

The Outbreak Of Novel Coronavirus (2019-COVID) Pandemic, Its Impacts On Vaccination Development And Health Care. A Systematic Literature Review Paper.

Nohman Khan¹, Muhammad Imran Qureshi²

UniKL Business School Universiti Kuala Lumpur, Malaysia.

²Faculty of Technology Management and Technopreneurship, Universiti Teknikal Malaysia Melaka, Malaysia

**Email: ¹nohman.khan@s.unikl.edu.my, ²qureshi@utem.edu.my*

Abstract: The recent deadly outbreak of Novel coronavirus (2019-COVID) associated with human to human transmission and severe human infection has been recently reported from the city of Wuhan in Hubei province in China and gradually the number of infected people around the globe increased in fatality ratio. This study aims to identify the historical background of the coronavirus family that is already affected the civilization and animals. This study will overview the overall literature published on the Coronavirus and vaccination development with nature of viruses. For that, the Scopus database and web of science database is selected to analyse the published literature. The research methodology is followed by the strict screening process of the PRISMA statement framework (2015) for the screening and quality assessment. Final 93 studies are included for the systematic literature review. The most important and critical part of the study is about the classification of the past literature on the topic of coronavirus. severe acute respiratory syndrome coronavirus (SARS), Middle East Respiratory Syndrome Coronavirus (MERS), bovine coronavirus, canine coronavirus and feline coronavirus are the major classifications discuss in the literature. This study contributes to the literature by providing an elaboration of a descriptive mapping of the existing literature on the studies of Coronavirus pandemic that is a greater challenge for humanity in the current circumstances. Finally, the future of the world after the 2019-COVID is more challenging and important for vaccination development and health care sector.

1. INTRODUCTION

The deadly recent outbreak of coronavirus (COVID-19) create the importance of the public health and services development in the field of the public health workforce to immediate response on the infectious disease outbreak anywhere in the world (WHO, 2020). The novel coronavirus (2019-COVID) associated with human to human transmission and severe human infection has been recently reported from the city of Wuhan in Hubei province in China and gradually the number of infected people around the globe increased in fatality ratio (Paraskevis et al. 2020). However, coronavirus is not a new name for the researchers and scientist, many coronavirus family viruses are already hit the human, birds and mammals. The virus is fist time conceptualise in the 1960s and later the family of coronavirus is extended in different periods with different characteristics (Kahn en McIntosh 2005). However, the SARS coronavirus was the point when researchers realise that animal

coronavirus is a potential threat for the human population. although the structure of species-to-species propagate of the SARS coronavirus remains unknown and Coronaviruses are common, and they are generally related to the upper respiratory tract family of disorders. They also trigger asthma in children and adults and severe respiratory disease in the elderly (Paules, Marston, en Fauci 2020). Coronaviruses are initially divided into four genera: alpha, beta, delta, and gamma, of which alpha and beta CoVs are known to infect humans. Coronaviruses are biologically diverse with the largest array seen in bats, suggesting that they are the reservoirs for many of these viruses. Peri domestic mammals may serve as intermediate hosts, facilitating recombination and mutation events with the expansion of genetic diversity (de Wilde et al. 2018). Common symptoms of severe acute respiratory syndrome (SARS) included fever, cough, dyspnoea, and occasionally watery diarrhoea, of infected patients, 20% to 30% required mechanical ventilation and 10% died, with higher fatality rates in older patients and those with medical comorbidities. Human-to-human transmission was documented, mostly in health care settings (De Wit et al. 2016).

Furthermore, Middle East respiratory syndrome (MERS) that is also known as MERS-COV was recognized in 2012 in Saudi Arabia. That is another highly pathogenic beta-COV and died one person with respiratory failure (Song et al. 2019). In the same way, SARS was spread the MERS also spread across the globe and was contained and eliminated in relatively short order, MERS has smouldered, characterized by sporadic zoonotic transmission and limited chains of human spread. MERS recorded 2494 cases and 858 deaths and a majority in Saudi Arabia and reservoir for the MERS was bats, yet human transmission events have primarily been attributed to an intermediate host, the dromedary camel (World Health Organization 2018). Clinically MERS and SARS are having many similarities like severe atypical pneumonia, but key differences are also evident (De Wit et al. 2016). Patients with MERS have prominent gastrointestinal symptoms and often acute kidney failure, likely explained by the binding of the MERS-CoV S glycoprotein to dipeptidyl peptidase 4 (DPP4), which is present in the lower airway as well as the gastrointestinal tract and kidney, MERS necessitates mechanical ventilation in 50% to 89% of patients and has a case fatality rate of 36% (Song et al. 2019).

Also, The recent strain that begins spreading from the city of Wuhan, the central part of Hubei province in China is related to two other coronaviruses that have caused major outbreaks in recent years: severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS). The full-genome study of COVID-19 revealed the secret that belongs to beta coronavirus, but it is divergent from SARS-CoV and MERS-CoV that caused epidemics in the past (Zhou et al. 2020). According to the (WHO, 2020) Coronaviruses are zoonotic, meaning they are transmitted between animals and people. Detailed investigations found that SARS-CoV was transmitted from civet cats to humans and MERS-CoV from dromedary camels to humans. Several known coronaviruses are circulating in animals that have not yet infected humans. Isolation and quarantine of the virus and the initial description of its specific cytopathic effects and morphology. The molecular framework is used successfully to identify infectious agents for many years (Zhu et al. 2020).

This study aims to identify the historical background of the coronavirus family that is already affected the civilization and animals. This study will overview the overall literature published on the Coronavirus. For that, the Scopus database and web of science will use to analyse the published literature. The novelty of the study is to find out the research work done by the past researchers in the field of coronavirus and vaccination development for the prevention of the coronavirus. In the light of past research and current reports related to the novel coronavirus (COVID-2019), this study will give direction to the researcher and practical implications related to vaccinations and medical necessities required for the control outbreaks like COVID-19. The recent outbreak is not only a greater challenge for the

scientists to develop the prevention vaccination but also question for the public health management institutions. The novel study will establish the direction for the researchers towards the outbreaks and discuss the future agenda in the conclusion segment. Although the current literature doesn't have enough data and literature about coronaviruses because the effect is the past is very much limited as compared to the recent destruction of the global health care. For that purpose, literature is looked in detailed and classified.

2. MATERIALS AND METHODS

The most recent outbreak of coronavirus disseminating fear and serious threat to civilization but at the same time, it significantly reshaped the societies at large. The study analyses the past literature using a systematic literature review (SLR) approach (REYES, 2015). The PRISMA framework templet is used to explain the overall process of selection and rejections of articles for the Review of Coronavirus. The PRISMA statement helps the researcher to improve the reporting of the review paper. The Review is limited to published literature in the Scopus and Web of Science databases. The keyword used coronavirus to access the literature. The total number of 719 articles were listed on an initial search. The search then narrowed to the subject areas to Medicine, Immunology and Microbiology Biochemistry, Genetics and Molecular Biology, Veterinary, Pharmacology, Toxicology and Pharmaceutics and Nursing, the total number of research articles were 102.

The most recent outbreak of coronavirus is not only creating the fear and threat to civilization but also open the directions of opportunities and socialization in a greater form. The study analysis the past literature to a systematic literature review (SLR) (REYES, 2015). The PRISMA statement templet is used to explain the overall process of selection and rejections of Article for the Review of Coronavirus. The PRISMA statement helps the researcher to improve the reporting of the review paper. The Review is limited to published literature in the Scopus database.

The study is based only on articles, review papers and conference papers. For maintaining the quality of the Review, every kind of duplication is checked very thoroughly. The other important problem was the citation checking during the study and the process citation is checked very strictly. Abstracts and conclusions of the articles are checked deeply for the analysis and purification of the articles to make sure at the possible level. A careful evaluation of each research paper was carried out at a later stage. The next exclusion criterion was to limit the papers published in the English language only. There was 1 article in non-English language and was excluded from the study. Furthermore, after the filtration of duplicate records, 9 more articles are removed from the study. We selected 93 articles after assessing each article on the aforementioned inclusion and exclusion criteria. Figure 1 shows the literature inclusion and exclusion at every stage.

