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1. Introduction

Coronavirus Disease 2019 (COVID-19), which broke out in Wuhan on December 31, 2019, was an emerging, rapidly developing epidemic and a Public Health Emergency of International Concern (PHEIC) that affected people around the world [1,2]. According to latest investigations, fever, cough and fatigue are the main symptoms of patients with mild COVID-19 while patients with severe COVID-19 might present...
with respiratory distress syndrome, shock and sepsis [3]. Both post-traumatic stress disorder (PTSD) and acute stress disorder (ASD) refer to the stress response that occurs after the person suffered a fatal and catastrophic traumatic event that is beyond the individual’s capacity [4,5]. The understanding about COVID-19 has been insufficient yet, and there is no effective treatment plan for it at this stage as vaccines are still testing or trial phases [1].

Most current practice to address COVID-19, Isolation and addressing symptomatic treatment is the only option at this stage, isolation and treatment measures would lead to a battery of emotional and behavioral reactions. Past evidence suggests that mental disturbance in COVID-19 cases is closely linked to symptoms coming in survivors after large infectious diseases.

Research proved that severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) survivors had a higher prevalence of PTSD [6,7]. Besides this, individuals with PTSD often suffered from depression and anxiety as well [8]. The research found that 59 percent of those who fully met the PTSD diagnosis had anxiety disorder and 34.5 % had depression [9]. According to the investigation results of Ju et, nearly 50 % of COVID-19 patients in isolation ward suffered from ASD, along with anxiety, depression, insomnia and other mental and psychological symptoms [10]. Moreover, a clinical survey of 68 patients with COVID-19 showed that the anxiety score was (60.20 ± 2.04), the incidence rate was 70.6 % (including 32 cases of mild anxiety, 20 cases of moderate anxiety and 3 cases of severe anxiety), the depression score was (64.03 ± 3.21), and the incidence rate was 73.5 % (including 34 cases of mild depression, 15 cases of moderate depression and 1 case of severe depression) among them [11]. Therefore, patients recovering from COVID-19 are more likely to suffer from PTSD, anxiety and depression.

Unfortunately, there are many limitations to treat mental disorders. Serotonin reuptake inhibitors (SSRIs) and Norepinephrine reuptake inhibitors (SNRIs) are commonly used as antidepressants drugs for the treatment of PSTD [12]. However, their clinical application was very limited (more or less 50 %), and this treatment regime comes with possible side physical discomfort, drug side effects and social isolation, COVID-19 infected with SARS and MERS. Therefore, due to the fear of disease, people had been infected [19], i.e. more than the total number of people previously increasing. Until Thursday, May 31, 2020, more than 6.15 million people could even suffer into mental distress [13]. Studies demonstrated that the prevalence of all kinds of mental illness within 30 months after the outbreak of SARS was 33.3 %, and a quarter of the patients had PTSD, while 15.6 % underwent depression disorder [14, 15]. Besides this, a four-year follow-up of 233 SARS survivors showed that more than 40 % claimed to be suffering from mental illness, and 40.3 % reported chronic fatigue problem [16]. In addition to this, many patients and medical workers went through severe emotional stress during the outbreak period of MERS [7]. When the epidemic was controlled, many medical workers and recovered patients would be bothered with anxiety, depression and even PTSD [7]. COVID-19 is a respiratory infection caused by corona virus that similar to SARS and MERS. An investigation on the basic reproduction number of SARS-COV-2 transmission proved that the R0 (2.8, 3.9) of SARS-COV-2 was higher than the R0 (2.2, 3.7) of SARS-COV, but lower than the R0 (2.0, 6.7) of MERS-COV, indicating that SARS-COV-2 was a medium-high infectious disease [17].

On January 30, 2020, the world health organization declared the outbreak of COVID-19 in Wuhan, central China as a Public Health Emergency of International Concern (PHEIC) [18]. So far, there is no treatment of covid-19 available and the number of infections continually increasing. Until Thursday, May 31, 2020, more than 6.15 million people had been infected [19], i.e. more than the total number of people infected with SARS and MERS. Therefore, due to the fear of disease, physical discomfort, drug side effects and social isolation, COVID-19 patients might be suffering from loneliness, anger, anxiety, depression, insomnia and PTSD in the period of treatment and isolation [20].

