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REVIEW

Novel corona virus disease (COVID-19): An updated review on epidemiology, pathogenicity, clinical course, treatments, migrant health concerns and risk factors predictions

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Abstract: The COVID-19 epidemic is considered the most important health disaster of the century and the largest humanitarian crisis since World War II. In December 2019, a new respiratory disease/disorder was discovered in Wuhan, Hubei province, China and World Health Organization named it COVID-19 (coronavirus 2019). It has been diagnosed with a new class of corona virus, called SARS-CoV-2 (a serious respiratory disease). According to the history of human civilization it is affected by the incidence of disease outbreaks caused by the number of viruses. Covid-19 is rapidly spreading across the globe, due to which mankind faces major health, economic, environmental and social challenges. The outbreak of coronavirus is seriously affecting the global economy. Almost all nations have problems limiting the spread of the disease by screening and treating patients, setting up suspects by keeping in touch, blocking large gatherings, maintaining full or partial closure etc. This paper describes the impact of COVID-19 on society and the global environment, and the ways in which the disease is likely to be controlled have been discussed.

Keywords: COVID-19, viral structure, innate immunity, diagnosis, vaccination, treatment, transmission.

INTRODUCTION

Life become much easier due to development in science and technology. People prefer mental calculations and solution rather than physical struggle. Industrialization has led the environment towards pollution (Bhagat, Reshmi *et al*., 2020). No doubt, the inventions and products are facilitating the human life in various ways however, lowering of self-work trend leads to poor physical capacity and immunity also. On daily basis, new pathogens come into being and the reason may be termed as pollution which directly attack the weaken immune system till death. One of the pathogen like that is Corona Virus (COVID-19), which is a new group of virus causes the major enzootic and pandemic infection (Ali, Jatoi *et al*., 2020). It belongs to coronaviridae family with in

Nidovirales order (Sarparast and Saffar, 2015). It is an enveloped RNA virus and named as corona after their Crown Like Projection image on electron microscopy (Schoeman and Fielding, 2019). It is derived from a Latin word corona, means halo or crown (Arvapalli, Lalini *et al*., 2020).

Worldwide rumors related to the origin are floating around regarding this very Novel Corona virus. Several conspiracies are rising regarding this pandemic as follows:

Corona virus named SARS-2 has been reported at the end of November (year) in Chinese city of Wuhan (Wang, Tang *et al*., 2020). Firstly reported the reasons of breakout that was the emergence from veterinary market of Wuhan (Mustafa, Zahoor *et al*., 2020). Kristian G Anderson from Scripps research institute proposed two possible origins of novel corona; (i) in one scenario the virus evolved to its

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current pathogenic state through natural selection in a non-human host and then jumped to humans (ii) and the other scenario, a non-pathogenic version of the virus jumped from an animal host into humans and then evolved to its current pathogenic state within the human population (Klitting, Mehta *et al*., 2020).

The initial cases were reported in December 2019 (Du Toit, 2020). In January 30, 2020, when the principal imported case in reported on January 30, 2020 in Tibet Province accounted for the spreading of COVID-19 in 31 territories of Chinese mainland (Jin, Yang *et al*., 2020). No matter from where this virus evoked, it proved to be fatal and not only fatal but also resulting in birth of different internal fears in every individual (Beheshtkhoo, Alipour *et al*., 2020). People are getting psychologically abused; poor due to lockdown to avoid the transmission of this pandemic (Xafis, Schaefer *et al*., 2020). This virus, which has greatly attacked the world's economy, has also patched its influence on educational system, health care system, migrant system, transport system and also the tourism all around the globe (Harari, 2020).

Every coin has two ends and every autumn brings a spring along. So, in this virus, the pollution of all types has been controlled to a very great extent resulting in a stronger immune system of all which is simultaneously helping every soul to fight against the disease (Ahmed *et al*., 2020). Thinking and reasoning is a part of human nature. Several questions are arising in minds of people of all ages regarding this virus. The most common of all question is, "How does the virus look like?" "How it enters the body and affects the immune system?" "How it replicates, transmit from one to other host?" "How its presence can be diagnosed?" "What can be the possible ways of medication to treat this condition and to prevent?" This review article will throw light on all the above mentioned questions of the virus under discussion along with preparedness plans and guidelines to follow from World Health Organization for whole affected worlds including migrants suffering with fewer facilities provided and its effects known to be the great threat to the public health systems, educational and transportation systems.

Biological origin & physicochemical properties
In view of their morphology as circular virions with a center shell and surface projections looking like a sun powered crown, they were named COVID (Latin: corona = crown). COVID are isolated into four genera, in particular alpha, beta, gamma and delta corona viruses exist. however alpha and beta corona viruses evidently begin from warm blooded creatures can taint vertebrates, specifically from bats, gamma and delta viruses start from pigs and fowls will in general contaminate them (Velavan and Meyer, 2020). The other two known β-COVIDs, SARS-COVID and MERS-COVID lead to severe and potentially fatal respiratory tract infections (Guo, Liao *et*

al., 2020). Previously, six COVIDs have been identified as human-susceptible virus, among which α-COVIDs HCoV-229E and HCoV-NL63 and β-COVIDs HCoV-HKU1 and HCoV-OC43 with low pathogenicity, cause mild respiratory symptoms similar to a common cold, respectively. The SARS-COVID-2 is a β-coronavirus, which is enveloped non-segmented positive-sense RNA virus and belongs to coronaviridae family with in Nidovirales order (subgenus; sarbecovirus, subfamily; Ortho-coronavirinae) (Zhu *et al*., 2020). The virus appears oval or round and diameter is about 60~100 nm. The information identified with physicochemical properties of COVIDs comes from SARS-COVID and MERS-COVID (Jin *et al*., 2020). The fundamental standards of avoidance and control of irresistible sicknesses are to take out the wellspring of disease, removed the course of transmission and secure the defenseless populace. SARS-CoV-2 is essentially communicated through respiratory beads and contact (Yang and Wang, 2020). This infection inactivate with UV light or temperature up to 56°C for at any rate 30 minutes and furthermore by using sanitizers, for example, chlorine, diethyl ether, 75% ethanol, per acetic corrosive and chloroform. SARS CoV-2 is stable on different surfaces like steel, plastic and cardboard. It can be detected after 72 hours on these surfaces (van Doremalen, Bushmaker *et al*., 2020b) (table 1).

Corona virus structure
Coronavirus contains genome- sRNA covered by protein named capsid additional digital covering in it which is not in all viruses hence corona virus is enveloped virus (Artika *et al*., 2020). The envelop is surrounded by spike proteins (S-proteins). The purpose of spike protein is to attach on the receptor cell in order to get in the cell through particular receptor and ultimately start replication process. Different receptors are used by many corona viruses for invasion e.g., the HCoV-229E receptor is aminopeptidase N (also called CD13), and the SARS-COVID receptor is ACE2 (Kuba *et al*., 2005). DPP4 also known as CD26 is the receptor for MERS-COVID.

