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Covid-19 Attack, Prevention, Precaution and Managemental Strategies

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Abstract **– Human population is increasing exponentially parallel to which serious public health issues are also progressing. During the last three decades a number of viral epidemics have caused huge human death throughout the globe. Corona viruses belong to family of single-stranded RNA viruses have widespread prevalence in humans. Currently new mutant corona virus disease (COVID-19) has led to a worldwide pandemic affecting more than 215 countries worldwide. COVID-19 is closely interrelated to SARS (severe acute respiratory syndrome) and MERS (Middle East respiratory syndrome corona virus) which were responsible for considerable deaths throughout the globe. The reported cases of COVID-19 have been crossed more than 3,759,967 worldwide out of which about 259,474 deaths are occurred up till now. This is novel mutant virus and human beings have not developed immunity against this until been infected and recovered. Thus this new devastating pathogen will prevail and affect the humanity in quite different way to common viruses. There is no any vaccine is present against this virus and only a good lock down, precautionary measures and proper isolation can helpful to avoid the huge loss. Therefore, this article is aimed to provide information for public awareness about the general overview and prevalence of COVID-19 also the effective management ways and precautionary measure to avoid this prevailing infection.**

Keywords **– COVID-19, MERS, SARS, Pandemic, Human, World.**

I. INTRODUCTION

Human population is increasing rapidly (approximately 6.8 billion) parallel to this increase a variety of diseases and serious public health issues are also progressing. During the last three decades a number of viral epidemics such as SARS corona virus prevailed in 2002 to 2003, and H1N1 influenza in 2009) have caused huge human death throughout the globe. In 2012 the MERS - CoV (Middle East respiratory syndrome corona virus) was first identified in Saudi Arabia. According to WHO health emergency dashboard 3349 81 confirmed cases were reported worldwide since the beginning of the epidemic up till March 23, 2020 at 13.51 am. Of these, 14652 (4.74%) have been fatal. Corona viruses belong to family of single-stranded positive sense RNA (approximately 30 kb in length) viruses (+ssRNA) isolated in various species of animals (Perlman and Netland, 2000) and can cross species barriers. These viruses are very contagious and have widespread prevalence in humans and are accountable for about 30% of common cold/flu (Mesel-Lemoine et al., 2012) to further severe infections such as MERS and SARS.

SARS-CoV-2 is sensitive to heat and ultraviolet rays, moreover, some organic solvents (ether ethanol, chloroform, chlorine-based disinfectants and per-oxyacetic acid etc) may also be helpful to destroy the protective cover of virus. Coronavirus survive best in cool and dry environment. At higher temperature and higher humidity level the virus is unable to survive. It is reported that COVID-19 cannot survive well when temperature is more than 28 °C and RH (relative humidity) below 70%. The COVID-19 reported in Wuhan, had

89% nucleotide identity with bat genetic source (CoVZXC21) and 82% with that of human genetic source (SARS-CoV). Therefore, reported virus was considered as result of mutation from a strain found in bats and named as SARS-CoV-2 (Chen et al., 2019). Pangolins are intermediate host, and humans are terminal host for SARS-CoV-2 (COVID-19). SARS-Cov-2 can stay alive for up to 3 days on hard surfaces (plastic and stainless steel) at temperatures 21-23 °C and 40% relative humidity. On the other hand it can alive approximately one month at 4°C.

Reports of new mutant coronavirus disease (COVID-19) outbreak that began in Wuhan (a city of Hubei province of china with 11 million inhabitants) on December 31, 2019 is increasing rapidly and exponentially in a growing number of countries. Virus is closely related to SARS (resulted in approximately 1,000 deaths in 2003) and MERS (Middle east respiratory syndrome coronavirus) which was responsible of 862 deaths in 2012 (Smith, 2006; WHO, 2020). The respiratory infection, *corona virus disease is* named COVID-19 by the WHO (February 11, 2020), also called SARS-CoV-2 [*severe acute respiratory syndrome corona virus 2* (Renetal. 2020)]. Although the most of the cases are first reported in China, outside of China the first case was reported on January 13 in Thailand and on January 16 in Japan. As the disease was prevailed more than eighteen countries of the world the outbreak was declared public health emergency of international concern by the WHO on January 30, 2020. First case of similar infection was identified in the US on February 26, 2020 which was not originated from China. The reported cases of COVID-19 have been crossed more than 3,759,967 worldwide out of which about 259,474 deaths are occurred up till now. However, 99% of these died from the coronavirus were also suffered in other medical conditions (National Health Authority Italy). In Pakistan total reported COVID-19 positive cases are 27,474 whereas, reported death due to COVID-19 are 618. The prevalence of COVID-19 in different province of the country is reported as: in Punjab10, 471 positive cases are reported; in Sindh 9,691; Balochistan 1876; Gilgit Baltistan 421; Azad Jummu and Kashmir 79; KPK (Khyber Pakhtunkhwa) 4327 and in Islambad 609 positive cases are reported up till May 09, 2020. However, out of these reported cases 7,756 are recovered. According to Dr Zafar Ali Mirza, a total of 270,025 tests are performed to confirm the positive corona cases (GOP, 2020).

The prevalence of the virus been diagnosed in dozens of other countries (>196) afterwards. The new mutant corona virus (COVID-19) shown high prevalence, however, how contagious it is not clear. We have not immunity against this new novel pathogen until been infected and have recovered. Therefore COVID-19 will prevail, infect and affect the health in way quite different to common viruses. It has shown to be spread from individual to individual amongst those having close contact. The virus can also be spread by respiratory droplets discharged when an infected person coughing or sneezing and severely affects airways and lungs. The intent of this article is to provide information for public awareness about the general overview and prevalence of new mutant ant corona virus (COVID-19) and the effective management, precautionary measure to avoid this prevailing infection.

