

## **Risk Factors Associated With COVID-19 Infection Among Schools' Children in Basrah City / Iraq**

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### **KEYWORDS**

Risk Factors,  
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### **ABSTRACT**

**Background:** COVID-19 pandemic has been the most important global issue since December 2019. has led to overloading of health systems all over the world. **Objective:** The study aims to identify the risk factors associated with COVID-19 infection among schools' children in Basrah city / Iraq. **Methods:** A cross-sectional study was carried out by using a pre-tested applied structured questionnaire among 1980 children. This sample was distributed throughout fifteen schools were selected using simple random sampling techniques. Finally, a simple random sampling method was used to select study participants. conducted from March 1st, 2022, to May 1st, 2024. Both descriptive and inferential statistics were used in the data collection and analysis process. **Results:** The findings showed the distribution of participants according to Corona infection: The children included in the study suffered from Corona infection at a rate of 27.2%. 60.3% do not have Corona infection, and 12.5% answered "possibly infection." The children at risk of contracting Corona infection were under 18 years of age and had middle school as an educational level respectively, 81.9% and 51.8%. They suffered from chronic diseases and also suffered from an allergy to the vaccine: 34.8% and 27%. They received the Corona vaccine type Pfizer, respectively, 37.9% and 36.3%. They had symptoms similar to the disease when taking the vaccine, 22.6%, and they used sterilization to sterilize hands, 42.8%. Also, 31.1% of them always avoid touching their noses and eyes with unwashed hands, 27.8% always maintain a social distance of no less than two meters, and 45.8% avoid shaking hands, hugging, and kissing during greetings. **Conclusions:** This study concludes that among the risk factors studied, there was a relationship between these factors and the Corona infection in children.

### **1. Introduction**

The cause of the illness known as coronavirus disease 2019 (COVID-19) is a novel coronavirus known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2); it was formerly known as 2019-nCoV. The virus was initially discovered after an epidemic of respiratory illness cases in Wuhan City, Hubei Province, China (CDC, 2022a). Contained within the Coronaviridae family, SARS-CoV-2 is a positive-sense single-stranded RNA virus (Kirtipal et al., 2020). somewhat similar to the coronaviruses that cause severe acute respiratory syndrome (SARS-CoV-1) and the Middle East respiratory syndrome (MERS-CoV), both of which have been linked to worldwide epidemics (MERS-CoV in 2012 and SARS-CoV-1 in 2003) (World Health Organization, 2022). The World Health Organization (WHO) declared a new coronavirus epidemic on January 30, 2020, and by March 11, 2020, it had become a pandemic (World Health Organization, 2020).

The symptoms of COVID-19 that have been confirmed and reported range widely, from minor issues like fever and cough to more serious instances that include breathing difficulties (CDC, 2022b). Cough, shortness of breath, chills, fever, muscular pains, sore throat, inexplicable loss of taste or smell, headache, and diarrhea are some of the most typical symptoms (Huang et al., 2020). Symptoms might begin moderately and become more acute between 2-14 days, getting worse if pneumonia develops in patients (CDC, 2022b). Approximately one out of every six infected persons becomes extremely ill and experiences trouble breathing, particularly in the elderly with underlying health issues (World Health Organization, 2021). Imaging is a crucial part of diagnosing and assessing the illness (Pan & Guan, 2020). A real-time reverse transcriptase-polymerase chain reaction (rRT-PCR) positive for coronavirus is required for the final diagnosis (Corman et al., 2020).

Aerosols from coughing or sneezing that may linger in the air for many minutes, as well as intimate contact, such as shaking hands or touching, are the two ways that the virus is spread (Georgiou & Kilani, 2020). These viruses can also be transmitted when people come into contact with infected

objects or surfaces and then touch their lips, noses, or eyes. Furthermore, it might last for a few days on numerous surfaces (Diaz-Quijano et al., 2020). Following the early 2020 COVID-19 epidemic, the World Health Organization (WHO) recommended effective infection control practices (IPC) such as the use of face masks and other personal protective equipment (PPE), social distancing, alcohol-based sanitizers, contact tracing, frequent hand washing, and quarantine (World Health Organization, 2023).

Worldwide, 104 nations reported COVID-19 cases and 43 countries reported COVID-19 fatalities over the 28 days from October 23, 2023, to November 19, 2023. Over 6 million deaths and over 772 million confirmed cases had been recorded worldwide as of November 19, 2023 (World Health Organization, 2023). As stated in a UNICEF report, 12,800 children and teenagers lost their lives to COVID-19, with adolescents accounting for 58% of those deaths due to both direct and indirect causes (UNICEF, 2023). The number of COVID-19 confirmed cases in Iraq in 2021 was 1498600, while the number in the Basrah Governorate was 168007 afflicted. Excluding the Kurdistan Region, there were 7515 fatalities in Iraq that same year. Specifically, there were 571 fatalities in the Basrah Governorate (Al-Araibi et al., 2021).