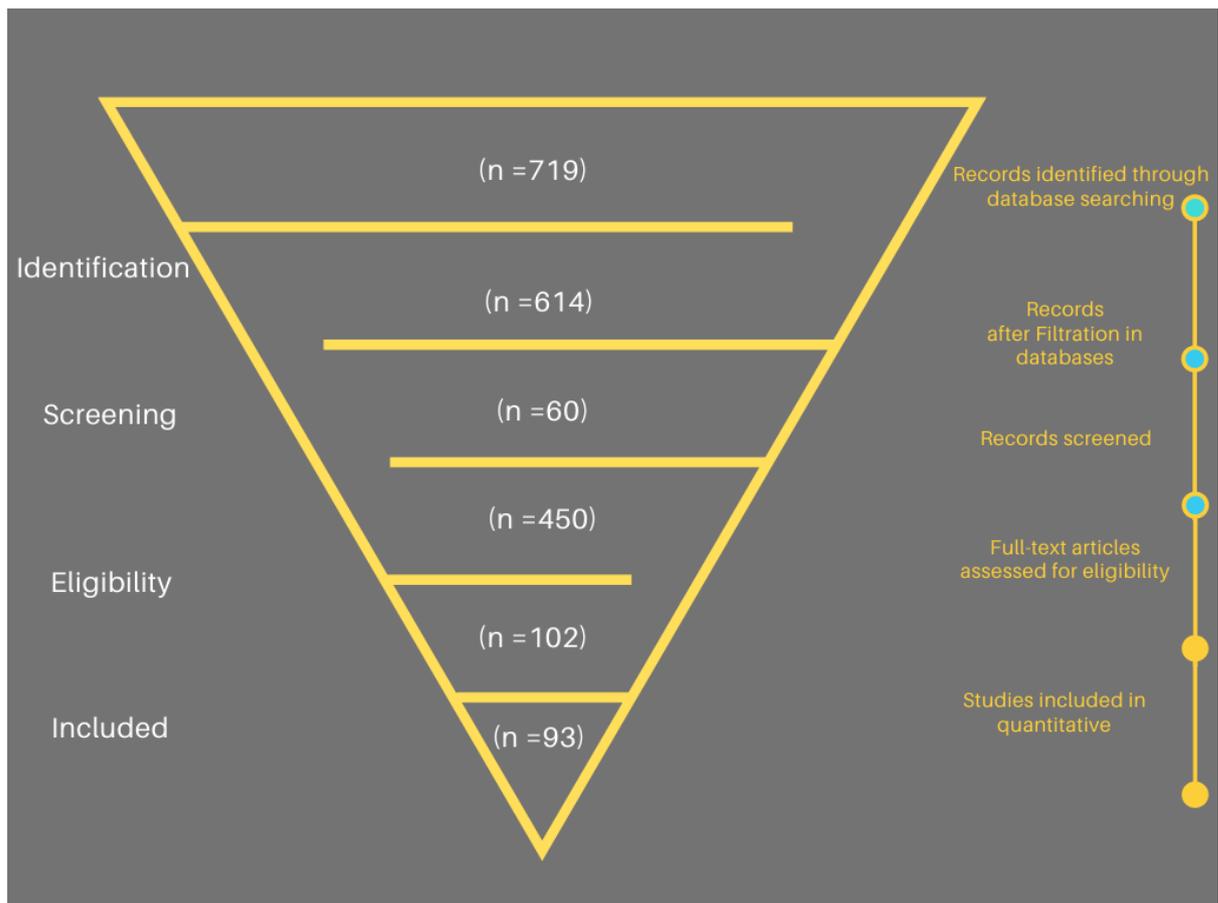


Figure1: Literature search details (PRISMA Framework)

3. RESULTS

Descriptive analysis

We selected 93 articles after a careful inclusion and exclusion process. Only original articles, review papers and conference papers written in the English language available in SCOPUS and Web of Science (WoS) databases were included in the Review. The total 82 studies are based in full articles, 8 review paper, and 3 conference papers are included in the study. Figure 2 showed the results of document selection after the quality assessment.

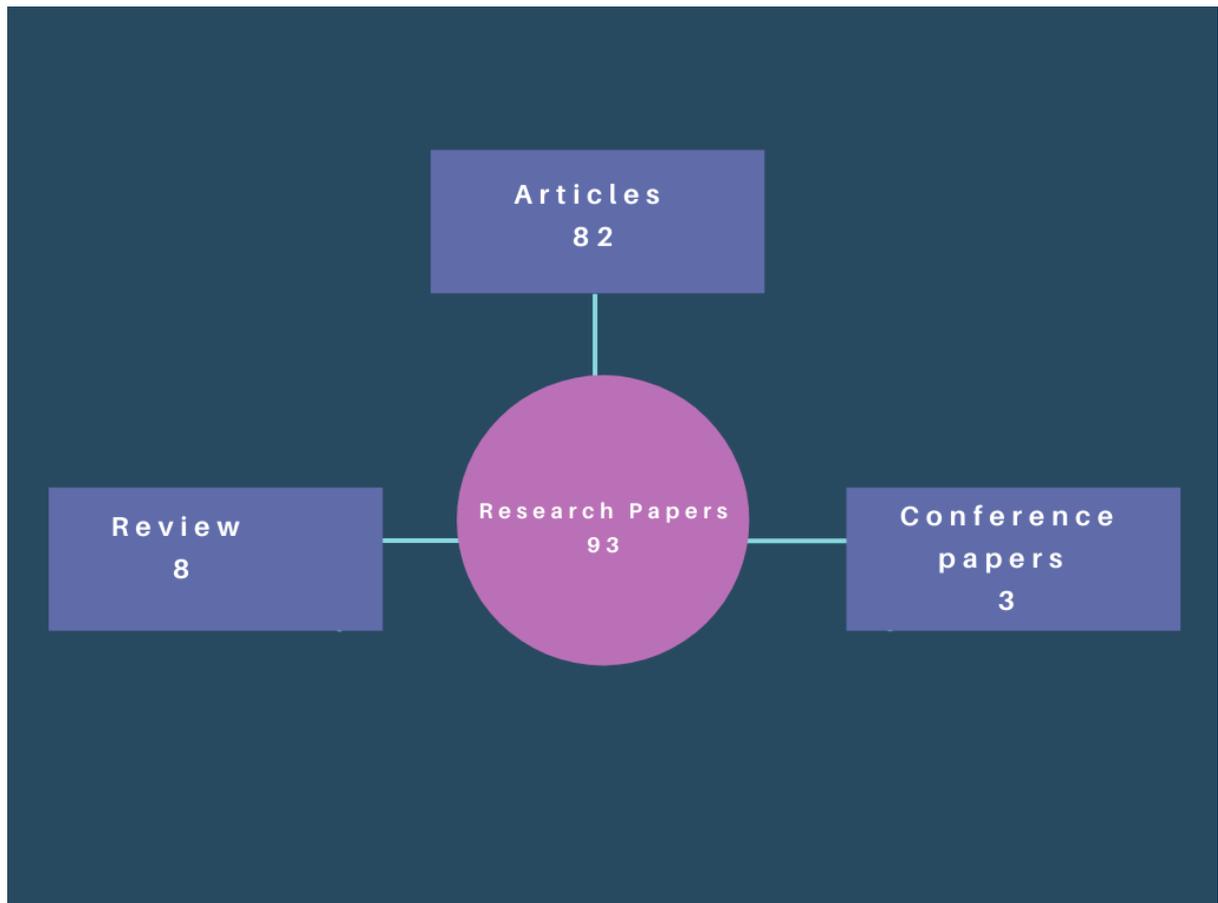


Figure 2: Distribution of articles based on article types

The study is not focusing on the specific time frame for the articles published in which year. The main purpose of the year-wise distribution is to understand the number of publications in a year selected and fulfil the criteria for the Review. Figure 3 shows the year base graph of publications from 1972 to 2020. The year 2005 and 2006 are contributing the highest number with the 9 articles each year. The year 2009 is second in the list with 7 articles on the coronavirus issue. The year 2006 contributed the 7studies. So, the number of contributions in the recent past is high rather than in the past. Figure 3 is showing the detail information of articles selected from the different years.

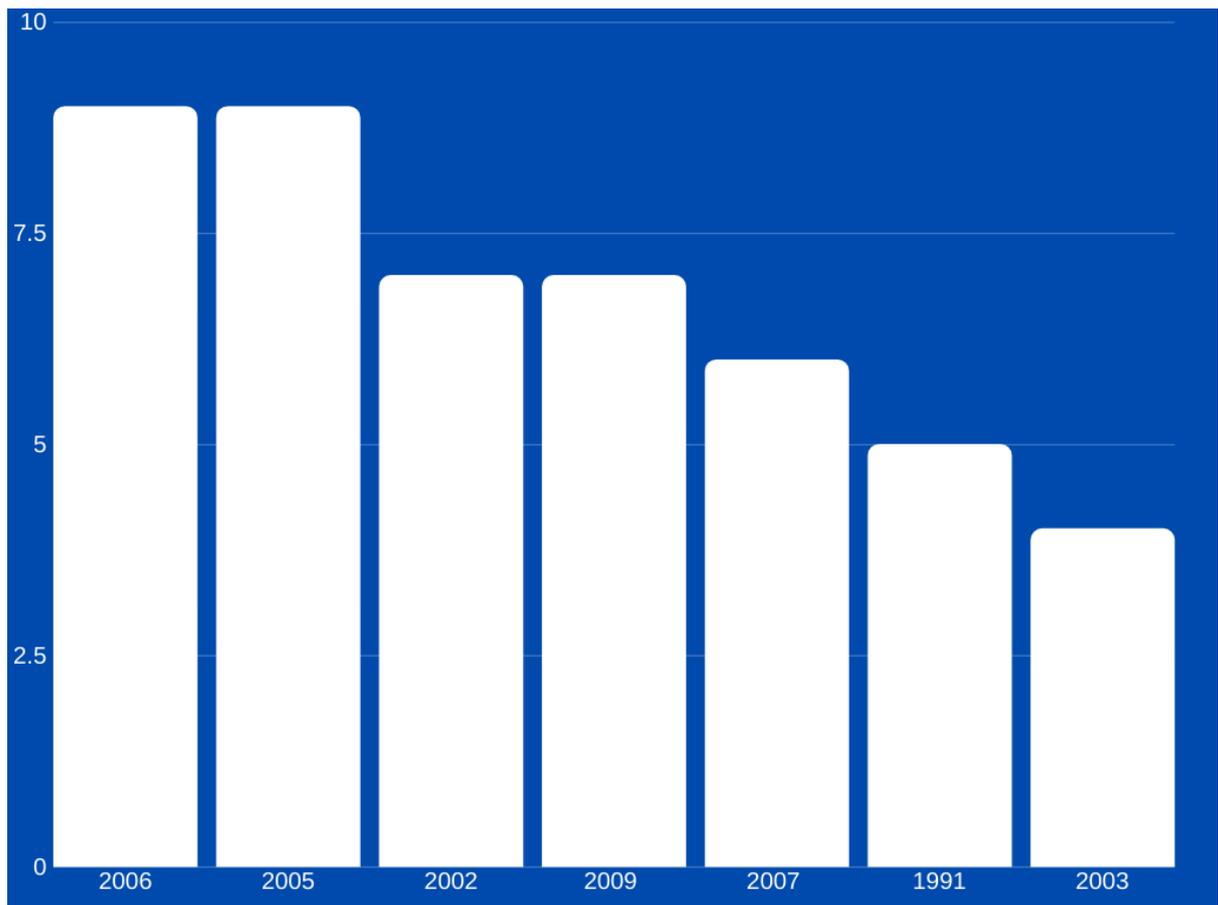


Figure 3: Distribution of research articles based on year categories

The journal-based publication is showing the journals with the highest number of publications contributed to the current study. Journal of Virology is top of the list with 7 studies contributed. The 5 studies are selected from the Virology journal. In the last third, most studies are selected from the Journal of General Virology with 4 numbers and figure 4 is showing the detail of the remaining journals.

