

## EPIDEMIOLOGICAL STUDIES OF THE NOVEL CORONAVIRUS (COVID-19) IN LIBYA

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### ABSTRACT

The coronavirus disease 2019 (COVID-19) outbreak originated in Wuhan, China, as a series of acute atypical respiratory diseases. It has now spread to 221 countries.

Symptoms may appear 2-14 days after exposure to the virus. Though some people may be asymptomatic, the common symptoms of COVID-19 patients include, but not limited to, fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, the new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, diarrhea.

Materials and Methods: The information was gathered from the review of relevant literature obtained from various databases such as Science Direct, Springer, PubMed, Google, and Google Scholar.

Mechanism of SARS-CoV-2 invasion into host cells: Coronaviruses are enveloped, positive-sense, single-stranded RNA viruses of ~30 kb. They infect a wide variety of host species. They are divided mainly into four genera;  $\alpha$ ,  $\beta$ ,  $\gamma$ , and  $\delta$  based on their genomic structure.  $\alpha$  and  $\beta$  coronaviruses infect only mammals 28 .

Case Study in Libya: COVID-19 cases have affected the medical education system in Libya. Several medical schools were temporarily closed for several periods during the war, which resulted in delays in the graduation and medical education of thousands of medical students.

Medicine traditional of herbal plant: Medicinal plants have a fundamental role in our beliefs, especially among the elderly, and in light of the lack of adequate treatment and lack of necessary medicines. Some herbs may boost the immunity in the blood and increase antibodies, and it is unknown to scientists until now whether this might positively affect the body's immunity.

Conclusion: This study was aimed to provide information on epidemiological characterization and the spatial and temporal patterns of the COVID-19 pandemic in Libya. It is conclusively evident that the pandemic has affected the whole country, with incidence rates varying from one region to another. Meanwhile, the prevention and control of COVID-19 in Libya is still a tough fight.

Keyword : Coronavirus disease 2019, Symptoms, Libya, and Pandemic.

### INTRODUCTION

The coronavirus disease 2019 (COVID-19) outbreak originated in Wuhan, China as a series of acute atypical respiratory diseases. It has now spread to 192 countries. This rapidly spread from Wuhan to other areas. The novel coronavirus was named as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2, 2019-nCoV) due to its high homology (~80%) to SARS-CoV, which caused acute respiratory distress syndrome (ARDS) and increased mortality during 2002–2003 (Abd El-Aziz & Stockand, 2020; Abdel Rahman et al., 2020; Ahmadifar et al., 2019; Allaq et al., 2020a, 2020b; Amalraj et al., 2017; Badr et al.,

2020; Bashir et al., 2020; Belouzard et al., 2012; Bredan et al., 2020; Chan et al., 2020; Daw, El-Bouzedi, et al., 2020; Daw, Zgheel, et al., 2020; Elhadi et al., 2020; Elhadi & Msherghi, 2020; Group, 2020; Grzanna et al., 2005; Hassan et al., 2020; Horby et al., 2020; Kembuan et al., 2020; Ksiazek et al., 2003; Lashkari et al., 2020; Li et al., 2020; Lu, 2020; Millet & Whittaker, 2014; Motlagh et al., 2020; Ou et al., 2020; Pan et al., 2020; Pastick et al., 2020; Rizk et al., 2020; Rouf et al., 2020; Tomazini et al., 2020; Walls et al., 2020; Wang et al., 2020; Wiersinga et al., 2020; F. Wu et al., 2020; Z. Wu & McGoogan, 2020; Yahya

et al., 2020a, 2020b; Yuki et al., 2020; Zheng et al., 2020; Zhou et al., 2020; Zou et al., 2020).

People with COVID-19 have had a wide range of symptoms reported – ranging from mild symptoms to severe illness. Symptoms may appear 2-14 days after exposure to the virus. Though some people may be asymptomatic, the common symptoms of COVID-19 patients include showed in Figure 1, but not limited to, fever or chills, cough, shortness of breath or difficulty breathing fatigue, muscle or body aches, headache, the new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, diarrhea. Severe cases of the epidemic can lead to pneumonia, multiple organ failure, and death (Ahmadifar et al., 2019).