2. Occurrence possibility of mental disease in COVID-19 survivors

2.1. Sudden epidemic is the cause of mental illness

Based on the researches, all of sudden and life-threatening events, people would experience the corresponding psychological stress reaction and emotions such as anxiety, fear and loneliness. A small number of people could even suffer into mental distress [13]. Studies demonstrated that the prevalence of all kinds of mental illness within 30 months after the outbreak of SARS was 33.3 %, and a quarter of the patients had PTSD, while 15.6 % underwent depression disorder [14, 15]. Moreover, a clinical survey of 68 patients with COVID-19 showed that the anxiety score was (60.20 ± 2.04), the incidence rate was 70.6 % (including 32 cases of mild anxiety, 20 cases of moderate anxiety and 3 cases of severe anxiety), the depression score was (64.03 ± 3.21), and the incidence rate was 73.5 % (including 34 cases of mild depression, 15 cases of moderate depression and 1 case of severe depression) among them [11]. Therefore, patients recovering from COVID-19 are more likely to suffer from PTSD, anxiety and depression.

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In this review, we were trying to find the pathogenic factors of mental disorders in COVID-19 survivors from the perspective of both western medicine and traditional Chinese medicine theory, and trying to put forward the corresponding TCM treatment plan (Fig. 1).

Fig. 1. COVID-19 leads to excessive Yang, internal heat and deficient Yin, which result in the imbalance of Yin and Yang. Then, COVID-19 survivors may suffer from depression, anxiety, insomnia and PTSD. Traditional Chinese medicine can restore the balance of Yin and Yang in human body to treat the mental and psychological symptoms.
proposed that compared with healthy people, COVID-19 patients
disease 2.2. The close relationship between inflammatory cytokines and mental
that patients with COVID-19 showed higher level of depression, anxiety,
recovered patients was 96.2 % [22]. Furthermore, studies demonstrated
prevalence of significant post-traumatic stress symptoms among the
investigation suggested that the medical workers infected with
were increased in patients. That might be related to cytokine storm during the
invasion of virus. Recent clinical studies had been done to [25,26]
summarize the clinical characteristics of COVID-19 patients. It’s also
proposed that compared with healthy people, COVID-19 patients’
lymphocyte count was significantly less. Besides this, their inflamma-
tory factors such as interleukin-1β (IL-1β), interleukin-6 (IL-6),
interleukin-8 (IL-8), interleukin-10 (IL-10) and the tumor necrosis factor
alpha (TNF-α) were markedly high. These levels of cytokines were
sharper in critically ill patients with pneumonia [26]. Therefore,
patients with COVID-19 showed signs of immune dysfunction and elevated
levels of inflammatory cytokines.

Meanwhile, several researches had provided obvious evidences
which indicates that immune system activation, pro-inflammatory cy-
tokines were concern with psychiatric symptoms [27]. Consequently,
patients with COVID-19 could have a higher propensity to be attacked
by mental disorders than normal people. There was evidence to support
the cross-correlation between cytokine levels and depression risk in
many diseases [28]. Along with this, depression may be related to in-
fected diseases which had been supported by the conclusion of rele-
vant studies [29]. In addition, a meta-analysis which brought into 54
studies demonstrated that levels of pro-inflammatory cytokines, espe-
cially IL-1β, IL-6, and TNF-α, were associated with depressive symptoms
[30]. An excessive dose of interleukin-1β had been affirmed to be
associated with neuro-inflammatory degenerative diseases and mental
disorders [31]. Shim et al. stated that lateral ventricular IL-1β could
induce anxiety-like behavior in rats [32]. Moreover, systematic reviews
had also found that higher levels of interleukin 6, interleukin 1 beta, and
TNF-α were interrelated with PTSD [35]. As a result, it is necessary to
pay close attention to their mental health during and after the treatment.

