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Review on the epidemiology and its public health importance on Middle East Respiratory Syndrome corona virus

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Abstract
The Middle Eastern Respiratory Syndrome Mers-Cov is a new zoonotic beta corona virus of the C lineage identified in dromedary camels in East Africa and the Arabian Peninsula that exhibits the dipeptidyl peptidase 4 (DPP4) receptor. It was first described in the Saudi Arabian kingdom of Saud in September of 2012, and worldwide in May of 2019. Camels are usually asymptomatic when afflicted. Unlike in camels, clinical signs and symptoms of MERS-CoV infection in humans range from asymptomatic or mild respiratory disease to severe respiratory illness and death. There is no pathognomonic manifestation in people or camels. Molecular and serologic tests are necessary to verify the diagnosis. There is presently no medication or vaccine available to treat or prevent MERS-CoV infection in humans. Strict restriction of camel movement, isolation of ill camels, camel handlers using personal protective equipment, and public awareness creation are all critical approaches for controlling MERS-CoV transmission, particularly among Ethiopian pastoralists who ingest unpasteurized camel milk. As a result, urgent epidemiological investigations are required, particularly in the nations' impoverished camel raising areas, to better understand the transmission patterns and human cases of MERS-CoV, as well as to guarantee that the aforementioned control measures are appropriately executed. As a result, the purpose of this study was to investigate the epidemiology and public health implications of MERS-CoV in Ethiopia's highly exposed pastoralist community, which has intimate contact with camels, and to recommend the illness for further epidemiological monitoring and inquiry.

Keywords: Camel, epidemiology, middle eastern respiratory syndrome, public health importance

1. Introduction
The Middle East respiratory syndrome coronavirus (MERS-CoV) is a newly discovered zoonotic virus that is creating widespread concern. It is a virus of the nidovirale order, which includes the corona viridae, arteryviridae, and coronaviridae families and is the most numerous group of corona viruses (Covs). It is a coronavirus-related Middle East respiratory syndrome virus that causes a viral respiratory illness. It is also known as camel flu (MERS-CoV). MERS cases were first reported in the Kingdom of Saudi Arabia in September 2012, and the virus was formally recognized internationally in May of this year [1, 2].
MERS-CoV has been discovered in dromedaries in the Middle East, Africa, and South Asia. Since 2012, 27 nations have recorded instances, with 858 people dying as a result of the virus and its complications. The great majority of MERS cases were recorded in Saudi Arabia, followed by the Republic of Korea. The virus's origins and exact mode of transmission are unknown, however it is suspected that it began in bats and was subsequently transmitted to dromedary camels at some time in the distant past based on the examination of distinct viral genomes [3].
The mode of disease transmission is unknown as well, but various studies suggest that it occurs through direct or indirect contact with dromedary camels (for example, camel milking, contact with camel nasal secretion, urine, or feces) or camel products such as unpasteurized camel milk, raw or undercooked camel meat [4].

Farmers, slaughterhouse workers, shepherds, dromedary owners and family members, and health care personnel caring for MERS-CoV patients are likely to be more vulnerable [5]. Individuals infected with MERS-CoV may experience no symptoms, moderate to severe respiratory disease, or even death. Human-to-human transmission is conceivable, especially in medical settings and among family members living in the same residence [6].

No or asymptomatic infection, moderate symptoms such as fever, cough, gastrointestinal illness, and shortness of breath, as well as severe disease such as pneumonia, acute respiratory distress syndrome, and mortality, are all part of the clinical spectrum. The illness can be lethal, especially for the elderly or people with compromised immune systems [7]. Specific laboratory testing, such as real-time reverse transcription polymerase chain reaction (RT PCR) on camel respiratory samples and serum, is required to confirm infection. MERS CoV is now believed to be a significant host for dromedary camels [8]. According to the Ethiopian Central Statistical Agency, dromedary camels constitute a subset of important livestock resources in Ethiopia, with a population estimated at 1, 209,321 individuals [9].

They are common in Ethiopia's lowlands, notably in the Afar, Somali, and Oromia areas, where pastoralism is the main way of life and mobility is an intrinsic strategy for optimally exploiting the geographically and temporally scattered pasture and water supplies. Large herds of camels and other domestic animals congregate around watering holes, offering an ideal habitat for disease transmission and spread among animals [10].

