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Suicidal and self-harm ideation among Chinese hospital staff during the COVID-19 pandemic: Prevalence and correlates

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ABSTRACT

The COVID-19 pandemic put global medical systems under massive pressure for its uncertainty, severity, and persistence. For detecting the prevalence of suicidal and self-harm ideation (SSI) and its related risk factors among hospital staff during the COVID-19 pandemic, this cross-sectional study collected the sociodemographic data, epidemic-related information, the psychological status and need, and perceived stress and support from 11507 staff in 46 hospitals by an online survey from February 14 to March 2, 2020. The prevalence of SSI was 6.47%. Hospital staff with SSI had high family members or relatives infected number and the self-rated probability of infection. Additionally, they had more perceived stress, psychological need, and psychological impact. On the contrary, hospital staff without SSI reported high self-rated health, willingness to work in a COVID-19 ward, confidence in defeating COVID-19, and perceived support. Furthermore, they reported better marital or family relationship, longer sleep hours, and shorter work hours. The infection of family members or relatives, poor marital status, poor self-rated health, the current need for psychological intervention, perceived high stress, perceived low support, depression, and anxiety were independent factors to SSI. A systematic psychological intervention strategy during a public health crisis was needed for the hospital staff’s mental well-being.

1. Introduction

The coronavirus disease 2019 (COVID-19) has resulted in nearly 66 million confirmed cases, and over 1.5 million deaths accumulatively by December 7, 2020 (World Health Organization, 2020). The pandemic of COVID-19 blocked the global economy, disturbed social activities, and affected people’s mental health. Furthermore, it put global medical systems under massive pressure for its uncertainty, severity, and persistence. The hospital staff was reported to suffer from high infection risk, heavy workload, psychological stress, and insomnia (An et al., 2020; Holton et al., 2020).

Previous studies have reported that suicidal ideation, a sensitive and specific indicator for suicide, was higher among medical healthcare workers than in the general population and associated with stress and mental disorder (Galfalvy et al., 2008). The suicide of nurses was reported during the COVID-19 pandemic (Rahman and Plummer, 2020). Only one study reported the suicide risk in frontline medical staff during the initial phase of the COVID-19 outbreak was 13%, equal to the general population. Additionally, it found that the years of working, family income, and daily working hours were associated with suicide risk (Zhou et al., 2020). However, the prevalence of suicidal ideation among hospital staff and its correlates are still unclear during a public health crisis by far (Naushad et al., 2019).

Chongqing municipality is one of the 34 provincial administrative regions, located in the middle of China with a 31 million population, bordered by Hubei province, and closely connected with Wuhan in culture, economy, and transport (State Statistical Bureau, 2020). Moreover, during the Chinese traditional holiday—the Lunar spring
festival, Chongqing is the third city outside of Hubei province, which received migration from Wuhan (Economic Observer, 2020). In the initial three months after the COVID-19 pandemic outbreak, the number of confirmed COVID-19 cases per million in Chongqing ranked the seventh in China, although the local government took vigorous measures to control the pandemic after starting the first level response to major public health emergencies on January 24, 2020 (Tencent news, 2020).

This study was derived from the cooperation between our team and the Chongqing Health Commission as a part of the Chongqing psychological screening and intervention program. We collected epidemiological data timely to investigate the prevalence of suicidal and self-harm ideation (SSI) and its related factors in hospital staff during the COVID-19 pandemic. Furthermore, we hope to improve the hospital staff’s mental well-being with some practical suggestions.

2. Methods

2.1. Design

This was a cross-sectional study.

2.2. Participants and data collection

This study was carried out based on the cooperation between our team and the Chongqing Health Committee following the introduction of an emergency psychological crisis intervention in the COVID-19 epidemic promulgated by the National Health Commission of China on January 27, 2020 (National Health Commission of China, 2020). The details of recruitment can be found in another recently published research by our team (Xu et al., 2020).

In the 48 hospitals assigned by the Chongqing government to treat the COVID-19 patients, four hospitals received all the 576 confirmed patients and were classified as designated hospitals in this study. Except that, 16 hospitals were in central urban districts; 26 hospitals were in counties; two hospitals did not participate in this survey. Hospital staff working in the clinic, assistant, back office, and administration departments from the 46 hospitals mentioned above scanned a QR-code from their workgroup in the WeChat application under administrative encouragement. They finished the e-questionnaire on the backstage of a specified psychological screening system (Chongyixinli) from February 14 to March 2, 2020, the three to five weeks after the COVID-19 pandemic outbreak in Chongqing.

