

# Development and challenges of mental health in China

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**To cite:** Que J, Lu L, Shi L. Development and challenges of mental health in China. *General Psychiatry* 2019;**32**:e100053. doi:10.1136/gpsych-2019-100053

Received 18 January 2019  
Accepted 20 January 2019

With the socioeconomic development and the acceleration of the ageing process of the population, the incidence rates of mental disorders and psycho-behavioural problems have become higher and higher worldwide. So far, the disease burden caused by mental disorders has ranked second in the world.<sup>1</sup> In China, the disease burden caused by mental disorders accounts for 13% of all non-communicable diseases burden.<sup>2</sup> Hence, mental health has become a major public health problem and social problem. In order to promote mental health, the Chinese government has promulgated a series of policies and regulations, as well as reform measures. Moreover, the upcoming 'China Brain Project' will also focus on some mental disorders such as autism, depression and dementia to improve mental health research in China.

## CURRENT STATUS OF MENTAL HEALTH IN CHINA

### Mental health services

#### High prevalence of mental disorders and low consultation rate

The epidemiological survey conducted in four provinces in China showed that the prevalence of mental disorders among adults in China was 17.5%, in which the prevalence of mood disorders (mainly depression), anxiety disorders and substance use disorders were 6.1%, 5.6% and 5.9%, respectively.<sup>3</sup> According to the WHO report, the recognition rate of global mental disorders is around 50%, and the recognition rate in China is far below the world average. Taking depression as an example, the recognition rate of depression was only 21% in Shanghai, China. In addition, the rate of diagnosis and treatment of mental disorders is also relatively low, with an average of only around 150 people per 100 000 people receiving treatment for serious mental disorders. The treatment rate for serious mental disorders in high-income countries is about 17 times that of low-income countries.<sup>4</sup>

#### High proportion of refractory mental disorders and poor medications response

The effectiveness of medications treating mental disorders varies among patients.

For example, when one patient with schizophrenia treated with aripiprazole gains improvement, about four patients cannot benefit from the same medication. When duloxetine is effective in treating one patient with depression, it is instead ineffective for the other eight patients.<sup>5</sup> For the sake of improving the precision of mental illness diagnosis and the effectiveness of various treatments, the US National Institute of Mental Health proposed the Research Domain Criteria programme in 2008.<sup>6</sup>

#### Insufficient and unevenly distributed mental health resources

In China, there is insufficient mental health resources and service capacity: (1) financial investment—the per capita investment from the Chinese government for psychiatric hospitals is about US\$1.07,<sup>7</sup> which is far lower than US\$35.06 in high-income countries during the same period<sup>8</sup>; (2) hospital beds—the number of psychiatric beds in China per 10 000 population is 3.15,<sup>9</sup> which is far lower than the 7.13 beds in high-income countries<sup>8</sup>; (3) professionals—in China for every 100 000 population, there are 2.19 psychiatric physicians (including assistant practitioners) and 5.51 registered nurses,<sup>9</sup> whereas in high-income countries, there are 13.06 psychiatrists and 23.49 registered nurses per every 100 000 people.<sup>8</sup> At the same time, we are facing problems such as having difficulties in bringing in mental health field talents and lacking vocational rehabilitation technicians. Moreover, the distribution of China's mental health resources is unbalanced, with the most hospitals and professionals concentrated in provincial capitals and developed eastern regions. It is indicated that 47.21% of institutions, 42.06% of psychiatric beds, 48.65% of physicians and 45.25% of nurses are located in 11 eastern provinces. Moreover, mental health personnel in grassroots medical institutions has insufficient service capacity, and most of the personnel are part-time.



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## Progress in mental disorder research

### Autism spectrum disorder

Autism spectrum disorder is a kind of neurodevelopmental disorders characterised by trouble with social interaction, impaired communication, restricted interest and repetitive behaviour. The aetiology and pathogenesis are still unclear while generally thought that autism spectrum disorder is closely related to genetic factors. Liu et al. from the Chinese Academy of Sciences found that *MECP2* transgenic monkeys showed repetitive behaviours and social interaction impairments<sup>10</sup> and established the world's first non-human primate model of autism which is significant for exploring pathogenesis and possible interventions for autism. The research team from Central South University discovered the autism susceptibility genes through genome-wide association study,<sup>11</sup> molecular inversion probes,<sup>12</sup> and targeted sequencing and functional analysis<sup>13</sup> which provides the possibility of early diagnosis and treatment of autism.

