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Prevention and Control Strategies for Children During COVID-19 Epidemic

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Abstract

At the end of December 2019, the epidemic of novel coronavirus 2019-nCOV [1] infection cause an epidemic all over the world, Chinese Center for Disease Control and Prevention(CCDC) announced that it belongs to "Class B" infectious diseases and follow as "Class A" infectious disease prevention and control measures. WHO announced that the disease caused by the coronavirus is called Corona Virus Disease 2019(COVID-19). The 2019 novel coronavirus outbreak was declared an "International Health emergency of International Concern (PHEIC)," the sixth International Public Health emergency declared by WHO since the SARS outbreak. China has a large population, up to Mar 25th, 2020, a total of 81,285 confirmed cases, 3287 death cases, 74051 cured cases have been reported[]. Although the epidemic in China has been controlled effectively, it is still at the peak of epidemic all over the world. Epidemiological investigation indicated that the population were generally susceptible to 2019-nCOV, and the elderly and people with primary diseases were more seriously, and there were confirmed cases in children and infants. A case of 30-hour newborn was recently reported. As a special group, children have poor immunity, and some children suffer from nephrotic syndrome, systemic lupus erythematosus, chronic kidney disease and other diseases. So it is particularly important to do some prevention and control works for them. After the implementation of active prevention and control measures, the current epidemic situation has been basically controlled in China. We summarized the relevant experience and strategies to share, hoping to save more lives.

Keywords: Novel coronavirus; COVID – 19; Children; The prevention and control; Experience

At present, most countries around the world are experiencing outbreaks of novel coronavirus infection, it is urgently needed to understand the harm of novel coronavirus, the way of transmission and take scientific prevention and control measures, to prevent the spread of the disease and make appropriate diagnosis and treatment plans, finally save more lives. The population is generally susceptible to *Corresponding authors 2019-nCoV [1]. Children as a special group with poor immunity, are also susceptible to the virus [2], so it is particularly important to do some prevention and control works for them. We hope that China's successful prevention and control experiences will be promoted and applied, to make certain contributions to human health.

2019 - nCoV biological characteristics

The coronavirus, which was isolated from the lower respiratory tract of a patient with unexplained pneumonia in Wuhan, was named 2019 - nCoV by WHO. According to the serotype and genomic characteristics, the coronaviruses are divided into four general: α,β,γ,δ. The novel coronavirus belongs to β [3], comparative analysis of the virus's genetic sequence suggests that the 2019 - nCoV's natural host may be bats [4].

Epidemiological characteristics of 2019-nCoV infection

At present, the main source of infection is the new coronavirus infection patients, asymptomatic infection may also become the source of infection. Respiratory droplets and contact transmission are the main transmission routes, the aerosol and digestive tract transmission routes also need attention, vertical transmission remain not been determined. The population is generally susceptible and has obvious family aggregation. By analyzing 1,334 cases in 31 provinces, Prof. Zhong nanshan and his team [5] found that the shortest incubation period for n-CoV infection in 2019 is 0d, the longest is 24d, and the median is 3d.

Clinical characteristics and diagnosis of 2019-nCoV infection in children

Refer to the pneumonia diagnosis and treatment program of the National Health Commission of the People's Republic of China (NHC for short) for novel coronavirus infection (Trial version 7) [6].

Combined with relevant literature [7], the diagnosis of children with COVID-19 should be combined with comprehensive analysis of clinical manifestations, laboratory examinations and imaging. Clinical manifestations, fever and cough are more common, accompanied or not accompanied by fatigue, muscle pain, nausea, vomiting, diarrhea, nasal congestion, sneezing, runny nose, sore throat, headache, dizziness, etc. the small infants often appear frequent vomiting, fever ratio up to about 76%, 1~2 days, the longest 8 days. Laboratory examination, the total number of white blood cells was normal or decreased, the lymphocyte count was decreased, most c-reactive protein (CRP) and erythrocyte sedimentation rate were increased, and calcitonin was normal. Imaging findings, the CT findings of children with covid-19 were diverse, and the CT findings of children with covid-19 showed typical patchy ground-glass density lesions in the lung, which were mainly distributed in the periphery of the subpleural lung, and were mostly seen in the lower lobe of both lungs, and in the lower lobe of the left lung [8]. This is different from that commonly seen in the right lower lobe in adults [9].

