

Coronavirus Pandemic

COVID-19 epidemic and Chinese medical students: perception, emotions, attitudes, and conformity during domicile quarantine

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Abstract

Introduction: Students from Shantou University Medical College were subject to domicile quarantine during the early phase of the COVID-19 outbreak.

Methodology: We investigated their experience during March-April 2020 using a cross-sectional, self-administered, anonymous online survey. **Results:** Out of 531 respondents, 75.7% became aware of the outbreak via the Internet (61.7%), WeChat (57.8%), and Weibo (49%). Nearly all students knew COVID-19 manifestations, incubation period, and transmission modes; about half considered wearing facemask and hand hygiene as effective epidemic interventions. They experienced various emotional reactions that changed significantly in response to the outbreak, lockdown, and quarantine ($p_s < 0.001$), with depression in 23.3%. Most students (83.4%-99.4%) had positive attitudes and good compliance towards domicile quarantine and preventive measures. Females were significantly better than males in hand hygiene compliance ($p = 0.04$). More students with positive attitudes and good compliance than those without educated their families ($p_s < 0.05 - p_s < 0.001$). Multiple logistic regression showed negative relationships between anger and hand hygiene attitude (OR = 0.06, 95% CI = 0.01-0.87); confusion and quarantine compliance (0.30, 0.12-0.76); and anger and compliance with quarantine (0.32, 0.11-0.93), facemask (0.12, 0.03-0.50), and hand hygiene (0.27, 0.08-0.88).

Conclusions: This study revealed how multichannel risk communication, early awareness, positive attitudes, and conformity of medical college students might have contributed to the favorable outcome from the COVID-19 epidemic in China. Clear, accurate, consistent, early risk communication by the local, national, and international public health authorities seems critical to promote public understanding, correct risk perception, and rational emotions and attitudes, leading to optimal conformity.

Key words: Pandemic; compliance; facemask; hand hygiene; lockdown.

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Introduction

First reported as an epidemic of unknown pneumonia in China, coronavirus disease 2019 (COVID-19) has taken its pandemic's path towards 221 countries and territories leaving an immense global health burden [1]. The pandemic containment, mitigation, and preventive measures adopted worldwide also have caused severe global disruption of psychosocial well-being [2-4], education [5], and economy [6], in addition to unforeseeable long-term consequences of the pandemic.

Although political, social, and cultural factors play overlapping roles in the response towards the COVID-19 pandemic in different countries, risk communication modes [7-9] (the ways and means authorities inform the public about the status of the epidemic, associated risks, and mitigation measures), public risk awareness [9-11]

and emotional responses [3,12-15], and public engagement in public health emergency measures [3] have influenced the outcome of reactive pandemic responses in the affected countries and proactive prevention efforts in the countries that remain COVID-19 free. Southeast Asian countries have seen a relatively better public cooperation with the pandemic containment, compared to some regions of Europe and the Americas as reported in various media outlets [16]. Notably, China's response to the COVID-19 received exceptional attention as well as scrutiny worldwide [17].

At the time 2019-nCoV (the provisional name of COVID-19) first broke out in China, students studying in colleges and universities across China were back in their hometowns to celebrate the spring festival with their families. As the epidemic was picking up speed,

the whole country went into various lockdown measures such as border closures, travel restrictions, closed management of communities, and outdoor restrictions (domicile quarantine) as part of the epidemic containment efforts [17]. China managed to contain the first wave of national epidemic in a relatively short time due in large part to public conformity [17,18]. With the infodemic of misinformation and disinformation on the Internet [19,20], media and information literacy has become critical in public risk awareness and perception [21]. Chinese college students, who are generally better educated, tech-and online-savvier, and thus better informed than most of their parents, could have played a significant role in fighting against the COVID-19 epidemic in China.

This study aimed to understand the factors influencing the outcome of China's response to the COVID-19 epidemic by investigating how Chinese medical college students stayed informed, responded to the epidemic, and conformed with public health emergency measures during the critical period of the epidemic.

Methodology

Study design and population

This is a cross-sectional, self-administered, anonymous, online survey with medical, dental, and nursing students at Shantou University Medical College in Guangdong province, China. This study was

conducted during the early phase of the 2019-nCoV (COVID-19) epidemic (March 2, 2020 - April 2, 2020).

Ethics approval and consent to participate

The study was approved by the ethics committee of Shantou University Medical College (SUMC-2020-06). Written informed consent was obtained from all participants before taking part in the survey by agreeing to the study objectives and statements about anonymity, data confidentiality, and data use.

