A SYSTEMATIC REVIEW AND META-ANALYSIS: PREVALENCE OF COVID-19 WITH OBESITY

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ABSTRACT

Background In the year 2019, the world witnessed the ongoing Pandemic i.e. SARS-2 Covid-19. The disease emerged from Wuhan, China, and spread all over the world by the beginning of 2020. The Covid-19 Mortality included Patients having comorbidities with other diseases like hypertension, diabetes, or cardiovascular diseases. Out them Obesity was also one of the concerning factors, as Obsessed people are more prone to diabetes and cardiovascular disease - obese people testing positive were under critical conditions and required extensive care. Previous studies have shown Obesity being the leading factor for so many lifestyle diseases like Diabetes, Cardiac arrest, etc. Obese people are more prone to infectious diseases. The present study aims to investigate the relationship of Covid-19 with Obesity and find out whether Obesity is one leading factor for the Covid-19 deaths. The study focuses on the seriousness of patients requiring extensive care suffering from Covid-19. ***Objective:*** *The study focused on the following objectives-*

- *To find out whether there are any similarities between Obesity.*
- *To study the impacts of obesity on Covid-19 and vice versa.*

Result*- Obesity increases the chances of patients getting hospitalised, admissions into ICU, or required ventilators. The obese groups requiring extensive care and ventilators were 10 times younger than normal-weight patients.*

Keywords: *Obesity, BMI, Obesity, and Covid-19, Covid-19 Mortality, Severe CoronaVirus 2019, Meta-analysis, Individuals with Covid-19, immune response, lipotoxicity, Covid-19 comorbidities, ICU, Ventilators.*

Introduction

In the year 2019, the world witnessed the ongoing Pandemic i.e. SARS-2 Covid-19. The disease emerged from Wuhan, China, and spread all over the world by the beginning of 2020. CoronaVirus was a deadly virus that Succumbed to the human body, weakening their immune system and damaging their internal mechanism. The virus spread rapidly affecting more than 2 million people and by April 2020 it took 200000 lives (Malik et al., 2021). Even though the impacts of diseases were unknown, the Covid-19 Mortality included Patients having comorbidities with other diseases like hypertension, diabetes, or cardiovascular diseases. Out them Obesity was also one of the concerning factors, as Obsessed people are more prone to diabetes and cardiovascular disease - obese people testing positive were under critical conditions and required extensive care. Patients in the U.S, Italy admitted into ICU or required ventilators had 25 above BMI (Fernando and Chan et al., 2020) The overweight person suffered from either diabetes or cardiovascular disease that increases the chances of Covid-19 Mortality.

Obesity is termed as an abnormal condition of fat accumulation in a body that leads to serious health problems. Having a higher scale in the Body Mass Index i.e above 25 is considered overweight and 30 or above is considered obese. Obesity is the condition when the weight of an individual is more than required than that of their height. Body Mass Index is the calculator of fat percentage and weight criteria for an individual(Helvaci et al.,2021). Obese people are the storehouse of diseases. Previous studies have shown Obesity being the leading factor for so many lifestyle diseases like Diabetes, Cardiac arrest, etc. Obese people are more prone to infectious diseases. Several studies have shown Obesity worsens the outcomes of Covid-19 infections. However, the studies haven't reproduced their results. An accumulating body of evidence demonstrates that persons suffering from obesity have poorer quality of life with Coronavirus Disease 2019 (COVID-19) and that a considerable number of patients requiring urgent care were overweight or obese. The Centre for Disease Control reported the population who are above the scale of 25 BMI would be likely to contract with Sars 2 Covid-19. The pandemic outbreak also led to increasing obesity among people, the movement restriction and work from home,

online classes are encouraging weight gain. Furthermore, the report states Obesity might double the chances of getting affected by Covid-19, it might increase the chances of hospitalisation or even increase the chances of death. Therefore it is not certain whether Patients will suffer more in Covid-19 than that of non Obsessed patients. (Malik et al., 2020).

