Epidemiology (Covid-19)

Artin Radmatin Grade 6, Valeh School, Tehran/Iran, artin.98.2.23@gmail.com

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http://www.ayimi.org , info@ayimi.org

ABSTRACT

Coronaviruses are a large group of viruses. Some important coronaviruses are Mers, Covid -19 and Sars which these viruses cause Respiratory problems. But another important point in epidemiology is pandemic and epidemic and differences between them. Pandemic is an epidemic that has spread to a large area, for example on several continents or around the world, and affects a significant number of people. In this research we want to analyze some important epidemiologic data but our most important data is gender and infection between men and women doesn't have a lot difference but death in men is more.

Key words: *Coronavirus, Epidemic, Pandemic, Epidemiology*

1 Introduction

Coronaviruses that can infect animals and humans and cause respiratory distress; these discomforts may be as mild as a cold or as severe as pneumonia. In rare cases, animal coronaviruses infect humans and then spread between them. You may remember the SARS virus from 2002 to 2003; The virus was an example of the corona virus, which was transmitted from animals to humans. Another important and newer breed of the virus is the coronavirus, which was discovered in the Middle East in 2012 and, according to scientists, the virus was first transmitted from camels to humans, and the new virus, Covid 19 or SARS Covid 2, which is an acute respiratory syndrome. ، a new branch of coronavirus discovered in 2019 in Wuhan, China. Pandemic is an epidemic that has spread to a large area, for example on several continents or around the world, but Pandemic not a widespread indigenous disease with a constant number of infected people. A pandemic occurs when a disease spreads to expectations around the world and people are not prepared for it. A pandemic is an epidemic that has spread to at least three WHO countries. An epidemic occurs when the number of cases of a disease, which of course can only be specific to a community or country, suddenly increases.

In this research we want to analyze some epidemiological data about controlling or strength of virus that our base virus is Covid-19 and some mutant covid-19 that again our base mutant virus is Delta Covid-19.

But a problem that researcher was thinking about it was how this virus transmit. According to the Centers for Disease Control and Prevention, person-to-person contact is thought to be the main route of transmission of the coronavirus. Suppose you are sitting in a meeting room with a person with a coronary infection and the patient suddenly sneezes or coughs. If the person does not cover their mouth and nose, they will be able to send breathing drops through your mouth or nose. In this case, the droplets that sit on you probably contain a virus. Or suppose you meet a person infected with the virus who has touched their nose and mouth with their hand. In this case, when you shake hands with this person, the viruses are transmitted from his hand to yours. In this situation, if you touch your nose or mouth with a dirty hand without rinsing, you may accidentally provide a point for the virus to enter your body. A recent small study suggests that the virus may also be present in faces and may contaminate toilet stones or baths. But more research is needed to prove this claim.

2 Tests to Diagnose Covid-19

We have several tests such as PCR and antibody tests to diagnose covid-19 .

An infectious disease test can tell you if you are currently infected with Covid-19- causing coronavirus. This is the same test that will be done if you are referred by your doctor based on symptoms and other factors for the Covid-19 test. In PCR the technician inserts a 15 cm cotton swab into either side of your nose and moves it for about 15 seconds. This movement will not hurt, but it may cause discomfort. The swab is then sent to a lab to test materials inside your nose.

An antibody test can show if you have ever been exposed to or infected with the Covid-19 virus, and if your body has made an antibody in an attempt to defend itself. It takes at least twelve days after exposure to the virus for the body to make enough antibodies to detect in the test. Blood or antibody tests (serology) look for antibodies. Your body makes antibodies when you have an infection. Covid-19 tests detect two types of antibodies:

- IgM, which the body builds for two weeks and then drops.
- IgG, which the body builds up more slowly (about 4 weeks) but usually lasts longer.

Swabs or sputum samples can only show the presence of the virus in the body at present, but a blood test will show if you have ever been infected with the virus, even if you have no symptoms. This is important in finding the prevalence of Covid-19 by researchers.

Aside from antibody tests, researchers are studying antibody therapies for Covid-19. The drug targets how the virus attaches to and enters the cell.

