

# World Journal of *Clinical Cases*

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**ABOUT COVER**

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Retrospective Study

# Home quarantine compliance is low in children with fever during COVID-19 epidemic

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## Abstract

### BACKGROUND

The coronavirus disease 2019 (COVID-19) outbreak began in China at the end of 2019. The disease is highly infectious. In order to prevent and control the epidemic situation, the state has issued a series of measures to guide the prevention and control of the epidemic. At the same time, it also introduced the measure of home isolation for children with fever. However, due to the nature of children, the implementation of the home isolation turned out to be quite difficult, and questions regarding the home isolation were brought out by parents when seeing doctors. For this reason, we decided to conduct this study.

### AIM

To study factors that influence home quarantine compliance in children with fever during the COVID-19 epidemic.

### METHODS

A total of 495 paediatric patients with respiratory tract infection and fever were selected from the general fever clinic at Xiamen Children's Hospital from February 6-27, 2020. On day 8 after the hospital visit, follow-up was conducted by telephone to evaluate the compliance of home quarantine.

### RESULTS

Among the ten quarantine measures, the proportion of families adhering to keeping 1.5 m distance, proper hand hygiene, wearing masks at home, and proper cough etiquette was very low (< 30% for each measure). Our analysis showed that compliance was related to gender and age of children, gender and age of primary caregiver, number of children in the family, and intensity of information on quarantine measures. We observed that compliance increased with the age of

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children. Compared with children whose caregivers were young adults, children with elderly caregivers were 2.461 times more likely to show poor compliance. Furthermore, children who received intensive information on quarantine measures had significantly better compliance.

## CONCLUSION

Compliance of children with fever to quarantine measures at home is low during the COVID-19 epidemic. Strengthening education on the quarantine measures is critical to improve compliance, in particular in young children with elderly caregivers.

**Key words:** COVID-19; Fever; Children; Home quarantine; Compliance; Influence factor

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**Core tip:** During the current coronavirus disease 2019 epidemic, home isolation of children with fever is of outmost importance. This study aimed to identify factors that influence children's home quarantine compliance and offer recommendations that will facilitate the home isolation.

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## INTRODUCTION

The coronavirus disease 2019 (COVID-19) has spread across the world, seriously affecting health and the development of a global society and economy<sup>[1,2]</sup>. Reducing the people flow and cutting off the transmission routes are of great significance for the prevention and control of the COVID-19 epidemic. The "Guidelines for Public Protection of Novel Coronavirus Infected Pneumonia"<sup>[3]</sup>, "Guidelines for the Prevention and Control of Infection in Domestic Isolated Medical Observation in New Coronavirus Infection"<sup>[4]</sup>, "The Recommendations of Experts in the Management of Integrated Traditional Chinese and Western Medicine for Patients with Fever at Home"<sup>[5]</sup>, and other documents issued by the Chinese National Health Commission emphasise that patients with fever need to be isolated at home during the COVID-19 outbreak. However, there are no reports on the compliance to home quarantine measures in these patients, especially in children. In this study, we studied the compliance of children with fever to home quarantine measures and examined factors that influenced this to provide reference for better implementation of home quarantine measures.

## MATERIALS AND METHODS

### Study design

Paediatric patients admitted to the general fever clinic at Xiamen Children's Hospital from February 6-27, 2020 were selected for this study. The inclusion criteria were: (1) Respiratory tract infection with body temperature over 37.3°C; (2) Mild disease that can be treated at home; (3) Fever without an epidemiological history of COVID-19 or fitting clinical diagnostic criteria for suspected COVID-19 cases<sup>[1]</sup>; and (4) informed of quarantine measures (general or intensive). General information was defined as a written notification of the quarantine measures whereas intensive information included explanation and demonstration by nurses. Patients were excluded based on the following criteria: (1) Unwilling to cooperate with the investigation; (2) Hospitalised within 7 d after first diagnosis; and (3) Failure to complete the survey after three telephone interviews. Our study was approved by the Xiamen Children's



Hospital ethics committee and all patients provided informed consent.