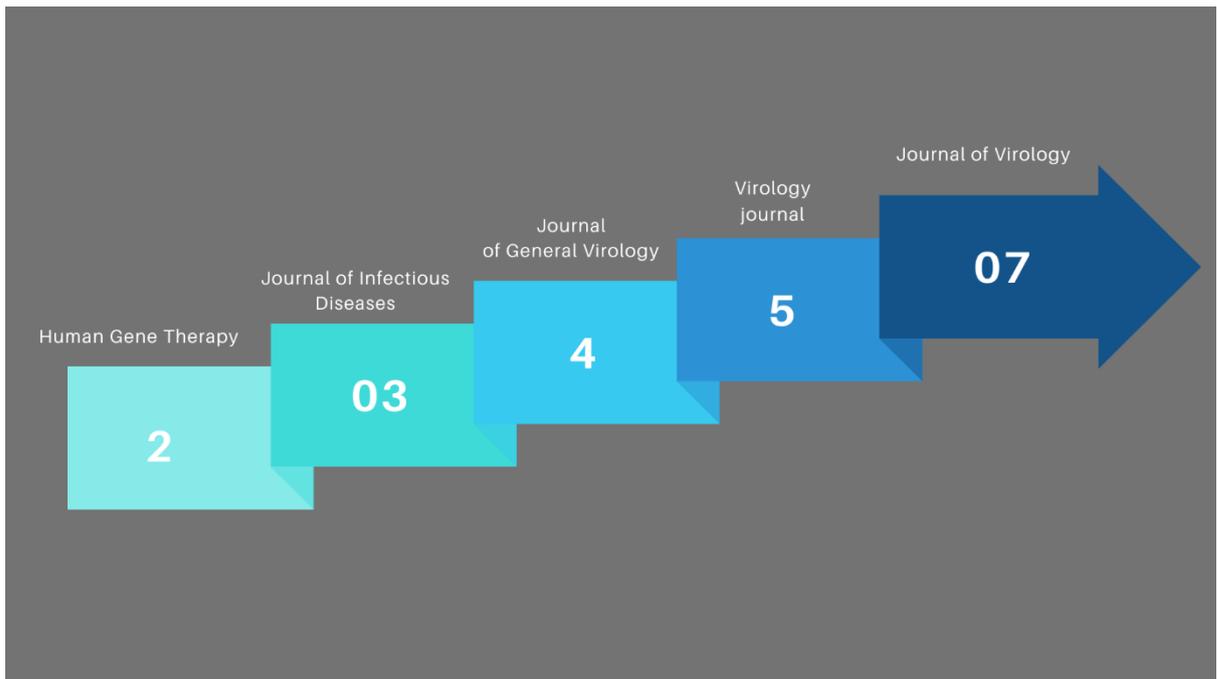


Figure 4: Distribution of research articles based on journals categories

Figure 5 indicates the highly cited papers. The article “How long do nosocomial pathogens persist on inanimate surfaces? A systematic review” cited 1134 times and published in BMC Infectious Diseases in the year 2006. Figure 5 is showing the detail citation report of the studies included in the current study.

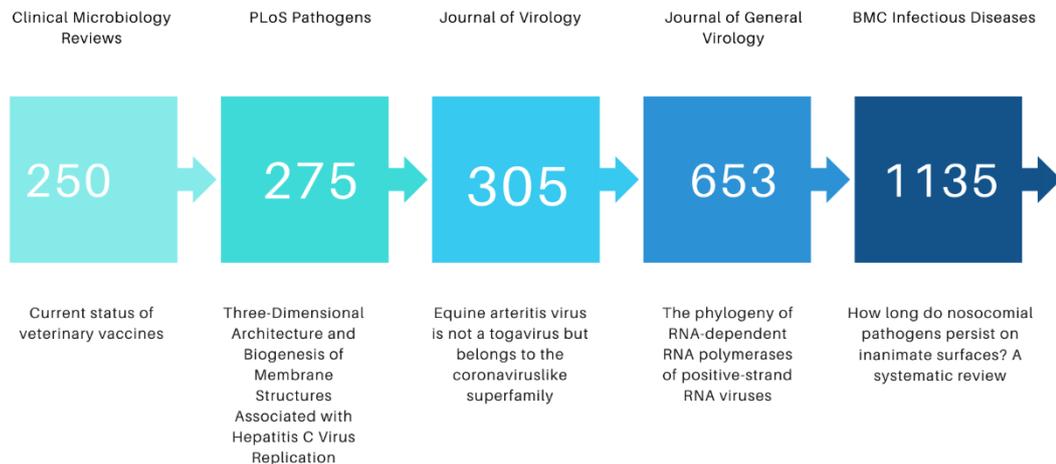


Figure 5: Distribution of research articles based on most cited

The Severe Acute Respiratory Syndrome coronavirus (SARS) coronaviruses

The classification part related to coronavirus maximum literature is related to SARS virus and that is the part severe virus in the family. According to Li et al., (2005) SARS-CoV is the member of the severe acute respiratory syndrome that emerged a serious epidemic in 2002-2003. The virus was infected over 8000 people and the fatality rate was 10%. Coronaviruses, which are large, enveloped, positive-strand RNA viruses, infect a variety of mammalian and avian species and can cause upper respiratory, gastrointestinal, and central nervous system diseases. The findings of the study are that the atomic details of two proteins explain the sensitivity of residue changes that extend cross-species infection and human to human transmission (Qureshi et al. 2015). The SARS not only infected the human but also a study discusses the Beluga Whale infected. The study found that the extreme divergent coronavirus was identified in the liver tissue in the deceased whale. The detection of a novel coronavirus in a deceased beluga whale raises several questions, including whether beluga whales are the natural host for this virus and whether the virus was pathogenic to the whale (Mihindukulasuriya et al. 2008). In conclusion, the study finds that novel coronavirus is from primary animal tissue, but these viruses can be transmitted the human and animal. While the other research name “Issues to consider for preparing ferrets as research subjects in the laboratory” suggested the laboratory use of ferrets for the application SARS. Ferrets are used to study the pathogenesis and treatment of a variety of important human diseases, including influenza, SARS, peptic ulcer disease, and cystic fibrosis to name only a few (Ball 2006). But the (Mitchell et al. 2013) study results and findings are concerning that the SARS was a serious public health issue as emerging pandemics. the key regulatory events that lead to disease pathology remain poorly targeted with therapeutics. The study results demonstrated that the utility of integrating diverse ‘omic datasets to predict and prioritize regulatory features conserved across multiple pathogen infection models. Researchers also focus the probes for the development of the fluorescence detection in the literature and combined to microgel particles for a highly sensitive fluorescence detection of nucleic acids (N Khan en Qureshi 2020).

Furthermore, the recommendations and findings of the study proposed the platforms combine the innovative double edge probe into microgels particles represents an attractive alternative to conventional sensitive DNA detection technologies that rely on amplification methods. Since the practice of DNA sequence detection has become increasingly ubiquitous in genetics, pathology, criminology, food safety, and many other fields, the robustness, flexibility and versatility of our microgel-based assay proof the concept of a new technology that after specific adaptations could open up new roots in the context of point-of-care testing through an easy and fast detection of sensitive diagnostic biomarkers by using fluorescent microscopy in miniaturized systems (Aliberti et al. 2016). But the literature also considers the SARS and its implications on the economic and social perspective. However, Zhu et al., (2004) after with infection antibody against the virus is generated and anti N protein antibody in SARS is not detectable in patients. It is believed that antibody responses induced by N protein of SARS is immunodominant and may play an important role in the viral response. Vaccination development-related many studies tested on the monkeys, the ability of adenoviral delivery of codon-optimised SARS-CoV strain Urbani structural antigens spike protein S1 fragment, membrane protein, and nucleocapsid protein to induce virus-specific broad immunity in rhesus macaques. findings are adenoviral-based vaccine for the SARC are has specific immune responses in the monkeys and promises for the development of a safer vaccine for the human (Gao et al. 2003). However, the Jiang et al., (2005) concluded that S protein is a major inducer of neutralising antibodies. These vaccines can encourage powerful defusing and defending replies in vaccinated animals but may induce antibodies that improve

infection by initial human SARS-CoV and animal SARS-CoV-like viruses. Recombinant RBD or vectors programming RBD may be used as innocuous and effective vaccines for avoiding infection by SARS-CoV with separate genotypes. The findings of the Du et al., (2009) that S protein plays key parts in the induction of neutralizing-antibody and T-cell responses, as well as protective immunity, during infection with SARS-CoV (Hendar, Nurhayati, en Sugiyarti 2018). In this Review, we highlight recent advances in the development of vaccines and therapeutics based on the S protein.