2.3. Measures

A structured e-questionnaire collected information on four domains, as described below. In this study, the criterion for SSI was the answer to the ninth item in PHQ-9, “Thought that you would be better off dead or of hurting yourself in some way.”. Not at all meant no SSI, while other answers, such as “several days”, “more than half the days”, or “nearly every day” meant SSI(Wang et al., 2020).

2.3.1. General information on demographic characteristics

Information regarding gender, age, ethnicity, educational background, marital status, number of children, hospital class, department, profession, technical title, work experience, work hours per day, and sleep hours per day were collected.

2.3.2. The COVID-19 pandemic related information

For detecting the impact on work, life, and attitudes in hospital staff, we collected the COVID-19 pandemic-related information. The questions were as followed: if they directly contacted with confirmed patients; how the quarantine status was in their workplace (complete isolation ward, partial isolation ward, or general ward); if they worked in a frontline department; if they had infected family members, relatives, or community members; if they have canceled their travel during the initial phase of the pandemic; how did they self-rated their possibility of infection (none, low, or high); if they were willing to work in a COVID-19 ward; if they still attend parties during the pandemic; if they were concern about COVID-19 progress; if they were confident in defeating COVID-19; and what was their prediction for the lasting time of this pandemic (1-2 months, 3-6 months, half to one year, 1-2 years, or more than 2 years).

2.3.3. Psychological status and the need

The Patient Health Questionnaire (PHQ-9) was used to measure the symptoms of depression (Spitzer et al., 1999). This scale consisted of a five-point Likert-type from “not at all” (score 0) to “extremely” (score 4), wherein participants were asked to indicate how often they had been bothered by the symptoms over the past two weeks. The total score of the PHQ-9 ranged from 0 to 27. The sensitivity and specificity reached .91 and .97, respectively, in the patients from Chinese general hospitals when the cut-off score was 10 (Hu et al., 2009). While in the general population, they reached .86 and .86 when the cut-off score was seven or higher (Wang et al., 2014). The Generalized Anxiety Disorder 7-item Scale (GAD-7) was used to measure anxiety symptoms (He et al., 2011; Spitzer et al., 2006). The GAD-7 score was calculated by assigning ratings of 0, 1, 2, and 3 to the response categories of “not at all”, “several days”, “more than half the days”, and “nearly every day”, respectively. A cut-off score of 10 on the GAD-7 had a sensitivity of .86 and a specificity of .96 in Chinese general hospital outpatients (He et al., 2010). The Patient Health Questionnaire (PHQ-15) (Chinese version) was used to measure somatic symptoms (Lee et al., 2011; Kroenke et al., 2002). The PHQ-15 score was calculated by assigning ratings of 0, 1, and 2 to the response categories of “not bothered at all”, “bothered a little”, and “bothered a lot”, respectively. Patients with high somatic symptom severity can be differentiated from those with low somatic symptom severity by the cut-off of 10 (Zhu et al., 2012). In this study, high-level depression, anxiety, and somatic symptoms were defined as scoring equal or over 10 in PHQ-9, GAD-7, and PHQ-15. Other information was collected, such as family relationships, relationships with children, self-rated health status, the previous and current need for psychological intervention, measures of moderating emotions, and the attitudes to individual or group psychological interventions during the pandemic.

2.3.4. Perceived stress and support

We reformulated a 14-item perceived stress scale and a 6-item perceived support scale, which originated from a previous study on frontline healthcare workers during the epidemic of severe acute respiratory syndrome (Tam et al., 2004). “Yes” or “No” options on the scales were adopted for convenience. The number of positive responses was counted as the total scores for the perceived stress and support. The participants were divided into seven groups by the perceived support score (0 to 6). Consequently, the SSI percentage for each group was calculated. We found that except for group “0”, the SSI percentage was higher than 10% in group “1” to “3”, while it was less than 10% in group “4” to “6”. Therefore, low perceived support was defined as equal to or less than 3 in this study. The same method was conducted to identify the cut-off of perceived stress. The SSI percentage from group “0” to “14” increased gradually from 1.0% to 44.4% and was higher than 10% from group “8” (10.2%). Therefore, high perceived stress was defined as equal to or more than 8.

