Obesity As A Major Risk Factor In N- Cov Disease

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ABSTRACT: The review gives an overview on the relation between obesity and n-CoV disease. A review has been done to understand the correlation of obesity with the n-CoV disease by retrieving a maximum of related articles from various search engines like PubMed, Google Scholar, MeSH, Core, Cochrane, bioRxiv, Semantic scholar and so on published from 2000 to 2020 (till date). Obesity is associated with SARS- CoV-2 which enhances inflammatory response in obese people compared to actual standard BMIs. Obesity is often specifically related to producing inflammation by triggering a cytokine storm in the lungs, which raises the likelihood of ARDS, thereby requiring respiratory assistance for the main issue. Obesity can hinder breathing by hampering the excursion of the diaphragm, inhibit immune responses to critical infection, it is pro-inflammatory and triggers diabetes and even oxidizing tension to worsen cardiovascular activity. This study indicates that obese people through respiratory viruses COVID19 are more likely to be hospitalized comparatively. The implementation of novel ideas on obesity control of ailments will certainly bring about a massive change. Constraining less dependence on recent literature in this area and also upgrading numerous research to increase consciousness among the general public so that they may take measures not to be vulnerable to COVID 19. The current research has shown a strong incidence of obesity in patients participating in medical treatment with SARS-CoV-2. Obesity can be hazard factored to SARS-CoV-2 severity which needs increased attention in susceptible individuals to take preventive measures.

KEYWORDS: Obesity, SARS-CoV-2, risk factor, association, high prevalence.

1. INTRODUCTION

Often referred to as COVID-19, the novel coronavirus was first detected in Wuhan, China,

and inflicted extensive sickness and mortality. Transport takes place mainly by aerosols or through droplets [1]. Severe acute coronavirus-2 syndrome (SARS-CoV-2) victims were described as having pre-existing conditions such as asthma, depression, diabetes, chronic respiratory disease, or leukaemia [2]. Interestingly, the body mass index (BMI) was seldom identified amongst these main risk factors for SARS-CoV-2 in pre-clinical trials from China, Italy, or the US [3]. Conversely, obesity has indeed been described as an independent predisposition cause for severe H1N1 infection with the pulmonary system [4]. In reality, abdominal obesity is associated with inadequate respiration from the lung foundation, resulting in a decreased concentration of blood oxygen [5]. The COVID-19 disease outbreak is already expanding quickly across the world, particularly in Europe and North America where the incidence of obesity is massive [6].

The analysis of the association between obesity and the prevalence of the infection is therefore of great clinical significance [7]. Before the outbreak of the influenza A / H1N1 pandemic in 2009, the body mass index (BMI) was usually not regarded as a human risk factor for influenza [8]. Although the levels of ILI reported in obese patients did not rise, early studies during the contagion indicated a correlation with the seriousness of the disease and obesity [9]. Some many older reports have identified a link between obesity and mortality due to the influenza pandemic [10]. During this pandemic, extended stay at home contributes to decreased physical activity so that unnecessary time is invested in waiting and resting or lying down [11]. Recognizing such undesirable collateral effects in COVID 19 pandemic is crucial in preventing distress of weight management attempts in youngsters with overweight and obesity [12]. Such inappropriate lockout consequences may have permanent influences on the degree of adult adiposity in kids and teenagers, depending on the period [13].

The general population may become conscious of this risk factor affecting coronavirus (COVID 19) and can take effective precautionary steps. A thorough understanding of the medical field can open up several new ideas [14]. And this research attempts to show that obese individuals are more prone to be admitted to hospital during this COVID 19 pandemic. Our main objective of this review is to understand the link between obesity and n-CoV disease.

Retrieval Of Data

A review has been done to understand the Correlation of obesity with the n-CoV disease by retrieving a maximum of related articles from various search engines like PubMed, Google Scholar, MeSH, Core, Cochrane, bioRxiv, Semantic scholar and so on published from 2000 to 2020 (till date). Using the five- step process of selection such as identification of clear objectives, identification of relevant articles, selection, data extraction & charting, finally, analysis and report was generated. The inclusion criteria for this article are related to the association of obesity with n-CoV and also the adipose tissue-related reactions to lungs in CoV. General information, other risk factors, and co-morbidities are excluded from this article.

