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The Relationship between COVID-19 Infection and Body Mass Index

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Abstract: Studies have indicated the reasons for considering obesity a risk factor for COVID-19 patients, and have only monitored the statistical relationship between obesity and risk factors due to the disease. Scientists have confirmed that: "The negative effects of obesity come from the fact that it impedes the movement of the diaphragm, which affects ventilation in the lungs. It may also impede immune reactions when infected with the disease, and trigger what is known as (oxidative stress processes), which have a negative effect on cardiovascular function.

Introduction

The US Centers for Disease Control and Prevention (CDC) has confirmed that people who are overweight, but not necessarily obese, may be more susceptible to developing serious symptoms from the novel coronavirus infection. According to Bloomberg, the warning recently published by the centers means that about two-thirds of Americans may face a greater risk of infection. About 40 percent of Americans are obese, while about 32 percent are overweight, both of which are dangerous

indicators of severe infection symptoms. According to the CDC, those who are obese are at greater risk if they contract the coronavirus, which may lead to hospitalization. The risk of death from the infection increases in proportion to the increase in the body mass index.

Doctors determine whether people are obese or overweight by calculating height and weight, which helps estimate body fat, in what is medically known as the body mass index. In August, a study by researchers at the University of North Carolina in the United States showed that obesity increases the risk of death from Covid-19 by about 50 percent, and may make vaccines against the disease less effective, according to the Guardian newspaper. The researchers described the study as "scary", and stressed that the risks to people with obesity are greater than previously thought. The study, which is a collaborative effort between the University of North Carolina, the Saudi Health Council and the World Bank, will increase pressure on governments to address obesity, including in the United Kingdom, where Boris Johnson has positioned himself as the head of a campaign to reduce obesity. The new study on the effects of Corona on people with obesity, defined as a body mass index above 30, found that they are at greater risk from the virus in all aspects, with a 113 percent increased risk of being admitted to hospital, a 74 percent increase in need of intensive care, and a 48 percent increase in death from the virus.

The aim of the research

To collect several new studies that have recently emerged that have confirmed the possibility of an increased death rate for obese people infected with the Covid-19 virus.

Coronavirus COVID-19

Coronaviruses are a family of viruses that can cause illnesses such as the common cold, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). A new type of coronavirus was discovered after it was identified as the cause of an outbreak that began in China in 2019.

The virus is now known as severe acute respiratory syndrome coronavirus 2, or SARS-CoV-2. The disease it causes is called coronavirus disease 2019 (COVID-19). In March 2020, the World Health Organization (WHO) declared COVID-19 a pandemic. Public health groups, including the U.S. Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO), monitor the pandemic and post updates online. They have also issued recommendations on prevention and treatment.

Symptoms

Signs and symptoms of COVID-19 may appear two to 14 days after exposure. The period after exposure and before symptoms appear is called the “incubation period.” Common signs and symptoms can include:

1. Fever
2. Cough
3. Fatigue

Early COVID-19 symptoms may include loss of taste or smell.

Other symptoms can include:

1. Shortness of breath or difficulty breathing
2. Muscle aches
3. Chills
4. Sore throat
5. Runny nose

6. Headache
7. Chest pain
8. Pink eyes (conjunctivitis)
9. Nausea
10. Vomiting
11. Diarrhea
12. Rash

This list is not exhaustive. Children usually have similar symptoms to adults, and their illness is generally mild. COVID-19 symptoms can range from very mild to severe. Some people may have only a few symptoms, and some people may have no symptoms at all. Some people may have a worsening of symptoms, such as worsening shortness of breath and worsening pneumonia, about a week after symptoms start. Older people are at higher risk of developing serious COVID-19 symptoms, and the risk increases as people get older. People with pre-existing medical conditions may be at higher risk of developing serious symptoms. Examples of serious health conditions that increase your risk of developing serious COVID-19 symptoms include:

1. Serious heart disease, such as heart failure, coronary artery disease, or cardiomyopathy
2. Cancer
3. Chronic obstructive pulmonary disease (COPD)
4. Type 2 diabetes
5. Obesity or severe obesity
6. Smoking
7. Chronic kidney disease
8. Sickle cell disease
9. Weakened immune system from solid organ transplants
10. Pregnancy

There are other conditions that increase your risk of developing serious symptoms, such as:

1. Asthma
2. Liver disease
3. Being overweight
4. Chronic lung disease, such as cystic fibrosis or pulmonary fibrosis
5. Medical conditions related to the brain and nervous system
6. Weakened immune system from bone marrow transplant, HIV, or some medications
7. Type 1 diabetes
8. High blood pressure

This list is not exhaustive. There are other underlying conditions that may increase your risk of developing serious COVID-19 symptoms.

Body Mass Index (BMI) and its relationship with the Corona virus BMI With COVID-19

A number calculated using a person's height and weight, it is a reliable indicator in most cases to assess overweight or underweight in most people. BMI does not measure the amount or percentage of body fat, but researchers have found that it is usually related to the percentage of fat in the body, and therefore it is an indicator of the amount of fat in a person, and it is also a means of assessing health risks using a person's weight and height.

BMI is calculated by dividing a person's weight in kilograms by the square of his height in meters. For example, if a person's height is 170 centimeters and his weight is 75 kilograms, 170 centimeters is converted to meters, which becomes 1.7, then the weight is divided by its square: 75/2 (1.7), and the result in this case is 25.95.

How to read the results?

For people aged 20 years or older, the body mass index is assessed as follows:

Less than 18.5: The person is underweight, which may weaken the immune system and increase the risk of osteoporosis. Underweight may also be associated with the person suffering from an eating disorder.

1. 18.5to 24.9: The weight is normal, which means that there are no health risks associated with the weight on the person's health, stressing that this does not mean that there are no health risks associated with other matters.
2. 25to 29.9: The person is overweight.
3. 30 or more: The person is obese.

Overweight and obesity are associated with an increased risk of many diseases, including high blood lipids, high blood pressure, diabetes, heart disease, stroke, cancer, sleep apnea, depression, gallbladder disease, and reproductive disorders such as decreased fertility and irregular menstruation, erectile problems, and arthritis.

For those under 20, the BMI is calculated and assessed using age- and gender-specific tables by a doctor, so the above assessment does not apply to those aged between 2 and 19.

It is known that obesity increases the risk of a number of diseases, including heart disease, cancer and type 2 diabetes. Preliminary research suggests that obesity may also make people more susceptible to Covid-19.

BMI is calculated by dividing a person's weight in kilograms by their height in metres. The World Obesity Federation says that given the high rates of obesity in the world, a high proportion of people who contract the coronavirus "have a BMI of more than 25". Preliminary studies from the United States, Italy and China also indicate that it is an important risk factor.

Other factors that lead to greater health deterioration when infected with Covid-19 include: advanced age, being male, and suffering from other health problems.

Why is obesity a risk for people with COVID-19?

The more weight you carry, the less fit you are and the less lung capacity you have. This means you struggle to get oxygen into your blood and throughout your body, which affects your heart and blood flow.

“Because people who are overweight have a higher demand for oxygen, it means their system is already under more stress,” said Professor Naveed Sattar, from the University of Glasgow. During a pandemic like COVID-19, this can be dangerous. As Dr Diane Silaya, from the University of Reading, points out: “Ultimately, an obese body is less likely to get oxygen to key organs.” This is one reason why overweight and obese people are more likely to need help with breathing and kidney support in intensive care.

The Role of Fat Cells and Infection

Scientists have discovered that an enzyme called "ACE2", found in cells, is the main route through which the virus enters the body. It is believed that higher levels of this enzyme are found in the fatty tissue of obese people, under the skin and around their organs. This may be one of the reasons why they are more susceptible to infection, as well as the risk of deteriorating health when they become ill.