Camel serum from several nations were discovered to contain antibodies to MERS CoV, and African countries are being investigated as a probable source of MERS-CoV establishment in the Middle East. Despite the fact that MERS-CoV isolates from camels and humans are almost similar. A recent study confirmed that, unlike the West African MERS-CoV virus, the Ethiopian Camel MERS-CoV shared genetic and phenotypic similarities with isolates from camels in the Arabian Peninsula, as well as a high prevalence of Mers-Cov antibodies, implying zonootic transmission to Ethiopia's high-risk population. As a result, it is regarded as a major hazard to human health. [11].

There are, however, limited active studies on the virus's public health importance and geographic spread in a high-risk pastoralist population in Ethiopia that has intimate contact with camels. The primary purpose of this research is to provide a thorough evaluation of the epidemiology and public health relevance of MERS-CoV in Ethiopia's highly exposed pastoralist group that has intimate contact with camels.

2. Litrature review

Coronaviruses may be found all over the world and cause a wide range of diseases in humans and animals. Coronaviruses are capable of causing mild to severe sickness in humans, including the common cold and severe acute respiratory syndrome (SARS). In September 2012, a new strain of the Coronavirus MERS-CoV (previously known as novel coronavirus) was detected in persons suffering from severe acute respiratory infection in the Kingdom of Saudi Arabia [12].

Saudi Arabia is the Middle East's MERS-Cov infection hotspot. Because they have a distinct cultural and religious practice, millions of Muslims from all over the world go to Saudi Arabia to undertake Hajj and Umrha rites. This might jeopardize the disease's global propagation. Since September 2012, 27 countries in the Middle East, North Africa, Europe, the United States of America, and Asia have reported MERSCoV infections [13].

The World Health Organization has received reports of 2143 laboratory confirmed cases of MERS CoV and at least 750 deaths worldwide, with the kingdom of Saudi Arabia accounting for 82% of the cases. According to the most recent report of the WHO on Saudi Arabia, 20 cases, including nine deaths, were reported between December 9, 2017 and January 17, 2018 [14]. From May to July 2015, South Korea experienced the largest MERS outbreak outside of Saudi Arabia, with 186 cases and 39 deaths (case fatality rate: 21 percent) [15]. Dromedary camels are assumed to be the source of human infection [16]. Humans are assumed to become infected by coming into close touch with an infected camel's mucosal membrane or by drinking unpasteurized camel milk [17].

According to the findings, the virus can only transmit from person to person. Travelers afflicted in the Arabian Peninsula and nearby nations, as well as close family contacts and healthcare personnel, have transferred MERS to other countries. Because no vaccines or particular antivirals have yet been produced, supportive care will continue to be the primary stay of case treatment [18].

2.1 Etiology

Respiratory syndrome in the Middle East The illness is caused by corona virus (MERS-CoV), an enveloped, positive sense, single stranded RNA virus with a genomic size of around 30,000 nucleotides [19]. The virus is a member of the coronaviridae family (order: nidovirales, subfamily: coronavirinae, genus: Beta corona virus) and lineage C. Corona virinae are divided into four categories [20]. Alpha, beta, gamma, and delta coronaviruses MERS-CoV is a virus that belongs to the Beta corona virus family [21].

The genomes are generally classified into two clades: clade A, which includes just a few strains, and clade B, which includes the great majority of strains [22]. MERS-CoV may persist on plastic and metal surfaces for 48 hours at 20°C and 40% relative humidity, which is similar to an indoor environment. In aerosol tests, MERS-CoV retains the bulk of its viability at 20 °C and 40% relative humidity. Higher temperatures or relative humidity levels reduce viability. MERS CoV remained infectious in unpasteurized camel milk for more than 72 hours after being introduced, but no infectious viruses were discovered after pasteurization [23].

MERS-CoV RNA and live virus have also been recovered from dromedary camel nasal and fecal samples, which may exhibit no indications of infection yet excrete the virus in nasal secretions, feces, milk, and urine. Bats may have been an early reservoir of MERS CoV, although this has yet to be verified. According to numerous studies, the virus has an average incubation period of 5 to 6 days, and an infected individual needs 13 to 14 days to acquire clinical sickness and then transfer to another person. Transmission might occur during the asymptomatic or incubation phases. Death can occur between 11 to 13 days in progressively ill people, although it can also occur between 5 and 27 days [24].