### Major depressive disorder

Depression is one of the most common mental disorders, and it has placed a heavy burden on the society and families. However, its pathogenesis is yet completely clear. Cai et al. found two loci that contribute to the risk of major depressive disorder on chromosome 10: one near the *SIRT1* gene, the other in an intron of the *LHPP* gene using low-coverage whole-genome sequencing of 5303 Chinese women with recurrent major depressive disorder.<sup>14</sup> Besides, Researchers from Zhejiang University proposed a new rapid antidepressant mechanism of ketamine which showed that blockade of NMDAR-dependent bursting activity in the lateral habenula relieved the inhibition of the reward.<sup>15</sup> Based on this finding, they also pointed out that astroglial potassium channel 4.1 (Kir4.1) could also exert rapid antidepressant effects.<sup>16</sup> In addition, our team found that depression promoted the coupling of death-associated protein kinase 1 (DAPK1) with the glutamate receptor subunit NR2B in the prefrontal cortex, and we proposed a new hypothesis that the interaction of extracellular DAPK1 with the NMDAR GluN2B mediated rapid effects of antidepressant.<sup>17</sup> Meanwhile, we also found that depression would lead to down-regulation of the protein kinase PKM $\zeta$  signalling pathway in the prefrontal cortex, and activation of this signalling pathway could produce antidepressant effects.<sup>18</sup> These studies have promoted the understanding of the pathogenesis of depression and provided a number of new molecular targets for the development of new antidepressants.

### Alzheimer's disease

With the acceleration of population ageing process, the number of patients with Alzheimer's Disease (AD) has risen sharply which makes it as the brain disease with the fastest-growing disease burden. Researchers from the Army Medical University found that peritoneal dialysis could effectively remove amyloid beta (A $\beta$ ) from the blood and might also decrease brain A $\beta$  deposition to improve cognition.<sup>19</sup> Meanwhile, they also innovatively used transgenic AD mice in parallel with their wild-type littermates to connect the two

blood circulations. The study showed that A $\beta$  derived from transgenic mice could induce AD pathological changes through the blood into the brain of normal mice and could cause functional deficits of neurons,<sup>20</sup> indicating the important role of A $\beta$  in the development of AD. In addition, we did a meta-analysis which found that there was a high risk of incident all-cause dementia in individuals with sleep disturbances,<sup>21</sup> and this might be probably caused by inadequate brain cleansing of neurotoxic waste products during sleep.<sup>22</sup> The finding provides a theoretical basis for understanding the pathogenesis of AD and contributes to the early prevention of the disease.

### Pathological emotional memory related diseases

Learning and memory are essential for the survival of an individual, but pathological emotional memory can lead to a series of mental disorders such as drug addiction, post-traumatic stress disorder, anxiety disorders and so forth. However, there is still no effective interventions for treating pathological emotional memory related disorders. Our research team innovatively proposed that the 'conditioned stimulus memory retrieval-extinction' procedure could erase drug memory, that is, extinction during the time window of reconsolidation after retrieval of a contextual cue could erase the cue-associated drug memory, and attenuate drug-seeking behaviour to eliminate pathological addictive memory.<sup>23</sup> On this basis, we also proposed the 'unconditioned stimulus memory retrieval-extinction' strategy to effectively interrupt the pathological memories related to all cues.<sup>24-26</sup> Importantly, we successfully achieved clinical transformation of this theory, for example, applying propranolol to interfere unconditioned stimulus-induced memory reconsolidation process could decrease nicotine craving in smokers.<sup>27</sup> Furthermore, in the awake state, when treating pathological emotional memory-related diseases, patients needed to repeatedly re-experience traumatic events which was not conducive to treatment compliance. To overcome this drawback, we found that conditioned stimulus re-exposure during slow wave sleep promoted fear memory extinction without altering sleep profiles which may be a new way to eliminate negative emotional memory without pain.<sup>28</sup> This series of original work overcomes the limitations of existing treatments and is a breakthrough in the field of pathological emotional memory related diseases treatment.

### Sleep disorders

Sleep is critical for growth and development; however, the mechanism underlying sleep is still unknown. Ren et al. from the Army Medical University found that the paraventricular thalamus was the key nucleus to regulate the sleep and wakefulness process, and suppression of the paraventricular thalamus neuronal activity caused a reduction in wakefulness, whereas activation of paraventricular thalamus neurons induced a rapid transition from sleep to wakefulness.<sup>29</sup> Moreover, recent studies indicated that sleep was close to mental health. Our meta-analysis research found that the prevalences of sleep disorders and depressive disorders were higher in the community of the elderly population

(≥60 years), and the comorbidities of sleep disturbances and depression were common.<sup>30</sup> With regard to its possible mechanism, the research team from Fudan University<sup>31</sup> discovered that lateral orbitofrontal cortex, dorsal prefrontal cortex, cingulate cortices and insula were potential neural basis for the association between depression and poor sleep quality. In future, more studies are needed to reveal the reason between sleep disorders and other disease.