Table 1: Literature on SARS

Author	Title	Procedur e	Setting	Findings
Li et al., (2005)	Structural biology: Structure of SARS coronavirus spike receptor-binding domain complexed with receptor	atomic details of protein	lab	The findings of the study are that the atomic details of two proteins explain the sensitivity of residue changes that extend cross-species infection and human to human transmission.
Mihindukulasuriya et al., 2008	Identification of a novel coronavirus from a beluga whale by using a pan viral microarray	Animal tissues	Experimental	the study finds that novel coronavirus is from primary animal tissue, but these viruses can be transmitted the human and animal.
Ball, 2006	Issues to consider for preparing ferrets as research subjects in the laboratory	Ferrets	Disease	Ferrets are used to study the pathogenesis and treatment of a variety of important human diseases, including influenza, SARS, peptic ulcer disease, and cystic fibrosis to name only a few
Mitchell et al., 2013	A Network Integration Approach to Predict	Database	network	results demonstrated that the utility of integrating

	Conserved Regulators Related to Pathogenicity of Influenza and SARS-CoV Respiratory Viruses			diverse ‘omic datasets to predict and prioritize regulatory features conserved across multiple pathogen infection models
Aliberti et al., 2016	The Highly sensitive and direct fluorescence detection of single viral DNA sequences by the integration of double-strand probes onto microgels particles	viral DNA	Experimental	the platforms combine the innovative double edge probe into microgels particles represents an attractive alternative to conventional sensitive DNA detection technologies that rely on amplification methods
Yadav et al., 2014	Crimean-Congo haemorrhagic fever: Current scenario in India	Economic	Review	study recommended that when the virus is spread the economic and social problems for economies increase and small economies are in huge trouble due to the viruses. But in case of SARS timely coordination between the states reduces the chances of greater economic and social lose
Hazra, 2004	Live, Attenuated Coronavirus Vaccines through the Directed	Vaccines	Review	findings are shows that social and economic loss is very limited due to SARS

	Deletion of Group-Specific Genes Provide Protection against Feline Infectious Peritonitis			
Zhu et al., 2004	Induction of SARS-nucleoprotein-specific immune response by use of DNA vaccine	Vaccination	Lab	It is believed that antibody responses induced by N protein of SARS is immunodominant and may play an important role in the viral response.
Gao et al., 2003	Effects of a SARS-associated coronavirus vaccine in monkeys	vaccine	Experimental	results show that an adenoviral-based vaccine can induce strong SARS-CoV-specific immune responses in the monkey, and hold promise for the development of a protective vaccine against the SARS causal agent.
Jiang et al., 2005	SARS Vaccine Development	Vaccine	Lab	Recombinant RBD or vectors programming RBD may be used as innocuous and effective vaccines for avoiding infection by SARS-CoV with separate genotypes.
Du et al., 2009	The spike protein of SARS-CoV —	Vaccine	Literature review	The work on SARS-CoV S protein-based

	<p>a target for vaccine and therapeutic development</p>			<p>vaccines and drugs will be useful as a model for the development of prophylactic strategies and therapies against other viruses with class I fusion proteins that can cause emerging infectious diseases.</p>
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Middle East Respiratory Syndrome Coronavirus (MERS)

The literature is showing the after the SARS outbreak another coronavirus cases recorded named, the Middle East Respiratory Syndrome Coronavirus, according to the WHO reports Middle East respiratory syndrome (MERS) is a viral respiratory disease caused by a novel coronavirus (Middle East respiratory syndrome coronavirus, or MERS-CoV) that was first identified in Saudi Arabia in 2012. Typical MERS symptoms include fever, cough and shortness of breath. Pneumonia is common, but not always present. Gastrointestinal symptoms, including diarrhoea, have also been reported and Approximately 35% of reported patients with MERS-CoV infection have died (WHO, 2012). In the current study, we find literature that is finding the reasons of MERS disease and prevention techniques to handle the situation. The study recommended the five super-spreaders of MERS contributed to developing necessary actively develop a system that involves planning, implementation, restoration and prevention before a disaster for the society. The author also recommended that to conduct more research towards the prevention and management of the infectious disaster (Choi en Park, 2016; Khan et al., 2017). The literature also discusses the other countries outside Saudi Arabia and the gulf that is highly affected with the Middle East Respiratory Syndrome Coronavirus was Korea and study developed two models to find the process of MERS in the Republic of Korea. Results of the study show that when the dieses emerged there were no proper measures and planning to control the virus but when the government isolated the patients from the public, the epidemic spread slowly and controlled quickly after the adaptation of the second model (Xia et al., 2015; Ramadani et al., 2019). Another study also concerns about the measures and planning of the controlling the pandemic situation in the corporate level, health awareness is vital for the plan implementation for pandemic control and everyone knows about her and his role to avoid the risky behaviours. The study also suggested that the corporate level is more important about the plan implementation of pandemic control for the communication paths must be clean for smooth communication (Ibrahim 2014). However, several experiments and lab processes are done for the vaccination by the scientist to cure SARS and MERS, proper vaccination was not developed by the scientist. Multiple neutralization mechanisms were demonstrated by solving the atomic structure of a NAb-RBD complex, through sequencing of neutralization escape viruses and by constructing MERS-CoV S variants for serological assays (Wang et al., 2015, Irfan et al., 2018). However, Haagmans et al., (2016) findings are that a significant reduction of excreted infectious virus and viral RNA transcripts in vaccinated animals upon MERS-

CoV challenge. Protection correlated with the presence of serum neutralizing antibodies to MERS-CoV. Induction of MVA-specific antibodies that cross-neutralize camel pox virus would also protect against camel pox.

Table 2: MERS

Author	Title	Procedure	Settings	Findings
Wang et al., 2015	Evaluation of candidate vaccine approaches for MERS-CoV	vaccination	lab	Multiple neutralization mechanisms were demonstrated by solving the atomic structure of a NAB-RBD complex, through sequencing of neutralization escape viruses and by constructing MERS-CoV S variants for serological assays
Haagmans et al., 2016	An orthopoxviral-based vaccine reduces virus excretion after MERS-CoV infection in dromedary camels	vaccination	lab	Induction of MVA-specific antibodies that cross-neutralize camelpox virus would also protect against camelpox.
Choi and Park, 2016	An analysis of actual conditions with the infectious disease of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) spreading in South Korea	infectious disease	data	Study recommended the five super-spreaders of MERS contributed to developing necessary actively develop a system that involves planning, implementation, restoration and prevention before a disaster for the society
Xia et al., 2015	Modelling the Transmission of Middle East Respiratory Syndrome Corona Virus in the Republic of Korea	control measures	lab	Results of the study show that when the disease emerged there were no proper measures and planning to control the virus but when the government isolated the patients from the

				public, the epidemic spread slowly and controlled quickly after the adaptation of the second model
Ibrahim, 2014	Middle east respiratory syndrome coronavirus (MERS-CoV) and its implications on pandemic planning	health concern	behaviours	corporate level, health awareness is vital for the plan implementation for pandemic control and everyone knows about her and his role to avoid the risky behaviours
Al-Hazmi, 2016	Challenges presented by MERS coronavirus, and SARS coronavirus to global health	antibody	Test	The findings show that there are many questions about the coronaviruses that are still not solved, even though there is an improvement in our knowledge about Corona-virus, numerous queries were still unanswered, together with the absolute origin, possible ways of transmission and exact treatment
Al Shehri, 2015	A lesson learned from Middle East respiratory syndrome (MERS) in Saudi Arabia	public health	professional development programs	public health care and public health services needs revitalization. Political will and support, integration of PHC and PH, and on-job professional development programs are three initial steps towards successful revitalization. In higher education and training programs, public health and health care process needs more and efficient system.

