



A review on Covid-19 (Corona Virus Disease), Transmission and Pathological effects

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Abstract

In response to public health, it is necessary to write a review on COVID-19 disease as emerging zoonotic disease. Transmission of the new pathogen SARS-CoV-2 virus have several ways , spill – over or Evolutionary jump help virus to spread from one host to another with a rapid adaptation (Epidemiological cycling) .

Covid-19 can transmitted from animals to humans (Zoonotic disease) or from humans to animals (Zooanthroponosis) or from humans to humans (Emerging Infectious disease) or from animals to animals as infectious disease .

On other hand some several wild animals considered reservoir host such as bats , snakes , frogs , hedge-hog , wild rats , marmots and rabbits . [17 , 16]

Since December 2019 when Covid-19 emerged in human from seafood market at Wuhan , Huanan city south China , rapidly transmitted all over the world as viral outbreak .

Introduction :

Zoonosis is an infection that is naturally transmitted from vertebrates animals to human , therefore animal population are maintained continuous source of human infection [25 , 26]

Fisher [6] mentioned that Viral infection can be acquired by humans through direct contact with animals or indirect exposure by vector-borne or by food-borne.

Spill-over events is the term used to describe when a virus has overcome naturally

occurring barriers necessary to spill over from one species to another leading to a new infection. Spill-over is a chance occurring , normal cycling infection , and frequently seen in human with immunodeficiency . In recent years HIV Ebola , Influenza , yellow fever , dengue , measles were studied as viral out break [27] .

Zoonotic viral infection (Covid-19 , AID, Influenza and Rabies) can occur due to wild animals (free or domesticated) as a emerging diseases from animals to humans .

Zoonotic transmission of viral diseases , 70% of these diseases were originated from wild animals while 30% were originated from domesticated wild animals [11 , 12 , 18] .

[25 , 26] wrote a list of epidemic diseases such as Covid-19 , Ebola , Lassa fever , SARS-cov-2, Rift Valley fever.

[29] considered Covid- 19 as a zoonotic , pandemic disease , similar to the SARS – CoV – 1 that emerged during 2002 .

[26] official data reported 4,628,903 confirmed cases and 312,009 deaths on 18 may 2020 due to COVID-19 infection .

Patients suffered from acute respiratory sings , symptoms were recorded , Autopsies were done for dead human patients in USA

in National Center for Emerging and Zoonotic Infectious Diseases . These cases were consulted (positive to PCR test for CoV- 2) . Swab specimens collected before and after death . Routine hematoxyline - eosin stains were performed for histopathologic evaluation . Electron microscopy diagnosis was done for the same specimens (lung and upper respiratory tract) fixed in formalin . Rabbits used as experimental animals preparing polyclonal antibody against SARS- CoV -2 .

In this review most characterization of Covid – 19 as zoonotic disease are summarized from several researches and reports .

Results :

COVID-19 :

Pandemic outbreak of Covid-19 caused by SARS-CoV-2 is a natural and has an animal origin through spillover infection

The first infection of human with COVID-19 were detected and confirmed in 41 cases in Wuhan city, Hubei Province in Seafood market in China , where a live and slaughtered animals are purchased in this market , like hundreds markets in that region [28 , 23 , 24 , 5] .

Transmission :

Causes of human infection , characterized by mild pathological changes in upper respiratory tract but can infect the lower respiratory tract and cause a sever and fatal respiratory syndrome [1 , 32] .

COVID-19 spreads from person to person mainly through respiratory route by coughing , sneezing , talking , breathing . Infected droplets or aerosols get into mouth , nose and eyes (airborne). Kissing , direct contact can easily transmit the virus leading to COVID-19 disease [1] .

COVID-19 transmit through food (Foodborne) , drinking water, breast milk , contamination with infected feces and urine , Also can transmitted from mother to her baby during pregnancy . Vectors can play important role in cause of transmission virus among animals and from animals to human .

One of the most important of cause of infection is the food which is depend on

animals (domestic and wild) such as dog , cats poultry , camels , bats , minks , rats , wolves , foxes , bamboo fishes . Hundreds markets are selling live and slaughtered animals in Wuhan , As well as Food production in restaurants and home deliveries sometimes contaminated [9 , 15]

Experiments were done on animals who had exposed to infected human (positive owners for COVID-19) , these animals include domesticated cats , dogs , ferrets , managed mink , lions and tigers (zooanthroponosis) . Studies have shown that cats , ferrets and primates are susceptible to infection with SARS-CoV- 2 and can transmit the virus . Zoo animals including a tiger and lion were reported to have been infected by zoo career . Zooanthroponosis infections (human to animals) in Netherland , Spain and Denmark also reported [16 , 21 , 20] . [14 , 15] . Worked on human- animal interactions and bat coronavirus spillover potential among rural residents in southern China and reported meat factories were the source of infection , Serological surveillance of the workers and farmers proved that .

[9] mentioned that risk of Coronavirus transmission is increase along with wildlife consumption by human in South East Asia , fur and network trade marketing , as well as zoo-anthroponosis (reverse zoonosis) occur .