II. SYMPTOMS

Coronaviridae family classifies into four genera: alpha CoV, beta CoV, deltaCoV, and gamma CoV (Chan et al., 2013). Rodents and bats have the gene sources of alpha Corona Viruses and beta CoVs whereas; birds have gene sources of gamma and delta CoVs. Seven corona virus species (HCoV-HKU1, HCoV-229E, HCoV-OC43, HCoV-NL63, SARS-CoV-2, SARS-CoV, and MERS-CoV) are identified capable infecting humans. Out of

these species SARS-CoV, SARS-CoV-2 and MERS-CoV are responsible to cause epidemics and great mortality in human population whilst remaining others may cause common cold to lower respiratory tract infections. About 2% of the population infected with corona virus do not show symptoms although are carriers whereas about 5% to 10% show acute respiratory infections symptoms (Chen et al., 2020).

Most cases (81%, without pneumonia and/or cases of mild pneumonia) of COVID-19 may be so mild that cannot be identified as corona infection (Read et al., 2020). 81% of cases infected with COVID-19 showed mild illness in the early period. Symptoms of infection range from very mild to severe fever, upper respiratory tract infection, sore throat, muscle pain (uncommon), fatigue, fast pulse rate, dry cough sometimes sputum production (a thick mucus), runny nose (rarely), shortness or difficult breathing which usually appear within 2-14 days (5-6 days after infection on an average) following exposure (Huang et al., 2019; WHO, 2020; Megan, 2020; Chen et al., 2020). Symptoms may be mild for the majority of persons, and in some situations comparable to the common flu. However, in case of an epidemic there might be very high number of deaths because health facilities be unsuccessful to give the necessary care for some patients when epidemic condensed in a very short period (Leon et al., 2020). In case of severe COVID-19 infections (14%) can progress to pneumonia (Wang et al., 2020) and dyspenea when patients need treatment in intensive care units (ICUs). According to WHO report about one third of severe and serious cases need mechanical ventilation (WHO, 2020). Very severe and serious cases (5%) lead to pneumonia, septic shock, multiple organ dysfunction and respiratory failure (Wu and McGoogan, 2019; Megan, 2020). Older people (above 60 years), persons having compromised immune systems and people having medical conditions such as cardiovascular may prone to more alarming/ serious condition. Children under 15 years of age showed no clinical sign of disease and the probability of occurrence of disease is same in both sexes.

III. DIAGNOSIS

Incubation period of the virus (COVID-19) varies widely between 1 to 14 days (Li et al., 2020; WHO, 2020f). On an average the disease persists 14 days from commencement to clinical healing for mild cases (WHO, 2020g) whereas for severe and critical cases the recovery period may exceeds 3 to 6 weeks. The time interval from symptom onset to fatality ranges from 14 to 56 days for COVID-19.

Testing is basis to understand the prevalence of the pathogen. Therefore, an extensive testing is required to know number of individuals infected with COVID-19. Testing help to understand origin and progression of infection and allows to take decisions for counteract measures to lessen the illness. However testing is lower in many countries because of mild symptoms and that most of populations remain unchecked especially in developing and underdeveloped places the capacity of testing for this pathogen is low. Currently there is no central reliable database on COVID-19 testing by the WHO because many countries particularly developing and under developed do not publish official tests reports on COVID-19 whereas others publish aggregate estimates (Ensheng et al., 2020).

COVID-19 can be diagnosed by a common PCR test of swabbed sample from throat and/or nose of patient. At present worldwide PCR protocol for COVID-19 diagnosed is followed according to WHO recommendation. This protocol was developed within two weeks after the COVID-19 infection was identified (WHO, 2020h). WHO-China joint mission on COVID-19, reported that in addition to PCR tests, serological diagnostic tests (based on antibody assays), although less common, can also be helpful to diagnose the disease.

IV. CASE FATALITY RATE OF COVID-19

The CFR (case fatality rates) of the seasonal flu in the United States is reported to be approximately 0.1% to 0.2% (US CDC, 2018-2019) whilst the CFR for COVID-19, reported is 2.3%. The CFR of SARS-CoV and MERS-CoV were 10% (Venkatesh and Memish, 2004; Munster et al., 2020) and 34% (Munster et al., 2020), respectively Whereas CFR for Ebola is reported to be 40% to 50% (WHO, 2020; Shultz et al., 2016). The seasonal flu has a CFR much lower than the present CFR for corona. The CFR of pandemic is higher for persons underlying health condition (cardiovascular disease, chronic respiratory diseases, diabetes, hypertension and cancer etc). However CFR was recorded to be 0.9% for those having not any preexisting health condition. The case fatality rate (total *deaths* due to disease by the number of *cases confirmed)* is measured to express severity of the disease. Often *crude* mortality rate is misreported as the CFR (WHO, 2020i). CFR value reveals the severity of the infection *in a specific context, at a certain time period, in a certain population.* CFR (case fatality risk and/ or case fatality rate or case fatality ratio) is critical to understand the limitations of available data, and how it varied from alternative measures (Taubenberger & Morens, 2006). The time required from symptom of COVID-19 onset to mortality varying from 2 to 8 weeks. This means that there are many who are ill and will die, but have not died until now. This is what happened in 2003during the SARS-CoV outbreak. The CFR was initially reported to be 3-5% during the early stages of the outbreak, but had risen to around 10% by the end.

Table 1. Prevelance of COVID-19 (laboratory-confirmed cases and deaths) in Western pacific and European region. Reported data since the beginning of the epidemic up till May 08, 2020 at 10.00 CEST. (Data obtained from WHO site).

