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# Clinical Characteristics and Psychosocial Impact of COVID-19 among Admitted Children and Neonates in Al-Nassr Pediatric Hospital, Gaza, Palestine

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## Abstract

**Introduction:** Pediatric clinical manifestations of COVID-19 are not typical, and relatively milder, compared with that of adult patients.

**Objective:** To characterize the clinical features of children and neonates admitted to Al-Nassr Pediatric Hospital with COVID-19 and to highlight psychosocial impact of the disease.

**Methods:** Prospective cohort study with retrospective review of patient files. Phone interviews with mothers were done to cover the psychosocial impact part of the study.

**Results:** In 72 hospitalized children and neonates were reported during the study period. Age range 1 day to 11 years. The mother was infected in the majority of cases. Out of the 72 cases, 40 were positive by PCR, of those, 34 cases had fever, 5 had mild upper respiratory symptoms, and 6 had coughed. Only 2 cases presented with respiratory distress, while diarrhea was reported in 11 cases. CBC was normal in all and the lower lymphocytic count was $1 \times 10^9$/L.CRP was done in 20 cases and none was positive. Blood culture was done in 26 cases diagnosed initially as sepsis and all were negative. Chest X- ray was done as indicated by the provisional diagnosis in 23 cases and with normal findings except one case with cardiomegaly due to DCM. 5 cases had at least one recorded comorbidity. All cases were discharged with clinical improvement. The duration of hospitalization was 1 to 8 days. COVID-19 infection especially with maternal separation has negative effects on babies and families.

**Conclusion:** Children have less severe acute COVID-19 than adults. COVID-19 infection has a significant psychological impact on families.

**Keywords: COVID-19; Neonates; PCR; Al-Nassr Pediatric Hospital**

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## Background

In December 2019, a pneumonia caused by a novel coronavirus that was later named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) emerged in Wuhan, Hubei Province, China. The outbreak of SARS-CoV-2 infection has resulted in a pandemic that has rapidly spread worldwide and has become the most serious public health threat. Globally, as of February 1st, 2021, there were more than 102 million confirmed cases of Coronavirus Disease 2019 (COVID-19) that caused more than 2.2 million deaths according to the World Health Organization (WHO) [1].

In Gaza strip with a population of over two millions, the first case of COVID 19 in the community was reported in 24th August 2020. Up to 17th February 2021, the total number of cases was 54,041. The pediatric age group (less than 18) represents 23.3% of total cases (total number was 12,597) and nearly equal male to female ratio (1.1:1). Among them, only 70 cases were reported in the neonatal age group (less than 1 month) (Figure 1, Table 1). Community spread of COVID was gradually increasing since late August 2020, reaching the peak in the mid of December 2020 (Figure 2, Table 2) with total deaths of 538 (mortality rate 1%). The least mortality was in the Pediatric age group (1% of total deaths (Figure 3) [2].

Although fever, malaise, myalgia, cough and dyspnea, diarrhea, and vomiting are the common chief complaints of adult patients with COVID-19, the clinical presentation of this infection in neonates is nonspecific, including temperature instability, acute respiratory distress syndrome,

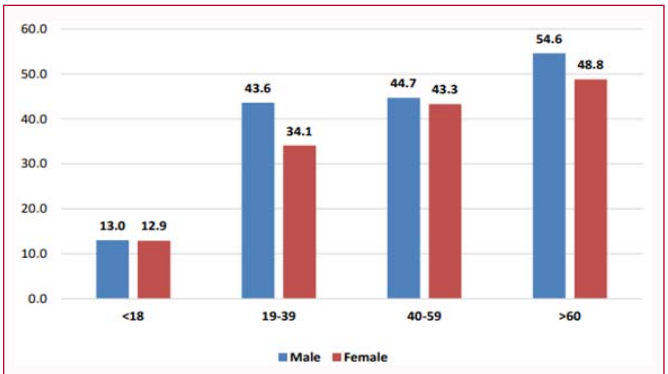


**Figure 1:** The incidence of confirmed cases by age group and gender/1000 population.

**Table 1:** Distribution of cases among pediatric age group.

| Age group | Male | Female | Total |
|---|---|---|---|
| 0-1 month | 36 | 34 | 70 |
| 2-12 month | 237 | 216 | 453 |
| 1-5 Yrs | 973 | 911 | 1884 |
| 5-12 Yrs | 2293 | 2281 | 4574 |
| 12-18 Yrs | 2937 | 2679 | 5616 |
| Total | 6476 | 6121 | 12597 |

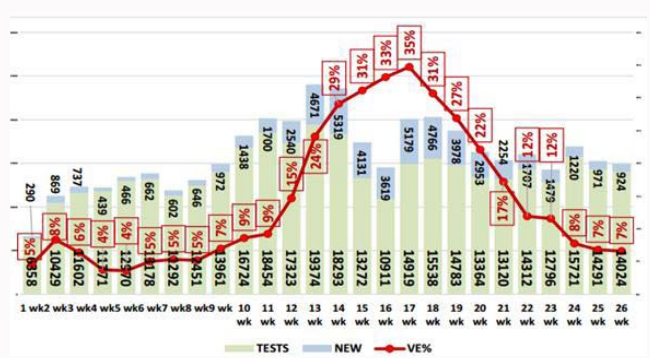


**Figure 2:** The number of discovered cases, the number of PCR tests done and the percentage of positive tests weekly.

cardiovascular dysfunction, or GI involvement with less severe disease in most cases [3].

