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(Research Article)

Impact of COVID-19 vaccines on lipid profiles and Thrombosis development, in Babylon province

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Abstract

The COVID-19 pandemic on public health in general, and specifically in Babylon Governorate, Iraq. The study indicates that vaccines emerged at a crucial time in combating the pandemic and limiting its global spread.

This study was conducted with 107 participants from various age groups and regions in Babylon Governorate. It aimed to study individuals' opinions and attitudes toward COVID-19 vaccines, assess their knowledge and level of trust in them, and identify factors influencing their acceptance of different vaccine types. Lipid prolife level was measured in individuals with thrombosis. The vaccine played a crucial role in reducing infection and mortality rates within a short period.

Patients were divided into two groups based on their thrombosis status and vaccination status (n=26), and their non-thrombosis status and vaccination status (n=59). Unvaccinated individuals were excluded from the study. A comparison of lipid profile test results revealed differences in lipid levels, a key factor contributing to vaccine-associated thrombosis. This study showed a decrease in high-density lipoprotein cholesterol (HDL-C), which is associated with lipid disorders, including mixed lipid disorders, in COVID-19 vaccinates who developed thrombosis after vaccination. Elevated levels of atherosclerotic lipids were also found to be a contributing factor to atherosclerosis, as observed in the outcomes of these patients compared to COVID-19 vaccinates without thrombosis complications.

Based on these findings, we recommend strengthening public health efforts by conducting further studies on vaccine safety, given the record time required for vaccine development and distribution. We also recommend raising global awareness of the importance of vaccines and completing more relevant studies. Their future adoption will be encouraged to help control the pandemic or in the event of future outbreaks.

Keywords: Thrombosis; COVID-19; Lipid profile; Babylon province

1. Introduction

In recent years, the world has witnessed an unprecedented pandemic, the outbreak of the novel coronavirus (COVID-19), which has caused significant losses across all fronts, including health, economic, and social. The severe acute respiratory syndrome coronavirus[1] (SARS-CoV-2) emerged in late 2019 and rapidly escalated into a global pandemic. This is due to its primary transmission methods, including respiratory droplets and the potential for spread by asymptomatic individuals, which pose significant challenges to limiting its spread.

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CoV belongs to a diverse family of RNA viruses, which cause a variety of diseases, from the common cold to more severe illnesses in more advanced cases, such as Middle East Respiratory Syndrome (MERS-CoV) and severe acute respiratory syndrome (SARS-CoV)[1, 2]. The new coronavirus strain, which was identified in December 2019, emerged in Wuhan, Hubei Province, China. It was named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by the International Committee on Taxonomy of Viruses (ICTV). The World Health Organization (WHO) previously declared the disease associated with SARS-CoV-2 infection "COVID-19." Following the emergence of the 2019 novel coronavirus, the virus spread rapidly from China to more than 200 other countries[3].

Coronaviruses are very small, delicate, single-stranded RNA viruses ranging in size from 60 to 140 nanometers. Their outer surface is composed of spiked, crown-like, pentapeptide projections that appear when viewed under an electron microscope[4]. Previously, mutated coronaviruses were believed to be transmitted only between animals, with bats being the most common animal hosts[2]. In 2012, a highly pathogenic strain of the coronavirus (MERS-CoV) emerged in Saudi Arabia, originating from bats and camels as intermediate hosts. It caused an epidemic in the Middle East[5]. It reappeared again, more virulent than the previous time and spreading more rapidly in December 2019, this time from the Huanan Seafood Market in Wuhan, China. Unknown pneumonia emerged with unknown symptoms, and its rapid spread claimed the lives of many people. The outbreak resulted in more than 70,000 infections and 1,800 deaths in the first 50 days[6, 7]. Symptoms associated with COVID-19 range from mild to severe, with the most common symptoms being fever (99%), fatigue (70%), dry cough (59%), loss of appetite (40%), muscle and body aches (35%), shortness of breath (31%), and phlegm (27%)[8]. However, some individuals infected with the virus are asymptomatic, and the infection can progress and lead to clinical abnormalities, even in newborns[9], [10]. For example, in a study of 24 asymptomatic individuals with the virus who all underwent chest computed tomography (CT), 50% of those infected had typical ground-glass opacities or macular shadows, and 20% had atypical imaging abnormalities[11]. The outbreak of the coronavirus pandemic in Iraq began on February 24, 2020. The first case was recorded in Najaf Governorate, involving an Iranian religious student studying in Najaf who tested positive for the coronavirus. Subsequently, several additional cases were discovered in several Iraqi governorates. Consequently, the virus was first introduced from Iran. After Najaf, Baghdad, and Kirkuk, the sequence of infections in the Iraqi governorates was Babil and Sulaymaniyah, followed by Maysan, Karbala, Wasit, Erbil, Anbar, Dhi Qar, Diyala, Basra, Nineveh, Dohuk, Salah al-Din, and then other governorates[12]. Amid the rapid spread of the virus, numerous preventive measures were taken by the World Health Organization to limit the spread of the virus. These measures included education, isolation, prevention, control of transmission, and treatment of infected individuals. These steps were crucial in controlling the disease and limiting the spread of COVID-19[13]. Extensive scientific and research efforts have led to the development of several effective and safe vaccines in record time to control the pandemic and reduce infections and deaths[14]. However, some doubts about the public acceptance of these vaccines remain a major challenge due to the timeframe in which the vaccine was approved and the manufacturing method[15]. There have been many divergent opinions and attitudes towards vaccination, which has led some to hesitate to receive them for fear of potential side effects[16].