Reporting Country/ Territory/Area	Transmission Classification[§]	Total Confirmed Cases	Total Deaths	Total Confirmed New Cases	Total New Deaths
China	Local transmission	84415	4643	06	0
Republic of Korea	Local transmission	10822	256	12	0
Australia	Local transmission	6896	97	21	0
Malaysia	Local transmission	6467	107	39	0
Japan	Local transmission	15547	557	84	6
Singapore	Local transmission	20939	20	741	0
Philippines	Local transmission	10343	685	339	27
Viet Nam	Local transmission	288	0	17	0
New Zealand	Local transmission	1141	21	2	0
Brunei Darussalam	Local/Imported cases	141	1	2	0
Cambodia	Local/Imported cases	122	0	0	0
Mongolia	Local/Imported cases	41	0	0	0
Fiji	Local/Imported cases	18	0	0	0
Papua New Guinea	Local/Imported cases	8	0	0	0
Guam	Local transmission	147	5	0	0

Reporting Country/ Territory/Area	Transmission Classification[§]	Total Confirmed Cases	Total Deaths	Total Confirmed New Cases	Total New Deaths
French Polynesia	Local/Imported cases	60	0	0	0
New Caledonia	Local/Imported cases	18	0	0	0
Italy	Local transmission	215858	29958	1401	274
Spain	Local transmission	221447	26070	1122	213
Germany	Local transmission	167300	7266	1209	147
France	Local transmission	135980	25946	512	177
Switzerland	Local transmission	30043	1517	66	13
The United Kingdom	Local transmission	206719	30615	5514	539
Netherlands	Local transmission	41774	5288	455	84
Austria	Local transmission	15673	609	22	1
Belgium	Local transmission	51420	8415	639	76
Norway	Under investigation	7995	209	42	0
Sweden	Local transmission	24623	3040	705	99
Portugal	Local transmission	26715	1105	533	16
Denmark	Local transmission	10083	514	100	8
Turkey	Local transmission	133721	3641	1977	57
Czechia	Local transmission	8031	270	57	8
Israel	Under investigation	16346	239	32	1
Ireland	Local transmission	22385	1403	137	28
Luxembourg	Under investigation	3859	100	8	2
Poland	Local transmission	15047	755	307	22
Finland	Under investigation	5673	255	100	3
Greece	Local transmission	2678	148	15	1
Iceland	Under investigation	1801	10	2	0
Russian Federation	Local transmission	187859	1723	10699	98
Romania	Local transmission	14499	876	392	18
Slovenia	Local transmission	1449	99	1	0
Estonia	Under investigation	1720	56	7	1
Croatia	Local transmission	2125	86	6	1
Serbia	Under investigation	9848	206	57	3
Armenia	Local transmission	3029	43	145	1

Reporting Country/ Territory/Area	Transmission Classification[§]	Total Confirmed Cases	Total Deaths	Total Confirmed New Cases	Total New Deaths
Bulgaria	Local transmission	1829	84	51	0
Slovakia	Local transmission	1445	392	28	9
Hungary	Local transmission	3178	199	68	10
San Marino	Local transmission	632	41	24	0
Lithuania	Local transmission	1433	49	5	1
Latvia	Local transmission	909	18	9	1
Bosnia and Herzegovina	Local transmission	2027	89	10	2
North Macedonia	Local transmission	1572	89	33	1
Andorra	Local transmission	752	47	0	0
Cyprus	Local transmission	889	21	6	0
Republic of Moldova	Under investigation	4605	145	129	2
Malta	Under investigation	486	5	2	0
Albania	Local transmission	850	31	18	0
Belarus	Local transmission	20168	116	913	4
Azerbaijan	Local transmission	2204	28	77	0
Kazakhstan	Under investigation	4578	30	69	0
Georgia	Local transmission	623	9	9	0
Ukraine	Local transmission	14195	361	504	21
Liechtenstein	Under investigation	83	1	0	0
Uzbekistan	Local transmission	2314	10	48	0
Monaco	Local/Imported cases	95	1	0	0
Montenegro	Local transmission	324	8	0	0
Kyrgyzstan	Local transmission	906	12	11	0
Holy See	Local/Imported cases	12	0	0	0
Faroe Islands	Under investigation	187	0	0	0
Kosovo	Local transmission	861	27	1	0
Guernsey	Local transmission	252	13	0	0
Gibraltar	Local transmission	144	0	0	0
Jersey	Under investigation	293	25	0	1
Greenland	Under investigation	11	0	0	0
Isle of Man	Under investigation	327	23	1	0

Table 2. Prevelance of COVID-19 (laboratory-confirmed cases and deaths) in South-East asia region and Eastern mediterranean region.

Reported data since the beginning of the epidemic up till May 08, 2020 at 10.00 CEST. (Data obtained from WHO site).

Reporting Country/ Territory/Area[†]	Transmission Classification[§]	Total Confirmed [‡] Cases	Total deaths	Total Confirmed New Cases	Total New Deaths
Thailand	Local transmission	3000	55	8	0
Indonesia	Local transmission	12776	930	338	35
India	Local transmission	56342	1886	3390	103
Sri Lanka	Local transmission	797	9	0	0
Bangladesh	Local transmission	12425	186	706	0
Maldives	Local transmission	648	3	30	1
Bhutan	Local/Imported cases	7	0	0	0
Nepal	Local/Imported cases	99	0	0	0
Timor-Leste	Local transmission	24	0	0	0
Iran (Islamic Republic of)	Local transmission	103135	6486	1485	68
Pakistan	Local transmission	25837	594	1764	30
Saudi Arabia	Local transmission	33731	219	1793	10
Qatar	Local transmission	18890	12	918	0
Bahrain	Local transmission	4199	8	265	0
Egypt	Local transmission	7981	482	393	13
Lebanon	Local transmission	784	25	34	0
Iraq	Local transmission	2543	102	63	0
Kuwait	Local transmission	6567	44	278	2
United Arab Emirates	Under investigation	16240	165	502	8
Morocco	Local transmission	5548	183	140	0
Jordan	Local transmission	494	9	21	0
Tunisia	Local transmission	1026	44	1	1
Oman	Local transmission	3112	15	154	2
Afghanistan	Local transmission	3563	105	171	1
Sudan	Local/Imported cases	930	52	78	3
Djibouti	Local transmission	1133	3	9	0
Somalia	Local/Imported cases	928	44	55	5
Syrian Arab Republic	Local transmission	45	3	0	0
Occupied Palestinian Territory	Local transmission	547	4	1	0

Table 3. Prevelance of COVID-19 (laboratory-confirmed cases and deaths) in region of the Americas and Eastern mediterranean region. Reported data since the beginning of the epidemic up till May 08, 2020 at 10.00 CEST. (Data obtained from WHO site).