An early cause for hope in the Coronavirus Disease 2019 (COVID-19) pandemic was the observation that children are much less likely to experience severe illness than adults. Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection in children is generally characterized by mild illness. Only a minority of children require hospitalization and the case fatality rate is very low (≤ 1%) [4].

Numerous studies have reported on COVID-19 in adults, but there is a relative paucity of data on pediatric COVID-19, particularly among neonates. One of the most important concerns of neonatal COVID-19 is whether or how SARS-CoV-2 can be transmitted from the mother to the fetus. The clinical course of COVID-19 in neonates is also of great interest [1].

Several studies have documented the damaging effects of psychological stress due to negative events in children. Anxiety, depression, lethargy, impaired social interaction, and reduced

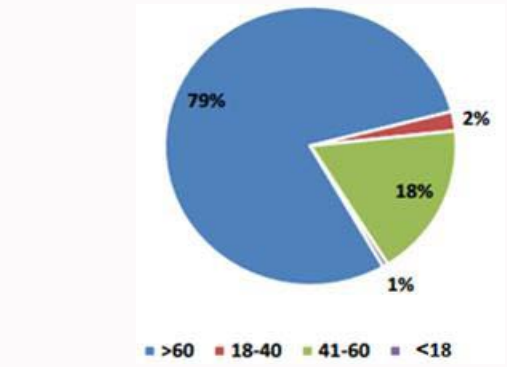


**Figure 3:** Distribution of deaths by age group.

appetite are commonly reported manifestations. Physiological effects include a weakened or compromised immune system. In the course of adverse events, children are often forced to stay home for long periods due to enforced isolation and school closure, resulting in limited connection with classmates and reduced physical activity [5].

Moreover, Family members who lost family or friends to COVID-19 can display acute post-traumatic stress disorder in which emotional numbness and insomnia are prevalent [6].

Mental health professionals should establish evidence-based guidelines and easy operational strategies to cope with COVID-19 pandemic-related mental health problems in children [7].

In this study we tried to characterize the clinical features, lab test correlations and discharge status of children and neonates admitted to Al-Nassr Pediatric Hospital with COVID-19 positive tests for either patients or their mothers. Moreover, we also tried to highlight the psychosocial effects of COVID-19 among their families.

## Methods

### Type of the study

Prospective observational cohort study with a retrospective review of patient files for the clinical, lab tests and radiologic findings.

### Testing method

According to the Ministry of Health recommendations after the community spread of COVID-19 in Gaza, COVID tests by PCR (Polymerase Chain Reaction) or RAT (Rapid Antigen Test) were asked for all admitted patients as well as their accompanying mothers. During the study period, PCR was the only available test in Al-Nassr Pediatric Hospital so all cases underwent this test.

### Study period

August 30th, 2020 to January 31st, 2021.

### Setting

Al-Nassr Pediatric Hospital (NPH), Gaza, Palestine.

### Inclusion criteria

All admitted children and neonates with positive COVID test, all admitted children and neonates with negative COVID test but positive COVID mothers.

### Exclusion criteria

Admitted children and neonates with negative COVID tests for both cases and mothers.

**Table 2:** Community spread of COVID was gradually increasing since late August 2020, reaching the peak in the mid of December 2020.

| | Number of tests | Percentage of positive tests | Number of cases | Number of cured cases | Number of deaths | Incidence/100.000 |
|---|---|---|---|---|---|---|
| January | 0 | 0% | 0 | 0 | 0 | 0 |
| February | 0 | 0% | 0 | 0 | 0 | 0 |
| March | 830 | 1.40% | 12 | 0 | 0 | 1 |
| April | 3811 | 0.10% | 5 | 12 | 0 | 0 |
| May | 5093 | 0.90% | 44 | 6 | 0 | 2 |
| June | 2949 | 0.40% | 12 | 39 | 1 | 1 |
| July | 1287 | 0.50% | 6 | 13 | 0 | 0 |
| August | 9277 | 4% | 321 | 2 | 3 | 16 |
| September | 50286 | 5% | 2675 | 1583 | 18 | 132 |
| October | 58299 | 6% | 3655 | 2658 | 12 | 181 |
| November | 79237 | 19% | 14731 | 7410 | 77 | 730 |
| December | 61642 | 32% | 19803 | 19483 | 264 | 981 |
| Jan-21 | 59129 | 17% | 10048 | 15099 | 147 | 498 |
| February | 36239 | 8% | 2729 | 5030 | 16 | 135 |

### Psychosocial impact part of the study

Phone interviews with mothers were done by the authors to discuss the psychosocial impact and to track if the cases, mothers and other family members got infected within 2 weeks after discharge. Informed verbal consent was secured prior to maternal interviews, and no personal identifiers were used in the research.

### Participants of the interviews

Mothers of admitted children and neonates in the period from August 30th, 2020 to January 30th, 2021.

### Data entry and analysis

Was done by the researchers using Microsoft-Excel Sheet over a 1month period (February 2021).

## Results

### Psychosocial impact

In 72 hospitalized children and neonates were reported during the study period. Of those 16 were admitted before 14th November 2020 (4 children, 12 neonates) while the other 56 (36 children, 20 neonates) were admitted after the implementation of home quarantine in November 14th, 2020. The discrepancy in sample size was compatible with COVID-19 trend in Gaza which was rising after the mid of November 2020 reaching the peak in the mid of December 2020 then gradually declining till the end of Jan 2021. The minimum age is 1 day and the maximum is 11 years. Nearly 80% (32 neonates, 26 children) are under 12 months and 51% are males. The mother was infected in the majority of cases (88.9%), while other family members got the infection in about 21%. Out of the 72 cases, 40 were COVID-positive by PCR at the time of admission (21 children, 19 neonates). Of those, 13 neonates and 16 children (29 cases) both baby and mother had positive COVID results on admission. Of the 32 neonates, one mother was COVID-positive during pregnancy but before delivery, one was positive during delivery while 27 got infected after delivery. A trial to track the delivery place of those mothers, most hospitals were implicated with more than half of deliveries occurred in Ministry of Health (MOH) Hospitals while the remaining in Non-Governmental Organizations (NGOs).

