

Novel Coronavirus 2019 (COVID-19) Out-break: A Review

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Abstract

There is a new public health crisis threatening the world with the emergence and spread of 2019 novel coronavirus (2019-nCoV). COVID-19 epidemic of coronavirus disease originating in Wuhan, China become a key public health challenge for the whole world and World Health Organization announced this epidemic as public health emergency of international concern. Novel coronavirus (2019-nCoV) is a new strain that was discovered in 2019 and has not been previously identified in humans and has not been previously identified in humans. The virus originated in bats and was transmitted to humans through yet unknown intermediary animals in Wuhan, Hubei province in China during the month of December 2019. Till date 96,000 reported cases and 3300 reported deaths because of COVID-2019. The disease is transmitted by inhalation or contact with infected droplets with incubation period of 2 to 14 days. The symptoms are usually fever, sore throat, dry cough, breathlessness, fatigue while many people are asymptomatic. Coronavirus (2019-nCoV) may progress to pneumonia, acute respiratory distress syndrome (ARDS) and can cause multi-organ dysfunction. Currently diagnosis is done by demonstration of the virus in respiratory secretions by special molecular tests like real-time reverse-transcription-polymerase-chain-reaction (RT-PCR), Radiological examinations (chest CT). It is paramount to implement infection control practices by infection source controlling, transmission route blocking, and susceptible population protection. Early preventive measures can be home isolation of suspected cases and those with mild illnesses and strict infection control measures at hospitals that include contact and droplet precautions. In conclusion time alone will tell how the virus will impact lives in world and in India. Future outbreaks of such viruses and pathogens of zoonotic origin are likely to continue, so apart from curbing this outbreak, efforts should be made to devise comprehensive measures to prevent future outbreaks of zoonotic origin. From Research studies and review papers it was concluded that Base line testing for symptomatic patient should be started with leukocyte counts, C-reactive protein, Erythrocyte sedimentation rate and D-dimer were also observed at high.

Keywords: Coronavirus Disease (COVID-19); Novel Coronavirus (2019-nCoV); Sources, Transmission Route; Pathogenicity; Symptoms

Introduction

Coronaviruses (CoV) are a large family of viruses this family of viruses causing illness ranging from the common cold to more severe diseases as acute and chronic respiratory, enteric and diseases of central nervous system in many species of animals, including humans. Coronaviruses are enveloped non-segmented positive-sense RNA viruses belonging to the family Coronaviridae, classified within Coronaviruses (CoVs) genus which is enveloped, single-stranded RNA and positive-sense. According to the evolutionary analyses, bats, rodents, avian species are the gene sources [1]. It has caused several emerged as human disease as in the case severe acute respiratory syndrome CoV (SARS-CoV) transmitted from bats and the Himalayan palm civet (*Paguma larvata*) in 2002-2003, China, and Middle East respiratory syndrome CoV (MERS-CoV) transmitted from dromedary camel (Camels dromedaries) in the Arabian Peninsula since 2012 [2]. The 2019-nCoV is a new strain discovered in late 2019 and has not been earlier recognized in humans. 2019-nCoV cause a self-limiting upper and lower respiratory infections in people with immune-competent [3]. It has been detected that 2019-nCoV has 89% of similarity in the nucleotide to bat SARS-like-CoVZXC21, while has 82% of similarity with that of human SARS-CoV [4]. The current review paper aimed to summarize the findings of the previous studies conducted of different researchers findings and written review papers on 2019-nCoV during the last two months through the systematic review.

Viral etiology

According to the recent research SARS-CoV-2 is zoonotic, with Chinese horseshoe bats (*Rhinolophus sinicus*) being the most probable origin and is like to SARS-CoV and Middle East respiratory syndrome coronavirus (MERS-CoV) [5,6]. Pangolins as the mainly likely intermediate host as per the current research reports [7].

Sources of 2019-nCoV outbreak

On 8th January 2020, a novel coronavirus was officially announced as the causative pathogen of Coronavirus disease by the reports Chinese Center for Disease Control and Prevention [8]. The epidemics of coronavirus disease 2019 (COVID19) initially started from Wuhan, China, last December and have become a major challenging problem public health for not only China but also countries around the world as whole [9] and on 30th January 2020, the World Health Organization (WHO) announced this outbreak as international concern because of public health emergency [10]. At first this virus was named as 2019-nCoV and formally as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). On 26th February 2020 it has been recognized by WHO in 34 countries, with a total of 80,239 confirmed cases and 2,700 deaths [11].