ACE2 is the receptor for COVID-19 (Zhou *et al*., 2020). Human angiotensin-converting enzyme 2 (ACE2) a functional receptor is occupied spike protein (Yang *et al*., 2020, Zhou *et al*., 2020). The angiotensin 2 receptor is Glycosylated. It means this receptor contains many carbohydrates group that help the receptor to stay active and performs its activity affectively. If the receptor will not be glycosylated, the binding of spikes protein and Angiotensin 2 receptor will also affect and the virus will not able to get into the cell (fig. 1).

Mechanism of human cell destruction
The virus infection cycle includes receptor involvement on host cell membrane surface. On the coronavirus surface, the S protein is known and attached to the receptor and then assault the host cell via endocytosis mediated by clathrin. The corona virus binds with

angiotensin 2 receptor of host cell. After binding the virus enters into the membrane bounded organelle, called Endosome of human host cell. The two mechanisms through which the viral RNA comes out of the endosome in cytoplasm are; (i) The viral and outer layers of endosome fuse and viral RNA and enters in the cytoplasm of the host cell. (ii) The endosome fuses with the lysosome of the host cell, the enzymes of lysosomes break the protein covering of virus in endosome and the genome(RNA) comes into the cytoplasm of the host cell (Brandenberger *et al*., 2020).

Corona virus mRNA already contains polyase tail and 5'-methylated cap which help it to identify the ribosomes of the cell easily to get attach and start forming protein. The first protein formed is RNA dependent RNA polymerase (Chen *et al*., 2020). The viral RNA contains polyase protein on 3' end and 5 methylated cap is presented on the 5' end of RNA. The RNA dependent RNA polymerase formed by the translation attaches to viral RNA and form a new RNA by moving on 3' to 5' which formed copy into 5' to 3' and continues replication. The unique property of this replication is to form RNAs of different sizes and attach to ribosomes to formed different inactive proteins. The protease enzyme presents in the cell to cut the long immature and inactive fragments of the protein formed by translation into small active fragments. Now these active fragments formed new copies of corona virus in the cell. Hence the cell lost its function and burst and this corona virus diffuses to the other cells of the body and starts the same mechanism (Del Rio and Malani, 2020) (fig. 2).

Human immune response against corona virus

The immune response is vital for the control of corona virus infection. It also leads to immune pathogenesis. The viral RNAs, as pathogen associated molecular patterns are detected by human pattern recognition receptors; TLR3, TLR7, TLR8, TLR9 sense viral RNA and DNA in endosome. RIG-1, MDA5, cGAS, DPP4R are responsible for the recognition of viral RNA and DNA in cytoplasm. A few plasma mediators, cytokines and chemokines were experienced assembled in covid-19 patient, including; IL-1, 2, 4, 7, 10, 12, 13, 17 GCSF, macrophage colony stimulating factor, IP-10, MCP-1, MIP-1 alpha, hepatocyte growth factor (HGF), IFN-gamma and TNF-alpha. The complex signaling recruits adaptors including TIR-domain containing adaptor protein to trigger. Downstream cascades molecules including; IFN-B (TRIF), MAVS & STING (Tanne, 2020) Presented in table 2 (table 2).

The innate immune response of Coronaviruses (COVID-19) infection is needed in a precise regulation to eliminate the virus, otherwise result in immunopathology. This leads to worsen the lungs injury. The corona virus first invades respiratory mucosa and get access to other cells like WBCs and triggering a series of immune responses in the body, which may be associated with the recovery or critical condition of COVID-19 patient in the case of viral resistance or poor immune system. (Guo *et al*., 2020).

Innate immunity
Extra cellular response & Intracellular response
COVID-19 taints macrophages, and afterward macrophages present COVID-19 antigens to T cells. This cycle prompts T cell enactment and separation, including the creation of cytokines related with the distinctive T cell subsets (i.e., Th17), trailed by a huge arrival of cytokines for safe reaction amplification. CD8 T cells produce compelling middle people to clear COVID by apoptosis (Guo *et al*., 2020, Sheikh *et al*., 2020).

Attachment of COVID-19 to DPP4R on the host cell through S protein leads to the appearance of genomic RNA in the cytoplasm. An immune response to viral RNA can be partially generated during COVID-19 replication. TLR-3 and TLR-4 (recognizing receptor) sensitized by viral RNA and cascades of signaling mechanisms (IRFs and NF-κB startup, respectively) are started to produce type I-IFNs and pro-inflammatory cytokines.

Type I IFNs production is important to elevate the discharge of antiviral proteins including IFN-B (TRIF), MAVS & STING for the protection of uninfected cells. Sometimes, accessory proteins of COVID-19 can interfere with TLR-3 signaling and bind the viral RNA of COVID-19 during replication to prevent TLR-3 activation and unfortunately evade the immune response creating viral resistance against natural innate immunity and hence leads to fatal effects of COVID-19. However, TLR-4 might know the S protein and lead to the startup of pro-inflammatory cytokines. The emission of enormous amounts of chemokines and cytokines (IL-1, IL-6, IL-8, IL-21, TNF-β, and MCP-1) is advanced in tainted cells in light of COVID-19 disease. These chemokines and cytokines, thus, select lymphocytes and leukocytes to the site of disease (fig. 3).

Epidemiology, susceptibility and population on high risk
Latest findings suggest that diseased persons of 60 years old are at high risk than children who may be less likely to be infected or may have milder or even without symptoms (Velavan and Meyer, 2020). In China, 30~65-year-old persons account for 71.45% and children under age of 10 account for 0.35% (Yang *et al*., 2020). Symptoms of COVID-19 normally appears after the 5.2 days of incubation period (Li *et al*., 2020). The total period of COVID-19 from onset of symptoms to death ranges from 6-41 days, whereas the median is on 14 days (Wang *et al*., 2020). This range depend upon the immunity system and age of the infected individual (Wang *et al*., 2020). The time from symptom onset to

Table 1: Physicochemical properties of COVID-19

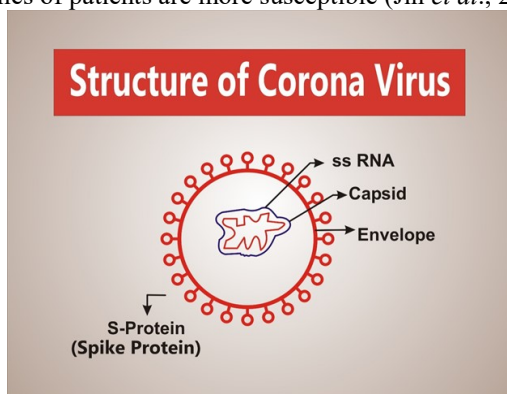| Parameter	Inference	References
Shape	oval or round	(Van Doremalen, Bushmaker *et al*., 2020a)
Encapsulated	Encapsulated with spikes protein	(Ibrahim, Abdelmalek *et al*., 2020)
Diameter	60~100 nm	(Van Doremalen, Bushmaker *et al*., 2020a)
Inactivation	Inactivate with UV light or temperature upto 56°C for at least 30mins and also sensitive to detergents such as chlorine, diethyl ether, 75% ethanol, peracetic acid and chloroform	(Cascella, Rajnik *et al*., 2020, Van Doremalen, Bushmaker *et al*., 2020a)
Stability	Stable on different surfaces like steel, plastic and cardboard. It can be detected after 72 hours on these surfaces	(Guo, Liao *et al*., 2020)

