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Evaluation of antibody titers, specific hematological parameters, and clinical manifestations correlated of SARS-CoV-2 infection Among symptomatic COVID-19 patients at the Brak isolation center in Libya.

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تقييم عيارات الأجسام المضادة , و المعايير الدموية المحددة , و المظاهر السريرية المرتبطة بعدوى فيروس كورونا المستجد SARS-CoV-2 بين مرضى كوفيد-19 المصحوبين بأعراض في مركز عزل براك في ليبيا .

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Abstract

Coronaviruses are a group of viruses that make mammals and birds sick. Some members of this group can infect people, and the new coronavirus (SARS-CoV-2) is a new strain of this group. It is the cause of the current worldwide pandemic, and it has never been found in people before. The virus can be passed from animals to people. This study was conducted to investigate the disease's distribution among patients and to evaluate antibody titers, considering the limited research on this virus in Libya despite its prevalent occurrence in various regions. Results: An analysis of 25 confirmed cases showed that men (18 cases; 72%) were more likely to get infected than women (7 cases; 28%).

The results showed that the risk of getting an infection went up with age, especially for people between the ages of 50 and 59. The most common clinical sign was fever, which was present in 23 cases (92%). Additionally, individuals with chronic conditions, including diabetes mellitus and hypertension, exhibited a heightened susceptibility to infection (41.9%). Pearson's correlation analysis indicated a positive association between CRP and D-dimer (R = 0.5, P = 0.06), although it lacked statistical significance. The lymphocyte count showed a negative correlation with CRP (R = -0.5, P = 0.3) and D-dimer (R = -0.5, P = 0.1), but neither of these correlations was statistically significant.

Keywords:SARS-COV-2, COVID-19, Antibody titers, Clinical manifestations , Hematological parameters.

المستخلص

فيروسات كورونا هي مجموعة من الفيروسات التي تسبب مرض الثدييات و الطيور. بعض أعضاء هذه المجموعة يمكن أن تصيب البشر ،و الفيروس التاجي الجديد (SARS-CoV-2) هو سلالة جديدة من هذه المجموعة . و هو سبب الجائحة العالمية الحالية ، و لم يكتشف في البشر من قبل . يمكن أن ينتقل الفيروس من الحيوانات إلي البشر. أجريت هذه الدراسة للتحقق من توزيع المرض بين المرضى و تقييم عيارات الأجسام المضادة ، مع الأخذ في الاعتبار قلة البحوث حول هذا الفيروس في ليبيا علي الرغم من إنتشاره في مناطق مختلفة.

النتائج : أظهر تحليل 25 حالة مؤكدة أن الرجال (18 حالة ؛72 %) كانو أكثر عرضة للإصابة مقارنة بالنساء (7 حالات ؛28%). كما أظهرت النتائج أن خطر الإصابة يزداد مع التقدم في العمر ، خاصة للأشخاص بين 50 و 59 سنة . كان العرض السريري الأكثر شيوعا هو الحمى ،حيث وجدت لدى 23 حالة. (92%)

بالإضافة إلي ذلك ، أظهر الأفراد الذين يعانون من حالات مزمنة، بما في ذلك داء السكري و ارتفاع ضغط الدم ، قابلية أكبر للإصابة (41.9%) . أشار تحليل بيرسون للارتباط إلي وجود ارتباط إيجابي بين CRP و (R=0.3, P=0.06) D-dimer رغم أنه لم يكن

ذا دلالة إحصائية. أظهرت نسبة اللمفاويات ارتباطا سلبيا مع CRP (R = -0.5, P = 0.3) و D-dimer (R = -0.5, P = 0.1) ، ولكن لم يكن أي من هذه الارتباطات ذا دلالة إحصائية.
الكلمات المفتاحية: كلمة، كلمة، كلمة، ...(في حدود 7 كلمات.

1.Introduction

1.1 Coronavirus and Its Variants

Coronaviruses are a group of viruses that make mammals and birds sick. They have similar chemical structures and shapes, and they make up a big family of viruses. Some of these viruses cause severe acute respiratory diseases in humans, which can range from mild cold-like symptoms to deadly conditions like Severe Acute Respiratory Syndrome (SARS), which is caused by the SARS-CoV virus. More serious and life-threatening strains, like Middle East Respiratory Syndrome (MERS), which is caused by the MERS-CoV virus and was first seen in the Middle East in 2012. Coronaviruses are thought to be a major cause of the common cold in both adults and children, especially in the winter and spring [1] .