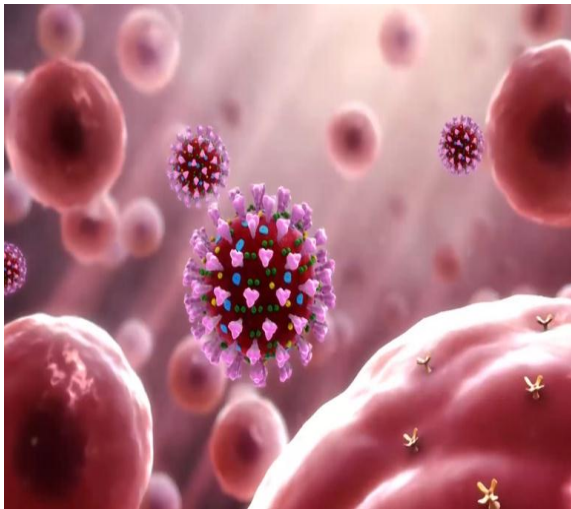


Fig. 1: coronavirus disease 2019 (COVID-19) <https://www.warminsterclinic.co.uk/coronavirus-precautions>

Globally, at least 1.7 million deaths have been directly attributed to COVID-19. Posing a significant international health threat, COVID-19 has drawn unprecedented attention from public health researchers worldwide, with more than 800 research articles published in academic journals within a year. There are also more than 300 epidemiologically and modeling preprints on COVID-19. Many of these articles seek to investigate the disease's epidemiological parameters at various locations to disseminate critical information between both modelers and policy-makers for a timely control response to be implemented. This is particularly crucial as the current epidemic involves the new pathogenic (SARS-CoV-2), on which restricted knowledge exists of its infectivity and clinical profile (Abd El-Aziz & Stockand, 2020; Abdel Rahman et al., 2020; Ahmadifar et al., 2019; Allaq et al., 2020a, 2020b; Amalraj et al., 2017; Badr et al., 2020; Bashir et al., 2020; Belouzard et al., 2012; Bredan et al., 2020; Chan et al., 2020; Daw, El-Bouzedi, et al., 2020; Daw,

Zgheel, et al., 2020; Elhadi et al., 2020; Elhadi & Mshergghi, 2020; Group, 2020; Grzanna et al., 2005; Hassan et al., 2020; Horby et al., 2020; Kembuan et al., 2020; Ksiazek et al., 2003; Lashkari et al., 2020; Li et al., 2020; Lu, 2020; Millet & Whittaker, 2014; Motlagh et al., 2020; Ou et al., 2020; Pan et al., 2020; Pastick et al., 2020; Rizk et al., 2020; Rouf et al., 2020; Tomazini et al., 2020; Walls et al., 2020; Wang et al., 2020; Wiersinga et al., 2020; F. Wu et al., 2020; Z. Wu & McGoogan, 2020; Yahya et al., 2020a, 2020b; Yuki et al., 2020; Zheng et al., 2020; Zhou et al., 2020; Zou et al., 2020).

This disease could also be fatal. A growing number of patients with severe diseases have continued to succumb worldwide. Epidemiological studies have shown that mortalities are higher in the elderly population (Abd El-Aziz & Stockand, 2020; Abdel Rahman et al., 2020; Ahmadifar et al., 2019; Allaq et al., 2020a, 2020b; Amalraj et al., 2017; Badr et al., 2020; Bashir et al., 2020; Belouzard et al., 2012; Bredan et al., 2020; Chan et al., 2020; Daw, El-Bouzedi, et al., 2020; Daw, Zgheel, et al., 2020; Elhadi et al., 2020; Elhadi & Mshergghi, 2020; Group, 2020; Grzanna et al., 2005; Hassan et al., 2020; Horby et al., 2020; Kembuan et al., 2020; Ksiazek et al., 2003; Lashkari et al., 2020; Li et al., 2020; Lu, 2020; Millet & Whittaker, 2014; Motlagh et al., 2020; Ou et al., 2020; Pan et al., 2020; Pastick et al., 2020; Rizk et al., 2020; Rouf et al., 2020; Tomazini et al., 2020; Walls et al., 2020; Wang et al., 2020; Wiersinga et al., 2020; F. Wu et al., 2020; Z. Wu & McGoogan, 2020; Yahya et al., 2020a, 2020b; Yuki et al., 2020; Zheng et al., 2020; Zhou et al., 2020; Zou et al., 2020).