The aim of this study to association and compares between thrombosis and non-thrombosis complications according to lipid profile test following the mRNA COVID-19 vaccine, At Babylon province.

2. Methods and Experimental

2.1. A Survey of COVID-19 Vaccines:

This pandemic has caused massive losses across all aspects of life: health, economics, and society. In this context, many vaccines have emerged as one of the most important tools for combating and mitigating the pandemic. However, public acceptance of these vaccines remains a major challenge. Attitudes and opinions toward vaccines have varied, leading some to be hesitant to receive them.

This research aims to survey COVID-19 vaccines by collecting the opinions and attitudes of a group of individuals in a specific region. The study addresses several key aspects, including:

- The extent of individuals' knowledge of COVID-19 vaccines.
- The degree of their confidence and attitudes toward vaccines.
- The health factors that influence their decision to receive the vaccine.
- The impact of vaccines on their health over time.

Through this study, we seek to gain a deeper understanding of public attitudes toward COVID-19 vaccines and their impact on public health. We hope the results will guide health and media efforts to raise awareness of the importance of vaccines and encourage their adoption in the event of a pandemic or similar disease. This will contribute to controlling the pandemic and protecting society from health risks.

2.2. Methodology

A mixed methodology was used to collect data on the impact of vaccines administered to citizens in the selected area. This methodology combined paper and electronic questionnaires, as well as blood samples drawn from individuals whose health status had changed for analysis. The questionnaire was designed to collect comprehensive information about participants' experiences with vaccines, including:

- Type of vaccine administered.
- Number of doses received.
- Side effects experienced after vaccination.
- Assessment of participants' overall vaccination experience.
- Demographic information of participants (age, gender, etc.).

Questionnaires were distributed in various locations in Babil Governorate, focusing on citizens who frequently visit crowded and public places, such as health centers and public institutions. The study included 107 citizens aged 12 and over. Data was collected over at least two months.

2.3. Ethical approval

This research was conducted in compliance with approved ethical standards, having received the approval of the Veterinary Ethics Committee and the approval of the Institutional Animal Ethics Council at Al-Qasim Green University under Resolution No. **533FD2**.

3. Result and discussion

to evaluate the efficacy and safety of COVID-19 vaccines among citizens in Babylon Governorate over a specific period. Data from 107 participants of different age groups distributed throughout Babylon Governorate were analyzed. Those who were uninfected and unvaccinated were excluded, while 85 vaccinated individuals were included and divided into two groups: those with thrombosis disorders who were vaccinated, and those non-thrombosis disorders who were vaccinated. Lipid profile test was performed on those with thrombosis disorders, and the results were compared to normal levels.

3.1. Gender Distribution of Participants

The study achieved an excellent gender balance, with males representing 50.5% (54 participants) and females representing 49.5% (53 participants) of the total sample. As shown in Figure 1, this balanced distribution enhances the reliability and validity of the results. This gender balance also demonstrates the absence of bias in participant selection, lending credibility to the study's findings. This distribution also contributes to a comprehensive understanding of participants' attitudes and opinions toward the study topic.