The immune system is affected above all else. The body's ability to fight the virus, known as the immune response, is not as good in obese people. This is due to inflammation caused by immune cells, called dendritic cells, which invade fat tissue and interfere with how our immune cells respond to infection. Scientists have confirmed that this can lead to what is called a "cytokine storm", a potentially life-threatening overreaction of the immune system as it causes inflammation and severe damage. A certain type of fat tissue is more susceptible to dendritic cell invasion, which could explain why people from black, African and minority ethnic (BAME) backgrounds in the UK, who have more of this type of tissue, have “higher rates of diabetes and may be more vulnerable to the virus”.

There are other hidden problems: obesity often goes hand in hand with other health problems, such as a weak heart or lungs, poor kidney function or type 2 diabetes. This may only become apparent with a severe infection such as Covid-19, all of which put the body under extra stress. Blood clots are also more likely, but the reasons for this are not clear.

As for hospital care, there can be challenges when it comes to managing obese patients in intensive care units because they are harder to intubate or have CT scans, due to weight restrictions. It is also harder to move and turn heavier patients to help them breathe. Another study conducted by researchers in Britain, clarified lifestyle factors that may lead to a higher likelihood of hospitalization due to Covid-19, including age, smoking, obesity, and chronic diseases. The study was based on a study of 640 cases admitted to the hospital between March 16 and April 16, as they found that avoiding obesity and being overweight leads to a reduced risk of hospitalization due to the novel virus, and that a high body mass index increases the likelihood of a person being admitted to the hospital, according to the study's co-researcher, Catherine Gill, Professor of Cognitive Epidemiology at the University of Southampton in Britain. The study was based on previous research and reports, including a report issued by the Public Health Agency in England, which stated that high levels of ACE-2 enzyme molecules in obese patients - an enzyme that produces a substance of the same name that leads to narrowing of blood vessels and releases hormones that raise blood pressure - make them more susceptible to infection; as this enzyme is believed to represent the main route through which Covid-19 enters the body.

Obese people are on the list of those most threatened by Covid-19

Day after day, the world learns about the new disease "Covid-19", caused by the novel coronavirus, and with increasing knowledge, new categories are joining the list of those most threatened by the disease. Since the beginning of the disease, there has been a warning that patients with heart disease, diabetes and cancer will suffer the most from the new disease in a way that threatens their lives. An Italian study published a few days ago by the "European Journal of Endocrinology" added obese patients to this list.

The study, conducted by doctors from the Universities of Alma Mater Studi and Rome and Bologna in Italy, indicates that people with a body mass index of 30 kg/m2 or more are at high risk of developing severe symptoms of Covid-19, while a body mass index of 35 kg or more significantly increases the risk of death. The body mass index (BMI) is a mathematical formula for identifying a person’s normal weight. It is the result of dividing the weight by the square of the height in meters (kilograms/square meter). The link between this index and the condition of nearly 500 patients admitted to the hospital with “Covid-19” in March and April 2020 was calculated. Of these, 41.9 percent had a BMI of less than 25 (normal weight), 36.5 percent had a BMI between 25 and 29.9

(overweight), and 21.6 percent had a BMI of at least 30 (obesity). Of the obese group, 20 (4.1 percent) had a BMI of at least (35), while 18 patients (3.7 percent) had a BMI of less than 20 (underweight). Among those with obesity, 51.9 percent experienced respiratory failure, 36.4 percent were admitted to the intensive care unit, 25 percent required mechanical ventilation, and 29.8 percent died within 30 days of symptom onset.

Patients with a BMI of at least (30) had a significantly increased risk of respiratory failure, admission to the intensive care unit, and death, compared with those with a lower BMI.