Obesity has a deep impact upon the functioning of the physiological processes, altering the function of the immune system making the body more vulnerable to diseases, and actively responding to infections. In the current COVID-19 era, Obesed patients suffer more as their internal mechanism poorly functions making them unable to cope with the deadly virus. As there is no particular treatment for Covid-19. Patients are cured with their responding capabilities. The Patients that were admitted into ICU were 10 times younger than the average weight person. Thus obese groups were unable to breathe and required additional ventilation. Despite having the best medical facilities People in the U.S die every day due to a lack of oxygen support.

Heftiness influences most physiological exercises and changes framework working, including the insusceptible framework. Understanding the impact of heftiness on the course of the disease is basic for forestalling or moderating grimness and passing . . Given the worldwide size of the heftiness pestilence, we foresee testing times for this gathering of patients all through Europe, the Americas, the Mideast, and the whole globe with a huge stoutness rate(Zhang et al.,2021). Stoutness was dependable with a considerable level of hospitalizations and mortality identified with H1N1 Viral disease in 2009, with an estimated 151,700–575,400 complete fatalities recorded.

The present study aims to investigate the relationship of Covid-19 with Obesity and find out whether Obesity is one leading factor for the Covid-19 deaths. The study focuses on the seriousness of patients requiring extensive care suffering from Covid-19.

Material & Method

Search Strategy

The following Systematic Review and Meta-Analysis include the PRISMA guidelines for including the relevant literature for analysis and excluding the irrelevant ones for the study. The search was conducted independently by the author using PubMed, Google Scholar, and Medline using the following keyword-

Obesity, BMI, Obesity, and Covid-19, Covid-19 Mortality, Severe CoronaVirus 2019, Meta-analysis, Individuals with Covid-19, immune response, lipotoxicity, Covid-19 comorbidities.

The search strategy for the study included no language, timeline barriers. The searched article, literature, and journals were merged together to avoid the duplicity of the results. In the initial phase, more than 1000 articles were gathered relating to Covid-19 and Obesity.

Inclusion and Exclusion Criteria-

All the information gathered in the initial phase went through a narrow filtration to remove the similar content - making the count of 500 relevant articles matching the hypothesis of the data.

Inclusion Criteria included the consideration of articles, journals, systematic reviews and meta analysis after 2018 , as the Pandemic hit the Globe during 2019.

The article that relates Covid-19 and Obesity were taken into consideration. Only articles and journals from PubMed , Medline and Google Scholar were given more importance.

Exclusion Criteria excluded the data published before 2018 along with that it excluded the data and information that provided comorbidities of Covid-19 with other diseases like Diabetes, heart disease etc. The opinions, case reports and review articles were excluded.

The remaining Articles and Journals were independently studied through thorough analysis of their abstract, results and conclusions to exclude the articles and journals that did not mention Covid-19, Obesity and Metabolic disease, Mortality rates of Obesed patients suffering from Covid-19. The articles without abstracts were also excluded from the list.

For the Abstracts that were in other languages than that of English, were translated using Google translator - relevancy is verified for inclusion and exclusion strategies.

After the Final Screening process- only 115 articles were selected for further detail content

study from which only the study that relates Obesity comorbidities with Covid-19 and related to that were carried further. Articles were double checked with their reference list . The study including retrospective perspective was excluded. For the final process only 10 articles met the inclusion Criteria out which the similar results articles were set for meta analysis.

Definition of Obesity

Obesity is defined as the state , where individuals possess weight that is considered higher than that of the healthy weight. When the individual intake more calories than he or she burns is considered to be overweight or obesed (Soreto et al., 2020). Obesity is measured through Body Mass Index- that divides weight by height. Above 25 is considered as overweight and above 30 is considered as Obese.

ICU- In medical terms ICU is considered as Intensive Care Unit. ICU is also known as Critical Care Unit , People are admitted into ICU when there is life risk or needs extensive care by the health professionals.

Ventilators- Ventilators are the devices that are used upon an emergency when the patients are not able to breathe. It provides artificial procedures to breathe in and out .