2.4. Ethics

Ethics approval for this study was provided by the Ethics Committee of Chongqing Medical University. Electronic informed consent was obtained at the beginning of participating in this survey. This study conforms to the ethical guidelines of the 1975 Declaration of Helsinki.
3. Results

A total of 11,705 e-questionnaires were collected. One hundred ninety-eight of them were excluded for duplication, incompleteness, or logistic error (less than 18 years old). Because a face-to-face survey was not recommended by the lockdown and social distance policy, we cannot distinguish which hospital staff refused this online survey from those who did not know it. Furthermore, the number of each hospital staff was unavailable. Consequently, it was not easy to get the response rate to the survey. Finally, 11,507 participants were included, with an average age of 33.37±8.22 years, the work experience of 10.30±8.44 years, 78.1% (8,986) females, and 54.11% (6,241) nurses. 6.47% (744) of the hospital staff reported SSI. The SSI prevalence in doctors, nurses, technicians, and administrators was 6.26%, 6.68%, 6.37%, and 5.56%, respectively. The prevalence of high-level depressive, anxiety, and somatic symptoms were 9.47%, 5.12%, and 19.54%, respectively. 0.83% of these participants ask for psychologists or psychiatrists when they felt apparent depression or anxiety.

T-test and χ2 test were used to analyze the differences between hospital staff with and without SSI regarding sociodemographic, epidemic-related, psychological, and perceived stress and support factors (Tables 1–3). Three out of fourteen sociodemographic factors showed differences, marital status, work hours per day, and sleep hours per day (Table 1). Except for direct contact with confirmed patients, isolated ward, and canceled travel, the remaining 9 of 12 epidemic-related factors showed significant differences between hospital staff with and without SSI (P<.05) (Table 2). Almost all the psychological characteristics showed significant differences between hospital staff with and without SSI (P<.001) (Table 3).

The LR binary logistic regressive analysis showed that poor marital relationship (OR, 1.779; 95%CI, 1.166-2.713), infection of family members or relatives (OR, 3.204; 95%CI, 1.491-6.888), poor self-rated health status (OR, 3.002; 95%CI, 2.484-3.629), anxiety (OR, 1.459; 95%CI, 1.064-2.001), depression (OR, 1.709; 95%CI, 1.324-2.205), the current need for psychological intervention (OR, 3.549; 95%CI, 2.917-4.315), previous experience of depression or anxiety (OR, 2.556; 95%CI, 1.777-3.673), work hours per day (OR, 3.549; 95%CI, 2.917-4.315), sleep hours per day (OR, 3.002; 95%CI, 2.484-3.629), and poor self-rated health status (OR, 3.002; 95%CI, 2.484-3.629) are independent risk factors to SSI in the hospital staff. Data were analyzed using SPSS version 25.0 (SPSS, Chicago, IL, USA), and P< 0.05 was considered statistically significant (double-side test).

### Table 1
Comparison of social demographic factors between hospital staff with and without SSI during COVID-19 pandemic (N=11,507).