The incidence is much lower in children, and current medical management is mostly supportive with no targeted therapy available. Several drugs, including lopinavir-ritonavir, redelivery, hydroxy-chloroquine, and azithromycin, have been tested in clinical trials closed. Nevertheless, none of them have been proven to be a definite therapy yet. More therapies are being tested in clinical trials (Wu et al., 2020).

Furthermore, only a few African states have successfully implemented detection, prevention, and control measures. However, the COVID-19 pandemic poses a challenge for fragile African countries and those with well-functioning health systems. Until now, studies evaluating the epidemiological and spatial spread of the COVID-19 pandemic in Africa are (Daw, El-Bouzedi, et al., 2020).

Libya is a developing country and less equipped to manage and control any pandemic due to the

anarchy and loss of central control since 2011 (Daw, Zgheal, et al., 2020). Libyan health-care infrastructure continues to deteriorate due to civil war, inadequate human and financial support, and inadequate health facilities. As stated by the Service Availability and Readiness Assessment (SARA-2017), conducted by the World Health Organization and Ministry of Health of Libya, 17 out of 97 hospitals are closed, and most hospitals operate at a low performance (Daw, Zgheal, et al., 2020). Only 40% of hospitals' inpatient beds are adequately functioning with an overall bed capacity of 15 per 10,000, which is lower than the required target of 25 per 10,000. Another concern is the lack of trained nurses. Moreover, Libya scored an average of 60% regarding the readiness of health emergency services, according to SARA-2017 (Daw, Zgheal, et al., 2020).

## MATERIALS AND METHODS

The information was gathered from the review of relevant literature obtained from various databases such as Science Direct, Springer, PubMed, Google, and Google Scholar.

**Mechanism of SARS-CoV-2 invasion into host cells:** Coronaviruses are enveloped, positive-sense, single-stranded RNA viruses of ~30 kb. They infect a wide variety of host species (Yuki et al., 2020). They are divided mainly into four genera;  $\alpha$ ,  $\beta$ ,  $\gamma$ , and  $\delta$  based on their genomic structure.  $\alpha$  and  $\beta$  coronaviruses infect only mammals (Yuki et al., 2020). Human coronaviruses such as 229E and NL63 are responsible for common cold and croup and belong to  $\alpha$  coronavirus. Invariance, SARS-CoV, Middle East respiratory syndrome coronavirus (MERS-CoV), and SARS-CoV-2 are classified as  $\beta$  coronaviruses (Yuki et al., 2020).

The virus's life cycle with the host consists of the following five steps: attachment, penetration, biosynthesis, maturation, and release. Once viruses bind to host receptors (attachment), they enter host cells through endocytosis or membrane fusion (penetration). Once viral contents are released inside the host cells, viral RNA enters the nucleus for replication. Viral mRNA is used to make viral proteins (biosynthesis). Then, new viral particles are made (maturation) and released. Coronaviruses consist of four structural proteins; Spike (S), membrane (M), envelope (E), and nucleocapsid (N) (Yuki et al., 2020).

Spike consists of a transmembrane trimetric glycoprotein protruding from the viral surface, which limited the diversity of coronaviruses and host tropism. Spike comprises two functional subunits; the S1 subunit is responsible for binding to the host cell receptor, and the S2 subunit is for

