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Managing Neonatal Intensive Care Units (NICUS) in Two Tertiary Level Hospitals during COVID 19 Pandemic First Wave: An Exploratory Health System Research

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Abstract

Background: COVID 19 is a worldwide epidemic that resulted in public suffering worldwide and ended the life of many; a lot of preventive measures were implemented to combat the spread of this pandemic. Neonatal intensive care units (NICUs) are dedicated units that deliver health care to neonates, so distinct preventive actions must be followed to protect them. Objectives: Assess admission regulations at two NICUs in two tertiary level hospitals during COVID 19 first wave pandemic peak. Determine precautions taken by healthcare providers to protect themselves and neonates. Method: Health system research exploratory study. Results: Hospital regulations regarding patient admission, triage, and visits were changed during the crisis. A robust infection preventive and control measures were followed including physical distancing. Conclusion: Hospital management, regulations and infection prevention measures should be revised and updated to decrease the spread and effect of the infectious virus on the life of neonates, their families, and providers especially during the time of pandemics. Recommendations: Studies are needed to revise and evaluate updated recommendations on how to prevent infectious diseases spread in NICUs during the time of pandemics. Key Words: COVID 19, NICUs, Hospital regulations

Introduction

In China a group of cases of pneumonia related with a novel pathogenic Corona virus, were first recognized in Wuhan, Hubei province. In January 2020, the global international health regulations, emergency committee of the world health organization announced the corona virus disease (COVID-19) as a public health emergency of international concern *(Rodríguez-Morales et al., 2020)*.

In February, 2020, Egypt announced the first case of COVID-19 (*Medhat and El Kassas, 2020*). COVID-19 is a respiratory system infectious disease which is transmitted through air droplets. Respiratory symptoms are the main manifestation; however, COVID-19 shows a clinically varied presentation. The disease varies from asymptomatic presentation up to severe pneumonia, acute respiratory distress syndrome, respiratory failure, or multiple organ failure (*Tsai et al., 2021*).

Higher risks of developing serious Coronavirus related disease is among older people especially with underlying health conditions (*Farshbafnadi et al., 2021*). Children are susceptible to COVID-19, however children's COVID-19 cases manifestation were mostly less severe than those of adult patients. Young children, particularly infants, were vulnerable to infection. (*Dong et al., 2020*).

During COVID-19 pandemic regulations and policies were established or reviewed at Neonatal Intensive Care Units (NICUs). This included screening, isolation (USA Health, 2020) and visitors' policies (Giordano et al., 2023). Therefore this study was conducted to explore the administrative regulation implemented during the pandemic in two tertiary care NICUs. This would help assessing the situation and developing future recommendations to proactively face any forthcoming crisis.

Aim and Objectives

Assess admission regulations at two NICUs in two tertiary level hospitals at Cairo University during COVID 19 first wave pandemic peak. Determine precautions taken by healthcare providers to protect themselves and neonates.

Participants and methods

Study design

This study was a descriptive health system exploratory research conducted at two NICUs in two tertiary hospitals during COVID 19 first wave in Egypt. The study included all newborns admitted to both NICUs in the time from the First of May to the end of July 2020, their mothers, a sample of health care providers working during the same time (nurses, physicians).

Study Population:

The study included all newborns admitted to both NICUs, their mothers, a sample of health care providers working during the same time (nurses, physicians).

Study Setting:

The study was conducted at two NICUs in two tertiary level hospitals at Cairo University during COVID 19 first wave in Egypt.

Sampling:

The study included all newborns admitted in both NICUs (N=381) during the mentioned period. For indepth interviews a convenient sample from health care providers working during this time was selected (2 nurses, 5 physicians).

Data Collection Tool and Technique:

I. A designed check list used to collect data from records:

Checklist covers causes of neonatal admission, fate, admission investigations.

2. In-depth interview guideline: A questionnaire guide for in-depth interview was structured which Covered the following items:

A. Admission and regulation criteria during COVID 19 pandemic

B. Triage and visits: Restricted accesses, Social distancing practices, Standardized procedures for hand washing and wearing personal protective equipment (PPE).

c. Regulations to protect Healthcare workers during the pandemic.