Most studies are restricted to established clinical risk factors for severe disease and death, such as socioeconomic characteristics or components (age, sex, education level) (Alimohamadi et al., 2021). Persons who have many comorbidities are more vulnerable to the infection (Xie et al., 2020). Numerous studies have shown that young people, especially students, are more susceptible to catching COVID-19 and transmitting the infection to others (Tavolacci et al., 2021).

Although infection rates are equal for men and women, males are more likely to have comorbid illnesses (such as obesity, diabetes, hypertension, and cardiovascular diseases), which are risk factors linked to poorer results of COVID-19 (Shi et al., 2020). However, women are frequently more vulnerable due to their greater devotion to caring professions (Ryan & El Ayadi, 2020). Additionally, it is well-recognized that older adults have greater mortality rates and are more vulnerable to COVID-19 (Dowd et al., 2020). Individuals who have uncontrolled medical illnesses such as lung, hypertension, renal, liver, and diabetes disease, smokers, cancer patients undergoing chemotherapy, recipients of organ transplants, and those on long-term steroids are more vulnerable to contracting COVID-19 (CDC, 2022b). Therefore, this study aims to identify the risk factors associated with COVID-19 infection among schools' children in Basrah city / Iraq

## 2. Material and methods

### Study Period:

This study was conducted from March 1<sup>st</sup>, 2022, to June 1<sup>st</sup>, 2024.

### Study Design

A cross-sectional study with an institutional basis was conducted among students in Basrah Governorate schools.

### Study population

All schoolchildren in Basra province who were younger than twenty years old at the period of the study comprised the study's population.

### Inclusion Criteria

This study included middle school and high school students.

### Exclusion Criteria

This study excluded elementary school students.

### Sample size and Sampling techniques

Using Thompson's statistical formula, the sample size was calculated (Thompson, 2012). Taking into

account the following presumptions:

$$n = \left[ \frac{N \times p(1-p)}{[N-1 \times (d^2 \div z^2)] + p(1-p)} \right]$$

n= The minimum sample size, N= Community size 757268, Z= Standard degree =1.96, P= Rate of availability of property = 0.50, d= Error ration = 0.05.

The minimal sample size, as determined by a Thompson formula, is 1980. The fifteen schools were chosen by use of simple random sampling methods. The particular study population was selected using simple random sampling methods.

## **Variables of the study**

### **Dependent variables**

This study used patient statuses of corona infection as a dependent variable.

### **Independent variables**

The independent variables are:

Descriptive characteristic of study population includes (Age in years, gender, educational level, living, blood group). Distribution of Risk factor of corona infection among study population includes (Suffering from chronic disease, suffering from allergic reactions, the number of times infected with corona infection, a family member infected with corona, the first case of corona disease, receiving hospital treatment, receive home treatment). Distribution of protecting measurement among study population regarding corona infection includes (Corona vaccine, corona vaccine type, wearing a mask during working hours, wash your hands normally, hands are usually sterilized, hand sanitizer material, continued touching of hands and eyes, leave a distance from others, greetings by shaking hands and kissing).

## **Data Collection Method**

A questionnaire was used to get the data. Through a thorough assessment of pertinent literature, a questionnaire was created, which the children who were interviewed used to gather data. Approximately twenty to twenty-five minutes were spent on each interview. To verify the validity of the study tool, the questionnaire was given to ten university specialists in the relevant field.

## **Statistical Analyses**

Statistical Packages for Social Sciences, version 27 (SPSS-27) was the statistical program that was used for data analysis. A descriptive statistical method (frequency, percentage, standard deviation, mean, bar charts, and tables), as well as an inferential statistical strategy (categorical test (Chi-square test)), were used to examine the data. P values equal to or less than 0.05 were taken into consideration for statistical significance.

## **Ethical Considerations**

According to Book No. 630 on June 14, 2022, clearance from the Southern Technical University/Basra ethical research committee was acquired before the study's conduct and data collection. In addition, after describing the goal of the study, the children's oral agreement was acquired, verifying their desire to participate. They were also told that participation in the study was entirely optional.

## **3. Results and Discussion**

Regarding the descriptive statistic of study sample. The study found 81.9% of participants was less than 18 years' old with  $mean \pm SD$  equal to  $15.93 \pm 3.206$ , most of them females at 72.5% of population, 51.8% as a half of participants hold intermediate school as education level, also for living most of

them from urban area at 90.3%, moreover 51.1% of participant was from blood group O+. as shown in Table (1). Concerning the distribution of study population according corona infection, the study found that the 27.2% suffer from corona infection compared with 60.3% don't infected by corona infection beside 12.5 % answered maybe infection at statistical difference at  $P.value =0.024$ . as appear in Figure (1).