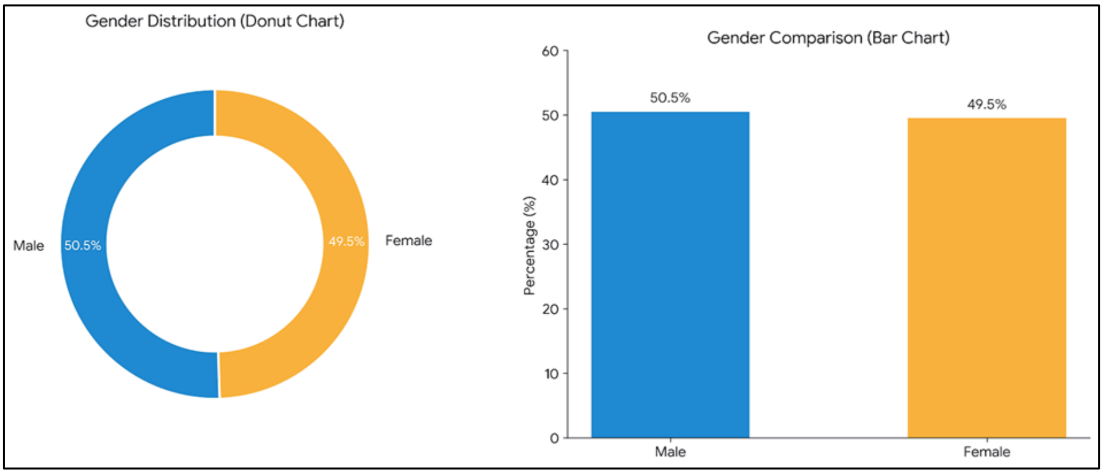

Figure 1 Shows the gender distribution of participants

3.2. Age Distribution

The age groups were divided into four main categories: the 36-55 age group, the largest, representing 36.45% (39 participants), followed by the 12-18 age group, representing 32.7% (35 participants), the 19-35 age group, representing 24.8% (27 participants), and the ≥56 age group, representing 5.5% (6 participants), as shown in Figure 2. The results showed an age diversity among the participants, reflecting an excellent diversity of ages and providing comprehensive and diverse results on the response of age groups to vaccination.

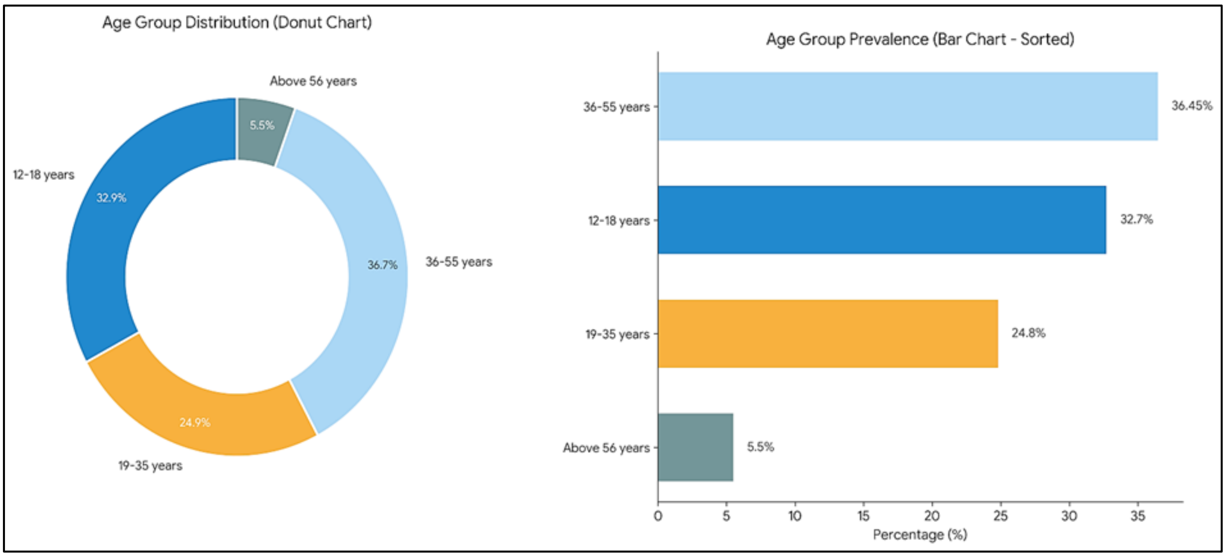

Figure 2 The figure shows the age distribution percentages of participants

3.3. Geographical Distribution of Participants

We note that most of the participants were concentrated in the central region of Babil Governorate, where they constituted 66.36% (71 participants). In comparison, the southern region constituted 31.78% (34 participants), and the northern region 1.87% (2 participants), as shown in Figure 3. This demonstrates that the distribution reflects the high population density in the central region and the ease of access to health services in the governorate center.

This concentration indicates several factors, such as high access to health services or population density. The low number of respondents in the northern regions highlights potential areas where health awareness is low or where reaching participants is difficult.