Survey development and administration

The survey instrument was designed to assess the demographics of participants, their awareness and knowledge about 2019-nCoV (COVID-19), emotional status during the epidemic, and attitudes and compliance towards the recommended epidemic intervention measures. Unaided open questions were used to extract the participants' true knowledge and emotions. Due to the time constraint, pilot testing and validation of the questionnaire were not done. An invitation for voluntary participation in the survey, which was available for a month on a survey hosting website, was announced via student social networks with a token prize incentive.

Data and Statistics

Completed survey data were exported to an Excel Database and analyzed using SPSS (version 19.0). Differences between categorical variables, including gender, residence, family structure, academic background, emotions, knowledge, attitude, and compliance, were analyzed by the Chi-squared test; the relationships between the variables were analyzed by multiple logistic regression. All statistical tests were two-tailed, and p -value < 0.05 was considered statistically significant.

Results

The characteristics of study participants

Among 531 participants, the majority were non-Hubei residents (98.1%, 521/531), females (60.3%, 320/531), undergraduates (82.3%, 437/531), and clinical medicine majors (77.8%, 413/531). Most students (69.9%, 371/531) were living in > 3-member households (Table 1).

Awareness of COVID-19 outbreak

The students came to know the outbreak news in 6 defined periods that were based on the significant news evolved during the early phase of the COVID-19 epidemic in China. Most students (75.7%, 402/531)

Table 1. Characteristics of study participants (N = 531).

Characteristics	N (%)
Gender	
Male	211 (39.7)
Female	320 (60.3)
Current location	
Hubei province ¹	10 (1.9)
Non-Hubei	521 (98.1)
Family structure	
< 3 members	52 (9.8)
3 members	108 (20.3)
> 3 members	371 (69.9)
With siblings	96 (18.1)
With grandparents	150 (28.2)
With both siblings and grandparents	149 (28.1)
Family member(s) in healthcare	123 (23.2)
Relative(s) in healthcare	262 (49.3)
Academic program	
Undergraduate	437 (82.3)
Postgraduate	94 (17.7)
Major	
Clinical medicine	413 (77.8)
Basic research	44 (8.3)
Nursing	39 (7.3)
Dentistry	35 (6.6)

¹ The epicenter of COVID-19 outbreak.

were aware of the outbreak before official announcements of COVID-19 as Class A infectious disease, whereas a considerable proportion of students (24.2%, 129/531) remained unaware of that announcement, including 12% (64/531) who did not notice the outbreak even after the epicenter Wuhan city was placed under lockdown (Figure 1).

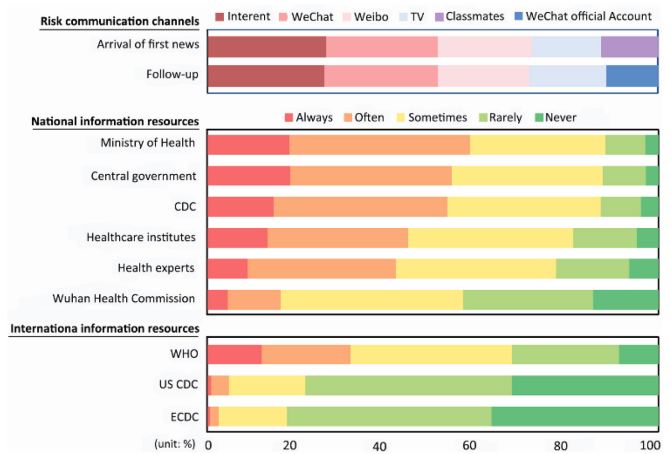
Risk communication channels and resources

The students received the first outbreak news and follow-ups through multiple communication channels, with the top three being the Internet (61.7%, 328/531 for first news; 66.7%, 354/531 for follow-ups), WeChat (57.8%, 307/531; 65.2%, 346/531), and Weibo (49%, 260/531; 52.2%, 277/531). Of note, WeChat and Weibo are equivalent platforms of WhatsApp and Facebook in China. Many students (up to 57%) always or often stayed informed by the national health experts and news via news outlets of the central and local governments. Many of them (65.7%, 349/531) always, often, or sometimes kept themselves current with the World Health Organization (WHO) for COVID-19 (Figure 2).