### Data collection

The subjects who met the inclusion criteria were surveyed by trained medical staff on the 8th day after the hospital visit. The questionnaire consisted of three parts: General data, prevention and control measures of home quarantine, and compliance scale. We collected demographic data from the family of the study subject, including the gender and age of the patient, the gender, age, and education level of the primary caregiver, the place of residence, and the number of children in the family. The home quarantine measures as recommended by the Chinese National Center for Disease Control and Prevention are shown in [Table 1](#).

According to the above prevention and control measures, the compliance scale of home quarantine was formulated. A Likert 4-point scale was used to assess adherence to each measure<sup>[6]</sup>: 1 = no adherence, 2 = occasional adherence, 3 = basic adherence, and 4 = full adherence.

### Data analysis

The questionnaire was evaluated and SPSS 21.0 was used for statistical analyses. Numerical data are expressed as the mean  $\pm$  SD and counting data are described by frequencies and percentages. Since compliance score was not normally distributed, we categorised the patients into two groups: High-compliance (score  $\geq 24$ ) and low-compliance groups (score  $< 24$ ).  $\chi^2$  test and multivariate logistic regression were used to analyse the factors influencing home quarantine compliance in children.

## RESULTS

### Study subject demographics

We recruited 495 paediatric patients, 82 of whom did not cooperate with the follow-up and 19 were excluded due to hospitalisation within 7 d after the first diagnosis. Therefore, we included a total of 495 in the final analysis. The average age was  $3.56 \pm 2.89$  years (range, 3 mo-13 years). The demographic data are shown in [Table 2](#).

### Compliance to quarantine measures at home

We scored the compliance level to ten quarantine measures. Measures that scored highly were no use of air conditioning, continuous home quarantine for 7 d, and no gathering. However, proper disinfection, keeping 1.5 meters distance, proper hand hygiene, cough etiquette, and wearing masks at home were not well adhered to. The proportion of families showing at least basic adherence to these measures was less than 30% ([Table 3](#)).

### Factors that influence compliance to home quarantine measures

Our analysis showed that home quarantine compliance was related to gender and age of the patients, gender and age of primary caregivers, number of children in the family, and how the family was informed of quarantine measures. Compliance of families with girls was significantly higher than those with boys ( $\chi^2 = 9.681$ ,  $P = 0.002$ ) and families with older children also adhered better to the measures ( $\chi^2 = 138.131$ ,  $P < 0.001$ ). In addition, a higher proportion of young caregivers followed the measures compared with middle-aged or elderly caregivers ( $\chi^2 = 8.175$ ,  $P = 0.017$ ) and female caregivers showed higher compliance as well ( $\chi^2 = 6.418$ ,  $P = 0.011$ ). Furthermore, single-child families were better in adhering to the measures than those with multiple children ( $\chi^2 = 4.141$ ,  $P = 0.042$ ). Importantly, the compliance of those who received explanation and demonstration of the measures by nurses was better than those who only received a written notification ( $\chi^2 = 18.961$ ,  $P < 0.001$ ).

After single-factor analysis of the factors that influenced compliance, we performed a multivariate logistic regression analysis ([Table 4](#)). Compliance was used as the dependent variable, and gender and age of patients, gender and age of caregivers, education level of caregivers, place of residence, number of children in the family, and whether a nurse explained the quarantine measures were taken as the independent variables. The variable assignment is shown in [Table 5](#). We found that the age of the children, the age of the caregiver, and whether nurses educated the families on the quarantine measures were the main factors affecting the compliance level ([Table 6](#)). Similar to our findings before, the compliance increased with the age of children and patients whose primary caregivers were elderly had 2.461 (1.371-4.418) times higher



