A REVIEW ON IMPACT OF COVID-19 IN INDIA AND NANOTECHNOLOGY CONFLICT AGAINST PANDEMIC SCENARIO IN INDIA ON MAY 27, 2020.

Keruthika. K, Saranya. S, Carolin kiruba. E, Nandhini. M, Ilavarasi. R*

Nanotechnology Division, Department of Electronics and Communication Engineering,

Periyar Maniammai Institute of Science and Technology, Thanjavur, India.

ABSTRACT:

Severe acute respiratory syndrome coronavirus2(SARS-COV-2) is a combination of major groups of viruses that can cause conditions from common cold to mortality; Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) are the other unrelenting diseases associated with COVID-19. The first case of COVID-19 was identified from a wholesale food market in Wuhan, China. Most of the viruses are dangerous it spreads an equivalent approach alternative coronavirus do, primarily through human-to-human transmission. The mammalian (human) mainly serve as host for human coronavirus 229E, NL63, Beta corona virus1 and SARS-related coronavirus. Recently graphene mask is manufacture to resist the virus COVID-19. The graphene mask is one of the advanced masks based on nanotechnology with superhydrophobic to prevent the humidity which carries the virus that brings disease. There is no availability of effective medicine and vaccine so far. In this review, biological characteristics of the corona, Transmission and symptoms, four stages, graphene mask and do's and don'ts of COVID-19, testing method and impact, immunity-boosting measures for self-care, diet for the cover-19 patient, the survival time of coronavirus, efficiency of the mask were discussed.

KEYWORDS: Biological characteristic and stages, Nanotechnology, Covid-19, Wuhan, WHO analysis.

1.INTRODUCTION:

Nowadays, COVID-19 virus has affected all over the country. a novel coronavirus was first caused in the city, Wuhan at China in December 2019. Within the following days, infections unfold across China and alternative countries around the world. The Chinese public health, clinical, and scientific communities took the response to permit for recognition of the new virus and shared the microorganism sequence to the world [1,2]. At January 30, 2020, the World Health Organization declared the eruption a Public Health Emergency of International Concern. At February 12, 2020, WHO named the disease caused by the novel as Coronavirus Disease 2019 (COVID-19). There are four major structural proteins encoded by the corona microorganism

order on the envelope, one in every of that is that the spike macromolecule that binds to angiotensin-converting protein a pair of receptor and mediates succeeding fusion between the envelope and host cell membranes to assist microorganism entry into the host cell. [3].

Patients with the COVID-19 infection well-tried by enzyme chain reaction are a median age of 55 years. They cause fever, dry cough, and shortness of breath and, within the most severe cases, have respiratory disease. The infection of COVID-19 is spreading quickly with increasing numbers of infected patients nationwide and worldwide [4]. Once a patient has been outlined as infected with COVID-19, he or she ought to be treated, taking into thought airborne and contact precautions. Most of the measures area unit symptomatic, though some antiviral medications are used. This study has reviewed the historical and human analysis proof by preventing and management of infections to supply guidance for the prevention of coronavirus [5]. Recently, children also infrequently affected by COVID-19 and cause several deaths. Therefore, looking forward to a potential anti- COVID-19 agent, which is a very challenging mission. Colloidal Silver nanoparticles (SNPs) with controllable size and shape is the potential antiviral agent for numerous viruses but their antiviral activity against novel COVID-19 have not been evaluated yet. [6].

January 30, 2020, more than 7000 cases are confirmed in China and 90 alternative cases have additionally been according to from a variety of states that embody Taiwan, Thailand, Vietnam, Malaysia, Nepal, Sri Lanka, Cambodia, Japan, Singapore, United Arab Emirates, US, The Philippines, India, Australia, Canada, Finland, France, and European country. In this case study illustrating (SNPs) with colloidal form and the capping agent tannic acid over SNPs have the potential antiviral activity against (COVID-19) [7]. In this novel, COVID-19 originated from the Human food market at china wherever snakes, doges, palm and different animals' unit sold-out and also unfold up to all or any over countries [8]. At February 23, 2020, COVID-19 immunizing agent has been with success developed. At present, the treatments of patients with SARS-CoV-2 infection area unit primarily symptomatic treatments [9].

We parametrize the model employing a vary of estimates regarding the COVID19 epidemic that is unsure. we tend to explore many variations of our benchmark situation, including the severity of the congestion effects on the death rate, a spread of valuations for the worth of lost lives, and therefore the risk of testing and cathartic the recovered agents from internment [10]. They found two strains, that they named L and S. The S kind is older; however, the L kind was a lot of common in early stages of the happening. All symptomatic patients had multifocal ground-glass opacities on chest CT, and conjointly had subsegmental areas of consolidation and pathology. All the symptomatic patients had enlarged c-reactive protein levels and reduced WBC counts [11].