2.2 Epidemiology

The first instances of corona virus infection were reported in Saudi Arabia, notably Jeddah, on June 13, 2012; following this epidemic, corona virus spread to other countries in Asia, Africa, Europe, and America [25]. The bulk of cases during this epidemic occurred in Middle Eastern nations such as Saudi Arabia, Qatar, the United Arab Emirates, Oman, Bahrain, Kuwait, and Iraq, as well as Jordan, Syria, Lebanon, Palestine, and Egypt. These nations, according to the European Centre for Disease Prevention and Control, are considered to be at high risk of corona virus infection [26].

MERS-CoV epidemiology in Saudi Arabia is characterized by health-care-associated outbreaks, sporadic cases with no apparent linkages to other known cases, and sporadic cases with no apparent links to other known cases [27]. MERS CoV developed from bat ancestors by an evolutionary recombination process, largely in African dromedary camels, before being transferred to the Arabian Peninsula via camel commerce routes, according to phylogenetic analyses and viral sequencing data [28].

Dromedary camels are the sole known viral reservoir and the principal source of zoonotic transmission to humans, according to current epidemiological findings. MERS-CoV can infect other livestock species; however, attempts to inoculate goats, sheep, and horses with live MERS-CoV did not result in viral shedding, and no epidemiologic data has linked any animal other than dromedaries in virus transmission [29].

Although MERS-CoV has been discovered in camels virtually all year, certain studies demonstrate a greater seroprevalence and virus detection during the milder winter and spring months. The seasonal fluctuation between winter and spring might be explained by a number of factors. MERS-CoV infections and viral excretion, for example, are more prevalent during the winter calving season. Furthermore, camel and human movements increase significantly throughout the winter season owing to camel racing contests, camel breeding, commerce, and moves to grazing areas, increasing the potential of viral dissemination. Furthermore, colder temperatures, particularly during the spring season, may increase viral survivability in the environment [30].

Indeed, multiple investigations have connected human cases to contact with infected camels, with MERS-CoV isolates detected in both camels and people [31]. Furthermore, people who work with camels have a much higher seroprevalence rate than the overall population, showing that camel exposure is a key risk factor [32].

Active MERS infection was discovered in dromedary camels from 15 different Asian (Saudi Arabia, UAE, Qatar, Oman, Iraq, Jordan, Kuwait, Iran, and Pakistan) and African (Egypt, Ethiopia, Kenya, Nigeria, Burkina Faso, and Morocco) countries [33]. According to more recent study, Ethiopia has a high seropositivity rate of 99.4% and a substantially higher MERS-CoV RNA detection rate in Ethiopia camels (15.7%) than in Burkina Faso (12.2%) and Morocco (7.6 percent). As a result, they are strongly suspected of being a zoonotic source for human MERS-CoV infections in Ethiopia, either directly by droplet infection via mucosal membranes or indirectly via milk, meat, or urine. [34].

2.2.1 Species affected and source of MERS-CoV

Active MERS infection was discovered in dromedary camels from 15 different Asian (Saudi Arabia, UAE, Qatar, Oman, Iraq, Jordan, Kuwait, Iran, and Pakistan) and African (Egypt, Ethiopia, Kenya, Nigeria, Burkina Faso, and Morocco) countries [33]. According to more recent study, Ethiopia has a high seropositivity rate of 99.4% and a substantially higher MERS-CoV RNA detection rate in Ethiopia camels (15.7%) than in Burkina Faso (12.2%) and Morocco (7.6 percent). As a result, they are strongly suspected of being a zoonotic source for human MERS-CoV infections in Ethiopia, either directly by droplet infection via mucosal membranes or indirectly via milk, meat, or urine. [36].

Bats have been found to be natural reservoirs for a variety of new viral illnesses in humans, including rabies, Nipah virus, Hendra virus, and Ebola virus [37, 38, 39, 40]. Due to their incredibly varied species and extensive evolutionary history, as well as their lack of B-cell-mediated immune responses, bats have co-evolved with a range of viruses, allowing them to carry viruses without presenting overt clinical indications of viral infections. [41, 42].

