The Importance of Natural (Inherited) and Acquired Immunity in Combating COVID-19

(Original Research Article)

Mohammed Marri Younus

Department of Zoology, Faculaty of Art, Derna of University, El-Gubba, Libya.
Corresponding Author: Department of Zoology, Faculaty of Art, Derna of University, El-Gubba, Libya. E.mail: Mohamed-marri@yahoo.com.

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Abstract

The current study included conducting a questionnaire regarding the comparison between natural and acquired immunity. It also indicates the importance of taking vaccines against the Covid-19 virus. The questionnaire was distributed to a sample size of 150 people from the medical and nursing staff in three Libyan hospitals including Al Wahda Teaching Hospital in Derna, Umm Al Razm General Hospital and Gubba General Hospital. The study performed during the period from 11/10/2020 to 11/10/2021. It has been shown that acquired immunity is the best in resisting the virus and recovering from it, and taking the vaccine in two doses is the best to make the body more immune. Also, the Chinese vaccines were the least types of vaccines in terms of side effects. Results found that the age group (1-10) years was having the most immune and considered the least in terms of death rate. While, the age group (66-98) was the most vulnerable age group to infection with the virus, and considered the most death rate groups.

Keywords: Acquired Immunity, Natural Immunity, Vaccines, Al Wahda Teaching Hospital, Umm Al Razm General Hospital, Gubba General Hospital.

Introduction

The immune system is a complex network of barriers, organs, cellular elements, and chemical molecules that interact to defend the body [Huang et al:2020,1021]. It is designed to attack and destroy a wide range of antigens (parts of the body of microbes that trigger an immune reaction) and pathogens, foreign or foreign (ie, those from outside the body)[Banks et al:2020,1478].

Therefore, it must be able to distinguish between the tissues and cells of the self on the one hand and anything from outside the body on the other, which is medically known as “self-tolerance” and having this ability prevents the immune system from attacking the tissues and cells of the body by mistake [Roberton et al:2020,903], which occurs in cases of autoimmune disease disorders.

The immune system is actually made up of two distinct systems: the congenital immune system and the acquired immune system, and they work in concert all the time [Sagan et al:2021,26].

The congenital immune system includes a series of non-specific (physical and chemical) barriers, along with cellular and molecular elements that have been deployed and pre-positioned to prevent and/or rapidly neutralize microbial infection at the site of its entry into the body[Yoshikawa et al:2020,98]. As these physical and chemical defenses are the most primitive forms of congenital immunity, whose abilities may be disturbed in certain health conditions.

For example, the skin has a primary role in providing physical protection, but its burns, wounds, or as a result of inserting an intravenous catheter, facilitates microbes entry into the body. Also, the respiratory system has multiple forms to provide physical protection, such as the mucous coating and cilia (Mucociliary) in the lining of the airways, which hinder microbes from sticking to the surfaces of cells and facilitate their expulsion by sneezing or coughing [Kam et al:2020,20].

But smoking and air pollution impair those abilities. As for the acquired immune system, it constantly evolves and adapts (acquired) with each time exposure to pathogens that may invade the body at intervals and under successive circumstances.

The traits of acquired immunity include: diversity, memory, mobility, flexibility, self-discrimination, repetition, and specificity. Diversity refers to the ability of the immune system to respond to many different pathogens or strains of pathogens [Zhou et al: 2020,1057]. And the feature of "immunological memory" provides the ability to respond faster and more powerfully in subsequent confrontation with the same microbe if it occurs [Castro:2020,564].

The "mobility" capabilities of the components of the immune system enable local immune reactions against microbes at the site of their entry to provide broader immune responses.

Discrimination between self versus non-self tissues and cells helps prevent damage to the body's cells by the immune system. Redundancy refers to the ability of the immune system to

produce components with similar biological effects from multiple immune cell lines, such as inflammatory cytokines (proteins produced by the body that act as messages to cells to trigger immune reactions). It also doubles the cellular components of the immune system to amplify the size and capacity of the immune response against microbes [Paules et al:2020,20].

The current study aims to compare natural (inherited) and acquired immunity in the prevention of Covid-19 virus, and the second goal is to demonstrate the effectiveness of taking vaccine doses to prevent the virus or to relieve symptoms of infection.

The importance of this study is evidenced by the fact that it is recent and new with regard to the study area and sample, and because it focuses on the emerging Covid-19 virus.