Table 2: Immune response components

Components of immune system	Types of components on immune system	References
Viral binding sites	S, N and E protein	(Dayer, 2020)
Human pattern recognition receptors	TLR3, TLR7, TLR8, TLR9 sense viral RNA an DNA in endosome.	(Kawai and Akira, 2010)
	RIG-1, MDA5, cGAS, DPP4R are responsible for the recognition of viral RNA and DNA in cytoplasm.	(Wilkins and Gale Jr, 2010)
Plasma mediators	IL-1, IL-2, IL-4, IL-7, IL-10, IL-12, IL-13, IL-17,GCSF, macrophage colony stimulating factor, IP-10, MCP-1, MIP-1 alpha, hepatocyte growth factor (HGF), IFN-gamma and TNF-alpha.	(Bozza, Cruz *et al*., 2008)
Adaptor protein	IFN-B (TRIF) , MAVS & STING	(Zhong, Chen *et al*., 2018)
Signaling pathways	IRFs and NF-Kb	(Oeckinghaus, Hayden *et al*., 2011)

recovery ranged from 12 to 32 days. Two consecutively negative RT-PCR test results, evidence from clinical features and chest CT findings suggested that the patients qualified for hospital discharge or discontinuation of quarantine (Lan Xu *et al*., 2020).

Elderly people with comorbidities like asthma, diabetes, hypertension, respiratory disorders & cancers are more susceptible of this infectious disease (Liang *et al*., 2020). Obesity and smoking are also the risk factors (Jia *et al*., 2020). This range depend upon the immunity system and age of the infected individual (Wang *et al*., 2020). The personals in direct contact with patients or infected individuals either having symptoms or not are included in high risk population. Healthcare providers and the families of patients are more susceptible (Jin *et al*., 2020).

Fig. 1: Structure of the Corona Virus (ssRNA, Envelop, S-Protein).

Clinical manifestation
COVID-19 symptoms normally show after 5.2 days incubation period (Li *et al*., 2020). The total period of COVID-19 from onset of symptoms to death ranges from 6-41 days, whereas the median is on 14 days (Wang *et al*., 2020). This range depend upon the immunity system and age of the infected individual (Wang *et al*., 2020). The range is shorter for more than 70-years age group while comparatively higher for less than 70-years age group population (Wang *et al*., 2020). The organ abnormalities were like the first examinations (Chan, *et al*., 2020, Chen, *et al*., 2020, Song *et al*., 2020). The main clinical manifestation of COVID-19 are fever (90% or more), dyspnea (up to 50%), cough (around 75%) and significant appearance of gastrointestinal symptoms (Rothan and Byrareddy, 2020). Moreover, most common symptoms at onset of COVID-19 illness are fever, cough, and fatigue, while other symptoms include sputum production, headache, hemoptysis, diarrhea, dyspnea, and lymphopenia (Huang *et al*., 2020, Ren *et al*., 2020). Acute kidney damage after kidney failure was presented. Among patients admitted to ICU, on the day of admission to ICU, the Glasgow Coma Scale, Sequential Organ Failure Assessment, and Acute Physiology and Chronic Health Evaluation II scores were set. Durations from onset of illness to admission to hospital, dyspnea, ARDS, and admission to ICU were presented (Huang, Wang *et al*., 2020). Abnormalities in chest CT images were detected among all patients.

Table 3: Psychological impacts of Covid-19

Type of study	Reviewed Information	References
Online survey	By original weibo data pool it was found an increase in negative emotions (anxiety, depression, and indignation) and sensitivity to social risks, as well as a decrease in positive emotions (Oxford happiness) and life satisfaction after declaration of COVID-19 in China.	(Lei, Li *et al*., 2020)
Short review	Pakistan being a collectivistic culture highly dependent on socialization has been critical towards self-isolation, social-distancing and quarantine and are reluctantly dealing with psychological impact of quarantine includes post-traumatic stress disorder, confusion and frustration.	(Mukhtar, 2020)
self-administered survey	It was examined the psychological distress, depression, anxiety, and stress experienced by health care workers and concluded that nonmedical health care personnel are at highest risk for psychological distress during the COVID-19 outbreak.in Singapore.	(Blake, Bermingham *et al*., 2020)
Survey	The level of toxic stress has significantly increased among Belgian active population because quarantined parents and quarantined hospital staff warranted a diagnosis of "trauma-related mental health disorder and high depressive symptoms.	(Jayaprabha and Jayavardhini, 2020)
Cross sectional survey	In an article of Mental Health Strategies to Combat the Psychological Impact of COVID-19 Beyond Paranoia and Panic, the author highlighted the fragility of mental resilience and the need for the provision of coordinated psychological intervention to the nation.	(Ong, Tan *et al*., 2020) (Ho, Chee *et al*., 2020)
Literature review	Sub-syndromal mental health problems are a common response to the COVID-19 pandemic. There is a need for more representative research from other affected countries, particularly in vulnerable populations.	(Rajkumar, 2020)
Online survey	Nurses, frontline medical staff and younger medical staff were more likely to have anxiety and depression than physicians, non- frontline medical staff and older medical staff respectively. Although serious psychological impact of COVID-19 is not so common in the medical staff in China, programs are needed to protect them against the negative impacts of COVID-19.	(Guo, Liao *et al*., 2020)
Review article	Mental health support and follow-up should be provided even 6 months after the release from isolation for those individuals with prior vulnerable mental health status. The current focus on the transmission of COVID-19 infection all over the world may probably distract public attention from psychosocial consequences of the outbreak in the affected individuals and in the general population.	(Torales, O'Higgins *et al*., 2020)

Table 4: Economical impacts of Covid-19

| Type of study	Reviewed information	References
Survey	Investors are more worried about corporate debt and liquidity, indicating widespread concerns that the health crisis may evolve into a financial crisis and economic loss.	(Ramelli and Wagner, 2020)
Review article	The prevalence of coronavirus throughout china and world 219-2020 has had a great impact on every field of life as well as at economic status of world.	(Wang, Cheng *et al*., 2020)
Online survey	The consequences of the COVID-19 also have associated adverse economic implications, which have badly affected the travel industry, disrupted the supply chain and stock exchanges and slowed the global economy in his review article.	(Shah and Farrow, 2020)
Online survey	The financial markets have seen dramatic movement on an unprecedented scale. Global financial market risks have increased substantially in response to the pandemic. The great uncertainty of the pandemic and its associated economic losses has caused markets to become highly volatile and unpredictable.	(Zhang, Tu *et al*., 2020)
Review article	In response to this global outbreak, author summarize the current state of knowledge surrounding COVID-19 which effect on economic condition worldwide.	(Sohrabi, Alsafi *et al*., 2020)
Online survey	This article discusses the economic impact of the Coronavirus/COVID-19 crisis across industries, and countries. It also provides estimates of the potential global economic costs of COVID-19, and the GDP growth of different countries.	(Fernandes, 2020)
Review article	In this review article sparked fears of an impending economic crisis and recession. Social distancing, self-isolation and travel restrictions have led to a reduced workforce across all economic sectors and caused many jobs to be lost. Schools have closed down, and the need for commodities and manufactured products has decreased.	(Nicola, Alsafi *et al*., 2020)