**Table 1 Prevention and control measures for home quarantine**

Item	Measure
Duration	7 d of continuous home quarantine
Mask usage	Wear masks properly when in close contact with family members
Cough etiquette	Cover coughs and sneezes with your elbow, not hands
Hand hygiene	Wash hands frequently and do not touch mouth, nose, eyes, and other parts of the face without washing hands
Distance	Keep 1.5 m distance from patients
Ventilation	Keep the rooms clean and ventilated: Half an hour in the morning, noon, and night. Keep warm during ventilation
Air conditioning	Do not use air conditioning, especially central air conditioning
Socialising	Do not gather with others who are not family
Disinfection	Swab articles used by the patient with 75% alcohol or soak in hot water (> 56°C) for 30 min
Mask disposal	Seal used masks in fresh bags and put them in the trash

**Table 2 Demographic data of the study subjects (n = 495)**

Item	Category	n/average	%
Age of patients (yr)		3.56 ± 2.89	
Gender of patients	Male	292	58.99
	Female	203	41.01
Age of patients	Baby	131	26.46
	Child	134	27.08
	Preschool children	121	24.44
	Schoolage children	109	22.02
Gender of caregiver	Male	286	57.78
	Female	209	42.22
Age of caregiver	Young	140	28.28
	Middle-aged	172	34.75
	Elderly	183	36.97
Education level of caregiver	Primary school or below	249	50.30
	Secondary school	50	10.10
	University or above	196	39.60
Place of residence	Urban area	335	67.68
	Rural area	160	32.32
Number of children in the family	1	261	52.73
	≥ 2	234	47.27
Type of information on quarantine measures	Intensive	294	59.39
	General	201	40.61

odds of poor compliance at home. Families who received explanation and demonstration of the quarantine measures by nurses had significantly better compliance than those without ( $P < 0.05$ ).

## DISCUSSION

The COVID-19 outbreak at the end of 2019 has spread around the world and has

Table 3 Compliance to home quarantine measures

Measure	Full adherence		Basic adherence		Occasional adherence		No adherence		Score	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	Average	SD
Disinfection	314	63.43%	177	35.76%	4	0.81%	0	0.00%	1.43	0.58
Distance	1	0.20%	85	17.17%	159	32.12%	250	50.51%	1.56	0.75
Hand hygiene	0	0.00%	118	23.84%	105	21.21%	272	54.95%	1.65	0.83
Mask usage	4	0.81%	103	20.81%	105	21.21%	283	57.17%	1.67	0.76
Cough etiquette	0	0.00%	79	15.96%	119	24.04%	297	60.00%	1.69	0.83
Mask disposal	31	6.26%	442	89.29%	22	4.44%	0	0.00%	2.59	1.09
Ventilation	483	97.58%	12	2.42%	0	0.00%	0	0.00%	3.02	0.33
Socialising	95	19.19%	400	80.81%	0	0.00%	0	0.00%	3.19	0.39
Duration	0	0.00%	21	4.24%	173	34.95%	301	60.81%	3.63	0.50
Air conditioning	111	22.42%	196	39.60%	64	12.93%	124	25.05%	3.98	0.15

Table 4 Single-factor analysis of factors influencing compliance

Group	Parameters	Compliance (%)		$\chi^2$	<i>P</i> value
		High	Low		
Gender of patient	Male	134 (45.89)	158 (54.11)	9.681	0.002
	Female	122 (60.10)	81 (39.90)		
Age of patient	Baby	28 (21.37)	103 (78.63)	138.131	< 0.001
	Infant	45 (33.58)	89 (66.42)		
	Preschool	93 (76.86)	28 (23.14)		
	School-age	90 (82.57)	19 (17.43)		
Gender of caregiver	Male	134 (46.85)	152 (53.15)	6.418	0.011
	Female	122 (58.37)	87 (41.63)		
Age of caregiver	Young	88 (61.11)	56 (38.89)	8.175	0.017
	Middle-aged	87 (50.58)	85 (49.42)		
	Elderly	81 (45.25)	98 (54.75)		
Education level of caregiver	Primary school or below	129 (51.81)	120 (48.19)	0.005	0.997
	Secondary school	26 (52.00)	24 (48.00)		
	University or above	101 (51.53)	95 (48.47)		
Place of residence	Urban area	169 (50.45)	166 (49.55)	0.669	0.413
	Rural area	87 (54.38)	73 (45.63)		
Number of children in the family	1	155 (55.76)	123 (44.24)	4.141	0.042
	≥ 2	101 (46.54)	116 (53.46)		
Explanation of quarantine measures by nurses	Yes	132 (63.16)	77 (36.84)	18.961	< 0.001
	No	124 (42.17)	162 (57.83)		