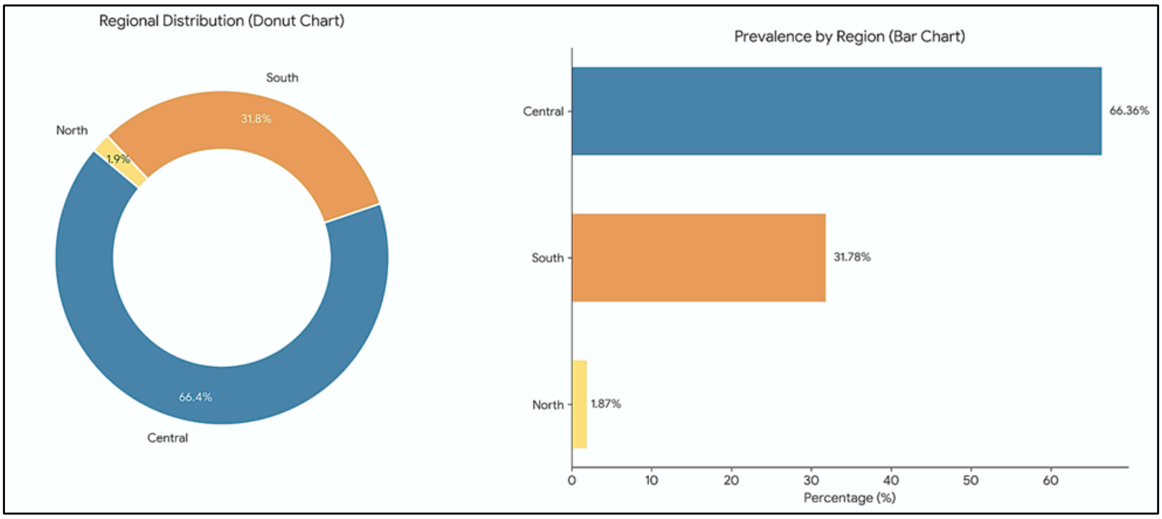

Figure 3 The geographical distribution of participants

3.4. Pre-existing chronic diseases before COVID-19

Figure 4 shows the prevalence of chronic diseases among participants before receiving the vaccine. 53.2% (58 participants) had diabetes, 24.8% (27 participants) had hypertension, and 15.6% (17 participants) had other conditions.

These high rates of chronic diseases underscore the importance of the COVID-19 vaccine for these at-risk groups. The presence of these more prevalent chronic diseases, such as diabetes and hypertension, is no less dangerous than pre-existing conditions. Therefore, these groups should be vaccinated to prevent these conditions from developing into serious, difficult-to-treat conditions if they contract COVID-19.

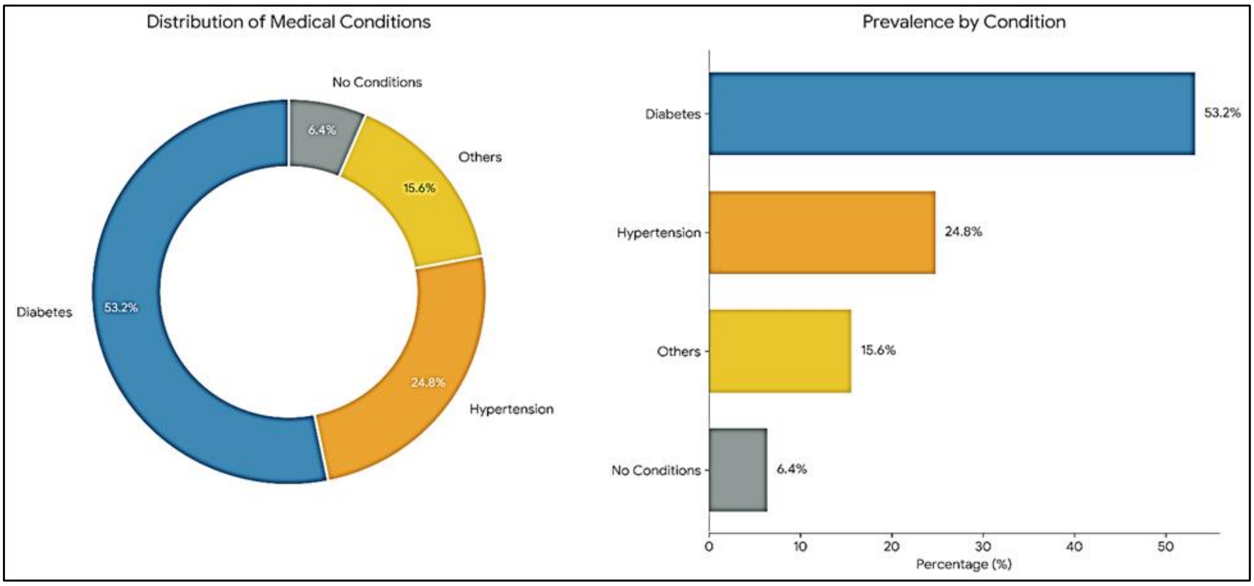

Figure 4 Chronic diseases suffered by participants before COVID-19

3.5. COVID-19 Infection Before Vaccination

Before the advent of vaccines, people relied primarily on certain medications prescribed by doctors to control symptoms only. It was recorded that 52.3% (56 participants) of participants had been infected with COVID-19 before the advent of vaccines, while 47.7% (51 participants) had not been infected, as shown in Figure 5.

This very large percentage confirms that many people were exposed to the COVID-19 within the community and indicates rapid community transmission and the potential for infection of others who were not infected.