The typical findings of chest CT images of ICU patients on admission are bilateral multiple lobular and sub segmental areas of consolidation, while the representative chest CT findings of non-ICU patients showed bilateral ground-glass opacity and sub segmental areas of consolidation. After that chest CT images showed bilateral ground-glass opacity, whereas the consolidation had been resolved (Huang *et al*., 2020, Lei *et al*., 2020). (fig. 4).
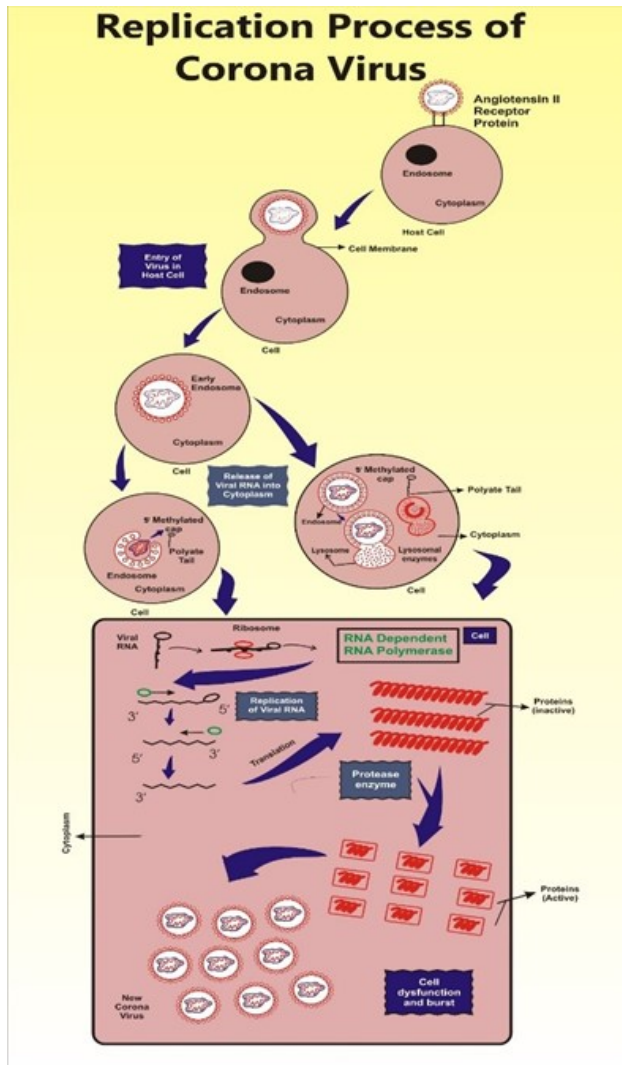
Fig. 2: Corona Virus Mechanism of Human Cell Destruction/Replication of Corona Virus.

The individuals affected with COVID-19 have showed the gastrointestinal signs and symptoms like diarrhea; however, SARS-COVID or MERS-COVID exhibited lower percentage of GI distress. Therefore, fecal and urine sample testing is compulsory to eliminate the conceivable another rout of spreading specially the healthcare workers and patients. Therefore, progress methods for identify the altered mode of administration such as fecal and urine samples instantly required to develop the schemes for hindering or decreasing transmission & making

therapeutics to control the illness (Rothan and Byrareddy, 2020).
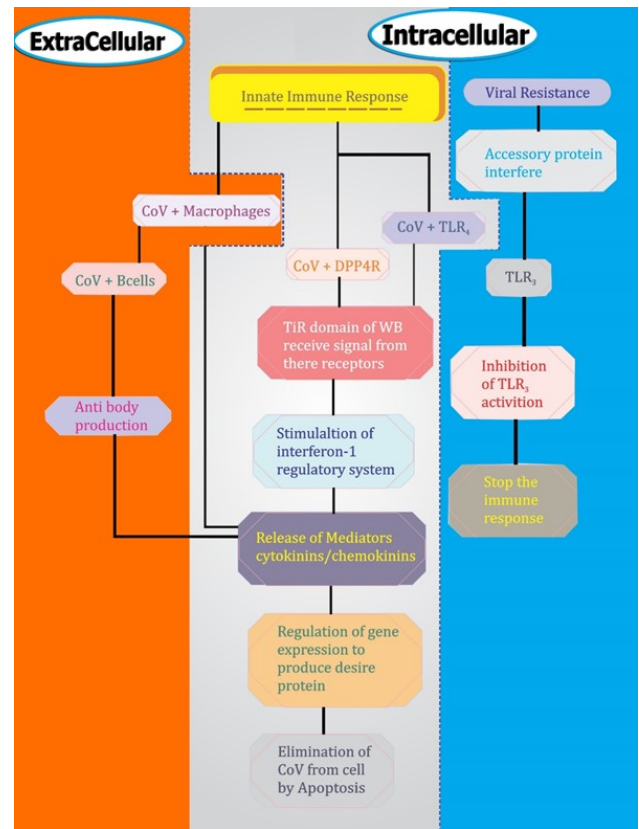
Fig. 3: Corona Virus Vs Innate Immunity/Innate Immune Response to Corona Virus.

Detection/Diagnosis
With the successful virus isolation and genome sequencing of SARS-CoV-2, the current diagnosis mainly depends on quantitative reverse transcriptase polymerase chain reaction to detect the SARS-CoV-2 nucleic acid. Respiratory specimens or blood samples can be used as a diagnostic standard for current corona infection (Shah and Farrow, 2020).

Nucleic Acid Test
A significant piece of our armamentarium against COVID-19 is viral conclusion since the underlying flare-up, demonstrative tests dependent on RT-PCR or cutting edge sequencing stages recognizable proof of the viral grouping immediately got conceivable. From that point, a few biotechnology organizations effectively made nucleic corrosive identification packs and a clump of fluorescent quantitative units and sequencing frameworks was direly endorsed by the China Food and Drug Administration (CFDA) (Jin *et al*., 2020). Specifically, a nucleic analysis paper has been effectively delivered, which can be utilized for quick recognition of SARS-COVID-2 with unaided eye perception in a short time (Jin *et al*., 2020).