If you notice any persons caused by severe symptoms like Trouble breathing or shortness of breath, ongoing chest pain or pressure, new confusion, Cannot wake up fully and Bluish lips or face get treatment immediately. Symptoms of COVID-19 may be the same as a foul cold or respiratory disease. Your doctor can suspect COVID-19 you've got a fever and a cough. You reside in a part with the virus or have travelled to places wherever it's unfolded. Current management of COVID-19 is appurtenant, and metabolism failure from acute metabolism distress syndrome (ARDS) is that the leading reason behind mortality. In this year COVID-19 cases in overall countries are discussed and mainly Tamilnadu states cases of COVID-19 are briefly explained in belonging graph [12].

2.BIOLOGICAL CHARACTERISTICS OF COVID-19:

Coronavirus is the subfamily of *orthocornavirinae* of the *coronaviridae* family of order *Nidovirales*. Covid-19 are non-segmented, positive-sense single-standard RNA virus (+ssRNA) and its classified into four sub-family such as α-COVID, β-COVID, γ-COVID and δ-COVID genera's [13]. The size of the coronavirus is about 65-125nm in diameter and the RNA ranging from 26 to 32kbs in length [14]. The RNA appears like a crown due to spike glycoprotein presence on the envelope [15]. The expression pattern and genomic organization of all coronaviruses are similar with huge overlapping frames (ORF1 a/b) which consist of 16 Nano structural proteins [16] include Spike (S) protein, Membrane (M) protein, Envelop (E) protein and Nucleocapsid (N) protein. Based on the analysis of phylogenetic genome length of SARS-COVID is similar to SARS-COVID-2 [17]. Finding of current research reveals that Covid-19 has ~80% similarity with SARS-COV, ~50% with MERS-COV and ~96% with bat coronavirus RaTG13 respectively [18]. The positive-sense genome serves as mRNA and translated to polyprotein la/lab (ppla/lab). The size of S protein varies from 1160 amino acids to 1400 amino acids and lies on virion surface where M protein binds to nucleocapsid and serves as organizer further E protein is the most epigenetic and smallest protein play multifunctional roles such as pathogenesis, assembly and release of viruses and N protein perform a complex formation with viral genome and paved way for M protein interaction and enhance transcription efficiency [19]. Generally, α and β genera's of COVID can infect mammals(Humans) and Six Covs infect the humans and lead to respiratory diseases such as HCOV-229E,HCOV-OC43,HCOV-NL63 and HKU1 [20].The annotated genome of COVID belong to 14 ORFs encoding with 27 proteins which comprise of 15nsps include nsp1 to nsp10 and nsp12 to nsp16 [21]. By the comparing of the receptor-binding domain of COVID spike protein with SARS-Cov and SARS-like COVID and found there is a significant similarity in the sequence of amino acid and uses same entry receptor the ACE2 protein [22].

3.TRANSMISSION:

In SARS-COV genomic sequence, the s-glycoprotein gene and receptor binding domain of SARS-COV is capable of direct human-to-human transmission. The s-glycoprotein which consist of subunits S 1 and S 2 can

attach to the receptor of ACE 2 (Antigen converting enzyme 2) of human cells on its surface [23]. The biological mechanism is mainly of interactions, which includes attachment of virus, recognition of receptors, cleaving of protease and fusion of membranes. From a bioinformatics analysis on single-cell data transcription of the healthy human gastrointestinal system and was carried out and it revealed that ACE 2 was either highly expressed in lungs AT2 cells but parallel in oesophagus upper and stratified epithelial cells [24]. Different samples were collected, tested and investigated for triamterene transmission Covid-19 from this it's found that there are no intrauterine fatal infections due to COVID-19 [25]. Initially, two species of snakes are considered to be the reservoir of SARS-COV-2, further several cases suggested that the main transmission of Covid-19 is by person-to-person [26]. The massive migration(movement) of humans during the Chinese New Year was reported as the major cause for the transmission [27], the primary route includes respiratory droplets and closer contacts [28]. The droplets transmission mainly occurs with the person who has a respiratory illness such as cold or cough and therefore having the risk of respiratory droplets on the mucosae they also occur through fomites around infected individuals [29]. The main characterization of Covid-19 includes examining the connection between confirmed cases, their infected and non-infected closer contacts [30]. The SARS-COV-2 cannot spread through aerosol; in case of spread, it is very tedious to control [31]. The SARS-COVID-2 viral RNA or live viruses that present in facies may lead another route might be faucal-oral transmission [32].