Reporting Country/ Territory/Area[†]	Transmission Classification[§]	Total Confirmed[‡] Cases	Total Deaths	Total Confirmed New Cases	Total New Deaths
United States of America	Local transmission	1215571	67146	22119	1949
Canada	Local transmission	63895	4280	1437	169
Brazil	Local transmission	125218	8536	10503	615
Chile	Local transmission	24581	285	1533	4
Ecuador	Local transmission	30298	1654	878	36
Peru	Local transmission	54817	1533	3623	89
Mexico	Local transmission	27634	2704	1609	197
Panama	Local transmission	7731	218	208	8
Argentina	Local transmission	5305	275	229	11
Colombia	Local transmission	3621	166	182	13
Uruguay	Local transmission	673	17	3	0
Costa Rica	Local transmission	761	6	6	0
Dominican Republic	Local transmission	9095	373	288	11
Venezuela (Bolivarian Republic of)	Local transmission	379	10	12	0
Trinidad and Tobago	Local/Imported cases	116	8	0	0
Honduras	Local transmission	1461	99	191	6
Bolivia (Plurinational State of)	Local transmission	1886	91	84	5
Paraguay	Local transmission	462	10	22	0
Jamaica	Local transmission	478	9	5	0
Guatemala	Local transmission	798	21	35	2
Cuba	Local transmission	1729	73	26	4
Barbados	Local transmission	82	7	0	0
Guyana	Local transmission	93	10	0	0
Bahamas	Local transmission	92	11	3	0
Haiti	Local transmission	108	12	7	0
Nicaragua	Under investigation	16	5	0	0
Saint Lucia	Local/Imported cases	18	0	0	0
Suriname	Local/Imported cases	10	1	0	0
Antigua and Barbuda	Local transmission	25	3	0	0
El Salvador	Local transmission	695	15	62	1
Grenada	Local transmission	21	0	0	0

Reporting Country/ Territory/Area[†]	Transmission Classification[§]	Total Confirmed [‡] Cases	Total Deaths	Total Confirmed New Cases	Total New Deaths
Saint Vincent and the Grenadines	Local/Imported cases	17	0	0	0
Guadeloupe	Local transmission	153	13	0	0
Martinique	Local transmission	182	14	0	0
Puerto Rico	Local transmission	2031	56	63	0
French Guiana	Local transmission	138	1	0	0
Aruba	Local transmission	101	2	0	0
United States Virgin Islands	Local transmission	66	4	0	0
Saint Martin	Local/Imported cases	76	14	0	0
Cayman Islands	Local transmission	78	1	0	0
Curacao	Local/Imported cases	16	1	0	0
Saint Barthelemy	Local/Imported cases	6	0	0	0
Bermuda	Local transmission	118	7	3	0
Montserrat	Local/Imported cases	11	1	0	0
Sint Maarten	Local transmission	76	14	0	0
South Africa	Local transmission	8232	161	424	8
Algeria	Local transmission	5182	483	185	7
Burkina Faso	Local transmission	736	48	7	0
Senegal	Local transmission	1492	13	59	1
Cameroon	Local transmission	2265	108	0	0
Democratic Republic of the Congo	Local transmission	897	36	100	1
Côte d'Ivoire	Local transmission	1571	20	55	2
Ghana	Local transmission	3091	18	372	0
Nigeria	Local transmission	3526	107	381	4
Rwanda	Local transmission	271	0	3	0
Togo	Local transmission	135	9	7	0
Kenya	Local transmission	607	29	25	3
Madagascar	Local transmission	193	0	0	0
Mauritius	Local transmission	332	10	0	0
United Republic of Tanzania	Local transmission	509	21	29	3
Ethiopia	Local transmission	191	4	29	0
Seychelles	Local/Imported cases	11	0	0	0
Equatorial Guinea	Local transmission	439	4	0	0

Reporting Country/ Territory/Area[†]	Transmission Classification[§]	Total Confirmed [‡] Cases	Total Deaths	Total Confirmed New Cases	Total New Deaths
Gabon	Local transmission	504	8	107	2
Central African Republic	Local/Imported cases	94	0	0	0
Congo	Local transmission	274	10	10	0
Eswatini	Local/Imported cases	153	2	30	0
Cabo Verde	Local/Imported cases	218	2	27	0
Liberia	Local transmission	189	20	11	0
Namibia	Local/Imported cases	16	0	0	0
Zambia	Local/Imported cases	153	4	14	0
Angola	Local/Imported cases	36	2	0	0
Benin	Local/Imported cases	140	2	38	0
Guinea	Local transmission	1927	11	71	0
Mauritania	Local/Imported cases	8	1	0	0
Zimbabwe	Local/Imported cases	34	4	0	0
Chad	Local/Imported cases	253	27	83	10
Eritrea	Local/Imported cases	39	0	0	0
Gambia	Local/Imported cases	18	1	1	0
Mozambique	Local/Imported cases	81	0	0	0
Niger	Local transmission	781	42	11	4
Uganda	Local/Imported cases	101	0	3	0
Reunion	Local transmission	427	0	2	0
Mayotte	Local transmission	854	10	115	1

V. PREVENTION AND SAFETY MEASURES

Scientists are working to get information about the prevalence, clinical spectrum of disease, latest diagnostics, preventive and remedial strategies to treat this novel disease. COVID-19 is a new strain of corona virus and there is no vaccine existed presently to avoid the infection. The vaccine preparation process will take approximately 6 months to one year; however, following supportive standard precautions are strongly recommended to reduce the transmission and/or lessen the risk of infection.

- COVID-19 can transmit from person to person, people showing the symptoms of disease are the most common source of prevalence; asymptomatic individuals are carriers and can also transmit the virus. It is essential to aware the infected people to stay away to avoid infecting others, also for receiving fast care and treatment to be initiated in time. Therefore, exploit maximum/ aggressive isolation to discourage the prevalence of virus. For this avoid mass gathering at work, public areas and even at home.
- Repeatedly disinfect the house with strong disinfectant such as sodium hypochlorite commonly known as b-

-leach.

