry, the majority of dental operations produce a huge number of droplets With aerosols, offering possible dangers of transmission of infections. Recognizing the the importance of aerosol transmission and its consequences for dentistry can help the recognition and rectification of carelessness in routine dental procedures. Apart from the usual safety measures, a few particular safety measures that should be used during a pandemic have been brought up in this review.

Keywords : Anosmia ,Antibodies,Antiviral medicines, Bacteria.

On January 30, 2020, the World Health Organisation declared an epidemic in response to the SARS-CoV-2 virus outbreak in Wuhan, Hubei Province, China, and its quick spread to 25 other nations. This occurred exactly one month after the disease's first case was reported on December 31, 2019 [1, 2, 3, 4]. According to their genetic makeup, coronaviruses are positive single-stranded RNA viruses that fall into four genera:,,, and coronavirus [5,6,7,8].

The beta-coronavirus genus is the source of the SARS-CoV-2 coronavirus. These viruses often cause mild respiratory illnesses in humans and are commonly seen in animals like birds and mammals. Owing to the virus's high propensity for emergence and SARS-CoV-2 RNA content, respiratory infections induced by the virus have lately resulted in fatal endemics in humans, including SARS and measles. The zoonotic pathogen responsible for these two forms of coronavirus illnesses is a member of the coronaviridae family's genus β-coronavirus [9,10,].

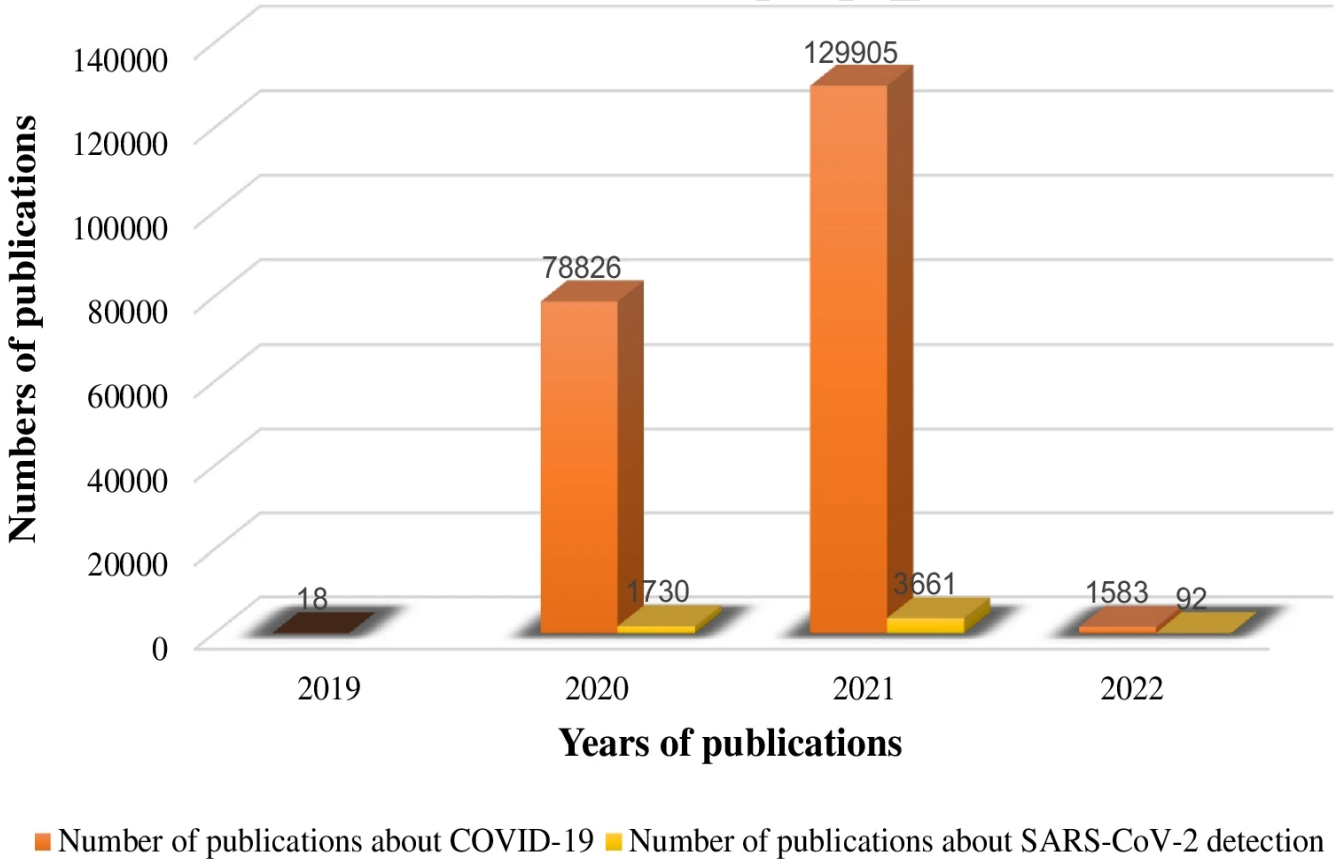
Middle East respiratory syndrome (MERS) was first recorded in Saudi Arabia in 2011–2012. Since then, 2495 cases have been documented, of which 858 cases have been linked to deaths, yielding

