Factors Affecting Infection Control Behaviors to Prevent COVID-19: An Online Survey of Nursing Students in Anhui, China in March and April 2020

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Background: The pandemic of coronavirus disease 2019 (COVID-19) has become a major public health challenge all over the world. People's knowledge, attitudes, and preventive behaviors about diseases affect the degree of adherence to control measures. This study aimed to survey the affecting factors of COVID-19 prevention behavior among nursing students in China.

Material/Methods: Six-hundred thirteen nursing students in Anhui, China participated in an online survey from March 30 to April 5, 2020. The survey collected demographic information, electronic health (eHealth) literacy, COVID-19-related knowledge, attitudes, and prevention behavior data using descriptive analysis and multinomial logistic regression to analyze the data.

Results: The mean age of study participants was 20.88 years, of which 31.8% were male (n=613). Television (84.9%) and WeChat (79.6%) were the major sources of their information. Nursing students had good knowledge (14.68±2.83), had positive attitudes (4.03±0.59), had good practices (3.92±0.65), and had basic eHealth literacy (30.45±6.90). Nursing students with higher eHealth literacy (odds ratio [OR]=0.89, P<0.01), good knowledge (OR=0.89, P<0.01), and positive attitudes (OR=0.24, P<0.01) took more preventive behaviors. Students living in the countryside (OR=0.09, P<0.01) and of a young age (OR=1.51, P<0.05) seldom took preventive actions. Men, compared with women, were less likely to take preventive measures (OR=1.44, P<0.05).

Conclusions: Good eHealth literacy, good knowledge, and a positive attitude were the most important variables that affected the prevention behavior against COVID-19. Targeted health education should be conducted for male students and students living in the countryside by providing reliable and effective online sources.

MeSH Keywords: Attitude • COVID-19 • Knowledge • Students, Nursing
Background

Novel coronavirus disease 2019 (COVID-19) is a new viral respiratory illness. Since its first outbreak in Wuhan, China in December 2019, coronavirus disease has become a major health problem, rampant spreading to many countries within a short time [1–3]. As of this study on April 10, 2020, the World Health Organization has reported a total of 1,610,055 laboratory-confirmed cases of COVID-19 and 96,365 deaths due to COVID-19 in 210 countries and territories all over the world [4].

Apart from global public health, COVID-19 has been also affecting the economy and social affairs [5]. The rapid increase in the number of deaths from the disease has caused public anxiety, fear, and depression, which further complicates efforts to prevent the spread of the disease. Faced with such challenges, the government has adopted the following measures to prevent the spread of the disease on the basis of severe acute respiratory syndrome prevention and control experience. Methods include sealing the city in the epidemic areas, community closure management, isolation of suspected cases and infected persons, closure of public places and recreational facilities, closure of schools, wearing masks when going out, travel restrictions, and so on. Countries around the world had also blocked the borders to prevent COVID-19 spread.

In facing the global pandemic of COVID-19, nurses are the primary caregivers for COVID-19 patients, responsible for providing knowledge and facilitating effective care interventions. However, healthcare workers who are at the front lines in the fight against infectious disease are the most vulnerable [6]. Evidence has been given by several investigators that taking care of an infected individual increased the risk of acquiring COVID-19 [7,8].

Nursing education in China is provided through a 4-year curriculum, which includes knowledge of preventive medicine for infectious diseases. In the Fundamental Nursing undergraduate course, nursing students learn basic personal protection knowledge such as hand washing and isolation gown wearing. However, nursing students who are exposed to the hospital settings during their clinical practice coursework are prone to infection because they may provide care to patients who are suspected of or diagnosed with COVID-19 infection [8,9]. Hence, as future health educators and healthcare providers, nursing students need more comprehensive knowledge and skills to deal with the epidemic and spread of disease, which may improve the country’s ability to respond to pandemics.

Electronic health (eHealth) literacy refers to the ability to find, discover, understand, and evaluate the knowledge gained from eHealth information sources and applications to solve health problems [10], and has been identified as an important skill set, especially in face of global healthcare challenges. Some previous studies have analyzed the knowledge and attitudes of students from Indonesia [11], Pakistan [12], Egypt [13], Jordan [14], and Spain [15]. However, no articles have analyzed factors influencing COVID-19 preventive behavior among nursing students in China, and no study has found the association between electronic literacy and preventive behavior.