Materials and Methods

The Descriptive Study Design

The research was conducted in three hospitals affiliated with the Ministry of Higher Education, namely: Al Wahda Teaching Hospital in Derna, Umm Al Razm General Hospital, and Gubba General Hospital. The data was collected during the period from 11/10/2020 to 11/10/2021.

A bout 150 individuals was selected for this study. Approximately, 50 individuals were selected from each hospital, including 25 doctors and 25 nurses. The questionnaire consisted of two parts:

- Part one included various questions asked to doctors and nurses in hospitals including the effectiveness of acquired and natural immunity, the effectiveness of the vaccine, and the types of vaccines taken.

- Part two included questions about the symptoms of the vaccine, the most resistant age to the virus through natural immunity, the most age group had a high death rate...).

The questionnaire was distributed to the sample members such as doctors and nurses in hospitals in order to fill the required information for the present study purpose.

The questionnaires were collected and classified. The statistical tables were used according to the appropriate statistical programs.

Questionnaire

Gender : Male: ☐ female: ☐
Age: / **Marital status:** Single : ☐ married: ☐

Educational level: / **Occupation:**

-Put the answer in the form of a sign:v /×

N	Questions	v	×
1	Does natural immunity play a role in preventing covid-19?		
2	Does acquired immunity play an important role in preventing COVID-19?		
3	Is taking the vaccine stronger than the natural immunity?		
4	Are vaccines against COVID-19 a stronger and longer-lasting protection?		
5	Does taking the vaccine make a person immune to infection with the Covid 19 virus?		
6	Is taking two doses of the vaccine better than taking one dose?		
7	Are mixed vaccines (combining two types of vaccine) effective and better than the unmixed vaccine?		
8	Are the symptoms resulting from taking the vaccine dangerous and intolerable?		
9	Do the symptoms resulting from taking the vaccine differ from one person to another according to the natural immunity?		
10	Does eating vitamin C, fruits, hot soup and food enhance natural immunity to prevent the virus or relieve its symptoms?		
11	Were the people who come to hospitals when they are infected who did not receive the vaccine?		
12	Is a person who has been vaccinated at risk of contracting COVID-19 again?		
13	Which of the following is the best vaccine against COVID-19? **Pfizer BioNTech** ○ **Sinovac** ○ **Janssen** ○ **Sinopharm** ○ **AstraZeneca** ○ **Moderna** ○ **Sputnik** ○ **CanSino** ○		

Form (1): The Questions in Questionnaire Form 1.

N	Questions	strong	moderate	mild
*	What were the symptoms of the vaccine?			
1	Pfizer BioNTech			
2	Sinovac			
3	Janssen			
4	Sinopharm			
5	AstraZeneca			
6	Moderna			
7	Sputnik			
8	CanSino			

*	What age groups are the most immune and resistant to the virus and the a high death rate ?	Put the answer(V)	
		most immune and resistant	high death rate
1	1-10 y		
2	11-18 y		
3	19-25 y		
4	26-35 y		
5	36-65 y		
6	66-98 y		

Form (2): The Questions in Questionnaire 2.

Results

According to Table (1), natural immunity constituted 46% of the ability to confront the Covid 19 virus, while acquired immunity played the most important role by 100% in confronting and recovering from the Covid 19 virus. It has clarified the important role of immunity acquired through taking the vaccine, and according to Table (1), the vaccine constitutes 90% of the success in recovering from the Covid 19 virus, and the study also showed that taking the vaccine is better than relying on natural immunity in people.

Table (1): The Frequency and Relative Distribution.

N	Questions	Frequency (n=150)	percentage (%)
1	Does natural immunity play a role in preventing covid-19?	**69**	**46**
2	Does acquired immunity play an important role in preventing COVID-19?	**150**	**100**
3	Is taking the vaccine stronger than the natural immunity?	**135**	**90**
4	Are vaccines against COVID-19 a stronger and longer-lasting protection?	**98**	**65.33**
5	Does taking the vaccine make a person immune to infection with the Covid 19 virus?	**141**	**94**
6	Is taking two doses of the vaccine better than taking one dose?	**150**	**100**
7	Are mixed vaccines (combining two types of vaccine) effective and better than the unmixed vaccine?	**18**	**12**
8	Are the symptoms resulting from taking the vaccine dangerous and intolerable?	**28**	**18.66**
9	Do the symptoms resulting from taking the vaccine differ from one person to another according to the natural immunity?	**92**	**61.33**
10	Does eating vitamin C, fruits, hot soup and food enhance natural immunity to prevent the virus or relieve its symptoms?	**79**	**52.66**
11	Were the people who come to hospitals when they are infected who did not receive the vaccine?	**135**	**90**
12	Is a person who has been vaccinated at risk of contracting COVID-19 again?	**123**	**82**