3. The pathogenesis explained by traditional Chinese Medicine
theory

Traditional Chinese medicine doctors named highly infectious and
easily prevalent disease as “Yi disease”, which meant epidemic, and
considered its etiology as “Yi Qi” [34]. Thus, in accordance with TCM
theory, COVID-19 pertained to the category of “Yi disease” [35].
Referring to the theory of TCM, “Yi Qi” entered the human body from
the mouth and nose, while the mouth connected the spleen as well as the
whole digestive system, and the nose linked the lung as well as the total
respiratory system [36]. While, COVID-19 in the infected patients would
first affect the lung and spleen, leading to abnormal function of lung and
spleen, and triggering a series of digestive and respiratory symptoms
[36]. The above statements were consistent with the clinical reports that
patients with COVID-19 had not only respiratory symptoms, but also
metabolic disorder symptoms such as diarrhea and vomiting [37].

The harmonious and consistent unity of body and emotion was the
stand point of TCM. Therefore, the emotions of patient were concerned
with the function of Five Organs (heart, liver, spleen, lungs and kidneys)
[38]. Seven main emotions in TCM (anger, joy, worry, thinking, sadness,
Fear, shock) were regulated by the state of function of the Five Organs,
meaning that the Five Organs control the generation and change of
Seven emotions. When the status of Five Organs changed, the moods
changed accordingly [38]. The lung controlled worry and sadness, while
the spleen controlled thinking [39]. As a result, once lung and spleen
was invaded by “Yi Qi”, the moods controlled by them would also be
abnormal. Then, the patients would be bothered with sadness, or they
could be tired of over thinking. Consequently, there was a tendency that
the COVID-19 survivors suffered from psychological disorders.

Additionally, there was a view in the TCM theory that the diseases
with sign of fever could cause the loss of Yin fluid in human body [34].
Yin fluid referred to body fluid and blood [40]. During the development
of COVID-19, “Yi Qi” could cause internal heat in body resulting in
the symptom of fever that consumed Yin fluid. As a result, the balance of Yin
and Yang was broken and the deficiency of Yin led to the relative excess
of Yang. Yin was supposed to be cold while Yang was considered hot.
Then the relative excess of Yang could make the internal body hotter
than normal, which contributed to the internal heat and Yin deficiency
syndrome.

Recently evidences demonstrated that 81.8 % of the COVID-19 sur-
vivors had been identified by TCM as deficiency of Qi and Yin, the main
symptoms of them were dry mouth, thirsty, palpitation, dry cough
without phlegm, and the symptoms were caused by the internal heat and
Yin deficiency [41]. As long as the internal heat and Yin deficiency
syndrome occurred, the heart would be influenced. In the TCM theory,
the emotions were controlled by the Five Organs and their generations
and changes were decided by heart [38,42]. Internal heat could disrupt
the heart’s dispensing and commanding. Therefore, the patients would
feel more sadness, and over thinking as well as abnormal anxious and
grim [42].

Synopsis of Prescriptions of the Golden Chamber is a classic book of
TCM, which provided a record of “Lily disease” caused by internal heat
and Yin deficiency in heart and lung. The main symptoms were will-
ingness to eat, loss of appetite, daily in a bad mental, less words, fatigue
but unable to sleep, unable to walk. They concluded that a series of
symptoms could appears including psychological abnormalities; pares-
thesia and eating behavior abnormalities [43]. These symptoms were
very similar to those of depression [44].

Another classic book of TCM Typhoid fever theory recorded an opinion
that after fever, internal heat had not been cleaned, which contributed to
“deficient dysphoria disease”, an internal heat disease due to deficiency
of Yin. The symptoms of “deficient dysphoria” such as insomnia, rest-
lessness were consistent with the clinical manifestations of anxiety [45].

“Lily disease” can be characterized by wandering mind and
confusing the illusion and reality, which was similar to PTSD patients’
traumatic memory forced into mind to reproduce the event scene in the
form of flashbacks or nightmares, compelling them repeatedly to expe-
rience the emotion and feeling of that time. On the basis of concept and
clinical manifestations of PTSD, Guo also considered PTSD as a kind of
“Lily disease”, and proposed PTSD of heart-lung Yin deficiency syn-
drome type [46]. Therefore, as explained in TCM, the abnormal func-
tions of the Five Organs and seven emotions caused by “Yi Qi” and
internal heat and Yin deficiency syndrome were the main etiological
factors of mental disorders in patients recovering from COVID-19.