an estimated 34.4% death rate. Although there haven't been any new MERS-CoV cases documented since 2004, the SARS-CoV-2 pandemic struck unpredictably in 2020 [11, 12].

The seventh member of the coronavirus family, SARS-CoV-2, is a beta-coronavirus species that, like MERS-CoV, causes respiratory illness in humans. Its genome size is 27–35 kb. It encodes a number of structural and non-structural proteins, same as other coronaviruses. Among its structural proteins are the spike glycoprotein (S), nucleocapsid protein (N), membrane protein (M), and coating protein (E) [13].

SARS-CoV-2 appears to be more resistant to bodily fluids and the environment than other viruses in its family, such as MERS-CoV and SARS-CoV, and it has a longer lead time. The viral coat is one of the hardest coats in the coronavirus family. Both MERS-CoV and SARS-CoV do not live in the environment and can infect people with fewer virus particles [14].

Scheme 1 Statistics of the number of publications per year related to COVID-19



WHAT ARE CORONAVIRUSES?

Coronaviruses are 80–120 nm in diameter, single-stranded, enclosed RNA viruses that fall into four groups:,,, and. Only six different coronavirus kinds could infect humans before COVID-19

was discovered; COVID-19 is a member of the β-coronavirus family. Of them, two coronaviruses, MERS-CoV and SARS-CoV, are superior to humans, whereas four coronaviruses, HCoV-OC43, HCoV-229E, HCoV-NL63, and HCoVHKU1, are less dangerous and only cause minor respiratory infections. They spread two deadly illnesses. In the meanwhile, SARS-CoV and COVID-19 share a very similar pathogenic mechanism and homology. COVID-19 is more temperature resistant than SARS-CoV because it adapted in bats, whose bodies have a greater temperature than humans [15]

As seen in Figure 1, the coronavirus consists of four primary structural proteins: S (spike), E (envelope), N (nucleocapsid), and M (membrane). The COVID-19 virus binds to angiotensin-converting enzyme-type-2 (ACE2) receptors in cells through the spike protein's receptor-binding domain (RBD). Because COVID-19 has a high affinity for ACE2, alveolar cells, myocytes, and vascular endothelial cells all contain the ACE2 receptor. It is also useful for genital pathology, which includes the ovaries and testes. In addition to producing sex hormones and perhaps lowering sexual desire, COVID-19 likely influences and decreases the amount of sperm produced [16,17].