| Features                        | Total Without SSI (n=10,763) | With SSI (n=744) | χ2/Z | P       |
|---------------------------------|------------------------------|-----------------|------|---------|
| Gender                          | N%                           | n%              | n%   | χ2/Z   |
| Female                          | 8986 (78.09%)                | 8393 (77.98%)   | 593 (79.70%) | 1.209 | .271   |
| Male                            | 2521 (21.91%)                | 2370 (22.02%)   | 151 (20.30%) |       |        |
| Ethnic group                    | Han                          | Han             | Miao | Else   |
| Han                             | 9955 (86.51%)                | 9322 (86.61%)   | 633 (85.08%) | 1.555 | .460   |
| Miao                            | 1238 (10.76%)                | 1151 (10.69%)   | 87 (11.69%)  |       |        |
| Else                            | 57 (0.50%)                   | 50 (0.46%)      | 7 (0.94%)   |       |        |
| Educational background          | Below junior high school     | 400 (3.48%)     | 378 (3.51%) | 2 (2.96%) | .793 | .428   |
| Undergraduate                   | 3030 (26.33%)                | 2819 (26.19%)   | 211 (28.36%) |       |        |
| Marital status                  | Single                       | 2981 (25.91%)   | 2786 (25.88%) | 195 (26.21%) | 20.756 | <.001 |
| Marital status                  | In normal relationship       | 8261 (71.79%)   | 7747 (71.98%) | 514 (69.09%) |       |        |
| In poor relationship            | 265 (2.30%)                  | 230 (2.30%)     | 35 (4.70%)  |       |        |
| Parenting situation             | No child                     | 3962 (34.43%)   | 3711 (34.48%) | 251 (33.74%) | .170 | .680   |
| With child                      | 7545 (65.57%)                | 7052 (65.52%)   | 493 (66.26%) |       |        |
| Hospital class                  | Wuhan city                   | 248 (2.16%)     | 228 (2.12%)  | 20 (2.69%) | 2.582 | .275   |
| Hospital class                  | County hospital              | 5958 (51.78%)   | 5564 (51.70%) | 394 (52.96%) |       |        |
| Department                      | Clinical department          | 9252 (80.40%)   | 8654 (80.66%) | 598 (81.47%) | 4.308 | .230   |
| Department                      | Assistant department         | 1303 (11.32%)   | 1225 (11.51%) | 68 (9.26%) | 3.471 | .176   |
| Back office                     | Administrative department    | 531 (4.61%)     | 492 (4.59%)  | 39 (3.51%) | 1.14  | 6.97  |
| Profession                      | Doctor                       | 4108 (35.70%)   | 3851 (35.78%) | 257 (34.54%) | 1.327 | .857   |
| Profession                      | Nurse                        | 6241 (54.24%)   | 5824 (54.11%) | 417 (56.05%) |       |        |
| Technician                      | Administrator                | 518 (4.50%)     | 485 (4.51%)  | 33 (4.44%) | 1.29  | .201   |
| Other                           | 352 (3.06%)                  | 331 (3.08%)     | 21 (2.82%)  |       |        |
| Technical title                 | None                         | 1401 (12.18%)   | 1314 (12.21%) | 87 (11.69%) | .412 | .681   |
| Primary title                   | 6331 (55.02%)                | 5921 (55.01%)   | 410 (55.11%) |       |        |
| Intermediate title              | 2814 (24.45%)                | 2631 (24.44%)   | 183 (24.60%) |       |        |
| Senior vice title               | 779 (6.77%)                  | 731 (6.79%)     | 48 (6.45%)  |       |        |
| Senior                          | 182 (1.58%)                  | 166 (1.54%)     | 16 (2.15%)  |       |        |
| Age                             | 33.37±8.22                   | 33.38±8.22      | 33.25±8.20  | .411 | .681   |
| Work experience                 | 10.30±8.44                   | 10.30±8.44      | 10.25±8.35  | .148 | .882   |
| Work hours per day              | 8.50±3.00                    | 8.44±2.96       | 8.89±3.53   | 3.406 | .001   |
| Sleep hours per day             | 7.32±1.16                    | 7.34±1.14       | 6.97±1.29   | -7.767 | <.001 |

*12 missing data. SSI = Suicidal and Self-harm Ideation; % = Percent; S.D. = Standard Deviation. # Nonparametric test was conducted.
higher perceived stress (OR, 1.422; 95%CI, 1.186-1.704), and insufficient support (OR, 1.428; 95%CI, 1.216-1.678) were independent factors for SSI after adjusting age, work experience, somatic symptom, work hours per day, sleep hours per day, self-rated probability of infection (<.05). These adjusted results are listed in Table 4.

4. Discussion

This study is the first large-scale cross-sectional research with many variables on SSI and its correlates among hospital staff during a pandemic. To our knowledge, studies on suicidal ideation among hospital staff during a public health crisis are rarely conducted (Naushad et al., 2019). It was challenging to compare SSI’s prevalence rate for various evaluating tools and different time quantum (current, 12-month, or lifetime suicidal ideation) in the non-epidemic days. The prevalence of suicidal ideation ranged from 5.8% for 12 months to 10.6% for a lifetime in the general population (Liu et al., 2020). The 12-month and lifetime suicidal ideation in doctor ranged from 6.4% to 18% (Shanafelt et al., 2011; Petrie et al., 2020; Wall et al., 2014) and from 3% to 51.1%, respectively (Petrie et al., 2020; Loas et al., 2018; Hem et al., 2000).