Of the 40 positive cases, 34 cases had fever (85%), 5 (12.5%) had mild upper respiratory symptoms, 6 (15%) had cough, and only 2 cases (5%) presented with respiratory distress, while diarrhea was reported in 11 cases (27.5%). CBC was normal in all cases in regard to WBC (4.4-21.8 $\times$ $10^9$/L) and the lower lymphocytic count was 1 $\times$ $10^9$/L. CRP was done in 20 cases (50%) and none was positive. Blood culture was done as indicated in 26 cases diagnosed initially as sepsis and all were negative. Chest X-ray was done as indicated by the provisional diagnosis in 23 cases and with normal findings except one case that had cardiomegaly due to DCM. Five cases (12.5%) had at least one recorded comorbidity. The comorbidities were as following (2 congenital heart diseases, 1 bronchial asthma, 1 non-ketotic hypoglycemia and 1 epilepsy).

Only the case of DCM required supplemental oxygen, and was admitted to intensive care for 1 day without need for mechanical ventilation. COVID-related mortality was zero and all cases were discharged with clinical improvement. The duration of hospitalization was 1 to 8 days (mean 4.5 days).

Although all the COVID-negative cases (13 neonates, 19 children) had been cared by COVID-Positive mothers without separation at time of admission, fever was the only symptom in neonates (54%). Among children, COVID-related symptoms were as following: fever, cough, mild URTI, RD and diarrhea in (10.5%, 21%, 10.5%, 10.5%, and 21% respectively). All the negative cases had none of COVID-related lab or radiologic abnormalities. Diagnosis of these cases was as following for neonates ( 9 sepsis, 1 HMD, 1 TTN, 1 Congenital pneumonia, 1 familial cholestasis) while for children was as following (7 sepsis, 2 meningitis, 1 acute bronchiolitis, 1 gastroenteritis, 1 hemolytic anemia, 1 UTI, 1 URTI, 1 interstitial pneumonitis, 1 diabetes and 3 seizure disorders ).

Although 4 cases were at risk (Bartter syndrome, Down with CHD, interstitial pneumonitis, DM), none of them had severe illness. The case of Down syndrome required oxygen while the child with interstitial pneumonitis required critical care without need for mechanical support. All cases were discharged after clinical improvement during the study period. The duration of hospitalization was from 1 to 14 days (Table 3).

Of note, one case presented at age of 28 days with dry cough,

**Table 3:** COVID in Children.

| | COVID-positive | COVID-negative baby but COVID-positive mother | Total |
|---|---|---|---|
| Total cases | 21 | 19 | 40 |
| Age | 45 days to 7 years | 1 month to 11 years | 1 month to 11 years |
| Sex | M 8 | M 13 | M 21 |
| | F 13 | F 6 | F 19 |
| Fever | Y 17 | Y 2 | Y 19 |
| | N 4 | N 8 | N 11 |
| Cough | Y 4 | Y 4 | Y 8 |
| | N 17 | N 15 | N 32 |
| RD (Respiratory Distress) | Y 1 | Y 2 | Y 3 |
| | N 20 | N17 | N 37 |
| Mild Upper Respiratory Tract Infection (URTI) | Y 2 | Y 2 | Y 4 |
| | N 19 | N 17 | N 36 |
| Diarrhea | Y 8 | Y 4 | Y 12 |
| | N 13 | N 15 | N 28 |
| baby at risk/co-illness? (y/n), if risk, specify | Y 5 [1] | Y 4 [2] | Y 8 |
| | N 16 | N 16 | N 32 |
| Family history of suspected/ confirmed cases | Y 17 | Y 19 | Y 36 |
| | N 4 | N 0 | N 4 |
| Specify family members | Mothers 13 | Mothers alone 18 | Mothers alone 28 |
| | Mothers and Other family members 4 | Mothers and Other family members 1 | Mothers and Other family members 7 |
| | | | Father 1 |
| Provisional diagnosis | 9: Sepsis | 3: sepsis | |
| | 4: Acute gastroenteritis | 1:Acute gastroenteritis | |
| | 1: meningitis | 3: meningitis | |
| | 1: UTI | 1: UTI | |
| | 1:febrile convulsion | 1: febrile convulsion | |
| | 1: fever without focus | 1:occultbactermia | |
| | 1:hypocalcemic convulsion | 1: A bronchiolitis, 1: URTI | |
| | 1:acoustic material ingestion | 1: Acute hemolytic anemia | |
| | 1:DCMwith heart failure | 1: Bartter syndrome with sepsis | |
| | 1:fatty acid oxidation defect with AGE | 1: Down syndrome with CHD and sepsis | |
| | | 1: interstitial pneumonitis | |
| | | 1: post vaccination convulsion, 1: epilepsy | |
| | | 1:DM | |
| | COVID-positive | COVID-negative baby but COVID-positive mother | Total |
| WBCs | 4.5-21.8 × $10^9$/L | 3.1-23.3 × $10^9$/L | 3-23 × $10^9$/L |
| | Mean 12 × $10^9$/L | Mean 12.8 × $10^9$/L | Mean 12 × $10^9$/L |
| Lymphocytes | 1.2-9.3 × $10^9$/L | 1-8.8 × $10^9$/L | 1-9.3 × $10^9$/L |
| | Mean 5 × $10^9$/L | Mean 4.5 × $10^9$/L | Mean 4.6 × $10^9$/L |
| Blood culture | Negative 8 | Negative 10 | Negative 18 |
| | Not done 13 | Not done 9 | Not done 22 |
| CRP | Negative 2 | Negative 2 | Negative 4 |
| | Not done 19 | Positive 2 | Positive 2 |
| | | Not done 15 | Not done 34 |
| CXR (Chest X-Ray) | Normal 4 | Normal 6 | Normal 10 |
| | cardiomegaly due to DCM 1 | Abnormal findings related to co-illness [2] | Abnormal findings related to co-illness [3] |
| | Not done 16 | Not done 11 | Not done 27 |