COVID-19, or Coronavirus Disease 2019, is a serious respiratory infection that can lead to Severe Acute Respiratory Syndrome. On December 12, 2019, it was first found in Wuhan, China. It quickly spread around the world and became a pandemic [2] .

A new variant of the coronavirus, called VUT-2020-12-1, has been found. It has at least 17 different mutations that could change how it looks on the surface, especially in the spike proteins. The change in structure caused a mutation in the spike glycoprotein, which is what makes up the surface of the coronavirus. This new variant has a number of changes, such as the N501Y mutation, which makes it more dangerous than the original strain. This strain is different from the last one because it has been linked to problems with the heart and blood vessels, which can cause serious pulmonary thrombosis and a quick decline in health. The World Health Organization (WHO) says that the Indian variant of COVID-19 made India's healthcare system weak, which caused a big crisis. This variant was first found in Maharashtra State, western India, in October 2020. Since then, it has been found in at least 17 other countries. The Indian variant is similar to the South African and Brazilian strains, but it is more worrisome because it has unique changes that make it harder for the immune system to find and make antibodies. The main danger of this Indian variant is that it changes the spike protein, which lets it get around the host's immune system and spread more easily inside the body. It has a high transmission rate and can get past the body's defenses. Researchers are looking into how well vaccines work against this variant, which needs more research to figure out what makes it different and how resistant it is to vaccines [3] .

1.2 Transmission of the Coronavirus

Investigations into the main source of infection showed that the Wuhan seafood market was the source, as the first cases were thought to be linked to direct contact with sick animals in the market. On January 22, 2020, it was revealed that the novel coronavirus came from wild bats, which are known to be the natural reservoir for many zoonotic viruses that can infect humans. The precise intermediary host responsible for transmitting the virus to humans has yet to be identified; it may be a wild or domesticated animal, or contaminated animal tissue ingested by humans. The primary mode of transmission is human-to-human, mainly through respiratory droplets released when an infected individual coughs or sneezes [4] .

Studies show that being in close contact with someone for a long time greatly raises the risk of transmission. For example, people who live with someone who is sick are much more likely to get sick than people who don't live with them [5] [6] .

The virus can also spread indirectly through dirty surfaces or objects, and people who don't show any symptoms can pass it on to healthy people [5][6] .

There have been reports of vertical transmission from mother to fetus. A baby in France tested positive for SARS-CoV-2 using PCR on samples taken from blood from the umbilical cord and a swab from the nasopharynx. Additionally, examination of the placental tissue and amniotic fluid demonstrated the presence of the virus. Vertical transmission can happen, but it is thought to be very rare. Some research suggests that the fetus is somewhat protected from SARS-CoV-2 because viremia is rare and the viral receptor and co-receptor are not very common in the placenta. Also, some positive nasopharyngeal swab results in newborns not very common in the placenta. Also, some positive nasopharyngeal swab results in newborns may be due to contamination with secretions from the mother rather than an actual infection [7] .

1.3 Mechanism of Viral Infection in Humans

The pathophysiological mechanisms of coronavirus infection remain incompletely elucidated; however, extensive research is underway to clarify the pathogenic characteristics of these viruses, particularly the novel coronavirus (SARS-CoV-2), to mitigate their transmission. The primary organ impacted by SARSCoV-2 is the lungs, with potential involvement of the kidneys [7] .

SARS-CoV-2 must invade host cells to survive and replicate after entering the human body. The viral spike (S) protein and a specific receptor protein on the host cell membrane interact to allow the virus to enter the cell. Research has shown that angiotensin-converting enzyme 2 (ACE2) is the host receptor for SARS-CoV-2, just like it was for SARS-CoV [8] .

Angiotensinconverting enzyme 2 (ACE2), found in the lungs, heart, kidneys, intestines, blood vessels, and testes, is crucial for blood pressure control. ACE2 damage has been linked to heart disease. Recent research suggests that ACE2 expression increases with age, especially in males, within the respiratory tract, potentially elucidating the exacerbation of clinical symptoms in older individuals. There are two parts to the viral spike (S) protein: S1 and S2. At first, the S1 subunit attaches to the ACE2 receptor on the host cell. After that, a host cell serine protease, like TMPRSS2, cuts the spike protein at the S1/S2 junction and turns it on. This activation lets the S2 subunit help the viral envelope fuse with the host cell membrane, which lets the virus enter the host cell. When SARS-CoV-2 enters a cell, it takes over the cell's machinery to make copies of its RNA genome and proteins. The viral RNA and proteins are then put together into new viral particles inside vesicles. The host cell then releases the new virions so that the infection cycle can continue [9] .

