COVID-19 Disease in Pregnant Women and Children Less Than 13 Years Old in Nahavand, Iran

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Abstract

Background: The prevalence of Coronavirus and COVID-19 disease has had far-reaching effects in various aspects. Considering the importance of a comprehensive study of the disease of Covid-19 and its epidemic, this study was conducted.

Methods: This research evaluated COVID-19 in pregnant women and children under 13 years of age in Nahavand City, west of Iran, from March 2020 to March 2021. Information about the epidemiology of COVID-19 disease was extracted from the infectious diseases unit of Nahavand Health Center. Descriptive statistics, chi-square test, and Logistic regression model were used to evaluate the disease. All data of this study were analyzed using SPSS software, version 16. The inclusion condition in this study was having positive RT-PCR. No general vaccination was performed at the time of this study.

Results: 22.5% of the children had a positive RT-PCR test. The age group of 12-13 years had the most patients. 36.3% of children needed hospital treatment. Pregnant women comprised 2.08% of the infected population of Nahavand city in the defined time. 6.7% of them were hospitalized. The mean age of the pregnant women was 28.4 years. The mortality rate in both groups was zero.

Conclusion: COVID-19 disease, in pregnant women, was significantly correlated with age, contact with COVID-19, underlying disease and hospitalization. According to the analysis of variance, there was a significant correlation between the disease and age groups in children under 13 years old.

Key Words: Coronavirus, Epidemiology, Pregnancy, RT-PCR.

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1- INTRODUCTION

The latest challenge to humans across the globe is the Coronavirus. The International community recognized the Coronavirus disease (COVID-19) in December 2020 (1). It became a widespread pandemic in the world in a short time (2). According to studies, the clinical symptoms of infected patients with SARS-CoV-2 are different from mild nonspecific symptoms to severe pneumonia with damaged organ function (3). At the onset of COVID-19 disease and according to pandemic Coronavirus, it was thought that COVID-19 disease has affected children less than adults. Only 2% of COVID-19 cases presented to the Centers for Disease Control and Prevention (CDC) included people under 18 years. Still, this mentality did not last long. The first Coronavirus patients with Kawasaki clinical similarities were seen in children in London, Italy, and New York, USA, in the spring of 2020. Since then, reports have been sent worldwide (4). Various dimensions of the disease in children are not clearly understood because many children have not been tested and screened for the Coronavirus. Therefore, further research in this area is necessary (5). A modeling study analyzing data from the first months of the COVID-19 epidemic showed that the frequency of COVID-19 disease in persons under 20 years old was about half of the adults over 20 years old. Of course, interventions in groups of children and adolescents may have only a small effect. However, these results may be premature and may not reflect the mysterious nature of the virus in children (6).

Pregnancy is also a special condition that needs special evaluation and care in the face of Coronavirus. Pregnancy is a condition in which the immune system has the most risk for viral infections. According to previous studies, there are different levels of COVID-19 in pregnant women. In some studies, most patients experience a mild disease, but in others, severe outcomes of this disease were seen (7-9). A study by Shoji et al. (10) found that underlying diseases were associated with increased risk for moderate-to-severe COVID-19 among pregnant women 15 to 44 years old, in the second to third trimesters (10). According to Liang et al., (11) radiological signs of viral pneumonia have been present in most pregnant women with COVID-19 infection (11). All the mentioned information is effective to help manage the condition and crisis of COVID-19 disease.

Due to the frequent mutations of the Coronavirus and the behavioral differences of the virus in certain groups such as children and pregnant women, further studies are needed on children as well as on maternal and fetal health. Nahavand city is one of the western cities of Iran. It has a young population; therefore, the frequency of mothers in fertility age and children under 13 years old is higher than the average rate of the country. This study investigated Coronavirus frequency, hospitalization percentage, death rate, and the effect of the underlying disease among pregnant women and children less than 13 years old referred to government health centers and hospitals in Nahavand city from March 2020 to the end of March 2021.