Table 5: Effects of Covid-19 on migrants

Type of study	Reviewed information	Citation
Review article	In a continued effort to curb the spread of coronavirus disease 2019 (COVID-19), countries have been tightening borders and putting travel restrictions in place. These actions have affected refugees and migrants worldwide. OR Refugees and migrants must be included in national public health systems, with no risk of financial or legal consequences for them.	(Kluge, Jakab *et al*., 2020)
Online study	Migrants, Asylums and refugees suffer under the constant duress of political and economic calamity by government authorities and the onslaught in the near term made worse by the coronavirus disease pandemic. OR This article aimed to provide Migrants and asylum seekers Policies to keep them out of the U.S. and COVID-19.	(Garrett, 2020)
Online survey	Immigrants and refugee population are often left out of epidemic preparedness planning and reaching out these marginalized population is a challenge OR In United States of America and European countries, many of the migrant workers are subjected to adverse conditions with little to no safety equipment, no social distancing and no additional support or pay.	(Bhagat, Reshmi *et al*., 2020)
Online survey	Citizens of many European countries have signed open letters to the European Parliament and national governments to start the evacuation of refugees. OR Urgent measures are required to ensure that these refugees and migrants - not only residents, tourists and international travelers are included in our response to COVID-19.	(Brandenberger, Baauw *et al*., 2020)
Study article	Many immigrants will have no income and are excluded from the social safety. Extreme poverty will extend to the more than 5 million U.S.-born children who have undocumented-immigrant parents. The $1 trillion economic relief package, which includes paid-leave benefits and direct cash for Americans, will not reach most undocumented immigrants or their families. OR Unfortunately, for many undocumented immigrants, calling their doctor is not an option. The Affordable Care Act excludes undocumented immigrants from eligibility for coverage, and an estimated 7.1 million undocumented immigrants lack health insurance.	(Page, Venkataramani *et al*., 2020)
Review article	The migration crisis that started in 2015 and has rekindled in recent months poses a major challenge. Attempts to settle asylum seekers and refugees across Europe have failed and revealed the limited solidarity within the EU. Border countries like Italy or Greece are struggling to handle the situation, partly due to the inadequate financial, technical and institutional support from other European countries.	(Bozorgmehr, Saint *et al*., 2020)

RT-qPCR (Real-time-reverse transcription polymerase chain reaction)

The diagnostic deficiency has been realized based on the single detection of viral nucleic acid, diagnosis with a combination of RT qPCR or NGS testing and clinical criteria might be more relevant in managing the current outbreak (Wang, Kang *et al*., 2020). The studies have shown that specimens of the respiratory tract were used to diagnose NCIP via RT-PCR. Patient serum was not collected for determining viremia. The viral load is a potentially useful marker associated with coronavirus infection's severity of disease and this should be established in NCIP (Huang, Wang *et al*., 2020). (RT-PCR) COVID-19 nucleic acid checks to determine whether or not they should return to work, 2 consistently negative RT-PCR test results separated by a minimum period of 1 day (Hasham, Ahmed *et al*., 2020, Lan, Xu *et al*., 2020).

Serological detection

As of late, immunizer discovery reagents for immunoglobulin M (IgM) and IgG and antigen recognition reagents for SARS-CoV-2 framed by colloidal gold and catalyst connected immunosorbent advances have likewise been effectively evolved and utilized for an assistant finding (Zhou, Yang *et al*., 2020).

CRISPR

The CRISPR techniques allow the development of nucleic acid detection technologies. Beneficial from the distinctive enzymatic properties of CRISPR enzymes, developed an improved nucleic acid detection technology for multiplexed quantitative and highly sensitive detection, combined with lateral visual readout flow (Myhrvold, Freije *et al*., 2018). The Cas13-based SHERLOCK (specific high-sensitivity enzyme reporter unlocking) platform has been shown to detect Zika virus (ZIKV) and dengue virus (DENV) in patient samples at concentrations as low as 1 copy per microliter (Myhrvold, Freije *et al*., 2018). However, the case-13 system has not been verified yet as it has not been tested for COVID-19 clinical sample (Jin, Yang *et al*., 2020).

Radio Imaging Techniques

The interpretation of chest X-ray findings is ambiguous, and thus various imaging modalities need to be

investigated. Although a chest x-ray can be easily obtained, compact and rapidly interpretable, patients are still improperly positioned and may have prior comorbidities that impair interpretation. On the other hand, CT scanning has improved lung specificities and visibility when investigating. When having a CT chest, the practitioners can completely understand the extent of lung infiltration. Most COVID-19 cases have common characteristics on CT images including bilateral dispersion of sporadic shades and opacity of ground glass (Kanne, 2020). In several "suspected" cases with negative testing of SARS-CoV-2 viral RNA, the CT trends were found (Wang, Kang *et al*., 2020). Artificial intelligence has been used to interpret the CT, the accuracy of the technique has been reached 96% which is enhancing the diagnostic efficiency. This technique is already in use at clinical set ups (Jin, Yang *et al*., 2020).

Transmission

The understanding the infection's transmission mechanisms is critical during the early stages of a new outbreak of an infectious disease. Estimation of transmission changes over time may provide insights into the epidemiological situation and assess whether interventions to contain the outbreak have a measurable impact. COVID-19 is a growing human COVID, and it shows similar to past outbreaks of SARS and MERS. Bats are potentially a compulsory source of COVID-19 and the present information does not confirm that the Wuhan Seafood Industry is the only source of infection (Jin, Yang *et al*., 2020). A novel coronavirus has brought ongoing viral pneumonia outbreak in China (Li, Guan *et al*., 2020, Paules *et al*., 2020) person to person transmission is reported (Li *et al*., 2020) while to best of our knowledge the transmission of COVID-19 from an asymptomatic individual having normal CT scan has not been reported yet. The chief transmission mode of COVID-19 are respiratory droplets, direct or indirect contact with these droplets while infection has estimated incubation time of 5.2 days (Jin *et al*., 2020).

Droplet transmission occurs when a person is in close contact (within 1 m) with someone with respiratory symptoms (e.g., coughing or sneezing) and is thus at risk of exposure to potentially infectious respiratory droplets (generally considered to be > 5-10μm in diameter) from his / her mucosa (mouth and nose) or conjunctive (eyes). Droplet transmission in the immediate environment around the infected person may also occur through fomites (Ong *et al*., 2020). COVID-19 is recognized for human-to-human transmission via direct touch, fomites, and potential aerosol routes (Huang *et al*., 2020, Wang *et al*., 2020). Currently we have very limited information about the vertical transmission through maternal primary infection but there is no evidence of transmission, but pregnant women will make every effort to minimize exposure to risk wherever possible (Fan *et al*., 2020).