The immune system in humans can find viral infections and quickly get rid of them. When the virus gets into the body, it can cause immediate cytotoxic effects and a stronger immune response. This overstimulation causes an inflammatory response throughout the body, which causes a cytokine storm that damages tissue later [10] .

Toll-like receptors (TLRs) and other host cell receptors can recognize either the whole virus particle or parts of it. When TLRs are turned on, they make more pro-inflammatory cytokines and interferons, which are the body's main natural defense against viruses. After that, immune cells gather at the site of infection and start to fight the virus. Because of this, lung epithelial cells make more mucus, which makes it harder for the lungs to do their normal job of exchanging gases (oxygen and carbon dioxide). This leads to symptoms like coughing, which releases respiratory droplets that contain viral particles. COVID-19 can manifest clinically as an upper respiratory tract infection, pneumonia, or Severe Acute Respiratory Syndrome (SARS). SARS is regarded as a pulmonary inflammatory disorder resulting from the hyperactivation of the immune system, which causes persistent lung damage. In extreme instances, multi-organ failure may ensue from extensive inflammation across various tissues, potentially leading to mortality [11] .

Some of the clinical signs that have been noted are tachycardia and hypoxemia, which are both related to the respiratory system. There have been cases of acidosis, hypoxemia, which are both related to the respiratory system. There have been cases of acidosis, which happens when the pH of arterial

blood drops. This condition activates peripheral chemoreceptors, which causes the respiratory rate to rise as a way for the body to maintain homeostasis[10] .

The COVID-19 pandemic has caused some of the biggest medical, social, and economic problems in recent history. In the absence of a fully efficacious antiviral treatment, decision-making and vaccination strategies are of paramount importance [9] .

1.4 Incubation Duration

There have been many studies to find out how long it takes for SARS-CoV-2 to infect someone. A study in Hubei Province, China, with 178 cases found that 95% of symptomatic people showed clinical signs an average of 13.7 days after infection, while 99% showed symptoms an average of 17 days after infection [12] .

Additional analyses revealed that more than 95% of patients exhibited symptoms within 14 days of exposure. Extensive research has determined that the typical incubation period spans from 5 to 6 days. The World Health Organization (WHO) says that the incubation period for SARS-CoV-2 is usually between 2 and 10 days, but in some cases, symptoms may not show up until 14 days later [12] .

1.5 The Best Time for Antibody Testing and Why It Matters

Antibody testing, also called serological testing or serodiagnosis, is usually done after a person has fully recovered from COVID-19. People may not be able to take this test if they can't get to a lab. A healthcare professional takes a blood sample, usually by pricking a finger or puncturing a vein in the arm, and then tests it to see if there are antibodies against the virus. Antibodies are important proteins that the immune system makes to fight and get rid of the virus. The results of the antibody test depend a lot on when and what kind of test it is. If the test is done too soon during an infection, before the immune response is fully developed, antibodies may not be found. Consequently, antibody testing is advised solely after a minimum of 14 days from the onset of symptoms to enhance the probability of detecting antibodies [12] .

1.6 Clinical Manifestations and Epidemiological Features

A study in Wuhan, China, with 99 patients, found that 68 (76%) were male and 32 (32%) were female. The main clinical sign was fever, which was seen in 82 cases (83%), and the second most common sign was dry cough, which was seen in 81 cases (82%). This study found that nausea and vomiting were the least common symptoms, affecting about 1% of participants [4] .

1.7 Complications SARS-CoV-2

Heart: Imaging studies done months after recovering from COVID-19 have shown that the heart is still damaged, even in people who only had mild symptoms. This makes it more likely that you will have heart failure or other heart problems[6] .

Lungs: COVID-19 pneumonia can hurt the alveoli, which are the tiny air sacs in the lungs, and this damage may last. The scar tissue that forms may make it harder for the lungs to work normally [6] .

Brain: Adolescents may suffer neurological complications, including strokes, subsequent to COVID-19 [6] .