4.SYMPTOMS:

The systematic digestive symptoms include diarrhea, nausea and vomiting; further investigating the patient from close contact with only respiratory symptoms include cough, chest discomfort, expectoration, shortness of breath and sore throat [33]. In the affected area, some patients diagnosed with coronavirus has not shown any respiratory symptoms such as coughing and fever during the time of diagnosis [34]. The novel coronavirus constantly evolving with new symptoms: the one notable symptom repeatedly reported was anosmia (loss of smell) and ageusia (loss of taste) Besides, some reported with dysgeusia (changing in taste) [35]. A small number of patients are diagnosed with headache or hemoptysis and asymptomatic. The old men with one or more addiction conditions along with COVID-19 are much possible to have respiratory failure due to severe alveolar damage [36]. The study among the patients with acute symptoms of COVID showed that 58% had hypertension, 25% had the cardiac disease and 44% had arrhythmia. From the released data of the National Health Council (NHC); 35% of patients with COVID-19 infection had hypertension and 17% had coronary heart disease [37]. Self-reported symptoms include 81% of fatigue, 71% of ageusia, 70% of fever, 68% of anosmia, 63% of myalgia, 68% of diarrhea and 27% of nausea [38]. The skin symptoms of novel coronavirus include erythematous rashes, urticarial and chickenpox like lesions [39]. The patients with digestive symptoms have higher liver enzyme level, lower monocyte count, and longer prothrombin time [40]. Laboratory test shows that leukocyte and lymphocyte count was below normal; C-reactive protein level

increased; mild increase in serum aminotransferases were observed [41]. The COVID-19 infection with severe dyspnea and pneumonia in approximately 75% of patients [42].

5.TESTING METHODS AND IMPACT:

TESTING METHOD	DURATION FOR RESULT	SENSITIVITY PERCENTAGE FOR COVID SAMPLE	REFERENCE
Chest CT Scan	30-90 Minutes	98%	[43]
RT-PCR	12-18 hours	71%	[44]
Isothermal amplification test	30 Minutes	89.9%	[45,46]
Convalescent plasma	45-50 Minutes	90.6%	[47]

Table 1: Illustrate the COVID-19 testing methods and percentage of sensitivity depending upon the results evolved

6.CURRENT SCENARIO ATTACKED BY COVID-19:

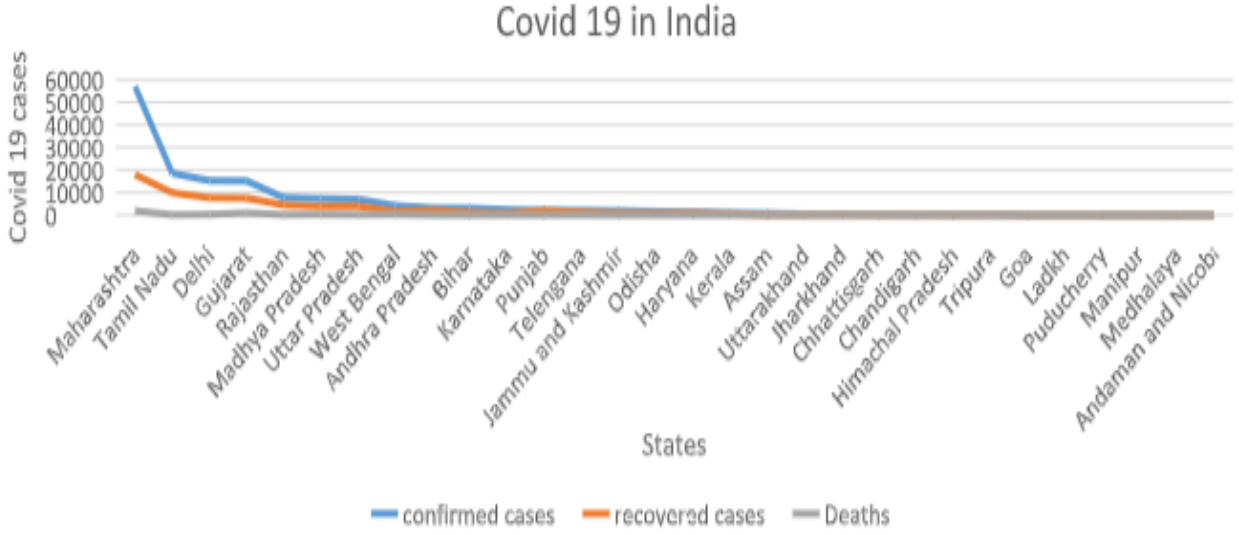

Fig 1: Schematic chart on conformed cases, recovered cases and death cases based on India.