- Regularly disinfect the house, rooms, bed sheets, clothes and all the surfaces of common touch. Apply strict bio-security protocol at entrance of house level.
- Don't use air conditionings in rooms instead use humidifiers to crease the humidity level. It will increase the mucus coating on mucus membrane, airways and lungs that will lead to fight against the pathogen.
- Use digital currency instead of paper or metal currency. If not possible then use the paper and/or metal currency after proper disinfection procedure.
- The households purchased from the market should be disinfected instantly when brought at home by placing these in boiled water (such as packed items) for one minute or by other ways.
- Repeatedly sanitize your hands throughout the day with an alcohol-based sanitizer and/or soap. It will break the lipid bi-layer protective cover of virus.
- Cover the mouth and nose when cough or sneeze to avoid the spread of droplets.
- Do not touch the eyes, nose and mouth with hands when hands are not clean.
- Stay at least a distance of 3-6 feet away from individual who is coughing or sneezing. Do not make contact with infected persons however, healthcare staff should contact following PPE personal protection protocol such as (FFP3 or N95 masks, goggles, gowns, and gloves).
- Restrict the common use commodities/items with own use don't share with others however think positive and stay positive to boost the immunity.
- Don't eat raw/undercooked meat.
- Try to keep immune system get improved through simple but healthy diet and use personnel hygiene. Get enough sleep (at least 8 hours). Try meditation, deep breathing and stretching exercises at home.
- Stay active and stress free. Get involve in religious activities because contact with almighty and believe in almighty will reduce/remove the stress ultimately it will improve the immune response. It is also better not to hear the news about COVID-19 if you are already more frightened.
- Use water in toilet as an alternative of toilet tissue papers.
- Stay away from live animals and livestock markets in areas reported for corona virus prevalence.
- Avoid international and intercity travelling to ensure isolation; however in case when travelling is indispensable consult WHO and CDC website for updates also consult with health advisor if having health complications.
- Consult the government health agency or doctor right away if you are suspected of having COVID-19 infection.

VI. TREATMENT / MANAGEMENT

A. *Nutritional Strategies to Combat the COVID-19 Infection*

Like other corona viruses COVID-19 is sensitive to heat and is killed at cooking temperature therefore avoid raw cooked foods. Nutrients like mineral vitamins and antioxidants help in repairing the cell lining of the long cells damaged by virus, therefore, use natural food full of these nutrients to successfully fight the virus. Fulfill large proportion of protein requirement consuming legumes and a small proportion from animal sources.

Improve the innate and adaptive immunity by diet consuming probiotics like yogurt, honey, fruits, fresh and/or cooked veggies and herbs to help the body to fight against virus. Stay well hydrated, it will increase the mucus coating on mucus membrane, airways and lungs that will lead to fight against the pathogen. Vitamin c (tomatoes, citrus fruits, papaya, strawberries, watermelon etc) is advised to develop healthy immune response against the disease. It increases the neutrophils, T cell count, chemicals released by T cells and cytokines. Green tea contains L-theanine which is reported to increase the proportion of T regulatory lymphocytes to cytotoxic lymphocytes and is helpful to increase the immune response (Juszkiewicz et al., 2019). Avoid the junk and fast food, sodas, alcohol and drugs as these can harm the vital organs especially heart and liver thus can increase the dangers of COVID-19. Also avoid cold drinks instead use fresh fruit juice to help the immunity. A plentiful regular use of ginger cinnamon, onion and garlic in food or in the form of extract may also be helpful, however it is just a suggestion and a sufficient research data is needed to prove the beneficial effect of these herbs against corona virus infection.

B. *Herbal Medicine*

For the management of lung inflammation associated with COVID-19, Chinese physicians have used 4-Methylumbelliferone (4-MU) and its derivatives which are commonly present in various traditional Chinese medicinal herbs. It also explains the combination of herbal therapy with FDA approved drugs in recovered patients in China (Shi et al., 2020). It can also open research gateways to look for herbal and other plant based medicine to manage the symptoms associated with COVID-19. Senna Leaves (Sana Makki) and black caraway (Nigella sativa), also known as black cumin is reported to treat many infectious diseases in Tibb e Islami hence may also prove promising for treating and/or preventing the COVID-19 infection.

C. *Use of Plasma or Serum Transfusion*

Use of plasma from animals recovered from viral infection to treat the sick animals is usual routine treatment in veterinary practices as in case of FMD (Foot and Mouth Disease) veterinarians exploit this technique. Similarly use of “convalescent plasma in patients in the recent scenario of ongoing COVID-19 pandemic as an emergency clearance and in extreme cases from patients who have already contracted, and subsequently recovered is under discussion and might be helpful to combat the recent devastating situation. Therefore, research is needed be conducted about the safe and effective use of plasma or serum to treat or combat the disease. Plasma transfusions have also been somewhat successful used in past to fight against the H1N1, SARS MERS epidemics and other viral outbreaks.

D. *Medicines/Chemical Therapy*

Currently there is no proper remedy available for COVID-19. Yet, symptomatic, and oxygen therapy is being used to treat the serious infection. Mechanical ventilation is needed in cases of respiratory dysfunction and hemodynamic support is required for managing septic shock. Use of inappropriate antibiotics as a supportive therapy should be avoided. Similarly corticosteroids be supposed to not be used for the treatment of acute