The researchers for the first time have correlated the 2019-nCoV infection with the Huanan South China Seafood Market (HSCM) it is because the first cases were found associated with this market [12], however the first case recorded outside China for a Chinese tourist in Thailand has no epidemiological linkage to the HSC market [13]. The research studies which indicated to the HSC market as a main and potential source for 2019-nCoV depended on that the HSC market is marketing several types of wild animals such as, birds, snakes, bats and marmots which are the natural reservoir of this virus. Moreover, according to WHO report all environmental samples from HSC market was positive for 2019-nCoV, however no association of any animal was identified with this virus [14]. On genomic sequencing of 2019-nCoV it was claimed that the snake is the wildlife reservoir. The theory depend on the principle of origin-unknown homologous recombination which was identified within the spike glycoprotein of the 2019-nCoV and might be used for explaining the snake-to-human cross species transmission. While in other research reports authors believed that the bats are the natural reservoir of this virus [15].

Pathogenicity and symptoms

2019-nCoV has incubation period between 7 and 14 days and fever is the most frequently symptoms, followed by malaise, dry cough, respiratory distress and shortness of breath [13,16]. This disease is also associated with, acute respiratory distress syndrome requiring intensive care, acute cardiac injury, diarrhoea, renal function disorder, deranged liver, multi-organ dysfunction syndrome and lymphopenia, septic shock and ultimately multi-organ failure. The mortality has been estimated to be between 10 and 30% compared to SARS-CoV (10% mortality) and MERS CoV (35% mortality) [12]. Chen., *et al.* investigated 99 COVID-19 patients and found 50% of them have no direct relation to HSC market and RT-PCR was effective in 51% detected infections. These patients have common symptoms of fever, cough, muscle ache, confusion, headache, sore throat, rhinorrhea, chest pain, shortness of breath, diarrhea, and nausea and vomiting and finally they conclude that 2019-nCoV was associated with acute respiratory distress syndrome and multiple organ failure [16].

Severe symptoms of COVID-19 are linked with rising numbers and speed of fatalities particularly in the epidemic region of China. On 22nd January 2020, the China National Health Commission reported the details of the first 17 deaths and on January 25, 2020 the death cases increased to 56 deaths. Wang., *et al.* during their findings found that the percentage of death among the reported 2684 cases of COVID-19 was approximately 2.84% as of 25th January 2020 and age of the death persons was within 48 - 89) years [17].

COVID-19 infected Patients showed increase leukocyte numbers, abnormal respiratory findings and increased plasma pro-inflammatory cytokines levels. As per the findings of Huang., *et al.* one patient infected with COVID-19 showed fever at day 5th with cough, coarse breathing sounds of both lungs, and a body temperature of 39.0°C [18]. The laboratory studies of Huang., *et al.* showed leucopenia with

leukocyte counts of 2.91×10^9 cells/L of which 70.0% were neutrophils. Additionally, a value of 16.16 mg/L of blood C-reactive protein was noted which is above the normal range (0 - 10 mg/L). Erythrocyte sedimentation rate and D-dimer were also observed at high [18]. COVID-19 infection main pathogenesis involves respiratory system and virus targeting as severe pneumonia, RNA-aemia combined with the incidence of ground-glass opacities, and acute cardiac injury [19]. Lei, *et al.* found in patients with COVID-19 infection significant high blood levels of cytokines (IL1- β , IL1RA, IL7, IL8, IL9, IL10) and chemokines (FGF2, GCSF, GMCSF, IFN γ , IP10, MCP1, MIP1 α , MIP1 β , PDGFB, TNF α , and VEGFA). Some of the severe cases of COVID-19 infection that were admitted to the intensive care unit showed high levels of pro-inflammatory cytokines (IL2, IL10, IL7, GCSF, IP10, MIP1 α , MCP1, and TNF α) that are reasoned to promote disease severity [19].