Other researchers speculated the proximal origin of SARS-CoV-2 could have resulted from natural selection in animal species before its evolutionary jump into humans or after a zoonotic transfer. the virus was naturally selected within the human population. [1 , 2]

A study was done by [12] Concluded increase of viral abundance with growing domesticated animals species population in proximity to human , changes in livestock food system in response to increase demand for animal products .

Swab samples collected from surfaces and cages in the market tested were positive for SARS-CoV-2 , majority of positive samples

were taken from animals , wild animals reared in captivity farm .

Pathophysiology :

Samples of (COVID-19) were prepared from people suffered sever acute respiratory syndrome (Histopathological lesions , predominant in respiratory tissues) . coronavirus 2 (SARS-CoV-2) , upper respiratory tract (nose , throat and sinuses) are effected as well as the lower respiratory tract (trachea , bronchi , bronchioles and alveoli) also affected , therefore lung mostly affected by COVID-19 infection , finally respiratory failure [3] . [3 , 32] isolated a novel coronavirus . from patients with pneumonia . SARS-CoV-2 may also affect central nervous system (virus detected in cerebrospinal fluid of autopsies) . [12] .

COVID-19 can cause acute myocardial injury and damage to the cardiovascular system . An acute cardiac injury was found in 12 % of infected people admitted to the hospital in Wuhan , China and with high rates of cardiovascular symptoms [30 , 31] .

Main pathological findings at autopsy are : Lung consolidation and pulmonary oedema . Bronchopneumonia , Serous exudation with fibrin exudation (Serofibrinous exudate) with sever acute respiratory Syndrome coronavirus 2 infection , multinucleated giant cells are present in lung tissue , alveolar spaces contain extracellular virions (electron microscope) . Macroscopic pericarditis , Intravenous Coagulation (Thrombosis) in heart and brain [19] .

[19] published a research work on effects COVID-19 on liver cause injury , damage to the liver tissue and at the end hepatic failure .

Signs and Symptoms :

Coronavirus have variable signs and symptoms , fever or chills (sometimes low and others high fever) , loss of taste , loss of smell , cough , shortness of breath or difficulty , Fatigue , difficulty in walking . Mortality rates for COVID-19 vary but higher among the elderly persons that suffering from immunosuppression [19] ,

people suffering diabetes , hypertension , heart disease [1 , 30 , 31] .

Complications :

[22] worked on hematological findings and Complications , secondary infection with opportunistic bacteria . Most complications are including pneumonia , kidney failure , thrombosis , heart attack , enteritis , multi-organs failure .

Management and Treatment :

COVID-19 patients must be wear simple face mask and need supportive care include fluid therapy , Oxygen support .

Patients must be under health care with special diet to improve immunity . Cell mediated immunity and antibody production . Immunity of this disease long – lasting in people who recover from the disease. [7 , 8] .

At the beginning , hydroxychloroquine or chloroquine used as treatment with vasodilators , corticosteroids , immune therapy , lipoic acid , bevacizumab , interferon beta . Food and Drug Administration (FDA) in united states gave the drug an emergency use authorization [10] .

Conclusions :

1 – Pandemic outbreak of COVID-19 caused by SARS – CoV- 2 . 2 – Direct or indirect main sources of outbreak are animals and their products .

3 – Raw or Under cooked meat is a source of transmission of virus from animals(wild and domestic) to human .

4 – Wild life is a reservoir host for coronavirus and many causative agents for several diseases .

5 – Social distancing and wearing Surgical mask to control and prevent droplets transmission .

7 – Maintain good ventilation and good air circulation .

8 - Increase risk of death with Elderly people suffered chronic diseases , diabetes , hypertension , heart diseases and immunosuppression .

References :

1 – Adams ML, Katz DL , Grandpre J . Population- Based Estimates of Chronic Conditions Affecting Risk for Complications