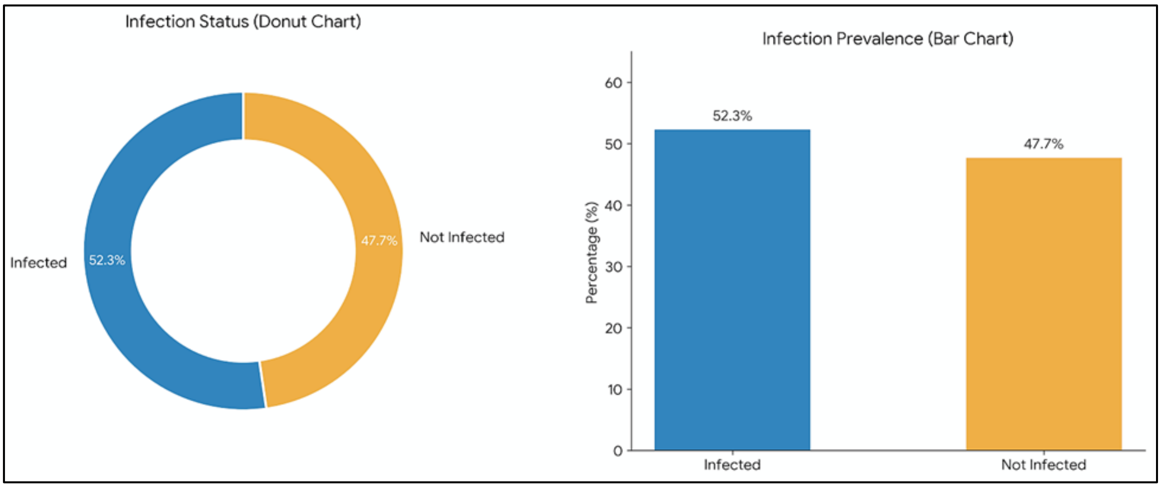

Figure 5 The percentage of people infected with COVID-19 before receiving the vaccine

3.6. COVID-19 Vaccination Status

After the vaccines were officially approved shortly after, they achieved record success in combating and mitigating the spread of the pandemic. The vaccination rate was high, reaching 79.44% (85 participants), while 20.56% (22 participants) were not vaccinated. This indicates high vaccination participation and good acceptance of the vaccines by the community, as shown in Figure 6. This participation indicates good acceptance of the vaccines in reducing the risk of infections that affect public health. However, a significant percentage of people still need to receive the vaccines to eliminate infections and significantly reduce them to save lives.

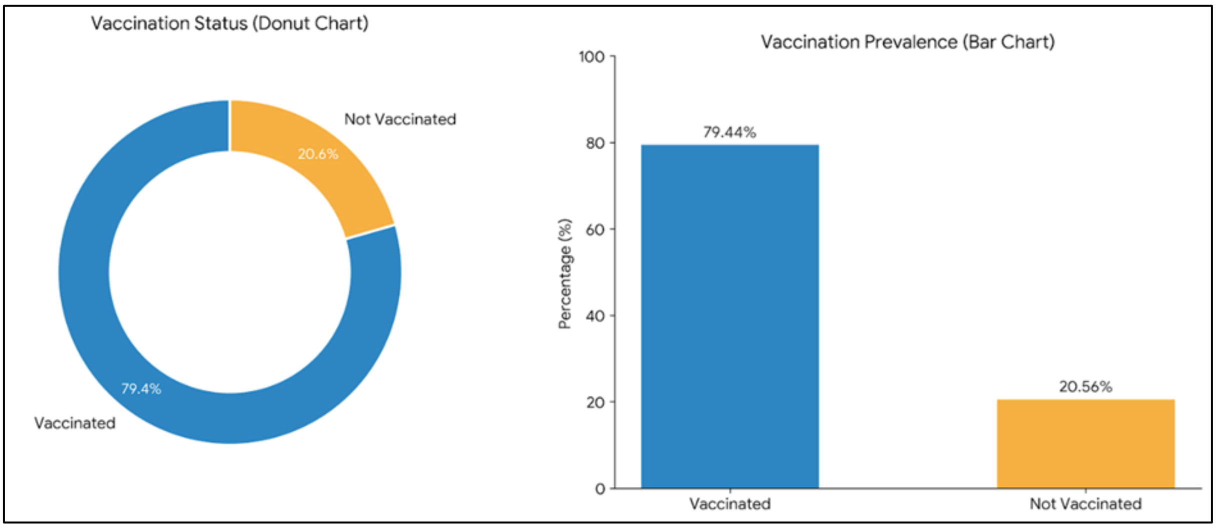

Figure 6 The COVID-19 vaccination rate

3.7. COVID-19 Infection After Vaccination

After the vaccines were officially approved by the World Health Organization and the community's high turnout for vaccination, good results were achieved compared to before the vaccines were approved. The infection rate recorded was 17.65% (15 participants) among those vaccinated, while 82.35% (70 participants) were free of the COVID-19 after vaccination, as shown in Figure 7.

This rate falls within the expected range and is consistent with international studies showing that vaccines are effective but do not provide 100% protection[17]. This evidence suggests that COVID-19 vaccines are highly effective, as shown by the results on participants. We note the low rate of infection after vaccination. However, 17.65% of those who contracted the COVID-19 may have contracted a breakthrough infection, highlighting the importance of ongoing health measures.