Table 2

Comparison of epidemic-related factors and psychological characteristics between hospital staff with and without SSI during COVID-19 pandemic (N=11507).

| Features                                         | Without SSI (n=10763) | With SSI (n=744) | χ²/Z  | P    |
|--------------------------------------------------|-----------------------|------------------|-------|------|
| Epidemic-related factors                         |                       |                  |       |      |
| Direct contact with confirmed patients           | No 9388 (87.22%)      | 633 (85.08%)     | 2.845 | .092 |
| Yes 1375 (12.78%)                                | 111 (14.92%)          |                  |       |      |
| Isolated ward#                                   | Complete isolation    |                  |       |      |
| ward                                             | 1095 (10.17%)         | 67 (9.01%)       | 1.319 | .187 |
| Partial isolation ward                           | 2269 (20.52%)         | 145 (19.49%)     |       |      |
| General ward                                      | 7459 (69.30%)         | 532 (71.51%)     |       |      |
| Frontline department*                            | No 9227 (85.73%)      | 612 (82.26%)     | 6.764 | .009 |
| Yes 1536 (14.27%)                                | 132 (17.74%)          |                  |       |      |
| Family members or relatives infected             | No 10370 (93.69%)     | 732 (98.39%)     | 30.485| <.001|
| Yes 33 (0.31%)                                   | 12 (1.61%)            |                  |       |      |
| Community members infected                       | No 9643 (89.59%)      | 646 (86.83%)     | 5.625 | .018 |
| Yes 1120 (10.41%)                                | 98 (13.17%)           |                  | .046  | .830 |
| Travel canceled                                  | No 1016 (9.44%)       | 72 (9.68%)       |       |      |
| Yes 9747 (90.56%)                                | 672 (90.32%)          |                  |       |      |
| Probability of infection#                        | None 915 (8.50%)      | 50 (6.72%)       | 9.553 | <.001|
| Low 7126 (66.21%)                                | 374 (50.27%)          |                  |       |      |
| High 2722 (25.29%)                               | 320 (43.01%)          |                  |       |      |
| Willingness to work in a COVID-19 ward           | No 2766 (25.70%)      | 235 (31.59%)     | 12.510| <.001|
| Yes 7997 (74.30%)                                | 509 (68.41%)          |                  |       |      |
| Attendance of parties                            | No 10062 (98.50%)     | 710 (95.43%)     | 39.474| <.001|
| Yes 161 (1.50%)                                  | 34 (4.57%)            |                  |       |      |
| Concerns on COVID-19 progress                    | No 1095 (10.17%)      | 67 (9.01%)       | -1.319| .187 |
| Yes 10654 (98.99%)                               | 718 (96.51%)          |                  |       |      |
| Confidence in defeating COVID-19                 | No 53 (0.49%)         | 20 (2.69%)       | 53.224| <.001|
| Yes 10710 (99.51%)                               | 724 (97.31%)          |                  |       |      |
| Prediction for lasting time#                     | 1-2 months 6698 (62.23%) | 391 (23.94%)   | 5.657 | <.001|
| 3-6 months 3748 (34.82%)                        | 309 (18.92%)          |                  |       |      |
| Half to one year 297 (2.76%)                     | 310 (18.98%)          |                  |       |      |
| 1-2 years 1120 (10.41%)                         | 311 (19.04%)          |                  |       |      |
| More than 2 years 8 (0.07%)                      | 312 (19.11%)          |                  |       |      |
| Psychological characteristics                    |                       |                  |       |      |
| PHQ-9                                            | <10 9831 (91.34%)     | 586 (78.76%)     | 128.372| <.001|
| >10 932 (8.66%)                                  | 158 (21.24%)          |                  |       |      |
| PHQ-15                                           | <10 8737 (81.18%)     | 521 (70.03%)     | 55.013 | <.001|
| >10 2026 (18.82%)                                | 223 (29.97%)          |                  |       |      |
| GAD-7                                            | <10 10275 (95.47%)    | 643 (86.42%)     | 117.129| <.001|
| >10 488 (4.53%)                                  | 101 (13.58%)          |                  |       |      |
| Self-rated health#                               | Poor 264 (2.45%)      | 103 (13.84%)     | -20.747| <.001|
| Normal 4092 (38.02%)                             | 463 (62.39%)          |                  |       |      |
| Good 6407 (59.53%)                               | 178 (23.92%)          |                  |       |      |
| Previous psychological need                      | No 10090 (93.75%)     | 515 (69.22%)     | 579.466| <.001|
| Yes 673 (6.25%)                                  | 229 (30.78%)          |                  |       |      |
| Current psychological need                       | No 10125 (94.07%)     | 508 (68.28%)     | 659.622| <.001|
| Yes 638 (5.93%)                                  | 236 (31.72%)          |                  |       |      |
| Relationship with child#                         | Good 7499 (69.70%)    | 520 (70%)        | -425  | .671 |
| Normal 514 (4.80%)                               | 45 (6.10%)            |                  |       |      |
| Poor 81 (0.80%)                                  | 7 (0.90%)             |                  |       |      |
| No child                                         | 2665 (24.80%)         | 171 (23.00%)     | 652 (86.20%) | <.001|
| Good 9834 (91.40%)                               | 550 (73.72%)          |                  |       |      |
| Normal 890 (8.30%)                               | 88 (11.8%)            |                  |       |      |
| Poor 39 (0.40%)                                  | 4 (0.50%)             |                  |       |      |
| Moderating emotions                              | By self 7438 (69.11%) | 508 (68.28%)     | 30.011 | <.001|
| People around 2808 (26.09%)                      | 168 (22.58%)          |                  |       |      |
| Psychiatrist 75 (0.70%)                          | 8 (1.08%)             |                  |       |      |
| Psychologist 75 (0.70%)                          | 8 (1.08%)             |                  |       |      |
| Psychiatrist Other 431 (40%)                     | 58 (7.80%)            |                  |       |      |
| Necessity of psychological intervention          | No 2632 (24.45%)      | 144 (19.35%)     | 9.886  | .002 |
| Yes 8131 (75.55%)                                | 600 (80.65%)          |                  |       |      |