Bovine coronavirus

The third major classification is related to the bovine coronavirus that is Bovine coronavirus (BCoV) is an important livestock pathogen with a high prevalence worldwide. The virus causes respiratory disease and diarrhoea in calves and winter dysentery in adult cattle. These diseases result in substantial economic losses and reduced animal welfare (Boileau en Kapil 2010). To examine the dynamics of bovine coronavirus Ohlson et al., (2013) and the bovine respiratory syncytial virus is studied for three years. For this purpose, 79 dairy herds were selected in Sweden, conducted a survey and measuring antibody concentrations. Milk samples of cows used annually. The findings of the study are pooled milk samples of cows are easy to monitor herd infection status. But the results of the study show that bovine enteric coronavirus is multiplied gradually in high efficiency. That is established from human rectum adenocarcinoma presents some properties of the differentiated brush border cell of the intestinal villi. The virus generates the characteristics of Bovine enteric coronavirus in shape, spikes, density and hemagglutination of rat erythrocytes (Laporte, Bobulesco, en Rossi 1980). But the later study included is also discuss the 4-5 weeks of old calves for the clinical signs, serum antibody titres to four viruses and serum levels of type I interferon (IFN) after arrival at a rearing unit. None of the calves show any rise and all calves were seropositive to bovine coronavirus (BCV) at arrival and two calves showed a rise in IgG titre to the virus. Findings of the study are IFN can be used for nonspecific indicators of early virus infection in calves(Yildirim et al., 1996; Alhakimi en Mahmoud, 2019). Yildirim et al., (2008) investigated the Bovine Rotavirus and Bovine coronavirus in his study, infections were examined in blood serum 498 unvaccinated adult cattle in turkey. Findings of the study showed the results seroprevalence of BRV was found in 146 (29.3%) and that of BCV was found in 131 (26.3%) in tested cattle sera. Bothe viruses founded the antibodies in 21 cattle sera. The results show that bovine rotavirus and bovine coronavirus are common in adult cattle the seropositive animals should be considered as a source of infection within the herd. Another study discusses the role of pathogenic agents that affect the gastrointestinal tract of neonatal goat kids. An intestinal tissue sample of 142 died kids was collected for the detection of toxins types. The results recommended that C perfringens type A and type D are the frequent toxin types influencing neonatal goat kids, with β 2 toxin being a further possible virulence component. SYBR green-based real-time PCR assay can be used as a quick lab-based technique for efficient screening of EPEC from enteritis affected kids. Group-A rotavirus and bovine coronavirus appeared to be instrumental in causing mixed infection enteritis in kids (Singh et al., 2018; Shafiq et al., 2019). Table 3 is showing the author, title and findings of studies below.

Table 3: Bovine coronavirus

Author	Title	Procedures	Settings	Findings
Ohlson et al., 2013	A longitudinal study of the dynamics of bovine coronavirus and respiratory syncytial virus infections in dairy herds	primiparous cows	dairy herds	The findings of the study are pooled milk samples of cows are easy to monitor herd infection status
Laporte et	A cell line	dog enteritis	lab	The virus generates the

al., 1980	particularly susceptible to bovine enteric Coronavirus replication: HRT 18 cells [Une lignée cellulaire particulièrement sensible à la replication du Coronavirus entérique bovine: Les cellules HRT 18.]	coronaviruses		characteristics of Bovine enteric coronavirus in shape, spikes, density and hemagglutination of rat erythrocytes
Yildirim et al., 1996	Type 1 interferon and virus-specific IgA and IgM antibodies as an aid in the diagnosis of ongoing infections in calves	ongoing infections	lab	Findings of the study are IFN can be used for nonspecific indicators of early virus infection in calves
Yildirim et al., 2008	Seroprevalence of the rotavirus and coronavirus infections in cattle	adult cattle	neutralization test	The results show that bovine rotavirus and bovine coronavirus are common in adult cattle the seropositive animals should be considered as a source of infection within the herd.
Singh et al., 2018	Detection of Clostridium perfringens toxins types, enteropathogenic e. Coli, rota and coronaviruses in the intestine of neonatal goat kids by molecular techniques	goat kids	lab	The results recommended that C. perfringens type A and type D are the frequent toxin types influencing neonatal goat kids, with $\beta 2$ toxin being a further possible virulence component.

Canine coronavirus and Feline coronavirus

The major forth classified literature based on the canine coronavirus and feline coronavirus found in the current study. Canine coronavirus infection the dogs and study screened 328 healthy dogs for the presence of canine coronavirus antibody in the serum samples. Total number of 239 of the samples were positive canine coronavirus antibody in

the results (Alamelu, Bhat, en Sastry 2002). Later another study also screened the dogs, according to the Ng'ambi et al., (2017) canine coronavirus is infected in dogs and author virologic and surgical investigation perform to find the presence and prevalence of canine coronavirus infection in the dog population. In the process, sera samples were analysed for antibodies against canine coronavirus. The results of the study concluded that canine coronavirus is widespread in the Turkish dogs and virus attributed to be one of the important viral agents in the dog. Another study is also conducted on the canine coronavirus in the Turkish dog's perspective and the study concluded that the canine coronavirus is responsible for acute diarrhoea, vomiting, appetite loss, lethargy and bronchopneumonia in dogs. For the study blood sample was collected randomly from a total of 102 clinically healthy shepherd dogs, 49 males and 53 females older than one year of age they are unvaccinated for canine coronavirus. Results show that there is no significant difference between gender and age groups (Medicine, 2017; Zahid et al., 2020). Table 4 is showing the authors, title and findings of literature in details below about Canine coronavirus and Feline coronavirus.

Similarly, the Feline coronavirus is also discussing in the literature by a few studies, feline viruses are normally infected wildcats. Daniels et al., (1999) conducted a survey 50 wildcats in Scotland, tested for the feline coronavirus infection. The results of the study show that the feline coronavirus was found in 33% of the sample tested to find that. Study confirms that most of the wildcats in Scotland are infected by the virus. Later in 2008 a study conducted in ocelots in native to Barro Colorado Island, Panama which is free of domestic animals, for antibodies to the feline herpes virus. Samples also were tested for feline leukaemia virus antigens. Positive tests results were only observed for FIV; 50% of the ocelots were positive. The study hypothesis that isolation of population has prevented the introduction of pathogens (Franklin et al., 2008; (Khan et al. 2020a).

Table 4: Canine coronavirus and Feline coronavirus

Author	Title	Procedures	Settings	Findings
Alamelu et al., 2002	Sero survey of canine coronavirus infection in dogs	dogs	lab	Total number of 239 of the samples were positive canine coronavirus antibody in the results
Ng'ambi et al., 2017	Seroprevalence of canine coronavirus in Kar's shepherd dogs in Kars province, Turkey	dogs	lab	results of the study concluded that canine coronavirus is widespread in the Turkish dogs and virus attributed to be one of the important viral agents in the dog.
Medicine, 2017	Canine coronavirus infection in dogs in Turkey: Virological and serological evidence	dogs	demographics	Results show that there is no significant difference between the gender and age groups
Daniels et al., 1999	Feline viruses in wildcats from Scotland	wildcats	test	The results of the study show that the feline coronavirus was found in 33% of the sample tested to find that. Study confirms

				that most of the wildcats in Scotland are infected by the virus.
Franklin et al., 2008	Ocelots on Barro Colorado Island are infected with feline immunodeficiency virus but no other common feline and canine viruses	wildlife populations	test	The study hypothesis that isolation of population has prevented the introduction of pathogens

Novel Coronavirus Disease 2019 (COVID-19)

The novel coronavirus is not very much highlighted in the literature and not enough literature is available on the topic yet due to the recent time. During the review of the literature, very limited studies are found on the topic, database show only two articles related to the novel coronavirus disease (2019-COVID). Paraskevis et al., (2020) finds the genetic similarity between the novel coronavirus (2019-COVID) and RaTG13 recommended that does not provide the exact variant that causes the large-scale outbreak in the human. Most likely the hypothesis that novel coronavirus (2019-COVID) may be originated from the bat. Results of the show that the 2019-COVID is not-mosaic consisting of almost half of its genome of a distinct lineage within the beta coronavirus. The study also recommended the quarantine for the infected people and care for the future of socialization. Mehta et al., (2020) explain that the mortality rate is 3.7%, one compared with a mortality rate of less than 1% from influenza and suggests that a subgroup of patients with severe COVID-19 might have a cytokine storm syndrome. However, Chen et al., (2020) concluded in his research SARS-CoV and SARS-CoV-2 have genetic similarity in the host cell ACE2 receptor. On the experience from the SARS vaccines, it is expected that all COVID-19 vaccine needs safety evaluations. Still a long time for the vaccination process completion (Qureshi et al., 2020; Khan en Qureshi, 2020).

Bibliometric Analysis

Although the literature is explaining the previous coronavirus family pandemics and vaccination development process, still nations are not successful to develop the vaccination for the COVID-19 outbreak. We conducted a detailed bibliometric analysis of past studies based on two fundamental parameters. The first one is the text mining to identify the major terms frequently studies together. This gives us the idea to cluster the major areas of research in the field. Figure 6 indicates the results of text frequency based on the co-occurrence of the related terms. This information is very crucial to forming the major cluster of areas of research. We used VOS viewer software for bibliometric analysis. The result indicated there are one cluster of the research. The cluster indicates the authors and coauthors number of the studies. The results also indicate that the 28 authors have links in different researches and total link strength is 59

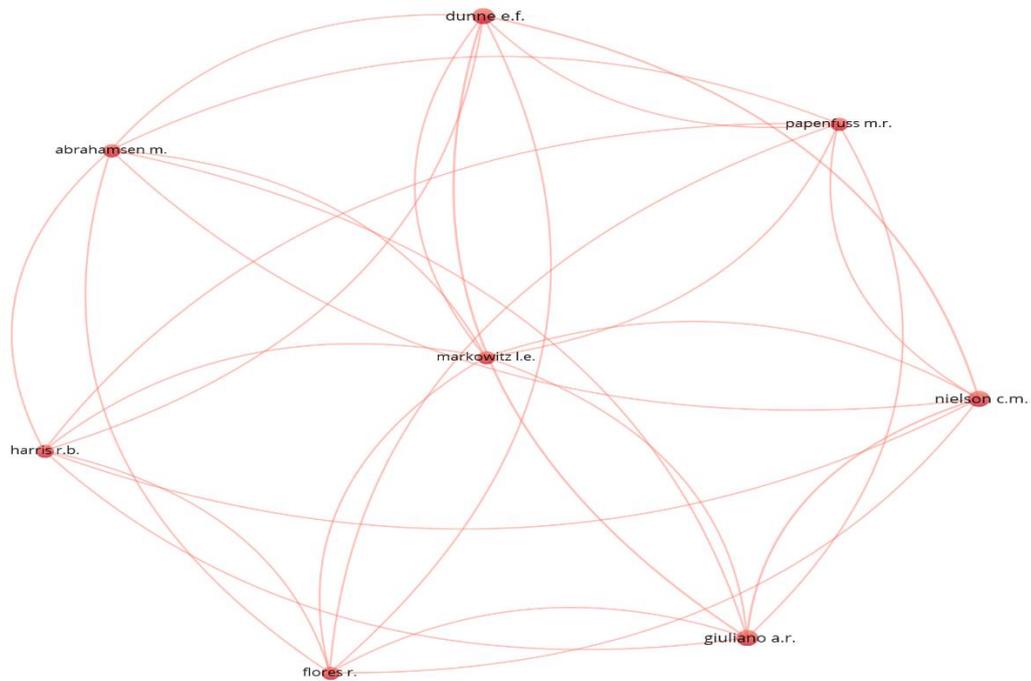


Figure 6: authors and coauthors link

The second important analysis in this regard is to assess the number of the terms used by the different studies included in the current study. The term corona virus is most apparently used by the studies and association is also used by the many authors. The figure 7 is showing the number of terms used in the different study visually. The term history is also used in high numbers in the studies.

