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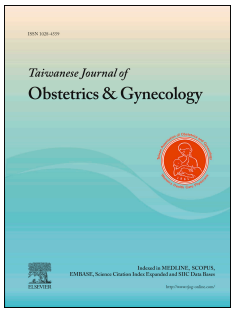

COVID-19 pandemic's effects on the quality of pregnant women's emergency treatment: review of two cases from a medical center in northern Taiwan

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Title page

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Abstract

The spread of COVID-19 has resulted in a high risk of infection in hospitals worldwide. The medical staff in emergency rooms, in particular, have borne the brunt of the pandemic, and strict protection measures are needed to avoid infection in these units. Taiwan as a whole has performed extremely well in this epidemic, an achievement that has been acknowledged internationally. This success can be attributed to the Taiwan Epidemic Prevention Management Center's extensive experience and courageous strategy. The emergency department professionals of all hospitals, in conjunction with the outstanding performance of the center's policy, have also done much to control the infection's spread. However, excessive protection can also negatively affect patients' safety and the quality of medical care, especially for pregnant and parturient women. This article uses two actual cases from a medical center in northern Taiwan to discuss the impact of COVID-19 on pregnant women. This case study serves to highlight that, to ensure more effective coordination during severe epidemics, a comprehensive infection prevention plan should be formulated. In addition, pregnant women's human rights must be safeguarded so that various protective mechanisms can be effectively used to achieve win-win solutions. Hospitals need to plan their production methods and timing in advance for when pregnant patients are in critical condition. The findings include that obstetricians recommend caesarean sections as a safer method in during epidemics. Emergency room physicians and obstetricians should also actively assist mothers prepare for birth to enhance maternal and fetal safety.

Keywords: COVID-19, pregnant, fetal safety, emergency department

Introduction

Overall situation and epidemic's impact

COVID-19—the coronavirus disease first identified in 2019—cases continue to increase worldwide, and most countries have implemented a blockade [1-5]. The number of confirmed cases reached 4.38 million on May 15, 2020, with more than 298,000 deaths, causing extensive panic around the globe. With the new crown epidemic's continued spread, everyone is now seeking to reduce the behaviors associated with "hospital shopping [6], [7]." However, specific patient categories, such as pregnant women, must still regularly go to hospitals and clinics to track the fetus's growth. Although no local cases of infection have been reported in Taiwan for 32 days thus far, 440 people have been diagnosed with COVID-19, and 7 people have died [8]. A second wave of infections is still expected in the future, which makes pregnant women who are in contact with those already in isolation or pregnant women who are suspected positive cases resist going for emergency medical treatment. Thus, the quality of medical treatment and overall safety of pregnant women and fetuses in hospital is being questioned.

Emergency departments' approach to suspected cases

Emergency room detections of possible new coronavirus infections necessitates outdoor triage classifications of patients as risk and non-risk individuals. Screenings of high-risk patients cover four areas: travel, occupation, exposure, and cluster (TOCC) status [9], [10]. Patients are also checked for fever or upper respiratory symptoms. Other symptoms include, among others, a loss of smell and taste and diarrhea. If a TOCC status is confirmed, the patient is treated as a suspected case. A throat cell swab and chest X-ray examination are performed at the outdoor screening station [10], [11-13].

Overall, patients would be safer if they were allowed to enter the emergency room until the culture's result is found to be negative. They should be able to consult the appropriate medical staff and receive further treatment. However, any patient whose chest x-ray results are not normal must be refused entry into the emergency room or any follow-up examinations and treatment (see Figure 1).

Case report

Two real-life cases are examined here, both of which demonstrate the actual conditions offered pregnant patients in a medical center in the capital city of Taipei. Normally, an obstetric examination is an easy, standard procedure in emergency rooms. Since the COVID-19 outbreak, pregnant patient care has become difficult, and these women must wait prolonged periods for the triage inspection, which can cause fetal safety concerns. These patients have complained about this process and become embroiled in unnecessary disputes.

The medical center in question processes close to 500 patients per month. About 20 obstetrics and gynecology patients visit the emergency department every day. The number of attending obstetricians varies from three to four. Overall, this facility is a quite well-known obstetrics and gynecology center.

Case One

A 36-year-old woman who was nine months pregnant came to the emergency department alone to seek medical treatment. The main reason was that she had just returned from an area in another country with COVID-19 cases. Because her due date was close and she felt strong fetal movement, she suspected she was about to give

birth. The patient took the “epidemic prevention taxi” alone to the hospital emergency unit to undergo the relevant examinations.