the fusion of the viral and cellular membranes. Angiotensin-converting enzyme 2 (ACE2) was identified as a functional receptor for SARS-CoV-2 (Millet & Whittaker, 2014; Ou et al., 2020). The structural and functional analysis shows that the spike for SARS-CoV-2 is also bound to ACE2 (Millet & Whittaker, 2014; Ou et al., 2020). ACE2 expression is high in the lung, heart, ileum, kidney, and bladder (Millet & Whittaker, 2014; Ou et al., 2020). In the lung, ACE2 is much expressed on lung epithelial cells. Whether or not SARS-CoV-2 binds to an additional target needs further investigation. Following the binding of SARS-CoV-2 to the host protein, the spike protein undergoes protease cleavage. A two-step sequential protease cleavage to activate spike protein of SARS-CoV and MERS-CoV was proposed as a model, consisting of cleavage at the S1/S2 cleavage site for priming and cleavage for activation at the S'2 site, a position adjacent to a fusion peptide within the S2 subunit (Walls et al., 2020). After the cleavage at the S1/S2 cleavage site, S1 and S2 subunits remain non-covalently bound, and the distal S1 subunit contributes to the stabilization of the membrane-anchored S2 subunit at the prefusion state (Walls et al., 2020). Subsequent cleavage at the S'2 site presumably activates the spike for membrane fusion via irreversible, conformational changes. The coronavirus spike is unusual among viruses because various proteases can cleave and activate it (Walls et al., 2020). The characteristic unique to SARS-CoV-2 among coronaviruses are the furin cleavage site ("RPPA" sequence) at the S1/S2 site. The S1/S2 site of SARS-CoV-2 was entirely subjected to cleavage during biosynthesis in drastic contrast to the SARS-CoV spike, which was incorporated into the assembly without cleavage (Walls et al., 2020).

**Epidemiological data of COVID-19:** At the beginning of the outbreak, COVID-19 cases were mostly observed among older adults (Ou et al., 2020; Walls et al., 2020; Zheng et al., 2020). As the outbreak continued, the number of cases among people aged 65 and older increased further, but some increases among children (< 18 years) were observed. The number of male patients increased initially, but no significant gender difference was observed as the case number increased. The mean incubation period was 5.2 days. The combined case-fatality rate was 2.3% (Ou et al., 2020; Walls et al., 2020; Zheng et al., 2020).

Of all reported cases in Libya, this occupied only 1% of the total cases, even though this age group makes up 4% of Libya's population. Overall, the data suggested that children were less symptomatic

than adults, as in Chinese reports. Among the children for whom complete information was available, only 67.08 % developed fever, cough, or shortness of breath in table 1.

Compared to 93% of adults reported in the same time frame, between the ages of 25 and 75 years. The estimated hospitalization rate for children aged 1 to 17 was 14% at most (Elhadi et al., 2020; Elhadi

& Msherghi, 2020). In contrast, infants accounted for the highest percentage of hospitalization (15–62%), which was similar to the Chinese CDC data. Despite the overall favorable outcome for the pediatric population, several deaths have been reported in Libya of 1.43 %, and further information needs to be obtained (Elhadi et al., 2020; Elhadi & Msherghi, 2020).

Table 1: Classification of COVID-19 patients

<b>Asymptomatic</b>	No appreciable signs or symptoms
Mild	Symptoms of acute upper respiratory tract infection (fever, fatigue, myalgia, cough, sore throat, runny nose, sneezing) or digestive symptoms (nausea, vomiting, abdominal pain, diarrhea)
Moderate	Pneumonia (frequent fever, cough) with no obvious hypoxemia, chest CT with lesions.
Severe	Pneumonia with hypoxemia (SpO <sub>2</sub> < 92%)
Critical	Acute respiratory distress syndrome (ARDS), may have shock, encephalopathy, myocardial injury, heart failure, coagulation dysfunction, and acute kidney injury.
Mild	Symptoms of acute upper respiratory tract infection (fever, fatigue, myalgia, cough, sore throat, runny nose, sneezing) or digestive symptoms (nausea, vomiting, abdominal pain, diarrhea)
Moderate	Pneumonia (frequent fever, cough) with no obvious hypoxemia, chest CT with lesions.
Severe	Pneumonia with hypoxemia (SpO <sub>2</sub> < 92%)

**Case Study in Libya:** COVID-19 cases have affected the medical education system in Libya. Several medical schools were temporarily closed for several periods during the war, which resulted in delays in the graduation and medical education of thousands of medical students (Elhadi & Msherghi, 2020).

