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Covid-19 – Comorbidity, Long Term Implications and Prevetive Measures.

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ABSTRACT

BACKGROUND

The fatalities caused by coronavirus disease 2019 or covid-19 crossed one million and became most lethal disease outbreak of the century. The extreme virulent nature also makes it more difficult to control.

SUMMARY

Comorbidities and covid-19 has very interesting relationship between them. As the preliminary study of patients found that comorbid patients have greater chances of developing severe symptoms and clinical complications if they catch the COVID-19 infection. Further many long term complications has started being reported and needs to more study and healthcare infrastructure. Preventive measures can be the best option to be followed in order to safeguard oneself from the infection.

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CONCLUSION

Comorbid patients must be very vigilant about the preventive measure as once they catch the infection, the course of treatment may not go on their side. Long term implications needs more study and proper conclusion can be drawn from that study in order to rectify the containment measures.

KEYWORDS: Covid-19, Mutation, Comorbidity, Long Covid-19, Preventive Measures, PPE.

INTRODUCTION

COVID-19 or coronavirus disease 2019 is the disease caused by novel coronavirus (SARS-COV-2) a new version of the previous coronavirus which caused severe acute respiratory syndrome (SARS) and Middle Eastern respiratory syndrome (MERS) (1)outbreaks in 2003 and 2012 respectively(2). Novel coronavirus has structure of sphere and spike protein on it which finds the angiotensin enzyme 2 (ACE2) receptors through which it takes the control of protein synthesis and functioning of the cell. The COVID-19 is extremely virulent and lethal which makes the containment of the disease more difficult. As of December 30, 2020, 81,986,277 COVID-19 infection cases have been reported from worldwide and 1,790,415 mortalities happened due to COVID-19 related complications(3). This huge number itself is the testimony of the lethal nature of the COVID-19(4). As the disease started as an outbreak in Wuhan city of the Hubei province in china, possible due to consumption of exotic species of pangolin and bats which harbors many such viruses, it spread through various countries devastating everything and affecting every aspects of human life. On March 11, 2020 World Health Organization (WHO) had to recognize its fatal consequences and labeled it as pandemic which was unprecedented as since the inception of the WHO, no other disease was named as such(5). Since them almost a year has passed and various trends and symptoms related to the infection has been studied and being under constant examination process. Recently reported new mutated strain of the coronavirus has been found in United Kingdom and South Africa but it has successfully spread to other parts of the world including India(6). One trend that underlying illness may severe the clinical outcomes in COVID-19 patients Many chronic illnesses like diabetes mellitus, heart ailments, acquired immunodeficiency syndrome, renal failure, obesity, asthma, chronic obstructive pulmonary disorder and so on is already grappling the whole world by their own negative consequences. But when combined with COVID-19 infection chances of developing severe clinical outcomes is more in comorbid patients as compared to the healthy one(7,8). Also reporting of long term COVID-19 illness is also a cause of concern as till now only treatment was thought to be most important that will take care of rest. Various preventive measures are there to prevent the infection from happening at first place. In this article all these topics would be seen from birds eye view and holistically overviewed.

COVID-19 AND COMORBIDITIES

COVID-19 has proven lethal and fatal for more than a million people around the world. The casualties are extremely high and one of the highest in past century that happened due to any disease outbreak. Almost all the sections of thesociety and age groups are affected by the pandemic. From health care workers to allied workers, law enforcement agency personnel's, and