After an emergency outdoor status assessment, the patient was classified as a high-risk patient returning to Taiwan from an infected area, who was in isolation at home in accordance with official regulations. Due to the closeness of the due date, any obstetric examinations had to be conducted during her isolation period. Going into labor earlier was also a possibility. Given that the emergency staff could not confirm whether the patient was infected with new coronary pneumonia immediately, her presence posed various challenges to the emergency epidemic prevention process.

The problems encountered by the patient in the emergency department included, among other obstacles, that the obstetrician refused to given the pregnant woman the obstetrical examination needed. The doctor did not dare to perform the examination before confirming that the patient was not infected. The woman’s family could not accompany her due to potential infection. No proper delivery room was available for an emergency delivery of her baby, and the equipment that came into contact with this patient would have to be sterilized. The nursing staff was extremely anxious about possible infection, especially as the patient did not have any epidemic prevention equipment. Finally, the results of the throat culture would only come out in more than two days.

After multiple discussions, the emergency department staff first performed a rapid screening test for the new coronavirus. After the first negative result, the patient was admitted to a single ward, where she waited for 24 hours before a second throat swab was performed, which was sent to the national polymerase chain reaction (PCR)

laboratory center for genetic screening for the coronavirus. Concurrently, the emergency staff started to prepare a negative pressure intensive care unit to serve as a place for labor preparation in case of the worst or unexpected case that the mother was infected.

Fortunately, the second screening result was negative, but the obstetricians and nursing staff were now equipped with complete protection gear, including N95 masks, protective goggles, waterproof devices, and Class-B protective gowns. Advanced planning could have ensured a Caesarean section protocol was in place earlier to deal with unexpected births and reduce unnecessary exposure risks. With extremely strict protection measures, neither patients nor their infants would be infected with the new coronavirus, and the mothers and babies could be released from isolation after the required period.

Case Two

A 30-year-old woman, four months pregnant, was rushed to a hospital emergency room for treatment after a car accident. The patient complained of an impact on the abdomen and abdominal pain, and she could not feel the fetus move. She was afraid that the baby was in trouble, so she went to the emergency department for treatment. The patient is a clinic nurse and thus in a high-risk occupation, so, despite no history of contact, travel, or group activities, she was also considered a suspected case of COVID-19.

She had to go to an independent outdoor screening station for technicians to check her chest X-ray and swab her throat for the virus. Concurrently, the emergency doctor wanted the obstetrician to do an ultrasound of the fetus. However, obstetricians

require that any COVID test must be negative before conducting any fetal ultrasound examination. Pregnant patients, therefore, must wait a long time in the emergency department, waiting for their virus screening test results. This process obviously reduces the quality of emergency medical care and jeopardizes these patients' safety.

In addition, because the pregnant woman in question was still in the early stage of pregnancy, she was afraid that an X-ray would affect the embryo's development, so she refused to undergo the chest X-ray. This incident also caused the emergency department doctors some headaches as they had no way to assess whether the patient's lungs were infected. Her refusal meant the doctors could not exclude the possibility of a new coronavirus infection through images.

Under the emergency physician and obstetrician's supervision, the patient was fully prepared by the obstetrician in charge of the ultrasonic equipment, and the isolation probe's contact position was covered. After the scan was completed, a complete disinfection procedure was performed quickly to reduce the risk of any new coronavirus infections. After passing through the outdoor screening station, the patient waited for more than five hours in the emergency room to complete the examination, and only then could she be discharged after confirming that the fetus was stable.

Discussion

Both of these pregnant women encountered difficulties in the emergency room due to epidemic prevention requirements, and doctors had no way to check them more quickly. The dilemma faced by these patients is mainly due to a lack of alternatives available that could confirm more rapidly whether the pregnant women were not infected [14-17]. They are left by the obstetricians to wait in a state of constant fear in

the emergency room for the result of their COVID test [18]. This measure overall reduces examinations' timeliness, which is a quite serious risk for pregnant women and their fetuses [19-21].

Impact of emergency procedures on pregnant women

In cases of abdominal pain or trauma in emergency mothers, special attention should be paid to the fetus's development. When a problem is detected, these patients must immediately go to the delivery or ultrasound room for doctors to check the placenta's condition in the womb. The sooner the staff can understand the patient's state of health, the more quickly they can control the injury's continued effects, which is extremely important for the mother and fetus [22], [23].

Since the COVID-19 outbreak, the emergency department and delivery room medical staff have been required to confirm a negative result of the fast outdoor screening tests before patients can be examined. This process causes a large number of patients to stay in the emergency room, generating a potential risk of cross infection. Thus, the emergency room treatment of pregnant women requires that the quality of epidemic prevention cannot always be taken into account and multiple medical professionals need to assist these patients in order to respect the hospitals' core values.