- from Coronavirus , United States .Emerging infectious Diseases; 2020. 26 (8) : 1831 – 1833 .
- 2 - Andresen KG , Rambaut A , Lipkin WI , Holmes EC , Garry RF , . The proximal origin of SARS-CoV-2 . Nat Med.; 2020. 26: 450 – 452.
- 3 - Barton LM, Duval , EJ, Stroberg E, Ghosh S , Mukhopadhyay S.. COVID-19 Autopsies , Oklahoma , USA . Am. J. Clin . Patho.; 2020. 153 : 725 – 733 .
- 4 - Bialek S , Boundy E , Bowen V , Chow N , Cohn A , Dowling N , . Sever outcomes among patients with coronavirus disease (COVID-19)- United State , Google Scholar; 2019.
- 5 - Cohen J. . Wuhan seafood market may not be a source of novel virus spreading globally . Science doi; 2020. 10 : 1126 .
- 6 - Fisher CR, Streicker DG , Shnell MJ (2018) . The spread and evolution of rabies virus conquering new frontiers . Nat. Rev. Microbio; 2018. 6 : 241- 255 .
- 7 – Gu J . Kortewerg C. Pathology and Pathogenesis of sever acute respiratory Syndrome . Am . J . Patho.; 2020. 170 , 1136 – 1147 .
- 8 - Huang C, Wang Y , Li X , Ren L, Zhao J , Hu Y , . Clinical features of patients infected with 2019 novel coronavirus in Wuhan , China . Lancet; 2020. 395: 497- 506 .
- 9 - Huong NQ , Nga NTT , Van Long , Luu BD , Latinne A, Pruvot M0 , . Coronavirus testing indicate transmission risk in Viet Nam , bioRxiv; 2013. 1 – 29 .
- 10 - Johnson BA , Grace D , Kock R , Alonso S , Rushton J, Said MY, . Zoonosis emergence linked to agricultural intensification and environmental change . Proc. Natl. Acad. Sci USA; 2013. 110 :
- 11 - Jones KE , Patel NG , Levy MA , Storeygard A, Balk D, Gittleman JL . Global trends in emerging infectious diseases . Nature; 2008. 451 : 990 – 997 .
- 12 - Letko M . Marzi A. Munster V. Functional assessment of cell entry and receptors usage for SARS-CoV-2 and other lineage B betacoronaviruses . Nature Microbiology ; 2020 . , 5 (4) 562 - .
- 13 - Li H , Mendelson E, Zong C, Zhang W , Hagan E, Wang N , . Human-animal interactions and bat coronavirus spillover potential among rural residents in southern China . Biosaf . Heal. ; 2020 . 1 : 84-90 .
- 14 - Li Q , Guan X, Wu P , Wang X , Zhou L , Tong Y, . Early transmission dynamics in Wuhan , China , of novel coronavirus – infected pneumonia . N . Engl. J. Med ; 2020 . 382 : 1199- 1207 .
- 15 - Li X , Zai J , Zhao Q , Nie Q , Li y , Foly BT, Evolutionary history , potential intermediate animal host and cross – species analysis of SARS-CoV-2 . J . Med. Virol . ; 2020 . 92 : 602 -611 .
- 16 – Mohamed A. Mahdy , Waleed Younis and Zamzam Ewaida . An overview of SARS , Covid – 2 and animal infection . fronter in vet. Science ; 2020 . , 11 , 2020 .
- 17 - Needham , Joseph . Science and Civilization in China . Volume 6 , Biology and Biological Technology , part 6 , Medicine . Cambridge , Cambridge University press ; 2000 . P. 154 .
- 18 - Plowright RK, Parrish CR, McCallum H , Hudson PJ , Ko AL ,Graham AL . Pathways to zoonotic spillover . Nat. Rev. Microbiol. ; 2017 . 15 : 502 – 510 .
- 19 - Ro osecelis , B . M. *et al* . Pathology and pathogenesis of SARS- CoV- 2 associated with fatal coronavirus , United States . EID , J. Vol. 26 ; 2020 . , No. 9 : 435 .
- 20 - Shi J . Wen Z , Zhong G , Yang H , Wang C , Huang B , . Susceptibility of ferrets cats , dogs and other domesticated animals to SARS – coronavirus 2 . Science; 2020 . , 368 : 1016 – 1020 .
- 21 - Sit THC , Brackman CJ , Ip SM, Tam KWS , Law TWS , . Infection of dogs with SARS-CoV-2 . Nature ; 2020 . 586 : 776 – 779 .
- 22 - Terpos E., Stathopoulos I, Elalamy I, Sergentanis , TN, Politou M. . Hematological findings and complications of COVID-19 . Am. J. Hemato.; 2020 . 12 : 120 .
- 23 - Wang N , Li S-Y , Yang X-L , Huang H – M, Zhang Y-J , Guo H , . Serological evidence of that SARS - related coronavirus in humans , China . Virol . Sin; 2018 . 33 : 104 – 107 .

- 24 - Wang C, Horby PW, Hayden FG, Gao GF. . A novel coronavirus outbreak of global health concern. *Lancet*; 2020. 395 : 470 – 473 .
- 25 - WHO (World Health Organization) , . Zoonosis. *Health Topics* ; 2020. Geneva .
- 26 - WHO (World Health Organization) , . Coronavirus disease (COVID-19) Pandemic. 2020 May 4 .
- 27 - Wolfe ND, Dunavan CP, Diamond J, . Origin of major human infectious diseases. *Nature* ; 2007. 447 : 279 – 283 .
- 28 - Wu, YC. Chen Cs. Chan YJ. . The outbreak of COVID-19 An overview . *J. of the Chinese Medical Association* ; 2020. 83 : (5) 217 – 220 .
- 29 - Yoo HS, Yoo D , . COVID-19 and veterinarians for one health , zoonotic and reverse-zoonotic transmissions . *J. Vet. Sci.* ; 2020. 21: 51 – 57 .
- 30 - Zhang T, Wu Q, Zhang Z, . Probable Pangolin origin *Biol.* ; 2020. 30 : 1346 – 1351 .
- 31 - Zhang C, Shi L, Wang FS , Liver injury in COVID-19 : Management and challenges . *Lancet Gastroenterol Hepato* ; 2020. 5 : 428 – 430 .
- 32 - Zohu N. Zhang D. Wang W. Li X. Yang B, Song J. A novel coronavirus from patients with pneumonia in China. *N Engl J.*; 2020. 382 : 727 – 733 .