Outcomes

From the studies the following outcomes were found-

The studies were selected that presented the severity of Covid-19. As per the Protocol of Diagnosis and Treatment- the patients admitted into hospitals, their age, admissions of patients into ICU, Ventilation requirements and Covid-19 Mortality (Chu et al., 2020). The Meta-analysis followed a random Method to study scenarios from different countries.

Data Extraction and Quality Assessment

The articles were chosen that matched with the present study objectives, only the relevant information were extracted from the selected sources. For each article the data type- Author, Year of Publication, Covid-19 and Obesity, Countries context, study trail , number of patients included in the study were extracted.

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Ethics

The systematic review and meta analysis used information with confidentiality. All the information gathered was used solely for the study and meta analysis purposes. The analysis used anonymous summary and the statistical findings from the previous records and researches. All the data used up for Meta analysis were reviewed thoroughly and approved for the research and supported the research objectives.

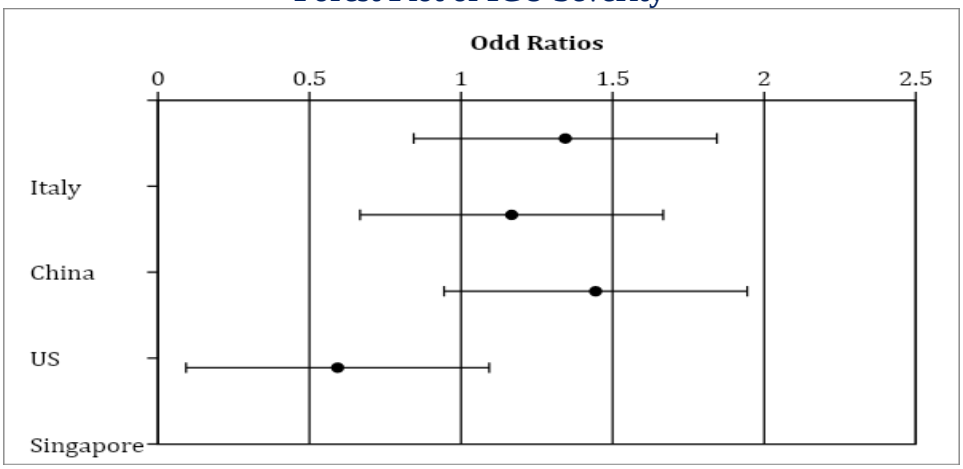
Statiscal Analysis

There were two categories for the study- admissions into ICU and Ventilators. The severity condition of Obesed groups and Non Obesed were recorded from each article. The Weighted Mean Deviation and Confidence Intervals (95%) were evaluated using the Stata Software. Number of Patients having an overweight and normal weight divided into serious and non serious groups. The OR and 95% CI were measured using the Software. Forest Plot was drawn to identify the heterogeneity (Zhao et al., 2020). P value less than 1 is considered having larger heterogeneity. To combine all the extracted points, the Random model was used. All the P values- bilateral.