Proper to conducting the risk factor of corona infection among study population, the study found that the answers about questions of risk factor as well as suffering from chronic disease, anemia was equal to 19.7% from infected person with corona compared with 27% suffering from allergic reaction. on the other hand, 27% the answered about family member accorded infection beside 9.5% answer with may be infected from family member. furthermore, only 9.1% of infected with corona have received treatment from hospital compared to 37.3% of them received treatment at home with all statements was statistically significant at  $P.value <0.05$ . as shown in Table (2).

Regarding the protecting measurement among study population according to corona infection, the study found that the answers about statement of protecting measurement as well as vaccine status about corona infection equal to 37.9% from study population beside 36.3% of them was vaccinated from Pfizer vaccine. on the other hand, 77.8% the answered about wearing a mask during working hours accorded corona infection beside 87.2% answer with morally hand wishing. furthermore, only 31.1% of infected with corona have Continued touching of hands and eyes compared to 37.3% of them Leave a distance from others with 45.2% of these were Greetings by shaking hands and kissing all statements was statistically significant at  $P.value <0.05$ . as shown in Table (3).

Concerning the relationship between descriptive characteristic and corona infection among study population. The study found significant statically relationship between age and corona infection among the study population at  $P.value <0.001$ , and level education at  $P.value 0.039$  while non-significant statically relationship between corona infection and gender at  $P.value 0.457$ , and living at  $P.value 0.657$ , and blood group at  $P.value 0.087$ . as shown in Table (4).

Also, for the relationship between risk factor and corona infection among study population. The study found significant statically relationship between corona infection and all statement of risk factors included, suffering from chronic disease among the study population at  $P.value <0.001$ , and allergic reactions at  $P.value 0.043$ , the number of times infected with corona at  $P.value 0.031$ , receiving hospital treatment at  $P.value 0.01$ , receive home treatment at  $P.value 0.042$ . as shown in Table (5). Concerning the relationship between protecting measurement and corona infection among study population. The study found significant statically relationship between take the corona vaccine and corona infection among the study population at  $P.value 0.002$ , and corona vaccine type at  $P.value 0.017$ , the appearance of symptoms similar to the disease when taking the vaccine at  $P.value <0.001$ , hands are usually sterilized at  $P.value 0.009$ , continued touching of hands and eyes at  $P.value <0.001$ , leave a distance from others at  $P.value <0.001$  while non-significant statically relationship between corona infection and Wearing a mask during working hours at  $P.value 0.09$  and wash your hands normally at  $P.value 0.282$ . as shown in Table (6).

The study found significant statically relationship between age and corona infection among the study population at  $P.value <0.001$ , as shown in Table (4). The findings of this study disagreed with the study conducted in Malaysia, which mentioned that most infections are among people aged 19 years and above (Ghazali et al., 2022). There may be differences in immune responses among younger individuals compared to adults. While children generally have milder symptoms, they can still carry and transmit the virus (Sinaei et al., 2021).

Also, the study found significant statically relationship between level education and corona infection among the study population at  $P.value 0.039$ . as shown in Table (4). The findings of this study agreed with the study conducted in the Netherlands, which reported that people in High school are more at risk of infection (de Gier et al., 2023). Middle school students often have a high level of social interaction both in and out of school. They participate in various group activities, attend classes with

different groups of peers, and engage in extracurricular activities. This increases the opportunities for the virus to spread (Hood et al., 2023).

The study found significant statically relationship between corona infection and suffering from chronic disease among the study population at P.value <0.001, as shown in Table (5). The findings of this study agreed with the study conducted in Abuja, Nigeria, which showed that persons with underlying chronic illnesses are more likely to contract the virus and become severely ill. (Guan et al., 2020). Chronic diseases often compromise the immune system, making it less effective at fighting off infections, including COVID-19 (Sapir et al., 2022).

The study found significant statically relationship between corona infection and allergic reactions among the study population at P.value 0.043, as shown in Table (5). This result is in line with the study in Europe, which mentioned that there are allergic reactions after COVID-19 vaccination in children (Maltezou et al., 2023). Individuals with a history of allergic reactions may have a more sensitive immune system and there can be genetic factors at play that predispose certain individuals to allergic reactions (Falcon & Caoili, 2023).