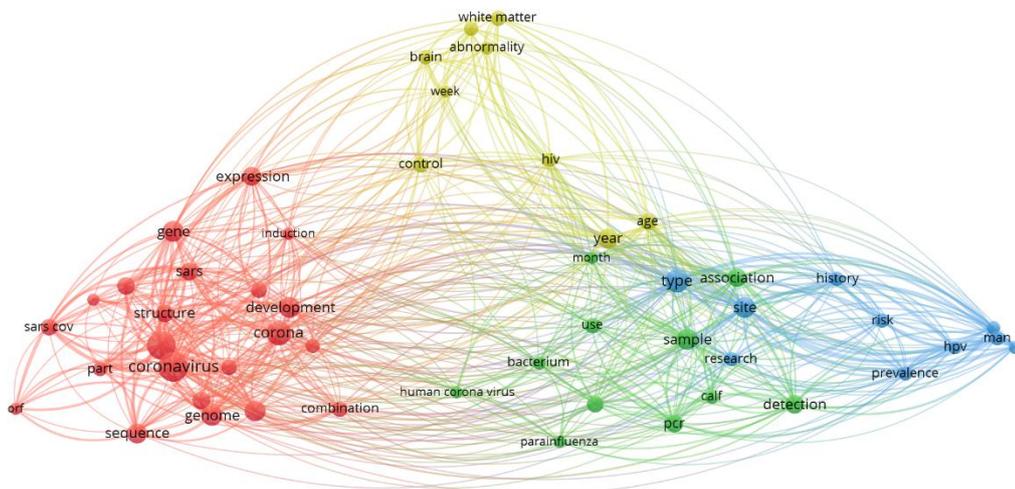


Figure7: terms used by the studies

Future of COVID-19

This study contributes to the literature by providing an elaboration of a descriptive mapping of the existing literature on the studies of Coronavirus pandemic that is a greater challenge for businesses and social structure in the current circumstances. The methodology and classification process of research is used to present a better mapping and understanding of research related to coronaviruses outbreaks and experiments for vaccine development. After developing the process of existing literature and dividing into the five different

classifications of coronavirus that were a threat to civilization in a different period; however, this article still has limitations. Reference literature selected in this paper is already published in the Scopus base journals and web of science that is completely following the high reputation and quality in respective fields, that make them very representable. Almost every article comes on eligibility criteria is encompass methodologies and empirical results, and review papers do not mention the empirical results and methodology but still, they are having the systematic picture of the Review in the concerned field. Although some very important reports and news also mention in the paper regarding the 2019-COVID, these reports and reputed newspapers have been subject to in-depth analysis. Moreover, in few times its hard to precisely define the viruses, but some of the related researches on coronavirus family were chosen to form a systematic Literature review on 2019-COVID future about vaccination and social distancing conditions.

Furthermore, the important contribution of this study is to underline the best possible future opportunities for Coronavirus vaccination development. Based on findings of a current systematic review, the agenda is formatted for future researches on the coronavirus (Ramakrishna et al. 2020). However, Coronavirus vaccination is a greater challenge for the scientists, but also public healthcare is challenging in the current scenario when the bigger states of the world are hands upfront of the outbreak (Khan et al. 2020b). The infrastructure that can facilitate a larger number of patients and infected people is crucial to comprehend (Al Shehri 2015). it must be realized that much more research is need conducted on the public health-related facilities in a different part of the worlds (Qureshi et al. 2019). Developed countries are also facing greater trouble in managing the resources for the infected people, a country like China, USA, UK and Spain also not has enough public health services to deal with the COVID-19. At the same time situation is worst for the underdeveloped countries, because the countries with fewer resources and larger populations are not able to control the 2019-COVID, Iran is a very real-time example of the statement. The world health organization is also suggested the medical emergency under the light of resources and medical abilities of the nations (WHO, 2020).

However, the novel COVID-19 is an RNA (Ribonucleic acid) virus that is a combination of genetic material covered by a protein shell. A host and RNA contact make new copies itself and move to infect other cells. Flu and measles are RNA virus are more disposed to changes when they compare with the DNA (Deoxyribonucleic acid) viruses. Like the smallpox and human papillomavirus. The RNA viruses are changing the norm frequently and COVID-19 Is changing slowly. SARS-CoV-2 is no exception, and over the past few months, it has been mutating (Zaman et al. 2013). The virus mutations, like what's going around in Italy and New York, don't seem to be any more infectious or fatal than the original strain that appeared in Wuhan, China. The virus mutating is good for the vaccine development. However, the vaccine development is time taking process and fully developing a vaccine and winning approval to use it in human patients could take three years(Hartford Business Journal,2020). Scientists are working aggressively for the vaccination development for the COVI-19 outbreak control and cure millions of humans that are potential infections of the virus. Vaccines work by injecting a dead virus or another safe version of illness into a person so their body attacks that "fake virus" and then has the antibodies available if a live virus invades. As per the settings of the SARS and MERS outbreaks in the recent past, researchers hope to streamline the discovery, development, and distribution of a COVID-19 vaccination, but the time frame is not yet clear.

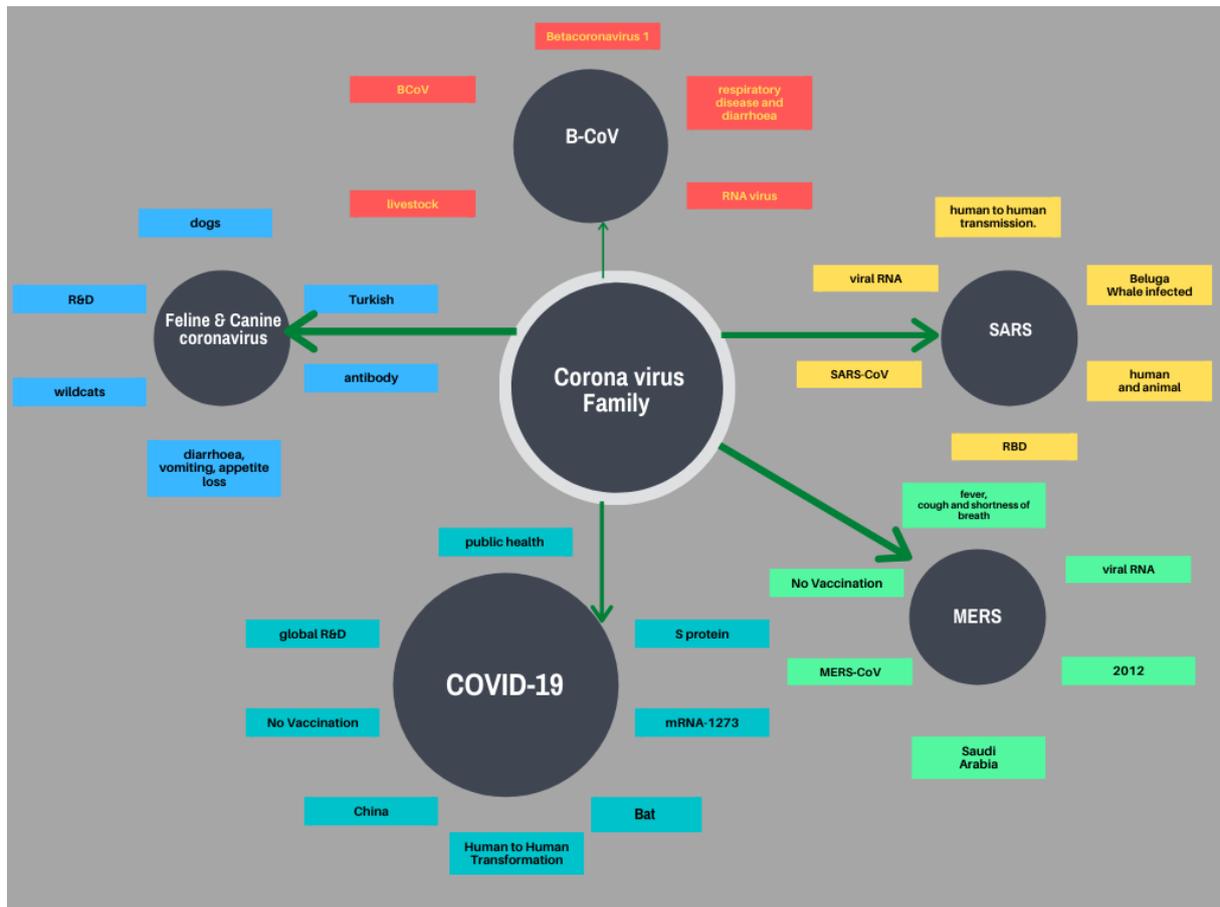


Figure 7: coronavirus family

Finally, the literature background shows that the coronavirus family viruses are still out of vaccination, MERS and SARS were control with coordination and management of the governments with each other. But the novel 2019-COVID is spreading more quickly, human to human interaction is the main reason for the infection. Quarantine of the infected people is the better option to handle the situation until the scientists can manage the proper vaccination. Moreover, literature also shows that after the SARS and MERS very limited efforts made by the researcher towards prevention of coronavirus in human.