Some adults and children develop multisystem inflammatory syndrome following COVID-19, which is marked by significant inflammation in multiple organs and tissues. A significant number of individuals recovering from SARS may subsequently develop chronic fatigue syndrome, a multifaceted disorder characterized by intense, enduring fatigue that fatigue syndrome, a multifaceted disorder characterized by intense, enduring fatigue that exacerbates with physical or mental exertion

and fails to ameliorate with rest. Similar results may happen to people who are recovering from COVID-19[6] .

1.8 Disease Diagnosis

In most cases, it is hard to tell the difference between a coronavirus infection and other common cold illnesses. It is especially hard to make an accurate diagnosis and keep track of clinical development when people suddenly get worse without any known underlying conditions or clear clinical signs [9] .

The World Health Organization (WHO) suggests that samples for SARS-CoV-2 detection be obtained from both the upper and lower respiratory tracts, encompassing sputum, bronchoalveolar lavage, or endotracheal aspirates. Reverse transcription polymerase chain reaction (RT-PCR) is used to find viral RNA in these samples. If the result is positive, it is best to test again to be sure; if the result is negative, it is also best to test again because false negatives can happen. The diagnosis is corroborated through the aggregation of patient data, clinical history, and supplementary laboratory tests, including standard blood analyses, renal and hepatic function assessments, and imaging studies. This thorough method helps doctors correctly identify the virus, evaluate the patient's clinical condition, and make sure that medical care is given quickly [6] .

1.9 Epidemiology

In December 2019, there were reports of several cases of pneumonia in Wuhan, China. The first case of atypical pneumonia was reported on December 12, 2019. There were officially 27 cases of viral pneumonia as of December 31, 2019, seven of which were very serious. The outbreak got worse around the Spring Festival in China in February 2020, when more people were traveling, which made the disease spread quickly. Wuhan was a major transportation hub, which helped the virus spread around the world [13] .

According to the most recent epidemiological reports ,there were more than 62 million COVID-19 cases worldwide by November 2020, with more than 40 million recoveries and fewer than 1 million deaths. According to the National Center for Disease Control, COVID-19 infections reach their zenith in winter, frequently manifesting as localized epidemics that may endure for weeks or months. After a few years, the region may see similar serological patterns again [4] .

1.10 Study objectives

This study seeks to examine the global dissemination of SARS-CoV-2 and the insufficient comprehension of its transmission mechanisms, emphasizing the deficiency of research undertaken in Libya despite its prevalent occurrence in various regions.

- Find the antibody titers for SARS-CoV-2 by looking at the microbiological and serological traits of the infection.
- Look at how the levels of antibodies in cases change based on how long the illness lasts.
- Examine the differences in antibody titers among various patient age groups.

1.11 Research problem

Even though SARS-COV-2is spreading around the world and more and more cases are being reported in Libya, there aren't enough thorough local studies looking at how the virus affects the immune system. There isn't enough information about the amount and distribution of antibody titers among infected people of different ages and illness duration. This lack of information makes it harder for the Libyan community to understand the immune response and makes it harder to come up with the right diagnostic and public health measures .

2. Materials and Methods

2.1 Specimens

The research involved 25 vials collected from patients at the isolation center of Barak General Hospital in the Barak Al-Shati region, spanning from August 1, 2021, to August 25, 2021. Serum samples were then collected alongside the completion of a questionnaire for each subject (Appendix). A complete blood sample was obtained from these people utilizing plastic syringes fitted with a G23 needle and transferred into 2 ml containers devoid of anticoagulant for antibody analysis. Thereafter, the samples were subjected to centrifugation to isolate serum from blood cells for analysis. Information concerning the patients' health status was also obtained directly from the patients.

2.2 Methods Employed

2.2.1 Patient Data

Data were retrospectively gathered from the medical records at the isolation center at Barak Al-Shati Hospital. The laboratory at the Barak Al-Shati branch of the Center for Communicable Disease Control confirmed the patients' infection with SARS-CoV-2 using the RTPCR technique. Communication was established with experts and supervising physicians in the isolation wards overseeing the patients to procure serum samples from the designated patients, in addition to complete blood count (CBC) data and the fulfillment of the study questionnaire.