respiratory distress syndrome and/or viral pneumonia (CPAM). Although the scientific basis are least, however, Lopinavir 400 mg; Ritonavir 100 mg (2 tablets by mouth BID) or Chloroquine (500 mg by mouth BID) and/or Hydroxychloroquine (400 mg by mouth OD) treatment is claimed to reduce/disappearance viral load in patients of COVID-19 (Wang et al., 2020), it is also reported that Hydroxychloroquine effect can be reinforced by Azithromycin (Gautret et al., 2020). Aspirin is an anti-inflammatory drug which also has anti-platelet aggregation and anti-lung injury effect. It inhibits the replication of virus, therefore may have promising effect to reduce the critical effect of covid-19, especially in diabetic and cardiovascular patients. However sound scientific reports about the use of these medicines are not present and most of these medicines are just anti-inflammatory response and are usually used in viral infection in older patients for the relief purpose in critical stages and under underlying conditions. Similarly effects of Sofosbuvir in combination with Ribavirin (Elfiky, 2020), Arbidol, Remdesivir, and Aavipiravir against COVID-19 have also been reported promising (Dong et al., 2020). Though, Alpha-interferon @ 5 million units by aerosol inhalation BID, and Lopinavir/ Ritonavir have been suggested (CPAM, 2020; Chu et al., 2004; jin et al., 2019; Huang et al., 2020). Gordon et al. (2020) suggested that Remdesivir (GS5734) may be promising and effective drug to treat COVID-19 infection. Remdesivir is an inhibitor of RNA polymerase against multiple RNA viruses including Ebola and has shown therapeutic and prophylaxis effect for HCoVs disease (Agostini et al., 2018; Wang et al., 2020). De Wit et al. (2020) reported the effect of Remdesivir in a rhesus macaque model of MERS-CoV infection. However, use of these drugs are not advised as first-line treatments due to potential side effects therefore, only be used if treatment with Chloroquine, and/or Hydroxychloroquine, Ritonavir and Lopinavir prove ineffective (Korea Biomedical Review; Gao et al., 2020). Moreover, there is great dispute and controversy about use and misuse of these anti-inflammatory drugs therefore; the standard research is needed to generate sufficient data to decide about the facts. Nitric oxide (NO is an essential signaling molecule between cells which is reported to have an antimicrobial activity for a number of viruses, protozoa and bacteria (Boucher et al., 1999; Pope et al., 1998; Pope et al., 1998; Adler et al., 1997; Boucher et al., 1999; Pope et al., 1998; Coleman**,** 2001; Adler et al., 1997; Akaike et al., 1997; Coleman, 2001; Asano et al., 1994; Geller et al., 1993; Guo et al., 1993).

VII. CONCLUSIONS

The COVID-19 is rapidly prevailing worldwide. SARS-CoV-2 is comparatively more infectious than SARS or MERS. Immunosuppressive, elder people (>60 years) and people suffering health conditions (cardiovascular, diabetes, cancer, pulmonary) are more prone to more risk of death. Currently there is no proper treatment or vaccine available for this fatal disease however, precautionary measures such as implication of bio-security at house level, aggressive isolation and intense care protocol proved to be helpful to prevent the prevalence and transmission of disease. Different supportive drugs are being used in effort to reduce the devastating effect of disease having inconsistent and varying results. At present preparation of vaccine against this novel virus is in progress and it will take at least 6 months to one year duration, therefore until the availability of vaccine we have to manage the problem in a wise lockdown, maintaining social distances, isolation and strictly control way.

REFERENCES

[1] Agostini ML, Andres EL, Sims AC, et al. Coronavirus susceptibility to the antiviral remdesivir (GS-5734) is mediated by the viral polymerase and the proofreading exoribonuclease. MBio 2018; 9(2): 1-15.
[2] Bauch CT, Lloyd-Smith JO, Coffee MP, Galvani AP. Dynamically modeling SARS and other newly emerging respiratory illnesses: past, present, and future. Epidemiology. 2005 Nov; 16(6): 791-801.
[3] CDC. 2018-2019. US Centers for Disease Control and prevention (CDC). Influenza Burden, 2018-19.