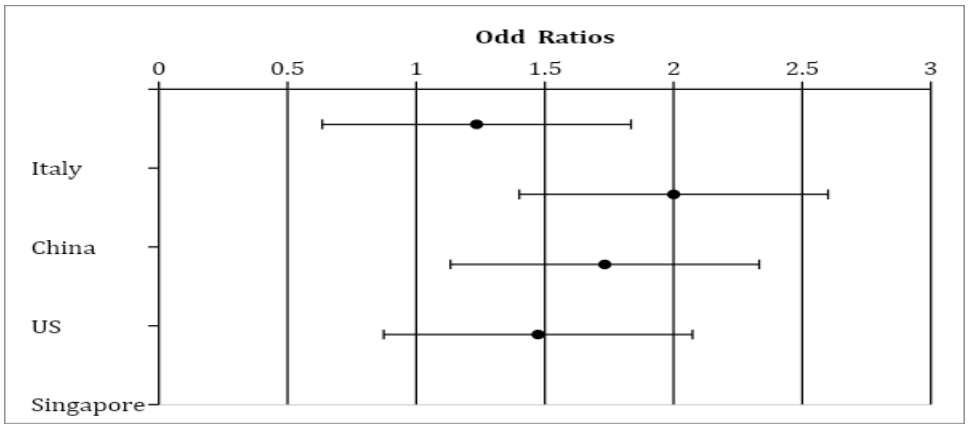
Results

The study conducted the search strategy to find out relevant articles regarding Covid-19 and Obesity from PubMed, Medlife and Google Scholar. Initially 500 articles were gathered, the duplicate articles were removed and for screening there were 325 articles. Abstract, Method and Results of the study were studied thoroughly and the articles used. The studies that were before 2019 were excluded, only the articles that contained Obesity, Covid-19 and ICU etc. were included for the study. After the inclusion and exclusion Criteria only 115 articles were undertaken for screening of full text analysis. For the Final Systematic Review and Meta Analysis only 10 articles were Chosen out of which 6 were introduced in the Qualitative analysis and 4 were chosen for Quantitative analysis.

Forest Plot of ICU Severity



Forest Plot of Ventilator Severity



Discussion

Records found through data base= 1000

Records after duplicates removed= 500

Record screened= 115

Full-text assessment for eligibility=10

Studies used for the qualitative analysis-6

Studies used for the quantitative analysis-4

In the study, using the search strategy in a systematic manner only 10 articles were selected for the systematic review and 4 articles were chosen for Meta-analysis. The effects of obesity over the serious outcomes against the Covid-19 were measured through a

thorough analysis. The analysis was done studying the effects from 4 different countries- Italy, China, U.S.A, and Singapore. Obesity is one of the leading factors in Countries like Italy and the U.S.A. Many Previous studies have shown Obesity tripled the risk of diseases. In the case of Covid-19, Obesity increases the seriousness of the virus. Therefore in simpler terms, People with overweight are likely to be hospitalised more because they have a lower metabolism rate. Detailed analysis of the literature reviewed in the study suggests that Obesity leads to increased invasive mechanical ventilation in Covid-19 affected patients. Reports of few recent studies have shown records of hospitalisation with the severity of Covid-19 that include more patients admitted into ICU who are not having a healthy BMI or are overweight. As the cases are new, there is no proven result to conclude Obesity is the leading factor of Covid-19 patients admitted into hospitals. But, surely, there are comorbidities between Covid-19 and Obesity(Hoong et al., 2020).To conduct the Meta-analysis, the Random Meta-Analysis method was used. The articles with similar outcomes were connected. The study included the OR (Odd ratio) and CI (Confidence Intervals for the Obese groups and Non- obese groups. The analysis was done based on Patients' admission into Invasive Mechanical Ventilation and ICU. Non - obese groups are considered to be the reference group.

Even though Obesity has the severity upon the outcomes of Covid-19 infections, the studies do not show it leads to death or Obesity is a leading factor for Covid-19 Mortality.

The details of the Meta-Analysis presents countries' scenarios of Patients getting hospitalised either into a ventilator or ICU.

Italy is one of the European countries having a significant impact upon western cuisine and culture. However, the country has a smaller population of over 6 crore people staying over the region. In the world index of Obesity- Italy ranks 107. More than one-third of the Italy Population is obese. The study (extract of an Italian Snapshot) was conducted taking 92 patients (Poly et al., 2021). Out of them, the Patients with younger age with overweight were ventilated. The meta-analysis shown in Figure - 2 presents the OR - 0.593 for patients admitted for ventilation and OR - 1.228 patients admitted for ICU. The majority of the Italy Population was Succumbed by the Corona Virus.

A more serious requirement for helped ventilation past unadulterated oxygen support (intrusive mechanical ventilation or noninvasive ventilation) and a higher admission to escalated or semi-concentrated consideration units were seen in patients with overweight and weight ($P < 0.01$ and $P < 0.05$, individually) even subsequent to adapting to sex, age, and comorbidities ($P < 0.05$ and $P < 0.001$, separately) or when patients with dementia or progressed disease were eliminated from the investigation ($P < 0.05$) (Sanchis Gomar et al., 2021).

