

The effectiveness of the Covid 19 vaccine in reducing infection in Dongola city, Northern State, Sudan

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KEYWORDS

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ABSTRACT:

Introduction: Coronavirus disease (COVID-19) caused by the SARS-CoV-2 virus is a communicable disease spread throughout the world after its first appearance in the Chinese city of Wuhan in 2019.

Objectives: The objective of this study was to evaluate the effectiveness of COVID-19 vaccines against infection and controlling the disease.

Methods: This cross-sectional study community based was conducted in Dongola city.

Sample size of 800 were randomly selected, from the city population, data were collected using validated questionnaires and it was analyzed using both the Microsoft Excel program and the statistical package of the Social Sciences program (SSPS).

Results: The study showed that there was a significant association between infection with Covid-19 and age, increases among the middle age groups by 61% and decreases among the elder group by 2%. Significant association found between infection with Covid-19 and the type of work, the infection increases among the health sector by 33% compared with workers of other sectors, and this can directly associate with the level of exposure of individuals and sources of infection. Vaccination coverage showed significant association with age, as the coverage increases among the middle age groups by 70% and decreases among the others due to the accessibility of vaccination.

Conclusions: Based on the research findings its recommended to increase vaccination coverage among elderly individuals and workers in the administrative field and self-employment, raising health awareness about the importance of the vaccine, clarifying the importance of personal protective methods in reducing the spread of the disease among the population.

1. Introduction

The global epidemic known as the Covid-19 pandemic, or the Corona virus pandemic, is brought on by SARS-Cove-2. In Wuhan, China, a new coronavirus was discovered in 2019. This virus is a novel strain that has never been found in humans before. [1]. the illness connected to acute severe respiratory syndrome the disease's first outbreak in early December 2019 in Wuhan, a Chinese city. On January 30, the World Health Organization formally declared the virus outbreak a public health emergency of international concern. On March 11, the organization confirmed that the outbreak had become a pandemic. Trials 1 and 2 of the Sinopharm vaccination were finished in August 2020, and the results demonstrated that there was a low incidence of adverse reactions and a COVID-19 neutralizing antibody response following vaccination. Since the COVID-19 pandemic is still present, it is imperative that the majority of people receive vaccinations. Vaccinating people to boost their herd immunity has become a crucial strategy for controlling the pandemic, though high vaccination uptake is not guaranteed [2]. Furthermore, communities' actual acceptance of the COVID-19 vaccination and related variables are still unknown, making it difficult for them to develop herd immunity against the pandemic. For many years, vaccinations have played a major role in keeping infectious diseases under control. They have helped prevent the spread of diseases like polio, rubella, mumps, and others. [3] (SRPC.org, 2021). Immunizations have been a key component in the long-term management of infectious diseases. They have contributed to the containment of illnesses like mumps, rubella, polio, and others. (SRPC.org, 2021) [3]. The first mass Covid-19 vaccination program began in early December 2020 after 4 types of Covid-19 vaccines have been approved worldwide so far under emergency use to cope with the Covid-19 pandemic (WHO, 2020). [4]

Parents' Attitudes, Aedh AI, (2022). A key component of public health initiatives to lessen the severe effects of the COVID-19 pandemic on both health and non-health outcomes is vaccination. Vaccinating against COVID-19 is essential for managing the pandemic. [5] Regarding the effectiveness of the vaccine and its possible side effects, there has been a great deal of concern ever since the mass vaccination campaign against COVID-19 began. K. Mirnia (2024), Even though widespread COVID-19 vaccination coverage is necessary, vaccine hesitancy remains a significant obstacle. [6] Findings: Global vaccination efforts were halted due to widespread concern over potential side effects of the vaccine Alharbi HS (2023). Numerous studies have demonstrated that people's perceptions and behavior can be influenced by the framing and communication of medical risks. However, there is a paucity of information regarding how the communication of COVID-19 vaccine side-effect risks influences vaccination intentions The Centers for Disease Control and Prevention (CDC) report that redness, swelling, fatigue, headache, muscle aches, chills, fever, and nausea were the most common side effects. There were also some reports of women experiencing irregular menstruation, chest pain, and breathing problems (source 27). The Covid-19 vaccine caused a range of adverse reactions, from mild to moderate to severe in certain instances. [7] (CDC, 2021). There have also been reports of other uncommon side effects, such as vesicolous-bullous skin, acute kidney injury, nephrotic syndrome, and reactivation of varicella or herpes simplex. However, the BNT162b2 and ChAdOx1 vaccines are linked to serious side effects such as thrombocytopenia and intravascular thrombosis. [8] (Alghamdi, 2021). A summary of the common to uncommon adverse consequences of giving COVID-19 vaccinations in a Middle Eastern population is given by Murished GM, Dandachi I, and Aljabr W. in 2023. The most frequently