Knowledge, attitudes, and compliance

Almost all students (96.2% to 99.8%) had correctly described the manifestations, incubation period, and transmission modes of COVID-19, and 16.9% to 39.2% knew the definition of the case, suspected case, or case fatality. Nearly half of the students considered wearing facemask and hand hygiene as effective epidemic

Figure 2. COVID-19 risk communication channels and resources for medical college students. WHO, World Health Organization; US-CDC, United States Centers for Disease Control and Prevention; ECDC, European Centre for Disease Control and Prevention.



intervention measures, but only 14% to 38% thought staying home, social distancing, and hygienic practices as such. Most students (91%, 483/531) educated or shared their knowledge with their family members (data not shown). (Table 2)

High proportions of students (92.8% to 99.4%) had positive attitudes towards home quarantine, facemasks, and hand hygiene. The students' compliance with home quarantine, wearing facemask in public, and doing hand hygiene after returning from outside was also very high (83.4% to 94.4%).

Figure 1. The earliest dates of medical college students' awareness about the COVID-19 outbreak in Wuhan, China, with reference to major outbreak news. PHEIC, Public Health Emergencies of International Concern.

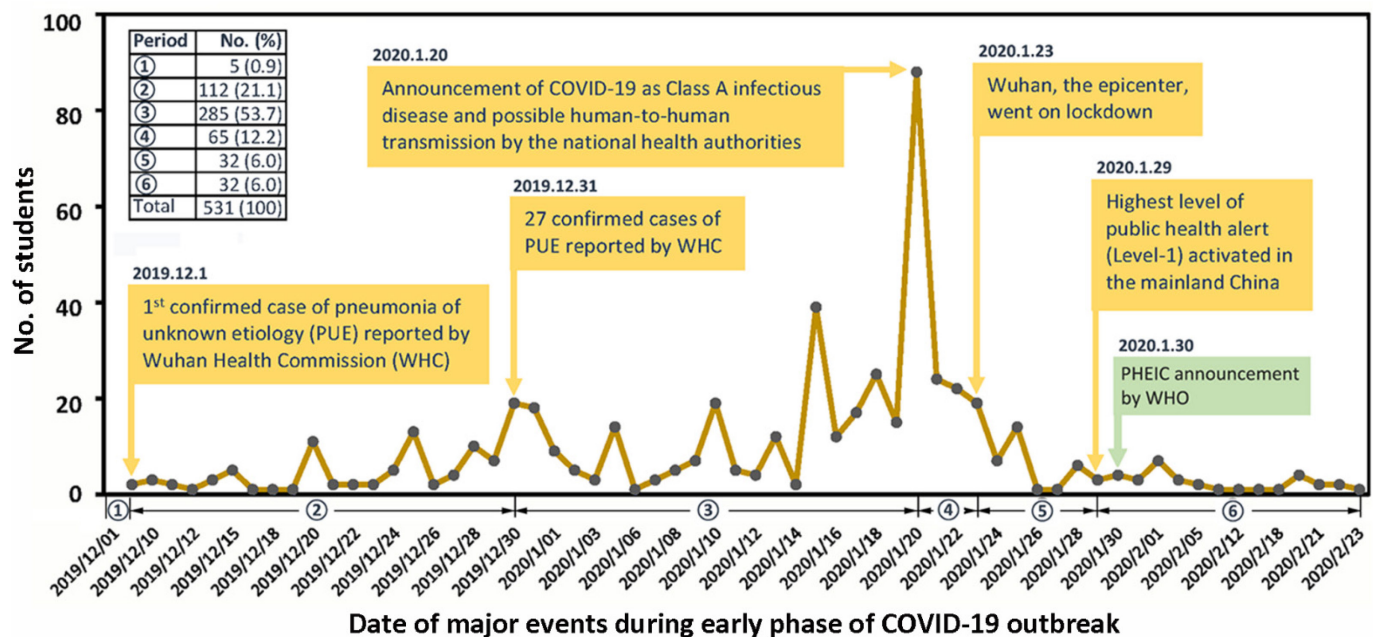


Table 2. COVID-19 knowledge and attitudes and compliance towards the epidemic interventions among Chinese medical college students.