Treatments

Recently discovered treatment for COVID-19 includes vaccination; prepared by China, America and Russia namely Sinopharm, Novavax COVID-19 vaccine and Sputnik V Vaccine respectively. However, COVID-19 patient is similar to that of other viral diseases like pneumonias, which consist primarily of supportive care and supplementation of oxygen when required (Del Rio and Malani, 2020). Most treatment is currently symptomatic and supportive while anti-inflammatory and antiviral therapies have been used. Continuous renal replacement therapy (CRRT), intrusive mechanical ventilation, and even extracorporeal membrane oxygenation (ECMO) have provided supportive care for patients (Jiang *et al*., 2020). Followings are the few under trial treatments for COVID-19.
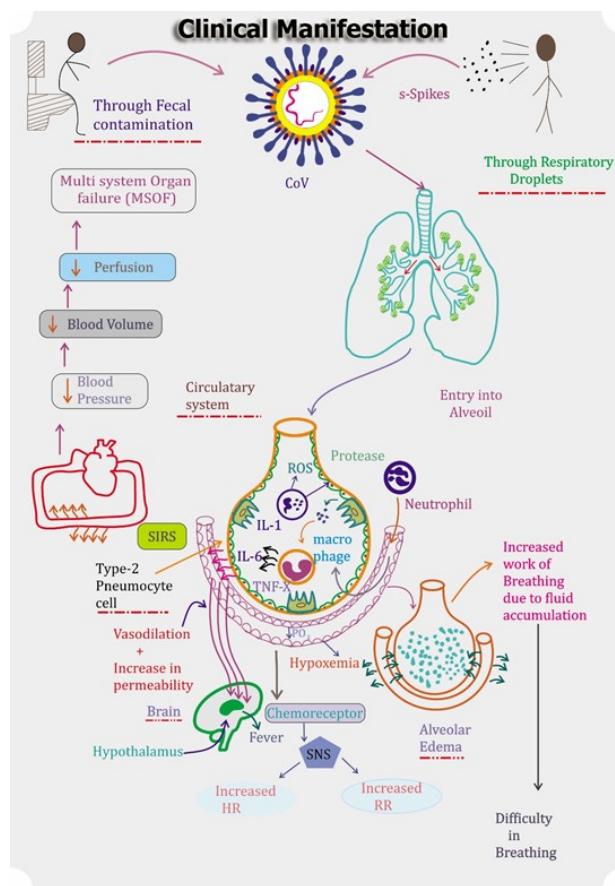
Fig. 4: Site of Infection and Clinical Presentations/ Clinical Manifestations of Corona Virus (Cascella *et al*., 2020).
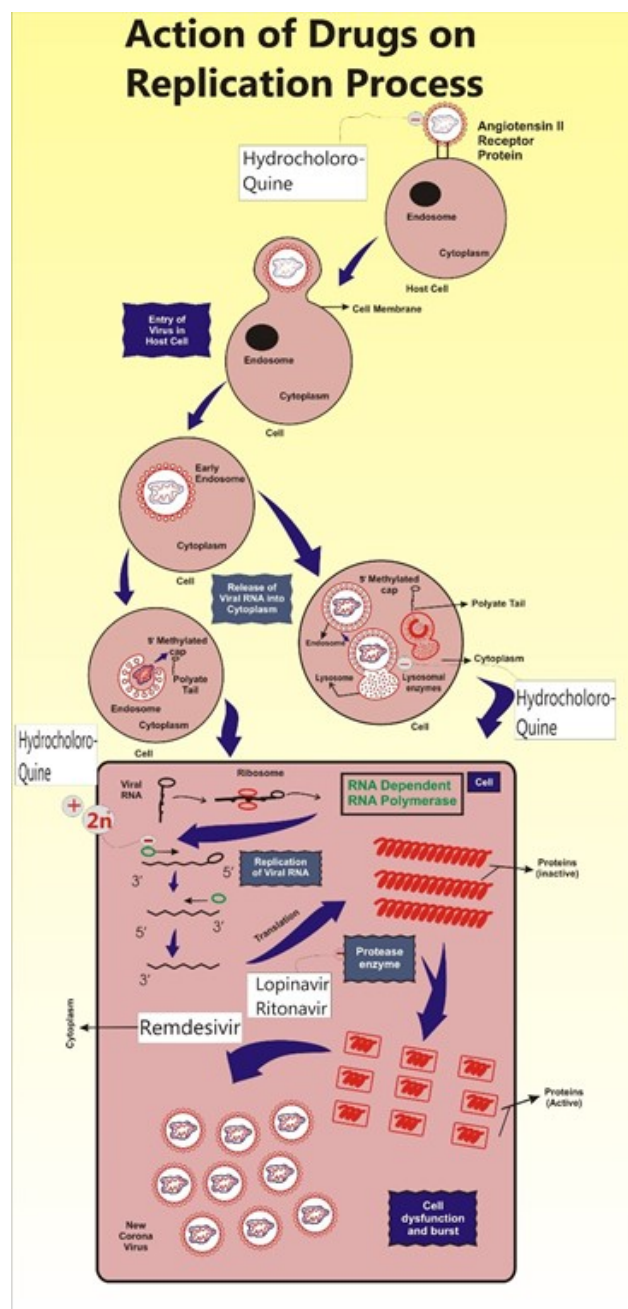
IFNs

IFNs are antiviral cytokines that induce some type of proteins which interfere the viral replication. There are two types of IFNs which are involved IFN α and IFN β. Synergistic effects of both with Ribavirin are shown *in vitro* (Tanne, 2020).

Antivirals

Although no antiviral treatment have been approved yet but many approaches have been proposed such as, Ribavirin have been previously used for the treatment of SARS with or without steroids (Cascella *et al*., 2020). Ribavirin in vitro shown the inhibiting results of viral replication of SARS COVID-19 in combination with IFN β. Nelfinavir is a selective HIV protease inhibitor which has been shown to have a high SARS-COVID inhibition suggesting a potential therapy for COVID-19.

Fig. 5: Action of Drugs on the Replication Process / Treatment Options (Cascella *et al*., 2020)

Lopinavir / ritonavir both are HIV drugs. These drugs are basically protease enzyme inhibitor. Protease enzyme can breakdown the inactive proteins form by the translation of replicated RNA copies of RNA dependent RNA polymerase. When this enzyme is inhibited by these drugs the large inactive proteins remains inactive which can process to form new coronavirus in host hence no more infection is caused; these inactive proteins are then degraded by the lysosmal enzymes (Yang and Wang, 2020) (fig. 5).

The doses used of both drug in combination is lopinavir 400mg + ritonavir 100mg. Lopinavir / ritonavir was also tested on the basis of effectiveness in MERS-COVID animal models but this may not be the case for COVID-19 humans (Del Rio and Malani, 2020). Some studies shown that lopinavir/ritonavir in combination with ribavirin have therapeutic effect in SARS. Lopinavir/ritonavir recommended for clinical treatment of COVID-19 (Huang, 2020). Remdesivir, a nucleoside prodrug thought to be working by inhibiting transcription of viral RNA, may be useful and clinical trials are underway (Del Rio and Malani, 2020). Furthermore, its efficacy and adverse effects are not being confirmed in clinical trials. Remdesivir was used in the treatment of the first COVID-19 patient in the United States (Hoehl, Rabenau *et al*., 2020), and antiviral activity against SARS-CoV-2 was demonstrated in vitro (Roy *et al*., 2020). Remdesivir basically a nucleoside analogue, an adenine group gets attach with the drug so it can bind against the thiamine in place of uracil during replication from RNA dependent RNA polymerase (Sarma *et al*., 2020). Hence, the replication stops and new copy is not formed and host doesn't get infect by corona virus.

Chloroquine interferes with ACE2 which potentially inhibits the SARS COVID-19. There are many important biochemical properties of chloroquine including antiviral activity. Chloroquine efficiently inhibits the COVID-19 in vitro (Roy *et al*., 2020). Hydro-chloroquine was also reported to have shown glycosylation of the angiotensin 2 receptor that is used as a binding site of coronavirus to the host cell (Fantini *et al*., 2020). In case the receptor will not be glycosylated, the binding of spikes protein and Angiotensin 2 receptor will also affect and the virus not be able to get into the cell. Hence, Hydro-chloroquine can prevent corona virus infection.