Pregnant women's risk of COVID-19 infection

With the rapid increase in new coronavirus infections, the number of diagnosed pregnant women and children has also increased, but few studies have been conducted on early neonatal infections. The existing international literature indicates that fetuses can cause an aneurysm related to Kawasaki disease or even death through vertically transmitted infection [24], [25]. According to a report published by *The Lancet* in

2020, nine pregnant women with advanced coronavirus in their third trimester did not have any new coronavirus in their amniotic fluid, cord blood, breast milk, or oropharyngeal or epidermal cells [26].

However, in two cases of neonatal coronaviruses diagnosed in Wuhan Children's Hospital on February 5, 2020, the mother had tested positive for new coronaviruses [27]. The doctors suspected a vertical transmission route of the maternal and infant infection. A study that appeared in *JAMA Pediatrics* also indicates that pregnant women with COVID-19 disease may transmit the virus to newborns [28]. The Wuhan research team tracked the newborns of 33 recently pregnant women in that city and found that three of them had been infected with Wuhan pneumonia upon giving birth by caesarean section. The infection rate was 9%. Virus screening produced negative results six days after birth for the other women.

On December 8, 2019, Wuhan researchers found that pregnant women were infected with the new coronary pneumonia. As of March 20, 2020, as many as 118 people were reported in this condition, most of whom could not give birth and nine of whom had abortions. However, no babies were found to be infected with the new coronavirus. According to another article co-authored by healthcare professionals, an analysis of 118 cases of pregnant women found that 52% of them had contracted the disease before becoming pregnant, and 64% still had the virus into the third trimester. Their main symptoms were fever and cough, and 79% of them had computer-processed scans showing signs of pneumonia. However, the article also pointed out that, although nine out of 118 pregnant women had been diagnosed with severe hypoxemia, the data were insufficient to prove that the risk of infection or serious illness is higher than average for pregnant women [29].

Pregnant women diagnosed and terminated

Many cases of new coronavirus infection in pregnant women have been reported in the international literature. Zhong Mingting, Director of the Department of Reproductive Medicine at Chimei Hospital, states that, if a pregnant woman is infected, her lung function will drop by 20–30%, which will increase the risk of premature delivery. He suggests that, when a mother is known to be infected, a cesarean section is the best option because natural delivery takes longer, which increases the risks for other pregnant women and the medical staff. At present, many large hospitals plan to create delivery rooms for COVID-19 infected mothers. If the diagnosis is confirmed, the doctors only need to be vigilant and plan the labor well in advance, which will not harm the baby [30-32].

Notably, State of Illinois officials report that a baby died of Wuhan pneumonia in Chicago, which is considered an extremely rare case of infant death from COVID-19 infection on a worldwide basis [33]. The research unit involved particularly emphasizes that pregnant women should receive virus screening and self-isolate as much as possible to prevent exposure to the virus [34].

Physicians' overreaction and fear of COVID-19

Emergency medical professionals have been asked to take care of suspected or diagnosed patients since the epidemic broke out, so health facility staff are unable to take care of their own safety. In the face of a severe epidemic, medical practitioners are naturally anxious about being infected, and they are afraid that the virus in question will spread. When community-wide infections spread rapidly, a large number of local patients will flood into the nearest hospital. If no complete protection is

available, the chances of medical professionals being infected are greatly increased.

A research report on Wuhan examined the number of infections in Hubei in the pandemic's early days, finding that the incidence of infections was 16% among medical practitioners, which is quite high [35]. The infection rate of medical staff in other countries is close to 10%, which clearly shows the importance of emergency services' epidemic prevention systems [35], [36]. A recent tragic development is the suicide of medical professionals in fear in the United States, so similar examples of hospital staff's negative-COVID reactions need to be examined for other countries [37-40].

Two cases in Taiwan have been reported of obstetricians reluctant to carry out follow-up treatments or examinations without negative COVID-19 test results when the epidemic first spread. These instances were attributed to the healthcare professionals' fear and anxiety about the risk of new coronavirus infection, which affect patients' overall safety and the quality of emergency departments' operations. Emergency medical staff—similar to ordinary people—cannot easily fulfill their responsibilities under the threat of a virus with a high risk of contagion [41]. In the future, more effective methods should be used to reduce medical practitioners' anxiety due to the new coronavirus epidemic in order to protect pregnant women seeking quality emergency medical care.

COVID-19 screening test results taking too long

According to the Ministry of Health and Welfare's statistics, Taiwan's testing capacity is 3,200 samples per day. The United States' Stanford University observes that Taiwan was aware of the crisis quite early, establishing the Disease Control Bureau in

advance, so it was well prepared for the detection of coronavirus diseases in 2019. The bureau has also gradually expanded its detection capabilities over time.