[4] Shultz, J. M., Espinel, Z., Espinola, M., & Rechkemmer, A. (2016). Distinguishing epidemiological features of the 2013–2016 West Africa Ebola virus disease outbreak. *Disaster Health*, *3*(3), 78-88.
[5] CDC. 2020. Epidemiological group of emergency response mechanism of new coronavirus pneumonia in Chinese center for disease control and prevention. Epidemiological characteristics of new coronavirus pneumonia. *Chinese Journal of Epidemiology*, 2020, 41 (2020-02-17).
[6] Chan JF, Kok KH, Zhu Z, Chu H, To KK, Yuan S, Yuen KY. Genomic characterization of the 2019 novel human-pathogenic coronavirus isolated from a patient with atypical pneumonia after visiting Wuhan. Emerg. Microbes Infect. 2020 Dec; 9(1): 221-236.
[7] Chan JF, To KK, Tse H, Jin DY, Yuen KY. Interspecies transmission and emergence of novel viruses: lessons from bats and birds. Trends Microbiol. 2013 Oct; 21(10): 544-55.
[5] Chen Wang, Peter W. Horby, Frederick G. Hayden, George F. Gao (2020) - A novel coronavirus outbreak of global health concern. In the Lancet. Volume 395, Issue 10223, P470-473, Feb 15, 2020. First published: January 24, 2020DOI: https://doi.org/10.1016/S0140-6736(20)30185-9 https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30185-9/fulltext.
[6] Chen Y, Liu Q, Guo D. Emerging coronaviruses: Genome structure, replication, and pathogenesis. J. Med. Virol. 2020 Apr;92(4):418-423.
[7] Chu CM, Cheng VCC, Hung IFN, et al. Role of lopinavir/ritonavir in the treatment of SARS: Initial virological and clinical findings. Thorax 2004; 59(3): 252–256.
[8] CPAM. 2020. China international exchange and promotive association for medical and health care, guideline against a novel 2019 coronavirus disease (COVID-19).
[9] De Wit E, Feldmann F, Cronin J, Jordan R, Okumura A, Thomas T, Scott D, Cihlar T, Feldmann H. Prophylactic and therapeutic remdesivir (GS-5734) treatment in the rhesus macaque model of MERS-CoV infection. Proc. Natl. Acad. Sci. U.S.A. 2020 Feb 13.
[10] Dong, L., Hu S. and Gao J. 2020. Discovering drugs to treat coronavirus disease 2019 (COVID-19). Drug Discov. Ther. 2020;14(1):58-60. doi: 10.5582/ddt.2020.01012.
[11] Elfiky AA. Anti-HCV, nucleotide inhibitors, repurposing against COVID-19. Life Sciences Published online February 28, 2020 https://doi.org/10.1016/j.lfs.2020.117477.
[12] Ensheng Dong, Hongru Du, Lauren Gardner (2020) – An interactive web-based dashboard to track COVID-19 in real time. in The Lancet infectious disease. February 19, 2020. DOI: https://doi.org/10.1016/S1473-3099(20)30120-1.
[13] Gao J, T Zhenxue, Yang X. Breakthrough: Chloroquine phosphate has shown apparent efficacy in treatment of COVID-19 associated pneumonia in clinical studies. Biosci trends published online February 19, 2020 https://doi.org/10.5582/bst.2020.01047.
[14] Ghani, A. C., Donnelly, C. A., Cox, D. R., Griffin, J. T., Fraser, C., Lam, T. H., …& Leung, G. M. (2005). Methods for estimating the case fatality ratio for a novel, emerging infectious disease. *American Journal of Epidemiology*, 162(5), 479-486.
[15] Gordon CJ, Tchesnokov EP, Feng JY, Porter DP, Gotte M. the antiviral compound remdesivir potently inhibits RNA-dependent RNA polymerase from middle east respiratory syndrome coronavirus. J. Biol. Chem. 2020 Feb 24.
[16] Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet Published online January 24, 2020 https://doi.org/10.1016/S0140-6736(20)30183-5.
[17] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z, Yu T, Xia J, Wei Y, Wu W, Xie X, Yin W, Li H, Liu M, Xiao Y, Gao H, Guo L, Xie J, Wang G, Jiang R, Gao Z, Jin Q, Wang J, Cao B. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020 Feb. 15; 395(10223): 497-506.
[18] Hui DS, Chow BK, Lo T, Tsang OTY, Ko FW, Ng SS, Gin T, Chan MTV. Exhaled air dispersion during high-flow nasal cannula therapy *versus* CPAP *via* different masks. Eur. Respir. J. 2019 Apr;53(4).
[19] Jin, Y., Cai, L., Cheng, Z. et al. A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version). Military Med Res 7, 4 (2020). https://doi.org/10.1186/s40779-020-0233-6 (8).
[20] Kogan A, Segel MJ, Ram E, Raanani E, Peled-Potashnik Y, Levin S, Sternik L. acute respiratory distress syndrome following cardiac Surgery: Comparison of the American-European consensus conference definition versus the Berlin definition. Respiration. 2019; 97(6): 518-524.
[21] Korea biomedical review website: http: //www.koreabiomed.com/news/articleView.html?idxno=7428.
[22] Leon Danon, Ellen Brooks-Pollock, Mick Bailey, Matt Keeling (2020) – A spatial model of CoVID-19 transmission in England and Wales: early spread and peak timing.
[23] Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, Ren R, Leung KSM, Lau EHY, Wong JY, Xing X, Xiang N, Wu Y, Li C, Chen Q, Li D, Liu T, Zhao J, Li M, Tu W, Chen C, Jin L, Yang R, Wang Q, Zhou S, Wang R, Liu H, Luo Y, Liu Y, Shao G, Li H, Tao Z, Yang Y, Deng Z, Liu B, Ma Z, Zhang Y, Shi G, Lam TTY, Wu JTK, Gao GF, Cowling BJ, Yang B, Leung GM, Feng Z. Early transmission dynamics in Wuhan, China, of novel coronavirus-Infected Pneumonia. N. Engl. J. Med. 2020 Jan 29.
[24] Megan Murray, 2020. Coronavirus FAQ's. Dr.Megan Murray who is an infectious disease researcher at Harvard. This is not based on published academic research.
[25] Mesel-Lemoine M, Millet J, Vidalain PO, et al. (2012) – A human coronavirus responsible for the common cold massively kills dendritic cells but not monocytes. J Virol. 2012; 86(14): 7577–7587. doi: 10.1128/ JVI.00269-12 https: //www.ncbi.nlm.nih.gov/pmc/articles/PMC3416289/.
[26] Munster, V. J., Koopmans, M., van Doremalen, N., van Riel, D., & de Wit, E. (2020). A novel coronavirus emerging in China-key questions for impact assessment. *New England Journal of Medicine*, *382*(8), 692-694.
[27] Munster, V. J., Koopmans, M., van Doremalen, N., van Riel, D., & de Wit, E. (2020). A novel coronavirus emerging in China-key questions for impact assessment. *New England Journal of Medicine*, *382*(8), 692-694.
[28] Perlman S, Netland J. 2000. Coronaviruses post-SARS: update on replication and pathogenesis. Nat. Rev. Microbiol. 2009 Jun; 7(6):439-50.
[29] Read JM, Bridgen JR, Cummings DA, Ho A, Jewell CP. Novel coronavirus 2019-nCoV: early estimation of epidemiological parameters and epidemic predictions. medRxiv. 2020;2020.01.23.20018549.
[30] Read JM, Bridgen JR, Cummings DA, Ho A, Jewell CP. Novel coronavirus 2019-nCoV: early estimation of epidemiological parameters and epidemic predictions. *medRxiv*. 2020;2020.01.23.20018549.
[31] Ren LL, Wang YM, Wu ZQ, et al. (2020) –Identification of a novel coronavirus causing severe pneumonia in human: a descriptive study [published online ahead of print, 2020 Feb 11]. *Chin Med J (Engl)*. 2020; 10.1097/ CM9.0000000000000722. doi: 10.1097/ CM9.000 0000000000722.
[32] Singer M, Deutschman CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M, Bellomo R, Bernard GR, Chiche JD, Coopersmith CM, Hotchkiss RS, Levy MM, Marshall JC, Martin GS, Opal SM, Rubenfeld GD, van der Poll T, Vincent JL, Angus DC. The third international consensus definitions for sepsis and septic shock (Sepsis-3). JAMA. 2016 Feb. 23; 315(8): 801-10.
[33] Smith RD (2006) – "Responding to global infectious disease outbreaks: lessons from SARS on the role of risk perception, communication and management". Social Science & Medicine. 63 (12): 3113–23. doi:10.1016/j.socscimed.2006.08.004.
[34] Taubenberger, J. K., &Morens, D. M. (2006). 1918 Influenza: the mother of all pandemics. *RevistaBiomedica*, 17(1), 69-79.