Question item	Number of students who answered correctly (%)
General knowledge (open question)	
Common signs and symptoms	530 (99.8)
Incubation period	511 (96.2)
Transmission modes	530 (99.8)
Definitions (open question)	
Suspected case	90 (16.9)
Case	104 (19.6)
Case fatality	208 (39.2)
Interventions (which measures are effective during the outbreak?)	
Wearing a face mask	287 (54.0)
Doing hand hygiene	248 (46.7)
Staying home	202 (38.0)
Keeping social distancing	106 (20.0)
Adopting hygienic practices (e.g., cleaning contaminated or suspected items)	75 (14.1)
Attitude (Options: Yes, Not Sure, No)	
Home quarantine is necessary (Yes)	519 (97.7)
Wearing facemask is necessary (Yes)	493 (92.8)
Hand hygiene is necessary (Yes)	528 (99.4)
Compliance (Options: No, Rarely, Sometimes, Usually, Always)	
Going out during the home quarantine period (No/Rarely)	477 (89.8)
Wearing a face mask in public (Usually/Always)	501 (94.4)
Doing hand hygiene after returning from outside (Usually/Always)	443 (83.4)

Figure 3. Changes of students' emotional responses in response to COVID-19 epidemic interventions. Significant changes in all emotional responses between outbreak, lockdown, and quarantine ($p_s < 0.001$ by Chi-squared test).

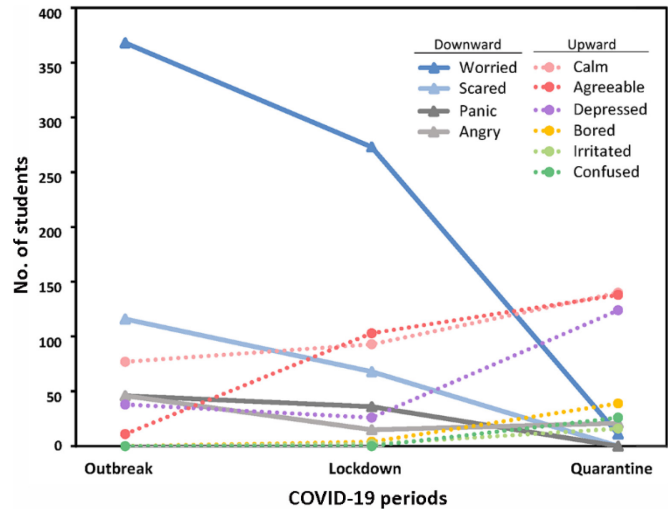
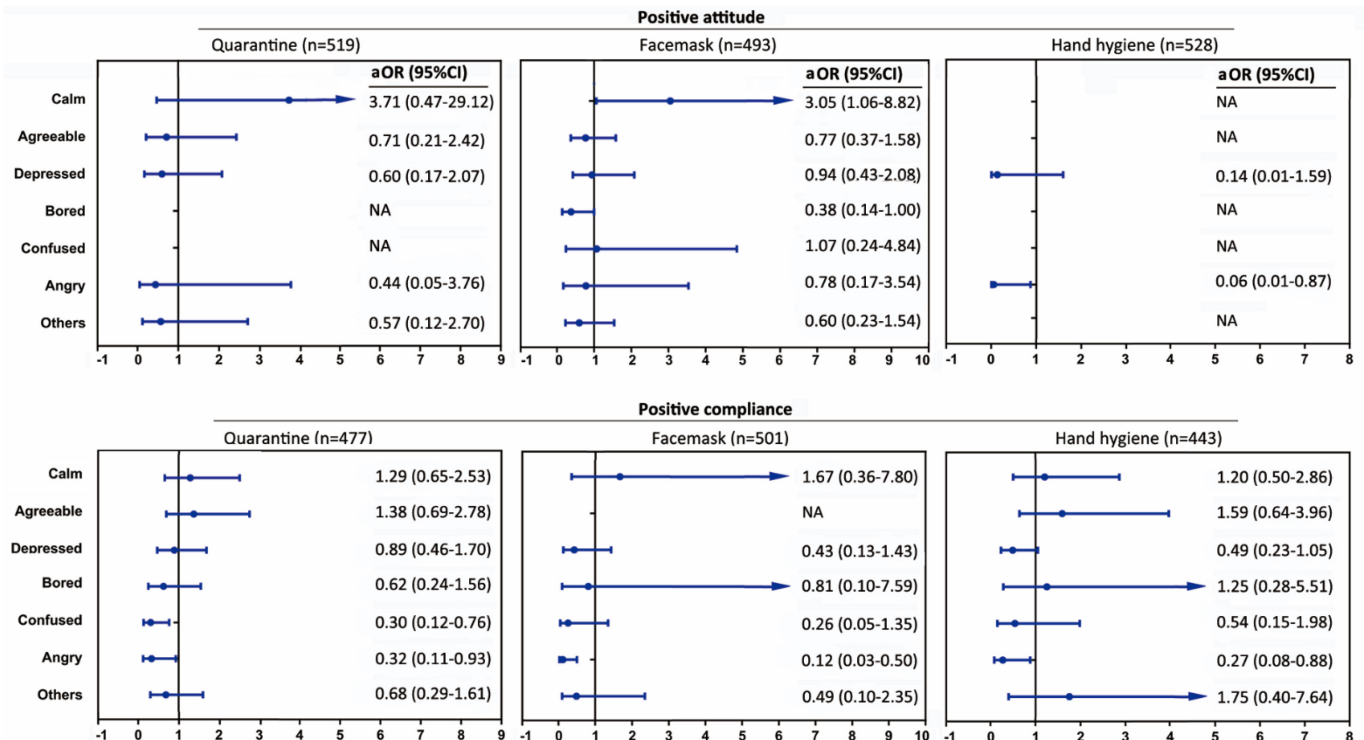