The study also showed that 90% of people who were vaccinated with the vaccine have exceeded the risk of contracting the virus, Covid 19, and even if they contract it, symptoms will be very mild. The study showed, according to Table (1), that people who took two doses of the vaccine succeeded in preventing infection with the virus by 100%, compared to those who took only one dose. As for the effectiveness of mixed vaccines, and here we mean the combination of two vaccines at the same time, their success rate in curing the virus was very weak, only 12%. According to Table (1), the side effects of taking vaccinations were minor and did not exceed the degree of severity of 18.66%. The study also showed, according to Table (1), that taking vitamin C, hot soup and healthy food contributes by 55.66% to strengthening the natural immunity to fight the Covid-19 virus. The study indicated a very important thing, which is that 90 % of patients who attended the three hospitals (Al Wahda Teaching - Gubba General - Umm Al Razm General) were those who did not take any type of available vaccine.

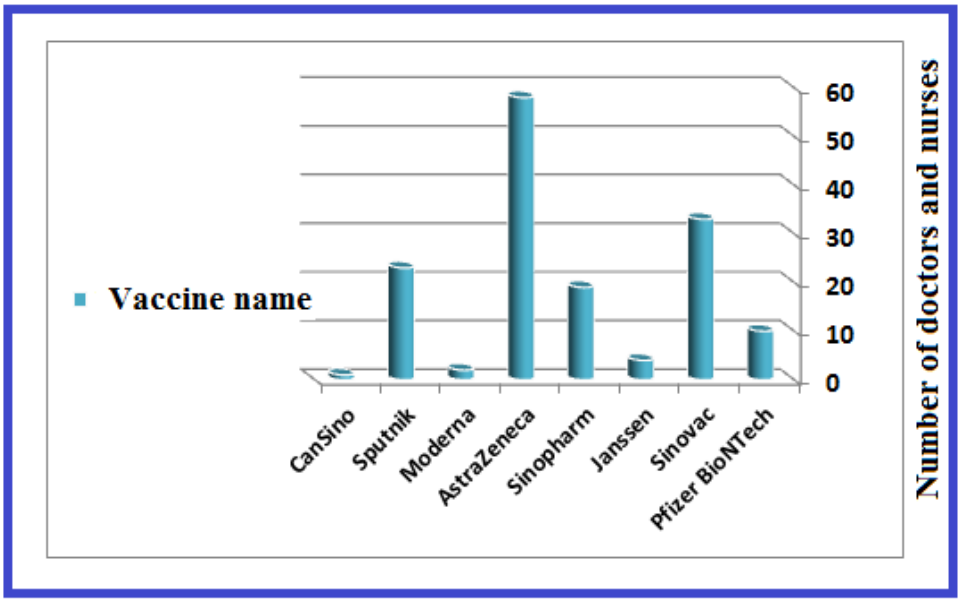

Figure (1): The most Important Vaccines Preferred by the Medical Staff.

The study showed, as shown in Figure (1), that the best type of vaccine was the AstraZeneca vaccine, Since the previous vaccine is effective and the people who received it were perfectly prevented from infection, but one of the most important problems of this vaccine is in the age groups less than 40 years, as those who are in the young age of those who received the vaccine were exposed to sudden blood clots, while its symptoms were moderate In elderly people over 50 years old.

The Chinese vaccine, Sinovac, came in second place in terms of preference, especially since people accepted this vaccine greatly and the numbers that got it were large, while in the third place came the Russian vaccine Sputnik, The Chinese vaccine, Sinopharm, came in fourth place.