Statistical Analysis:

Quantitative analysis: Data was collected, coded then entered as a spread sheet using Microsoft Excel 2016 for Windows, of the Microsoft Office bundle; 2016 of Microsoft Corporation, United States then analyzed using IBM Statistical Package for Social Sciences software (SPSS), 21st edition, IBM, United States. The data were presented as number and percentages for the qualitative data, mean, standard deviations, range, and median for the quantitative data.

Qualitative analysis: thematic analysis was performed to data from in-depth interviews.

Ethical Consideration:

Data collection tool was anonymous. Confidentiality of the data was maintained all through the process and no one could reach the data except the researchers. Approval from the faculty research ethics committee was obtained.

Results

This study was carried out on 381 neonates admitted to both NICUs. Table (1) shows distribution of demographic data in current studied cohort. The mean age of patients was $4.6\pm$ 7.18 days and ranged from 1 to 86 days. 212 (55.6%%) were male while 169 (44.4%) were females. Regarding admission, it was the first time to NICU admission in the majority of cases (79.3%). While concerning the diagnosis of the studied cohort, pneumonia was the most common cause of NICU admission representing 29.4% cases while jaundice was the second most common cause representing 28.9% cases. The mean duration of being inpatient was 11.03 \pm 13.4 days. Regarding the fate of the admitted cases 76 (19.9%) of them died (Table 2). Nasopharyngeal swabs on admission were done in 10 (2.6%) neonates, CBC or CRP was performed to 347 cases (91.1%), chest X-ray or CT on admission was done in 376 (98.7%) neonates (Table 3).

Qualitative Analysis:

Based on the analysis of in-depth interviews with five neonatology residents two nurses (one nurse from the infection control team, and one head nurse) the following recommendations and measures were mentioned as regulatory and precautionary measures during the time of study.

1. For the mother: asking about history of contact with suspected or confirmed cases and presence of any symptoms suspecting infection with COVID 19; isolation between confirmed and suspected mothers and their babies until the result of mothers' PCR; stoppage of breast feeding and its replacement with formula.

2. For the newborn: examining all neonates on admission if having any signs or symptoms suspecting COVID 19; X-ray or CT scan of chest on admission for neonates; putting the newborns of confirmed and suspected mother in a separate quarantine zone; throat swabs PCR to newborns of confirmed or suspected mothers. When suspicion of cases occurred later on by clinical, laboratory and radiological evidences, nasopharyngeal swab PCR for COVID 19 were done to the neonate .CBC and CRP was performed to all neonates on admission and repeated later on weekly basis.

3. Regarding triage system and visits: Visits were not allowed during the first wave except for mothers who breast fed their babies; and adoption of social distancing practices was followed.

4. Regarding health care workers: the health care workers mentioned that the following measures were adopted during the epidemic: washing hands frequently with soap and water; wearing face masks when dealing with patients; wearing Personal Protective Equipment (PPE) when dealing with cases suspected or confirmed to have COVID19; social distancing practices were adopted.

Table (1): Demographic data of the studied cohort. Studied cohort (n= 381) Mean ± SD Age (days) Median(min-max) 2.0 (1.0-86.0) 4.6± 7.2 Gender % No. Male 212 55.6% Female 169 44.4%

Table (2)

Admission order, causes, duration and outcome of the studied cohort. (n=381)			
Variables	No	%	
Order of admission			
First	302	79.3%	
Second	77	20.2%	
Third	2	0.5%	
Causes of admission			
Pneumonia	112	29.4%	
Jaundice	110	28.9%	
Preterm Respiratory Distress Syndrome (RDS)	90	23.6%	
Congenital Heart Disease (CHD)	25	6.6%	
Hypoxia, Persistent Pulmonary Hypertension (PPHTN), Post-arrest	15	3.9%	
Sepsis	12	3.1%	
Multiple congenital anomalies	11	2.9%	
Renal problem	6	1.6%	
Hydrocephalus	4	1 %	
Convulsions	4	1 %	
Metabolic disorders	4	1 %	
Others as Hemorrhagic Disease of Newborn (HDN), icthyosis, organophosphorus poisoning, hormonal disorders	11	2.9%	
Length of Stay (days)			
Median(min-max)	Mean ± SD		
7.0 (0.0-97.0)	11.0± 13.4		
Prognosis			
Recovered	305	80.1%	
Died	76	19.9%	