Bats have delayed viral clearance due to their low metabolic rate and decreased immune response during hibernation, making them potential reservoirs for numerous viruses. The most prevalent animals afflicted by Middle East respiratory illness and exploited as a source of infection are Homo sapiens (humans), camels, and bats [43]. Despite the fact that llamas and alpacas are harmed marginally, notably in Israel and Qatar [44].

2.2.2 Transmission Method

The principal modes of transmission include nasal mucus, sputum, saliva, milk, or raw meat from infected camels. Droplets or direct touch, on the other hand, can be a secondary mode of transmission, and the virus can spread through the air or fomites [45]. The majority of transmission in humans has happened in the setting of intimate contact with a very sick individual in health care, however there is no evidence of symptomatic transfer [46].

2.2.3 Risk factors in Humans

Camel workers offer a substantial risk factor for primary and household transmission of MERS CoV, such as camel training, milking camels, contact with camel waste, and inadequate hand cleanliness before and after contact with a camel. Those who have pre-existing medical co-morbidities have worse illness and a greater death rate than patients who do not have co-morbidities [47].

Advanced age, male sex, co-morbid illness (heart disease, obesity, diabetes, kidney disease, lung disease, and immunocompromised states), low serum albumin concentration, concurrent infection, positive plasma MERS CoV RNA, professional other than health care workers, altered mental capacity, high pneumonia severity index score on hospital admission, and sign of severe inflammation at initial presentation are all risk factors for poor outcome in people infected with MERS-CoV [48].

The MERS CoV Dipeptidyl peptidase 4 receptor has been reported to be increased in smokers' and chronic obstructive pulmonary disease patients' lungs, which may explain why individuals with concomitant lung illness are more vulnerable to severe infection [49]. People who have intimate contact with dromedary camels, MERS CoV patients, and health care personnel caring for MERS-CoV patients are at a greater risk of infection than the general population [50].

2.2.4 Risk Factor in Dromedary Camels

MERS-CoV infection in dromedary camels is influenced by age and gender. MERS-CoV antibody seroprevalence increases with age in camels, although virus shedding decreases as a result of numerous serological investigations, as measured by MERS-CoV RNA detection in nasal swabs. Camels under two years old, for example, have a median seroprevalence of 52% (992/1972; range 0-100%), while camels aged 2-5 years (702/924; range 30-100%) and beyond 5 years (1226/1370; range 0-100%) had a combined median seroprevalence of 97 percent [51].

The presence of MERS-CoV RNA in male vs female camels has shown inconsistent results. Some research report that female camels have much greater seroprevalence than males, whilst others find the reverse or no significant difference [52].

When comparing the distribution of male and female camels, it is important to remember that females are primarily used for milking and reproduction, as well as being in closer contact with calves, which are more susceptible to infection and shed virus in greater quantities than older camels, and thus have a higher chance of contracting MERS-CoV [53]. Male camels are the more prevalent sex in slaughterhouses and among transportation camels, and they move more, resulting in increased interaction with other camels and herds, and hence a higher risk of MERS-CoV infection. [54].

2.2.5 Status of MERS-CoV

MERS has resulted in 2434 laboratory confirmed human cases with a case fatality rate of 36% (876 fatalities) recorded globally from the time the virus was initially detected until May of this year. By the end of May 2021, there had been a total of 2574 laboratory confirmed MERS cases recorded worldwide, with 886 fatalities (case fatality ratio 34.4 percent). The vast majority of these cases (2167) were recorded from Saudi Arabia, where 804 people died as a result of the disease, representing a 37.1 percent case fatality rate. According to these findings, the virus is still spreading with a high death rate, posing a concern to public health throughout the Middle East and around the world. Africa is home to 77 percent of the world's 28.5 million dromedary camels, with Somalia (6.2 million), Sudan (4.8 million), Kenya (3 million), and Ethiopia having the greatest camel populations (1.2 million). Only 4% of the total is accounted for by the Arabian Peninsula. In the Arabian Peninsula, Qatar and the United Arab Emirates have the largest density of camels per land area [55].