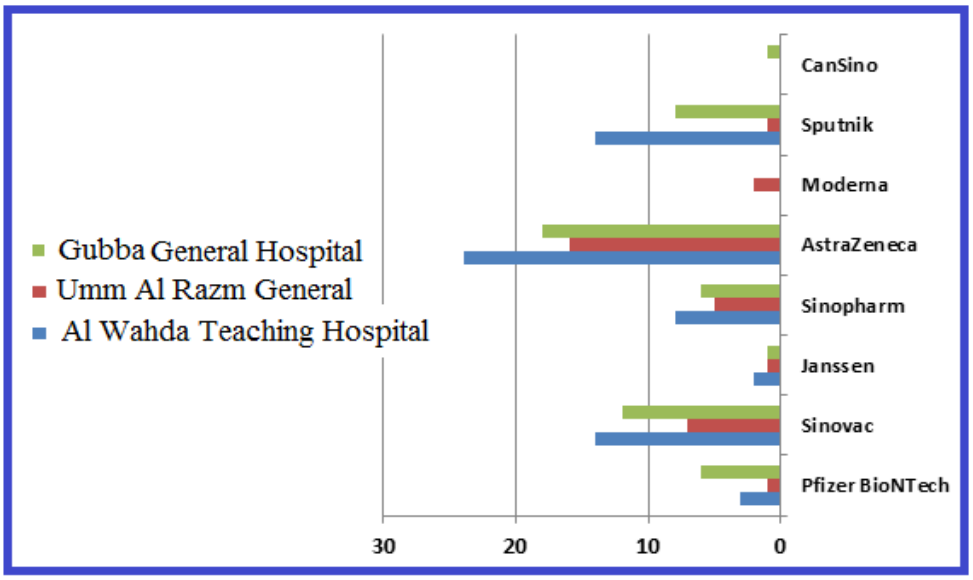

Figure (2): Priority Distribution of Vaccines in the Three Libyan hospitals.

It was also shown from Figure (2) that the priority list for vaccines in the Libyan hospitals in which the questionnaire was distributed was as follows: First came the vaccine AstraZeneca vaccine, Which had the advantage in the three hospitals, Followed by the two vaccines (Sinovac-Sputnik) in Al Wahda Teaching Hospital in Derna, then the vaccine (Sinovac) in Gubba General Hospital, next is the (Sputnik) vaccine at Gubba General Hospitalas well, Finally a vaccine (Sinopharm) in Al Wahda Teaching Hospital in Derna.

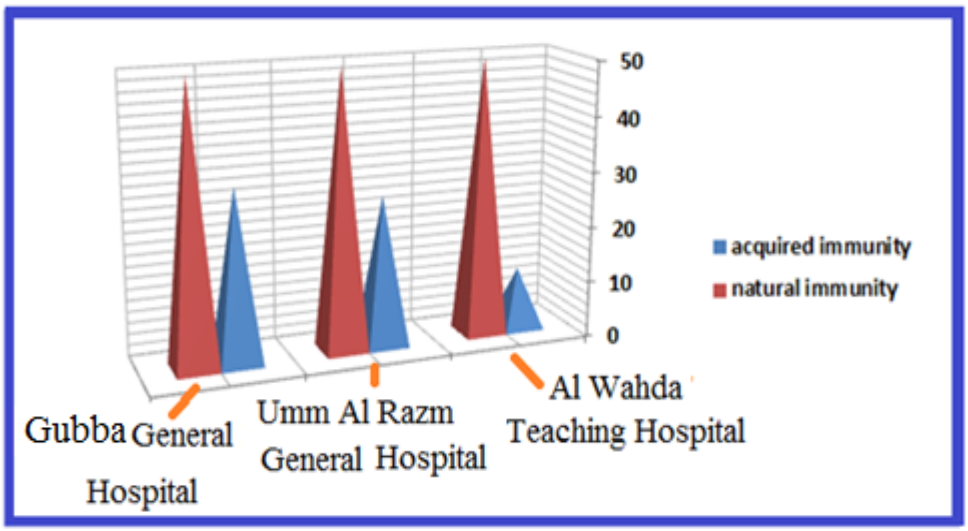

Figure (3): The Advantage of Natural and Acquired Immunity against COVID-19.

Through Figure (3), we find that the doctors and nurses in the three hospitals have unanimously agreed that the immunity acquired through the vaccine is the best and most successful in resisting the Covid-19 virus than natural immunity, which plays a simple and unreliable role in the subject of treatment.