TYPES OF CORONAVIRUS

The four subtypes of coronaviruses—alpha, beta, gamma, and delta—are used by scientists to categorise various species. Human illness has been associated with seven coronaviruses. Four of these, as illustrated in Fig. 2, are human coronaviruses that impact the upper and lower airways, nose, sinuses, mouth, and lungs. These include human coronavirus 229E and NL63, which belong to the alpha-CoVs, as well as human coronavirus OC43 and HKU1, which belong to the beta-CoVs. These viruses are ubiquitous worldwide, causing 15–30% of all cases of the common cold. Only a tiny portion of instances result in them spreading to the lower respiratory tract.coronavirus (CoV) phylogenetic tree based on RNA-dependent RNA polymerase nucleotide sequences (RdRp). MEGA 6 was used to construct the tree using the greatest likelihood technique, yielding 1000 bootstrap values. The genera alpha-CoV, beta-CoV, gamma-CoV, and delta-CoV are represented by the four major phylogenetic groupings. Different subgenera can be found in each CoV genus. Human CoVs are indicated by the letters in blue. Reproduced from [18].with permission. From infections in animals, three additional coronaviruses were discovered. These viruses eventually spread to humans after evolving throughout time. These coronaviruses pose a greater threat to human health. They are stated as follows:-

• SARS-CoV-2 was the virus that started the COVID-19 pandemic.

•The virus known as SARS-CoV, or severe acute respiratory syndrome coronavirus, was the cause of the SARS outbreak in 2002–2003 [19].

•The Middle East respiratory syndrome coronavirus (MERS-CoV) was the source of the 2012 MERS outbreak [20].

ORIGIN AND SPREAD OF COVID-19

With a genomic content (GC) ranging from 32 to 43%, coronaviruses are single-stranded, positive-sense RNA viruses with the longest genomes of any known RNA virus. Because of its spherical form, which includes branches that protrude and a crown, this viral family has been named coronavirus. The Latin word corona, which means crown, is the source of this name. 15% of respiratory illnesses are caused by coronaviruses, which typically do not result in an acute form of the illness but can cause moderate upper respiratory infections. Numerous species (mammals) as well as humans are infected by this virus family [21,22].Since 1965, coronaviruses have been the subject of research. It has been determined that these viruses may infect both humans and animals, and that some can even spread from one species to another [32]. Research conducted during the SARS pandemic has revealed that bats are carriers of many coronaviruses that can potentially infect humans [30]. The new corona virus may have started in snakes or bats, similar to the SARS virus, but other animals may still act as mediated hosts, according to research that retrieved the genetic material of the virus from those who examined it.

CLINICAL FEATURES

Fever (9.87%), cough (7.67%), and exhaustion (1.38%) are the most prevalent clinical symptoms of COVID-19 infection; rarer symptoms include diarrhoea (7.3%) and vomiting (5%), which are comparable to those of other coronaviruses with an animal origin. Approximately nine days following the start of the illness, acute respiratory distress syndrome (ARDS) manifests. The virus harms not just the lungs but also the heart, kidneys, liver, eyes, and neurological system [23]. This virus causes neurological symptoms such as dizziness, amnesia, loss of taste and smell, nerve pain, seizures, and strokes. These symptoms are linked to inflammation and hypoxia in the brain. Brain inflammation can result directly from a breach in the blood–brain barrier or indirectly from a cytokine storm (autoimmune encephalitis).encephalitis caused by a virus [24,25]. Because COVID-19 induces thrombosis in the veins and arteries, it also contributes to cardiovascular problems. This disease's thrombosis mechanism is caused by vasoconstriction, inflammation, platelet activation, and vascular dysfunction. Patients are prescribed antithrombotic medications based on this information [26]. A small percentage of COVID-19 patients also have co-infections with other viruses, most often respiratory syncytial virus, rhinovirus, enterovirus, and SARS-CoV-2 coronaviridae [27].