| | | | |
|---|---|---|---|
| Other abnormal investigations | All Related to the provisional diagnosis | All Related to the provisional diagnosis | |
| Mother COVID-19 PCR | Positive 16 | Positive 19 | Positive 35 |
| | Negative 5 | Negative 0 | Negative 5 |
| Antibiotics | given 18 | given 13 | given 31 |
| | Not given 3 | Not given 6 | Not given 9 |
| Need for oxygen supplementation | Y 1 [4] | Y 2 [5] | Y 3 |
| | N 20 | N 17 | N 37 |
| Need for MV | N 21 | N 19 | N 40 |
| Duration of hospitalization (days) | 1-8 days | 1-13 days | 1-13 days |
| | Mean 3.4 days | Mean 5.2days | Mean 4 days |
| Kind of discharge (outcome) | Improvement 21 | Improvement 19 | Improvement 40 |

- Pulmonary stenosis with epilepsy, bronchial asthma, epilepsy, DCM, non-ketotic hypoglycemia.
- Bartter syndrome, down syndrome with CHD, interstitial pneumonitis, diabetes.
- One case of meningitis with mild perihilar infiltrates one case of interstitial pneumonitis one case cardiomegaly due to DCM.
- Given for the case of DCM.
- Given for the cases of Down syndrome with CHD, interstitial pneumonitis.

**Table 4:** COVID in neonates.

| | COVID-positive baby | COVID-negative baby but COVID-positive mother | Total |
|---|---|---|---|
| Total cases | 19 | 13 | 32 |
| Age | 28-3 | 28-1 | 28-1 |
| | (mean 16.4) | (mean 13.7) | (mean 15) |
| Sex | M 10 | M 6 | M 16 |
| | F 9 | F 7 | F 16 |
| GA | FT 19 | FT 12 | FT 31 |
| | PT 0 | PT 1 | PT 1 |
| Place of delivery | MOH 12 | MOH 5 | MOH 17 |
| | NGO 7 | NGO 5 | NGO 12 |
| | | Unknown 3 | Unknown 3 |
| Fever | Y 17 | Y 7 | Y 24 |
| | N 2 | N 6 | N 8 |
| Cough | Y 2 | Y 0 | Y 2 |
| | N 17 | N 13 | N 30 |
| RD (Respiratory Distress) | Y 1 | Y 4 | Y 5 |
| | N 18 | N 9 | N 27 |
| Mild upper respiratory Tract Infection (URTI) | Y 3 | Y 0 | Y 3 |
| | N 16 | N 13 | N 29 |
| Diarrhea | Y 3 | Y 1 | Y 4 |
| | N 16 | N 12 | N 16 |
| Baby at risk/co-illness? (y/n), if risk, specify | N 19 | N 13 | N 32 |
| Family history of suspected/confirmed cases | Y 16 | Y 13 | Y 29 |
| | N 3 | N 0 | N 3 |
| Specify family members | Mothers alone 8 | Mothers alone 12 | Mothers alone 21 |
| | Mothers and Other family members 8 | Mothers and Other family members 1 | Mothers and Other family members 8 |
| Provisional diagnosis | Sepsis 18 | Sepsis 9 | Sepsis 27 |
| | Jaundice 1 | TTN 1 | TTN 1 |
| | | Cong pneumonia 1 | Cong pneumonia 1 |
| | | PT with HMD 1 | PT with HMD 1 |
| | | Jaundice 1 | Jaundice 2 |
| WBCs | 4.4-15.2 × $10^9$/L | 8.2-18.7 × $10^9$/L | 4.4-18.7 × $10^9$/L |
| | Mean 9.6 × $10^9$/L | Mean 12.2 × $10^9$/L | Mean 10.6 × $10^9$/L |

| | | | |
|---|---|---|---|
| Lymphocytes | 1-8.2 × $10^9$/L | 2-9.8 × $10^9$/L | 1-6.8 × $10^9$/L |
| | Mean 3.8 × $10^9$/L | Mean 5.7 × $10^9$/L | Mean 4.5 × $10^9$/L |
| Blood culture | Negative 18 | Negative 13 | Negative 31 |
| | Not done 1 | | Not done 1 |
| | COVID-positive baby | COVID-negative baby but COVID-positive mother | Total |
| CRP | Negative 18 | Negative 11 | Negative 30 |
| | Not done 1 | Positive 1 | Positive 1 |
| | | Not done 1 | Not done 1 |
| CXR (Chest X-Ray) | Normal 18 | Normal 10 | Normal 28 |
| | Not done 1 | Abnormal findings related to co-illness 3 | Abnormal findings related to co-illness 3 |
| | | | Not done 1 |
| Other abnormal investigations | Positive urine c/s 3 | Positive urine c/s 1 | Positive urine c/s 4 |
| | | Cholestasis 1 | Cholestasis 1 |
| Mother COVID-19 PCR | Positive 13 | 13 | Positive 26 |
| | Negative 6 | | Negative 6 |
| Antibiotics | Antibiotics given 18 | Antibiotics given 12 | Antibiotics given 30 |
| | Not given 1 | Not given 1 | Not given 2 |
| Need for oxygen supplementation | N 19 | N 9 | N 28 |
| | | Y 4 (for other indications)* | Y 4 (for other indications)* |
| Need for MV | N 19 | N 10 | N 29 |
| | | Y 3 (for other indications)* | Y 3 (for other indications)* |
| Duration of hospitalization (days) | 2-6 days | 1-14 days | 1-14 days |
| | Mean 4 days | Mean 5.8 days | Mean 4.9 days |
| Kind of discharge (outcome) | Improvement 19 | Improvement 12 | Improvement 31 |
| | | Death 1 | Death 1 |