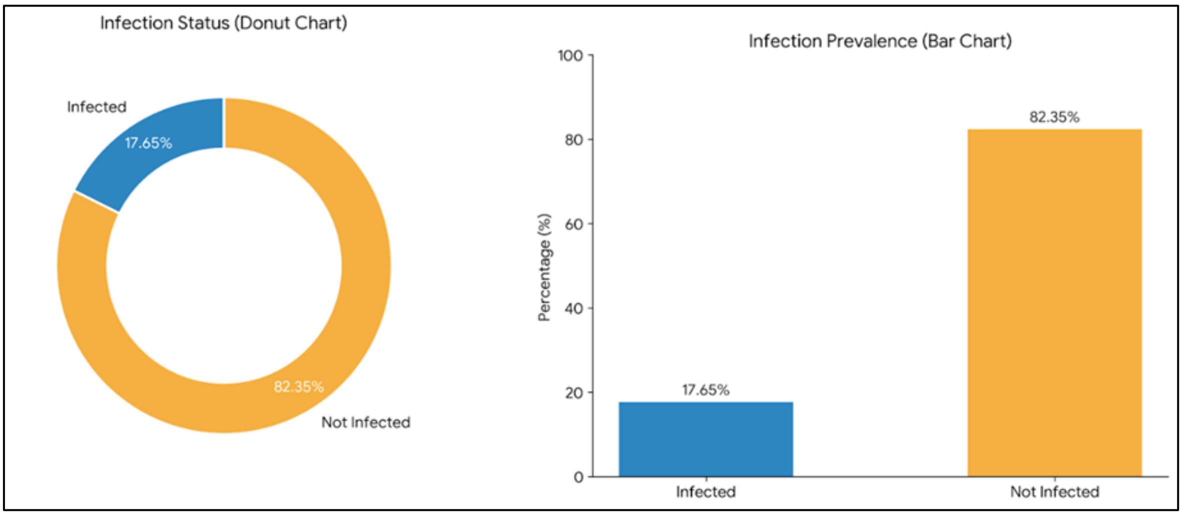

Figure 7 The incidence of COVID-19 after vaccination

3.8. Types of vaccines used among participants.

Figure 8 shows the types of vaccines used for vaccination among participants, distributed as follows: Pfizer 36.45% (39 participants), AstraZeneca 18.69% (20 participants), and Sputnik V 9.35% (10 participants), while Sinopharm 14.95% (16 participants), and 20.56% (22 participants) did not receive any vaccine.

We note that Pfizer dominates the largest percentage, which may indicate the ease of access to this type or its availability by the local government in Babylon. The strong campaigns and citizens' demand for the vaccine, compared to the unvaccinated, also indicate this.

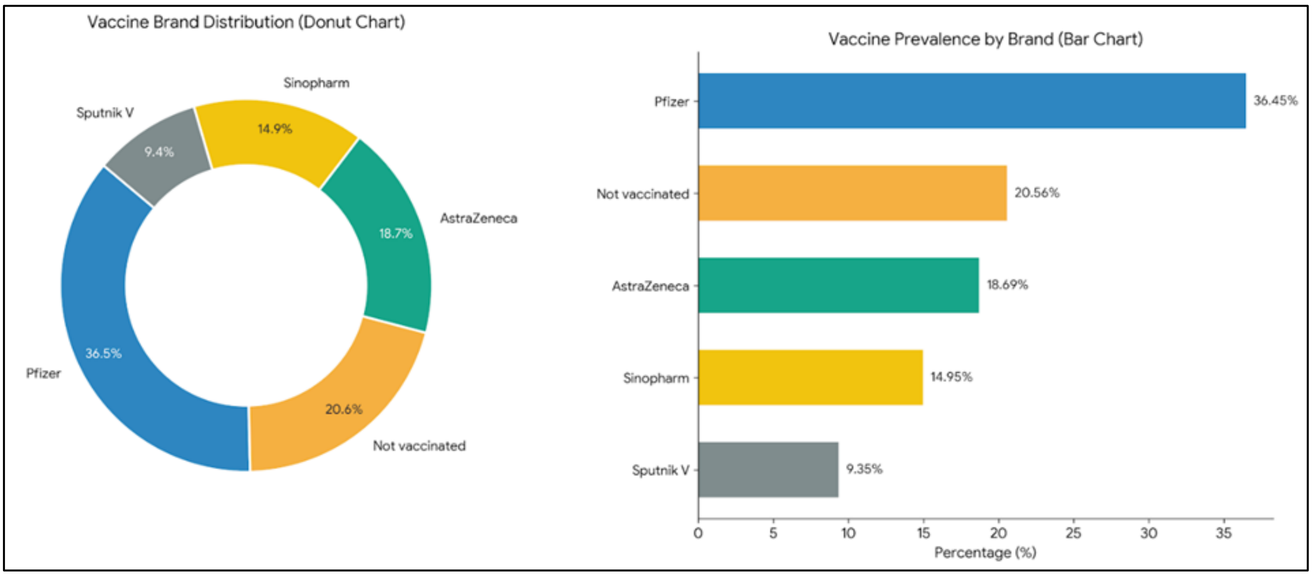

Figure 8 The types of vaccines and the number of people vaccinated with each vaccine