According to the clinical features of infected cases, they can be divided into: asymptomatic or subclinical infection, mild infection, common pneumonia, severe pneumonia, critical cases and other clinical types [9,10].

2019-nCoV infection in children

Up to 24:00 on Feb 7th, 2020, China has reported 285 confirmed cases of children, with no child deaths reported [9,11]. On Feb 4th, 2020, 2 cases of 2019-nCoV children were confirmed in Germany [12]. Among them, the youngest case was only 30 hours after birth [13], and the maximum age of onset was 18 years old [9]. From the current treatment of children cases, most of the clinical manifestations are relatively mild, can without fever or pneumonia, have a good prognosis, and most of them recovered in 1-2 weeks, some cases may progress to lower respiratory tract infection. Currently, there are no reports of critically ill in children [9].

Prevention and control strategies for medical staff during diagnosis and treatment

Protection of medical staff

Permission of the attending medical staff

First-line medical staff should accept pre-employment screening and be trained in novel coronavirus knowledge, and the following conditions should be excluded: pregnant women, people over 55 years of age, chronic disease history (chronic hepatitis, chronic nephritis, diabetes, autoimmune diseases and tumors), people with acute fever, epidemiological history. Testing blood routine, urine routine, liver function, myocardial enzyme and chest radiograph before job.

Isolation and protection requirements

Refer to the pneumonia diagnosis and treatment program of the National Health Commission of the People's Republic of China (NHC for short) for novel coronavirus infection (Trial version 7).

Isolation observation of medical staff after contact with COVID-19

a) Health care workers in close contact with COVID-19 patients: should be relatively isolated, avoid walking around and avoid extensive contact.

b) In case of symptoms such as fever, cough, shortness of breath, etc, isolated and checked must be taken immediately.

c) End work in COVID-19 ward, pharyngeal swab examination and blood routine examination should be conducted, and staff with abnormalities should be strictly isolated for observation, staff with no symptoms will be quarantined for 1 week before starting work.

d) Protection guidelines for different staff [14], as shown in (Table 1).

Guidelines for personal protection during a novel coronavirus outbreak										
Order	hand hygiene	Cap	Surgical mask	Medical protective mask	Overalls	Protec tive clothi ng	Gloves	Isolateon gown	Protective mask/ goggles	Shoe s/boo ts
jobs	→									
General department	■	□	■		■					
The operating room	■	■	■	□	■		■	□	□	□
Preview triage	■	■	■		■		□	■		

Fever outpatient/ respiratory/emergency/paediatrics	■	■	■	□	■		□	■/□	□	□
Possible spillage work	■	■		■	■	□	■	■	■	□
Diagnosis and treatment of suspected/ confirmed cases	■	■		■	■	■	double	□	■	■
Patient transport/ accompany	■	■		■	■	■	■	□	■	■
Routine laboratory operation	■	■	■		■		■			
Laboratory testing of suspected samples	■	■		■	■		■	■		
Laboratory virus testing	■	■		■	■	■	double	□	■	□
Environmental cleaning and disinfection	■	■		■	■	■	Long sleeves and thick	□	■	□
Samples shipped	■	■	■		■					
Body to deal with	■	■		■	■	■	Long sleeves and thick	■	■	■
The administrative management	■		■		□					
■Must choose □According to the exposure risk to choice										

Table 1: Guidelines for protection of different personnel's.

The detailed procedures for treating febrile children and suspected children are shown in (Figure 1).