4. LIMITATIONS

This study contributes to the literature by providing an elaboration of a descriptive mapping of the existing literature on the studies of Coronavirus pandemic that is a greater challenge for a scientist to develop the vaccination in the current circumstances. The methodology and classification process of research is used to present a better mapping and understanding of research. After developing the process of existing literature and dividing into the four different classifications of coronavirus that were a threat to civilization in a different period; however, this article still has limitations. Reference literature selected in this paper is already published in the Scopus base journals and web of science that are completely following the high reputation and quality in respective fields, which make them very representative. Almost every article comes on eligibility criteria is encompass methodologies and empirical results, and review papers do not mention the empirical results

and methodology but still, they are having the systematic picture of the Review in the concerned field. Although some very important reports and news also mention in the paper regarding the 2019-COVID, these reports and reputed newspapers have been subject to in-depth analysis. Moreover, in few times it's hard to precisely define the viruses, but some of the related researches on coronavirus family were chosen to form a systematic Literature review on the 2019-COVID future about public health care and vaccination development for COVID-19.

5. REFERENCES

- [1] Alamelu, M. S., M. Narayana Bhat, en K. N. V. Sastry. 2002. "Sero survey of canine coronavirus infection in dogs". *Indian Journal of Animal Sciences* 72(12):1096–97.
- [2] Alhakimi, Wail, en Mohammed Mahmoud. 2019. "The Impact of Market Orientation on Innovativeness: Evidence From Yemeni SMEs". *Asia Pacific Journal of Innovation and Entrepreneurship*.
- [3] Aliberti, A., A. M. Cusano, E. Battista, F. Causa, en P. A. Netti. 2016. "High sensitive and direct fluorescence detection of single viral DNA sequences by integration of double strand probes onto microgels particles". *Analyst* 141(4):1250–56.
- [4] Anon. n.d. "Coronavirus". Opgehaal 18 Maart 2020a (<https://www.who.int/health-topics/coronavirus>).
- [5] Anon. n.d. "Farmington biotech teams with Yale to pursue COVID-19 vaccine | Hartford Business Journal". Opgehaal 10 April 2020b (<https://www.hartfordbusiness.com/article/farmington-biotech-teams-with-yale-to-pursue-covid-19-vaccine>).
- [6] Anon. n.d. "Why outbreaks like coronavirus spread exponentially, and how to 'flatten the curve' - Washington Post". Opgehaal 18 Maart 2020c (https://www.washingtonpost.com/graphics/2020/world/corona-simulator/?fbclid=IwAR1PbiW_lkcPupOGT-SnW-zGeQDS6zs-hG1nJxCCVQ4q9bLya6mxIB_r78k).
- [7] Ball, Roberta Scipioni. 2006. "Issues to consider for preparing ferrets as research subjects in the laboratory". *ILAR Journal* 47(4):348–57.
- [8] Boileau, Mélanie J., en Sanjay Kapil. 2010. "Bovine Coronavirus Associated Syndromes". *Veterinary Clinics of North America - Food Animal Practice* 26(1):123–46.
- [9] Chen, Wen Hsiang, Ulrich Strych, Peter J. Hotez, en Maria Elena Bottazzi. 2020. "The SARS-CoV-2 Vaccine Pipeline: an Overview". *Current Tropical Medicine Reports* 1–4.
- [10] Choi, Gyu Yil, en Sang Sub Park. 2016. "An analysis of actual conditions with the infectious disease of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) spreading in South Korea". *Indian Journal of Science and Technology* 9(25).
- [11] Daniels, M. J., M. C. Golder, O. Jarrett, en D. W. MacDonald. 1999. "Feline viruses in wildcats from Scotland". *Journal of Wildlife Diseases* 35(1):121–24.
- [12] Du, Lanying, Yuxian He, Yusen Zhou, Shuwen Liu, Bo Jian Zheng, en Shibo Jiang. 2009. "The spike protein of SARS-CoV - A target for vaccine and therapeutic development". *Nature Reviews Microbiology* 7(3):226–36.
- [13] Franklin, Samuel P., Roland W. Kays, Ricardo Moreno, Julie A. TerWee, Jennifer L. Troyer, en Sue VandeWoude. 2008. "Ocelots on Barro Colorado Island are infected with feline immunodeficiency virus but not other common feline and canine viruses". *Journal of Wildlife Diseases* 44(3):760–65.

- [14] Gao, Wentao, Azaibi Tamin, Adam Soloff, Leonardo D’Aiuto, Edward Nwanegbo, Paul D. Robbins, William J. Bellini, Simon Barratt-Boyes, en Andrea Gambotto. 2003. “Effects of a SARS-associated coronavirus vaccine in monkeys”. *Lancet* 362(9399):1895–96.
- [15] Haagmans, Bart L., Judith M. A. Van Den Brand, V. Stalin Raj, Asisa Volz, Peter Wohlsein, Saskia L. Smits, Debby Schipper, Theo M. Bestebroer, Nisreen Okba, Robert Fux, Albert Bensaid, David Solanes Foz, Thijs Kuiken, Wolfgang Baumgärtner, Joaquim Segalés, Gerd Sutter, en Albert D. M. E. Osterhaus. 2016. “An orthopoxvirus-based vaccine reduces virus excretion after MERS-CoV infection in dromedary camels”. *Science* 351(6268):77–81.
- [16] Hendar, H., T. Nurhayati, en G. Sugiyarti. 2018. “Religio-centric Fashion Advantage on Marketing Performance: The Role of Innovativeness and Customer Responsiveness”. *Accounting & Management* 63(4):1–20.
- [17] Ibrahim, Salwan. 2014. “Middle east respiratory syndrome corona virus (MERS-CoV) and its implications on pandemic planning”. Bll 489–92 in *Society of Petroleum Engineers - SPE Middle East Health, Safety, Environment and Sustainable Development Conference and Exhibition, MEHSE 2014*. Society of Petroleum Engineers.
- [18] Irfan, A., A. Rasli, Z. Sulaiman, A. Sami, en M. I. Qureshi. 2018. “Use of social media sites by Malaysian universities and its impact on university ranking”. *International Journal of Engineering and Technology(UAE)* 7(4.28 Speci):67–71.
- [19] Jiang, Shibo, Yuxian He, en Shuwen Liu. 2005. “SARS Vaccine Development - Volume 11, Number 7—July 2005 - Emerging Infectious Diseases journal - CDC”. *Emerging Infectious Diseases* 11(7):1016.
- [20] Kahn, Jeffrey S., en Kenneth McIntosh. 2005. “Discussion”. *Pediatric Infectious Disease Journal* 24(11 SUPPL.).
- [21] Khan, N, en M. I. Qureshi. 2020. “A systematic literature review on online medical services in Malaysia”. *International journal of online and biomedical engineering* 16(6):107–18.
- [22] Khan, N. U., A. M. Rasli, en M. I. Qureshi. 2017. “Greening human resource management: A review policies and practices”. *Advanced Science Letters* 23(9):8934–38.
- [23] Khan, Nohman, en Muhammad Imran Qureshi. 2020. “A systematic literature review on online medical services in Malaysia”. *International journal of online and biomedical engineering* 16(6):107–18.
- [24] Khan, Nohman, Muhammad Imran Qureshi, Ishamuddin Mustapha, Sobia Irum, en Rai Naveed Arshad. 2020a. “A systematic literature review paper on online medical mobile applications in Malaysia”. *International journal of online and biomedical engineering* 16(1):63–82.
- [25] Khan, Nohman, Muhammad Imran Qureshi, Ishamuddin Mustapha, Sobia Irum, en Rai Naveed Arshad. 2020b. “A systematic literature review paper on online medical mobile applications in Malaysia”. *International journal of online and biomedical engineering* 16(1):63–82.
- [26] Laporte, J., P. Bobulesco, en F. Rossi. 1980. “A cell line particularly susceptible to bovine enteric Coronavirus replication: HRT 18 cells”. *Comptes rendus des seances de l'Academie des sciences. Serie D, Sciences naturelles* 290(9):623–26.
- [27] Li, Fang, Wenhui Li, Michael Farzan, en Stephen C. Harrison. 2005. “Structural biology: Structure of SARS coronavirus spike receptor-binding domain complexed with receptor”. *Science* 309(5742):1864–68.
- [28] Mehta, Puja, Daniel F. McAuley, Michael Brown, Emilie Sanchez, Rachel S. Tattersall,