The purpose of this study was (1) to determine the level of nursing students’ knowledge, attitudes, and preventive behavior toward COVID-19 and the level of eHealth literacy; and (2) to survey the factors affecting COVID-19 prevention behavior among nursing students in China.

Material and Methods

Design

The descriptive cross-sectional survey was performed among nursing students to investigate knowledge, attitudes, preventive behaviors, and the eHealth literacy level regarding the 2019 novel coronavirus. The survey was conducted in an online questionnaire for 6 days (30 March–5 April 2020).

Data collection

The online questionnaire link had been posted on WeChat because WeChat is the most common and widely used social media in China [16]. Study participants were chosen through a cluster-stratified sampling process. First, all nursing students were stratified by grades. Second, within every grade, simple random sampling was done using a random number table. A professor who was willing to send the link to the students was found in every grade. After informed consent, the purpose of the survey was explained to the students by the professor.

Considering the authenticity and validity of the survey, the same Internet protocol address can only be used once. The questionnaire, which was automatically monitored by the system, was allowed to be submitted anonymously after completing all questions. Students could withdraw from the test at any time. A response time of less than 160 s was considered invalid.

Participants

All nursing students were recruited from a medical college located in Anhui Province in China. The inclusion criteria for the participants were (1) being first- to fourth-year undergraduate nursing students; (2) voluntarily participating in the study. In consideration of nonresponses, the sample size was increased to 912. After excluding 67 students who submitted
invalid questionnaires and 214 students unwilling to participate, 631 of the samples were used.

Ethical issues

Approval to conduct the study was obtained from the Ethics Committee of the School of Nursing of Wannan Medical College (no. 20200003.10) and was performed in accordance with the Declaration of Helsinki.

Measurements

Questionnaire

The survey comprised 5 sections: demographics, knowledge of COVID-19 (diagnosis, treatment, and preventive measures), attitude, practice, and the eHealth literacy level. A self-administered structured survey questionnaire was based on information given by the National Health and Family Commission of China and some previous related surveys [17–24].

1. Demographics

This section contained 7 items assessing general characteristics, including age, gender, grade, etc.

2. Knowledge about COVID-19.

This section is mainly to discern the knowledge level of different groups about coronavirus by using 21 items. This scale included questions about the facts of COVID-19 (3 items); symptom (3 items); transmission (6 items); diagnosis (4 items); and treatment (5 items). A correct answer was assigned 1 point, whereas a wrong answer or “don’t know” were assigned 0 points. The total score ranged from 0 to 21. A higher score indicated a higher level of knowledge. Items 11, 13, 14, and 17 received more incorrect answers than correct. Cronbach’s alpha coefficient of the knowledge scale was 0.646.

3. Attitude toward COVID-19.

Thirteen items were provided for the participants to survey their attitudes and beliefs. Each item used a 5-point Likert scale coded from 1 “strongly disagree” to 5 “strongly agree.” Total attitude scores ranged from a minimum of 13 to a maximum of 65. A high score was considered a good attitude. Cronbach’s alpha coefficient of attitude scale was 0.917.

4. Preventive behaviors for COVID-19.

A total of 8 questions was included to evaluate the performance of COVID-19 prevention and used a 5-point Likert scale coded from 1 “never” to 5 “always.” Total scores ranged from 8 to 40. A higher score means that the respondent practices better COVID-19 prevention behavior. Cronbach’s alpha coefficient of preventive behaviors scale was 0.852.

5. eHealth Literacy Scale (eHEALS).

Developed by Norman and Skinner [10] in 2006, eHEALS was translated into a Chinese version and revised by Guo et al. [25] in 2014. Assessment of eHealth literacy level among nursing students was carried out through an 8-item eHealth scale. Five-point Likert-type scales were applied, ranging from “strongly disagree” (1 point) to “strongly agree” (5 points). The total score ranged from 8 to 40 points and a score ≥32 meant that nursing students had basic literacy levels. Cronbach’s alpha coefficient of eHEALS was 0.975.