The study found a significant statically relationship between corona infection and the number of times infected with corona among the study population at P.value 0.031, as shown in Table (5). The findings of this study agreed with the study in Norway, which reported that there was an association with a higher risk of reinfection (Bøås et al., 2024). Some individuals may not develop a strong or lasting immune response after the initial infection, making them more susceptible to reinfection (Negi et al., 2022).

The study found a significant statically relationship between taking the corona vaccine and corona infection among the study population at P.value 0.002, as shown in Table (6). The findings of this study disagreed with the study conducted in France, which reported that 58.0% of students reported that they would choose to have a vaccination (Tavolacci et al., 2021). Vaccinated individuals might engage in more social interactions or less cautious behavior, believing they are fully protected, thereby increasing their risk of exposure (De Gaetano et al., 2023).

The study found a significant statically relationship between the corona vaccine type and corona infection among the study population at P.value 0.017, as shown in Table (6). This study's findings agree with the study conducted in Saudi Arabia, which stated that most students had been vaccinated with the Pfizer vaccine against Corona (Almalki et al., 2023). Different vaccines have varying levels of efficacy against infection. Some vaccines might be more effective in preventing infection, while others might be more effective in reducing the severity of illness (Mohammed et al., 2022).

The study found a significant statically relationship between the appearance of symptoms similar to the disease when taking the vaccine and corona infection among the study population at P.value <0.001, as shown in Table (6). This study's findings agree with the study conducted in Hubbali, Karnataka, which mentioned that there are signs and symptoms similar to the disease after receiving the vaccine (Andanigoudar et al., 2022). The vaccine may trigger an immune response that includes mild symptoms similar to the disease, such as fever or fatigue. These symptoms are generally a sign that the body is building protection (World Health Organization, 2021).

The study found a significant statically relationship between hands that are usually sterilized and corona infection among the study population at P.value 0.009, as shown in Table (6). This study's findings agree with the study conducted in Saudi Arabia, which found that sterilized and washed hands can help prevent transmission of the Coronavirus (COVID-19) (Almutairi, 2022). The places where students gather, such as schools, could have high transmission rates regardless of individual hygiene practices. Even with good hand hygiene, close and prolonged contact in such environments can increase the risk of infection (Melaku & Addis, 2023).

The study found a significant statically relationship between continued touching of hands and eyes and corona infection among the study population at P.value <0.001, as shown in Table (6). This

study's findings disagree with the study conducted in Dessie City, Ethiopia, which found that 54.4% of students always avoid touching their noses and eyes with unwashed hands (Feleke et al., 2022). Environments like schools can have a high degree of surface contamination due to the number of people and the diversity of activities. This increases the likelihood that students' hands will contact contaminated surfaces (Zhen et al., 2022).

The study found a significant statically relationship between leaving a distance from others and corona infection among the study population at  $P.value <0.001$ , as shown in Table (6). This study's findings disagree with the study conducted in Dessie City, Ethiopia, which found that 65.2% of students always maintain a social distance of at least two meters (Feleke et al., 2022). In settings where social distancing is not practiced, such as crowded classrooms, the virus can spread more easily due to higher population density and shared air spaces (Cheshmehzangi et al., 2023).

The study found a significant statically relationship between Greetings by shaking hands and kissing and corona infection among the study population at  $P.value <0.001$ , as shown in Table (3 & 6). This study's findings agree with the study conducted in Dessie City, Ethiopia, which mentioned that Only 38.6% of the students avoided shaking hands, hugging and kissing during greetings (Feleke et al., 2022). Students who consciously avoid physical greetings may also be more aware of other preventive measures, such as wearing masks, maintaining social distancing, and practicing good hand hygiene. This heightened awareness and adherence to multiple preventive strategies contribute to a lower risk of infection (Chiu et al., 2020).

#### 4. Conclusions

According to the findings, it can be concluded that Corona infection is a significant health problem among children. The findings also indicate that the majority of the children at risk of contracting Corona infection were under 18 years of age, had a middle school level of education, suffered from chronic diseases were allergic to the vaccine. Furthermore, children experienced symptoms similar to the disease when taking the vaccine, and used hand sterilization, consistently avoided touching their noses and eyes with unwashed hands, always maintained a social distance of at least two meters and avoided physical contact such as shaking hands, hugging and kissing during greetings. Therefore, was a relationship between these factors and Corona infection.

#### 5. Recommendations

This study concludes that increase awareness and education about Corona infection risk factors in children under 18 years old, focus on vaccinating children under 18, especially those with chronic diseases and those at a middle school education level, develop and implement special care plans for children with chronic diseases to minimize their risk of infection, implement strict health protocols in schools, including regular disinfection, mandatory mask-wearing, and temperature checks. By implementing these recommendations, we can mitigate the impact of Corona infection among children and create a safer environment for their growth and development.

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