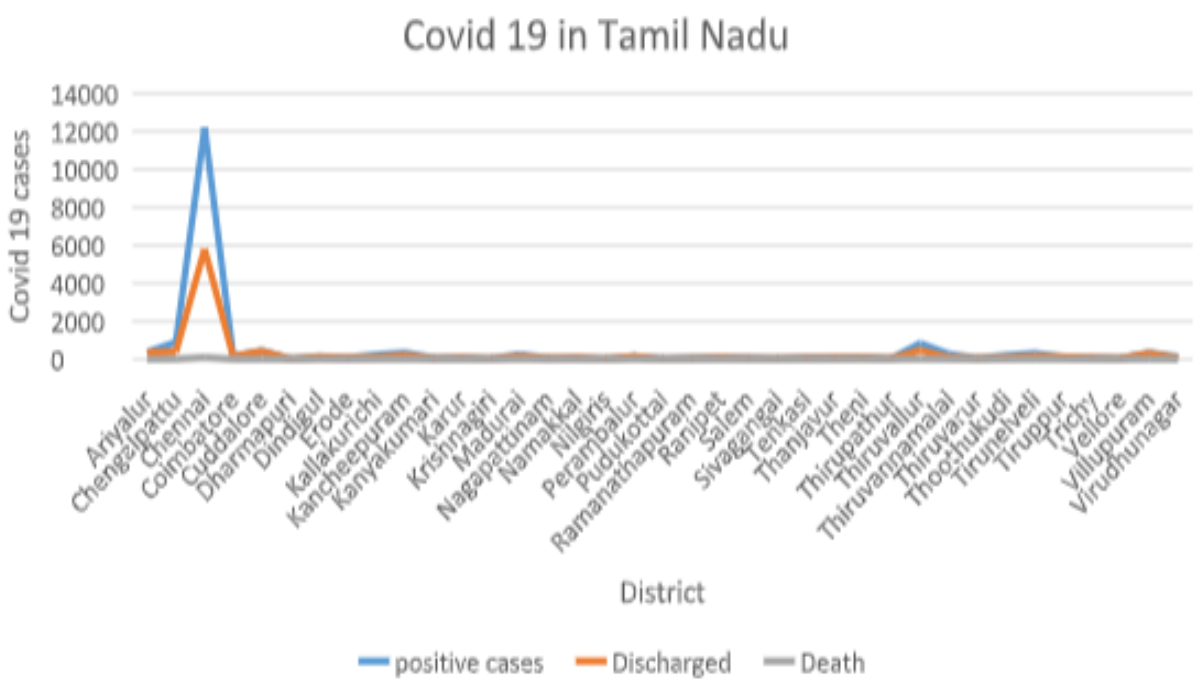

Fig 2: Schematic chart of positive cases, discharged and death cases based on Tamilnadu.

7.BAR CHART OF WORLD:

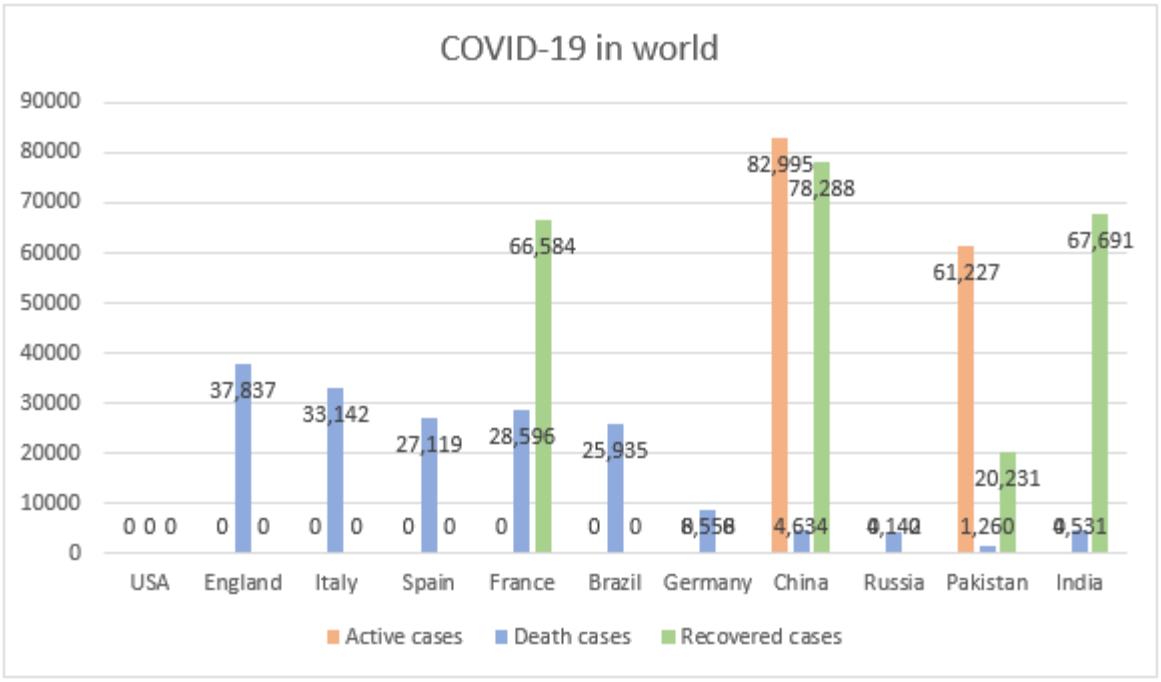

Fig 3: Schematic bar chart of active cases, recovered cases and death cases based on the world.

8.FOUR STAGES OF COVID-19:

8.1 Stage 1: Early stage (Appearance of the disease):

When cases are only spread by foreign from affected countries and those people who have travelled abroad check positive. The phase once the sickness is simply introduced, and positive cases begin to emerge for the first time. the approach of the disease is restricted to individuals with travel histories to the infected areas, as was the case with few Indian COVID-19 cases reported from the last week of Jan to mid-March. During this stage, everything is contained, as only a few individuals have contracted the virus.