2- MATERIALS AND METHODS

This retrospective study aimed to investigate the epidemiology of COVID-19 disease in patients referred to the government health centers of Nahavand city (These centers include 16-hour centers, Ayatollah Alimaradian Hospital and Shahid Qudousi Hospital) from March 2020 to March 2021. In this study, direct sampling was not performed, and all pregnant women, nonpregnant women and children under 13 years of age with a definitive diagnosis of COVID-19 based on positive RT-PCR tests in the defined

time frame were selected as the study group. The data collection tool was a checklist designed by the Ministry of Health and Medical Education (MOHME). Variables of age, sex, reporting city, place of residence (city/village), travel history to infected areas, travel location, history of contact with a passenger in infected areas, pregnancy status, underlying disease, date of onset of symptoms, date of hospitalization, sampling date, the test result, the patient's condition, and the date of death/discharge were recorded. Then, the frequency and correlation between underlying diseases, hospitalization percentage, and recovery or death rate in the target groups were investigated.

All statistical analyses were performed using SPSS software version 16. Logistic regression was used to evaluate the effect of possible risk factors on the occurrence of Coronavirus infection at a significance level of 95% (P <0.05). Descriptive statistics and chi-square tests were used to express numbers and percentages for continuous variables and to assess the impact of potential risk factors in

Coronavirus infection. It is noteworthy that general Coronavirus vaccination was not performed at the time of this study.

3- RESULT

This study investigated the frequency and epidemiology of COVID-19 disease in pregnant women and children under 13 years of age in Nahavand city, for the first time.

3-1. Prevalence of COVID-19 virus in children under 13 years of age

The total number of the individuals referred to the hospitals and 16-hour centers of this city under 13 years of age was 306. According to the records registered in the health centers, the RT-PCR test was positive for 69 (22.5%) of these children.

Table 1 shows the frequency of children under 13 years of age with symptoms of COVID-19 and the frequency of children under 13 years of age with positive RT-PCR tests in Nahavand city from March 2020 to the end of March 2021.

Table-1: Frequency of COVID-19 among Under-13 children referred to health centers in Nahavand city, 2020-2021

Age	Frequency	Percentage (%)
<1	4	5.79
1-2	6	8.69
2-3	3	4.34
3-4	3	4.34
4-5	3	4.34
5-6	4	5.79
6-7	8	11.59
7-8	6	8.69
8-9	3	4.34
9-10	4	5.79
10-11	5	7.24
11-12	5	7.24
12-13	15	21.73
Total	69	100

As seen in **Fig. 1**, the most affected group was between 12-13 years of age (n=15). The largest statistical difference between the groups with the apparent symptoms of COVID-19 and the definitive patients of COVID-19 belonged to 1-2-year-old children; out of 40 cases with COVID-19 symptoms, 6 (15%) had positive RT-PCR.
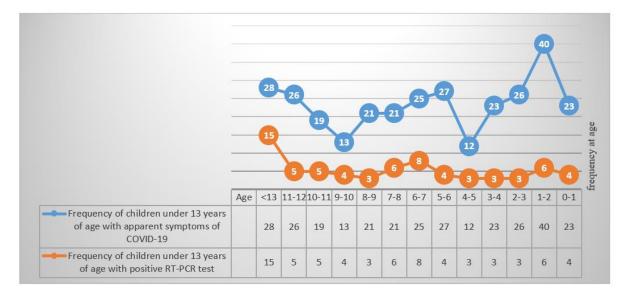

Age	<13	11-12	10-11	9-10	8-9	7-8	6-7	5-6	4-5	3-4	2-3	1-2	0-1
Frequency of children under 13 years of age with apparent symptoms of COVID-19	28	26	19	13	21	21	25	27	12	23	26	40	23
Frequency of children under 13 years of age with positive RT-PCR test	15	5	5	4	3	6	8	4	3	3	3	6	4

Fig. 1: comparing the groups with the apparent symptoms of COVID-19 and the definitive patients of COVID-19 in children under 13 years of age in Nahavand city, 2020-2021.