These data support the recent change by the US Centers for Disease Control and Prevention to lower the threshold for classifying a person at increased risk of COVID-19 from a BMI of 40 to 30; while the UK still defines the threshold for risk as a BMI of (40) or above, at which point a person is considered moderately at risk by the UK criteria.

While the Italian study did not indicate the reasons for considering obesity a risk factor for COVID-19 patients, and was content to monitor the statistical relationship between obesity and risk factors due to the disease, Dr. Samir Muhammad, a consultant in internal medicine at the Egyptian Ministry of Health, monitored in special statements to Asharq Al-Awsat what he believes are negative repercussions of obesity that increase the risk. He says: “I believe that the negative effects of obesity come from the fact that it impedes the movement of the diaphragm, which affects ventilation in the lungs. It may also cause obstruction of immune reactions when infected with the disease, and trigger what is known as (oxidative stress processes), which have a negative effect on the function of the heart and blood vessels.

Prevention

The U.S. Food and Drug Administration (FDA) has issued emergency authorization for some COVID-19 vaccines in the United States. The vaccine may protect you from getting COVID-19 or from getting severely ill if you get it.

You can take additional steps to reduce your risk of getting infected. The World Health Organization (WHO) and the U.S. Centers for Disease Control and Prevention (CDC) recommend these precautions to avoid exposure to the virus that causes COVID-19:

1. Avoid close contact (within 6 feet or 2 meters) with anyone who is sick or has symptoms.
2. Maintain distance from others (within 6 feet or 2 meters). This is especially important if you are at higher risk for severe illness. Keep in mind that some people may have COVID-19 and can spread it to others, even if they don’t have symptoms or don’t know they have it.
3. Avoid crowds and poorly ventilated enclosed spaces.
4. Wash your hands often with soap and water for at least 20 seconds, or use an alcohol-based hand sanitizer that contains at least 60% alcohol.
5. Wear a mask in indoor and outdoor public spaces where the risk of COVID-19 transmission is high, such as crowded events and activities. Additional instructions regarding masks vary depending on whether you have been vaccinated. Surgical masks can be used if available. N95 masks should be used only by healthcare providers.
6. Cover your mouth and nose with your elbow or tissue when coughing or sneezing. Discard the tissue after use. Wash your hands immediately.
7. Avoid touching your eyes, nose, and mouth.
8. Avoid sharing dishes, drinking glasses, towels, bedding, and other household items if you are sick.
9. Clean and disinfect frequently touched surfaces, such as doorknobs, light switches, electronics, and tables, daily.

10. If you are sick, stay home and do not go to work, school or university, and the same applies to public places, unless it is for the purpose of obtaining medical care. If you are sick, avoid public transport and taxis, including those requested via smart applications.
11. The best way is to follow a healthy and balanced diet and exercise regularly. Brisk walking, jogging and cycling are good options, even with social distancing measures in place.
12. Eat slowly and avoid situations that may tempt you to overeat.

Types of Vaccine:

A COVID-19 vaccine helps you build immunity to the SARS-CoV-2 virus that causes COVID-19 without getting sick.

How Different Types of COVID-19 Treatment Work

Vaccines stimulate an immune response so your body remembers how to fight the virus in the future. Some vaccines use a whole virus to trigger your immune system to respond. Other vaccines use parts of the virus, or genetic material that provides instructions for making specific proteins like those found in the virus. Many COVID-19 vaccines include the spike structure on the surface of the COVID-19 virus, called the S protein. The S protein helps the virus enter your cells and start an infection. Manufacturers around the world are working to produce different types of vaccines. The main types of COVID-19 vaccines currently available in the United States or in large-scale clinical trials include:

Messenger RNA (mRNA) vaccine. This type of vaccine uses a genetically engineered form of messenger RNA (mRNA) to give your cells instructions on how to make a harmless piece of the S protein on the surface of the COVID-19 virus. After you get the vaccine, your cells start making parts of the protein and displaying them on their cell surfaces. This prompts your body to make antibodies. If you get COVID-19, these antibodies will fight the virus. After the mRNA helps your cells make the protein parts, the mRNA is immediately broken down. It never enters the nucleus of your cells, which contains your DNA. Both Pfizer-BioNTech and Moderna are using mRNA in their COVID-19 vaccines.