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ordinary citizens all are reeling under the brutal pressure of the pandemic. Elderly, pregnant women, new born and infants are vulnerable sectionsaccording to age group as they are in their immunosuppressive state(9). According to the International nurse's council, more nurses has died due to COVID-19 complications on duty than in First World War(10). Manydoctors were deceased in the line of duty as they are in the close vicinity of the infected patients(11).The reporting of high casualties around the world is attributed to the underlying chronic illness or comorbidity in an infected person. According to various studies, comorbidity is the biggest decider whether a person will severe symptoms or not post COVID-19 infection. Various chronic illness like hypertension, diabetes, and renal ailment, coronary artery disease, chronic obstructive pulmonary disorder (COPD), asthma, obesity and many more has penetrated deeply in the human lifestyle, as our daily schedule has changed for the worse. Stagnant and physically inactive lifestyle, less exercise, eating food containing high sugar and fats has proven extremely deadly already. People are already sufferingfrom these and many more diseases and needs time to timemedical intervention to live life properly. But after the inception of the COVID-19 pandemic, comorbid and multi morbid patients has various impacts that affected them negatively. The COVID-19 pandemic is still unfolding new aspects day by day but study done so far has confirmed the severity of the symptoms observed in comorbid patients if they contracted the COVID-19 infection. Regardless of the age it affects the COVID-19 infected patients severely and always result into negativeconsequences. Children which are older than infants are less affected but there has been reported thatchildren's developing mild to severe symptoms of the infection. It may culminate into severe illness in severalchildren's. Children's free from any underlying illness is more secure than children's with already having chronic underlying illness.(12) The disorders that includes obesity, genetic disorders, medical anomaly, neurological and inheritedmetabolic disorder, sickle cell, diabetes etc. which if are present in children can develop severe infection related condition. The precise and exact analysis on how each morbidity acts and results during course of treatment. The highest affected regions like Italy and Spain were found to be inhabited by more obese and heart ailment complaining people and the diet also contained high sugar and fat contents along with consumption of liquor. The modus operandi of the virus that is novel coronavirus (SARS-COV-2) is that it gets entry through angiotensin converting enzyme 2 (ACE2) receptors and released the spike proteins which then take the control of the host cells and also the control of various essential protein synthesis process. These receptors are present in heart, lung, kidney and many other places and if the mechanism in these places are not in equilibrium chances are the person concern would develop severe symptoms.

A study conducted on 1813 patients suggested that in ICU more male patient were admitted from general ward as compared to their female counterpart. But this does not mean that they that is male patients develop severe symptoms than female. This suggested that male COVID-19 infected patient may have higher chances of clinical deterioration of the medical condition. Dyspnea was more prevalent among all age groups and genders and can be a predictive method to proactively treat the infected patient suffering from COVID-19. Not all patients developed severe illness who are having underlying chronic medical illness along with COVID-19 but largely the trend remains the same. Another illness that is chronic obstructivepulmonary disorder (COPD) is observed to be developing more severe illness post ICU admission of the infected patient. Though the study have its limitations on the sample or subject numbers it largely

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confirms the trend of the comorbidity and COVID-19 infection(13).

Another study found that sympathetic discharge that is generally over activated in patients suffering from chronic illnesses likeheart and kidney ailments may worsen the illness if infected by the COVID-19. Increase chemo sensitivity was found in COPD, sleep apnea, cardiovascular disease which in turn increases the sympathetic discharge(14). Metabolic syndromes like obesity and diabetes also increases the discharge as there is increase in leptin and insulin in the blood level in the said condition. In COVID-19 infection, the sympathetic discharge induced by various comorbidities pulmonary, cardiovascular, renal and metabolic may show negative repercussionsover the course of treatment. Cardiovascular illness along with COVID-19 infection may culminate into myocardial infarction, myocarditis and in these unfortunate events activation of the sympathetic dischargemaybe prove fatal, increasing the mortality rate. A vicious circle is formed when sympathetic response makes a person vulnerable and if such person catch the disease, then it may further aggravate the sympathetic discharge leading to a dangerous and fatal cycle culminating in mortality. Also study suggested that male and old age gender may be at vulnerable side as the said discharge are found to be higher mostly obesity induced activation(15).

Correlation between immune system dysfunction and the clinical outcome COVID-19 infected patients having comorbidities was analyzed by a study. As the immune system weakens more is the chance of contracting the infection of the COVID-19. Comorbidities like heart ailments, renal ailments, pulmonary disease, obesity, diabetes mellitus etc. weakens the innate immune response and the oxidative stress on the body is increased. Inflammation in tissues may be seen as a consequence. These series of events culminates in to immunity and in turn makes the person vulnerable to catch the infection quickly(16).