At present, reverse transcription (RT) PCR testing has been adopted uniformly across Taiwan, and tests are conducted by contract laboratories via throat swabs. This type of test is a direct detection of the virus with the highest accuracy, which proved to be the most important tool during the epidemic's earliest phase. Many of the first screening tests in various hospitals were nucleic acid tests, which take about four hours, after which the second screening test must go through the gene sequencing RT-PCR method. The diagnosis thus takes from one to three days to confirm. This process is not fast enough to improve the quality of pregnant women's emergency medical treatment [42], [43].

More recently, the Taiwan Central Research Institute has successfully developed the SARS-CoV-2 (i.e., new coronavirus) fast screening reagent antibody, which means the virus can be diagnosed in 10 to 15 minutes. This test is scheduled to be mass-produced in July this year. The availability of more rapid screening methods will greatly reduce the time spent in emergency rooms waiting for test results, thereby improving the timeliness of medical treatment for pregnant women and helping to improve the quality of these medical services.

High virus specificity: ever-changing disease not to be taken lightly

The literature points out that 80% of COVID-19 patients are mild cases, and nearly 50% do not even have obvious symptoms [44]. Often the new coronavirus appears asymptomatic, and individuals can be infected without knowing, making its incubation period difficult to determine and increasing the number of variables in

pregnant women in isolation. Recent research has found that a characteristic of COVID-19 is that the clinical symptoms are not directly related to the amount of virus present. People with mild symptoms and those with confirmed respiratory disease have almost the same level of infection [45], [46].

Among the patients diagnosed in Taiwan, cases have been reported of symptoms that have improved even when the amount of virus has increased. Thus, seemingly healthy diagnosed individuals will still discharge the virus and infect others, and the lack of symptoms may be caused by the patients' own weak immunity. In addition, people with asymptomatic infections still can change quickly and become severely ill.

COVID-19's "re-positive" problem has also contributed to the general population's panic as they fear being infected again, making the trust between individuals disappear [47]. The re-positive cases may occur when patients have not fully recovered and the virus has not disappeared, but the amount of virus is too small to be detected. Other causes can be that the medical tests are not strong enough, the range tested is not wide enough, and the sampling procedure does not go deep enough during the inspection. If the infected cells are not properly collected, the test results will be negative [48]. At present, no reports exist that infected pregnant women have tested negative and then returned to test positive after recovery. Further studies are needed to confirm whether this situation is atypical, with symptoms being caused by the decline in mothers' immunity after pregnancy.

Current emergency and hospital solutions

If pregnant women are confined to their homes due to inspection, prevention, or isolation requirements, they need to be escorted by appropriate government units to a

hospital to be screened or checked by doctors. In this way, these women can avoid emergency visits to the emergency department for consultations with unknown health professionals, which may also create unintended loopholes in the emergency epidemic prevention. Emergency departments should meet pregnant women's needs as much as possible, strengthening lines of communication and coordinating with backline operations to strengthen their protection capabilities. The emergency staff can thus check pregnant women as early as possible to avoid triggering unnecessary disputes [49].

Pregnant women's response to hospitals

Becoming a mother is the most important reason women worry before giving birth. Their baby's condition needs to be constantly evaluated, and, during the epidemic, this process cannot be reduced to emergency hospital visits [50-52]. Many women are afraid of going to the hospital and being infected, so they may seek to delay the process of delivery and even put the fetus in danger. The World Health Organization has made various recommendations for how pregnant women can avoid catching the new coronavirus pneumonia, including increasing the frequency of hand-washing, avoiding touching their face, increasing the distance between social encounters, and avoiding overly close contact with people. Protecting pregnant women before and after childbirth is considered extremely important [53-55].

During this period, the COVID-prevention is very important [56]. The five key points need to be remembered by pregnant patients and their healthcare providers:

1. No one should relax during the epidemic as regular inspections are required and attention should be paid to changes in fetal activity at all times.
2. "Effective protection" is needed, and "interruption of protection" should be

avoided when making contact with others.

3. Good protective behaviors need to be developed including wearing surgical masks, diligently washing hands, changing clothes immediately after returning home, taking a shower, and doing a good job of personal hygiene to ensure protection.
4. Epidemic prevention measures should be perfected so that, for example, when coughing or sneezing, toilet paper or elbows need to be used to block the droplets and direct inhalation into the respiratory tract must be avoided.
5. Everyone should clean and disinfect themselves each time after contact.