Statistical analyses

IBM SPSS version 21.0 (Chicago, IL, USA) was used for all statistical analyses. The distribution of continuous variables was described by means and standard deviations. The distribution of categorical variables was described by frequencies and percentages. Data were verified to have normal distribution before analysis by using the Kolmogorov-Smirnov test and examining normality plots.

The Mann-Whitney U and the Kruskal-Wallis tests were performed to identify contributory factors associated with knowledge, attitude, and practices regarding coronavirus. Spearman’s rank correlation test was used to analyze the correlations among variables. Multinomial logistic regression was used to analyze the correlation between preventive behavior and the main variables. P<0.05 was considered statistically significant for all statistical analyses.

Results

Response rates and demographics

The response rate was 67.21%. The average age of the 613 students was 20.88 years (SD=1.55; range 17–25), of which 31.8% were men; 35.8% of the students lived in the city. The final study sample comprised 161 freshman, 175 sophomores, 124 juniors, and 153 seniors. Also, 46.3% of students experienced clinical practice; 54.1% of the participants (score ≥32) had basic eHealth literacy levels; 21 students had flulike symptoms during the COVID-19 outbreak.

The nurses listed television (84.3%), WeChat (79.6%), blog (78.1%), and school network platform (75.5%) as the most frequent sources of education about COVID-19. Most of the participants wished to know information on epidemic trends...
(91.2%), medical progress (89.9%), progress in vaccine research (88.9%), government prevention and control measures (86.0%), and protective measures (85.8%) (Table 1).

### Knowledge

The mean score on knowledge about COVID-19 was 14.68 of 21 points (SD=2.83). Most students had a good level of knowledge on COVID-19. A majority of students held misconceptions that antiviral drugs (81.4%, 499/613) and antibacterial drugs (60.5%, 371/613) can be used to treat the virus. Of the participants, 76.3% incorrectly believed that the COVID-19 virus can be vertically transmitted from mother to child. Over 90% of students were aware that new coronavirus pneumonia is a fatal respiratory disease that can be spread through droplets and virus-contaminated objects (Table 2). There was a significant difference in knowledge on the basis of grade ($\chi^2_{4} = 53.40, P<0.001$), clinical practice experience ($Z_{mwu}=-6.71, P<0.001$), and eHealth literacy ($Z_{mwu}=-4.48, P<0.001$) (Table 3).

### Attitude

The mean score on attitude about COVID-19 was 4.03 of 5 points (SD=0.59). About 70-80% of the students agreed that infection can be prevented by following the guidelines, wearing a mask when going out, and isolating infected patients. Over 30% of the students were not sure about vaccine injection and carrying out a clinical internship in the hospital with infected patients (Table 4).

The results of the attitude score were significantly different in sex ($Z_{mwu}=-4.31, P<0.001$), grade ($\chi^2_{3} = 12.68, P=0.005$), and eHealth literacy ($Z_{mwu}=-4.48, P<0.001$) (Table 3).

### Table 1. Sample characteristics (N=613).

| Variables                      | Characteristics          | N    | %   |
|--------------------------------|--------------------------|------|-----|
| Sex                            | Male                     | 195  | 31.8|
|                                | Female                   | 418  | 68.2|
| Living areas                   | City                     | 220  | 35.9|
|                                | Countryside              | 393  | 64.1|
| Grade                          | First year               | 161  | 26.3|
|                                | Second year              | 175  | 28.5|
|                                | Third year               | 124  | 20.2|
|                                | Fourth year              | 153  | 25.0|
| Clinical practice experienced  | Yes                      | 284  | 46.3|
|                                | No                       | 329  | 53.7|
| eHealth literacy               | Low                      | 281  | 45.9|
|                                | High                     | 332  | 54.1|
| Current health status          | Good                     | 502  | 81.9|
|                                | Neither good nor bad     | 90   | 14.7|
|                                | Bad                      | 21   | 3.4 |
| Sources of information         | Newspapers/magazines     | 409  | 66.7|
|                                | School network platform  | 463  | 75.5|
|                                | Television               | 517  | 84.3|
|                                | WeChat                   | 488  | 79.6|
|                                | Blog                     | 479  | 78.1|
|                                | Community                | 284  | 46.3|
|                                | Classmates/friends/family| 447  | 72.9|
| Information wish to know       | Epidemic trends          | 559  | 91.2|
|                                | Medical progress         | 551  | 89.9|
|                                | Government prevention and control measures | 527 | 86.0|
|                                | Progress in vaccine research | 545 | 88.9|
|                                | Protective measures      | 526  | 85.8|