Transmission route

Respiratory infections can be transmitted through droplets of different sizes: when the droplet particles are $> 5 - 10 \mu\text{m}$ in diameter they are referred to as respiratory droplets, and when they are $< 5 \mu\text{m}$ in diameter, they are referred to as droplet nuclei [20]. Droplet transmission occurs when a person is in close contact (within 1m) with someone who has respiratory symptoms (e.g. coughing or sneezing) and is therefore at risk of having his/her mucosae (mouth and nose) or conjunctiva (eyes) exposed to potentially infective respiratory droplets [21-23]. At the January mid there was no clear evidence of human to human transmission of this disease, but it was found currently one of the main serious and concerning problem with 2019-nCoV is the transmission route, since it can easily transmitted through the daily practices (shaking hands, touching contaminated objects, or kissing). Besides, it can survive for long time in the environment. However, according to the findings of Ong, *et al.* in an analysis of 75,465 COVID-19 cases in China, airborne transmission was not reported but it was found that 2019-nCoV virus is primarily transmitted between people through respiratory droplets and contact routes [20,24]. For this reason, the mask is effective to prevent the transmission of virus from the patient to healthy persons, while the mask could not itself prevent the COVID-19 infection. The second main concern with the virus transmission is the rapid of the transmission it has mentioned that one patient can transmit the virus to 14 around people. In a comparison to SARS- and MERS-CoV outbreak which has associated with super spreading ($R_0 > 10$), based on the data published up to 21 January, the 2019-nCoV has low R_0 [25]. The most susceptible populations included whom who have significant health conditions such as diabetes, hypertension and heart and/or kidney function issues. In comparison during the MERS-CoV outbreak most Susceptible Populations were the smokers and who have a cardiovascular disease, diabetes, hypertension and other chronic illnesses [24,26].

Diagnostic testing

The diagnosis of COVID-19 can be based on a combination of epidemiologic information (e.g. a history of travel to or residence in affected region 14d prior to symptom onset), clinical symptoms, CT imaging findings, and laboratory tests (e.g. reverse transcriptase polymerase chain reaction [RT-PCR] tests on respiratory tract specimens) according to standards of either the WHO (2020) [1]. Since the outbreak of COVID-19, the diagnostic testing methods of the virus (2019-nCoV) in human clinical specimens included, real-time RT-PCR, next-generation sequencing, Scanning electron microscopy (SEM) and cell culture [27]. In contrast, commercially available multiplex NAAT tests were ineffective for diagnostic the patient with 2019-nCoV infection [28]. This is the reason for delay in preventing the COVID-19 outbreak since the cell culture; PCR and SEM need more time to detect the virus in the COVID-19 samples. The CT findings included consolidative pulmonary opacities and bilateral pulmonary parenchymal ground-glass. In sometimes the symptoms associated with a rounded morphology and a peripheral lung distribution [25]. The chest radiograph for a patient after 8 days of the diseases showed bilateral lung consolidation with relative peripheral sparing while was more extensive after 11 days [29]. It should be mentioned that a single negative RT-PCR test result from suspected patients does not exclude infection. Clinically, we should be alert of patients with an epidemiologic history, COVID-19-related symptoms, and/or positive CT imaging results. So far, there has been no evidence from randomized controlled trials to recommend any specific anti-nCoV treatment, so the management of COVID-19 has been largely supportive (WHO 2020). Currently, the approach to COVID-19 is to control the source of infection; use infection prevention and control measures to lower the risk of transmission; and provide early diagnosis, isolation and supportive care for affected patients [1].