Among the comorbidities, preliminary findings suggests that diabetes mellitushave serious repercussions if combined with COVID-19 infection and have long term implications if the patient is cured. Diabetes mellitus has been affecting 463 million people currently and according to estimates it can reach up to 578 million by the year 2030. And the year on year increase figures are also alarming suggesting loosen noose on the disease spread. More infected patients with COVID-19 along with chronic condition of diabetes mellitus were found to be in the ICU treatment and care. Mechanical ventilations and machine ventilators with oxygen support system is the common and compulsory requirement among such patients. The clinical outcome in diabetes mellitus is patients infected by COVID-19 is more negative and chances of mortality are high as compared to non-diabetic patients with COVID-19 infection. In addition diabetes invites other morbidities such as obesity, hypertension, renal failure, palpitations which can future aggravates the clinical outcome in any situations. The body of diabetic patient with considerable amount of patient history is constantly reeling under high oxidative stress, inflammation and weakened immune response which makes them more vulnerable to catching any infection. The COVID-19 already deadly and lethal in nature attacks mainly on cell functioning and in turn immune response system which is not able to cope up with the pressure and is already under pressure. Uncontrolled blood glucose level only adds to the long list of woes that diabetic patients faces(17).

Obesity is also among the widespread chronic illness that is growing faster day after day. This is

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the disease caused due to unhealthy lifestyle, genetically inherited and consuming diet with high fats and sugars which results into depositions of harmful lipids and unutilized carbohydrates. In a study conducted where body mass index more than 30 kg/m^2 , people were having less saturation of oxygen in blood profile than the safe minimum value. Inflammation of lesser grade may be found in obese people which can again aggravate by COVID-19 infection and in turn may suppress the innate immune response towards external pathogenic invasion like coronavirus. Around 47 percent of obese people were infected by COVID-19 and 68.6 percent received ventilation treatment. This highlights the need of preventive measures among these people(18).

LONG TERM IMPLICATIONS OF COVID-19

So far now the world knows about the challenge faced by the medical fraternity and researchers along with governmental agencies in treatment duration only. But post treatment there is increasing emergence and reporting of the illness that are persisting for months after the discharge from COVID-19 treatment. A condition known as long COVID-19 may be underestimated for now but will peek out in a near future as more people are being recovered from the illness. As this phenomenon is new and there is shortage of any major conclusive research on the topic but previous outbreaks of same coronavirus family that is severe acute respiratory syndrome (SARS) and Middle eastern respiratory syndrome (MERS) can provide valuable lessons as they also have shown similar consequence post discharge and which persisted for few years(2). Long term complications of COVID-19 which were reported from various geographical regions includes reduced physical activity, extreme fatigue, loss of intermittent taste and smell, palpitations, sleep apnea, occasional hypoxia, headache and many more. In SARS and MERS, long term consequence include myocarditis, weakening of cardiovascular muscle, reduction in vitamin D levels as long home or hospital isolation is mandatory in certain contagious diseases, reduction in levels of carbon monoxide diffusion from the body, damaging of various tissues such as alveolar tissues leading to problem in diffusing oxygen taken from surrounding to the blood, hypertension, anxiety and many more. Psychological impact was also prominent but less talked about which includes anxiety, depression, bipolar disorders and so on. This was attributed to long periods of isolation leading to loneliness and reduced meeting with loved ones and family members due to virulent nature of the virus. Especially in athletes where importance of physical fitness is more than anything else, infection of COVID-19 may prove devastating for their future career. Although athletes are meant to be fit and to generate strong immune response, long days of lockdown and physical social distancing has hindered their physical activities and practice session drastically and they should check whether they are fit as usual any more or not. Although movement restrictions are easing up but after arrival of new and more virulent coronavirusstrain, chances of reimposition of lockdown according to the ground condition cannot be totally denied. Also it is important to safeguard oneself from the infection we can see some severe long term complications in some individuals(19).