N-COV - AN OVERVIEW

The novel 2019 coronavirus disease [COVID 19] was reported in Wuhan, China, in December 2019. The transmission of this disease is triggered by the movement of bacterial droplets from the sick individual to a safe person within six meters of air space [15]. It is an inconsistent pathogen caused by two highly pathogenic HCoVs Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and Middle East respiratory syndrome coronavirus (MERS-CoV) [16]. Coronaviruses are broad enveloped positive-strand RNA viruses that are classified into four genera, namely alpha, beta, delta, and gamma, where alpha and beta coVs are considered to infect humans [17]. The glycoprotein surface spike (S) is the key for binding host target cells and therefore is convinced to be a crucial component of the constraints of the host range [18]. The infection can be asymptomatic or feverish and dry cough can be present. People over the age of 65 have a strong risk of developing severe problems and accidents whether they are immunocompromised or have pre-existing conditions [19]. These issues are also clustered among some ethnic groups (e.g., African Americans and Asians) who often tend to be more vulnerable to worse COVID-19 consequences. A growing number of studies have related obesity to more serious COVID-19 disease and mortality [20]. Therefore, currently, no vaccine finds strict control, and the management of infections is available.

Obesity As One Of The Risk Factor For N-Cov

Obesity is indeed one of the main contributing factors correlated with hospitalization with COVID19 in deadly conditions. Extreme obesity with a body mass index (BMI) of 40 or higher places, the individuals
are at high risk for COVID 19 problems [21]. One of the significant clinical risk factors for SARS-COV2 observed in clinical reports from various countries such as the United States and China has been noted in the Body Mass Index [BMI] [22]. Obesity is widely accepted as a risk factor for acute illness, as demonstrated by the serious long-term infections in patients with obesity after influenza A H1N1 outbreak [23].

A few other findings indicate that COVID 19 is noteworthy that obesity, with a substantially higher odds ratio than any cardiovascular or pulmonary disease, was the chronic condition that has the strongest association with critical diseases [24]. It is now well recognized that obesity is a pro-inflammatory condition. Many findings also show that none of China's original research looked at obesity as a risk factor, but had little support for it. Additionally, for individuals with extreme obesity, serious COVID-19 care can often be jeopardized by medical and recovery problems exacerbated by the physical consequences of their obesity [25].

Correlation of adipose tissue metabolism with n-cov viral disease

Overweight and obese individuals, as well as multiple serious chronic diseases or any underlying conditions of health, increase the risk of COVID 19. Obese individuals may have lower amounts of oxygen than healthier persons, and these adipokines and cytokines including TNF-α and interferons represent a low-grade systemic inflammation of abdominal obesity and may cause a compromised immune response [26].

Furthermore, obesity and metabolic syndrome are believed to enhance the inflammation of type 2 and can have consequences on the lung parenchyma and bronchi contributing to COVID19 related complications [27]. Obesity is often specifically correlated with inflammation by triggering a cytokine disturbance in the lungs, which raises the likelihood of ARDS such that the main problem involves respiratory assistance. Obesity will limit breathing by hindering the excursion of the diaphragm, inhibit immune responses to critical illness, is pro-inflammatory and causes diabetes and even oxidizing stress to worsen cardiovascular activity [28]. Studies find that obesity is related to serious cases of coronavirus, along with other diseases such as cardiac failure and chronic kidney disease. In a French report, the incidence of invasive ventilators in patients with COVID-19 contamination admitted to the Intensive Care Unit was far more than seven times significantly higher in patients with Body Mass Index (BMI) > 35 relative to BMI < 25 Kg / m [29]. Of many persons with COVID-19 ranging in an age less than 60 years in New York City, those in BMI between 30-34 Kg / m2 and > 35 Kg / m2 were 1.8 times and 3.6 times considerably more probable than persons with BMI < 30 Kg / m2 to be admitted to critical care.
We propose that obesity or premature accumulation of ectopic fat could be a coherent contributing factor for extreme COVID-19 disease, diminishing both the defensive cardiorespiratory buffer and potentiating the immune dysregulation that seems to influence the development to serious disease and organ dysfunction in a fraction of COVID-19 victims [30].