A 73-year old Libyan male visited Saudi Arabia in February 2020. There, he encountered other people during a religious gathering. He returned to Tripoli, Libya, on March 5, 2020. His medical history included hypertension and type-2 diabetes mellitus (Bredan et al., 2020; Daw, El-Bouzedi, et al., 2020). Although his symptoms started with fever, cough, and generalized fatigue on March 18, he visited the Tripoli Central Hospital on March 22, where he was admitted with progressive dyspnoea, tachypnoea, and continued fever. On examination, his temperature was 39 °C, heart rate 75 beats/min, blood pressure 110/60 mm Hg, and oxygen saturation 95% on room air. On auscultation, decreased air entry bilaterally in the lower zone was noted. A high-resolution computed tomography (HRCT) showed multi-lobar and bilateral ground-glass opacities in both lungs, mostly in the mid to lower lungs, with peripheral subpleural distribution (appendix). Complete blood count results included:  $0.70 \times 10^9/L$  lymphocyte count (reference range,  $1.0\text{--}4.0 \times 10^9/L$ ),  $8.8 \times 10^9/L$  white blood cell

count,  $168 \times 10^9$  platelet count (reference range,  $150\text{--}400 \times 10^9/L$ ), and 11.9 g/dL hemoglobin concentration. C-reactive protein concentration peaked on admission day at 168.4 mg/L (reference range, <5mg/L), and he was isolated and appropriately treated with cefixime 400 mg (tablet) every 24 h and azithromycin (500 mg on day one, followed by 250 mg per day). As of April 4, the patient's condition had steadily improved. On examination, his temperature was 37 °C; heart rate 89 beats/min, blood pressure 140/70 mm Hg, and oxygen saturation 98% on room air. Besides, the patient was tested negative on April 4, 2020. Consequently, he was discharged and followed up accordingly (Bredan et al., 2020; Daw, El-Bouzedi, et al., 2020).

Additionally, twenty-six of his family members were isolated until the RT-PCR assay tested negative on March 26 (Daw, El-Bouzedi, et al., 2020).

**Medicine traditional of herbal plant:** Medicinal plants have a fundamental role in our beliefs, especially among the elderly, and in light of the lack of adequate treatment and lack of necessary medicines. Some herbs may a boosting the immunity in the blood and increase antibodies, and it is unknown to scientists until now whether this might positively affect the body's immunity (Daw, El-Bouzedi, et al., 2020). Proving the ability of a herb or any other substance to enhance the body's immunity is one of the most complex issues, and in



general, some types of herbs are known that they may contribute to enhancing the health of the immune system, but this is still uncertain, and there is still a need for more work. Thus, it is necessary to review the potential benefits of common medicinal plants and herbs (Allaq et al., 2020b).

**Ginger:** Dry ginger or ginger is used as a common ingredient in herbal medicine figure 2. Ginger is rich in anti-bacterial and anti-inflammatory properties is used as a popular home remedy for cough and cold in the form of tea, and it can help boost immunity naturally (Ahmadifar et al., 2019). Ginger an herbal medicinal product with broad anti-inflammatory actions (Grzanna et al., 2005).

Ginger, the rhizome of the *Zingiber officinale* is commonly consumed dietary condiments (Rahmani, 2014), generally considered to be safe (Afzal et al., 2001), and used to cure various diseases (Figure 1). It also shows a role in cancer prevention by inactivating and activating various molecular pathways. role of ginger in diseases management via modulation of biological activities including anti-inflammatory and anti-oxidative activities, and regulation of genes mechanism of action (Silva & Fernandes Júnior, 2010). Ginger plays a vital role in traditional Indian Ayurvedic medicine. It is also used as an ingredient in traditional Indian drinks (Mashhadi et al., 2013). Fresh ginger is one of the main spices used for making dishes, both vegetarian and non-vegetarian based foods. Indian traditional medicinal remedies especially for cough and asthma, consist of fresh ginger juice with a little juice of fresh garlic mixed with honey (El-Ghorab et al., 2010). It also suggests of that 1-2 tea spoons of ginger juice with honey are a potent cough suppressant. Besides these ginger is very often used to cure many illness such as indigestion, tastelessness, loss of appetite, flatulence, intestinal, nausea, vomiting, allergic reactions, acute and chronic cough, common cold, fever, allergic rhinitis, sinusitis, acute chronic bronchitis, respiratory troubles, pain, headache, backache or any kind of muscular catch, painful tooth and swelled gum etc (kumar Gupta & Sharma, 2014).