Investigations performed on admission to the studied cohort.			
Investigations	Studied cohort (n=381)		
-	No.	%	
Nasopharyngeal swabs on admission			
No	371	97.4%	
Yes	10	2.6%	
CBC or CRP on admission			
No	34	8.9%	
Yes	347	91.1%	
Chest X-ray or CT on admission			
No	5	1.3%	
Yes	376	98.7%	

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Table (3)

Discussion

After COVID-19 had spread from China to other countries over the world, WHO declared that the outbreak constitutes a Public Health Emergency of International Concern (PHEIC) in January 2020 (WHO, 2020). Egypt government announced a package of precautions to limit the spread of infection (SIS.Gov, 2020). In 2020 Cairo University Hospitals published its guide for managing hospitals during COVID-19. The guide included recommendations for infection prevention and control for health care workers during COVID-19 pandemic, within the framework of the university's plan to confront the pandemic, combat the spread of infection, and raise the level of awareness among medical staff (CU.EDU, 2020). The guide highlighted international recommendations for COVID-19 prevention and control. Recommendations included; triaging patients at entry points, screening patients and facility attendees for infection signs and symptoms, preventing visitors from entering the facility except for care givers or the parents, importance of hand washing, face mask, social distancing and patient isolation. For healthcare providers, the guide recommended the use of suitable personal protective equipment, hand hygiene and social distancing (CU.EDU, 2020).

This was articulated in the current study where interviewees affirmed the presence of regulations that guide service provision. Regulations encompassed admission regulations which included screening by history, symptoms and signs, swab for suspected cases, visiting regulations, quarantine zone for suspected and confirmed cases, social distancing and also infection prevention and control regulations e.g. hand hygiene, PPE, etc...

Parents visiting NICU was debated during COVID-19. Their attendance was restricted in many NICUs worldwide during the pandemic. A study by *Giordano et al. (2023)* acknowledged the importance of parental presence.

Also another research discussed policy changes in neonatal intensive units during the pandemic and how it resulted in many parents being separated from their babies which may have long term effect on the family as whole (*Fonfe et al., 2021*).

In the current study, all newborns of suspected or confirmed mothers were isolated from their mothers and breastfeeding was stopped and replaced by formula to avoid direct contact between mothers and babies. This may be explained by the uncertainty and lack of research evidence early in the pandemic.

This was also discussed in early reports which did not recommend mother-baby contact or breastfeeding. However, later most international organization, such as WHO and UNICEF, encourage breastfeeding and mother-baby contact provided that COVID-19 infection prevention and control measures are adopted. On the other hand if the general health of the mother hampers direct mother baby contact, expressing milk is encouraged to be provided safely to infants (*Pereira et al., 2020*). In the current study, the main reasons for admission were pneumonia, jaundice and preterm RDS.

More than three quarter recovered and only 19.9% died.

Other studies also communicate respiratory problems and prematurity as common causes of admission. For example a study implemented to explore neonatal admission in Neonatal Intensive Care Unit at Zagazig University children hospital found that the commonest primary diagnosis during NICU admission were RDS (21.1%). Congenital pneumonia was (8.5) and aspiration pneumonia was (5.2%) (*Elbanna et al., 2020*).

While another study in Jordan reported that respiratory failure of the newborn (41.2%) and prematurity (33.3%) were the main indications for admission *(Khasawneh et al., 2020).* Regarding neonatal mortality in 2015 a published literature review study reported that mortality rates varied and ranged from 4 to 46% in developed countries and 0.2 to 64.4% in developing countries

(Chow et al., 2015).