reported side effects included injection site pain, fever, headaches, exhaustion, and muscle soreness. Those with underlying comorbidities may be more vulnerable to side effects following vaccination, especially if they have known allergies or suffer from conditions like diabetes or cancer. [9] According to Mirnia K. (2024), After the first dose of the vaccine, the most common side effects (presented in more than 50% of the study participants) were injection site pain (61.7%), myalgia (51.8%), and muscle pain (50.9%). Following the second vaccination dose, myalgia (15.8%), chills (9.2%), fever (10.3%), headache (9.9%), and injection site pain (26.8%). were the most common side effects reported. In conclusion, different side effects may arise after receiving the first and second doses of the COVID-19 vaccine, depending on the type of vaccine. These results help to address the persistent issue of vaccination hesitancy, which has been caused by a generalized concern about the safety profile of vaccines. Twenty-961 mucus samples from patients with confirmed Covid-19 infection were included in the study. Of these, 1381 were vaccinated, and 19580 were not. Of these, 7240 (34.5%) had confirmed Covid-19 infection. The rate of infection among unvaccinated contacts was 35.6%, higher than that of contacts who received one dose of the vaccine (22.8%) and two doses (12.1%). [10] . The observation of mild to moderate post vaccination signs and symptoms led to the conclusion that the vaccines from Pfizer, AstraZeneca, and Sinopharm were safe. After the first and second doses, respectively, Comparing the Sinopharm vaccine to the Pfizer and AstraZeneca vaccines, the Sinopharm vaccine showed a lower frequency of side effects. Gender or age did not significantly affect the duration or severity of the adverse effect. One should keep a close eye on any unusual side effects to determine whether or not the vaccination is to blame. [8]. Maria Elena Flacco's research and a group of researchers revealed that every participant who was older than eighteen and living in the Italian province of Pescara on January 1, 2021. The results were: biologically-confirmed COVID-19 disease (diagnosed by a specialist physician and requiring hospital admission); SARS-CoV-2 infection (detected by RT-PCR, or reverse transcription polymerase chain reaction, tested through nasopharyngeal swabs by the accredited laboratories of the Local Health Unit of Pescara); and COVID-19-related hospital death.. The exposure was the status of COVID-19 vaccination (one, two, or at least one dose versus none). The study found that following two vaccination doses, the risk of infection dropped by 98% and by 55% to 95 [10]. Aedh AI. Attitudes of Parents, (2022) concluded that the ongoing immunization campaign may not be as successful if parents are reluctant to get the COVID-19 vaccine at a significant rate. Parents were 9.5 times less likely to vaccinate their children against COVID-19 and 72.2% of them expressed vaccine hesitancy. In comparison to 15.51% of parents who had no interest in vaccinating their children, roughly 27.8% of parents said they were ready to get the COVID-19 vaccine as soon as possible. Parents who were over 41 (37.79%), under 25 (34.48%), non-Saudi (40.59%), had postgraduate and higher degrees (39.5%), and made more than 10,000 SAR per month (34.96%) demonstrated a notably high willingness to work., worked in government sectors and as healthcare professionals (40.36%), were self-employed (33.33%), had three to five children (35.26%), and were male (31.33%). who have a family member with severe COVID-19 symptoms, who was not vaccinated and experienced severe to moderate symptoms after vaccination, who think COVID-19 is an uncommon disease and does not require vaccination, and who have all of these characteristics demonstrated a significantly higher reluctance to vaccinate their children against COVID-19. Intentions to vaccinate their children were higher among parents who exercise caution and do not think that recent vaccines pose a greater risk. It has been observed that childhood vaccination