From a medical viewpoint, the research and genetic data demonstrate evidently that obesity (including excess fat mass) is directly correlated with asthma, diabetes, cardiac attack, stroke, atrial fibrillation, kidney dysfunction including heart failure [31]. Obesity attenuates several risk factors for cardiovascular, excessive coronary disease progression, and negative cardiorenal outcomes. There is always a question regarding the metabolic. In persons with diabetes, or at elevated risk of diabetes, obesity, and additional ectopic fat resulting in insulin tolerance deficiency and decreased beta-cell size [32]. These impair the capacity to elicit an effective metabolic reaction to immunological threat, causing certain diabetes patients during severe conditions to need significant quantities of insulin [33]. Overall, the comprehensive metabolic control required for multiple genetic interactions and successful host protection is missing, resulting in functional immunological deficiencies [34]. COVID-19 virus can also actively interrupt the activity of the pancreatic beta-cell by interfering with ACE2. Obesity promotes thrombosis, which is important considering the correlation of extreme COVID-19 with pro-thrombotic disseminated intravascular coagulation and elevated venous thromboembolism levels [35].

Obese individuals can experience enhanced viral stripping that indicates the potential for high viral exposure, particularly if certain members of the family are excessive. This can be compounded in overpopulated multiethnic families that are more widespread in societies of social poverty where obesity is widespread [36]. Both of these findings point to the likelihood of obesity in COVID-19 giving rise to a more adverse virus vs host immune response partnership. Malnutrition and hypoglycemia in some obese individuals can also

exacerbate the condition [37].

Incidence of n-CoV disease in obese patients

According to the study, patients with obesity had higher serum C-reactive protein levels, and lower lymphocyte numbers. Median stay in hospital was 23 days for patients with obesity versus 18 days for those of average weight (P = 0.037), and 33.3% of patients with obesity had extreme COVID-19 against 14.7% of controls (P = 0.007) [38]. Following age, sex, alcohol, asthma, diabetes and dyslipidemia changes, obesity was correlated with triple chances of extreme COVID-19 (adjusted OR = 3; 95 per cent CI, 1.22-7.38) against less serious illness, with each 1 U rise in BMI correlated with a 13 per cent improvement in threat (aOR = 1.13; 95 % Ci, 1.01-1.28) [39].

Abnormally high prevalence of obesity in patients admitted to SARS intensive care-CoV 2 has been found. Obesity was 5% (BMI > 30 Kg/m2) when there were 47 in total, like class II (BMI = 35 - 39. 9 Kg/m2) in 13. 7% to 14% and class III obesity (BMI > 40 Kg / m2) in 5%. The incidence of obesity in non-SARS COV2 patients was only 25. 8%, close to the rate in the Nord and Pas de Calais general population, when balanced for age and sex [40]. It revealed that the need for invasive respiratory support, a reliable surrogate for the extent of SARS-CoV 2, steadily increased with body mass groups, hitting approximately 90 per cent in patients with a BMI > 35 kg /m2. Following age and female standardization the rate of obesity was 1. 89 times more in obese cases despite age and female standardization [41]. An analysis of 3,615 COVID-19 patients who attended an urban hospital in New York indicates that obesity even in comparatively younger patients has raised the likelihood of illness. For example, patients that were extremely obese (BMI > 34 kg / m2) who were under 60 years of age were 3.6 times more likely to be admitted to ICU than patients of the same age range that were fewer than 30 years of BMI [42].

In a New York City survey with more than 4,000 people, scientists consider weight to be the primary risk factor rather than sex, one of the most important factors correlated with COVID 19. People with obesity may be sick and need acute treatment and face difficulties in patient handling, as fluid resuscitation in patients with obesity becomes more challenging [43]. Obtaining medical testing (since there are weight restrictions on MRI machines) may be more difficult, so it is often tougher to place and move with nursing workers suggesting that they do not perform well while susceptible.