### Prospects of mental health in China

Currently, under the concept of the biological-psychology-sociological medicine pattern, mental health has attracted more attention, and its service in China has been greatly expanded to include not only the severe mental disorders, such as schizophrenia and bipolar disorder, but also depression, anxiety, maladaptation, and other mental and psychological problems. Moreover, the transformation of the disease philosophy, the innovation of basic medical theory and the rapid advancement of new technology will bring milestones development to psychiatry medicine. In 2013, the implementation of the Mental Health Law in China made the clinical research and medical services for mental disorders law-abiding and rule-based. In 2014, China established the National Clinical Research Center for Mental Disorders which raised the mental and psychological development to the national strategic level for the first time. In addition, 'Healthy China 2030 Planning Outline', '13th Five-Year Hygiene and Health Plan', 'China's Long-Term Plan for Prevention and Treatment of Chronic Diseases 2017–2025' and 'National Mental Health Work Plan 2015–2020' are announced gradually. These announcements have indicated the urgent need for strengthening mental health research, service and management in China and put forth new requirements for the future development of psychiatry.

### Depth exploration of the pathogenesis in mental disorders

With rapid development of neuroscience technology and the innovation of methodology in recent years, the combined application of imaging technologies, molecular biology, and information science and engineering will deeply explain the pathogenesis of mental disorders at different levels. The rapid development of genetic techniques such as high-throughput sequencing enables us to detect new susceptibility genes associated with mental disorders; neuronal circuit manipulation techniques such as optogenetics, chemical inheritance and tracing of neural loops, as well as rapid imaging techniques and analytical methods development are helpful to make the mechanisms of mental disorders clear from neuronal circuits to brain regions. Animal models of mental disorders such as non-human primates and induced pluripotent stem cells provide the possibility for explaining the pathogenesis of mental disorders deeply.

### Achieving early diagnosis and treatment of mental disorders

The cause of mental disorders is complex, and the course of disease is protracted. In the future, efforts should be made to develop new technologies that can be used for early prevention, early identification and early intervention, thereby

effectively reducing the incidence, progression and relapse of mental disorders. First, we should promote the integration of multidisciplinary, such as neurology, sleep medicine, immunology and psychiatry. And on the basis of biological big data and artificial intelligence, a large cohort should be established to construct an integrated intelligent system for mental disorder screening, diagnosis, treatment and rehabilitation. Second, the interaction of genetic and environmental risk factors in the development of mental disorders should be explored to identify high-risk groups for precise prevention and reduce the occurrence of the diseases by controlling risk factors. Third, current classification diagnosis of mental disorders mainly depends on the symptoms and signs of patients and lacks objective indicators that can be used for early screening of high-risk groups with high reliability and validity. In the future, biological indicators will be intended for redefining and classifying mental disorders to provide personalised treatment options for patients. Fourth, with the deepening of research, more targets related to mental disorders have been discovered. In future, the new-generation psychiatric medications with quick onset, good efficacy and few side effects should be developed. In addition, it is necessary to apply non-medication interventions such as physical therapy and psychotherapy to treat mental disorders.

### Building a sound mental health service system

At present, the construction of mental health service system in China is relatively lagging. Community-based rehabilitation system is an important part of the mental health service system. Making up the insufficiency in mental health rehabilitation system is important to prevent disability and poverty caused by mental disorders and promote the re-entry of patients to the society. Also, private mental hospitals have arbitrary charges, false medical advertisements and unqualified medical personnel problems. It is beneficial to standardise the development of private hospitals. In addition, the mental health service system still has problems such as inadequate healthcare network, ignoring the importance of disease prevention, and lacking sound regulations and policy support for mental health work. Therefore, relevant policies and regulations should be made to promote the changes in mental health service, establish a mental health alliance and provide the best quality services for people with mental disorders.

Overall, the medical health system reform in China has entered a critical period, and there are challenges and opportunities for us to develop mental health. Regarding the increasing burden of mental disorders, shortage of mental health resources and the numerous predicaments faced by present condition of mental disorder prevention and treatment, our country should increase investment in the field of mental health, raise public awareness of mental health through education, build mental health rehabilitation system in the whole country and improve the accessibility of mental health services. Clinical workers and researchers should cooperate with each other to strengthen the understanding of the pathogenesis of mental disorders

and improve the level of medical services. Only in this way can bring the mental health achieve faster and better development, and the physical and mental health of people and the harmony and stability of society can be effectively guaranteed.

**Contributors** LL proposed the topic and main idea, JQ wrote the draft of the manuscript, LL and LS commented on and revised the manuscript. All authors contributed to and have approved the final manuscript.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient consent for publication** Not required.

**Provenance and peer review** Not commissioned; internally peer reviewed.

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