affected physical and mental health as well as significantly impacted the economy<sup>[2]</sup>. The population is generally susceptible to the disease<sup>[1]</sup> and the number of children infected also increases gradually<sup>[7-9]</sup>. COVID-19 is mainly transmitted by respiratory droplets, direct contact, and aerosols in narrow and confined spaces<sup>[1]</sup>. Home quarantine has been demonstrated to be an effective way to cut off the transmission route in the prevention and control of COVID-19. The transmission mode of other respiratory infections is similar to that of COVID-19. Therefore, home quarantine

**Table 5 Variable assignment of the multivariate logistic regression analysis**

Item	Variable	Assignment
Dependent variable	Compliance	High = 0, low = 1
Independent variable	Gender of patient	Female = 0, male = 1
	Age of patient	Baby = 1, infant = 2, preschool = 3, school-age = 4
	Gender of caregiver	Female = 0, male = 1
	Age of caregiver	Young = 1, middle-aged = 2, elderly = 3
	Education level of caregiver	Primary school or below = 1, secondary school = 2, university or above = 3
	Place of residence	Urban = 1, rural = 2
	Number of children in the family	1 = 1, $\geq 2$ = 2
	Explanation of quarantine measures by nurses	No = 0, yes = 1

**Table 6 Multivariate analysis of factors influencing compliance**

	B	SE	Wald	P value	OR (95%CI)
Age of patient	-1.399	0.129	117.631	< 0.001	0.247 (0.192-0.318)
Explanation of quarantine measures by nurses	0.757	0.239	10.022	0.002	2.133 (1.334-3.409)
Number of children in the family	-0.263	0.239	1.211	0.271	0.768 (0.481-1.228)
Age of caregiver compared with young people					
Middle-aged	0.365	0.291	1.573	0.210	1.441 (0.814-2.551)
Elderly	0.901	0.298	9.110	0.003	2.461 (1.371-4.418)

measures are also suitable for children with respiratory infection and fever.

As a special group, children are in a stage of psychological and physiological development and their awareness, behaviour, language, cognition, and self-control are not perfect<sup>[10]</sup>. Among the ten quarantine measures, the proportion of paediatric patients keeping effective distance, proper hand hygiene, wearing masks at home, and proper cough etiquette was very low. If these home quarantine measures for children are not adhered to, family transmission of infectious diseases can occur easily. There are differences in behaviour and awareness among children of different genders and ages, which affect the children's compliance. There was difference in children's compliance between genders as demonstrated by univariate analysis, but there was no difference in the multivariate regression setting, indicating that children's gender is not an independent predicting factor. However, compliance increased with the age of the patient and decreased with the age of the caregiver.

Children with different ages have different awareness, understanding, and self-control ability. The compliance of parents with infants is particularly strong. The knowledge of prevention and control in family members and their continuous care, understanding, and cooperation with children are closely related to children's compliance<sup>[11,12]</sup>. Studies have shown that practical support from family and emotional support from peers can significantly improve compliance in children with chronic diseases<sup>[13]</sup>. Studies have also shown that the closer the family relationship, the stronger the enthusiasm and cohesion of the interaction and the higher the compliance<sup>[14]</sup>.

The differences in gender, age, and education level of caregivers may affect the understanding and implementation of prevention and control measures. In this study, the children's compliance of young and middle-aged caregivers was better than that of elderly caregivers. It may be because the elderly caregivers are mostly grandparents and they do not ideally implement the professional prevention and control measures. In addition, Chinese traditional culture of "love from another generation" leads to the lack of effective supervision of children and thus poor compliance of children in the care of elderly caregivers.