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Table 2. Level of knowledge of COVID-19 (N=613).

| Items | Correct answers | Incorrect answers |
|-------|-----------------|-------------------|
|       | N   | %  | N   | %  |
| Fact  |      |    |      |    |
| Q1. COVID-19 is a respiratory infectious disease caused by coronavirus (T) | 585 | 95.4 | 28 | 4.6 |
| Q2. The first case of human infection with COVID-19 reported in Wuhan China in 2019 (T) | 401 | 65.4 | 212 | 34.6 |
| Q3. Coronavirus can be fatal (T) | 584 | 95.3 | 29 | 4.7 |
| Symptoms |      |    |      |    |
| Q4. Ultraviolet light, heat sensitivity, 56°C for 30 min, ether, 75% alcohol, chlorine disinfectant, peracetic acid, chloroform inactivate virus (T) | 485 | 79.1 | 128 | 20.9 |
| Q5. The main symptoms are fever, dry cough, and fatigue. Other symptoms are stuffy nose, runny nose, sore throat, myalgia, and diarrhea (T) | 559 | 91.2 | 54 | 8.8 |
| Q6. Severe symptoms are dyspnea and/or hypoxemia, acute respiratory distress syndrome, multiorgan dysfunction, septic shock (T) | 538 | 87.8 | 75 | 12.2 |
| Transmission (COVID-19 spread trough) |      |    |      |    |
| Q7. Respiratory droplets (sneezing, coughing) (T) | 590 | 96.2 | 23 | 3.8 |
| Q8. Close contact with the patient (T) | 431 | 70.3 | 182 | 29.7 |
| Q9. Contact with virus-contaminated objects (T) | 563 | 91.8 | 50 | 8.2 |
| Q10. Aerosol (T) | 544 | 88.7 | 69 | 11.3 |
| Q11. Transplacental transmission (F) | 145 | 23.7 | 468 | 76.3 |
| Q12. COVID-19 infection was believed to originate in bats(T) | 423 | 69.0 | 190 | 31.0 |
| Treatment |      |    |      |    |
| Q13. Antibiotics can help treatment (F) | 114 | 18.6 | 499 | 81.4 |
| Q14. Antiviral can help treatment (F) | 242 | 39.5 | 371 | 60.5 |
| Q15. Rehabilitated plasma helps treatment (T) | 443 | 72.3 | 170 | 27.7 |
| Q16. Traditional Chinese medicine (Huoxiang Zhengqi capsule/Lotus Qingwen capsule) helps treatment (T) | 296 | 48.3 | 317 | 51.7 |
| Q17. Vaccines to prevent new coronavirus infections are available (F) | 183 | 29.9 | 430 | 70.1 |
| Diagnosis |      |    |      |    |
| Q18. The population is generally susceptible to infection (T) | 459 | 74.9 | 154 | 25.1 |
| Q19. Real-time reverse transcription polymerase chain reaction can help to diagnose COVID-19 (T) | 370 | 60.4 | 243 | 39.6 |
| Q20. Viral next-generation sequencing can help to diagnose COVID-19 (T) | 480 | 78.3 | 133 | 21.7 |
| Q21. The incubation period of coronavirus is from 1 to 14 days (T) | 498 | 81.2 | 115 | 18.8 |

clinical practice experience ($Z_{sw}=-3.70$, $P<0.001$), eHealth literacy ($Z_{sw}=-7.89$, $P<0.001$), and health status ($\chi^2_{sw}=17.01$, $P<0.001$) based on participants’ characteristics. In comparison with men, women had a more positive attitude. The overall attitude of higher-grade students about COVID-19 was more positive. Students who had clinical practice experience showed a more positive attitude. The higher applicability of eHealth literacy would result in a more positive attitude. Students in good health kept a good attitude (Table 3).
The mean score on prevention behavior about COVID-19 was 3.92 of 5 points. (SD=0.65). In COVID-19 prevention of behavioral problems, 28.87, 25.87, and 11.09% of the participants had never or rarely performed items 1, 3, and 4, respectively (Table 5).