Prevention

Since at this time there are no approved treatments for this viral disease even prevention at this stage is crucial for its control it is because of several properties of this 2019-nCoV make prevention difficult namely, non-specific features of the disease, the infectivity even before onset of symptoms in the incubation period, transmission from asymptomatic people, long incubation period, tropism for mucosal surfaces such as the conjunctiva, prolonged duration of the illness and transmission even after clinical recovery. Isolation of confirmed or suspected cases with mild illness at home is recommended [30]. The ventilation at home should be good step to for prevention and destruction of 2019-nCoV. Patients should be asked to wear a simple surgical mask and practice cough hygiene [25]. Caregivers should be asked to wear a surgical mask when in the same room as patient and use hand hygiene every 15-20 min. The greatest risk in COVID-19 is transmission to healthcare workers [31]. In the SARS outbreak of 2002, 21% of those affected were healthcare workers [32]. Till date, almost 1500 healthcare workers in China have been infected with 6 deaths. The doctor who first warned about the virus has died too. It is important to protect healthcare workers to ensure continuity of care and to prevent transmission of infection to other patients [33,34]. While COVID-19 transmits as a droplet pathogen and is placed in Category B of infectious agents (highly pathogenic H5N1 and SARS), by the China National Health Commission, infection control measures recommended are those for category A agents (cholera, plague). Patients should be placed in separate rooms or cohorted together. The rooms and surfaces and equipment should in hospitals and isolations should undergo regular decontamination preferably with sodium hypochlorite. Healthcare workers should be provided with fit tested N95 respirators and protective suits and goggles [34]. Airborne transmission precautions should be taken during aerosol generating procedures such as intubation, suction and tracheostomies. All contacts including healthcare workers should be monitored for development of symptoms of COVID-19. Patients can be discharged from isolation once they are afebrile for at least 3 d and have two consecutive negative molecular tests at 1 day sampling interval. Negative molecular tests were not a prerequisite for discharge. At the community level, people should be asked to avoid crowded areas and postpone non-essential religious, seminar, conference and travel to places with ongoing transmission. They should be asked to practice cough hygiene by coughing in sleeve/tissue rather than hands and practice hand hygiene frequently every 15 - 20 minutes. The use of mask by healthy people in public places has not shown to protect against respiratory viral infections and is currently not recommended by WHO. However, in China, the public has been asked to wear masks in public and especially in crowded places and large scale gatherings are prohibited (entertainment parks etc.) [35]. The international response has been dramatic. Initially, there were massive travel restrictions to China and people returning from China/ evacuated from China are being evaluated for clinical symptoms, isolated and tested for COVID-19 for 2 weeks even if asymptomatic. However, now with rapid world-wide spread of the virus these travel restrictions have extended to other countries. Whether these efforts will lead to slowing of viral spread is not known. A candidate vaccine is under development.

Current scenario of disease

The 2019 novel coronavirus (2019-nCoV), officially named as COVID-19 by the WHO, has spread to more than 170 countries including China prompting the WHO to declare the disease as a global pandemic. Confirmed novel coronavirus cases have crossed 530,000, while more than 24,000 deaths have been reported across the world as Europe becomes the new epicenter of coronavirus. More than 80% of the global COVID-19 cases are currently outside China (WHO 2020).

Globally there have been 2,549,632 confirmed cases of COVID-19, including 175,825 deaths, reported to WHO on 24 April 2020.

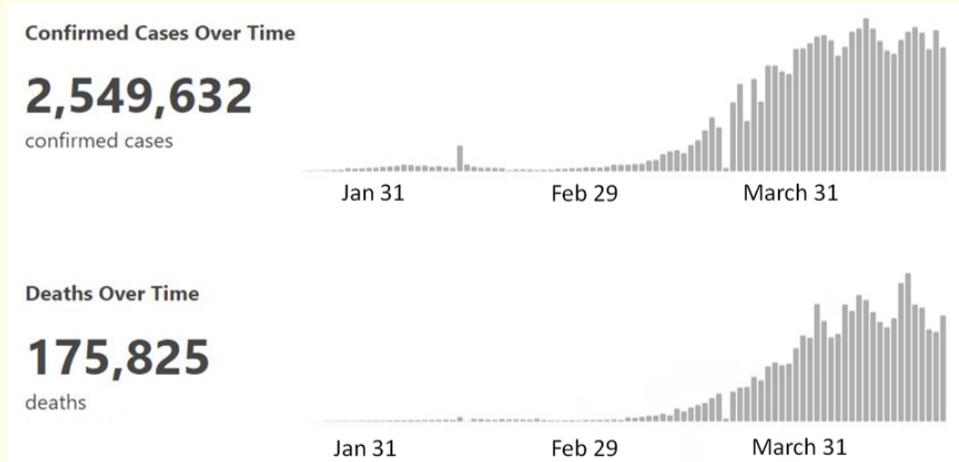


Figure 1: Source: WHO.