* Frontline department: includes the intensive care unit, outpatients, COVID-19 designated ward, emergency, pneumology, or infection department. SSI = Suicidal and Self-harm Ideation; % = Percent. # Non-parametric test was conducted.
COVID-19 pandemic (Perceived stress and support in hospital staff with and without SSI during COVID-19 pandemic (N=11,507).

| Table 3 | Perceived stress and support in hospital staff with and without SSI during COVID-19 pandemic (N=11,507). |
|---------|------------------------------------------------------------------------------------------|
| Features | Without SSI (n=744) | With SSI (n=10763) | χ² | P |
| Perceived stress | | | | |
| 1. Heavy workload | No 7910 (73.49%) | 435 (54.87%) | 78.831 | <.001 |
| | Yes 2853 (26.51%) | 309 (45.13%) | | |
| 2. Recruitment into other hospitals | No 8388 (77.93%) | 565 (75.94%) | 1.600 | .206 |
| | Yes 2375 (22.07%) | 179 (24.06%) | | |
| 3. Hazardous working environment | No 3641 (33.83%) | 188 (25.27%) | 22.966 | <.001 |
| | Yes 1222 (66.17%) | 838 (74.73%) | | |
| 4. Unclear job instructions | No 9584 (89.05%) | 540 (72.58%) | 178.413 | <.001 |
| | Yes 1179 (10.95%) | 204 (27.42%) | | |
| 5. Ambiguous infection control policies | No 9856 (91.57%) | 562 (75.54%) | 208.84 | <.001 |
| | Yes 907 (8.43%) | 182 (24.46%) | | |
| 6. Risk for own health | No 4459 (41.43%) | 187 (27.69%) | 54.508 | <.001 |
| | Yes 6304 (58.57%) | 538 (72.31%) | | |
| 7. Interference with home life | No 4518 (41.98%) | 187 (25.13%) | 81.677 | <.001 |
| | Yes 6245 (58.02%) | 557 (74.87%) | | |
| 8. Risk of infecting relatives/friends | No 4035 (37.49%) | 180 (24.19%) | 52.999 | <.001 |
| | Yes 6728 (62.51%) | 564 (75.81%) | | |
| 9. Disrupting personal plans | No 3063 (28.46%) | 102 (13.71%) | 75.918 | <.001 |
| | Yes 7790 (71.54%) | 642 (86.29%) | | |
| 10. Isolation from friends/relatives | No 9481 (88.09%) | 537 (72.18%) | 156.39 | <.001 |
| | Yes 1282 (11.91%) | 207 (27.82%) | | |
| 11. Healthcare workers getting infected | No 10356 (96.22%) | 672 (90.32%) | 60.638 | <.001 |
| | Yes 407 (3.78%) | 72 (9.68%) | | |
| 12. Fear of infecting colleagues | No 4832 (44.89%) | 207 (27.82%) | 82.399 | <.001 |
| | Yes 5931 (55.11%) | 537 (72.18%) | | |
| 13. Handling colleagues’ negative emotions | No 7666 (71.23%) | 394 (52.96%) | 110.687 | <.001 |
| | Yes 3097 (28.77%) | 350 (47.04%) | | |
| 14. Being discriminated against as a high-risk spreader | No 9122 (84.75%) | 527 (70.83%) | 99.591 | <.001 |
| | Yes 1641 (15.25%) | 426 (29.17%) | | |
| Perceived stress | Low 8687 (80.71%) | 46 (57.26%) | 232.329 | <.001 |
| | High 2076 (19.29%) | 318 (42.74%) | | |
| Perceived support | 1. Getting adequate support from family | No 463 (4.30%) | 118 (15.86%) | 193.923 | <.001 |
| | Yes 10300 (95.70%) | 626 (84.14%) | | |
| 2. Getting adequate support from colleagues | No 423 (3.93%) | 104 (13.98%) | 160.785 | <.001 |
| | Yes 10340 (96.07%) | 640 (86.02%) | | |