| Variables            | Characteristics | N (%) | Knowledge Mean rank Z and P | Practice Mean rank Z and P | Attitude Mean rank Z and P | eHEALS Mean rank Z and P |
|----------------------|-----------------|-------|-----------------------------|---------------------------|---------------------------|--------------------------|
| Sex                  | Male            | 195 (31.8) | 290.15 | -1.62 | 0.105 | 259.93 | -4.50 | 0.000** | 261.94 | 0.001** | 274.90 | 0.002** |
|                      | Female          | 418 (68.2)  | 314.86 | -4.00 | 1.962 | 328.96 | 0.000** | 328.02 | 0.000** | 321.97 | 0.000** |
| Living areas         | City            | 220 (35.9)  | 307.11 | 0.00 | 0.991 | 347.73 | -4.27 | 0.000** | 312.43 | 0.000** | 312.45 | 0.000** |
|                      | Country-side    | 393 (64.1)  | 306.94 | 0.00 | 0.099 | 284.20 | -0.27 | 0.783 | 303.96 | 0.000** | 303.95 | 0.000** |
| Clinical practice    | Yes             | 284 (46.3)  | 358.25 | 0.00 | 0.000** | 321.55 | -1.89 | 0.058 | 335.43 | 0.000** | 325.41 | 0.015* |
|                      | No              | 329 (53.7)  | 262.76 | 0.00 | 0.099 | 294.44 | -3.70 | 0.000** | 282.46 | 0.000** | 291.11 | 0.000** |
| eHEALS               | Low             | 281 (45.9)  | 272.44 | 0.00 | 0.000** | 241.23 | -8.48 | 0.000** | 245.77 | 0.000** | 141.00 | 0.000** |
|                      | High            | 332 (54.1)  | 336.25 | 0.00 | 0.000** | 362.67 | -7.89 | 0.000** | 358.83 | 0.000** | 447.50 | 0.000** |

| Variables            | Characteristics | N (%) | Knowledge Mean rank $\chi^2$ | P | Practice Mean rank $\chi^2$ | P | Attitude Mean rank $\chi^2$ | P | eHEALS Mean rank $\chi^2$ | P |
|----------------------|-----------------|-------|-----------------------------|   |-----------------------------|   |-----------------------------|   |-----------------------------|   |
| Grade                | First year      | 161 (26.3) | 241.31 | 53.40 | 0.000** | 310.24 | 5.104 | 0.164 | 310.24 | 12.68 | 0.005** | 314.61 | 0.005** |
|                      | Second year     | 175 (28.5) | 281.20 | 0.00 | 0.991 | 283.64 | -0.27 | 0.783 | 280.69 | 0.000** | 273.70 | 0.000** |
|                      | Third year      | 124 (20.2) | 353.45 | 0.00 | 0.000** | 328.39 | 0.000** | 342.98 | 0.000** | 313.85 | 0.000** | 313.85 | 0.000** |
|                      | Fourth year     | 153 (25.0) | 367.99 | 0.00 | 0.000** | 312.97 | 0.000** | 327.06 | 0.000** | 331.53 | 0.000** |
| Current              | Good            | 502 (81.9) | 309.81 | 0.00 | 0.000** | 318.77 | 0.000** | 320.66 | 0.000** | 325.28 | 0.000** |
|                      | Not good nor bad| 90 (14.7) | 304.51 | 2.32 | 0.034 | 254.23 | 12.303 | 0.002** | 250.63 | 0.000** | 226.81 | 0.000** |
| Health status        | Neither          | 21 (3.4) | 250.50 | 0.00 | 0.991 | 251.79 | 0.000** | 221.95 | 0.000** | 213.79 | 0.000** |

Mann-Whitney U test and Kruskal-Wallis test. *P<0.05; **P<0.01.

**Prevention behavior**

The mean score on prevention behavior about COVID-19 was 3.92 of 5 points. (SD=0.65). In COVID-19 prevention of behavioral problems, 28.87, 25.87, and 11.09% of the participants had never or rarely performed items 1, 3, and 4, respectively (Table 5).