Future research perspectives

Structural knowledge of the relationship between obesity and COVID-19 may recommend medical measures (e.g. validated weight reduction medications, low-calorie diet plans) to possibly minimize the likelihood of severe COVID-19 disease growth. Regarding public safety, the communication of threats without triggering anxiety is significant. People around the world should be encouraged to improve their lifestyle to minimize risk in both the current and subsequent COVID-19 waves [44]. In addition to

growing rates of exercise, effective nutrition advertising will be strengthened, relying on easier therapy to support individuals embrace positive improvements.

This is challenging with present stay-at-home laws restricting rates of exercise – the "quarantine weight gain". More alarmingly, the subsequent financial crisis can accelerate obesity, particularly in the most vulnerable, a danger that policymakers ought to tackle as we recover from the existing disease outbreak. This global epidemic has demonstrated that for the avoidance of infectious illness and stronger adverse reactions to viral pandemics, more, not less, must be done to combat and eliminate obesity in our culture. Raising awareness of the potential cause in regards to COVID 19 hospitalization [45]. Enhance research and determine etiological factors for obesity. Following protocol to maintain strategies to regulate the population in normal BMI, not only for the way of transmission. Such guidelines may be strictly implicated.

2. CONCLUSION

The implementation of novel ideas on obesity control will certainly bring about a massive change in various ailments. Constraining less dependence on recent literature in this area and also upgrading numerous research to increase consciousness among the general public so that they may take measures not to be vulnerable to COVID 19. This is important to take proactive steps to preserve regular BMI that may affect children as well as the elderly who are more susceptible to this pandemic threat. Current research suggests a strong incidence of obesity in patients participating in medical treatment with SARS-CoV-2. This review thus highlights the increased attention to be taken in obese individuals to control the severity of covid disease.

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Author contributions
J. Dhivyadharshini, contributed to execution of the work, data collection and drafting of manuscript. Dr.A.S.Smiline Girija, contributed to concept and design of the study, validation of the data collection, revision and proof-reading of the review. Dr. Jayalakshmi, contributed to validation of the data collection, revision and proof-reading of the review.

Conflict Of Interest
The authors declare no conflict of interest.

REFERENCES

[1] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China [Internet]. Vol. 395, The Lancet. 2020. p. 497–506. Available from: http://dx.doi.org/10.1016/s0140-

6736(20)30183-5

[2] Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study [Internet]. Vol. 395, The Lancet. 2020. p. 1054–62. Available from: http://dx.doi.org/10.1016/s0140-6736(20)30566-3

[3] Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus–Infected Pneumonia [Internet]. Vol. 382, New England Journal of Medicine. 2020. p. 1199–207. Available from: http://dx.doi.org/10.1056/nejmoa2001316

[4] Watson RA, Pride NB, Thomas EL, Fitzpatrick J, Durighel G, McCarthy J, et al. Reduction of total lung capacity in obese men: comparison of total intrathoracic and gas volumes. J Appl Physiol. 2010 Jun;108(6):1605–12.

[5] Ashwin KS, Muralidharan NP. Vancomycin-resistant enterococcus (VRE) vs Methicillin-resistant *Staphylococcus Aureus* (MRSA). Indian J Med Microbiol. 2015 Feb;33 Suppl:166–7.

[6] Paules CI, Marston HD, Fauci AS. Coronavirus Infections-More Than Just the Common Cold. JAMA [Internet]. 2020 Jan 23; Available from: http://dx.doi.org/10.1001/jama.2020.0757

[7] de Wilde AH, Snijder EJ, Kikkert M, van Hemert MJ. Host Factors in Coronavirus Replication. Curr Top Microbiol Immunol. 2018;419:1–42.

[8] Sheahan TP, Sims AC, Leist SR, Schäfer A, Won J, Brown AJ, et al. Comparative therapeutic efficacy of remdesivir and combination lopinavir, ritonavir, and interferon beta against MERS-CoV. Nat Commun. 2020 Jan 10;11(1):222.