Conclusion

Epidemic prevention measures in hospitals are clearly important, so, to deal with cases of pregnant women in critical situations, emergency department professionals must plan delivery methods and timing in advance. Experts recommend that obstetricians use cesarean section as a safer approach to reduce infections. Emergency room physicians and obstetricians should ensure they are completely protected while actively assisting pregnant women to do a good job of ensuring maternal and fetal safety.

Disclaimer

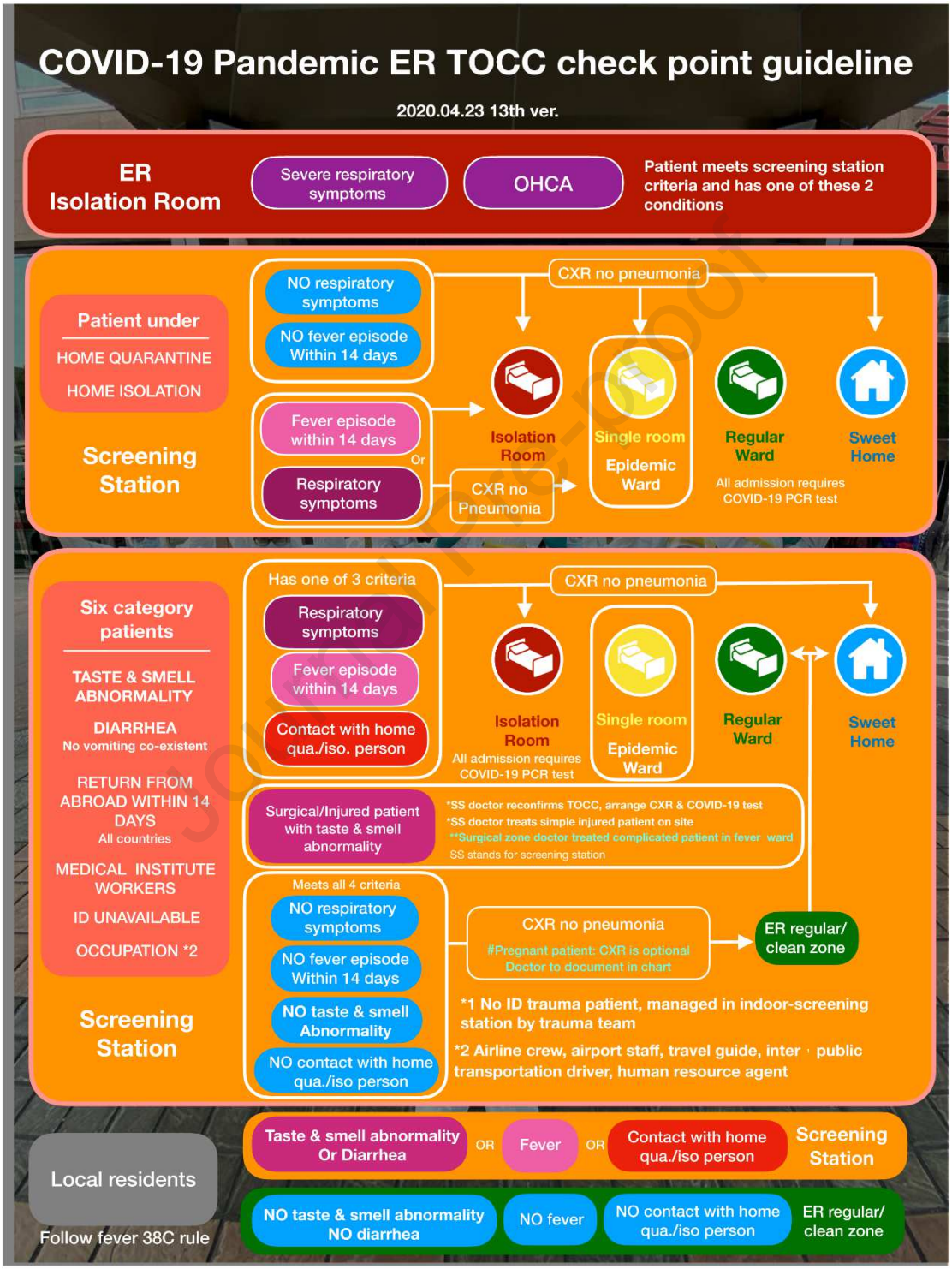
Some of the cited part in this article from web-sites has not been peer-reviewed; it cannot replace the expert's clinical judgment, nor has it examined the credibility of its cited source in detail.

Conflicts of interest

The authors have no conflicts of interest relevant to this article.

Figure Legend

Figure 1: New coronavirus infection inspection and ER triage guideline, a medical center north in Taipei.



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