4. Therapeutic methods proposed by traditional Chinese
Medicine theory

4.1. Depression

Classic decoctions of TCM such as Lily Bulb and Rehmanna Decoc-
tion, Lily Bulb and Anemarrhenae Decoction and Gammal Daazo
Decoctions were used to treat the depression (Table 1). Lily Bulb and
Rehmanna Decoction were composed of lily bulb and raw Rehmanna
root juice. It had the functions of nourishing Yin and clearing heat,
tonifying and normalizing heart and lung, and was the first decoction for
Lily disease. Lily Bulb and Rehmanna Decoction could be applied to the
treatment of depression induced by various etiologies [47]. Change the
composition of Lily Bulb and Rehmanna Decoction and add Anemarrhena asphodeloides Bge, then Lily Bulb and Rehmanna Decoction became Lily Bulb and Rhizoma Anemarrhena Decoction. Anemarrhena was cold in TCM theory, and it would turn the efficacy of decoction colder [48]. By adding Anemarrhena asphodeloides Bge., the heat-cleaning function of the decoction could be strengthened, making it more suitable for those who were already diagnosed as internal heat and Yin deficiency syndrome with more heat.

Ganmai Dazao Decoction was indicated for “Hysteria disease”, whose symptoms were sadness, crying, mood disorders, and abnormal behavior, which were very similar to the symptoms of depression. Ganmai Dazao Decoction was composed of Liquorice Root Radix Glycyrrhizae (licorice), Triticum aestivum L. (Float wheat fruit), Jujubae Fructus (jujube), which was a decoction aiming at nourishing Yin of heart and calming mind [49]. Lily Bulb and Rehmanna Decoction, commonly used in modern clinical practice for a long time in combination with modern medical drugs, had achieved considerable results in the treatment of depression caused by multiple causes [50]. Guo et al. had observed the curative effect of Lily Bulb and Rehmanna Decoction combined with Flupentixol and Melitracen Tablets in the treatment of menopausal depression and found that the total clinical effective rate of the combined group was significantly higher than that of the single group [51].

Furthermore, Lily Bulb and Rehmanna Decoction was able to alleviate the symptoms of depression patients with Yin deficiency and internal heat syndrome remarkably and long-term administration was not harmful [52]. In addition, the investigation used Lily Bulb and Rehmanna Decoction combined with fluoxetine for 6 weeks, confirmed that it was able to reduce the anxiety somatization factor and sleep factor, and the efficacy was more obvious than other modern depression intervention medicine [53]. Yan et al. adopted Ganmai Dazao Decoction combined with Lily Bulb and Rhizoma Anemarrhena Decoction to treat depression. Compared with conventional modern medicine, the decoctions were safer and the incidence of adverse reactions was less [54]. Liu et al. took use of Ganmai Dazao Decoction combined with Lily Bulb and Rhizoma Anemarrhena Decoction in the treatment of depression, which effectively alleviated the depression symptoms of patients and improve the sleep status [55]. The research indicated that modified Ganmai Dazao Decoction had clinical efficacy and safety in the treatment of perimenopausal patients with initial severe depression, which mechanism may be related to the regulation of monoamines and amino acid neurotransmitters, the regulation of immune inflammation, and the reduction of the level of inflammatory factors [56].