PREVENTIVE MEASURES FROM COVID-19

As we have seen comorbidity and its negative effects on patient in COVID-19 infection and the long term implications of the COVID-19 infection. One thing is clear that warding off the virus must tries than curative treatment as it will help manifold. In pandemic as lethal and deadly as

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COVID-19, prevention overpowers cure treatment and needs to be followed so that burden on health care facilities as well negative impact on oneself can be minimized. Various preventive measures has been notified by various guidelines issued by health authorities all across the world along with World Health Organization (WHO). Preventive measures are meant to protect oneself from any infection in current scenario it is COVID-19. Preventive measures imposed by governments such as lockdown and movement restrictions are easing up as the time passes and proactive measures adopted by residents itself would help more in containing the menace of COVID-19. Wearing od proper mask, maintaining at least six feet distance two individual, using personal protectiveequipment's (PPE)kits, face shield, sanitizing hands regularly, not touching public surface if no necessary etc. are the safe practices that must be followed in order to prevent the infection from entering into the body. Especially health care professionals and law enforcement agency personnel's who are at the forefront of the containment strategy needs to be provided with sophisticated equipment's , personal protective equipment kits so that they are safe from the infection. The efficacy of the PPE kits and masks were notable in Ebola outbreak where health care professionals were able to trace and treat and thereby contain the spread of the disease in African countries. According to the International nurses'council, more nurses died during the COVID-19 duty than during the First World War. Also many doctors are no more with us because of COVID-19 related complications which they caught on the line of duty. Already the doctor to per unit population is low across the world and we cannot afford to lose them Preventive measures also includes the change in diet. Having healthy diet is the part and parcel of healthy lifestyle which keeps you disease free.Supplementary and prophylactics have proven to be effective in keeping away the COVID-19 infection and any infection in general. Probioticswhich extremely helpful inmaintaining gut health and good bacteria in gut. These bacteria helps in absorbing various types of essential components and foods. Also it helps in maintaining good metabolism which further enhances the innate immune responses of the body. Vitamin C, Vitamin D, zinc, probiotics can be inculcated in day to day diet in order to have balance and healthy diet. Cutting on high sugar, fats and carbohydrates diet may also help in restoring the lost balance in human body. If foods are not available which can be a rare situation then tablets and fortified products can fulfill the need of the situation. Also many citrus fruits contain Vitamin C which can be cheap as well as easily and readily available. Vitamin D deficiency can be seen widespread already before the arrival of the pandemic therefore people are more vulnerable on Vitamin D deficiency side and should look into the matter as soon as possible. Reasons behind general deficiency includes more desk jobs resulting in less exposure to sunlight, body not exposed to sun due to ritualistic prohibition and not enough consumption of vitamin D foods such as sea food , meat and other products containing the Vitamin D. Vitamin C related to antioxidants properties along with anti-inflammatory responses(20). COVID-19 induces on the body, the stress called oxidative stress which happens due to malfunctioning of the body as host cells has been hijacked by the coronavirus. Vitamin C acts as reducing agents for oxidative stress and also exhibits anti-inflammatory properties. The inflammation has been reported in patients suffering from COVID-19 infection. Alveolar tissues and other cell found to be not working properly due to infection. Both Vitamin C, vitamin D are meant to be lowering these stress of the body induced by the infection. Vitamin D improves the innate immune response of the body and provide strong defense against external pathogenic invasion like coronavirus. Probiotics are long known to be enhancing metabolism and building strong shield against external invasion of any disorder. The gut lung axis role is already established in the various studies conducted all around the world. As the lifestyle is changing decade by decade probiotics needs tobe a part of life and is now one of the essential supplementary materials that human body needs to maintain the equilibrium(21).Many studies from relevant literature can be

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tracked (22-24). Kanoje et. al. reported on home remedies for the elderly in the direction of protection against COVID-19 (25). Related issues were also reported in studies of Khatib et. al. (26), Shah et. al. (27) and Gaidhane et. al (28). Ghate et. al reported about Covid-19 in pregnant women (29). Gosavi et. al. explored the link between smoking and Covid 19 (30).

CONCLUSION

It can be concluded from the study that all the mortality and morbidity cases of the COVID-19 infection which developed severe illness post admission in hospital or COVID-19 care facilities may be attributed to over activation of sympathetic discharge.There is the need to find the correlation between the comorbidity and the COVID-19 infection outcome in comorbid patients as it will help in both ways. Vulnerable section would be acquainted about the possible danger associated with them regarding infection and they should strictly follow preventive measures. Secondly, clinicians after looking at the study results may curate the treatment course of the COVID-19 according to the contemporary situations which will reap maximum benefits. Long term consequences are worrying and proper investment in post-COVID-19care must be done in order to avoid chaotic situations in future. Further prevention is better than cure is proved from above examples and following of preventive measures should be part and parcel of lives till the virus id defenestrated from the human life.