8.2 Stage 2: Progressive stage (Local transmission):

When their native transmission from infected persons. In this stage, the source of the virus is identified and is so easier to perform contact tracing and contain the spread via self-quarantining. Now India is facing stage 2.

The virus spreads locally, through a person who has either a travel history or the one who are available in direct contact with an already infected person. This stage usually sees an infected person pass the virus onto their family, friends, neighbors and others who tend to be in his/her close area and vicinity. The virus transmission during this stage is monitored by contact tracing, isolating individuals with symptoms, strict screening measures, social distancing, and quarantine efforts.

8.3 Stage 3: Peak stage (Community transmission):

This is the stage of community transmission. during this stage who have been exposed to an infected person or anyone who had a travel history to affected countries, still check positive. In alternative words, individuals are unable to spot wherever they could have picked up the virus from. Singapore, Italia and European countries are facing Stage 3.

This occurs, tough to trace the source of the infection spread. Once community transmission begins, it becomes tough to contain the disease and to prevent the chain of transmission. because the disease pops-up in random people during a community, contact tracing and isolation becomes not possible and large-scale lockdowns become extraordinarily vital.

8.4 Stage 4: Absorption stage (Widespread outbreak):

This is the worst stage of the infection wherever it takes on the shape of an epidemic. large numbers are infected and it tough to manage and contain the spread. In this fourth and last of transmission, there a widespread outbreak an epidemic as the number of cases and deaths begin rapidly multiplying, without stopping. during this stage, the un wellness becomes endemic, i.e. native to the population. Whereas China witnessed this stage

of transmission earlier in February, countries like European nation and also the USA apparently during this right now [48].

9.GRAPHENE MASK:

COVID-19 Is a pandemic and its affecting 210 countries, mainly spread by respiratory droplets. Nowadays the usable surgical masks are disposable and cannot sterilize themselves for further use. Fabricated Graphene mask with superhydrophobic, self-cleaning and outstanding photothermal properties .it has been fabricated by dual-mode laser-induced forward transfer method by depositing one to few layers of graphene in low melting temperature of the non-woven mask. Therefore, superhydrophobic surfaces were found out on the surface of the mask which can induce the aqueous solutions to roll off. Under ultraviolet rays of sunlight illumination, the surface surgical mask temperature increased to 80 c and make it self-sterilize for reuse. Graphene coated mask can be recycled directly in solar-driven desalination while in long term use results in salt rejection performance [49].

10.DO'S AND DON'T:

S.NO	DO'S	DON'TS
1.	Practice washing hands at least 20 sec.	Standing near to someone during sneezing
2.	Wash hands with soap and water or use an alcohol-based sanitizer.	Redundant touching of your nose, eyes, and mouth.
3.	If you are feeling unwell, visit the doctor and wear a mask to hide your mouth and nose.	Reuse the mask
4.	If you have got any symptoms related to COVID-19, please call helpline immediately.	Touch the wall, the elevator switch, doorknob, shaking hands, power switch, etc.
5.	Test your mask efficacy by blow test	Skip used right ripped or damped mask
6.	Check your date of appointment before visiting the hospital.	unneeded travelling or gathering
7.	Maintain a distance of at least 1M from consultant or doctor during the testing of COVID-19	Wearing the mask only over mouth.
8.	Remove the mask from behind the ears or head.	Touch the front of the mask.

9.	Wash your hands before and after touching the mask and discarding the mask.	Wearing of a loose mask.
10.	Discard your used mask in appropriate manner advised by health council.	disposing of used mask in public places

Table 2: Represents the habitual behaviour like do's and don'ts to maintain the hygienic of individuals to avoid prevent virus-like COVID-19 [50,51].