- en Jessica J. Manson. 2020. "COVID-19: consider cytokine storm syndromes and immunosuppression". *The Lancet* 395(10229):1033–34.
- [29] Mihindikulasuriya, K. A., G. Wu, J. St. Leger, R. W. Nordhausen, en D. Wang. 2008. "Identification of a Novel Coronavirus from a Beluga Whale by Using a Panviral Microarray". *Journal of Virology* 82(10):5084–88.
- [30] Mitchell, Hugh D., Amie J. Einfeld, Amy C. Sims, Jason E. McDermott, Melissa M. Matzke, Bobbi Jo M. Webb-Robertson, Susan C. Tilton, Nicolas Tchitchek, Laurence Josset, Chengjun Li, Amy L. Ellis, Jean H. Chang, Robert A. Heegel, Maria L. Luna, Athena A. Schepmoes, Anil K. Shukla, Thomas O. Metz, Gabriele Neumann, Arndt G. Benecke, Richard D. Smith, Ralph S. Baric, Yoshihiro Kawaoka, Michael G. Katze, en Katrina M. Waters. 2013. "A Network Integration Approach to Predict Conserved Regulators Related to Pathogenicity of Influenza and SARS-CoV Respiratory Viruses". *PLoS ONE* 8(7).
- [31] Ng'ambi, Jones Wilfred, Ndivhuho Ramuthaga, en David Brown. 2017. "Effect of dietary threonine level on productivity and carcass characteristics of indigenous Venda chickens". *Indian Journal of Animal Research* 50(OF):565–68.
- [32] Ohlson, A., S. Alenius, M. Tråvén, en U. Emanuelson. 2013. "A longitudinal study of the dynamics of bovine corona virus and respiratory syncytial virus infections in dairy herds". *Veterinary Journal* 197(2):395–400.
- [33] Paraskevis, D., E. G. Kostaki, G. Magiorkinis, G. Panayiotakopoulos, G. Sourvinos, en S. Tsiodras. 2020. "Full-genome evolutionary analysis of the novel corona virus (2019-nCoV) rejects the hypothesis of emergence as a result of a recent recombination event". *Infection, Genetics and Evolution* 79:104212.
- [34] Paules, Catharine I., Hilary D. Marston, en Anthony S. Fauci. 2020. "Coronavirus Infections-More Than Just the Common Cold". *JAMA - Journal of the American Medical Association* 323(8):707–8.
- [35] Qureshi, M. I., N. U. Khan, A. M. Rasli, en K. Zaman. 2015. "The battle of health with environmental evils of Asian countries: promises to keep". *Environmental Science and Pollution Research* 22(15):11708–15.
- [36] Qureshi, Muhammad Imran, Nohman Khan, Syed Muhammad Ahmad Hassan Gillani, en Hamad Raza. 2020. "A systematic review of past decade of mobile learning: What we learned and where to go". *International Journal of Interactive Mobile Technologies* 14(6):67–81.
- [37] Qureshi, Muhammad Imran, Shazia Qayyum, Abdelmohsen A. Nassani, Abdullah Mohammed Aldakhil, Muhammad Moinuddin Qazi Abro, en Khalid Zaman. 2019. "Management of various socio-economic factors under the United Nations sustainable development agenda". *Resources Policy* 64:101515.
- [38] Ramadani, Veland, Robert D. Hisrich, Hyrije Abazi-Alili, Léo Paul Dana, Laxman Panthi, en Lejla Abazi-Bexheti. 2019. "Product innovation and firm performance in transition economies: A multi-stage estimation approach". *Technological Forecasting and Social Change* 140(August 2018):271–80.
- [39] Ramakrishna, S., H. Ahmad, M. I. Qureshi, en N. Khan. 2020. "Review on nexus between economic growth and environmental quality". *International Journal of Psychosocial Rehabilitation*.
- [40] Shafiq, M., R. Tasmin, M. I. Qureshi, en J. Takala. 2019. "A new framework of blue ocean strategy for innovation performance in manufacturing sector". *International Journal of Engineering and Advanced Technology* 8(5):1382–89.
- [41] Al Shehri, Ali M. 2015. "A lesson learned from Middle East respiratory syndrome (MERS) in Saudi Arabia". *Medical Teacher* 37(S1):S88–93.
- [42] Singh, D. D., R. V. S. Pawaiya, K. Gururaj, N. K. Gangwar, A. K. Mishra, Rashmi

- Singh, Dimple Andani, en Ashok Kumar. 2018. "Detection of Clostridium perfringens toxinotypes, enteropathogenic e. coli, rota and corona viruses in the intestine of neonatal goat kids by molecular techniques". *Indian Journal of Animal Sciences* 88(6):655–61.
- [43] Song, Zhiqi, Yanfeng Xu, Linlin Bao, Ling Zhang, Pin Yu, Yajin Qu, Hua Zhu, Wenjie Zhao, Yunlin Han, en Chuan Qin. 2019. "From SARS to MERS, thrusting coronaviruses into the spotlight". *Viruses* 11(1).
- [44] Wang, Lingshu, Wei Shi, M. Gordon Joyce, Kayvon Modjarrad, Yi Zhang, Kwanyee Leung, Christopher R. Lees, Tongqing Zhou, Hadi M. Yassine, Masaru Kanekiyo, Zhi Yong Yang, Xuejun Chen, Michelle M. Becker, Megan Freeman, Leatrice Vogel, Joshua C. Johnson, Gene Olinger, John P. Todd, Ulas Bagci, Jeffrey Solomon, Daniel J. Mollura, Lisa Hensley, Peter Jahrling, Mark R. Denison, Srinivas S. Rao, Kanta Subbarao, Peter D. Kwong, John R. Mascola, Wing Pui Kong, en Barney S. Graham. 2015. "Evaluation of candidate vaccine approaches for MERS-CoV". *Nature Communications* 6(1):1–11.
- [45] de Wilde, Adriaan H., Eric J. Snijder, Marjolein Kikkert, en Martijn J. van Hemert. 2018. "Host factors in coronavirus replication". Bll 1–42 in *Current Topics in Microbiology and Immunology*. Vol 419. Springer Verlag.
- [46] De Wit, Emmie, Neeltje Van Doremalen, Darryl Falzarano, en Vincent J. Munster. 2016. "SARS and MERS: Recent insights into emerging coronaviruses". *Nature Reviews Microbiology* 14(8):523–34.
- [47] World Health Organization. 2018. *Annual review of diseases prioritized under the Research and Development Blueprint*. Geneva, Switzerland: World Health Organization 2018.
- [48] Xia, Zhi Qiang, Juan Zhang, Ya Kui Xue, Gui Quan Sun, en Zhen Jin. 2015. "Modeling the Transmission of Middle East Respirator Syndrome Corona Virus in the Republic of Korea". *PLoS ONE* 10(12).
- [49] Yildirim, Yakup, Seval Bilge Dagalp, Mehmet Tolga Tan, en Atila Taner Kalaycioglu. 2008. "Seroprevalence of the rotavirus and corona virus infections in cattle". *Journal of Animal and Veterinary Advances* 7(10):1320–23.
- [50] Yilmaz, V. 2017. "Seroprevalence of canine coronavirus in Kars shepherd dogs in Kars province, Turkey". *Israel Journal of Veterinary Medicine* 72(1):37–41.
- [51] Zahid, Muhammad, Haseeb Ur Rahman, Wajahat Ali, Musa Khan, Majed Alharthi, Muhammad Imran Qureshi, en Amin Jan. 2020. "Boardroom gender diversity: Implications for corporate sustainability disclosures in Malaysia". *Journal of Cleaner Production* 244.
- [52] Zaman, Khalid, Muhammad Imran Qureshi, Mehwish Iftikhar, Syed Gohar Abbas, Umar Hassan, Khalid Khan, en Management Sciences. 2013. "Relationship Between Job Stress, Workload, Environment and Employees Turnover Intentions: What We Know, What Should We Know". *World Applied Sciences Journal* 23(6):764–70.
- [53] Zhou, Peng, Xing-Lou Yang, Xian-Guang Wang, Ben Hu, Lei Zhang, Wei Zhang, Hao-Rui Si, Yan Zhu, Bei Li, Chao-Lin Huang, Hui-Dong Chen, Jing Chen, Yun Luo, Hua Guo, Ren-Di Jiang, Mei-Qin Liu, Ying Chen, Xu-Rui Shen, Xiao-Shuang Zheng, Kai Zhao, Quan-Jiao Chen, Fei Deng, Lin-Lin Liu, Bing Yan, Fa-Xian Zhan, Yan-Yi Wang, Geng-Fu Xiao, en Zheng-Li Shi. 2020. "Discovery of a novel coronavirus associated with the recent pneumonia outbreak in humans and its potential bat origin". *Nature* 2020.01.22.914952.
- [54] Zhu, Min Sheng, Ying Pan, Hua Qun Chen, Yue Shen, Xiao Chun Wang, Yong Jun Sun, en Kai Hua Tao. 2004. "Induction of SARS-nucleoprotein-specific immune response by use of DNA vaccine". *Immunology Letters* 92(3):237–43.

- [55] Zhu, Na, Dingyu Zhang, Wenling Wang, Xingwang Li, Bo Yang, Jingdong Song, Xiang Zhao, Baoying Huang, Weifeng Shi, Roujian Lu, Peihua Niu, Faxian Zhan, Xuejun Ma, Dayan Wang, Wenbo Xu, Guizhen Wu, George F. Gao, en Wenjie Tan. 2020. “A novel coronavirus from patients with pneumonia in China, 2019”. *New England Journal of Medicine* 382(8):727–33.