[35] Venkatesh, S. & Memish, Z.A. (2004). SARS: the new challenge to international health and travel medicine. *EMHJ – Eastern Mediterranean Health Journal, 10 (4-5), 655-662, 2004.*
[36] Wang D, Hu B, Hu C, et al. (2020) – Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–Infected Pneumonia in Wuhan, China. JAMA. Published online February 07, 2020. doi:10.1001/jama.2020.1585.
[37] Wang M, Cao R, Zhang L, et al. Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro. Cell Research 2020;30:269–271.
[38] WHO. 2019."Naming the coronavirus disease (COVID-19) and the virus that causes it". International committee on taxonomy of viruses (ICTV).
[39] WHO.2020i. Report of the WHO-China joint mission on coronavirus disease 2019 (COVID-19). Available online at: https:// www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf.
[40] WHO. 2020 (h). WHO protocols for COVID-19 laboratory testing in human. Accessed on https://www.who.int/emergencies/diseases/ novel-coronavirus-2019/technical-guidance/laboratory-guidance
[41] WHO.2020. Report of the WHO-China joint mission on coronavirus disease 2019 (COVID-19). Available online here. See also: coronavirus: action plan. A guide to what you can expect across the UK. Published 3 Mar. 2020.British government.Online here.
[42] Wilder-Smith, A., & Freedman, D. O. (2003). Confronting the new challenge in travel medicine: SARS. *Journal of Travel Medicine*, *10*(5), 257-258.
[43] World Health Organization (2020). Report of the WHO-China joint mission on coronavirus disease 2019 (COVID-19). Available online at: https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf
[44] World Health Organization (2020k). Ebola virus disease: Factsheet.
[45] World Health Organization (2020e).Report of the WHO-China joint mission on coronavirus disease 2019 (COVID-19). Available online at: https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf.
[46] World Health Organization (2020f). Report of the WHO-China joint mission on coronavirus disease 2019 (COVID-19). Available online at: https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf.
[47] World Health Organization (2020g). Report of the WHO-China joint mission on coronavirus disease 2019 (COVID-19). Available online at: https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf.
[48] Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. JAMA. 2020 Feb 24.
[49] Xu, X. W., Wu, X. X., Jiang, X. G., Xu, K. J., Ying, L. J., Ma, C. L., … & Sheng, J. F. (2020). Clinical findings in a group of patients infected with the 2019 novel coronavirus (SARS-Cov-2) outside of Wuhan, China: retrospective case series. *bmj*, 368.
[50] Juszkiewicz A, Glapa A, Basta P, et al. The effect of L-theanine supplementation on the immune system of athletes exposed to strenuous physical exercise. *J IntSoc Sports Nutr*. 2019;16(1):7. Published 2019 Feb 15. doi:10.1186/s12970-019-0274-y
[51] Pope, M., P. A. Marsden, E. Cole, S. Sloan, L. S. Fung, Q. Ning, J. W. Ding, J. L. Leibowitz, M. J. Phillips, and G. A. Levy. 1998. Resistance to murine hepatitis virus strain 3 is dependent on production of nitric oxide. *J. Virol.* 72:7084-7090.
[52] Guo, F. H., H. R. De Raeve, T. W. Rice, D. J. Stuehr, F. B. Thunnissen, and S. C. Erzurum. 1995. Continuous nitric oxide synthesis by inducible nitric oxide synthase in normal human airway epithelium in vivo. *Proc. Natl. Acad. Sci. USA* 92:7809-7813
[53] Geller, D. A., C. J. Lowenstein, R. A. Shapiro, A. K. Nussler, M. Di Silvio, S. C. Wang, D. K. Nakayama, R. L. Simmons, S. H. Snyder, and T. R. Billiar. 1993. Molecular cloning and expression of inducible nitric oxide synthase from human hepatocytes. *Proc. Natl. Acad. Sci. USA* 90:3491-3495.Coleman, J. W. 2001.Nitric oxide in immunity and inflammation. *Int. Immunopharmacol.* 1:1397-1406.
[54] Boucher, J. L., C. Moali, and J. P. Tenu. 1999. Nitric oxide biosynthesis, nitric oxide synthase inhibitors and arginase competition for L-arginine utilization. *Cell Mol. Life Sci.* 55:1015-1028.
[55] Asano, K., C. B. Chee, B. Gaston, C. M. Lilly, C. Gerard, J. M. Drazen, and J. S. Stamler. 1994. Constitutive and inducible nitric oxide synthase gene expression, regulation, and activity in human lung epithelial cells. *Proc. Natl. Acad. Sci. USA* 91: 10089-10093.
[56] Adler, H., J. L. Beland, N. C. Del-Pan, L. Kobzik, J. P. Brewer, T. R. Martin, and I. J. Rimm. 1997. Suppression of herpes simplex virus type 1 (HSV-1)-induced pneumonia in mice by inhibition of inducible nitric oxide synthase (iNOS, NOS2). *J. Exp. Med.* 185:1533-1540.
[57] Akaike, T., Y. Noguchi, S. Ijiri, K. Setoguchi, M. Suga, Y. M. Zheng, B. Dietzschold, and H. Maeda. 1996. Pathogenesis of influenza virus-induced pneumonia: involvement of both nitric oxide and oxygen radicals. *Proc. Natl. Acad. Sci. USA* 93:2448-2453.
[58] Shi, Y., Wang, Y., Shao, C., Huang, J., Gan, J., Huang, X., Bucci, E., Piacentini, M., Ippolito, G., Melino, G. 2020. COVID-19 infection: the perspectives on immune responses (Nature Publishing Group).

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