Many patients have elevated levels of transaminases, cardiac enzymes, and creatinine, but few have elevated levels of lymphopenia, thrombocytopenia, elevated levels of D-dimer, c-reactive protein (CRP), erythrocyte sedimentation rate (ESR), lactate dehydrogenase (LDH), creatine

kinase (CK), ferritin, and prolonged prothrombin time (PT). Thrombocytopenia and elevated D-dimer values raise the risk of ventilator dependency, intensive care unit admission, and death. The degree of the illness is correlated with high levels of interleukin 6 (IL-6) and IL-10 as well as low levels of CD4 + T and CD8 + T cells. The immune system's most significant virus-killing cells, CD8 + T cells, compensate for their loss by accumulating more CD8 + marks on their surface to boost activity.Human leukocyte antigen (HLA) class I is recognised by CD8 + + T cells, while class II is recognised by CD4 + + T cells. People who have HLA from their parents are either more sensitive to or resistant to specific infections. Reductions in CD4 + T cell counts have the potential to impede B memory cell formation. [28, 29, 30]

EPIDEMIOLOGY AND PATHOGENESIS

Because coronaviruses frequently recombinate and have a wide genetic variety, interspecific transmission has increased [31]. The virus's natural host is the bat, with penguins and snakes serving as its intermediate hosts. The utilisation of natural hosts and interfaces enabled the first transfer. Infectious virus transmission in society most often occurs by direct and respiratory contact drops. It takes an average of 3 days (varying from 0 to 24 days) to incubate, and it takes an average of 14 days from the time the first symptom appears until death [32]. Thankfully, there have been no reports of the virus spreading intrauterine from an infected mother to the foetus [33].Because COVID-19 is coated and less persistent in the gastrointestinal tract than viruses that are not visible, it is less likely to contaminate surface and groundwater. Additionally, there is little chance of the virus spreading through an infected person's excrement. Sunlight, low or high pH, and high temperatures all lower the amount of viruses. Between two hours and nine days, the virus's survival rate fluctuates at distinct rates. Temperature, relative humidity, and surface type are variables that impact the virus's ability to survive. Ethanol and hypochlorite, two common disinfectants, both destroy 70% and 0.1% of the virus in one minute [34].The disease spreads from person to person primarily through asymptomatic carriers. There is little information available on disease carriers who do not exhibit symptoms. A sizable portion of these carriers are under the age of fifteen. Since most asymptomatic carriers have a normal CT picture and no clinical indicators, real-time PCR is the most effective method of differentiating them [35].Clinical signs and CT imaging do not help much in this regard.

BIOANALYTICAL DIAGNOSTIC METHODS

For a quick and precise molecular diagnosis of the virus, it is essential to properly collect a respiratory tract sample at the right time and from the right anatomical area prior to testing. The virus is most prevalent in the upper and lower respiratory tract five to six days after the sickness first appears, and nasopharyngeal and oropharyngeal swab specimens are suitable. Bronchoalveolar lavage is the best method for obtaining a sample from the lower respiratory

tract when sampling is postponed. Real-time reverse transcription-polymerase chain reaction (RT-PCR) findings are falsely negative when the swab or sample is exposed for 30 minutes at 56 °C, as this kills the virus RNA. The most crucial step after the test is to correctly interpret the results using a combination of molecular and serological techniques. Real-time viral nucleic acid detection A common technique for identifying coronavirus infection is RT-PCR; however, due to its high specificity and low sensitivity, this method might result in false negative results and require a lot of time [36] The combined use of CT imaging and laboratory testing could aid in the early diagnosis of COVID-19 pneumonia, it was concluded after negative results. Molecular approaches are complimentary tools to antibody-based immunoassay techniques. These methods are the most effective for diagnosing asymptomatic patients and for epidemiological studies of the disease, but they are slow and cheap.The Envelope corona gene should be used to screen the material for molecular detection, and the RdRp gene (RNA-dependent RNA polymerase) should be used to corroborate the results. Two proteins, N1 and the virus Nucleocapsid N2, are being tested in the USA. Anti-N protein antibody, an immunodominant antigen, is employed in the immunoassay approach for early illness diagnosis[37].