requirements have a positive effect on the COVID-19 vaccination. There was a 9.9-fold increase in parents' reluctance to vaccinate their children against COVID-19 when those children had any kind of chronic illness. 47.8% of parents reported having heard or seen campaigns opposing the COVID-19 vaccine. Insufficient safety data, possible long-term repercussions, and vaccination. There was a 9.9-fold increase in parents' reluctance to vaccinate their children against COVID-19 when those children had any kind of chronic illness. 47.8% of parents reported having heard or seen campaigns opposing the COVID-19 vaccine. The primary concerns regarding COVID-19 were the lack of sufficient safety data, possible long-term effects, and vaccine efficacy. After analyzing 27 publications [5], Alharbi HS (2023) discovered that acceptance rates for parental vaccinations varied across the globe. In spite of this, the majority of the studies discovered a similar set of variables influencing parental acceptance and reluctance to the COVID-19 vaccine. The primary sociodemographic variables influencing vaccination decisions were parents' age, educational attainment, race, children's age, and annual household income. The source of information, parents' acceptance of getting vaccinated themselves, the perceived risks and benefits of the COVID-19 vaccine, and prior acceptance of the influenza vaccine were other common factors. Examining parents' willingness to consent to their children receiving the COVID-19 vaccine revealed that the most frequent factor influencing their choice was a lack of knowledge regarding the safety and effectiveness of the vaccine. Despite the fact that there is ample proof of the effectiveness and safety [7]. Study done by Menni C et al. (2022), people with comorbidities and those 55 years of age or older saw a greater decline in vaccine effectiveness. Among those under 55, vaccination effectiveness held steady after five months. Booster shots make vaccines more effective again. Following booster doses, adverse reactions resembled those following the second dose. Comparing homologous and heterologous booster schedules, homologous boosters had fewer systemic side-effect reports (17.9% vs. 13.2%). Age was found to be a significant factor in vaccine hesitancy (Ayyalasomayajula S et al., 2023), with the majority of reports indicating a negative correlation between age and fear of unfavorable vaccination outcomes. According to nine studies, women expressed more reluctance to get vaccinations than men did. Other factors contributing to vaccine hesitancy included a lack of trust in science ($n = 14$), concerns regarding efficacy and safety ($n = 12$), a decline in infection-related fear ($n = 11$), and worry about adverse effects ($n = 8$). Pregnant women, Democrats, and Blacks all exhibited high vaccine hesitancy. Income, obesity, social media, and the population living with vulnerable members are among the few studies that have identified factors influencing vaccine hesitancy. In March 2021, the COVID-19 vaccine was introduced in Sudan; however, due to a number of unfavorable discussions among the populace, its distribution may have been postponed. The purpose of this study was to determine the vaccination coverage and related variables among the people living in Dongla City. Our goals were to look into the efficacy of the COVID-19 primary vaccination series, its decline, and the safety and efficacy of booster doses. This investigation was planned as a cross-sectional, community-based study. Using the contracture questionnaire guidelines, data were gathered through interviews. The Statistical Package for Social Sciences (SPSS) program was utilized to analyze the data, and Chi-square or Fisher's exact test as well as logistic regression were employed to determine whether vaccine acceptance was correlated with other study variables and demographic factors. [11] According to Raja SM, (2022), medical students had a high level of uncertainty regarding the COVID-19 vaccine, at 44.2% ($n = 96$). Those who were hesitant cited safety and effectiveness concerns as their primary motivators. The

acceptance of the vaccine was not found to be associated with any demographic factors. [12]. According to Badi S. et al. (2023), only 10% of the population in Sudan had received their two primary doses of the COVID-19 vaccine by the end of May 2022, despite the country's delayed uptake of the vaccine. 51% of participants had sufficient knowledge about the COVID-19 vaccine. Knowledge of the vaccine is higher among individuals with post-secondary education and those in employment. They came to the conclusion that employment and higher education levels were linked to a rise in roughly half of the participants' adequate vaccination knowledge. However, the majority of research participants had not received the vaccination, and vaccinations are not widely trusted. [13]

2. Objectives

Coronavirus disease (COVID-19) caused by the SARS-CoV-2 virus is a communicable disease spread throughout the world after its first appearance in the Chinese city of Wuhan in 2019. The objective of this study was to evaluate the effectiveness of COVID-19 vaccines against infection and controlling the disease.

3. Methods

This cross-sectional community base study design was conducted in Dongola to evaluate the effectiveness of COVID-19 vaccines against infection and controlling the coverage of the disease. The study began in October 2022 and ended in April 2023. (Johan Wiley 1977) equation was used to select a sample size of 800 were randomly selected from the population of Dongola city (N= 15111). Multistage stratified sampling technique was followed to determine the study units. Data was collected by structured questionnaires, and it was analyzed using both the Microsoft Excel program and the statistical package of the Social Sciences (SPSS) program. The Chi-square test was applied to determine the significance of the association between the study variables (P-value to 95%).

4. Results

The study showed that there was a significant association between infection with Covid-19 and age, increases among the middle age groups by 61% and decreases among the elder group by 2%. Significant association found between infection with Covid-19 and the type of work, the infection increases among the health sector by 33% compared with workers of other sectors, and this can directly associate with the level of exposure of individuals and sources of infection. Vaccination coverage showed significant association with age, as the coverage increases among the middle age groups by 70% and decreases among the others due to the accessibility of vaccination.