REFERENCES:

1. Batawi S, Tarazan N, Al-Raddadi R, Al Qasim E, Sindi A, AL Johni S, et al. Quality of life reported by survivors after hospitalization for Middle East respiratory syndrome (MERS). Health Qual Life Outcomes [Internet]. 2019 Jun 11 [cited 2020 Dec 18];17(1):101. Available from: https://doi.org/10.1186/s12955-019-1165-2
2. Ngai JC, Ko FW, Ng SS, To K-W, Tong M, Hui DS. The long-term impact of severe acute respiratory syndrome on pulmonary function, exercise capacity and health status. Respirol Carlton Vic. 2010 Apr;15(3):543–50.
3. COVID-19 Map [Internet]. Johns Hopkins Coronavirus Resource Center. [cited 2020 Dec 30]. Available from: https://coronavirus.jhu.edu/map.html
4. WHO Coronavirus Disease (COVID-19) Dashboard [Internet]. [cited 2020 Dec 30]. Available from: https://covid19.who.int
5. WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020.pdf.
6. Wise J. Covid-19: New coronavirus variant is identified in UK. BMJ [Internet]. 2020 Dec 16 [cited 2020 Dec 23];371:m4857. Available from: https://www.bmj.com/content/371/bmj.m4857
7. Guan W-J, Liang W-H, Zhao Y, Liang H-R, Chen Z-S, Li Y-M, et al. Comorbidity and its impact on 1590 patients with COVID-19 in China: a nationwide analysis. Eur Respir J. 2020;55(5).
8. Dushyant Bawiskar, Pratik Phansopkar, Ayurva Vilas Gotmare. COVID-19 Facets: Pandemics, Curse and Humanity. Int J Res Pharm Sci. 2020 Aug 6;11(SPL1):385–90.
9. Yan J, Guo J, Fan C, Juan J, Yu X, Li J, et al. Coronavirus disease 2019 in pregnant women: a report based on 116 cases. Am J Obstet Gynecol [Internet]. 2020 Jul 1 [cited 2020 Oct 17];223(1):111.e1-111.e14. Available from: https://www.ajog.org/article/S0002-9378(20)30462-2/abstract
10. ICN confirms 1,500 nurses have died from COVID-19 in 44 countries and estimates that

healthcare worker COVID-19 fatalities worldwide could be more than 20,000 [Internet]. ICN - International Council of Nurses. [cited 2020 Dec 17]. Available from: https://www.icn.ch/news/icn-confirms-1500-nurses-have-died-covid-19-44-countries-and-estimates-healthcare-worker-covid