2.2.2 Classification of Infection Severity

Cases were categorized depending on the patient's clinical status as follows:

- Mild cases: Patients exhibiting mild symptoms or asymptomatic status, diagnosed through routine tests and imaging that indicate altered pulmonary conditions, alongside a medical history demonstrating their capacity to manage symptoms and complications of the disease from a health standpoint. The patient's age and the physicians' evaluation of the necessity for medical seclusion were also taken into account.

- Moderate cases: Patients hospitalized with moderate symptoms, diagnosed with regular testing and imaging that reveal distinct and severe alterations in lung status. Physicians evaluated the patient's risk for heightened consequences and illness advancement, irrespective of age, and the medical history revealed no additional health issues.

- Severe cases: Patients were sequestered in specialized facilities due to pronounced symptoms, significant alterations in regular examinations, pulmonary imaging, and the patient's general health status as per medical history. The gravity of problems and physicians' apprehensions over the patient's state were also considered [14] .

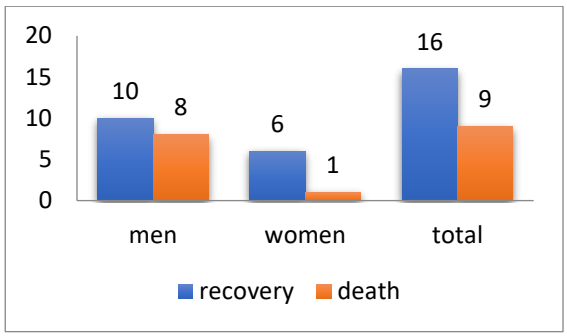
2.2.3 Tests

The tests were conducted utilizing solutions sourced from different firms, specifically ORP and D-dimer from Lansionbio, and antibody assay solutions from MAGLUMI. Statistical Analysis: The statistical program MiniTab 16 was employed to evaluate and compare various categories and factors. The Chi-square test was conducted at a significance level of 0.05 (P-value) to ascertain the presence of statistically significant differences. A correlation test was performed to determine the presence of strong positive or negative statistically significant relationships.

3. Results

3.1 Case Distribution and Clinical Symptoms

Of the 25 cases in the study, 18 (66.7%) were men and 7 (33.3%) were women.



Iiiustration 1: COVID-19 infection rates between genders , recoveries, and prevention.

Two patients (7.5%) were asymptomatic, while 23 patients (92.5%) had clinical symptoms.

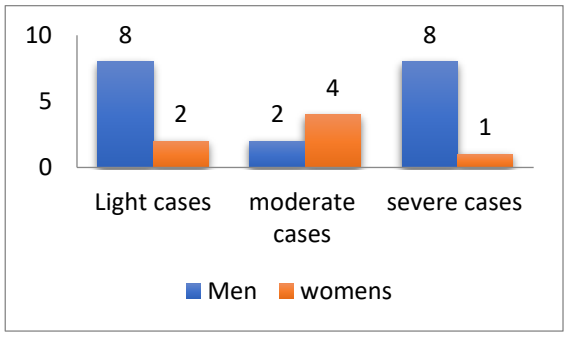
The following symptoms were noted:

Fever: 23 cases (92%) , 19 cases (76%) of generalized weakness and exhaustion , Headache: 18 cases (72%). , Ageusia and anosmia: 15 cases (60%) , 12 cases (48%) of dyspnea , 16 cases (64%) of dry cough , Two cases (8%) of acute respiratory distress , One case of nausea and vomiting (4%) .

Symptoms	Number	Percentage
No symptoms	2	8%
Fever	23	92%
General fatigue	19	76%
Headache	18	72%
Loss of taste and smell	15	60%
Dizziness and shortness of breath	12	48%
Cough	4	16%
Severe respiratory distress	2	8%
Nausea and vomiting	1`	4%

tabel 1:symptoms experienced by patients.

The distribution of cases by severity was as follows: 9 severe cases (36%), 6 moderate cases (24%), and 10 light cases (40%) .



iilustration 2: number of infected cases according to their severity .

3.2 Age-Based Case Distribution:

The study's patients ranged in age from 20 to 80. The following is the breakdown of COVID-19 cases by age group:

- Three cases (12%) occurred in the age group under 30.
- Age range of 30–40 years: 4 cases (16%) There were 8 cases (32 percent) in the 40–50 age group.
- Age range of 50–60 years: 4 cases (16%).
- Age range of 60– 70 years: 3 cases (12%).
- Age range of 70–80 years: 3 cases (12%) .