There was a significant difference in prevention behavior according to sex ($Z_{\text{mwu}}=-4.50$, $P<0.001$), living area ($Z_{\text{mwu}}=-4.27$, $P<0.001$), eHealth literacy ($Z_{\text{mwu}}=-8.48$, $P<0.001$), and health status ($\chi^2=12.30$, $P<0.001$) (Table 3).

**eHealth literacy**

The participants’ mean score was 30.45 of 40 on eHealth literacy (SD=6.90). Over 50% of participants had basic literacy
Relationship between preventive behavior and other main variables

Preventive behavior for COVID-19 was significantly correlated with knowledge ($r_s=0.177$, $P<0.01$), attitude ($r_s=0.406$, $P<0.01$), eHealth literacy ($r_s=0.416$, $P<0.01$), sex ($r_s=0.182$, $P<0.01$), living area ($r_s=-0.173$, $P<0.01$), and health ($r_s=-0.142$, $P<0.01$) (Table 6).

Influencing factors on preventive behavior for COVID-19

In the multinomial logistic regression analysis model, the preventive behavior was always taken as the control. For every 1 year older, the nurses would choose less protective behavior was always taken as the control. For every 1 year older, the nurses would choose less protective behavior was always taken as the control. For every 1 year older, the nurses would choose less protective behavior was always taken as the control. For every 1 year older, the nurses would choose less protective behavior was always taken as the control. For every 1 year older, the nurses would choose less protective behavior was always taken as the control. For every 1 year older, the nurses would choose less protective behavior was always taken as the control. For every 1 year older, the nurses would choose less protective behavior was always taken as the control. For every 1 year older, the nurses would choose less protective behavior was always taken as the control. For every 1 year older, the nurses would choose less protective behavior was always taken as the control. For every 1 year older, the nurses would choose less protective behavior was always taken as the control.
Compared with the group of nursing students that always take preventive behaviors, nursing students who had poor eHealth literacy (OR=0.95, 95% CI: 0.78, 0.88), had insufficient knowledge about COVID-19 (OR=0.92, 95% CI: 0.64, 0.85), had a poorer attitude (OR=0.64, 95% CI: 0.13, 0.78), and lived in the countryside (OR=0.41, 95% CI: 0.03, 0.30) are more inclined to often take preventive action (Table 7).

**Discussion**

The current descriptive study assessed the factors influencing preventive behavior regarding COVID-19 among nursing students in China. This study revealed that COVID-19-related knowledge is relatively high among the participants. Positive attitudes and good precautionary measures were also reported among participants.

Social media (WeChat) at 79.6% is the second-highest source of information for the nursing students to learn about COVID-19, which was consistent with a study in Jordan (83.4%) [14]. The data show that students rely heavily on social media, reminding the government and professionals that they should pay more attention to improving reliable and effective online sources.
Table 7. Multinomial logistic regression analysis of the factors affecting preventive behavior level toward COVID-19 among the nursing students (N=613).

| Variables          | N   | Preventive behavior level |          |          |          |
|--------------------|-----|----------------------------|----------|----------|----------|
|                    |     | Seldom         |         | Sometimes |         | Often     |
|                    |     | OR   | 95% CI | P       | OR   | 95% CI | P       | OR   | 95% CI | P       |
| Age                | 613 | 1.51 | 1.08, 2.10 | 0.02**  | 1.01 | 0.93, 1.11 | 0.78  | 1.01 | 1.08, 2.10 | 0.80  |
| eHEALS             | 613 | 0.83 | 0.78, 0.88 | 0.00**  | 0.89 | 0.87, 0.91 | 0.00** | 0.95 | 0.78, 0.88 | 0.00** |
| Knowledge          | 613 | 0.74 | 0.64, 0.85 | 0.00**  | 0.89 | 0.84, 0.94 | 0.00** | 0.92 | 0.64, 0.85 | 0.00** |
| Attitude           | 613 | 0.32 | 0.13, 0.78 | 0.01*   | 0.24 | 0.19, 0.32 | 0.00** | 0.64 | 0.13, 0.78 | 0.00** |
| Male               | 706 | 2.37 | 0.88, 6.33 | 0.09   | 1.44 | 1.07, 1.95 | 0.02*  | 0.86 | 0.88, 6.33 | 0.22  |
| Female             | 1625 | Ref     |          |         | Ref     |          |        | Ref     |          |
| City               | 868 | 0.09 | 0.03, 0.30 | 0.00**  | 0.30 | 0.23, 0.41 | 0.00** | 0.41 | 0.03, 0.30 | 0.00** |
| Countryside        | 1463 | Ref     |          |         | Ref     |          |        | Ref     |          |
| Health status=good | 1933 | 0.21 | 0.04, 1.17 | 0.08   | 0.51 | 0.18, 1.47 | 0.21  | 0.47 | 0.04, 1.17 | 0.13  |
| Health status=bad  | 325  | 0.59 | 0.09, 3.97 | 0.59   | 0.88 | 0.29, 2.67 | 0.83  | 0.64 | 0.09, 3.97 | 0.38  |
| Health status=bad  | 73   | Ref     |          |         | Ref     |          |        | Ref     |          |