According to the reported statistics, 33.3% (n = 23) were girls and 66.6% (n = 46) were boys. The Chi-square test showed a significant relationship between mal sex and disease in children (p = 0.012). 78.5% of children lived in urban areas, and 21.4% lived in rural areas. Forty-four cases had outpatient treatment, and the treatment process continued at home. Twenty-five children (36.3%) were hospitalized for an average of 3 to 5 days to receive further treatment. Six children had underlying diseases, including cardiovascular and chronic lung disease. Evaluation of the clinical test of children did not provide significant laboratory findings. Fortunately, the present study reported no mortality in children under 13 years of age. Based on the analysis of variance, there was a significant relationship between the disease and age groups (p = 0.005). It is noteworthy that there was no inpatient with a negative test result among children.

3-2. Prevalence of COVID-19 virus among pregnant women

In total, 3544 individuals were infected with COVID-19 in Nahavand city from March 2020 to March 2021. According to **Table 2**, 1791 (50.6%) were women. Overall, 178 pregnant women with symptoms of COVID-19 referred for the test, 74 of whom had positive RT-PCR tests. Among pregnant women with positive RT-PCR test, 43.2% lived in urban areas, and 56.7% lived in rural areas. The mean age of pregnant women was 28.4 years. 91.8% of the cases were housewives, and 8.1% were employed. 2 cases had a history of travel and 5 had a history of contact with an infected person. Five cases (6.7%) had an underlying disease, and (6.7%) were hospitalized; reports showed that the average duration of hospitalization was less than 3 days. The death rate in this group was reported as zero.

Table-2: Frequency of women with COVID-19 in Nahavand city, 2020-2021

Total frequency (100%) of the sample: 1791				
Variable		Non-Pregnant women N = 1613, n %	Total Pregnant mothers (with and without positive RT-PCR) N =178, n %	Pregnant women with positive RT-PCR test=74, n %
Age (years)	<16	36 (2.2)	0 (0)	0 (0)
	16-24	109 (6.7)	44 (24.7)	19 (25.6)
	25-29	116 (7.1)	51 (28.6)	28 (37.8)
	30-34	191 (11.8)	41 (23.03)	15 (20.2)
	35-39	161 (9.9)	37 (2.29)	12 (16.2)
	40-65	749 (46.4)	5 (2.80)	0 (0)
	65 <	352 (21.7)	0 (0)	0 (0)
Urban		1285 (79.7)	113 (63.38)	42 (56.7)
Rural		327 (20.2)	65 (36.5)	32 (43.2)
Housewife		1318 (81.7)	158 (88.76)	68 (91.8)
Employed		294 (15.4)	20 (11.2)	8 (10.8)
Travel history		15 (0.9)	14 (7.86)	2 (2.7)
Contact history of a person with Covid-19		56 (3.7)	5 (2.8)	5 (6.75)
History of underlying disease	Cardiovascular	260 (16.125)	6 (3.37)	2 (2.7)
	Diabetes	122 (2.56)	0 (0)	0 (0)
	Respiratory	69 (4.2)	3 (1.6)	1 (1.35)
	Kidney	13 (0.80)	1 (0.56)	0 (0)
	Cancer	12 (0.74)	0 (0)	0 (0)
	Blood pressure	9 (0.55)	0 (0)	0 (0)
	Hypothyroidism	1 (0.06)	1 (0.56)	0 (0)
	Rheumatism	2 (0.12)	0 (0)	0 (0)
	Neurological disorder	35 (2.17)	1 (0.56)	1 (1.35)
	Both Thalassemia minor and Hypothyroidism	0 (0)	1 (0.56)	1 (1.35)
	Other	9 (0.55)	1 (0.56)	0 (0)
Hospitalization		649 (43.2)	14 (7.86)	5 (6.75)
Mortality		66 (4.09)	0 (0)	0 (0)