Patients who were overweight and suffering from Pneumonia were ten times younger than patients having normal weight. And the overweight younger patients who needed extensive care were more often admitted to ICU.The U.S being the developed nations having best medical facilities failed to win over the virus. There were frequent cases Covid-19 appeared in the report. 39.6 percent of the U.S population comes under the obesity category. Majority i.e 78 % of the patients admitted in the U.S into ventilation and ICU were obesed or overweight. Even with the death ratio of Covid-19 graphs , the overweight people's conditions went critical in the hospital, unable to cope with the deadly virus (Dietz and Santos -Burgoa et al., 2020). Even though the children suffered less of the deadly virus, few cases reported children that have more weight need ventilation or require ExtraCorporeal membrane oxygenation. The studies that showed Covid-19 Mortality rates and Severity rates shows patients with overweight are more likely to be affected severely by the virus. They suffered from suffocation and were unable to breathe. Covid-19 affected patients dropped down their immune system, death out of choking due higher cholesterol levels were noted down.

China, the place where the outbreak has evolved and spread all over the world. SARS-2 Covid-19. The first case was found in Wuhan in 2019. Despite being the place from where the virus emerged. China somehow managed to have control over the virus. The study was

done upon 383 patients suffering from Covid-19 in China - 53% were of normal weight, 32% were overweight and 10% were obese and the rest were underweight. large patients had expanded chances of advancing to serious Coronavirus. As the serious patient respiratory disorder Covid 2 might keep on spreading around the world, clinicians should give close consideration to hefty patients, who ought to be painstakingly dealt with speedy and forceful therapy. Few other studies showed Obesity has severe impacts on the outcomes of Covid-19. Therefore obese percent were hospitalized more.

Singapore is the maritime island city of Southern Asia. 39% of their Population are overweight upon which 13% hit the obesed groups. The medical of Singapore has reported the Obesity and Covid-19 being the same side of the coin . As the overweight children suffering from Covid-19 are hospitalised due to lack of oxygen. And a lockdown was imposed making the children become couch potatoes. The main review exploring the death rates in the ICU setting, found a more modest extent of fat patients in the people who kicked the bucket, rather than studies in the overall clinic setting where non-survivors had a bigger extent of stout patients (Caci et al., 2020). Further examination on corpulent patients in the ICU setting might be valuable in explaining their forecast and results to research the exception results found in the stud .39 showed that stout patients had an OR of 32.1 (95% CI 6.7–153.0) for mortality that was essentially bigger than those in different investigations. The review zeroed in on Coronavirus patients with cardiovascular sickness first and, inside this subpopulation, fat patients were distinguished, while different examinations enrolled unselected patients with extreme or basic Coronavirus. This contrasting populace could clarify the higher OR for mortality, given the intensifying impact of both cardiovascular sickness and weight on mortality. Rejection of this review didn't significantly affect the aftereffects of the meta-examination.

As per all the studies it can be stated that obesity has some sort of relationship with covid-19. In countries like the USA and Italy where the hospitalisation facilities are best fail to deal with the patients suffering from covid-19. In the USA and Italy, more than 500 people were dying every single day because of a lack of ventilators and ICU. Even though they have a very less population than China and India, more people are dying because of the severity of the disease (Popkin et al., 2020). People with obesity are more likely to suffer from various diseases. In case of the pandemic outbreak, the majority of the patient were admitted into ventilators and I see you were found to be overweight or obese. They required special treatment and extensive care.

Conclusion

To conclude the systematic review and meta-analysis for revealing the connection of Obesity with the ongoing Pandemic Covid-19 shows that there is some sort of relationship existing as an obese group admitted into hospitals more in number in the U.S, Singapore, and Italy. Although Obesity has somewhat increased Covid-19 Mortality rates. However, there is no medical evidence that Obesity is one leading factor for Covid-19 Mortality. But obesity has been found to contribute to serious health issues for Covid-19 patients. Obesity increases the chances of patients getting hospitalised, admissions into ICU, or required ventilators. The obese groups requiring extensive care and ventilators were 10 times younger than normal-weight patients.

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