3.9. Symptoms after COVID-19 Vaccination

After vaccination, some vaccinated people experienced mild to moderate symptoms. The following is a breakdown of the results: Symptoms after the first dose: 18.3% of participants experienced symptoms after receiving the first dose of the COVID-19 vaccine. These symptoms may be a result of the body's natural immune response as it begins to build immunity against the virus.

The percentage of symptoms after the second dose was 7.4%. Some participants experienced symptoms after the second dose. These are mild side effects that occur after vaccination, confirming the immune response that results from these symptoms.

The percentage of symptoms after the third dose: 0%, with no signs of symptoms after receiving the third dose. This may indicate that the additional third doses were beneficial in some way or that the participating group experienced fewer and less noticeable side effects.

3.10. Development of Type 1 Diabetes in Participants with Type 2 Diabetes

In this study, which included 107 participants, 20.56% of the participants were excluded previously because they had not received the vaccine.

The proportion of people who developed the disease was 11%, representing 8 people. Individuals with type 2 diabetes can progress to type 1 diabetes, and this was the case for 14 participants with type 2 diabetes, representing more than half of the participants. This may indicate a misunderstanding of the differences between the two types of diabetes, given their different pathophysiology.

3.11. Thrombosis Group vs. Non-Thrombosis COVID-19 Patients.

A comparison of lipid levels between COVID-19 patients with and without thrombosis. This study includes both lipid profile tests and a discussion of whether they represent a thrombotic factor in COVID-19 patients or are incidental findings. Previous studies have shown that lipid abnormalities are an important marker for thrombotic events and predict them in various clinical contexts[18]. The comparison included a group of COVID-19 patients with thrombosis/hypertension (n=26) and a group of patients without thrombosis (n=59) from the original cohort.

This is shown in Table 1 below. The lipid levels between COVID-19 patients with and without thrombotic complications show significant differences in the lipid profile tests performed on patients with thrombosis. Elevated levels of total cholesterol, triglycerides, and low-density lipoprotein (LDL) cholesterol were observed, while decreased levels of high-density lipoprotein (HDL) cholesterol were observed when compared to the group without thrombosis. The greatest effect was observed for high-density lipoprotein cholesterol (HDL-C) levels (Cohen's coefficient d = 0.95), suggesting that a decrease in HDL-C levels may be associated with a risk of thrombosis. The decrease in HDL-C was 3.56 times greater than in the thrombosis groups (p = 0.008). Furthermore, mixed dyslipidemia was 3.33 times more common (p = 0.011). These findings support the hypothesis that dyslipidemia, particularly the decrease in HDL-C levels, leads to an increased susceptibility to thrombosis in COVID-19 patients, which is consistent with the reports of [19], who demonstrated that a decrease in HDL-C levels predicts severe outcomes from COVID-19[20].

Table 1 Lipid Profile Comparison: Thrombosis vs. Non-Thrombosis COVID-19 Groups.

Parameter	**Thrombosis/HTN (n=26) Mean ± SD**	**No Thrombosis (n=59) Mean ± SD**	**p-value**
TC (mg/dL)	192.89 ± 22.73	178.45 ± 28.67	0.018*
TG (mg/dL)	152.82 ± 80.54	124.56 ± 65.23	0.043*
HDL-C (mg/dL)	41.00 ± 6.33	48.67 ± 9.45	<0.001*
LDL-C (mg/dL)	121.33 ± 19.32	108.45 ± 22.67	0.012*
VLDL-C (mg/dL)	30.56 ± 16.11	24.91 ± 13.05	0.078

4. Conclusion

This study aimed to evaluate the efficacy and safety of COVID-19 vaccines among residents of Babylon Governorate over a specific period. Data from 107 participants of various age groups distributed throughout Babylon Governorate were analyzed. The uninfected and unvaccinated individuals were excluded, while the vaccinated participants, numbering 85, were divided into two groups: those with thrombosis who were vaccinated, and those without thrombosis who were vaccinated. Lipid profile tests were performed on those with thrombosis, and the results were compared to normal levels.

The results of this study showed a decrease in high-density lipoprotein cholesterol (HDL-C), which leads to lipid disorders, including mixed lipid disorders, among COVID-19 vaccinated individuals who experienced thrombosis after vaccination. Elevated levels of lipids that contribute to atherosclerosis were found to be a contributing factor to atherosclerosis, as observed in the outcomes of patients with thrombosis compared to COVID-19 vaccinated individuals without thrombosis complications. Lipid disorders may be a major contributing factor to the increased incidence of thrombosis. Other factors include age, which is an independent predictor of lipid abnormalities, and the difference in sex and high-density lipoprotein cholesterol (HDL-C) levels, which were more pronounced in males than in females, may partially explain the variation.