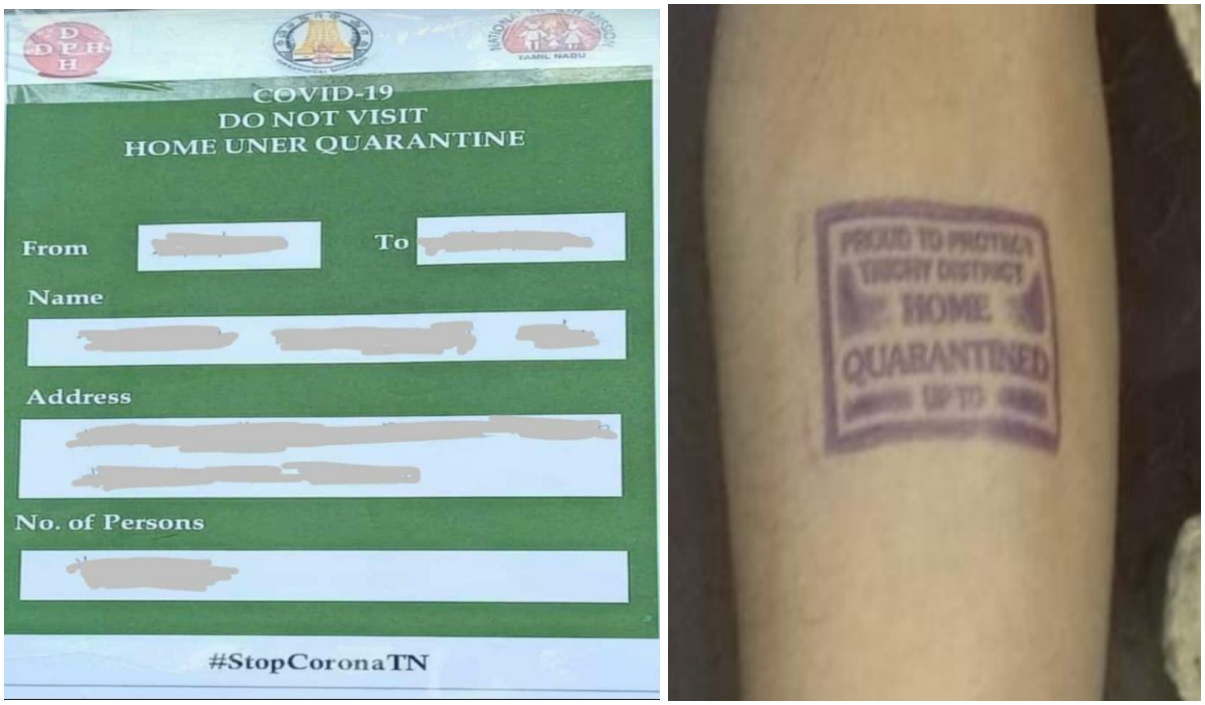

Fig 4: Represents the government provided notice and awareness for the home quarantined for an affected person of COVID-19 at the early stage.

11. IMMUNITY BOOSTING MEASURES FOR SELF-CARE:

Drink warm water through the day. Daily practice yoga Sana, pranayama and meditation for at least 30 min in the early morning. Consume spices like turmeric, cumin, coriander, onion, garlic, ginger, pepper, clove, milk in your cooking. Kabasura-kudineer contains 15 herds and thonthasura-kudineer contains 10 herds. By using this drink, the spike protein binds over the human cell receptor and act as a barrier over the virus and other infection. Weekly twice practice taking steam inhalation by using mint and caraway seeds. The benefits of inhalation are making your pores open on skin remove wastages and protect from infections. Simple treatment by using milk and turmeric is to avoid cold and cough. Take some healthy fruits to improve our immune powder.

12.DIET FOR COVID-19 PATIENTS:

S.NO	TIMING	DIET
1.	7:00 am	Ginger and lemon with skin in warm water
2.	8:30 am	idly, juice, milk and 2 boiled egg etc.
3.	11:00 am	Ginger and lemon with skin in warm water
4.	1:00 pm	Wheat items, mint rice, boiled vegetable's, spinach and roasted Bengal gram dal.
5.	3:00 pm	Pepper and turmeric juice
6.	4:00pm	Grains
7.	7:00pm	1 Boiled egg and wheat items

Table 3: Represents the diet of covid-19 patients.

13.SURVIVAL TIME OF CORONA VIRUS:

S.NO	DIFFERENT SURFACES	TIME DURIATION
1.	Steel	2-28 days
2.	Ceramic	5 days
3.	Metal	5 days
4.	Glass	4-5 days
5.	Paper	3 hours -5 days
6.	Plastic	2-5 days
7.	Aluminum	2-8 hours
8.	Wood	4 days

Table 4: Survival virus of corona virus on different surfaces

14.EFFICIENCY OF MASK:

TYPES OF MASK							
S. No	**Foreign particles**	**N95 Mask**	**Surgical Mask**	**Ffp1 Mask**	**Activated Carbon**	**Cloth Mask**	**Sponge Mask**
1.	Virus	95%	95%	95%	10%	0%	0%
2.	Bacteria	100%	80%	80%	50%	50%	05%

3.	Dust	100%	80%	80%	50%	50%	05%
4.	Pollen	100%	80%	80%	50%	50%	05%

Table 5: Represents the efficiency of mask.

15.NOVELTY

Nanotechnology solutions to mitigate COVID-19 for protection, medication and detection. vaccines based on nanotechnology can improve vaccine efficacy, drug delivery to promote responses, scalable detection, affordable, immunization strategies and effective solutions.

S.NO	NANOMATERIALS	ROLE OF NANOTECHNOLOGY
1.	Nanoparticles	MEDICATION • The nanoparticle can terminate the virus structure • Used as a drug as well
2.	Nano sensors	DETECTION • Even at very low concentrations, can detect viruses and bacteria • Warn the patients (low viral load) handling clinicians before symptoms. •
3.	Nano filter	PROTECTION • Nano filter face mask can filter viruses • Reusable and Self sterilize face mask could help to rectify the shortage of mask supplying.