Vector vaccine. In this type of vaccine, scientists take genetic material from the COVID-19 virus and insert it into a different type of live, weakened virus, such as an adenovirus. The weakened virus (called a viral vector) acts as the delivery system. When the viral vector enters your cells, it delivers genetic material from the COVID-19 virus that gives your cells instructions to make copies of the S protein. Once the cells display the S proteins on their surfaces, your immune system responds by creating antibodies and defensive white blood cells. If you become infected with COVID-19, the antibodies will fight the virus. Vector vaccines cannot cause COVID-19 or the vector virus. Also, the genetic material delivered by the vector will not become part of your DNA. The Janssen/Johnson & Johnson COVID-19 vaccine is a vector vaccine. AstraZeneca and the University of Oxford are also currently working on a vector vaccine to combat COVID-19.

Subunit vaccine. Subunit vaccines include only the parts of the virus that best stimulate your immune system. This type of COVID-19 vaccine contains harmless S proteins. Once your immune system recognizes the S proteins, it creates antibodies and defensive white blood cells. If you get infected with COVID-19, your antibodies will fight the virus.

Novavax is making a COVID-19 vaccine with immunomodulatory technology. In the United States, the U.S. Food and Drug Administration has granted emergency use authorization to COVID-19 vaccines made by Pfizer-BioNTech, Moderna, and Janssen/Johnson & Johnson. The FDA and the CDC recommend continued use of the Janssen/Johnson & Johnson vaccine in the United States because its benefits outweigh its risks. If you get this vaccine, you should be educated about the potential risks and possible symptoms of a blood clotting problem. More types of vaccines are expected to be authorized in the coming months.

Results and Discussion

- In a study of nearly 17,000 Covid-19 patients in UK hospitals, those who were obese, with a body mass index (BMI) of more than 30, had a 33 per cent higher risk of death than those who were not obese.
- A separate study of NHS electronic health records found that the risk of dying from Covid-19 was doubled among people who were obese. The researchers said that if other health conditions linked to obesity, such as heart disease and type 2 diabetes, were taken into account, the risk would be even higher.
- A study of critically ill patients in UK intensive care units found that around 34.5 per cent were overweight, 31.5 per cent were obese and 7 per cent were severely obese (73 per cent in total)، compared with 26 per cent of those with a healthy BMI.
- It is worth noting that 64 percent of the population in Britain suffers from overweight and obesity, and 35 percent of them have a body mass index ranging between 25 and 29, while 29 percent of them have a body mass index of 30 or higher. Image, GETT
- The body mass index (BMI) is used as a simple way to determine overweight by dividing the weight in kilograms by the square of the height in meters. Results from 25 to 30 mean that the person is overweight, while the person is obese if the result is from 30 to 40, and obesity becomes severe if the index calculation exceeds 40. Egypt ranks 19th in the world in female obesity, and 61st in the world in male obesity, according to estimates by the World Obesity Federation and the Egyptian Ministry of Health for the year 2016.
- Two heavy guests
- Last August, the Wiley electronic library published a study based on analyzing the results of 75 papers and research in English and Chinese on the novel coronavirus and obesity. The study, in which 10 researchers participated, concluded with several different results, the most important of which is that obese people are 46% more likely to contract the virus than their normal counterparts, and that their hospitalization rate after infection is 113% higher, and that the rate of admission of obese patients to intensive care is 76% higher and the death rate among them is 48% higher, if infected with Covid-19, especially those with extreme obesity.
- The research findings were not surprising to the study's lead author, Perry Popkin, Professor of Nutrition at the University of North Carolina in the United States, who stressed in statements to "For Science" that "the obesity rate in most countries exceeds 20%, but what is worrying is that there are possibilities that the effect of vaccines in protecting against infection with the virus is less effective in obese patients."
- The research paper monitored studies that also linked chronic diseases - such as heart disease, diabetes, and types of cancer - to obesity, and the effect of respiratory infections plays a greater role on the lungs in obese patients.