[9] Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study [Internet]. Vol. 395, The Lancet. 2020. p. 507–13. Available from: http://dx.doi.org/10.1016/s0140-6736(20)30211-7

[10] Murphy R, Fragaszy EB, Hayward AC, Warren-Gash C. Investigating obesity as a risk factor for influenza-like illness during the 2009 H1N1 influenza pandemic using the Health Survey for England [Internet]. Vol. 11, Influenza and Other Respiratory Viruses. 2017. p. 66–73. Available from: http://dx.doi.org/10.1111/irv.12420

[11] Girija ASS, Smiline Girija AS, Vijayashree Priyadharsini J, Paramasivam A. Plasmid-encoded resistance to trimethoprim/sulfamethoxazole mediated by dfrA1, dfrA5, sul1 and sul2 among Acinetobacter baumannii isolated from urine samples of patients with severe urinary tract infection [Internet]. Vol. 17, Journal of Global Antimicrobial Resistance. 2019. p. 145–6. Available from: http://dx.doi.org/10.1016/j.jgar.2019.04.001

[12] Grasselli G, Zangrillo A, Zanella A, Antonelli M, Cabrini L, Castelli A, et al. Baseline Characteristics and Outcomes of 1591 Patients Infected With SARS-CoV-2 Admitted to ICUs of the Lombardy Region, Italy. JAMA [Internet]. 2020 Apr 6; Available from: http://dx.doi.org/10.1001/jama.2020.5394

[13] Smiline ASG, Vijayashree JP, Paramasivam A. Molecular characterization of plasmid-encoded blaTEM, blaSHV and blaCTX-M among extended spectrum β-lactamases [ESBLs] producing Acinetobacter baumannii [Internet]. Vol. 75, British

Journal of Biomedical Science. 2018. p. 200–2. Available from: http://dx.doi.org/10.1080/09674845.2018.1492207

[14] Viscido G, Gorodner V, Signorini FJ, Biasoni AC, Navarro L, Rubin G, et al. Obese Patients with Type 2 Diabetes: Outcomes After Laparoscopic Sleeve Gastrectomy. J Laparoendosc Adv Surg Tech A. 2019 May;29(5):655–62.

[15] Callaway E. Coronavirus vaccines: five key questions as trials begin [Internet]. Vol. 579, Nature. 2020. p. 481–481. Available from: http://dx.doi.org/10.1038/d41586-020-00798-8

[16] Shahana RY, Muralidharan NP. Efficacy of mouth rinse in maintaining oral health of patients attending orthodontic clinics. Research Journal of Pharmacy and Technology. 2016;9(11):1991–3.

[17] Marchetti M, Palahí M. Perspectives in bioeconomy: strategies, Green Deal and Covid19 [Internet]. Vol. 17, Forest@ - Rivista di Selvicoltura ed Ecologia Forestale. 2020. p. 52–5. Available from: http://dx.doi.org/10.3832/efor0059-017

[18] Freedman DS, Butte NF, Taveras EM, Lundeen EA, Blanck HM, Goodman AB, et al. BMIz- Scores are a poor indicator of adiposity among 2- to 19-year-olds with very high BMIs, NHANES 1999- 2000 to 2013-2014 [Internet]. Vol. 25, Obesity. 2017. p. 739–46. Available from: http://dx.doi.org/10.1002/oby.21782

[19] Klatsky A. Body Mass Index and Mortality in a Very Large Cohort: Is It Really Healthier to Be Overweight? [Internet]. The Permanente Journal. 2017. Available from: http://dx.doi.org/10.7812/tpp/16- 142

[20] Vijayashree Priyadharsini J, Smiline Girija AS, Paramasivam A. In silico analysis of virulence genes in an emerging dental pathogen A. baumannii and related species. Arch Oral Biol. 2018 Oct;94:93– 8.

[21] de Wit E, van Doremalen N, Falzarano D, Munster VJ. SARS and MERS: recent insights into emerging coronaviruses. Nat Rev Microbiol. 2016 Aug;14(8):523–34.