**Table 5:** Total number of admissions.

| | Total | After 14th Nov 2020 | Before 14th Nov 2020 |
|---|---|---|---|
| Admitted children | 4 | 36 | 40 |
| Admitted neonates | 12 | 20 | 32 |
| Total | 16 | 46 | 72 |
| Interviewed mothers of children | 1 | 26 | 27 |
| Interviewed mothers of neonates | 8 | 17 | 25 |
| Total | 9 | 43 | 52 |

severe respiratory distress and cyanosis requiring mechanical ventilation. Chest radiography showed white lungs and her COVID-PCR was negative. The baby died within 10 h of admission. As all family members were COVID-positive, the authors reported this case as suspected COVID-related mortality. Fifty-two mothers were interviewed to cover the psychosocial impact part of the study and to track cases and their families after discharge. Nineteen mothers either refused the interview or were difficult to get access with. Of the 52 mothers, age range was 19 to 46 years (mean 28.9). Age of their babies was from 1 day to 11 years. Number of family members was 3 to 12 (mean 5.5). Nearly half of mother's education was Bachelor degree (48%), followed by high school (40%), preparatory school (9.6%) and only one elementary school level. Cases were obligatory quarantined before November 14th, 2020 in hospitals or hotels according to local protocols, from then, domestic quarantine was applicable in all except 2 cases whom home environment was not suitable. Strict quarantine regulations were followed in all except 7 cases who admitted non-commitment during their home quarantine. Duration of quarantine was 10 to 45 days (mean 16.4). The long duration for some families was due to sequential infection of other family members (cluster family infection occurred in 34.6% of cases). About 75.6% (31/41) of families who were home-quarantined had suitable domestic environment, however, about half of mothers (20/41) didn't have a special bathroom. Moreover, 88.4% received healthy food and vitamin supplementations as recommended. 46% of mothers experienced any COVID-related symptoms. Before November 14th, one third of mothers were separated from their families and during the quarantine, fathers were taking care of the separated families in 78% and other family members participated in the remaining 22%. After this date, mothers were caring for their sick kids in 51%, while fathers and other family members contributed in 28% and 21% respectively. Out of the 46 infants, 39 (84.7%) received and continued breast-feeding during the maternal or infant COVID infection. The interviewed ladies expressed the following feelings upon receiving the COVID-positive results: Shocked, scared, cried, collapsed, worried, upset, sad, difficult feeling, expected in (63.4%, 7.7%, 1.9%, 1.9%, 3.8%, 1.9%, 1.9%, 3.8%, 13.4% respectively). On the other hand, about 19% of kids for affected families experienced psychological problems as following: Scared and worried in 60%, secondary incontinence in 40%. These negative psychological effects were doubled in case of maternal separation (33% *vs.* 16% before and after November 14th, 2020). As 50 of the interviewed mothers are housewives, one of the two working ladies lost her short-term contract because of her infection (Table 4). About 56% of the families had been bulled by their relatives and neighbors. Nearly all families received psychological support by their families and 40% by the Ministry of health. About 20% of mothers were annoyed from the hosting services of the quarantine department or