Endosome and lysosomes require an acidic environment to work, the hydro-chloroquine (very basic drug) can alter the acidic pH of the cell to basic due to which endosome will unable to fuse with virus to release viral RNA in the cell. Same with lysosomal enzymes they will also unable to break the protein covering of the virus hence the viral RNA will also not release to the host cell hence by altering the pH of the cell organelles, hydro-chloroquine was also reported to have shown preventive effect (Fantini *et al*., 2020).

Meanwhile, Zn+2 ion is importantly used to diminish the activity of RNA dependent RNA polymerase through which the replication of this viral RNA does not occur after the entry of viral RNA in to the host cell. Here, Zinc ion is positively charged which means it is hydrophilic but the cell membrane is lipophilic so it requires an ionophore for its transport across the cell membrane. Hydro-chloroquine by acting as ionophore for the transport of zinc ion can act to resolve the viral attack (Nitulescu *et al.*, 2020). Hydro-chloroquine recommended dosage were reported as 500mg as B.D in China and 500mg as O.D in South Korea (Rana and Dulal, 2020).

Arbidolis a broad spectrum antiviral compound. Arbidiol and its derivative Arbidolmesylate have shown the promising results for inhibiting the COVID-19 in vitro. Arbidiol is recommended for COVID-19 treatment (Chan *et al.*, 2020).

Convalescent Plasma
Human convalescent serum is an alternative for COVID-19 disease prevention and care that could be readily available if there are ample numbers of people who have healed and are able to donate immunoglobulin-containing serums (Casadevall and Pirofski, 2020). Recently, FDA has approved the convalescent plasma technique for treatment of COVID-19 (Tanne, 2020). There are some risks related to this technique as plasma could carry some other infectious substances, so the effectiveness and the risks factors are still needed to confirm by further trials (Casadevall and Pirofski, 2020).

Monoclonal Antibodies
It has been reported that monoclonal antibodies (mAb) target S1-RBD, S1-NTD or the S2 region, block the joining of RBDs to the receptors and interfere with S2-mediated membrane fusion or entry into the host cell (Jiang *et al.*, 2020). Monoclonal antibodies would be valuable for the production of SARS-COVID-2 antigen detection tests and serological assays and cross neutralizing the COVID-19. Moreover, the production of mAb takes a specific time duration, which is hard to accomplish in a short time in clinical application (Jin *t al.*, 2020).

Prevention and Control
Preventive measures are the only way to control and limit the any infectious disease. Preventive strategies include isolation of infected or suspected individuals, essential measures adopt during diagnosis and treatment of infected patients, droplet contact and airborne measures should be considered. Coronavirus stay on the surfaces for longer period of time. Transmission through healthcare workers is the major problem so it is recommended that health care workers must wear gloves, personal protective equipment (PPE) and N95 masks. Ocular transmission is also reported so the head gears and eye protectors must be use (Lu, Liu *et al.*, 2020).

There are many challenges such as isolation of infected persons and shortage of protective equipment in most of the hospitals (Del Rio and Malani, 2020). The latest epidemic has prompted a discussion on the efficacy of quarantines in China and elsewhere. The proper quarantine can limit the transmission of infection, but human rights may not be neglected, however in the modern era of globalization it is very difficult to impose effective quarantine (Del Rio and Malani, 2020).

WHO and many other organizations have given recommendations to prevent the threat of COVID including: washing hands properly, avoid touching eyes mouth and nose, self-isolation with mild symptoms, maintain social distancing, avoid close contact with animals, use disposable tissues while coughing and sneezing, People with more than 70 years may have weak immune system and should be more careful to their health. Ultimately, the WHO continues to emphasize the utmost importance of regular hand hygiene, respiratory etiquette and environmental cleaning and disinfection as well as the importance of maintaining physical distances and avoiding direct, unprotected contact with people with fever or respiratory symptoms (WHO, 2020d, WHO, 2020e).

Impacts of Covid-19 pandemicity
Impact on health care system
Health care system include achieving lower administrative costs by standardizing coverage and insurance transactions; providing coverage through publicly funded programs rather than private insurance; and automating transactions among providers, patient and insurers. The duty of medical professionals to put the need of patients first during epidemic and pandemic situations (Atkeson, 2020). Advancement of an emergency framework and instrument should be joined by making arrangements for medical clinic order and control to direct versatility as identified with accessible assets and via preparing for staff whose jobs may change to accomplish the medical services objectives during pandemicity (Du Toit, 2020).

Psychological impacts
Right now, there is little data on the mental effect and psychological wellness of the overall population during the pinnacle of the COVID-19 plague. The majority of the creators zeroed in just on distinguishing the study of disease transmission and clinical attributes of contaminated patients (Chen *et al.*, 2020, Huang *et al.*, 2020), the genomic characterization of the virus (Lu *et al.*, 2020) and challenges for global health governance (Rubin and Wessely, 2020). However, there is some degree of research articles reported the statistical analysis of psychological impact on COVID-19 on the general population over the world (Wang *et al.*, 2020). Moreover, a diverse range of literature reviews indicating the definite

psychological symptoms are exaggerated during current pandemic situation as shown in table 3. (table 3)

Economical impacts

Corona pandemic hit the global economy in such a bad manner like never before (Ranasinghe, 2020). The condition is more likely than World war 3 and world is hit by a recession that has been more severe than 2008. In 2008 recession mostly effected the banks and other monetary institutions but as now with this pandemic due to crash in oil prices it hit each and every business around the globe (Fernandes, 2020). Let's look at oil prices; The demand for oil has a sudden reduce due to lock down all over the world and in this situation OPEC (Organization of Petroleum Exporting Countries) decided to reduce also oil production in order to maintain a balance between demand and supply all over the world (Ramelli and Wagner, 2020). But contrary Russia refused to reduce the production in order to crash the market of USA (Remember Russia is in alliance with OPEC but USA is competitor of OPEC. The oil exported around the world is of two types 1) BRENT CRUDE (by OPEC), 2) WTI Western Texas Intermediate (oil exported by US) (Chapter and Outlook, 2020). Brent crude hit its lowest less than 20$/Barrel in past 21 years and WTI went negative for the first time in history. After this low in prices all the countries whose economy was dependent on Oil export, gone through a great financial damage however the countries that are oil importing like Pakistan, India and China they may have little reliefs to their economies because of purchasing oil in lowest prices (WHO, 2020a).

Global Recession

Risk of recession is measured by the percentage change in GDP (Gross domestic Product) or the value of goods and services, typically over three months or a year. But the international Monetary Fund (IMF) says that the Global economy will shrink by 3% this year (Makridis and Hartley, 2020). Till the date, the duration of the lockdown, as well as how the recovery will take place is still unknown. That is why several scenarios are used. In a mild scenario, GDP growth would take a hit, ranging from 3-6% depending on the country. As a result, in the sample of 30 countries covered, we would see a median decline in GDP in 2020 of -2.8%. In other scenarios, GDP can fall more than 10%, and in some countries, more than 15% (Atkeson, 2020) (table 4).

Effects of Covid-19 on migrants

Chronicled plan of movement, customary business, and populace relocation are reliable with the presence of a public strategy that advances or supports migration as a wellspring of populace development to join to guarantee that the worldwide dissemination of these transients is inconsistent. Unfamiliar conceived inhabitants make up the most different percent of the nation's populace (Page, Venkataramani *et al*., 2020). Some countries, especially those in Europe, have foreign-born people, who show up in refugee movements, seek asylum, or temporary travel (Lau, Khosrawipour *et al*., 2020).