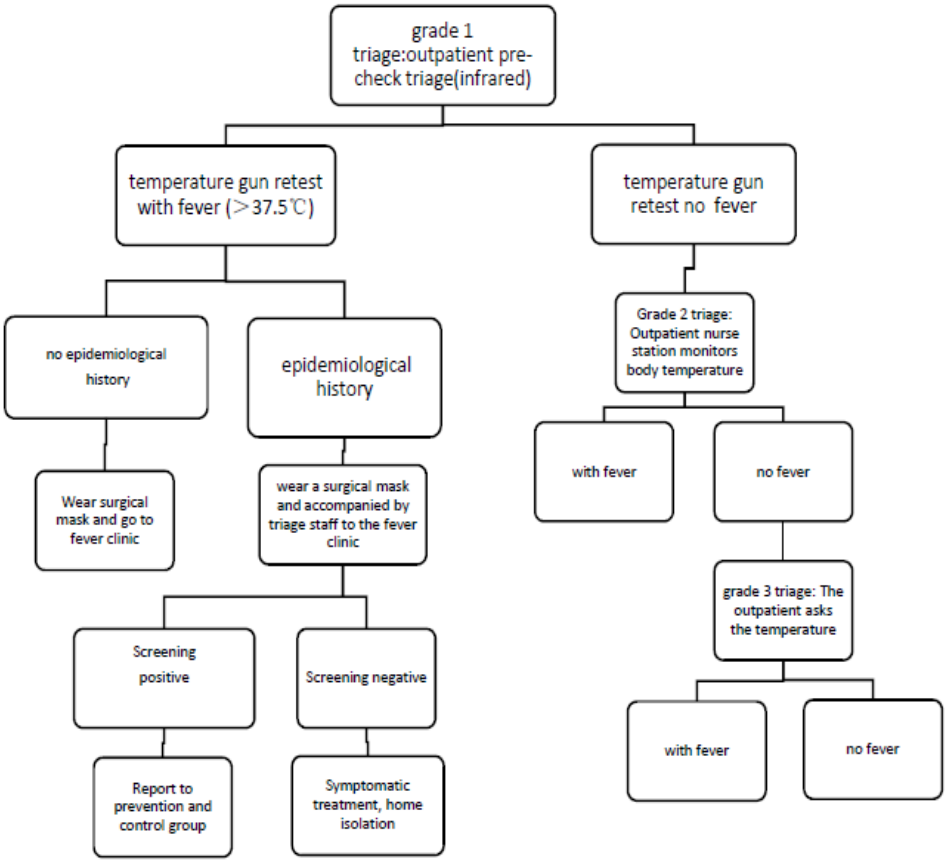

Figure 1: Guideline for children outpatient pre-test during 2019-nCoV infection.

Hospitals with the following conditions may receive febrile children and suspected children

A. Equipped with fever clinic.

B. Conduct standardized training and guidance according to the above protection plan for medical staff.

Reception process

a) The fever and suspected children are firstly pre-diagnosed and triaged: their temperature was measured and directed to the designated fever clinic by a specialist.

b) Carefully inquire about the history of present illness, the living and traveling history of the epidemic area, and the contact history of the people in the epidemic area. And fill in the corresponding commitment letter. The following patients enter the screening process.

c) Travel history or residence history of the epidemic area within 14 days prior to onset; Or had been exposed to fever from the epidemic area or patients with respiratory symptoms within 14 days before onset; Or a patient who has a cluster or respiratory symptoms.

d) Acute fever within 72 hours, not accompanied by influenza-like symptoms, and no other etiology has been confirmed.

e) Patients with fever screening underwent the following examinations: nucleic acid examination of sputum/pharyngeal swab, blood routine, urine routine, blood gas, liver and kidney function, CRP, PCT, cardiac enzymes+ myoglobin, prothrombin assay and chest CT.

f) Test positive and report to the superior new crown epidemic prevention and control team.

g) For patients with acute fever (within 72 hours, body temperature > 37.5 ℃) and normal pulmonary imaging, if the absolute value of peripheral blood lymphocytes is less than 0.8×109/L, or if the CD4 and CD8 T cell counts are significantly decreased, even if the nucleic acid test is not positive, the patient can be isolated at home and the state of the child during isolation can be closely observed.

h) Children with confirmed severe or critical illness shall be transferred to intensive care unit or to a superior designated medical institution for diagnosis and treatment immediately.