1613 women referred without pregnancy, most of whom were 40-65 years old (46.6%). Among them, 33% had a history of underlying disease. The underlying diseases mainly included cardiovascular, respiratory, chronic neurological diseases and diabetes. 43.2% of nonpregnant women were hospitalized in different hospital wards, which was a much higher rate than that of the pregnant women (6.75%). A 62-year-old female patient with diabetes died in the CCU because of the side effects of the Coronavirus. Eight nonpregnant women were hospitalized in the ICU; four of them had underlying diseases, including three of cardiovascular diseases and one of cancer. Unfortunately, 7(87.5%) nonpregnant women died in the ICU at a mean age of 64. COVID-19 was significantly correlated with travel history, patient contact, underlying disease and pregnancy (P <0.001).

4- DISCUSSION

The present study showed that 63.7% of children had mild COVID-19 symptoms that did not require hospitalization. 36.3% of children needed hospitalization, among whom a 44-day-old infant was hospitalized in the isolation ward for 5 days, and other children were supervised in public wards of the hospital. During the defined time frame, the mortality rate of children under 13 years old in Nahavand city was zero. Similarly, Ludvigsson (12), in a systematic review of 45 papers and scientific letters, demonstrated that 1%-5% of diagnosed COVID-19 cases diagnosed during January 1 and March 18, 2020, were children; they often had a milder illness than adults and death was very rare. The diagnostic findings were similar to adults. Fever and respiratory symptoms were common, but fewer children appeared to have severe pneumonia, increased inflammatory markers were less common in children, and lymphocytopenia appeared to be rare (12). Another meta-analysis reviewing 1964 articles worldwide on the epidemiology of Coronavirus in children under 5 years of age in 2021 showed that 43% of children had no clinical symptoms and 7% had severe illnesses that required special care. This study, also, recorded that the variety in the diagnostic tests for children is one of the effective factors in reducing clinical studies on children (13). This problem was evident in the current study of Nahavand city. Doctors did not prescribe the same tests for diagnosis in children, so the results of the children's tests were not comparable. In another study by Dong et al., 43 articles were reviewed (14). Out of 121 cases studied, one death case was recorded related to a ten-month-old infant without any underlying disease (14). It is noteworthy that in our study, no child needed to be hospitalized in the specific care unit, except for one case who was hospitalized in the isolation ward; other children who needed further treatment were hospitalized in the pediatric ward.

The age range of the pregnant women with COVID-19 in the present study was 16 to 39. 37.8% of these women were 25-29 years old. 93.25% of them had mild symptoms such as fever, chills, shortness of breath, gestational hypertension, and cough, which were treated in the form of outpatient and the recovery period spent at home. 6.75% had more severe clinical symptoms, and they were hospitalized in the hospital's general ward for a maximum of 4 days. 91.8% of the pregnant women with COVID-19 in Nahavand were housewives; therefore, they needed more care and training to encounter infectious diseases. 6.7% of these women had underlying cardiovascular disease (n = 2), chronic pulmonary disease (n = 1), simultaneous thalassemia minor and hypothyroidism (n = 1), and one case had chronic neurological disease. Other pregnant women with COVID-19 did not need intensive care in this study. The mortality rate of pregnant women with COVID-19 against nonpregnant women with COVID-19 was zero to 4.09%. No case of preeclampsia, eclampsia and preterm delivery was reported. The mortality rate of pregnant women in this study was reported to be zero. On the other hand, 42.3% of nonpregnant women in the age range of 20 to 44 were hospitalized, 0.04% of whom died, and 0.1% had a severe disease. In a similar study, Kim et al. (4) showed no cases of death or severe hospitalization in pregnant women with COVID-19. However, most of them (96.2%) were hospitalized. Kim et al. (4) reported that the prevalence of COVID-19 infection in pregnant women in the age range of 20 to 44 was lower in comparison to their nonpregnant counterparts. However, among women with COVID-19 between 20-44 years of age, pregnant women had a higher risk for