Fig. 2: Ginger

**Turmeric:** Turmeric a wide range of biological activities (Lal, 2012) (Figure 3) and is used in traditional medicines and is one of the components of herbal medicine (Lal, 2012). The Western world has consumed turmeric in tablet form (Silva & Fernandes Júnior, 2010). It is locally consumed as a popular spice added to foods in India (Abdel Rahman et al., 2020). Often used to treat muscle pain or even as first aid in an injury. Turmeric contains many ingredients that can help fight disease (Amalraj et al., 2017). The essential oil inhibits the growth of various bacteria, parasites, and pathogenic fungi (Verma et al., 2018). Turmeric's protective effects on the cardiovascular system include lower cholesterol and inhibiting platelet aggregation (Verma et al., 2018) and Constituents of turmeric affects Alzheimer's disease. Extract of turmeric suppresses symptoms associated with arthritis (Sikha & Harini, 2015) and its extract inhibit angiogenesis constituents can induce radio protection constituents to stimulate muscle regeneration (Andrade et al., 2018). Turmeric enhances wound healing and protects against pancreatitis (Mncwangi et al., 2012).



Fig. 3: Turmeric

**Echinacea:** Echinacea is an herb found primarily in the United States and southern Canada. It has many uses Figure 2 echinacea has properties that can relieve pain, reduce inflammation, and have antiviral and antioxidant effects. This makes it an ideal herb to support the immune system and boost its function (Kembuan et al., 2020). Also antifatigue agent, Immune System Effects of Echinacea antibacterial or antiviral activity through the immune system modulation (Kumar & Ramaiah, 2011). Pharmacology and clinical properties of Echinacea species used medicinally (Block and Mead, 2003). Ecology and clinical properties treat symptoms of upper respiratory infections such as colds and influenza (Broadhurst et al., 2000), inflammatory conditions, including immune-modulating activities,

antiviral activities, and antibiotic activities (Vimalanathan et al., 2009).



[https://www.google.com/search?q=Echinacea&tbm=isch&ved=2ahUKEwidoZ3XtAhXJnEsFHTXQBGUQ2-cCegQIABAA&oq=Echinacea&gslcp=CgNpbWcQAzIECCMQJzICCAAYAggAMgIIDI CCAAYAggAMgIADICCAAYAggAMgIADoHCCMQ6gIQJ1DttAVY1rkFYI\\_IBWgBcAB4AIA BMogBMpIBATGYAQCgAQQgAQtd3Mtd2l6LWltZ7ABBMABAQ&scient=img&ei=vpXsX53KE8m5rtoPtaCTqAY#imgrc=IcadAwczyeNzFM](https://www.google.com/search?q=Echinacea&tbm=isch&ved=2ahUKEwidoZ3XtAhXJnEsFHTXQBGUQ2-cCegQIABAA&oq=Echinacea&gslcp=CgNpbWcQAzIECCMQJzICCAAYAggAMgIIDI CCAAYAggAMgIADICCAAYAggAMgIADoHCCMQ6gIQJ1DttAVY1rkFYI_IBWgBcAB4AIA BMogBMpIBATGYAQCgAQQgAQtd3Mtd2l6LWltZ7ABBMABAQ&scient=img&ei=vpXsX53KE8m5rtoPtaCTqAY#imgrc=IcadAwczyeNzFM)  
Fig. 3: Echinacea

**Garlic:** Garlic has pharmaceutical effects Figure-4 and used to cure vast conditions including blood pressure and cholesterol, hepatoprotective, anthelmintics, anti-inflammatory (Tesfaye & Mengesha, 2015), antioxidant, antifungal and wound healing, asthma, arthritis, sciatica, lumbago, backache (El-Saber Batiha et al., 2020), bronchitis, chronic fever, tuberculosis, rhinitis, malaria, obstinate skin fistula (Tesfaye & Mengesha, 2015). Frost says garlic is a potent anti-microbial herb, especially in the gut. It is believed to be antiprotozoal, antibacterial, and antiviral. These properties can help fight chest infections and respiratory infections (Motlagh et al., 2020). properties, including anticarcinogenic, antioxidant, antidiabetic, renoprotective, anti-atherosclerotic, antibacterial, antifungal, and anti-hypertensive activities in traditional medicines (El-Saber Batiha et al., 2020).