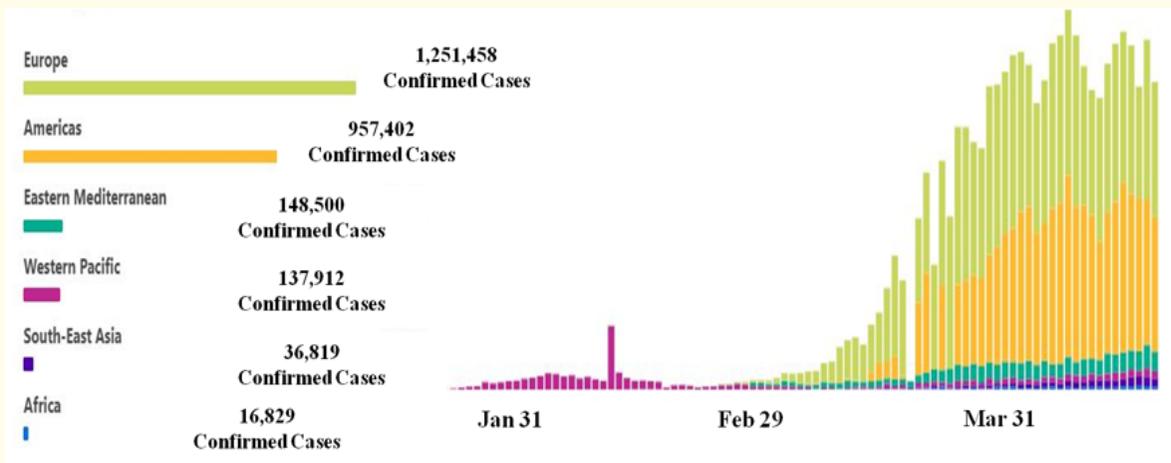


Figure 2: Case comparison who regions (Source: WHO).

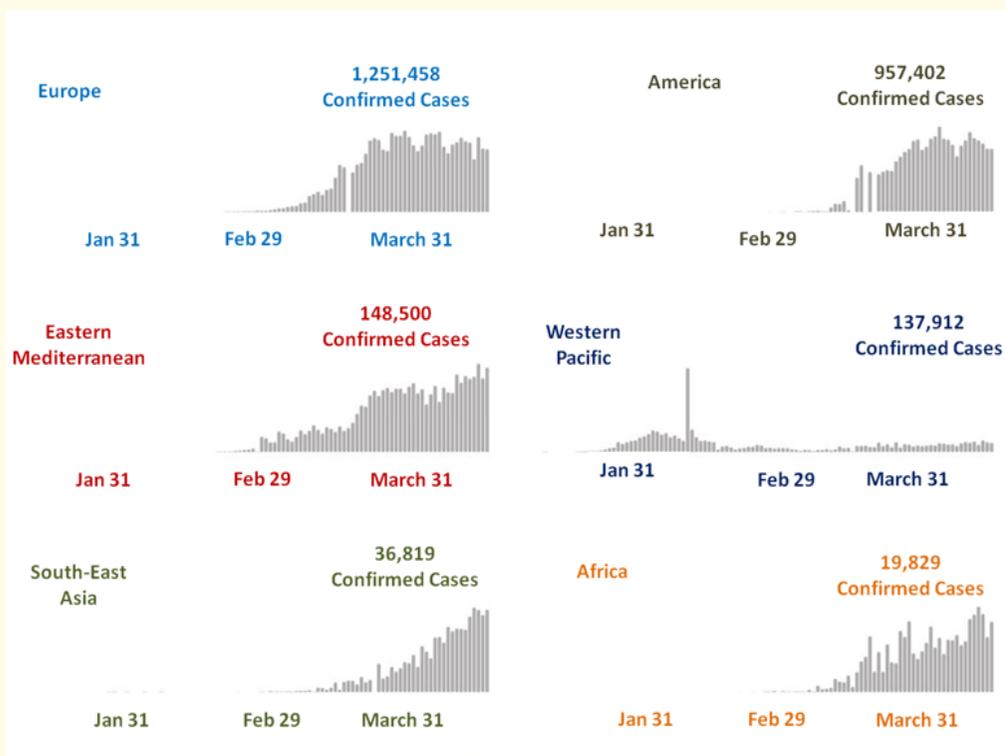


Figure 3: Daily cases by WHO region (Source: WHO).