Example:

Obesity increases the chances of contracting the virus by 46%.. and extreme obesity increases the death rate by 48%.

Samira, 50, made her way to Kafr El-Dawar General Hospital, gasping for breath; last May, she contracted COVID-19 and suffered from a high temperature, difficulty swallowing, and digestive problems. "Samira," who refused to give her name explicitly, told "For Knowledge": I had a panic attack after entering the hospital, and despite the help of the medical team, I felt like I was going to die, and my fear did not calm down after 15 members of my family joined me and remained with me in isolation, but the doctors were more careful about my condition because I was extremely obese.

Samira did not exaggerate when she talked about the doctors' increasing interest in her condition after the heavy guest "COVID-19" joined another guest no less heavy than it, which is "obesity." Since the announcement of the emergence of the "Covid-19" pandemic, which was first reported in the Chinese city of Wuhan in December 2019, the circle of research has not stopped addressing thorny questions about the relationship between obesity and this outbreak that has infected more than 62 million, 619 thousand, and 466 people, and claimed the lives of 1 million, 459 thousand people around the world until (November 29) according to the latest statistics, in addition to addressing the impact of patients' weight gain on the deterioration of their health condition, and how obesity slows down the speed of their recovery from the disease. While 33% of Egyptians suffer from obesity and 6% from morbid obesity, according to statements by Egyptian Minister of Health Hala Zayed, the journey of Egyptian obesity patients who have been infected with the virus becomes noteworthy, especially with the number of people infected with the virus in Egypt exceeding 111 thousand people at the time of writing the report. "Samira" has lived with being overweight for 13 years; She is 165 cm tall and weighs 120 kg, which makes her movement slower and makes her gasp for air if she exerts the slightest effort, in addition to suffering from back and foot pain. When she was infected with "Covid-19", doctors gave her blood thinners in case of any clots, according to statements to "For Knowledge".

Inside the isolation ward at the 15th of May Hospital in Cairo, Sarah Al-Hadidi, a chest physician, spent five months, during which she followed up hundreds of cases daily, but one of those cases remained stuck in her memory, which was the case of a doctor who entered the hospital infected with the novel virus and was suffering from extreme obesity. Although he did not suffer from other diseases such as high blood pressure or diabetes, "his condition deteriorated rapidly within two days." "There are procedures that the medical team usually takes with intensive care patients, such as making the patient sleep on his stomach, which helps him breathe better, but the doctor was unable to do that, and he continued to sleep sitting for about a week, and his condition was improving slowly," Al-Hadidi said in statements to "For Science". He was even forced to leave the hospital and complete his treatment at home for a month.

As for Dr. Hossam Fathy, a member of the medical team for isolation at Esna Hospital in Upper Egypt, he treated some obese patients infected with Corona, adding: "I dealt with a 65-year-old obese patient who entered the hospital in bad condition, and his respiratory system collapsed very quickly, and the laryngeal tube that is installed to help him breathe was not suitable for him, and we did not have other tubes available, so we had to install it, but the results were not the best, and the patient died 7 days after entering the hospital."

Sir Stephen O'Reilly, a professor at the University of Cambridge, said in statements to "For Science" that "losing even a little weight definitely increases the chances of survival from the novel Corona virus." He added that “obesity alone may constitute a risk factor, even if it is not accompanied by other diseases such as diabetes; as diseases resulting from obesity do not occur only due to dense fat around the abdomen or chest, but also due to metabolic disorders resulting from an imbalance in the amount of foods and elements in the body, and these crises increase with each increase in weight, not just excessive obesity.”

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