In 2013, 500 dromedary camel sera were examined in the United Arab Emirates (UAE), and 96 percent of them were seropositivity [56]. In Ethiopia, MERS-CoV seroprevalence in camels has been observed to be high. According to reports, substantial numbers of animals from Nigeria and Ethiopia were seropositive for MERS CoV, with an overall seropositivity of 94 percent in adult dromedaries in Nigeria and 93 percent and 97 percent in juvenile and adult camels in Ethiopia, respectively [57].

A recent investigation demonstrated that, unlike the West African MERS-CoV viruses from Burkina Faso and Nigeria, the Ethiopian camel MERS-CoV exhibited genetic and phenotypic characteristics with isolates from Arabian Peninsula camels, indicating zoonotic transmission to Ethiopia's human population. Despite the virus's high seropositivity, Ethiopia has only had a few evaluations and research on epidemiological monitoring and the virus's public health relevance [58].

Table 1: Summary of MERS-CoV seroprevalence reports in Dromedary Camels from various countries

Countries	Prevalence in Camels	References
Saud Arabia	92.7%	[59]
UAE	82%	[60]
Israel	71.8%	[61]
Sudan	99%	[62]
keniya	76.3%,	[63]
Nigeria	72%	[94]
Ethiopia	87.3%	[65]

2.3 Public Health significance of MERS-CoV

Because of its high mortality rate and extensive dispersion, the Middle East respiratory syndrome corona virus (MERS CoV) has been a global public health issue since its discovery in 2012 [66]. One of the most important public health problems is this highly pathogenic virus, which has a high fatality rate. Saudi Arabia is the most impacted location, with the bulk of MERS-CoV infections, and there are presently no viable medications or vaccinations for prevention and treatment [67].

In 2002, the severe acute respiratory syndrome corona virus (SARS-CoV) was responsible for the first zoonotic transmission of a corona virus to humans. SARS-CoV produces a global pandemic, according to WHO, with 8,400 reported infection cases and 800 fatalities; similarly, MERS-CoV is the second known zoonotic introduction of a highly deadly virus. Middle East respiratory syndrome in humans was initially found in 2012 in Saudi Arabia, and in May 2015, more than 1000 infection cases were recorded, with around 40% of those infected dying as a result of the condition [68].

HCoV-EMC/2012 is a MERS-CoV strain that has been determined to have 100% same viral sequencing to the virus discovered in Egypt from tomb bats. This finding implies that MERS-CoV is primarily transmitted by bats, who then transmit the virus to camels, who then transfer the virus to people [69].

In Ethiopia, MERS-CoV seroprevalence in camels has been found to be high, ranging from 93 to 97 percent in pastoral camel raising regions. Ethiopia has remained a possible concern due to its closeness to the Near East and North Africa, where MERS-CoV exists in people and camels, as well as frequent travel for business and religious activities. A recent research found a high incidence of MERS-CoV in Amibara district camels (87.3 percent (n=514/589), 95 percent CI: 84.5-89.9) and 85.1-99.4 percent in Afar and Oromia area camels. Despite studies showing a high incidence of MERS-CoV antibodies in camels, no human cases have been documented to yet. The public health impact of MERS-CoV in a highly exposed pastoralist population in Ethiopia with intimate contact with camels has not been examined due to a lack of continuing investigations and evaluations. As a result, further monitoring and research are necessary in both the camel and exposed human populations in the nation [70].

2.4 Pathogenesis

Understanding of MERS-CoV pathogenesis has been hampered due to a paucity of patient autopsy or pathology materials [71]. *In vitro* investigations on animal models and human lung cell lines from a single autopsy, however, show that they infect and multiply in human airway epithelial cells while reducing interferon production. The virus is typically spread by the respiratory droplets of infected persons, which enter the human body through the respiratory tract mucosa [72].

The MERS-CoV virus predominantly interacts with the host dipeptidyl peptidase-4 (DPP4, also known as CD26) receptor via its spike (S) protein after entering the respiratory system. Many human organs, including the lungs, kidneys, liver, bone marrow, thymus, and intestines, have DPP4 receptors on their epithelial surfaces [73].

DPP4's systemic distribution helps viral spread in the human body. In the respiratory tract, DPP4 is largely expressed on type I and type II pneumocytes, endothelial cells, nonciliated bronchial epithelial cells, and a few kinds of hematopoietic cells [93].