Significant differences between the age groups were revealed by statistical analysis ($\chi^2 = 8.601$; P = 0.014).

Age group	Males	Females	Total
<39	2 (8%)	1 (4%)	3 (12%)
40-50	2 (8%)	2 (8%)	4 (16%)
50-60	6 (24%)	2 (8%)	8 (32%)
60-70	3 (12%)	0	3 (13%)
70-80	4 (16%)	0	4 (16%)
80-90	3 (12%)	0	3 (13%)

tabel 3: the distribution of cases according to age grouping.

3.3 Chronic Illnesses in Infected Patients

Of the COVID-19 patients, 13 cases (52%) were linked to chronic diseases, while 12 cases (48%) had no underlying medical conditions. The following chronic diseases were prevalent in COVID-19 patients:

- Four cases (16%) of diabetes mellitus.
- One case of hypertension (4%).
- Nine cases (36%) of diabetes and hypertension co-occurred.
- One case (4%) of hypertensive heart disease .

Significant differences between the disease categories were revealed by statistical analysis (χ^2 = 8.601; P = 0.014).

Disease category	Males	Females	Total
No chronic disease	8 (32%)	4 (16%)	12 (48%)
Diabetes mellitus	0 (0%)	2 (8%)	2 (8%)
Hypertension	1(4%)	0 (0%)	1 (4%)
Diabetes mellitus and hypertension	8 (32%)	1 (4%)	9 (36%)
Cardiac problems with hypertension	1 (4%)	0 (0%)	1 (4%)

tabel 4: chronic diseases among the patients.

3.4 Hematological Characteristics and Antibody Levels in COVID-19 Patients

The lymphocyte percentages of COVID-19 patients were distributed as follows:

3.6%, 8.6%, 14%, 33.5%, 42.3%, 52%, 68%, 76%, 86%, and 99.3%, in that order. The same patients had CRP levels of 10 mg/dl, 10 mg/dl, 10 g/dl, 220 mg/dl, 32.79 mg/ dl, and 113.73 mg/dl, in that order.

The following were the D-dimer concentrations: 2 mg/dl, 5.5 mg/dl, 23 mg/dl, 25 mg/dl, 131 mg/dl, 220 mg/dl, 259.88 mg/dl, 531 ng/dl, 1000 ng/dl, 10,000 ng/ dl, 10,000 ng/dl, 110 ng/dl, 3720 ng/dl, 2344 ng/dl, and 1657.79 ng/dl.

The following was discovered by the Pearson correlation study:

- R = -0.5, P = 0.3 is the correlation between lymphocytes and CRP.
- R = -0.5, P = 0.1 is the correlation between D-dimer and lymphocytes.
- R = 0.5, P = 0.06 is the correlation between CRP and D-dimer.

3.5 Infections by Illness Stage

Six patients in all had antibody assays performed both during and after infection. The IgG and IgM antibody assay results from the first sampling were as follows:

(0.09–0.032 AU/ml); (0–0.112 AU/ ml); (30–33.11 AU/ml); (0–0 AU/ml); (2.386–11.15 AU/ml); and (0.39–0.677 AU/ml).

The following were the outcomes of the second sampling for the same patients:

(0.089–0.549 AU/ml); (31.84-2.013 AU/ml); (0.5–29.75 AU/ml); (47.58-3.049 AU/ml); (1.794–13.12 AU/ml); (3.101–0.612 AU/ml) ; (38.3-6.162 AU/ml).

3.6 The study of epidemiology

Eleven men (44%), and six girls (24%), made up the total of 17 recovered COVID-19 patients, or 68%. Eight deaths (32%), including one female (4%) and seven males (28%), were reported among COVID-19 patients.

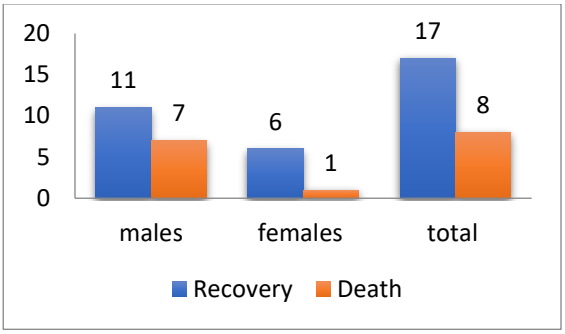


Illustration 3: number of recoveries and deaths from COVID-19 patients.