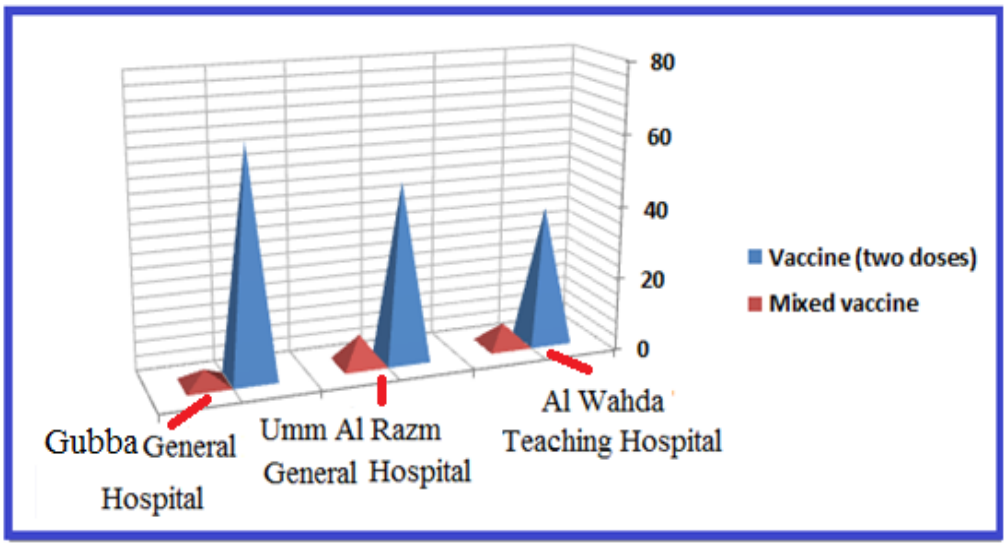

Figure (4): The Importance of the Vaccine (Two Doses) and Mixed Vaccines.

Figure (4): shows that the use of the two-dose vaccine is the best and most effective in vaccinating against the virus, while the mixed vaccines have not yet proven effective in preventing Covid-19.

Table (2): The Severity of Symptoms Caused by the Eight Virus Vaccines.

vaccine	strong	moderate	mild
Pfizer BioNTech		√	
Sinovac			√
Janssen	√		
Sinopharm			√
AstraZeneca		√	
Moderna	√		
Sputnik		√	
CanSino		√	

It has been shown through the study that the least vaccines in terms of the severity of the symptoms of infection are the Chinese vaccines Sinopharm-Sinovac, It was also found that the most severe vaccines in terms of the severity of the symptoms of infection with the virus are the American vaccines, Moderna-Janssen.

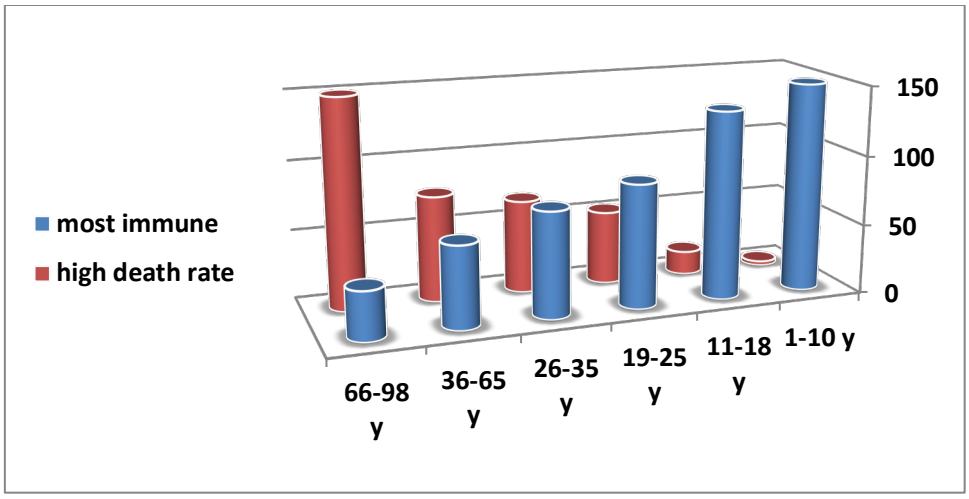

Figure (5): Immunity and Mortality by Age Group of People.

Figure (5): indicated that the age groups whose ages ranged between (1-10) are the most immune and resistant to the Covid 19 virus and at the same time are the least age groups with the number of deaths, while it was found that the age groups (66-98) are the least immune among the age groups with the highest mortality rate.