Fig. 4: Garlic

#### Anti-viral drugs

Although the US Food and Drug Administration (FDA) has approved only one drug to treat coronavirus disease in 2020 (COVID-19), scientists are

currently testing several drugs (Abd El-Aziz & Stockand, 2020). The US Food and Drug Administration has approved the antiviral drug remdesivir (Veklury) to treat adult COVID-19 patients, as well as children 12 years of age or older. Remdesivir may be prescribed to patients with Covid 19 whose condition requires hospitalization. It is given to the patient through a needle inserted into the skin (intravenously) (Badr et al., 2020). The FDA has approved the emergency use of a drug called baricitinib (Olumiant) (Bashir et al., 2020). The FDA states that baricitinib can be used with remdesivir to treat people admitted to hospital who need ventilators or additional oxygen after they have had COVID-19 (Bashir et al., 2020). Researchers are studying other potential treatments for COVID-19, including:

**Antiviral drugs:** In addition to remdesivir, other antivirals currently being tested include: favipiravir and merimepodib. Studies have found that combining lopinavir and ritonavir is not sufficient (Bashir et al., 2020).

**Dexamethasone:** The corticosteroid dexamethasone is one of the anti-inflammatory drugs researchers are currently studying to treat or prevent organ dysfunction and lung injuries caused by inflammation. Studies have found that it reduces deaths by nearly 30% in people dependent on ventilators and by nearly 20% in people who need additional oxygen (Tomazini et al., 2020). The US National Institutes of Health recommended this drug for people admitted to hospital with COVID-19 who were put on mechanical ventilators or require additional oxygen. Other corticosteroids, such as prednisone, methylprednisolone, or hydrocortisone may be used if dexamethasone is not available. Dexamethasone and other corticosteroids may cause harm if given to less severe Covid 19 patients (Tomazini et al., 2020).

**Unproven drugs:** Researchers are studying several unproven drugs such as amlodipine and losartan. However effective these drugs are in treating or preventing COVID-19 is not yet known. Ivermectin and famotidine are not likely to help treat COVID-19 (Wiersinga et al., 2020).

**Hydroxychloroquine and chloroquine:** Previously, the FDA approved the use of these malaria drugs in emergencies during the COVID-19 pandemic. Nevertheless, the FDA withdrew its approval when graphical analyzes showed that these drugs are ineffective in treating COVID-19. These drugs can also cause serious problems (Pastick et al., 2020).

**Medicines that protect against COVID-19:** Researchers are studying the effectiveness of certain

drugs in preventing COVID-19 patients before and after exposure to the virus.

### Conclusion

This study was aimed to provide information on epidemiological characterization and the spatial and temporal patterns of the COVID-19 pandemic in Libya. It is conclusively evident that the pandemic has affected the whole country, with incidence rates varying from one region to another. Meanwhile, the prevention and control of COVID-19 in Libya is still a tough fight. We have seen some European countries' health systems buckled under the surge of COVID-19 and appealed for help. The internal conflict in Libya has affected the national health care system immensely. There is a dearth of information on the capacity to provide care for critically ill patients in ICUs in Libya and a lack of accuracy and efficient tracing policy of COVID-19 infected cases. Hence, swift action to control the virus's further spread and improve response capabilities is urgently needed.

The study demonstrated the spatiotemporal characteristics and trends of COVID-19 in Libya, which is essential to better focus on preventive efforts. The country must scale up its containment and mitigation strategies — quarantine, isolation, and social distancing. Establishing functional infection prevention and control practices could help detect and contain the ongoing epidemic.

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