Figure 4. Univariate logistic regression analyses of relationships between students' emotional reactions and their attitudes and compliance regarding COVID-19 epidemic interventions. Others included helpless, happy, excited, and relaxed. NA, not available (i.e., no relevant emotion was reported).



By subgroup analysis, we observed that there was a significantly higher rate of positive attitude towards quarantine in the students who have relatives in healthcare than those who do not ($p = 0.04$); compliance with hand hygiene was significantly better in females than males ($p = 0.04$); and significantly more students with positive attitudes and good compliance than those without educated their families ($p_s < 0.05 - p_s < 0.001$) (data not shown).

Emotional responses towards COVID-19 epidemic and interventions

The students reported having experienced various forms of emotional reactions including worry, scare, panic, anger, calmness, agreeableness, depression, boredom, irritation, and confusion during the epidemic. These emotional reactions changed significantly with three major epidemic-related events—outbreak, lockdown, and quarantine ($p_s < 0.001$). The outbreak news caused most students to feel worried (69.3%, 368/531) and some feeling scared (21.8%, 116/531), panic (8.7%, 46/531), or angry (8.7%, 46/531), although some remained calm (14.5%, 77/531). Many students were worried (51.4%, 273/531) but some stayed agreeable (19.4%, 103/531) and calm (17.5%, 93/531) with the lockdown. Domicile quarantine was associated with calmness (26.4%, 140/531), agreeableness (26%, 138/531), and depression (23.3%, 124/531) among the students (Figure 3).

Relationships between emotional responses and attitudes/compliance

Multiple logistic regression analyses showed negative relationships between certain emotional responses and students' attitude or compliance with the epidemic interventions as follows: the anger and hand hygiene attitude (OR = 0.06, 95% CI = 0.01-0.87); the confusion and quarantine compliance (0.30, 0.12-0.76), and the anger and quarantine (0.32, 0.11-0.93), facemask (0.12, 0.03-0.50), and hand hygiene compliance (0.27, 0.08-0.88) (Figure 4).

Discussion

With the rising death toll of COVID-19 and the fear of multiple pandemic waves, countries around the world have employed various containment strategies endurable to their public healthcare infrastructure, financial capacity, and sociocultural and political values. While some countries took a softer and reactive approach, others adopted aggressive and proactive measures [16]. Among the pandemic-stricken countries, China has taken the most drastic control

measures unprecedentedly in public health history [16,17]. Nationwide infection containment was activated early in the first phase of the epidemic and strict quarantine measures remained effective countrywide up until the time of this writing.

Risk communication, awareness, and knowledge vs. media and online literacy

As reported by more than 75% of the students, the outbreak news circulated online and on WeChat much earlier than the announcements of the local and central governments, which is consistent with a previous report from China [18]. What concerns us is that a quarter of students remained uninformed until quite late. The remote location of their hometown and/or lack of Internet access could be plausible reasons for some at least. Although the power of social media and the Internet as an effective risk communication mode in public health emergencies is undeniable, traditional modes of delivering news through radio and TV seem indispensable for resource-limited regions.

It is quite unusual for Chinese college students that notwithstanding their language barrier, a good proportion of them (65.7%) followed WHO for COVID-19 news, illustrating their media and online literacy. One likely reason is that the medical college in this study is one of the internationalized universities and colleges in China where English is the teaching and learning media in elite programs supported largely by foreign staff and expatriates. Besides, search strategies, resources, and evaluation of evidence are introduced in the undergraduate courses. Accordingly, most students had the correct and current knowledge of the essential information (such as COVID-19 manifestations and transmission) at the early phase of the outbreak.