**Table 6:** Psychosocial interviews results.

| | Before 14th November 2020 | Since 14th November 2020 | Total results |
|---|---|---|---|
| Total interviews | 9 interviews | 43 interviews | 52 interviews |
| | (mothers of 1 child,8 neonates) | (mothers of 26 child, 17 neonates) | (mothers of 27 child, 25 neonates) |
| Age of the mother | 23-39 (mean 28.5) years | 19-46 (mean 29.3) years | 19-46 (mean 28.9) years |
| Age of the child | 1-45 days | 1 day-11 years | 1 day-11 years |
| Number of family members | 4-12 (mean6.6) | 3-12 (mean 5.4) | 3-12 (mean 5.5) |
| Level of education | Elementary 1, Preparatory 2, high school 1, college 5 | Elementary 0, Preparatory 3, high school 20, college 20 | Elementary 1, Preparatory 5, high school 21, college 25 |
| Place of quarantine | EGH 7, hotel 1, other hospitals 1 | Hotel 2 due to lack of healthy home environment,41 home quarantine | Before 14th Nov: EGH 7, hotel 1, other hospitals 1 |
| | | | After 14th Nov: Hotel 2 due to lack of healthy home environment, 41 home quarantine |
| | Before 14th November 2020 | Since 14th November 2020 | Total results |
| Duration of quarantine | 13-45 (mean 21) days | 10-30 (mean 17.2) days | 10-45 (mean 16.4) days |
| Have you developed any COVID-related symptoms? | Y 4, 5 N | Y 20 , N 23 | Y 24 , N 28 |
| Did any of your family got infected during your disease? | Y 3, N 6 | Y 15 , N 28 | Y 18 , N 34 |
| Describe your feeling when you knew about your or your baby COVID result? | Shock 5, upset 1, sorrow 1,difficult feeling 1, expected 1 | Shock 28, scared 4, cried 1, collapsed 1, worried 2, difficult feeling 1, expected 6 | Shock 33, scared 4, cried 1, collapsed 1, worried 2, upset 1, sorrow 1, difficult feeling 2, expected 7 |
| What interventions have you done after receiving the COVID result? | Obligatory quarantine through the MoH according to local protocols | Hospital quarantine followed by home-quarantine 11 | Before 14th Nov: Obligatory quarantine through the MoH according to local protocols |
| | | Hotel quarantine 2 | After 14th Nov: Hospital quarantine followed by home-quarantine 11 |
| | | Self-quarantine at home with restrictions 28 | Hotel quarantine 2 |
| | | Self-quarantine at home without restrictions 2 | Self-quarantine at home with restrictions between family members 28 |
| | | | Self-quarantine at home without restrictions between family members 2 |
| Do you have a healthy special place for home quarantine? | | Y 31 , N 12 | After 14th Nov: Y 31 , N 12 |
| Do you have a private bathroom at your home? | | Y 23 , N 20 | After 14th Nov: Y 23 , N 20 |
| Have you been separated from your baby? | Y 3, N 6 | All families were quarantined together | Before 14th Nov: Y 3, N 6 |
| | | | After 14th Nov: All families were quarantined together |
| | Before 14th November 2020 | Since 14th November 2020 | Total results |
| Who cared for you and your kids during the quarantine? | Father 7 | Mother 22 | Mother 22 |
| | other family members (aunts) 2 | Father12 | Father19 |
| | | Other family members 9 | Other family members 11 |
| Are you breast-feeding your baby? | Y 7, N 2 | Y 32, N 5, not applicable (child >2 years) 6 | Y 39, N 7, not applicable (child >2 years) 6 |
| Have you continued breast feeding during the quarantine? | Y 7, N 2 | Y 32, N 5, not applicable (child >2 years) 6 | Y 39, N 7, not applicable (child >2 years) 6 |
| Have any of your kids suffered from psychological problems during the quarantine? | Y 3, N 6 | Y 7, N 36 | Y 10, N 42 |
| | (1 scared, 1 worried, 1 secondary incontinence) | (4 scared and worried,3 secondary incontinence) | (6 scared and worried,4 secondary incontinence) |
| | | | |
| Have you received healthy food and vitamin supplements? | Y 9 (all served through quarantine centers) | Y 37, N 6 | Y 46, N 6 |
| How much have you been committed in home quarantine? | Self-commitment 7 | Self-commitment 35 | Self-commitment 42 |
| | Obligatory commitment 2 | Obligatory commitment 1 | Obligatory commitment 3 |
| | | No commitment 7 | No commitment 7 |
| If you are a worker, have your work been affected because of your infection? | All are housewives | 1 fired from a short-term contract | 1 fired from a short-term contract |
| | | 1 work not affected | 1 work not affected |
| | | 41 housewives | 50 housewives |
| | | | |
| Have any one bullied you during your disease? | Y 4, N 5 | Y 25, N 18 | Y 29, N 23 |
| Have you received psychological support from the MOH (Ministry of Health)? | Y 5, N 4 | Y 16, N 27 | Y 21, N 31 |

| | | | |
|---|---|---|---|
| Have you received psychological support from your family or friends? | Y 9 | Y 41, N 2 | Y 50, N 2 |
| Have you cleaned or sterilized your home after recovery? | Y 8, N 1 | Y 41, N 2 | Y 49, N 3 |
| What have you learned from this experience in regard to health practices? | All Commitment putting masks, hand hygiene, being outdoors only if necessary, avoiding crowded areas | All except one admitted Commitment putting masks, hand hygiene, being outdoors only if necessary, avoiding crowded areas | All except one admitted Commitment putting masks, hand hygiene, being outdoors only if necessary, avoiding crowded areas |
| Are you satisfied with the service of Al-Nassr Pediatric Hospital? | Y 7, N 2 | Y 35, N 8 | Y 42, N 10 |

staff attitude in Al-Nassr Pediatric Hospital. At the end of quarantine duration, 94% sterilized their homes. Lastly, changing behavior and hygiene practices was admitted by all except one family in terms of putting masks, hand hygiene and physical distancing (Table 5, 6).

## Discussion

Since December 2019, patients with fever, dry cough, normal, or decreased white blood cell counts that were initially diagnosed as "Fever of Unknown Origin with pneumonia" have been continuously increasing in Wuhan. The causative agent of this unexplained infected pneumonia was identified as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) which not only has a strong human-to-human transmission but also causes severe pneumonia to death. SARS-CoV-2 is so aggressive that the infection has been transmitted to other countries and is seriously imperiling human life. World Health Organization has declared this disease to constitute a Public Health Emergency of International Concern on January 30th, 2020 [8].

In Gaza strip with a population of over two millions and since the global pandemic spread of COVID-9, the government started strict quarantine regulations for any personnel entering Gaza, so till late August 2020, all COVID-19 positive cases were from quarantine centers and the first case in the community was reported in August 24th, 2020. Up to February 17th, 2021, the total number of cases was 54,041 with 23.3% were in the pediatric age group (<18 years). Community spread of COVID was gradually increasing, reaching the peak in the mid of December 2020 with total deaths of 538 (mortality rate 1%). The least mortality was in the pediatric age group (1% of total deaths) [2].