11. Green A. A tribute to some of the doctors who died from COVID-19. The Lancet [Internet]. 2020 Nov 28 [cited 2020 Dec 27];396(10264):1720–9. Available from: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)32478-8/abstract
12. Palmer K, Monaco A, Kivipelto M, Onder G, Maggi S, Michel J-P, et al. The potential long-term impact of the COVID-19 outbreak on patients with non-communicable diseases in Europe: consequences for healthy ageing. Aging Clin Exp Res. 2020 Jul;32(7):1189–94.
13. Jain V, Yuan J-M. Predictive symptoms and comorbidities for severe COVID-19 and intensive care unit admission: a systematic review and meta-analysis. Int J Public Health [Internet]. 2020 May 25 [cited 2020 Dec 28];1–14. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7246302/
14. Halaris A. Inflammation-Associated Co-morbidity Between Depression and Cardiovascular Disease. Curr Top Behav Neurosci. 2017;31:45–70.
15. Porzionato A, Emmi A, Barbon S, Boscolo-Berto R, Stecco C, Stocco E, et al. Sympathetic activation: a potential link between comorbidities and COVID-19. FEBS J. 2020 Sep;287(17):3681–8.
16. Ejaz H, Alsrhani A, Zafar A, Javed H, Junaid K, Abdalla AE, et al. COVID-19 and comorbidities: Deleterious impact on infected patients. J Infect Public Health. 2020 Dec;13(12):1833–9.
17. Bouhanick B, Cracowski J-L, Faillie J-L, French Society of Pharmacology, Therapeutics (SFPT). Diabetes and COVID-19. Therapie. 2020 Aug;75(4):327–33.
18. Callender LA, Curran M, Bates SM, Mairesse M, Weigandt J, Betts CJ. The Impact of Pre-existing Comorbidities and Therapeutic Interventions on COVID-19. Front Immunol. 2020;11:1991.
19. Rimmer A. Covid-19: Impact of long term symptoms will be profound, warns BMA. BMJ [Internet]. 2020 Aug 13 [cited 2020 Dec 17];370:m3218. Available from: https://www.bmj.com/content/370/bmj.m3218
20. Rishi P, Thakur K, Vij S, Rishi L, Singh A, Kaur IP, et al. Diet, Gut Microbiota and COVID-19. Indian J Microbiol. 2020 Sep 28;1–10.
21. Sundararaman A, Ray M, Ravindra PV, Halami PM. Role of probiotics to combat viral infections with emphasis on COVID-19. Appl Microbiol Biotechnol. 2020 Oct;104(19):8089–104.
22. Joseph, M.B., S. Pohekar, A. Raut, and M. Patil. “The Palliative Care and Covid-19 Pandemic.” International Journal of Research in Pharmaceutical Sciences 11, no. Special Issue 1 (2020): 618–22. https://doi.org/10.26452/ijrps.v11iSPL1.2861.
23. Joshi, K., N. Acharya, S. Acharya, and S. Joshi. “A Grave Situation with COVID in the Gravid: A Narrative Review.” International Journal of Research in Pharmaceutical Sciences 11, no. Special Issue 1 (2020): 496–99. https://doi.org/10.26452/ijrps.v11iSPL1.2837.
24. Kalagani, B., M. Yeola, and A. Zade. “Surgical Protocols for Patients with COVID19.” Journal of Datta Meghe Institute of Medical Sciences University 15, no. 1 (2020): 144–48. https://doi.org/10.4103/jdmimsu.jdmimsu_142_20.
25. Kanoje, R., and A. Pargaonkar. “Home Remedies for the Elderly in the Direction of Protection against COVID-19: An Ayurveda Perspective.” International Journal of Research in Pharmaceutical Sciences 11, no. Special Issue 1 (2020): 1167–70. https://doi.org/10.26452/ijrps.v11iSPL1.3576.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 6977 – 6985
Received 05 March 2021; Accepted 01 April 2021.

26. Khatib, M.N., S. Gaidhane, M. Khatib, M. Ahmed, A. Gaidhane, and Z.Q. Syed. "SARS-CoV and SARS-CoV-2: Similar Viruses with Different Trajectories." Wutan Huatan Jisuan Jishu 16, no. 5 (2020): 544–48.
27. Shah, A., F. Laliwala, D. Singhal, A. Gaidhane, and N. Khatib. "Documenting Ocular Findings and Conjunctival Viral Prevalence amongst Patients with COVID-19 Admitted in a Tertiary COVID Care Hospital, Ahmedabad." European Journal of Molecular and Clinical Medicine 7, no. 7 (2020): 1887–91.
28. Gaidhane, S., N. Khatib, Q.S. Zahiruddin, A. Gaidhane, S. Telrandhe, and P. Godhiwal. "Depression, Anxiety and Stress among the General Population in the Time of COVID-19 Lockdown: A Cross-Sectional Study Protocol." International Journal of Research in Pharmaceutical Sciences 11, no. Special Issue 1 (2020): 360–64. https://doi.org/10.26452/ijrps.v11iSPL1.2726.
29. Ghate, V.C., S. Borage, and P. Shelotkar. "Covid-19 in Pregnant Women." International Journal of Research in Pharmaceutical Sciences 11, no. Special Issue 1 (2020): 430–32. https://doi.org/10.26452/ijrps.v11iSPL1.2805.
30. Gosavi, S., S. Shrivastav, R. Kamble, P. Daigavane, and S. Gosavi. "The Link between Smoking and Covid 19 — a Short Review." International Journal of Research in Pharmaceutical Sciences 11, no. Special Issue 1 (2020): 931–33. https://doi.org/10.26452/ijrps.v11iSPL1.3165.