[22] Sun H, Ren X, Chen Z, Li C, Chen S, Wu S, et al. Association between body mass index and mortality in a prospective cohort of Chinese adults [Internet]. Vol. 95, Medicine. 2016. p. e4327.
Available from: http://dx.doi.org/10.1097/md.0000000000004327

[23] Song Z, Xu Y, Bao L, Zhang L, Yu P, Qu Y, et al. From SARS to MERS, Thrusting Coronaviruses into the Spotlight. Viruses [Internet]. 2019 Jan 14;11(1). Available from: http://dx.doi.org/10.3390/v11010059

[24] Paramasivam A, Vijayashree Priyadharsini J, Raghunandhakumar S. N6-adenosine methylation (m6A): a promising new molecular target in hypertension and cardiovascular diseases. Hypertens Res. 2020 Feb;43(2):153–4.

[25] Priyadharsini JV, Vijayashree Priyadharsini J, Smiline Girija AS, Paramasivam A. An insight into the emergence of Acinetobacter baumannii as an oro-dental pathogen and its drug resistance gene profile – An in silico approach [Internet]. Vol. 4, Heliyon. 2018. p. e01051. Available from: http://dx.doi.org/10.1016/j.heliyon.2018.e01051

[26] Campitelli MA, Rosella LC, Kwong JC. The association between obesity and outpatient visits for acute respiratory infections in Ontario, Canada [Internet]. Vol. 38, International Journal of Obesity. 2014.
p. 113–9. Available from: http://dx.doi.org/10.1038/ijo.2013.57

[27] Kwong JC, Campitelli MA, Rosella LC. Obesity and Respiratory Hospitalizations During Influenza Seasons in Ontario, Canada: A Cohort Study [Internet]. Vol. 53, Clinical Infectious Diseases. 2011. p. 413–21. Available from: http://dx.doi.org/10.1093/cid/cir442

[28] Stoye E. China coronavirus: how many papers have been published? [Internet]. Nature. 2020. Available from: http://dx.doi.org/10.1038/d41586-020-00253-8

[29] Simonnet A, Chetboun M, Poissy J, Raverdy V, Noulette J, Duhamel A, et al. High prevalence of obesity in severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) requiring invasive mechanical ventilation [Internet]. Obesity. 2020. Available from: http://dx.doi.org/10.1002/oby.22831

[30] Cocoros NM, Lash TL, DeMaria A, Klompas M. Obesity as a risk factor for severe influenza-like illness [Internet]. Vol. 8, Influenza and Other Respiratory Viruses. 2014. p. 25–32. Available from: http://dx.doi.org/10.1111/irv.12156

[31] Cocoros NM, Lash TL, Nørgaard M, Farkas DK, DeMaria A, Sørensen HT. Hospitalized prenatal and childhood infections and obesity in Danish male conscripts [Internet]. Vol. 23, Annals of Epidemiology. 2013. p. 307–13. Available from: http://dx.doi.org/10.1016/j.annepidem.2013.04.002

[32] Sattar N, McInnes IB, McMurray JJV. Obesity a Risk Factor for Severe COVID-19 Infection: Multiple Potential Mechanisms. Circulation [Internet]. 2020 Apr 22; Available from: http://dx.doi.org/10.1161/CIRCULATIONAHA.120.047659

[33] Samuels JD. Obesity and severe COVID-19 disease: a strong association [Internet]. Obesity. 2020.

Available from: http://dx.doi.org/10.1002/oby.22866

[34] Sohaib Shahzan M, Smiline Girija AS, Vijayashree Priyadharsini J. A computational study targeting the mutated L321F of ERG11 gene in C. albicans, associated with fluconazole resistance with bioactive compounds from Acacianilotica. J Mycol Med. 2019 Dec;29(4):303–9.

[35] Pratha AA, Geetha RV. Awareness on Hepatitis-B vaccination among dental students-A Questionnaire Survey. Research Journal of Pharmacy and Technology. 2017;10(5):1360–2.

[36] Caussy C, Wallet F, Laville M, Disse E. Obesity is Associated with Severe Forms of COVID-19 [Internet]. Obesity. 2020. Available from: http://dx.doi.org/10.1002/oby.22842

[37] Renuka S, Np M. COMPARISON IN BENEFITS OF HERBAL MOUTHWASHES WITH CHLORHEXIDINE MOUTHWASH: A REVIEW. Asian Journal of Pharmaceutical and Clinical Research. 2017 Feb 1;3–7.