Literature review of reported neonatal cases showed that the male to female ratio was 2.8 to 3:1, so the authors stated that male infants were more susceptible to SARS-CoV-2 infection than female. In 88% of cases, the mothers were affected by SARS-CoV-2 [9,10]. However, reported pediatric cases showed that the children of all ages appeared susceptible to COVID-19, and there was no significant sex difference [11]. Merely 2.4% of cases are under 18 years old. Children also appear to develop a milder disease, when compared to adults [12]. Moreover, COVID-19 in pediatrics occurs in the early stages of its outbreak at a high rate and in a family cluster pattern [13].

In our study, all age groups were susceptible to COVID-19 (age range 3 days to 11 years), and there was no sex predilection. Moreover, most cases were part of family clusters and the mothers were affected in 85% and 87.5% of our neonatal and Pediatric cases respectively.

In neonates, it is challenging to differentiate between the symptoms of COVID-19 and RDS, TTN (Transient Tachypnea of the newborn), and sepsis. Clinical manifestation of infected neonates might be nonspecific, such as temperature instability, apnea, respiratory distress, GI symptoms (vomiting, diarrhea, and abdominal distension.), poor feeding and lethargy, the predominant symptom being mild respiratory symptoms. Term neonates are usually asymptomatic [9].

Children with COVID-19 infection may be asymptomatic or have fever, dry cough, and fatigue, with a few upper respiratory symptoms; some patients have gastrointestinal symptoms, including abdominal discomfort, nausea, and vomiting, abdominal pain [14].

In our review, presentation of the 19 COVID-positive neonates was with fever, diarrhea, rhinorrhea, and cough, respiratory distress in 89.5%, 15.8%, 15.8%, 10.5%, and 5.2% respectively. While the 21 positive children presented with fever, diarrhea, cough mild upper respiratory symptoms and respiratory distress in 81%, 38%, 19%, 9.5% and 1% respectively.

Typical laboratory findings were minor changes in white blood cell counts (reports of both increased and decreased lymphocyte and, less commonly, neutrophil counts), as well as mildly elevated inflammatory markers (erythrocyte sedimentation rate, C-reactive protein or procalcitonin), liver enzymes, creatine kinase, lactate dehydrogenase or D-dimers [14]. One published study shows high percentage of lymphopenia [15].

Other studies emphasized that in infants and children, unlike adults, elevated inflammatory markers are less common, CRP does not increase in neonates, and leukopenia and lymphopenia are less common [9].

In the review of our 40 COVID positive cases, CBC was normal in all cases and the lower lymphocytic count was $1.2 \times 10^9$/L in children and $1 \times 10^9$/L in neonates, with negative results of CRP and blood culture.

Radiologic findings were unspecific and milder compared with those in adults. They included unilateral or bilateral infiltrates on chest radiograph or computer tomography and, sometimes, additional ground-glass opacities or consolidations with a surrounding halo sign in the latter [14].

In this review, none of the COVID-19 positive cases showed abnormalities by Chest X-ray, except for one pediatric case which showed cardiomegaly due to the underling cardiomyopathy. CT scan was not done for any of the patients symptomatic and supportive treatment is the mainstay of therapy for patients of SARS-CoV-2 infection including the supply of oxygen, the maintenance of water-electrolyte, and acid-base balance. Antibiotics are suggested just for cases with clinical or paraclinical signs of bacterial super infection [8].

A systematic review of case reports and small case series, mainly from China and Italy showed that respiratory management was performed according to the mild clinical status of infected neonates,

with the majority of them left in spontaneous breathing (room air). Only 1 out of 10 neonates needed mechanical ventilation, but concomitant conditions (i.e., prematurity) cannot be excluded and may have contributed to the clinical status [16].

In our study, all of the cases were on room air, except for the case of cardiomyopathy WHO needed oxygen supplementation. None of our patients required mechanical ventilation. Antibiotics were administered for most of the cases for provisional diagnosis of sepsis and they were discontinued after negative CRP and blood culture results [17].

In a cohort analysis of 101 neonates born to mothers with perinatal COVID-19 infection, 2 (2.0%) had positive test results for COVID-19 but none had clinical evidence of coronavirus disease 2019, despite most infants rooming-in with mothers and direct breast feeding, fifty-five infants were followed up to first 2 weeks of life, all of whom remained healthy [18].

Here, we also reported 13 neonates and 19 children whose COVID tests were negative neonates, however, cared by COVID-positive mothers without separation during admission. Fever was the only symptom in about 54% of neonates without any other COVID-related abnormalities. Reported COVID-related symptoms in the 19 children were fever, cough, mild URTI, RD and diarrhea in (10.5%, 21%, 10.5%, 10.5%, and 21% respectively) without any other COVID-related lab or radiologic abnormalities. All cases were discharged with clinical improvement and mean hospital stay of 5 days in children and 6 days in neonates.

Of note, one case presented at age of 28 days with dry cough, severe respiratory distress and cyanosis requiring mechanical ventilation. Chest radiography showed white lungs and her COVID-PCR was negative. The baby died within 10 h of admission. As all family members were COVID-positive, the authors reported this case as suspected COVID-related mortality.

Most of studies emphasize that the coronavirus disease in children seemed to be a milder disease course and better prognosis than adults. Most of the pediatric patients have recovered within 1 to 2 weeks after onset. It is very uncommon to progress to lower respiratory tract infections. Deaths were extremely rare [12,19].

In a systematic review of 18 case reports and 8 case series with a total number of 44 COVID-19 positive neonates, the overall prognosis was good with a mortality rate of zero as all of the 44 cases were discharged in a good health state after a median hospital stay of 10 days [19].