3 Methods

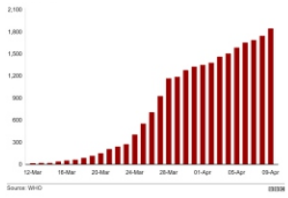
In this research we want to analyze epidemiological data such as age, gender, geographical spread and the most common symptoms of the disease.

3-1 Geographical spread

Many countries that have historically survived the widespread outbreak of infectious diseases had a younger population than others. According to scientific researches, young people are more likely to develop a mild form or without symptoms of infectious diseases. Young people are also less likely to develop underlying diseases that make Covid 19 worse.

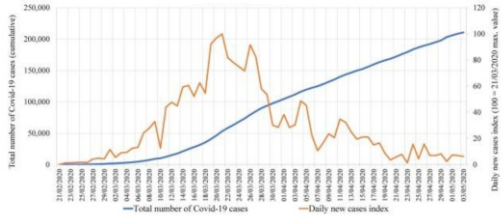
The incidence of the new corona virus in Africa has been lower than in other continents. So far, only about 45,000 cases of the virus have been reported in Africa. 60% of Africa's population is under 25 years old (Fig.1). In contrast, the Italian population, in which the new type of corona virus is widespread, is considered to be older. The Italian population, in which the new type of corona virus is widespread, is considered to be older. The average age of Italians is over 45 years. The outbreak of Covid 19 has so far killed nearly 29,000 people in Italy (Fig. 2).

On the other hand, the immune system of young people is stronger than the elderly. This helps them fight the new corona virus in their body.



Africa

Fig. 1: Confirmed Coronavirus cases in South Africa



Italy

Fig. 2: The spread of Coronavirus in Italy

3-2 Cultural Factors

Specialists believe that cultural factors in some communities, including greater social distance, have helped them cope with the outbreak of the new coronavirus. Citizens in India and Thailand, for example, often greet each other by maintaining physical distance.

The use of masks during illness is also one of the effective cultural factors in preventing the spread of the new Corona virus. People in Japan and South Korea are accustomed to wearing masks when they are sick. However, the use of masks was not common in European countries before the outbreak of the new Corona virus. The continent of Europe has seen the highest mortality rate among the continents due to Covid 19 disease. Keeping the elderly at home instead of in a nursing home is another cultural factor influencing the spread of the new Corona virus. Countries with higher nursing home populations had higher mortality rates due to the outbreak of Covid 19 (Fig. 3).

3-3 Action of Governments Against the Spread of the Virus

Countries whose governments responded quickly to the outbreak of Covid 19 with quarantine and social distancing were less likely to be harmed in practice than other countries. Vietnam and Greece are two countries that quickly adopted measures for social distance.

Of course, the speed of vaccine injection also helps to control the virus, and of course, the higher the speed of import or production of the vaccine, and of course the speed of injection, the lower the prevalence of the virus. Of course, there are different vaccines of different types with the required number of doses and, of course, different levels of effectiveness around the world, and we want to get information of this type.

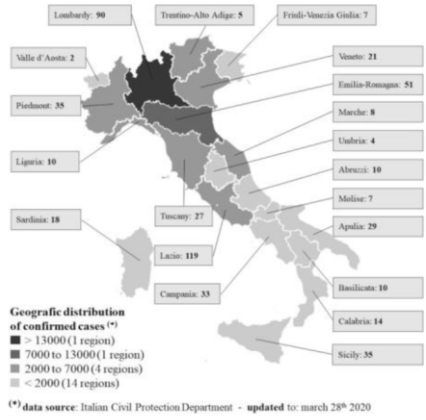


Fig. 3 : Geographic Distribution

There are different vaccines in the world with different effectiveness on covid-19 and mutant covid-19 .

1- Pfizer Vaccine
Vaccine type: RNA proteins
Product: America and Germany
Confirmations: FDA License - Emergency Use License
2-Moderna Vaccine
Vaccine type: RNA proteins
Product: America
Confirmations: FDA approved
Efficiency percentage: more than 90%
3. Strazenka Vaccine
Vaccine type: Genetically modified virus
Product: England
Confirmations: FDA approval
Efficiency percentage: 76%

3-4 Weather conditions

Examining the areas where the new type of corona virus has become widespread, it can be cautiously concluded that the virus is less prevalent in hot and dry areas. Other types of coronavirus were less common in hot, dry areas in the past. The new corona virus spread late winter in countries with temperate climates such as the United States and Italy. In contrast, countries with tropical climates such as Chad and Guinea did not see the outbreak. However, scientists emphasize that it is not possible to rely solely on rising temperatures to deal with the corona. Brazil, for example, which has a tropical climate, is now the most important outbreak of Covid 19 in South America.