FIELD-EFFECT TRANSISTOR BIOSENSOR

The field-effect transistor (FET) is a type of transistor that uses an electric field to regulate current flows in two-dimensional (2D) semiconductors, such as graphene, MoS2, and black phosphorous (BP). FETs are three-terminal devices made up of a drain, a gate, and a source. The current flow in FETs is controlled by applying a voltage to the gateway that modifies the conductivity between the drain and the source. A layer of isolation, such as SiO2, is chosen as a transducer from the biological recognition element to the target molecule in the biosensor for the FET (Bio-FET). When charged molecules, including biomolecules, adhere to the FET gate, which is usually composed of a dielectric compound, the underlying semiconductor material's charge distribution a shifts, leading toshift in the conduction of the channel. FET sensors have the advantages of being inexpensive, easy to use, and responsive quickly. They may be calibrated for a variety of applications and are monitored in real time with inexpensive metres. One important aspect of FET sensor performance is the ability to establish high sensitivity and selectivity for particular biomolecules by anchoring specific probes on the conducting channel [38]. The two main compartments of a Bio-FET are one for field-effect transistors and the other for organic identification. Kim and colleagues devised a FET-based biosensing device for the detection of SARS-CoV-2 in medical samples (Fig. 3). To make the sensor, a particular antibody against the SARS-CoV-2 spike protein was placed on the FET graphene sheets. The sensor's performance was evaluated using antigen protein, cultured virus, and nasopharyngeal swab specimens from COVID-19 patients. Proposed FET device detected SARS-CoV-2 spike protein at 1 fg/mL in phosphate-buffered saline and 100 fg/mL in clinical transport medium. Additionally, the FET sensor successfully detected SARS-CoV-2 in clinical samples (LOD: 2.42×102 copies/mL) and

culture media (LOD: 1.6 × 101 pfu/mL). This apparatus is a highly sensitive immunological way to diagnose COVID-19 that does not require labelling or pretreatment [39].

APTASENSING AND NUCLEIC ACID DETECTION

Aptometrists are biosensors with aptamers as their biological component. Single-stranded DNA or RNA molecules are known as aptamers [106]. Compared to protein-based antibodies, they exhibit extremely great thermal stability. By placing these nucleic acid molecules next to the target molecule, a selective procedure known as systematic evolution of ligands by exponential enrichment (SELEX) is used to obtain the molecules in vitro. Currently, a popular technique for separating high-affinity single-stranded (ss) DNAs or RNAs from a sizable library of random sequences is called SELEX. A crucial and limited step in the SELEX process has always been tracking the enrichment progress of candidate aptamers. Several methods have been tried thus far to assess library enriching: surface plasmon resonance (SPR), dot blotting, electrophoretic mobility shift assay (EMSA), enzyme-linked oligonucleotide assay (ELONA), real-time quantitative PCR (qPCR), and EMSA [108].The following is a summary of the SELEX process steps: The process involves five steps: (1) nucleotide binding to target molecules; (2) aptamer-target complex separation from other unbound nucleotides; (3) aptamer separation from the target; (4) aptamer amplification by PCR to alter the selected aptamer's properties; and (5) separating the two strands of DNA and lowering the concentration to enhance the affinity of the selected aptamers. Numerous molecules, including mineral ions, tiny chemical compounds, proteins, nucleic acids, viruses, bacteria, and even cells and tissues, can be bound by aptamers. These newly developed compounds have a variety of uses, such as bioimaging, therapeutic agents, drug delivery systems, disease diagnostics, nutritional research, novel medications, and agents for the identification of dangerous substances. Since aptamers have solved many of the drawbacks of antibodies, they are frequently used as an alternative to antibodies. Because of their acidic nucleic acid structure, aptamers often exhibit substantially lower immunogenicity and toxicity than antibodies. A good indicator of toxin or molecule with very low immune response is an aptamer, which is also very high quality[40].