SSI = Suicidal and Self-harm Ideation; % = Percent.

Stelnicki and his colleagues reported the 12-month and lifetime suicidal ideation in nurses was 10.5% and 33%, respectively (Stelnicki et al., 2020). The prevalence of suicidal ideation showed a wide range in the general population or the medical personnel. However, medical professionals hold a higher rate of 12-month and lifetime suicidal ideation than the general population (Kim et al., 2018; Han et al., 2016; Cao et al., 2015; Cano-Langreo et al., 2014).

For the current suicidal ideation during the non-epidemic days, two studies showed that 15.9% of the Chinese clinicians in 6 country hospitals (Nie et al., 2020) and 10.8% of nurses in a province reported suicidal ideation in the last one or two weeks (Wang et al., 2020), which were surprisingly higher than that in this study (6.26% and 6.68%). This finding may be interpreted from several aspects as below. First, hospital staff spent considerable time and energies coping with realistic difficulties, such as patients treatment, personnel shortage, and personal protection. They had no time to “think about death”. Second, they were prone to reflect pressure through emotional and somatic symptoms. The percentage of hospital staff with psychological impact during the pandemic approached 50% with depression, 44.6% with anxiety, 34% with insomnia, and 71.5% with distress, respectively (Lai et al., 2020). Third, our data were collected in the first three to five weeks of the pandemic spreading in China (Dingxiangyuan, 2020). Halford and his colleagues found some suicidality indices have fallen in the United States in the early stage of the COVID-19 pandemic. However, they thought that the COVID-19 pandemic might have caused an increase in suicide risk factors that could yield long-term increases in suicidality and suicide rates (Halford et al., 2020). Forth, hospital staff internalized a robust “ready to devote occupational faith in the non-pandemic days”. Therefore, we predicted that the SSI rate might increase at the end of the pandemic and may not be higher than in non-epidemic days after the active psychological intervention. Our subsequent study may further verify this hypothesis.

Although there is no study focused on SSI in medical professionals during a public health crisis, previous studies found a few common social and psychological factors which indirectly caused SSI. A systematic review found high-risk working environments, job stress, perceived infection risk, social rejection, and poor family relationships were related to anxiety, depression, and posttraumatic stress in healthcare employees during SARS (Brooks et al., 2018). Family members or relatives confirmed or suspected, working in frontline departments, working in Wuhan hospitals were susceptible to more stress, depression, anxiety,
insomnia, and distress during the COVID-19 pandemic (Lai et al., 2020; Luo et al., 2020). Furthermore, a systematic review found age, gender, education, professional experience, work type, or profession were related to adverse outcomes in medical responders during the public health crisis (Naushad et al., 2019). However, it was not found in this study. Unexpectedly, this study found some unique risk factors related to SSI for the first time, including poor self-rated health status, current or previous need for psychological intervention, and necessity of psychological intervention during the pandemic.