Scientists believe that the heat of summer, which leads to more people leaving their homes and indoor environments, may help reduce the transmission of the new corona virus. One of the effective factors in the spread of this virus is the long-term presence of people in closed environments with the infected person.

A study from a university in the US state of Connecticut shows that UV rays from direct sunlight can be effective in

in killing the new Corona virus. In this way, contact with surfaces exposed to direct sunlight is unlikely to transmit the virus.

3-5 Human Disease

3-5-1 Underlying Disease (both in delta Covid and Covid-19)

According to studies, the most common underlying diseases in people with Covid are 19 cardiovascular diseases and diabetes. In cases leading to death, the most common underlying diseases have been cardiovascular disease and diabetes.

A: Why are some people have a higher percentage of underlying diseases?

The results of a recent study show that high cholesterol, which most diabetics and heart patients suffer from, is associated with an increase in cell infection.

According to the Daily Mail, people with metabolic conditions such as diabetes and cardiovascular disease are more likely to have severe coronary heart disease. Chinese researchers are now investigating the cause in a recent study.

Most people with diabetes and cardiovascular disease have high cholesterol; For this reason, researchers at the Chinese Academy of Military Medical Sciences in this study examined the role of "good" cholesterol, known as high-density lipoprotein (HDL), in coronary heart disease.

In this study, the researchers specifically looked at the SR-B1 receptor, which binds to cholesterol molecules and is found in cells in the human body, including the lungs, which are targeted by the coronavirus.

The researchers found that SARS-CoV-2, which infects Covid-19, could not directly utilize the receptor, but could use the process of binding cholesterol to SR-B1 to penetrate cells.

The researchers found that SARS-CoV-2 uses cholesterol molecules in a taxi to penetrate cells to reach the cell surface; Then, when Covid-19 reaches the cell surface, its "spike" protein attaches to the ACE2 receptor and infects the cell. ACE2 is a receptor that allows the corona virus to enter human cells.

This study showed that the corona virus uses cholesterol molecules that bind to the SR-B1 receptor to enter the cell. The researchers then found that blocking the SR-B1 receptor and neutralizing it could prevent the infection. Targeting the SR-B1 receptor could be a potential way to develop therapies for coronation in the future, they say.The results of this study show that SR-B1, the SARS-CoV-2 cell binding procedure, facilitates the virus to enter cells and infect them. Thus, SR-B1 may be a potential therapeutic target for limiting SARS-CoV-2 infection (Fig. 4).

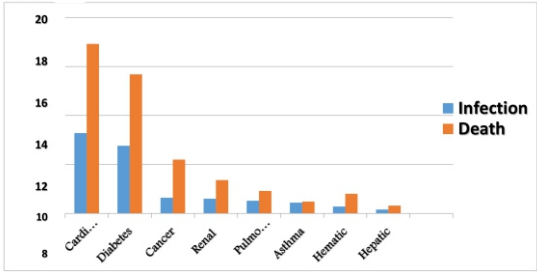


Fig. 4: Death and Infection data

3-5-2 Age

Most death in Covid-19 was in 70 to 79 years old group and most infection in 50 to 59 years old and also in Delta covid infection is most in 1to14years and the most death in 60 to 74 years old (Tables 1and 2).

Table 1: Covid-19 Death and Infection data

Age	Covid 19 Death	Covid 19 Infection
0 - 9 years	0.1%	0.9%
10 -19 years	0.9%	1.2%
20 - 29 years	0.9%	8.1%
30 - 39 years	3.4%	17%
40 - 49 years	6.6%	19.2%
50 - 59 years	14.4%	22.4%
60 - 69 years	23.1%	19.2%
70 -79years	28%	8.8%
80 - 89 years	19.6%	3.2%
90 and older	3.2%	

Table 2: Delta Covid Death and Infection data

Age	Delta Covid Infection	Delta Covid Death
<=14 years	35%	1%
15-29	18%	3%
30-44	22%	11%
45-59	15%	32%
60-74	8%	39%
>=75	2%	14%

3-5-3 Gender

Evidence suggests that although the incidence is the same between men and women, the mortality rate is higher among men than women. This may be due to differences in the immune responses of the two sexes or differences in different behavioural characteristics is gender.For example, the pattern and prevalence of smoking vary between the genders. But in general, differentiated data on gender are not enough.