Despite that only < 40% of the students perceived staying home, social distancing, and hygienic practices as effective epidemic interventions, most students considered these measures necessary and complied accordingly. Their recognition of other outbreak-related epidemiologic terms, such as the case, suspected case, and case fatality, was also quite poor, probably due to their confusion with inconsistent and changing case definitions, narratives, and reporting policy of COVID-19 in China [22], WHO [1], Centers for Disease Control and Prevention (CDC) [23], and European Center for Disease Prevention and Control (ECDC) [24], in addition to the infodemic of misinformation [25]. The same reason could have affected their risk perception and thus emotional reactions to the developing outbreak.

Emotional responses during the epidemic and the impact

The pattern of emotional responses of the students in this study follows that commonly seen in previous major outbreaks [26-28]; they reacted similarly to the general population [14] and other college students in China [18] or those from other countries [3,12,27]. Initial outbreak psychology, such as worry, scare, panic, and anger, preceded their understanding and acceptance of reality as calmness, agreeableness, and depression at the time of quarantine. Their optimistic emotions could be linked to their remoteness from the epicenter because 98% of them are non-Hubei residents.

Emotional responses can positively or negatively influence how people conform to the recommended interventions during public health crises. For example, functional fear is the positive predictor of compliance behavior in the COVID-19 outbreak [29], but, anger or disagreements will result in non-compliance, and irrational behavioral responses towards public health orders and restrictions [21,25]. Negativities are instigated by sociocultural and political values as well as inadequate health literacy levels in the concerned communities; especially, people with poor health literacy, and hence poor understanding about the nature of the epidemic, tend to have negativity towards the intervention strategies and measures [21]. In this study as well, we observed that those who were confused or angry had negative attitudes towards or poor compliance with the epidemic intervention measures during the quarantine period. Although they accounted for merely a small proportion (8.9%), if this rate is applied to the entire country with a population of 1.4 billion, these poor compliers could cause considerable disruption to the epidemic containment efforts, potentially amplifying the disease burden. This also reminds us the importance of an aggressive, targeted public education on the needs population during outbreaks as suggested previously [25].

Up to 23% of students had depression during the quarantine period. This depression rate is quite concerning due to its long-lasting and significant impact [28]. Monitoring early the needy (especially those with a history of depression) and providing functional psychological support would prevent long-term consequences.

The impact of public conformity on the outcome of the COVID-19 epidemic

Relationships between attitudes and behaviors are well recognized in psychology. In this study, very high

rates of positive attitudes and good compliance regarding COVID-19 interventions were observed. As demonstrated by our findings and supported by the previous study [18], the favorable outcome from COVID-19 containment in China appears primarily attributable to the exceptional public conformity with the lengthy and aggressive interventions implemented nationwide. The stringent public orders through modern mass surveillance technologies, for instance, closed-circuit television camera (CCTV) and drone-based monitoring of quarantined people, might as well have contained non-compliant outliers.

Considering their cognizance about COVID-19 and knowledge transfer to their families, it is worth mentioning the role of the medical college students as family health educators in the fight against COVID-19. For some students, however, their family members or relatives in healthcare could have influenced their attitudes and behaviors.

Study limitations

As with any self-reported survey, there are strengths and limitations in this study. The study was conducted during the domicile quarantine period, not in the earliest phase, of the epidemic to allow the students emotionally settled and ready to participate in the survey. Accordingly, we were able to capture their initial surprise response as well as transition into realization with behavioral change. But we are not sure if their reported positive attitudes and conformity behaviors are free of social desirability bias (the tendency of giving socially acceptable answers) and social conformity bias (the tendency of following the actions of others rather than using their own judgment). Addressing such biases with creative questions would be needed in future studies. By using unaided open questions, we could capture the students' true knowledge and emotions. Our findings, however, represent only the students of one medical college with a unique profile, thus are not generalizable to other college students or the wider public in China.

Conclusions

This study with medical college students revealed how multichannel risk communication, early awareness, positive attitudes, and conformity might have contributed to the favorable outcome from the COVID-19 epidemic in China. This study also offers a reminder for future outbreak preparedness that clear, accurate, consistent, early risk communication by the local, national, and international public health authorities seems critical to promote public

understanding, correct risk perception, and rational emotions and attitudes, leading to optimal conformity.

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Authors Contributions

DG administered the survey, analyzed the data, and prepared tables and figures; WBT conceived the idea, designed the study, interpreted the data, and wrote the manuscript; both authors approved the final manuscript.

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