oxygen therapy after hospitalization (4). Moreover, a study in 2021 in Italy showed that the preterm birth rate in pregnant women with COVID-19 was 11.1%. Stillbirth and maternal and neonatal mortality had remained stable compared to the pre-epidemic period; in this group, the need for ventilation support and/or ICU increased among women with pneumonia during the alpha variant period. The emergency cesarean was indicated for most pregnant women (15).

In a study by Jafari et al. (16), the mean age and gestational age (GA) in pregnant women were 33 (28-37) years and 36 (37-34) weeks, respectively. Both nonpregnant patients and pregnant women showed the same clinical signs of COVID-19, including fever, low cough, chills, fatigue, and other physical symptoms. Pregnant women had a higher proportion of leukocytosis and thrombocytopenia and a lower proportion of C - reactive protein (CRP) than nonpregnant patients. Unlike to the results of our study, Jafari et al. (16) showed that cesarean delivery and preterm delivery were more common in pregnant women with COVID-19 as compared to the pregnant women without COVID-19, and the mortality rate in nonpregnant women to pregnant women was 6.4% to 11.3% (16). In line with the results of the study by Jafari et al., Villar et al. (17) in 2021, expressed that pregnant women with COVID-19 had a higher risk of preeclampsia and eclampsia, infection, hospitalization, preterm delivery, gestational hypertension, fever, shortness of breath and even mortality risk; and the mortality rate in pregnant women was 22 times higher than in other women (17).

Therefore, studies show different results regarding the effects of COVID-19 on pregnant women. Some studies have considered that the factor of pregnancy in the recovery process of COVID-19 has additional risks of morbidity including increase of symptoms, increase in

hospitalization rate, but no difference in mortality (18) while other studies like the one by Hantoushzadeh express that it is prudent to be aware of the danger of mortality in pregnant women in second and third trimesters (19).

In the present study, there were no study restrictions because of the regular ranking of information in the Excel file by the health network of Nahavand city. Patients' information was transferred to this study confidentially, without mentioning their names and personal information details. The results of this study and similar studies indicate the need for more clinical and laboratory studies with monitoring methods in high-risk groups, including pregnant women and children.

5- CONCLUSION

According to previous studies, in the early variants of the Coronavirus, children had much fewer clinical symptoms of the respiratory tract than adults, and the mortality rate in children was very low. However, as carriers of the Coronavirus with mild clinical symptoms, they had a large share in the epidemiology of the virus. Therefore, it is worth it for children to learn the necessary warnings for self-control care and avoid being present in crowded places.

The present study reported zero mortality rate in pregnant women and children under 13 years of age. Also the prevalence of COVID-19 among pregnant women was much lower than that among non-pregnant women. No cases of death or severe illness were reported in pregnant women with COVID-19. However, our evaluation was limited by the lack of severe cases. Large-scale studies are needed for further evaluation.

6- ETHICAL CONSIDERATIONS

The ethical committee has approved this study at Hamadan University of

Medical Sciences (Reference number: IR.UMSHA.REC.1400.107)

8- COMPETING INTERESTS

None.

10- AUTHOR CONTRIBUTIONS STATEMENT

Maryam Soori, Khodayar Oshvandi suggested the idea and designed the study. Maryam Soori, Khodayar Oshvandi, Hassan Mahmoodi and Mostafa Kaviani wrote the main manuscript text. Maryam Soori, Khodayar Oshvandi, Manoochehr Solgi, Hassan Mahmoudi and Mostafa Kaviani performed the statistical analysis and prepared figures. The manuscript was reviewed by Maryam Soori, Khodayar Oshvandi, Mnoochehr solgi, Hassan Mahmoodi, and Mostafa Kaviani.

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