In the current study majority of the neonates had the following investigations on admission CBC or CRP, Chest X ray or CT chest. These investigations were reported as part of COVID-19 diagnosis algorithm in another Egyptian study. Where investigations for suspected case were CBC and radiology while to confirm diagnosis nasopharyngeal swab for PCR was used, and serum ferritin, D dimer, LDH, and CRP were used to assess severity *(Mostafa et al., 2020).*

Conclusion

Hospital management, regulations and infection prevention measures should be revised and updated to decrease the spread and effect of the infectious virus on the life of neonates, their families, and providers especially during the time of pandemics.

Recommendation

Studies are needed to revise and update recommendations on how to prevent infectious diseases spread in NICUs during the time of pandemics.

Abbreviation

CBC: Complete Blood Count CHD: Congenital Heart Disease COVID: Corona Virus Disease. CRP: C Reactive Protein CT: Computed Tomography HDN: Hemorrhagic Disease of Newborn LDH: Lactate dehydrogenase

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NICUs: Neonatal intensive care units PCR: Polymerase Chain Reaction PHEIC: Public Health Emergency of International Concern PPE: Personal Protective Equipment PPHTN: Persistent Pulmonary Hypertension RDS: Respiratory Distress Syndrome SPSS: IBM Statistical Package for Social Sciences software UNICEF: United Nations Children's Fund WHO: World Health Organization

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Retrieved from https://www.who.int/publications/m/item/covid-19-public-health-emergency-ofinternational-concern-(pheic)-global-research-and-innovation-forum, . Accessed on 6-9-2024 إدارة وحدات الرعاية المركزة لحديثي الولادة في إثنين من مستشفيات المستوى الثالث أثناء الموجة الأولى لجائحة كوفيد ١٩: بحث استكشافي للنظام الصحي

منة الله سعيد حسني شحاتة، تامر أحمد عبد الحميد، شيماء مراد إبراهيم البلاسي، سميرة عبد المنعم عطا حسين

الملخص العربى

المقدمة

كوفيد ١٩ هو وباء عالمي أدى إلى معاناة عامة في جميع أنحاء العالم وأنهى حياة الكثيرين؛ وتم تنفيذ الكثير من الإجراءات الوقائية لمكافحة انتشار هذا الوباء. وحدات العناية المركزة لحديثي الولادة هي وحدات مخصصة تقدم الرعاية الصحية لحديثي الولادة، لذلك يجب اتباع إجراءات وقائية خاصة لحمايتهم.

اهداف الدراسة:

تقييم لوائح القبول في اثنين من وحدات العناية المركزة لحديثي الولادة في اتنين من مستشفيات المستوي الثالث للرعاية خلال ذروة جائحة الموجة الأولى لكوفيد ١٩. تحديد الاحتياطات التي اتخذها مقدموا الرعاية الصحية لحماية أنفسهم وحديثي الولادة.

الطريقة:

دراسة استكشافية لأبحاث النظام الصحي. النتائج: تم تغيير لوائح المستشفى المتعلقة بقبول المرضى وفرز هم وزياراتهم خلال الأزمة. تم اتباع إجراءات صارمة للوقاية من العدوى ومكافحتها بما في ذلك التباعد الجسدي. ا**لاستنتاج:**

يجب مراجعة وتحديث لوائح إدارة المستشفى وإجراءات الوقاية من العدوى لتقليل انتشار الفيروس المعدي وتأثيره على حياة حديثي الولادة وأسر هم ومقدمي الرعاية خاصة خلال فترة الأوبئة. **التوصيات:**

هناك حاجة لدر اسات لمراجعة وتقييم التوصيات المحدثة حول كيفية الوقاية من انتشار الأمراض المعدية في وحدات العناية المركزة لحديثي الولادة خلال فترة الأوبئة.

الكلمات المفتاحية: كوفيد ١٩، وحدات العناية المركزة لحديثي الولادة، لوائح المستشفى