Since the outbreak of the epidemic, public health education is conducted by phone messages, social media, television, and community or rural broadcasts by loudspeaker. It is easy for the public to understand and accept the simple prevention and control

measures such as not using air conditioning, adequate ventilation, and no gathering. However, more professional prevention and control measures such as proper hand hygiene and wearing of masks, cough etiquette, disinfection, and disposal of articles are more challenging. According to a survey<sup>[15]</sup>, 97.62% of the public can understand the epidemic situation of COVID-19 through the media and internet, but 38.44% of the public still fail to adequately adapt and respond. Similarly, we found that the public's performance in more professional prevention and control measures was insufficient. As an important means of blocking the source of infection, hand hygiene is a key measure to prevent the infection<sup>[16]</sup>. Some studies have shown that compliance to proper hand hygiene in adults is not high. For example, the rate of adequate execution of handwashing among persons accompanying inpatients is only 22.44% and about 87.16% of the respondents do not know how to do it properly<sup>[17]</sup>. Multiple studies demonstrate that hand hygiene compliance rate of patients' family members is only 21.88%-27.60%<sup>[18-20]</sup>. It is critical to improve the professional prevention and control knowledge of the paediatric patients' family and caregivers. Lary *et al*<sup>[21]</sup> showed that health education can improve the implementation rate of children's hand hygiene, which is consistent with the results in our study<sup>[21]</sup>. Further investigation is needed on how to improve other professional prevention and control measures.

Health education is one of the main tasks of nursing work and improving patient compliance is one of the overall goals<sup>[22]</sup>. Conventional education by a written notification cannot completely replace professional health education given by nurses. The manner and content of health education should be adjusted according to the child's situation, views, and preferences so that both parents and children can understand. Effective communication is an important factor in the success of health education, which can be achieved by harmonious doctor-patient and nurse-patient relationships. A gentle, reliable, and empathetic medical staff is more likely to make children and parents comply<sup>[23]</sup>. As a result, it is necessary to conduct professional health education for children and family members to improve the compliance of home quarantine.

Our research has several limitations. Some important factors, such as the family's income, the occupation of the main caregiver, and the size of the family's housing, can also affect children's compliance with home isolation. This study did not address those potentially confounding factors due to the lack of data availability. These parameters need to be investigated in future studies.

In conclusion, it is necessary to strengthen the professional education of the quarantine measures and improve supervision of young children, especially by elderly guardians, to improve the children's compliance with home quarantine measures.

## ARTICLE HIGHLIGHTS

### Research background

The new coronavirus pneumonia outbreak that began in December 2019 had a severe impact in China. In order to control the spread of the epidemic, China has put forward measures for the isolation of patients with fever at home. As a patient group, children are characterized by still developing consciousness, behavioral, language, cognition, and self-control capabilities. In this study, we aimed to assess the implementation of children's home isolation prevention and control measures and the factors that may affect compliance.

### Research motivation

Due to the nature of children, the implementation of the home isolation turned out to be quite difficult, and questions regarding the home isolation were brought out by parents when seeing doctors.

### Research objectives

The main purpose of this study was to assess the implementation of child home isolation measures and the factors that affect compliance. The results of our research will aid the development of intervention programs that improve children's compliance.

### Research methods

The parents of 495 pediatric patients participated in our survey. We collected data on the implementation of child home isolation measures, including gender of patient, age

of patient, number of family members, gender of caregiver, age of caregiver, and compliance with isolation. For the latter we collected data on adherence to 1.5 meters distance, hand hygiene, cough etiquette, and wearing masks at home.

### Research results

The level of compliance among 495 children was low. In univariate analysis, the compliance with home isolation was related to gender and age of the child, gender and age of the main caregiver, number of children in the family, and intensive health education. The number of children in the family was not an independent factor that affects compliance.

### Research conclusions

Children's adherence to home isolation is generally low, and health education is imperative for improving compliance. Senior caregivers as well as young children should be the key target groups of health education.

### Research perspectives

Home isolation is an important measure for prevention and control of the new coronavirus epidemic. However, proper implementation of home isolation among children with fever is relatively poor. In order to improve children's compliance, social structures need to be mobilized. Better health education and enhanced supervision need to be provided in order to protect children's physical and mental health.

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