The receptor DPP4 is more prevalent on the epithelial cells lining the lower airways and alveoli and less abundant on the upper conducting airways and nasal cavity. According to recent studies, having a past lung illness may enhance the risk of developing MERS because chronic pulmonary ailments result in higher DPP4 expression [75]. MERS-CoV infection is more severe in those who have chronic lung illness, renal failure, diabetes, or have a weaker immune system [76].

2.5 Clinical Symptoms

2.5.1 Clinical Signs in Humans

MERS-CoV infects humans and produces a range of symptoms, from asymptomatic to acute respiratory infection with moderate to severe respiratory episodes and death. After a 2 to 14-day incubation period, symptomatic MERS CoV is frequently presented. More than half of MERS patients have been observed to suffer acute renal impairment within ten days of the beginning of symptoms, necessitating renal replacement treatment in the majority of instances. Direct renal injury, namely the presence of DPP4 in renal cells and MERS-CoV in urine, is considered to contribute to the common symptoms of acute renal impairment in MERS patients [77].

The condition is frequently more severe in those who already have health problems, and the most common symptoms are fever, cough, shortness of breath, and pneumonia, which is a common consequence. Rhinorrhea, sputum production, wheezing, chest discomfort, Myalgia, headache, and malaise, rigors, sore throat, nonproductive cough, dyspnea, rigors, and chills are some nonspecific symptoms of respiratory tract infection. People may also have gastrointestinal problems such as diarrhea, nausea, or vomiting [78].

People with severe symptoms may require hospitalization for a lengthy period of time in order to get mechanical breathing and critical care. Rapid clinical deterioration with respiratory failure frequently happens a few days after these early symptoms appear. A high temperature, tachypnea, tachycardia, and hypotension are all symptoms of worsening [79].

2.5.2 Clinical signs of MERS-CoV in Dromedary Camels

Camels infected with MERS CoV show relatively mild clinical indications of illness in general, and most MERS-CoV infections do not appear to generate any symptoms. This suggests that the virus has been present in the camel population for some time. Coughing, sneezing, respiratory discharge, fever, and lack of appetite have all been recorded as signs of camel infection in the laboratory and in the field [80].

2.6 Diagnosis

The majority of diagnostic laboratories are still concerned about MERS-Cov diagnosis. However, epidemiologic history is essential for making diagnosis and avoiding epidemics. There is no pathognomonic clinical indication of the illness in people or camels. As a result, molecular and serologic tests to validate the diagnosis are required. Because of their antigenic similarities, antibodies against beta coronaviruses have been reported to cross-react with antibodies against other species of the genus. The gold standard for diagnosing MERS-CoV infection is still viral detection in respiratory tract samples [81].

2.6.1 Polymerase Chain Reaction

Molecular tests are utilized to detect active infection (the presence of MERS-CoV) in patients suspected of having MERS-CoV based on clinical symptoms and linkages to MERS-infected locations (CDC, 2020). The technology is exceedingly sensitive, capable of producing millions to billions of copies of a certain product for sequencing, cloning, and analysis [82].

It is one of the most dependable laboratory procedures utilized as a confirmatory test in the diagnosis of MERS CoV. Lower respiratory materials, such as sputum, tracheal aspirates, and bronchoalveolar lavage fluid, are chosen for RT-PCR because they have the largest viral loads and consequently yield [83].

Upper respiratory tract specimens, such as nasopharyngeal and oropharyngeal swabs, nasopharyngeal aspirates or wash, and serum collection, are advised for viral identification, especially if lower respiratory specimens are unavailable and symptoms have been present for 7 days or less. Urine and stool samples, on the other hand, are acceptable. When compared to respiratory tract specimens, however, these specimens have a lower amount of the virus. A variety of factors influence the effectiveness of RT-PCR testing, including laboratory personnel experience and skill, laboratory environment characteristics such as contamination avoidance, and the kind and condition of specimens being tested. The first probe and primer sets for MERS-CoV detection by RT-rtPCR were produced shortly after the illness was initially reported. Real-time reverse transcription PCR (RT-PCR) targeting upstream of the MERS CoV E protein gene is utilized to test for current MERS-CoV infections in camel nasal swabs. For confirmation, the World Health Organization-recommended open reading frame (ORF) 1a gene was employed [84].