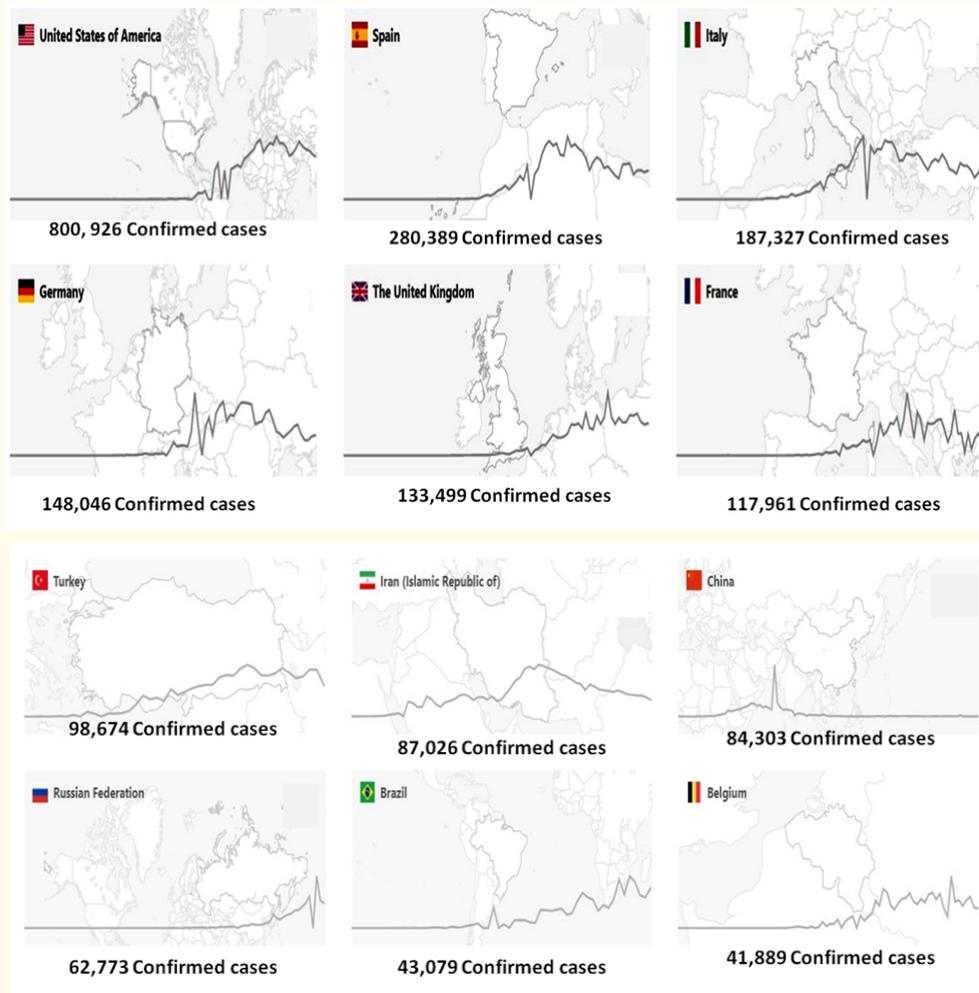


Figure 4: Highest cases - By country, territory, or area (Source: WHO).

Situation update in India

As of 21 April 2020 (8:00 AM), according to the Ministry of Health and Family Welfare (MoHFW), a total of 18601 COVID-19 cases, (including 77 foreign nationals) have been reported in 32 states/union territories. These include 3251 who have been cured/discharged, 1 who has migrated and 590 deaths. Hospital isolation of all confirmed cases, tracing and home quarantine of the contacts is ongoing. On 14 April 2020, the Prime Minister announced the extension of the earlier 21-day nationwide lockdown till 3 May 2020 (WHO 2020).

Conclusion

Time alone will tell how the virus will impact lives in world and in India. More so, future outbreaks of different categories of viruses and pathogens of zoonotic origin are likely to continue. Therefore, apart from curbing this virus outbreak, efforts should be made to plan comprehensive procedures to prevent future outbreaks of different viral & bacterial diseases. From Research studies and review papers

it was concluded that Base line testing for symptomatic patients should be started with leukocyte counts, C-reactive protein, Erythrocyte sedimentation rate, D-dimer and rapid immune assay tests at large.

Disclosure of Potential Conflicts of Interest

Authors declare that they have no conflict of interests.

Author's Contribution

All the authors have contributed equally. All authors read and approved the final manuscript.

Ethical Statement

It is review paper and approval for writing and submission was taken from Principal, Government Medical College, Doda.

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