Table 6: Represents the role of nanotechnology against pandemic

16. CONCLUSION:

This paper reviews the current COVID – 19 pandemics in India and Tamil Nadu. Despite COVID – 19 is a great thread that spread rapidly worldwide. We have shown that the biological characteristics, transmission, symptoms, stages, protective measures, do's and don'ts, Immunity boosting, survival time of coronavirus and diet of patients for COVID- 19. The data reveals the scenario of cases in India and Tamil Nadu. The health and safety measures are increased to protect the people from the diseases. The COVID – 19 done both pros and

cons for the world. Even though it took away the life of many people and change the scenario of the world, but it purified the air and reduced the effects of pollutions, repairs the ozone layer, etc. People started to live hygiene and changed their food style into a healthy diet.

ACKNOWLEDGMENT

I would like to thank Nanotechnology Division, Department of Electronics and Communication Engineering of Periyar Maniammai Institute of Science and Technology for providing necessary materials and supports for do this work.

REFERENCES:

1. Zu, Zi Yue, et al. "Coronavirus disease 2019 (COVID-19): a perspective from China." *Radiology* (2020): 200490.
2. Jones, David S. "History in a crisis—lessons for Covid-19." *New England Journal of Medicine* (2020).
3. Guarner, Jeannette. "Three emerging coronaviruses in two decades: the story of SARS, MERS, and now COVID-19." (2020): 420-421.
4. Yang, Wenjie, et al. "Clinical characteristics and imaging manifestations of the 2019 novel coronavirus disease (COVID-19): A multi-center study in Wenzhou city, Zhejiang, China." *Journal of Infection* (2020).
5. Luo, Hui, et al. "Can Chinese medicine be used for prevention of corona virus disease 2019 (COVID-19)? A review of historical classics, research evidence and current prevention programs." *Chinese journal of integrative medicine* (2020): 1-8.
6. Singhal, Tanu. "A review of coronavirus disease-2019 (COVID-19)." *The Indian Journal of Pediatrics* (2020): 1-6.
7. Rothan, Hussin A., and Siddappa N. Byrareddy. "The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak." *Journal of autoimmunity* (2020): 102433.
8. Shereen, Muhammad Adnan, et al. "COVID-19 infection: origin, transmission, and characteristics of human coronaviruses." *Journal of Advanced Research* (2020).
9. Sun, Pengfei, et al. "Understanding of COVID-19 based on current evidence." *Journal of medical virology* (2020).
10. Alvarez, Fernando E., David Argente, and Francesco Lippi. *A simple planning problem for covid-19 lockdown*. No. w26981. National Bureau of Economic Research, 2020.
11. Bai, Yan, et al. "Presumed asymptomatic carrier transmission of COVID-19." *Jama* 323.14 (2020): 1406-1407.
12. Mehta, Puja, et al. "COVID-19: consider cytokine storm syndromes and immunosuppression." *The Lancet* 395.10229 (2020): 1033-1034.

13. Nassiri, N. "Perspective on Wuhan Viral Pneumonia." *Adv in Pub Health, Com and Trop Med: APCTM-106 Coronaviruses are enveloped, non-segmented, positive-sense single-stranded RNA virus. The coronavirus subfamily is genotypically and serologically divided into four genera, the α, β, ɣ, and δ coronaviruses. There are nearly* 30 (2020).Shereen, Muhammad Adnan, et al. "COVID-19 infection: origin, transmission, and characteristics of human coronaviruses." *Journal of Advanced Research* (2020).
14. Cascella, Marco, et al. "Features, evaluation and treatment coronavirus (COVID-19)." *Statpearls [internet]*. StatPearls Publishing, 2020.
15. Zhou, Min, Xinxin Zhang, and Jieming Qu. "Coronavirus disease 2019 (COVID-19): a clinical update." *Frontiers of medicine* (2020): 1-10.
16. Ahmed, Syed Faraz, Ahmed A. Quadeer, and Matthew R. McKay. "Preliminary identification of potential vaccine targets for the COVID-19 coronavirus (SARS-CoV-2) based on SARS-CoV immunological studies." *Viruses* 12.3 (2020): 254.
17. Udugama, Buddhisha, et al. "Diagnosing COVID-19: the disease and tools for detection." *ACS nano* 14.4 (2020): 3822-3835.
18. Dhama, Kuldeep, et al. "Coronavirus disease 2019–COVID-19." (2020).
19. Acula ithu 5 and athu 7 - Xu, Jiabao, et al. "Systematic comparison of two animal-to-human transmitted human coronaviruses: SARS-CoV-2 and SARS-CoV." *Viruses* 12.2 (2020): 244.
20. Chen, Yu, Qianyun Liu, and Deyin Guo. "Emerging coronaviruses: genome structure, replication, and pathogenesis." *Journal of medical virology* 92.4 (2020): 418-423.
21. Wu, Aiping, et al. "Genome composition and divergence of the novel coronavirus (2019-nCoV) originating in China." *Cell host & microbe* (2020).
22. York, Ashley. "Novel coronavirus takes flight from bats?." *Nature Reviews Microbiology* 18.4 (2020): 191-191.
23. Guo, Yan-Rong, et al. "The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak–an update on the status." Military Medical Research 7.1 (2020): 1-10.
24. Gu, Jinyang, Bing Han, and Jian Wang. & quot;COVID-19: gastrointestinal manifestations and potential fecal–oral transmission." Gastroenterology 158.6 (2020): 1518-1519.
25. Chen, Huijun, et al. "Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records." The Lancet 395.10226 (2020): 809-815.
26. Rothan, Hussin A., and Siddappa N. Byrareddy. "The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak." Journal of autoimmunity (2020): 102433.