Severe cases (as defined by the national health commission of China)， if they meet one of the following criteria, they should be hospitalized for treatment and transferred to a designated medical institution for diagnosis and treatment as soon as possible (1) respiratory distress (PR ≥ 30 times/min). (2) at rest, oxygen saturation ≤93%, and (3) arterial partial oxygen pressure (PaO2)/ oxygen inhalation concentration (FiO2) ≤300mmHg. (1 MMHG = 0.133 kPa).

Critical cases (as defined by the national health commission of China): those who meet one of the following criteria shall be admitted to the intensive care unit immediately and transferred to a designated medical institution for treatment as soon as conditions permit. (1) respiratory failure occurs and mechanical ventilation is required; (2) shock; (3) combined with other organ failure requires ICU care.

Referral of children with fever, suspected diagnosis and confirmed diagnosis

Referral indications: the patient's condition is unstable, severe or critical, and there is no ICU or multidisciplinary consultation condition in the receiving unit.

Referral process and necessary conditions

a) The director of the department or the chief physician-level staff evaluates the condition and determines that referral is required.

b) The relevant person in charge of the medical service department or the new epidemic prevention and control group of the unit shall communicate with the relevant person in charge of the medical service department or the new epidemic prevention and control group of the superior hospital or the hospital to be transferred to, coordinate the reception and treatment and introduce the disease in writing.

c) The referral team includes 1 pediatrician, 1 febrile outpatient doctor and 1 nurse.

d) The referral child should use a special vehicle, and transport personnel personal protection and vehicle disinfection, see "novel coronavirus pneumonia case transfer work plan (trial)"

e) Inform the family of the possible risks before referral and sign the informed consent.

Record the referral process and deal with emergencies at any time.

Referral process of the receiving unit patients

Personnel protection as mentioned above

Reception process

a) Make necessary preparations, including personnel, equipment, medicine and protection, after receiving the notification of referral from lower units.

b) Report to the relevant person in charge of the new epidemic prevention and control team and the person in charge of the department.

c) A green channel shall be opened for rapid assessment of the patient's condition after receiving the patient, and the patient shall be admitted to the fever ward or intensive care unit according to the patient's condition.

d) The treatment plan for children admitted to the fever ward is determined by the fever ward physician and the pediatrician on a daily basis.

e) The treatment plan for admission to the intensive care unit shall be determined by the icu physician, associate chief physician of the pediatric respiratory department or above on a daily basis, with multidisciplinary consultation if necessary.

Prevention and control measures of novel coronavirus infection in neonates and children

The main transmission ways of children's infection are droplets and contact.

There are also reports of conjunctiva, aerosol, digestive tract transmission, more to strengthen protection. Children's physiological and anatomical characteristics and autoimmune function is low, is prone to respiratory tract infection of the population, especially young children, and the younger the age, the more difficult to find, once the onset, the faster progress, the incubation period is the shortest 1 day that onset, up to 24 days, ranging from an average of 3 to 7 days.

How to screen for neonatal novel coronavirus infection

There are some reports of neonatal infection, the possible pathway of coronavirus infection in newborn:

close contact transmission and droplet (between family members, family visitors), hospital acquired infection, vertical transmission coronavirus include vertical transmission via the placenta or breastfeeding is unclear [13], but from 2 cases of confirmed neonatal in wuhan children's hospital, vertical transmission should be taken into consideration [14]). Therefore, according to one of the following needs to carry out screening newborn: (1) maternal confirmed or highly suspected infection; (2)

maternal close contact with family members confirmed or highly suspected infection; (3) after the birth of the newborn family care personnel have confirmed and highly suspected infection.