Similarly, the prognosis of our cases was also good, and all of them were discharged after clinical improvement with a median hospital stay of 4 days.

Implementation of Strict quarantine measures has effectively slowed the spread of new cases of infection on both the Chinese mainland and the rest of the world. However, researchers have realized that such measures might have adverse psychological effects on children who are quarantined. For children who are quarantined at home with their parents or relatives, the stress caused by such a sharp change in their environment might be eased to some degree. However, children who are separated from their caregivers require special attention, including children infected with or suspected of being infected with Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), who are quarantined in local hospitals or collective medical observation centers; and children whose caregivers are infected with SARS-CoV-2 or who have died from the disease and are thus under the care of social charity groups. These children might be more susceptible to mental health problems because of their higher risk of infection, and the grief and fear caused by parental loss or separation [7]. In Gaza, COVID cases were obligatory quarantined before November 14$^{th}$, 2020 in hospitals or hotels according to local protocols, this policy has effectively delayed the community spread but caused stress to the separated families. After that date, domestic quarantine was applicable [20].

For the 52 interviewed mothers, strict domestic quarantine regulations were followed in all except 7 families. Duration of quarantine was 10 to 45 days (mean 16.4). The long duration for some families was due to sequential infection of other family members. Moreover, although the stress of family disruption was eased by domestic quarantine, environmental change especially in long durations of quarantine had been distressing to all family members.

More than 1 in 5 U.S. homes, housing about one quarter of all Americans, lack sufficient space and plumbing facilities to comply with recommendations to isolate or quarantine to limit household spread of COVID-19. This proportion is particularly high among homes occupied by minority and poor individuals and among apartments, a pattern that mirrors both the high incidence of COVID-19 [21]. During quarantine, strategies to further increase home-based physical activity and to encourage adherence to a healthy diet should be implemented. The WHO has just released guidance for people in self-quarantine, those without any symptoms or diagnosis of acute respiratory illness, which provides practical advice on how to stay active and reduce sedentary behavior while at home [22].

In our review, about 75.6% (31/41) of families who were home-quarantined had suitable domestic environment, however, about half of mothers (20/41) didn't have a special bathroom. Moreover, 88.4% received healthy food and vitamin supplementations as recommended.

Due to the potential concern for transmission of infection from maternal respiratory secretions to the newborn, temporary separation of the maternal-baby dyad, allowing for expressed breast milk to be fed to the infant, was initially recommended but later revised to include breastfeeding by the American Academy of Pediatrics in contrast to international societies, which recommend direct breastfeeding. This separation can have negative health and emotional implications for both mother and baby [22].

Our interviews showed that out of the 46 infants, 84.7% received and continued breast-feeding during the maternal or infant COVID infection. Before the decision of home-quarantine, one third of admitted cases were separated from their mothers after being confirmed to have COVID infection. This added negative psychological effects to their mothers.

There has been a profound impact of parents trying to explain to their children the drastic change in family routines. Parents struggle to teach abstract concepts such as illnesses due to respiratory viruses, hand washing, and wearing masks. Regardless of age, all children are reassured by knowing that their parents will be there to care for and that they will be safe. Many parents themselves are struggling to deal with their own emotions dealing with a plethora of uncertainty in addition to being calm enough to support their child's feelings [6].

COVID-19 has changed the family routines in caring with

children, as fathers contributed in 78% during the maternal quarantine before November 14th, 2020, while they contributed less (in 28%) with implementation of home quarantine. Other members in extended families cared for kids in about one fifth of families (22% and 21% before and after November 14th, respectively). Nearly all families received psychological support by their extended families. In addition, changing behavior and hygiene practices was admitted by nearly all families in terms of putting masks, hand hygiene and physical distancing. However, our study hasn't addressed disrupting the routines of life and home-schooling.

Several studies on COVID-19 and pregnancy have been published recently, but the impact of this pandemic on maternal mental health has not yet been properly evaluated. However, the importance of considering the possibility of increased risk to avoid adverse effects has been highlighted. The risk may be related to concerns regarding the wellbeing of the unborn child, but aggravated by unintended consequences of preventive measures, such as quarantine, physical distancing, home isolation, remote consultations with healthcare professionals, and inability to obtain expected level of support and care prenatally as well as during the intrapartum and postnatal periods [23].

In our study, the interviewed ladies expressed the following feelings upon receiving the COVID-positive results: Shocked, scared, cried, collapsed, worried, upset, sad, difficult feeling, expected in (63.4%, 7.7%, 1.9%, 1.9%, 3.8%, 1.9%, 1.9%, 3.8%, 13.4% respectively).

Results of one study show that 85.7% of the parents perceived changes in their children's emotional state and behaviors during the quarantine. The most frequent symptoms were difficulty concentrating (76.6%), boredom (52%), irritability (39%), restlessness (38.8%), nervousness (38%), and feelings of loneliness (31.3%), uneasiness (30.4%), and worries (30.1%) [24].

Our study showed that about 19% of kids for affected families experienced psychological problems as following: Scared and worried in 60%, secondary incontinence in 40%. These negative psychological effects were doubled in case of maternal separation (33% *vs.* 16% before and after November 14th, 2020).

Duration of quarantine, provision of inadequate information, boredom and frustration, fears about being infected, financial losses, and stigma were some of the factors identified with stress in quarantined population. Stigma in particular has been a recurrent theme in literature with regard to distress associated with quarantine [25].

In this review, about 56% of the families had been bullied by their relatives or neighbors, which put much psychological stress on them.

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