In addition to this, some animal experiments had been carried out to explore the antidepressant pharmacological mechanism of above decoctions. After Lily Bulb and Rehmanna Decoction intervention, the content of monoamine such as neurotransmitters norepinephrine (NE), 5-hydroxytryptamine (5-HT) and dopamine (DA) were greatly increased in the hippocampus of CUMS rats, and the activity of monoamine oxidase was significantly reduced [57]. Bi et al. treated depressed rats with Ganmai Dazao Decoction, and the results showed that it could significantly improve the depressed behavioral characteristics of rats, and significantly increase the activity and content of neurotransmitters 5-HT and NE in the brain of rats [58]. Study confirmed that Ganmai Dazao Decoction could significantly improve the depression-like behavior of CUMS rats by regulating HPA axis elevation and protecting hippocampus injury [59]. The intervention of Lily Bulb and Rehmanna Decoction combined with Ganmai Dazao Decoction could also increase the content of monoamine neurotransmitters in the brain of depression animal model [60]. Besides this, research proposed that Lily Bulb and Rhizoma Anemarrhena Decoction could alleviate the loss of pleasure and despair in depressed rats, and promote the remodeling of neurons. The mechanism behind this was related to inhibiting the hyperfunction of HPA axis and up-regulating the expression of BDNF mRNA in hippocampus of depressed rats [61]. Previous evidence showed that antidepressant mechanism of Lily Bulb and Rhizoma Anemarrhena Decoction was also related to up-regulation of monoamine transmitters in serum and cerebral cortex [62].

Furthermore, there are some experiments about active compounds of these decoctions. Evidence from Guo et al. confirmed that lily saponins, as the main component of Lilii Bulbus, could relieve depression symptoms, whose effect might be related to the increased level of monoamine neurotransmitters in brain and the hyperfunction inhibition of HPA axis [63]. Research suggested that lily saponins treated depression with irritable bowel syndrome by synergistically regulating the content of brain-gut peptide and the function of 5-HT nervous system in blood, stomach and intestine [47]. Further, in the alcohol extract of Rehmannia glutinosa Linosch is one of the main effective components with higher content of it. Study proved that catalpol had more remarkable antidepressant effect by involving monoamine nervous system than other ingredients in Rehmannia glutinosa Linosch [64]. Moreover, research that Licorice flavonoids could shorten the immobility time of forced swimming test (FST) and tail suspension test (TST) in mice, antagonize the blepharoptosis induced by reserpine in mice and increase the number of autonomous activities in mice. By decreasing the expression of Caspase-3 protein in hippocampus of depressed rats to reduce the apoptosis of nerve cells in depressed mice, it could play an antidepressant role [65]. Moreover, Gong et al. suggested that Timosaponin in Anemarrhena asphodeloides Bge. reduced the contents of TNF-α, IL-1β and IL-6 in mouse brain tissue for anti-inflammatory treatment of depression [66].

Therefore, these three TCM decoctions can be applied to the treatment of depression.

### 4.2. Anxiety

Suanzaoren Decoction, Huang lian E jiao Decoction, Zhizi Chi Decoction, were used for anxiety of internal heat and Yin deficiency

| Decoctions | Components | TCM efficacy |
|-----------|------------|--------------|
| Suanzaoren Decoction | Ziapihus spinosa Hu (Ziapihui Spinoae Semen), Liquorice Root Radix Glycyrrhizae (licorice), Anemarrhena asphodeloides Bge (Rhzoma Anemarrhena), Poria cocos (Schw.) Wolf. (Poria), Gardeniae Fructus (cape jasmine) | nourishing Yin and blood promoting sleep |
| Huanglian E jiao Decoction | Coptidis Rhizoma (coptis), Scutellariae Radix (scutellaria), Paoniae Radix Alba (paonia), Perillae Fructus (Perilla frutescens) | nourishing Yin and heart, reducing heat and calming the mind |
| Zhizi Chi Decoction | Saffron, Lily Bulbus (Lilium), Safflower, Gardeniae Fructus (cape jasmine), Sojae Semen Praeparatum (fermented soya beans) | nourishing Yin and reducing intrathoracic heat |
Complementarily, mixed anxiety-depression disorder (MAD) was also a common comorbid psychiatric disorder that frequently-observed with PTSD [83]. Thus, COVID-19 survivors may suffer from MAD. The above three kinds of decoctions have been proved to be effective in treating depression [84].

In conclusion COVID-19 survivors with anxiety could be treated with the above three decoctions, and patients with insomnia and MAD could also take the decoctions.