In the two cases, the wellbeing attributes of these unfamiliar conceived or transients are impacted by their wellbeing status and conditions, their evolving surroundings, and their new climate. For some transients, the change time frame isn't significant as far as wellbeing in light of the more limited travel time (Kluge, Jakab *et al*., 2020). For certain transients, for example, the individuals who move to exile camps or the individuals who get dealing or dealing as a method for appearance, change time can truly influence wellbeing. On the off chance that the wellbeing and illness structures that impact the spread of infection in the settler and change times are not quite the same as those at the objective, the relocation and movement cycle can recognize contrasts in the spread of sickness and fill in as a transmission way between areas (Garrett, 2020).

The effect of network-based wellbeing and the results of the conclusion of travel started spans is straightforwardly identified with two basics. The first is the size of the contrast between the purpose of flight and the objective, the second the size of the quantity of individuals moving between the different illness designs. The nature and results of individual problems are considered by various different variables, for example, time spent, complex social and monetary components, admittance to and admittance to moderate medical care, instructive increases, and social wellbeing rehearses (Brandenberger, Baauw *et al*., 2020).

As to irresistible sickness, the connection between illness transmission and relocation has for quite some time been known. Wellbeing and boundary techniques were created without endeavors to control the importation of scourges. In the course of recent years, the cycle and extent of relocation have gone through many significant changes, and a large number of those progressions have changed the idea of the movement related irresistible sickness (Bozorgmehr, Saint *et al*., 2020).

Since the 1960s, movement designs in a significant number of the transient examples have changed. The transient areas of Australia, Canada and the United States, previously open and focal Europe, have moved to Latin American, African, and Asian sources. Source districts would now be able to incorporate lacking areas of the world, numerous in tropical and subtropical locales (Bhagat, Reshmi *et al*., 2020). Simultaneously, the conditions that decide the general prosperity of individuals including institutional wellbeing administrations and the limit with respect to general wellbeing control in various wellsprings of migration – face significant obstacles. The created districts of the world have kept on creation extraordinary steps in the

administration of transmittable illnesses basic to general wellbeing. Huge numbers of the infections in the further developed locales are at truly low paces of decrease or the finishing of infection transmission (table 5).

Environment impacts of COVID-19

The lock down situation dramatically improved the overall environmental condition around the Globe (Lau, Khosrawipour *et al*., 2020). ESA European Space Agency Sentinel-5P Satellite over the last few weeks reported a significant drop in polluting gases like Nitrogen dioxide in result of lockdown. The water bodies all around the world are cleaned significantly (Isaifan, 2020).

WHO guidelines/Preparedness plans against covid-19 pandemic

Most outcasts and transients live in individual and common facilities in urban areas, towns, modern and urban territories. They face comparative wellbeing dangers from coronavirus sickness 2019 (COVID-19) as their host populaces. In any case, because of the states of their transient excursions, restricted business openings, packed and poor living and working conditions with lack of access of food, water, sanitation, and other essential administrations, outcasts and vagrants may have explicit vulnerabilities. Numerous vagrants are regularly prohibited from national projects for wellbeing advancement, malady avoidance, treatment and care, just as from money related security plans for wellbeing and social administrations. This avoidance makes early recognition, testing, determination, contact following and looking for care for COVID-19 hard for evacuees and transients subsequently expanding the danger of flare-ups in these populaces, and that such flare-ups may go unchecked or even effectively disguised (WHO, 2020f).

Guiding principles

Physical and Mental Health Level

All states have a commitment to secure and elevate the privilege to wellbeing for all individuals on their region, without separation, and this incorporates exiles and transients. This alludes to one side to get to social insurance administrations, for example, testing, diagnostics, care and treatment and referral just as counteraction and wellbeing advancement related exercises for COVID-19. Exiles and transients paying little heed to their legitimate status are qualified for this and other all-inclusive human rights. In addition, they ought not be scapegoated, criticized or in any case focused with explicit, oppressive measures (WHO, 2020b).

Unbiased and non-discriminant health services

The privilege to COVID-19 readiness, counteraction and control for exiles and transients ought to be practiced through non-unfair, kid and sexual orientation touchy complete laws and national approaches and practices. The wellbeing conditions experienced by displaced people and transients, incorporating those with COVID-19 contaminations, ought not be blamed for forcing self-assertive limitations, criticism, confinement, expulsion and different types of prejudicial practices (Ahmed, Rizvi *et al*., 2020).

Refugees and Migrants child and gender sensitive health Structure

Well-being frameworks should mean to convey socially, etymologically and kid, sex and age-responsive COVID-19 administrations that are open to all populaces. Evacuees and transients are especially defenseless against general wellbeing dangers and some of them may require unique help arrangements. These incorporate arrangements for individuals with basic conditions and additionally inabilities, the old, individuals encountering sexual savagery, misuse and abuse and different types of sex based brutality, just as unaccompanied or isolated kids, just as individuals in confinement (Suphanchaimat, Kosiyaporn *et al*., 2019).

Equality in treatment on workplace

It is important that worldwide work gauges and major rights are maintained, including that displaced person and transient specialists are furnished with reasonable working conditions, remembered for medicinal services and social protection projects, and fundamental privileges. Laborers and businesses have significant obligations at the work environment in time of emergency, including COVID-19 flare-ups. Bosses ought to be adaptable and investigate various choices for leave and pay plans (WHO, 2020c).

Future prospects

There is a colossal vulnerability about to what extent this emergency will last and what harm it would do to the economy, work of individuals and accessibility of fundamental human services administrations. Given its size and spread, the board of vagrants under lockdown speaks to a gigantic calculated test. A portion of these provokes should be tended to right away and some are the long haul:

1.Various challenges like nourishment and fundamental courtesies, risk assesses assessment, screening of the perhaps tainted people must be isolated independently are identified with abandoned vigrant.

2. There is a pressing requirement for the improvement of bona fide database for the abandoned transients at goal, in roadway camps and return vagrants in towns. Information on volume and qualities of the transients (in camps, home isolate) is expected to move the advantages of social government assistance plots at present and for future administration needs.

3. During and post-lockdown period, the essential pay backing must be ensuring to transients and their abandoned families who are not enlisted to the social

plans and rely upon day by day compensation for endurance.

4. With extreme interruption, the inquiry emerges, regardless of whether turn around transients will return to work in towns or remain in their towns. In the event that they don't return, how to manage likely monetary worry in goal regions.

CONCLUSION

Unprecedented challenges of COVID-19 have affected the civilization in various ways like psychological, financial, environmental more over health and migrants related issues that's ultimately caused disastrous changes in global environment. This paper focus on action mechanism of COVID-19 on human body, immune response against COVID-19, clinical manifestation and preventive measures for the susceptibility of COVID-19. Diagnostic ways for the detection and possible ways for treatment of COVID-19 has also been discussed. Moreover, issues regarding migrants during pandemic situation are elaborated to improve the outcomes of COVID-19 cases.

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