27. Singhal, Tanu. "A review of coronavirus disease-2019 (COVID-19)." The Indian Journal of Pediatrics (2020): 1-6.
28. Cai, Jing, et al. "Indirect virus transmission in cluster of COVID-19 cases, Wenzhou, China, 2020." Emerg Infect Dis 26.6 (2020).
29. World Health Organization. Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations: scientific brief, 27 March 2020. No. WHO/2019-nCoV/Sci_Brief/Transmission_modes/2020.1. World Health Organization, 2020.
30. Bi, Qifang, et al. "Epidemiology and Transmission of COVID-19 in Shenzhen China: Analysis of 391 cases and 1,286 of their close contacts." MedRxiv (2020).
31. Wang, Juan, and Guoqiang Du. " COVID-19 may transmit through aerosol." Irish Journal of Medical Science (1971-) (2020): 1-2.
32. Hindson, Jordan. "COVID-19: faecal–oral transmission?." Nature Reviews Gastroenterology & Hepatology 17.5 (2020): 259-259.
33. Han, Chaoqun, et al. "Digestive symptoms in COVID-19 patients with mild disease severity: clinical presentation, stool viral RNA testing, and outcomes." The American journal of gastroenterology (2020).
34. Wang, Hai-Yang, et al. "Potential neurological symptoms of COVID-19." Therapeutic Advances in Neurological Disorders 13 (2020): 1756286420917830.
35. Russell, Beth, et al. "Anosmia and ageusia are emerging as symptoms in patients with COVID-19: What does the current evidence say?." ecancermedicalscience 14 (2020).
36. Zu, Zi Yue, et al. "Coronavirus disease 2019 (COVID-19): a perspective from China." Radiology (2020): 200490.
37. Zheng, Ying-Ying, et al. "COVID-19 and the cardiovascular system." Nature Reviews Cardiology 17.5 (2020): 259-260.
38. Yan, Carol H., et al. "Association of chemosensory dysfunction and Covid-19 in patients presenting with influenza-like symptoms." International forum of allergy & rhinology. 2020.
39. Bouaziz, J. D., et al. "Vascular skin symptoms in COVID-19: a french observational study." Journal of the European Academy of Dermatology and Venereology (2020).
40. Pan, Lei, et al. "Clinical characteristics of COVID-19 patients with digestive symptoms in Hubei, China: a descriptive, cross-sectional, multicenter study." The American journal of gastroenterology 115 (2020)
41. Luo, Shihua, Xiaochun Zhang, and Haibo Xu. "Don't overlook digestive symptoms in patients with 2019 novel coronavirus disease (COVID-19)." Clinical Gastroenterology and Hepatology (2020).

42. Velavan, Thirumalaisamy P., and Christian G. Meyer. "The COVID-19 epidemic." Tropical medicine & international health 25.3 (2020): 278.
43. Bernheim, Adam, et al. "Chest CT findings in coronavirus disease-19 (COVID-19): relationship to duration of infection." *Radiology* (2020): 200463.
44. Ai, Tao, et al. "Correlation of chest CT and RT-PCR testing in coronavirus disease 2019 (COVID-19) in China: a report of 1014 cases." *Radiology* (2020): 200642.
45. Park, Gun-Soo, et al. "Development of Reverse Transcription Loop-mediated Isothermal Amplification (RT-LAMP) Assays Targeting SARS-CoV-2." *The Journal of Molecular Diagnostics* (2020).
46. Yu, Lin, et al. "Rapid colorimetric detection of COVID-19 coronavirus using a reverse tran-scriptional loop-mediated isothermal amplification (RT-LAMP) diagnostic plat-form: iLACO." *medRxiv* (2020).
47. Chen, Long, et al. "Convalescent plasma as a potential therapy for COVID-19." *The Lancet Infectious Diseases* 20.4 (2020): 398-400.
48. Liu, Dehan, et al. "Pregnancy and perinatal outcomes of women with coronavirus disease (COVID-19) pneumonia: a preliminary analysis." *American Journal of Roentgenology* (2020): 1-6.
49. Zhong, Hong, et al. "Reusable and Recyclable Graphene Masks with Outstanding Superhydrophobic and Photothermal Performances." *ACS nano* (2020).
50. Kachroo, Varsha. "Novel Coronavirus (COVID-19) in India: Current Scenario." *International Journal of Research and Review* 7.3 (2020): 435-447.
51. Lal, Hitesh, et al. "Out Patient Department practices in orthopaedics amidst COVID-19: The evolving model." *Journal of Clinical Orthopaedics and Trauma* (2020).