4.3. Post-traumatic stress disorder

Lily Bulb and Rehmannia Decoction and Guilu Erxian Decoction were the decoctions for PTSD of internal heat and Yin deficiency syndrome (Table 3). Most of the researches on the treatment of PTSD with Chinese herbal medicine were done on animal but the less clinical studies were reported. Research suggested that patients with PTSD of Yin deficiency of heart and lung Syndrome were suitable to be treated with Lily Bulb and Rehmannia Decoction. As they showed lung dryness symptoms such as lung heat cough, which are also a common symptom in the convalescence of COVID-19. It was suggested to add Tubers Radix Ophiopogonis (ophiopogon japonicas), Liquorice Root Radix Glycerrhizae (licorice) in the decoction [46]. Meanwhile, if patients had insomnia, they can add Ziziphus spinosa Hu and Radix Pseudostellariae (Heterophyllus Falsesaratwor Root) [46]. Furthermore, the investigation confirmed that Lily Bulb and Rehmannia Decoction could up regulate 5-HT level in hippocampus and deal with the symptoms of PTSD [85]. The results demonstrated that Lily Bulb and Rehmannia Decoction down regulated the expression of glucocorticoid receptor (GR) in hippocampus, up regulated the expression of glucocorticoid receptor (MR), and improve the symptoms of PTSD in rats [86].

Guilu Erxian Decoction was composed of antler gum, tortoise plate gum, ginseng and wolfberry fruit which nourished Yin. Li et al. demonstrated that Guilu Erxian Decoction may play an anti-PTSD role by regulating synaptic plasticity, anti-apoptosis, anti-inflammation and promoting fear memory extinction through network pharmacology [87]. Moreover, researches had confirmed that the therapeutic mechanism of was to regulating the function of the HPA axis, the expression of GR and 5-HT receptors in the hippocampus to improve the emotional and behavioral abnormalities in PTSD rats [88,89]. Besides this, study confirmed that Lycium barbarum polysaccharide in Guilu Erxian Decoction can reduce the level of cortisol in serum to improve the symptoms of PTSD [90]. Previous evidence showed that ginsenoside Rg2 can regulate the function of HPA axis to treat PTSD [91]. Consequently, PTSD patients could be treated with the two decoctions.

5. Conclusion

From the perspective of modern medicine, survivors of SARS, MERS and other severe and major infectious diseases were more likely to suffer from mental illness. Clinical investigation about the mental health status of patients and survivors of COVID-19 also indicated that COVID-19 was accompanied by higher possibility of psychological disorder such as depression, anxiety and PTSD. Disturbance of immune cytokines in patients with COVID-19 was also an inducing factor of mental diseases.

Table 3

| Ingredients of commonly used TCM decoctions for the treatment of PTSD. |
|-----------------------------|-----------------------------|-----------------------------|
|              | Decoctions | Components | TCM efficacy  |
| Lily Bulb and | Lilii Bulbus (lily bulb) and | Rehmannia | nourishing Yin |
| Rehmannia | Rehmannia glutinosa Linoch | juice | and clearing heat |
| Decoction    | juice       | (raw Rehmannia root | |
| Guilu Erxian | Colla Corii Cervi (antler glue), Tortoise | juice | nourishing kidney |
| Decoction    | Shell Caroax et Plastrum Testudinis (Tortoise-plastron glue), Root Radix | Ginseng (Ginseng), Fructus Lycii | Yin |
|              | (Chinese Wolfberry fruit) | (Chinese Wolfberry fruit) | |

syndrome (Table 2). They were recorded in Typhoid fever theory, and were classic decoctions for “deficient dysphoria” and insomnia. Suanzaoren Decoction was composed of the Ziziphus spinosa Hu (Ziziphi Spinosisae Semen), Liquorice Root Radix Glycyrrhizae (licorice), Anemarrhena asphodeloides Bge. (Rhizoma Anemarrhena), Poria cocos (Schw.) Wolf. (tuckahoe) and Chuxiong Rhizoma (rhizome of Chuanxiong), which nourished Yin and blood, and helped to promote sleep. Coptidis Rhizoma (coptis), Scutellariae radix (scutellaria), Paeoniae Radix Alba (paeonia), Colla Corii Asini (donkey-hide gelatin) and fresh egg yolk constituted the Huang lian E jiao Decoction, which nourished yin and heart, reduced heat and calmed the mind. Zhizi Chi Decoction nourished yin and reduced intrathoracic heat especially.