Declarations: *Conflict of interest The authors declare no competing interests*

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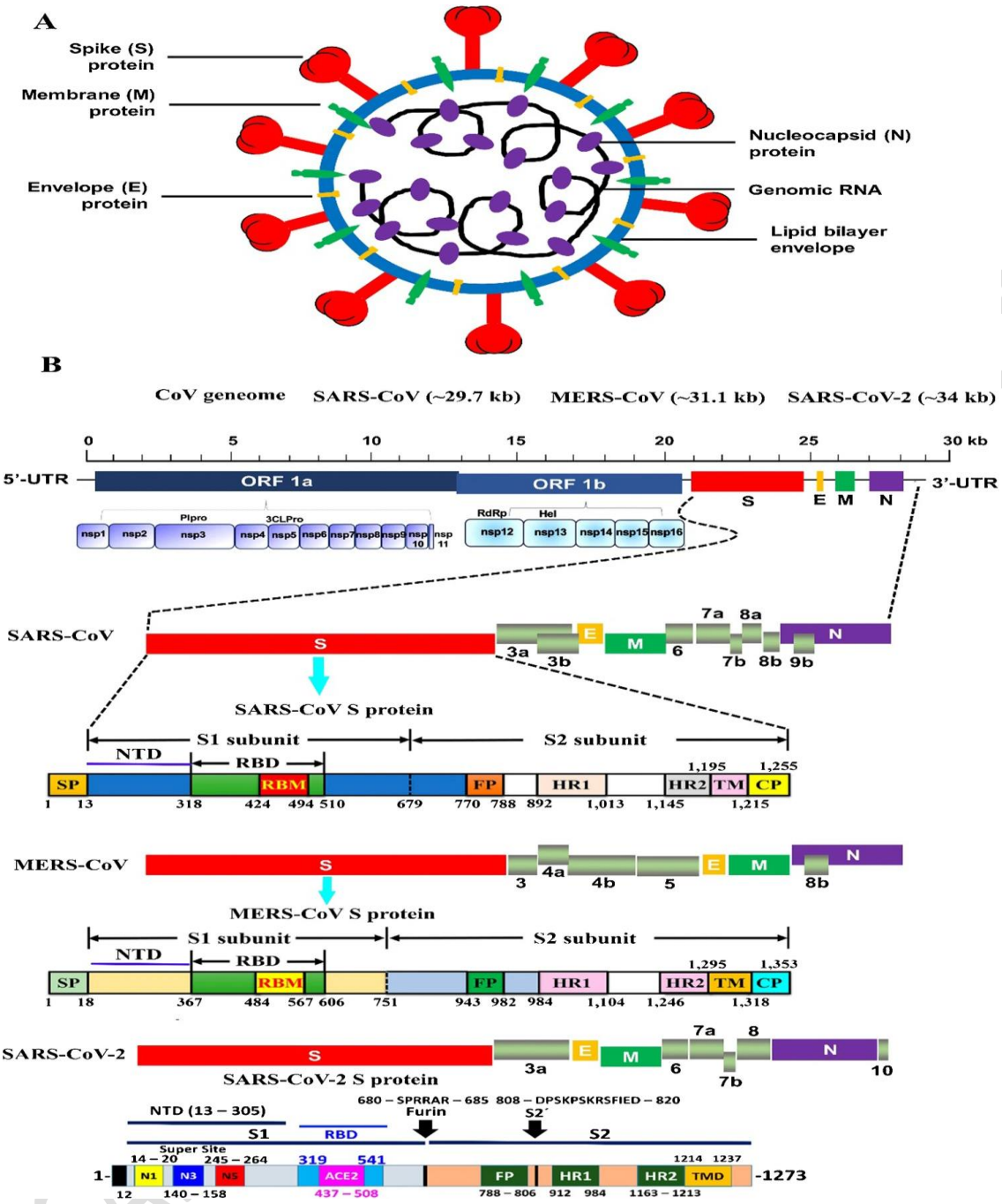
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SARS-CoV-2 (~34 kb)
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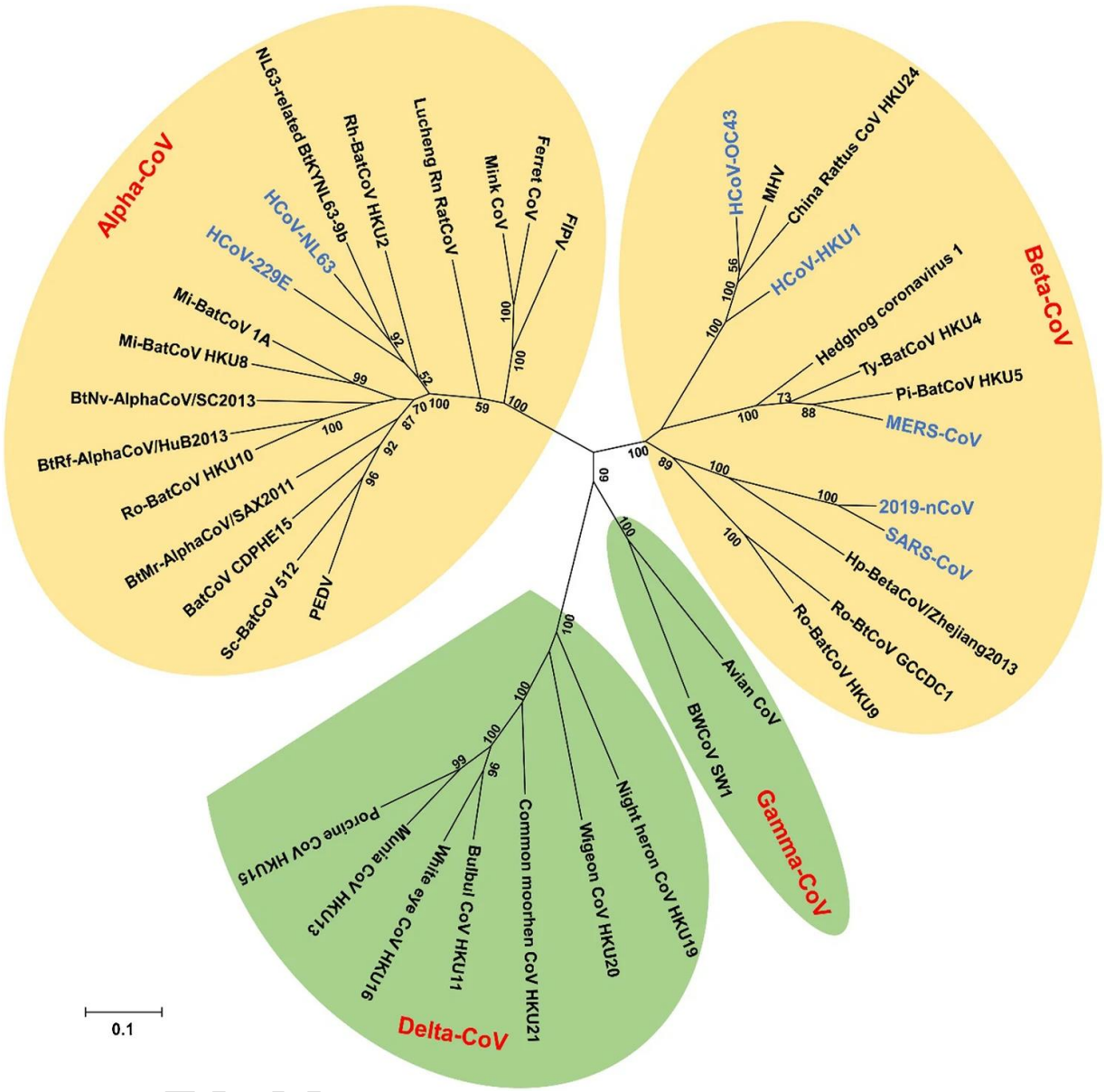
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Mink CoV
Ferret CoV
FIPV
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HCoV-229E
Mi-BatCoV 1A
Mi-BatCoV HKU8
BtNv-AlphaCoV/SC2013
BtRf-AlphaCoV/HuB2013
Ro-BatCoV HKU10
BtMr-AlphaCoV/SAX2011
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Sc-BatCoV 512
PEDV
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Pi-BatCoV HKU5
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SARS-CoV
Hp-BetaCoV/Zhejiang2013
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Avian CoV
BWCoV SW1
Night heron CoV HKU19
Wigeon CoV HKU20
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Bulbul CoV HKU11
White eye CoV HKU16
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Porcine CoV HKU15
Delta-CoV
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Fig No :- 03