* P < 0.05; ** P < 0.01. Ref – reference level; OR – odds ratio; CI – confidence interval.

The present study showed that the students were least knowledgeable toward the question of treatment of COVID-19. Surprisingly, 70.1% of students did not know that there was no vaccine available, which was higher than that of Pakistan (33%) [12]. Of the participants, 81.4% had insufficient knowledge regarding the uselessness of antibiotics for COVID-19. Transplacental transmission was incorrectly identified by 76.3% of the students. Since the quality of the information available on social media is insufficient, open-access journals on COVID-19 should be provided by the educators and the government to help improve the students’ understanding of COVID-19.

Concerning attitudes, 35.5% of the students expressed a neutral or negative attitude about carrying out a clinical internship in hospitals receiving COVID-19 patients. The result of Cervera-Gasch et al. was in line with our findings [15]. This is likely to reflect the concerns of nursing students who are not ready to take care of infected patients. Only 59.91% of respondents stated that they were willing to inject a vaccine against COVID-19 if it is available. Another similar study stated that 26% of the participants would not use the vaccine [26]. Our findings suggest that greater emphasis should be placed on the rise of vaccine hesitancy.

This present study showed that 71.22% of the students wore masks, gloves, and goggles. Only about 50% of the participants were willing to wear face masks in a previous study [13]. The difference may be due to the rapid depletion of masks since the coronavirus pandemic.

Factors influencing the students’ practice against COVID-19 were assessed. The correlation between students’ knowledge, attitudes, and practice shows that sufficient knowledge and positive attitudes are affecting their actions against COVID-19. Knowledge is a prerequisite for establishing positive attitudes and promoting positive behaviors [13], although eHealth literacy can promote the acquisition and application of online health information to adopt a positive attitude and conduct health-promoting activities. Therefore, for nurse undergraduates, it is crucial to provide emergency disease training, increase eHealth literacy courses, and improve the curriculum with courses such as epidemiology and new emerging diseases.

The living area as a factor was correlated with preventive behaviors. In the present study, it was found that students living in rural areas adopt fewer protective measures. To prevent future spread, it is necessary for the government to intensify education for students living in rural areas.

Gender was another factor that affects nursing students’ COVID-19 prevention behavior. The present study showed that in response to COVID-19, men were less likely to take protective behavior than women. This coincides with the research in Saudi Arabia and Pakistan [27,28]. Studies suggest that
targeted health education should be conducted for this high-risk population that is particularly vulnerable to COVID-19.

The limitations of the study were that all participants weremajoring in nursing; the findings are limited to Anhui, China; and there is a female predominance. The reason for vaccine hesitancy still unknown. Future studies addressing this point could help people receive immunization to end the pandemic.

Conclusions

Good eHealth literacy, good knowledge, and a positive attitude were the most important variables affecting prevention behavior against COVID-19. Targeted health education should be conducted for male students and students living in the countryside by providing reliable and effective online sources. It is crucial to provide emergency disease training, increase eHealth literacy courses, and improve the curriculum, such as adding epidemiology and new emerging diseases courses.

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Competing interests

None.

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