But the findings that women are less likely to get sick or have a stronger immune system are not unique to Quid 19. In the case of other viral diseases, such as the flu or AIDS or hepatitis, it has been proven that women experience more severe episodes of the disease than men. What has been considered so far are some reasons

1- Excessive smoking by men compared to women

2- Differences in daily conditions and hygiene between men and women. More men in business and community than women

3- The role of two hormones, estrogen and testosterone

The female hormone estrogen is able to stimulate the immune system, while the male hormone testosterone is likely to do just the opposite.

Estrogens are a group of sex hormones that create and maintain female characteristics in the human body.

Testosterone is a hormone that is present in both women and men, but is found in smaller amounts in women and more in men (for example, hair growth in the body is one of the factors affected by the presence of testosterone in the body).

The question of what functions an extra X chromosome does in women (women have two X chromosomes and men have only one X chromosome that contains the female immune response) has long fascinated researchers. The answer to this question, according to many researchers, is that this chromosome is involved in the immune system.

* Stronger immune response in women, of course, has disadvantages, because women are more likely than men to develop autoimmune diseases such as arthritis, rheumatoid arthritis and lupus. In these diseases, the immune system attacks the body's own organs and tissues. 80% of people

have female autoimmune disease.

4 Cytokines and T Lymphocytes

What is a Cytokine?

When comparing male and female patients, the researchers found significant differences in the immune response in the early stages of infection. These differences included higher levels of different types of inflammatory proteins called cytokines in men.

Research has shown that severe cases of Covid-19 lead to a mysterious condition that disrupts the immune system; Instead of attacking only infected cells, the immune system attacks healthy cells as well. This condition is known as cytokine storm. Cytokines are used as part of the body's innate immune response. They are the first public counterattack to attack pathogens. However, in severe cases of Covid-19, the overproduction of cytokines, known as "cytokine storms," causes fluid to accumulate in the lungs, depriving the body of oxygen, and potentially causing shock, tissue damage, and lack of The proper functioning of different organs. Higher concentrations of cytokines earlier in men cause these symptoms to occur earlier. In contrast, scientists found that female T lymphocytes function more strongly than male T cells.

What is T lymphocyte?

It is a type of blood lymphocyte that is involved in the body's specific defences. T lymphocytes are initially made immaturely in the bone marrow. It then circulates to the thymus. There it is able to detect foreign factors, mature and return to the blood. Therefore, the site of bone T lymphocyte production and maturation is the thymus.

* The thymus is a gland in front of the trachea that is located behind the sternum.

T lymphocytes are responsible for cellular immunity. These cells have antigen receptors on their surface that are complemented by only one type of antigen. That is, they are able to specifically identify an antigen of cancer cells or virus-infected cells. When T lymphocytes are exposed to this cell, they multiply to form the following two types of cells:

1- Deadly T lymphocyte

After attaching to foreign target cells, these lymphocytes secrete a substance called perforin. Perforin is a protein that causes cavities in foreign cells when it comes in contact with them. As a result, lethal T lymphocytes can program to kill enzymes, enter the foreign cell, and eventually kill it.

2- Memory T cell

These cells are the body's immune memory. These T cells, like T lymphocytes, are sensitive to an antigen and play a role in the body's secondary immunity, meaning that when we are exposed to the same foreign cells for the second time, more deadly T lymphocytes and T cells are produced and the body produces more memory. Shows a faster immune response.

As a result, the poor response of T lymphocytes in men leads to worsening of the disease. Also, the lymphocyte T response in older men was significantly worse than in young male patients.

Researchers have now suggested that the treatment developed for Covid-19 should be such that, even with these differences, it can treat patients.

5 Results

According to the conducted researches in a determined period of time and a determined social community (during my research):

Infection : Men:57% , Women:43%

Death : Men: 59% , Women :41%

Acknowledgments

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