[38] Graham BS, Mascola JR, Fauci AS. Novel Vaccine Technologies: Essential Components of an Adequate Response to Emerging Viral Diseases. JAMA. 2018 Apr 10;319(14):1431–2.

[39] Charland KM, Buckeridge DL, Hoen AG, Berry JG, Elixhauser A, Melton F, et al. Relationship between community prevalence of obesity and associated behavioral factors and community rates of influenza-related hospitalizations in the United States [Internet]. Vol. 7, Influenza and Other Respiratory Viruses. 2013. p. 718–28. Available from: http://dx.doi.org/10.1111/irv.12019

[40] Mertz D, Kim TH, Johnstone J, Lam P-P, Science M, Kuster SP, et al. Populations at risk for severe or complicated Avian Influenza H5N1: a systematic review and meta-analysis. PLoS One. 2014 Mar 6;9(3):e89697.

[41] Vaishali M, Geetha RV. Antibacterial activity of Orange peel oil on Streptococcus mutans and Enterococcus - An In -vitro study. Research Journal of Pharmacy and Technology. 2018 Feb 28;11(2):513–4.

[42] Girija SA, Jayaseelan VP, Arumugam P. Prevalence of VIM- and GIM-producing Acinetobacter baumannii from patients with severe urinary tract infection. Acta Microbiol Immunol Hung. 2018 Dec 1;65(4):539–50.

[43] Marickar RF, Geetha RV, Neelakantan P. Efficacy of Contemporary and Novel Intracanal Medicaments againstEnterococcus Faecalis [Internet]. Vol. 39, Journal of Clinical Pediatric Dentistry. 2014. p. 47–50. Available from: http://dx.doi.org/10.17796/jcpd.39.1.wmw9768314h56666

[44] Geetha RV, Thangavelu L, Others. Evaluation oEvaluation of anti-inflammatory action of Laurus nobilis-an in vitro studyf anti-inflammatory action of Laurus nobilis-an in vitro study. International Journal of Research in Pharmaceutical Sciences. 2019;10(2):1209–13.

[45] Girija As S, Priyadharsini J V. CLSI based antibiogram profile and the detection of MDR and XDR strains of Acinetobacter baumannii isolated from urine samples. Med J Islam Repub Iran. 2019 Feb 8;33:3.

Figure 1: Represents obesity as a major risk factor in n-CoV infections.

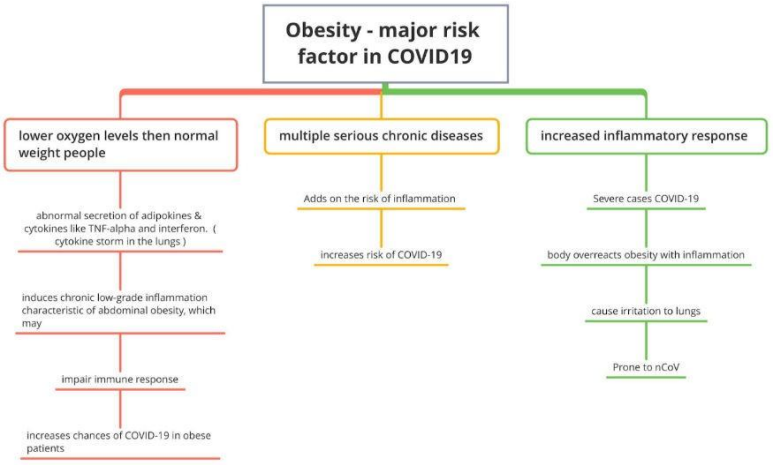

Figure 1: The self illustrated figure represents obesity as a major risk factor in n-CoV infections. Obese individuals may have lower amounts of oxygen than the healthy persons which leads to the secretion of adipokines and cytokines including TNF-α and interferons. These adipokines and cytokines induce a low- grade systemic inflammation and may cause a compromised immune response. Obesity attenuates several risk factors in multiple chronic conditions and it also adds on the risk of inflammation, hence increases their exposure to n-CoV diseases. In severe cases of COVID-19, the body overreacts with the adipose tissues. This brings upon inflammation causing irritation to lungs, therefore obese people are found to be more prone to n-CoV diseases.