5. Discussion

The study's findings showed a significant prevalence of COVID-19 even among those who had received vaccinations in the age range of 31 to 43. This could be because of the activity of this age group, which raises the risk of infection exposure. In comparison to other age groups, this group is representative of the labor force and includes teachers, freelancers in the marketplace, workers in the administrative and health sectors, and people with high levels of social activity, all of which may raise their risk of contracting the Covid-19 virus. The aforementioned finding was comparable to the one published by Xinhua Yu in 2020, confirming that the degree of group activity was associated with Covid-19 infection. The findings of the (Xinhua Yu 2020) study demonstrated that the rates of infection varied by age group, with the highest rates occurring among those aged 31–43, 44–57, 18–30, 57–70, and over 70.. The importance of this correlation between age and infection can be used to control the least incidence of the disease by

targeting the age group 31-44 by vaccination, activity restriction, and other prevention methods.

The study showed that the infection rates are related to the type of work, where the infection rates are higher among workers in the health sector, followed by teachers and university students, then administrators, and the lowest percentage among self-employed, which indicates that the association between infection and the type of work is directly proportional to the degree of contact between individuals, where we find that workers in the health sector, they are the most individuals in contact with the infected peoples, so the percentage of infection increases among them. Compared to administrators, who only interact with their coworkers, the high level of mixing between people in this category in classrooms and residential complexes between students and teachers as well as with their families may be the cause of this. This relationship suggests that the rate of infection rises with the rate of contact between people in offices and free businesses where contact is restricted to those who work there. These findings were consistent with numerous reports from the World Health Organization (WHO) (2020), which based its decision to implement curfews and social distancing measures to slow the spread of the Covid-19 disease.

According to the World Health Organization, which implemented curfews and social segregation policies to slow the spread of the disease, this relationship shows that the rate of infection rises as the rate of contact between people increases. Coverage with the Covid-19 vaccine reached more than two-thirds of the participants, and it may be due to the vaccination strategy used, in addition to that, which started providing vaccines in centers and institutions and running mobile vaccination campaigns that targeted homes. Vaccine coverage has increased in this age group 31-43 May their ability to reach vaccination centers, in addition to targeting government institutions, labor gatherings and markets, be a reason for this rise, as they represent the working class, and were the results obtained similar to the results of the study he conducted (Mark. A. Katz 2022) to a great extent. This result is also like the result you get (Mark. A. Katz 2022) The study indicated that there is a relationship between age and vaccination coverage, and the results showed that the rate of vaccination coverage is directly proportional to the ability of the group to access vaccines.

High coverage rates among workers in the health and administrative sectors, the same as what you get (Mark. A.katz 2022) In his study, this increase may be due to their good knowledge about the importance of vaccination and the seriousness of the disease, in addition to the vaccination strategy that targeted workers in the health sector first to protect them and the role of administrative institutions in providing vaccine doses for their workers.

The high coverage of vaccines at the university and post-university educational level may be due to the fact that they represent workers in the health and administrative sectors which can be associated to their health awareness.

The availability and easy access of vaccines to protect against disease infection contributed and encouraging about quarter of the Dongola population to take the vaccine.

The percentage of abstention from vaccination due to fear of the side effects of vaccines increased to more than two-thirds. The effect of rumors about these vaccines, such as sudden death, blood clots and infertility, were the main reasons for behind refusing to take the vaccine. The former, results were near to the conducted by (Chandramani singh, 2021).

More than half of the participants who vaccinated with the Covid-19 vaccine were had side effects from the vaccines, and this result is higher than the result you mentioned (Qutaiba A 2021) Environmental conditions and population characteristics may have an impact on this result. , and this result also found with a slight difference with a study conducted by (Xinhua Yu 2020) who revealed that the environmental difference, the nature of work, and the activity of the population also may be a reason for this difference. Johnson's vaccine showed a high incidence of side effects, and this may be due to the fact that Johnson's vaccine was a single dose instead of two doses, unlike other vaccines, and Snowpharm's vaccine showed a low incidence of side effects. This is similar to the study you conducted (Balsam Qubais, 2021) And the composition of the Snowpharm vaccine could have an effect on the emergence of side effects.

The infection rate of Covid-19 decreased after full vaccination compared to partial vaccination, and the infection rate decreased in partial vaccination compared to non-vaccinated people, and this may be due to the high rate of protection after completing the vaccine doses, and this is similar to what he mentioned (Chandramani 2022) and (Ivan Martinez 2021, & Amanat, 2020) Also, the level of infection with mild Covid-19 after vaccination compared to the level of acute infection is similar to what he mentioned in his study as well, and this may be due to the fact that the vaccine forms immune bodies that work to resist the disease in addition to medical treatment, which reduces the severity symptoms of the infection (Trogakos, 2022).

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