Breast feeding should pay attention to frequent hand washing and local hygiene

Breastfeeding is not recommended for suspected and uncured women. For confirmed novel coronavirus infection of the mother, the newborn immediately after birth according to the virus infection process isolation observation for two weeks, do not feed mother's milk. Lopinavir/ritonavir is secreted in the milk of rats, and it is not known whether human milk contains the drug. Therefore, you should not breastfeed while taking the drug.

Key points of child protection

Timely and correct isolation: parents with suspected cases who are isolated at home, if they do not have the conditions to separate from their children, try to ensure that the rooms are separate. Suspected parents should avoid contact with children, and wear appropriate masks at home (suspected parents should not wear respirators with breathing valves at home). Children should also wear appropriate masks. Conditional answer to choose children N95 to prevent germ mask first, next children surgical mask → children medical mask → disposable mask → children cotton mask, guide children to use mask correctly.

Family daily protection: if a baby or newborn cannot wear a mask, parents should take special precautions to protect the child, because parents without symptoms may be carriers, parents should take the initiative to wear a mask, oneself cough or sneeze, should pay attention to the cough etiquette. Do not kiss the child, do not breathe out, pant for the child, not the child into the mouth of the same food, not the child to share cutlery, drinking utensils, not the child's mouth blowing way to make food cold feeding. Parents should try to avoid going to public places with dense crowds, wear masks when going out, change clothes and shoes immediately after entering the door from the outside, properly handle masks, and contact children after thorough washing and cleaning. Guide children to wash mouth with saltwater in the morning and evening to improve their awareness of prevention.

A. Strictly regulate hand washing: urge children to wash their hands and face frequently without touching. Wash your hands before eating, after defecating, and after touching unclean objects.

B. strengthen ventilated room: conditional family daily timing should open air purifier, ultraviolet disinfection, conditions of families in turn each room ventilation 2 ~ 3 times a day, every time a window ventilated, 30 minutes to an hour, the room ventilation when transfer the child to other room, good heat preservation measures, avoid catching a cold ventilation on children.

C. Household cleaning and disinfection: keep the household environment clean and tidy. Wipe the surface of objects with alcohol once a day. Keep the ground clean and dry. If the household has 84 disinfectant containing chlorine disinfectant, it can be configured according to the correct method (84 disinfectant 10ml+990ml water) and mop the ground 1 to 2 times a day.

D. Adequate activity and rest

Routine care of children during the outbreak of novel coronavirus infection

i. Parents shall observe their children's defecation and urination every day: keep the stool unobstructed. The occurrence of abdominal distension, diarrhea, constipation and other indigestion and intestinal abnormal symptoms to be vigilant.

ii. Balanced nutrition every day: ensure adequate nutrition, and properly eat high-protein food, fresh and clean vegetables and fruits.

iii. All food should be fully cooked before consumption, do not eat wild animals, should be light and easy to digest diet, not greasy fish and meat, so as to avoid unhealthy diet leading to diarrhea caused by unnecessary panic.

iv. Drink more water and urinate more. Try not to drink cold water, but warm water to speed up the body's metabolism. At the same time, drink more dairy products (milk, yogurt).

Principles of handling children after contact with suspected patients

Parents do not hide, do not escape. Take the initiative to observe 14 days of isolation at home, no symptoms can be removed from isolation but try not to go out. Children's disease changes quickly, once symptoms occur, go to the nearest pediatric fever outpatient, pay attention to self-protection on the way to hospital.

In conclusion, COVID-19 is still serious all over the world, 2019-nCoV transmission is fast, virulence is strong and with great harm. Children as a special group with poor immunity, are also susceptible to the virus. Fortunately, the outbreak has been well controlled by aggressive and effective prevention and control measures in China. We write and share this article for public, hope to save more lives.

Project source: Epidemiological survey of children with kidney disease in Chengdu

Project number: 120513

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