The novel coronavirus is a strain of the coronavirus family that had not been identified before and had not been found in humans. It is the etiological agent of the COVID-19 pandemic, zoonotic in origin, and transmissible between animals[1] .

Males (18 cases; 72%) were more susceptible to infection than females (7 cases; 28%), according to the study's findings. This finding is consistent with a study conducted in Wuhan, China, with 100 patients, of whom 32 (32%) were female and 68 (68%) were male [4] .

It also aligns with Tang and colleagues' research, which found that male patients made up 53.6% (98 cases) of the total, compared to 46.4% (85 cases) of the female patients. According to the study, 21 patients had an 11.5% death rate [15] .

According to the current trial's isolated patient mortality rate was a startling 36%. According to this study, fever was the most common symptom among COVID-19 patients, occurring in 23 cases (92%), followed by headache in 18 cases (72%), and general fatigue and weakness in 19 cases (76%). With only one case (4%), nausea and vomiting were the least common symptoms. The findings are consistent with a study conducted in China that found that fever was present in 82 patients (83%), while nausea and vomiting were the least common symptoms, occurring in just one case (1%) [4] .

Chronic illnesses are one of several factors that increase the risk of contracting COVID-19. 49.5% of the patients in this study had a chronic illness. This result is consistent with a previous study in China that found that 51% of cases involved patients with chronic illnesses, making them a vulnerable group. Similarly, Tang and colleagues reported that chronic conditions were present in 75% (41 cases) of the patients in their study. According to the current study, those with both diabetes and hypertension (41.9%) made up the cohort most at risk for infection. This finding is consistent with a study that examined 41 cases at Wuhan Hospital in China and found that diabetes was the most common subgroup among patients with chronic illnesses, accounting for 8 cases (20%) [7][15] .

Although patients under 39 years old had the lowest infection rate, with 4 cases (24%), the study's findings showed that the likelihood of infection increased with age. With 21 cases (22.6%), patients over 40 were the group most affected. This information is consistent with a Chinese study that found

that the age group most affected was 50–59 years old, with 30 cases (30.3%), while those under 39 years old had the lowest infection rate, with 10 cases (10%) (Chen et al., 2020). Several studies have demonstrated that SARS-CoV-2-infected patients exhibit lymphopenia, or a reduction in the number of lymphocytes. It's unclear exactly how the virus causes lymphocyte depletion. This is consistent with the results of the current study, which showed that 7 people had lymphocyte counts below the typical range of 20–45%. A 2020 study in China found a positive correlation (R = 0.6) between higher lymphocyte counts and inflammatory markers, but the difference was not statistically significant. According to Pearson correlation analysis, the current study found a positive but non-significant relationship between CRP and lymphocytes, with R = -0.5 and P = 0.3. Likewise, a negative but non-significant relationship between D-dimer and lymphocytes was observed (R = -0.5, P = 0.1). These findings support previous research [14] .

5. Conclusions and Suggestions

5.1 Conclusions:

The results showed that :

- men were more likely than women to be infected with COVID-19. Mild cases predominated, followed by moderate and then severe cases.
- Only 2% of cases showed no predominated, followed by moderate and then severe cases.
- Only 2% of cases showed no symptoms at all. Fever was the most common symptom seen in patients, while nausea and vomiting were the least common.
- Patients under the age of 39 had the lowest risk of infection, while those between the ages of 51 and 59 were the most affected.
- Individuals with long-term conditions were more likely to contract COVID-19.
- Diabetes patients were the most vulnerable to COVID-19 infection among chronic conditions.
- The death rate was higher than 36 percent.

5.2 Suggestions:

- Hold awareness seminars to educate the public about the latest developments and consequences of COVID-19 infection.
- The goal is to reduce misinformation, stop the spread of medical rumors, and improve public knowledge of the disease's most recent developments.
- People with suspected infections should be advised to get repeat medical swab testing if needed, and the importance of timely diagnostic testing in such cases should not be understated.
- To look at how the virus affects the patient groups most affected, more specialized clinical research is required.

- To evaluate antibody titers in individuals who have received the COVID-19 vaccine after a previous infection and recovery, more specialized research is required.
- Antibody titer testing should be performed on eligible plasma donors to determine the best time to achieve maximal levels of IgM and IgG.

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