Discussion

The study has proven that acquired immunity has proven 100% effective in the body's resistance to the virus and in healing it by taking vaccinations **Table(1)**, and the contribution of natural immunity was weak in resisting the Covid 19 virus, especially since natural (inherited) immunity is related to the genes of each person and varies from person to person[Zhou et al:2020,1057]. For another, and according to the age group, while we found that the acquired immunity was more effective because the vaccine contains the same virus, but to a reduced degree[Parohan et al:2020,1420]. This allows the white blood cells and the immune system in the body to recognize the patterns of the virus and eliminate them if the body is exposed to the virus again, and perhaps infection and what happens after infection is very dynamic." There are two main arms of the innate immune system[Houghton et al:2020,579], which is the body's first line of defense, Once the body detects a foreign intruder, key molecules, such as interferon and pro-inflammatory cytokines, launch a widespread attack[Huang et al:2020,1020]. Perhaps the most effective and good vaccines that gave excellent results in confronting and preventing the virus in the three Libyan hospitals included in the study was the British vaccine AstraZeneca **Figure (1),**Followed by the Chinese vaccine Sinovac,[Stein et al:2020,430] Then the Russian vaccine Sputnik, The reason for the effectiveness of previous vaccines is that they provided people with long-term immunity to the virus, and even people who took those vaccines and were infected with the virus again, they

had very mild and negligible symptoms of the virus, especially the Chinese vaccines[Banks et al:2020,1478].

Perhaps the vaccines that dominated in the three Syrian **Figure(2)** were First came the vaccine AstraZeneca vaccine, Which had the advantage in the three hospitals[Roberton et al:2020,903], Followed by the two vaccines (Sinovac-Sputnik) in Al Wahda Teaching Hospital in Derna, then the vaccine (Sinovac) in Gubba General Hospital, next is the (Sputnik) vaccine at Gubba General Hospitalas well, Finally a vaccine (Sinopharm) in Al Wahda Teaching Hospital in Derna, the reason for this is that these vaccines are the only ones that entered the three Libyan hospitals, and they were free through the World Health Organization as free aid, except for some people who received other vaccines during their stay outside the country[Bhopal et al:2021,13].

It has been shown from Figure (3) that acquired immunity is the best in achieving successful prevention from the effects of the virus and infection, because this immunity comes through vaccines that strengthen the first lines of defense in the body's immune system[Banks et al:2020,1479].

The study also showed that the two-dose vaccine proved a clear success in the three hospitals (Figure 4) in which the study was conducted. Very, because the vaccine has prepared the immune system in advance and the body's first line of defense to attack and eliminate the virus instead of attacking the body's own immune cells[Huang et al:2020,1022]..

It has been shown through the study **Table(2)** that the least vaccines in terms of the severity of the symptoms of infection are the Chinese vaccines Sinopharm-Sinovac, This is due to the fact that the Chinese vaccine contains a dead virus, so the symptoms are mild and do not exceed the feeling of pain at the place of the needle or a slight rise in temperature[Sadinsky et al:2020,1015].

According to the questionnaire and according to **Figure (5)**, the age group from (1-10) years is the most immune age group and resistance to infection with the virus, meaning that the natural (inherited) immunity of children of those age groups is strong, meaning that children are better off than adults thanks to Powerful "first responder" immune cells diminish with age [Sagan et al:2021,26]. These cells are the body's first line of defense. Once the body detects a foreign intruder, key molecules, such as interferon and pro-inflammatory cytokines, launch a widespread attack.

The previous category of children is also considered a carrier and carrier of the virus, and symptoms may not appear on them, and here lies the danger [Castro:2020,566]. As for adults in the age group of people aged between (66-98) years, according to **Figure (5),** these are the most vulnerable to infection with the virus because of their weak natural immunity[Yoshikowa et al:2020,98], As their immune cells, which are the first line of defense, have become old, and people of the previous age group, most of them suffer from chronic diseases such as high

arterial pressure, diabetes, asthma, chronic neurological diseases with age [Kam et al:2020,20], heart diseases, and therefore all of these things It contributes in one way or another to weakening their immunity and thus being greatly affected by the virus[Castro:2020,564]. Therefore, the deaths from the virus were the largest among the age group (66-98) years compared to the rest of the other groups, and the age group (1-10) years was The age group had the lowest mortality rate[Paules et al:2020,20].

Conclusion

Immunity differs from person acquired, which arises by receiving the Covid-19 vaccine, is the best to confront the virus and prevent infection, while natural (inherited) immunity varies from person to person according to the nature and age of the person and is stronger in the younger age groups, as is the case when children.

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