One of our findings deserved much attention. Less than 1% out of 11,507 hospital staff had asked for a psychologist or psychiatrist when they felt apparent depression or anxiety. A previous study reported that physicians had a high suicide rate and low suicidal attempts rate (Item et al., 2000). Their role conflict, stigma, and occupational qualification probably blocked them from seeking mental health assistance (Chin et al., 2019). Therefore, a regular mental health screening, training of coping with psychological crisis, various accessible psychological supports, and necessary referral to psychiatric services may help to reduce the SSI or other adverse outcomes among hospital staff and prevent it from evolving into suicidal behavior.

This study had two strengths. First, this is a large-scale study, including 11,507 participants, to detect SSI prevalence among hospital staff. Second, this study, to the best of our knowledge, was the first one so far to investigate SSI and its related factors during a public health crisis. However, there are several limitations. First, this cross-sectional study cannot reveal causality, and voluntary participation may result in selection bias. Second, vertical comparison cannot be conducted for lacking the previous psychological information. Third, most references in this study were on doctors and suicidal ideation because there were limited studies on other medical professionals or self-harm ideation. Fourth, the response rate was uncalculated for unavailable staff numbers in each hospital and voluntary participation. Perhaps those with SSI prefer not to complete surveys so that the percentage may be the minimum SSI prevalence in hospital staff.

5. Conclusions

The prevalence of SSI was 6.47% among hospital staff during the COVID-19 pandemic. Self-rated health status, infection of family members or relatives, poor marital relationships, the current need for psychological intervention, depression, and anxiety were risk factors for SSI. An active systematic psychological intervention should be conducted to reduce the psychological effect and SSI incidence among hospital staff.

### Table 4

Factors associated with SSI in hospital staff (N=11507).

| Variables                                | B     | S.E.  | Walt df | P    | OR    | 95% CI  |
|------------------------------------------|-------|-------|---------|------|-------|---------|
| High stress (Low stress)                 | .352  | .092  | 14.473  | .001 | 1.422 | 1.186   |
| Inadequate support (Adequate support)    | .357  | .082  | 18.916  | .001 | 1.428 | 1.216   |
| The current need for psychological intervention (Not need) | 1.267 | .100  | 159.949 | .001 | 3.549 | 2.917   |
| Probability of infection-No              | 9.822 | 2     | .007    |      |       |         |
| Probability of infection-Low             | -.318 | .164  | 3.751   | .053 | .728  | .528    |
| Probability of infection-High            | -.068 | .172  | 0.158   | .691 | .934  | .667    |
| Self-rated health condition-Well         | 167.242 | 2   | <.001   |      |       |         |
| Self-rated health condition-Normal       | 1.724 | .158  | 119.168 | .001 | 5.699 | 4.116   |
| Self-rated health condition-Poor         | 1.099 | .097  | 129.331 | .001 | 3.002 | 2.484   |
| Marital status-Single                    | 9.833 | 2     | .007    |      |       |         |
| Marital status-Normal relationship       | -.068 | .092  | .549    | .459 | .934  | .779    |
| Marital status-Poor relationship         | .576  | .215  | 7.149   | .008 | 1.779 | 1.166   |
| Family member or relatives infected (Not infected) | 1.164 | .390  | 8.894   | .003 | 3.204 | 1.491   |
| Depression (Normal)                      | .536  | .130  | 16.939  | .001 | 1.709 | 1.324   |
| Anxiety (Normal)                         | .378  | .161  | 5.486   | .019 | 1.459 | 1.064   |

Forward LR binary regressive analysis was conducted. CI = Confidence Interval; SSI = Suicidal and Self-harm Ideation; OR = Odds Ratio; % = Percent; df=degree of freedom; S.E.= Standard Error. The current need for psychological intervention, self-rated health condition, depression, perceived stress, perceived support, family member or relative infected, marital status, probability of infection, and anxiety were included in this model from the first to ninth step successively, adjusting age, work experience, work hours per day, sleep hours per day, and somatic symptom.

### Authors’ statement

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### Declaration of Competing Interest

None

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Supplementary materials

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