Meng et al. [67] randomly divided 90 patients with generalized anxiety disorder into the observation group and the control group with 45 cases each, the observation group was treated with modified Suanzaoren Decoction, and the positive control group was treated with estazolam, the results proved that the total effective rates of the observation group and the control group were 91.11 % and 75.56 % respectively, suggesting that modified Suanzaoren Decoction was more appropriate than modern medicine in the treatment of generalized anxiety disorder. Zhang et al. [68] analyzed the clinical effect of modified Suanzaoren Decoction on cancer patients who met the CCMD-3 anxiety disorder into the observation group and the control group with 45 cases each, the observation group was treated with modified Suanzaoren Decoction, and the total effective rate was 96 % [72]. Liu et al. reported 50 cases of anxiety treated with Zhizi Chi Decoction, and the total effective rate was 96 % [72].

In addition, study confirmed that Suanzaoren Decoction combined with Zhizi Chi Decoction was more effective than diazepam in the treatment of anxiety disorder, and the relapse rate after cessation of the medication was lower [73]. Liu et al. applied Suanzaoren Decoction combined with Zhizi Chi Decoction to the treatment of 60 cases of anxiety insomnia, and consequently the symptoms of anxiety and insomnia were significantly improved [74].

Meanwhile, there are some reports about the therapeutic mechanism and effective compounds of the above decoction. Researches considered that the anti-anxiety effects of Suanzaoren Decoction and Huanglian E jiao Decoction were both related to the increase of γ-GABA level [75, 76]. Besides, Suanzaoren Decoction also decreased the release of NE in hippocampus and inhibited the synthesis of 5-HT [76]. Sanjoinine A isolated from Zizyphi Spinosisae Semen had been proved to be concerned the GABAergic transmission [77]. Polysaccharides and flavonoids which had certain synergistic effect on anti-anxiety in Ziziphus spinosa Hu, Anemarrhena asphodeloides Bge. and Poria cocos (Schw.) were also important compounds in Suanzaoren Decoction [78]. In addition, study confirmed that berberine which was the main component of Coptidis Rhizoma in Huanglian E jiao Decoction could regulate the expression of monoamine neurotransmitters and their metabolites and 5-HT receptors to resist anxiety [79]. Baicalin and wogonin isolated from Scutellariae radix both perform anti-anxiety effects mediated by γ-GABA [80,81]. Moreover, A research mentioned that geniposides, as the main component of Gardeniae Fructus water extract, was one of the anti-anxiety components of Gardeniae Fructus [82].
In regards to TCM, COVID-19 survivors are in a state of internal heat and Yin deficiency during recovery period, which leads to the abnormality of seven emotions. Therefore, the COVID-19 survivors have the tendency to develop mental disorder. “Lily disease”, “hysteria” and “deficient dysphoria” are Yin deficiency and internal mental diseases recorded in ancient Chinese medicine books. Their symptoms are very similar to those of depression, anxiety and post-traumatic stress disorder. Western medicine has many side effects and high recurrence rate in the treatment of mental diseases.

Thus, the use of traditional Chinese medicine such as “Lily disease”, “Hysteria disease” and “Deficient dysphoria disease” could be a better treatment plan option for survivors of COVID-19 suffering from mental diseases. Lily Bulb and Rehnmannia Decoction, Lily Bulb and Anemarhena Decoction and Gannai Dazao Decoction were used to treat the depression after the recovery of COVID-19. Suazaoren Decoction, Huang lien E jiao Decoction, Zhizhi Chi Decoction, was suggested for anxiety. Moreover, Lily Bulb and Rehnmannia Decoction and Guili Erxian Decoction were the decoctions for PTSD.

**Author’s contributions**

ZB and KM to the concept of this study, XX, WX, SF, HZ, YL and XL contributed to literature review and data analyses, XX, HZ, AR, YW, SWG and XZ contributed to draw diagram. KM and ZB draft and finalize the manuscript. All authors have read and approved the final version of the manuscript.

**Declaration of Competing Interest**

All authors declare no competing interest. All funding source just support in conduct of experiments. We strictly disclosed that all funders had no role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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