2.6.2 Serology testing

As a result of the MERS-CoV outbreak, serology testing is no longer utilized for diagnosis, but rather for epidemiologic surveillance or research reasons (example, retrospective diagnosis). It is used to identify past infection in patients who have been exposed to the virus (MERS-CoV antibodies). Antibodies are proteins produced by the immune system during infection to fight and eliminate viruses, bacteria, and other organisms [85]. MERS-CoV antibodies indicate that a person was previously infected with the virus and established an immune response. To identify MERS CoV antibodies, an indirect fluorescent antibody (IFA) test, an enzyme linked immunosorbent assay

(ELISA), and a serum neutralization test were developed [86].

2.7 Treatment

There is no authorized therapy for MERS in either animals or humans at the moment. However, several medications show promise and may prove to be important therapeutics in the future. Remdesivir, for example, decreased illness severity, viral multiplication, and lung damage in mice when given before or after MERS-CoV infection. Despite being an interesting pharmacological option for the treatment of Middle East respiratory syndrome, nitazoxanide is a novel medicine that has been extensively investigated in clinical trials and post-marketing experience [87].

In humans, the treatment is supportive, such as (pain relievers such as acetaminophen and ibuprofen, which are used to reduce fever and pain, bed rest, which helps your body fight the illness, IV fluids, which are given through the vein to help keep your body hydrated, and oxygen supplementation, which ensures your body has enough oxygen) [88]. All suspected or confirmed MERS patients should be quarantined in addition to being isolated [89].

2.8 Prevention and Control

With no herd immunity in the general population and limited effective treatment and immunization options, infection control measures to interrupt the chain of transmission remain the cornerstone of controlling the MERS epidemic, as they have been for other novel emerging respiratory virus epidemics [90].

The fundamental aims of community infection control are to identify and isolate all zoonotic reservoirs as well as infected persons from nonimmune people. It is better to avoid coming into touch with settings that have been polluted by animal body fluids, tissues, or excrement. MERS-CoV may be shed and persist in the milk of camels with active nasal or fecal virus shedding, hence unpasteurized camel milk should be avoided. Public education and the dissemination of diagnostic testing to health care institutions can help discover human cases early [91].

In nations where MERS-CoV is already prevalent in dromedary camels, preventive interventions are unlikely to work. As a result, control techniques such as stringent restriction of camel movement, including the installation of a MERS-CoV clearance requirement prior to importation and carriage of camels, including those submitted for slaughter, are being adopted. Camels with MERS-CoV RNA should be confined and tested on a regular basis. It is stressed that anyone dealing with dromedary camels must wear personal protection equipment. It is critical to make efforts to educate camel owners and the general people about the hazards of consuming unpasteurized camel milk and urine. Accelerated development of safe and effective MERS-CoV vaccines for use in animals or humans as part of MERS-CoV preventive measures [92].

3. Conclusions and Recommendation

MERS-CoV is a zoonotic emerging virus illness, and dromedary camels have been a significant source of its development, outbreak, and epidemiological pattern in recent years, making it a global public health issue. The route of illness transmission is uncertain, however several studies suggest that it happens through direct or indirect contact with dromedary camels or camel products such as raw or undercooked camel meat. Due to Ethiopia's large camel population (1,209,321), the disease's danger level is quite high, and the Ethiopian Camel is particularly vulnerable. MERS-CoV has a significant frequency of Mers-Cov antibodies due to genetic and behavioral similarities with isolates from camels in the Arabian Peninsula. As a result, these camels are mostly found in the lowlands of some of the locations where pastoral populations live. The following recommendation is made as a result of the above finding.

1. In camel-rearing pastoralist settings, public knowledge of the condition should be raised. As part of a coordinated health approach, continuous epidemiological surveillance and molecular detection of MERS-CoV infection in camels and people in camel raising regions should be begun.
2. More research and analysis of the disease should be done, taking into consideration all elements of MERS-CoV sickness, including identifying risk factors that can be used to manage the disease.
3. In a catastrophe situation, collaboration between the human and animal health sectors is crucial for recognizing the danger of MERS-CoV transmission between animals and humans.

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