These findings support a comprehensive assessment of lipid profiles and cardiovascular risk stratification in COVID-19 patients, particularly those with additional risk factors for stroke. Prospective controlled studies are needed to establish causal relationships and evaluate the potential for modifying lipid levels to prevent stroke in this patient population.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

If studies involve use of animal/human subject, authors must give appropriate statement of ethical approval. If not applicable, then mention 'The present research work does not contain any studies performed on animals/humans subjects by any of the authors'.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] "Richman, D. D., Whitley, R. J., & Hayden, F. G. (2016). Virology. ASM Press.".

[2] Yin, Y., & Wunderink, R. G. (2018). MERS, SARS and other coronaviruses as causes of pneumonia. Respirology, 23(2), 130–137.".

[3] "Lai, C. C., Shih, T. P., Ko, W. C., Tang, H. J., & Hsueh, P. R. (2020). Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. International journal of antimicrobial agents, 55(3), 105924.".

[4] Richman, D. D., Whitley, R. J., & Hayden, F. G. (2016). Virology. ASM Press.".

[5] Wang, N., Shi, X., Jiang, L., et al. (2013). Structure of MERS-CoV spike receptor-binding domain complexed with human receptor DPP4. Cell Research, 23, 986.".

[6] "Tallarico, M., Cicciù, M., Lumbau, A. I., & Meloni, S. M. (2020). Coronavirus Disease 2019 Coexistence in the Daily Practice. European Journal of Dentistry, 14(S 01), S171-S176.".

[7] "Hong, K. H., Lee, S. W., Kim, T. S., Huh, H. J., Lee, J., Kim, S. Y., ... & Yoo, C. K. (2020). Guidelines for laboratory diagnosis of coronavirus disease 2019 (COVID-19) in Korea. Annals of laboratory medicine, 40(5), 351-360.".

[8] Jackson, C. B., Farzan, M., Chen, B., & Choe, H. (2022). Mechanisms of SARS-CoV-2 entry into cells. Nature Reviews Molecular Cell Biology, 23, 3–20.".

[9] "23. Hu, Z., Song, C., Xu, C., et al. (2020). Clinical characteristics of asymptomatic infections with COVID-19 screened among close contacts in Nanjing, China. Science China Life Sciences.".

[10] "20. Liu, Y. C., Liao, C. H., Chang, C. F., et al. (2020). A locally transmitted case of SARS-CoV-2 infection in Taiwan. New England Journal of Medicine.".

[11] "24. Guan, W. J., Ni, Z. Y., Hu, Y., et al. (2020). Clinical characteristics of coronavirus disease 2019 in China. New England Journal of Medicine.".

[12] "31. Beigel, J. H., et al. (2020). Remdesivir for the treatment of COVID-19 — Final report. New England Journal of Medicine.".

[13] "RECOVERY Collaborative Group. (2021). Dexamethasone in hospitalized patients with Covid-19. New England journal of medicine, 384(8), 693-704.".

[14] "Callaway, E. (2020). The race for coronavirus vaccines.".

[15] "World Health Organization. (2022). Implementation guide for vaccination of health workers. World Health Organization.".

[16] "Milionis, C., Ilias, I., Tselebis, A., & Pachi, A. (2023). Psychological and social aspects of vaccination hesitancy—implications for travel medicine in the aftermath of the COVID-19 crisis: A narrative review. Medicina, 59(10), 1744.".

[17] K. Tentori, A. Passerini, B. Timberlake, and S. Pighin, "The misunderstanding of vaccine efficacy," *Soc. Sci. Med.*, vol. 289, p. 114273, 2021.

[18] S. P. Jackson, W. S. Nesbitt, and E. Westein, "Dynamics of platelet thrombus formation," *J. Thromb. Haemost.*, vol. 7, pp. 17–20, Jul. 2009, doi: 10.1111/j.1538-7836.2009.03401.x.

[19] J. Mohammadshahi, H. Ghobadi, G. Matinfar, M. H. Boskabady, and M. R. Aslani, "Role of Lipid Profile and Its Relative Ratios (Cholesterol/HDL-C, Triglyceride/HDL-C, LDL-C/HDL-C, WBC/HDL-C, and FBG/HDL-C) on

Admission Predicts In-Hospital Mortality COVID-19," *J. Lipids*, vol. 2023, pp. 1–10, Mar. 2023, doi: 10.1155/2023/6329873.

[20] J. Fan *et al.*, "Low-density lipoprotein is a potential predictor of poor prognosis in patients with coronavirus disease 2019," *Metabolism*, vol. 107, p. 154243, 2020.