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REVIEW ARTICLE

Treatment Rate for Major Depressive Disorder in China: a Meta-Analysis of Epidemiological Studies

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Abstract

Major depressive disorder (MDD) is a common psychiatric disorder in China, but its reported treatment rate varies largely across different studies. The objective of this meta-analysis was to determine the pooled treatment rate for people with MDD in China and its associated factors. Both English (PubMed, Cochrane Library, PsycINFO, Web of Science) and Chinese (Chinese National Knowledge Infrastructure, WanFang and SinoMed) databases were searched from their commencement date to November 13, 2018. Epidemiological studies that reported the treatment rate of MDD were included and synthesized using a random effects model. Fifteen studies covering 609,054 participants were included. The pooled treatment rate for MDD in China was 19.5% (95% CI: 10.7%–28.4%). Among the 15 studies, 9 reported the number of patients who received treatments in psychiatric hospitals with a pooled treatment rate of 5.2% (95% CI: 2.8%–7.5%). Meta-regression found that study quality ($\beta = 0.131$, $P = 0.028$) and male gender ($\beta = 0.006$, $P = 0.039$) were significantly associated with a higher treatment rate for MDD. In China, the treatment rate for MDD, particularly in psychiatric hospitals, was low. Effective public education and increasing access to mental health services will probably increase the number of people seeking and receiving treatment.

Keywords Major depressive disorder · Treatment rate · Meta-analysis · China

Introduction

Major depressive disorder (MDD) is a severe psychiatric disorder. The point prevalence of MDD is around 4.7% globally with regional differences [1, 2]. Increasing

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evidence suggests that the variation in its epidemiology, clinical presentation, and treatment is significantly influenced by sociocultural and economic factors [3–5]. For this reason, it is important to refine prevalence rates at the country level and understand the associated factors.

During the past decades, the rapid economic development in China has led to fundamental shifts in its sociocultural context. In particular, emerging social problems such as the collapse of traditional family structure, increasing divorce rate, rising medical costs, migration to cities for employment, and a rapidly widening poverty gap [6] have increased the risk for psychiatric disorders, particularly MDD [7]. A meta-analysis of 17 studies found that the lifetime prevalence of MDD in China was 3.3% [8].

MDD is associated with great personal and family suffering, disability, poor daily functioning, huge treatment burden, insomnia [9–11], an increased risk of suicide, major physical diseases [12, 13] and other psychiatric disorders [14]. Therefore, treating MDD promptly with pharmacological and/or psychological treatments could lead to a better prognosis [15]. From a public health standpoint, it is important to investigate the treatment rate of MDD in order to improve its outcomes. Some studies have been conducted and found that undertreatment of major psychiatric disorders including MDD is common globally. For example, the past-year treatment rate of psychiatric disorders including MDD varied from 7.0% to 20.3% across countries [16, 17]. In the United States, less than 30% of adults who were positively screened for depression received any treatment [18]. In China, estimates of treatment rates for MDD varied greatly. A multicenter survey of 10 areas found that over 60% of MDD patients ever received psychosocial therapy or pharmacotherapy [19]. However, other studies reported discordant treatment rates of 4% (elderly patients in Wuhan) [20] and 24% (primary care patients in Hong Kong) [21]. The treatment rate and help-seeking behaviors of people with MDD may depend on a number of factors, such as health policies [22], basic demographic factors [23], illness phases [17] and mental health resources [24]. In addition, the presence of comorbid somatic symptoms [25] and sleep problems [26] are also related to help-seeking behaviors. To date, no meta-analysis or systematic review on treatment rate for MDD in China has been published.

This meta-analysis aimed to examine the treatment rate for MDD and its associated factors based on epidemiological surveys in the general population in China.

Methods

The protocol of this meta-analysis was registered with the registration number: PROSPERO CRD42019122127. This meta-analysis was conducted according to the Preferred Reporting Items for Systematic Review and Meta-analysis [27].

Study Criteria

Studies that satisfied the following inclusion criteria were analyzed: 1) cross-sectional epidemiological surveys on the prevalence of MDD in adult general populations; 2) studies conducted in China; 3) having data of treatment rate for identified MDD patients. Studies in special populations, such as those with major medical conditions, were excluded.

Literature Search

Two researchers (HQ and QQZ) independently searched PubMed, Cochrane Library, PsycINFO, Web of Science, Chinese National Knowledge Infrastructure, WanFang and SinoMed databases from their inception date to November 13, 2018, using the following search words: (major depressi* OR depressi*) AND (epidemiology OR prevalence) AND (China OR Chinese) AND (treat* OR Therapeutics). Two researchers (HQ and QQZ) independently screened titles and abstracts, and then read the full texts of potentially eligible studies. The reference list of included studies and relevant reviews were also screened and checked for potential studies to include. Any disagreements in the literature search were resolved by consensus or a discussion with a senior researcher (YTX). If multiple papers were published based on the same dataset, only the study with the largest sample size was included.

Data Extraction and Quality Assessment

Data extraction was independently performed by two researchers (HQ and QQZ) with the aid of an Excel spreadsheet. The first author, publication year, survey year, geographic areas, sampling method, sample size, gender distribution, age, education, marital status, proportion of rural participants, number of patients with MDD, and number of patients seeking help from medical services due to MDD were recorded. Study quality was independently assessed by the same two researchers using an 8-item quality evaluation instrument for epidemiological studies [28–30]. The assessment instrument consists of the following items: definition and representativeness of the target population, sampling methods, response rate $\geq 80\%$, description of non-responders, data collection methods, validation of MDD assessment instruments, confidence intervals, and subgroup analyses of MDD prevalence. The total score was generated by summing all items, with higher scores indicating higher quality. This instrument has previously been used in other meta-analyses [31, 32].

Statistical Analyses

Stata version 15.0 and Comprehensive Meta-analysis version 2.0 were used to conduct the meta-analysis. Treatment rates and 95% Confidence Intervals (CIs) were calculated with a random-effects model [33]. Heterogeneity across studies was measured using I^2-statistic and Cochran's Q test; I^2 statistic of >50% or Cochran's $Q < 0.1$ ($P < 0.05$) [34] were indicative of significant heterogeneity. Subgroup analyses for categorical variables, such as geographic area (eastern, middle, western and nationwide) [35], sample size (using median splitting method), response rate (using median splitting method), education (using median splitting method), proportion of married status (using median splitting method) and rural participants (using median splitting method), and meta-regression analyses for continuous variables, such as proportion of male gender, and study quality, were conducted to examine the moderating variables of the results. Publication bias was tested by means of the funnel plot and Egger's test [36]. To estimate the consistency of the results, sensitivity analysis was conducted by removing studies individually. The significance level was set at a two-sided alpha of 0.05.

Results

Study Selection and Characteristics and Study Quality

Altogether, 7211 studies were identified through database search. After applying inclusion criteria, 15 studies covering 609,054 participants were included. Details are shown in Fig. 1. Table 1 summarizes study characteristics. Eight studies were conducted in the eastern, three in the middle, and two in western areas of China. In addition, there were two studies that were nationwide in scope. All were cross-sectional studies and used a multi-stage, stratified, random sampling survey design. The screening scales used in the first stage of the surveys included the revised edition of the General Health Questionnaire (GHQ-12) in four studies, the Patient Health Questionnaire-9 (PHQ-9) in one study, and the Center for Epidemiology Studies of Depression (CES-D) in another. In addition, the Composite International Diagnostic Interview (CIDI) was used in three studies and the Structured Clinical Interview for DSM-IV (SCID) was used in six studies for the diagnosis of MDD. The mean quality assessment score was 7, with a range of 5 to 8.

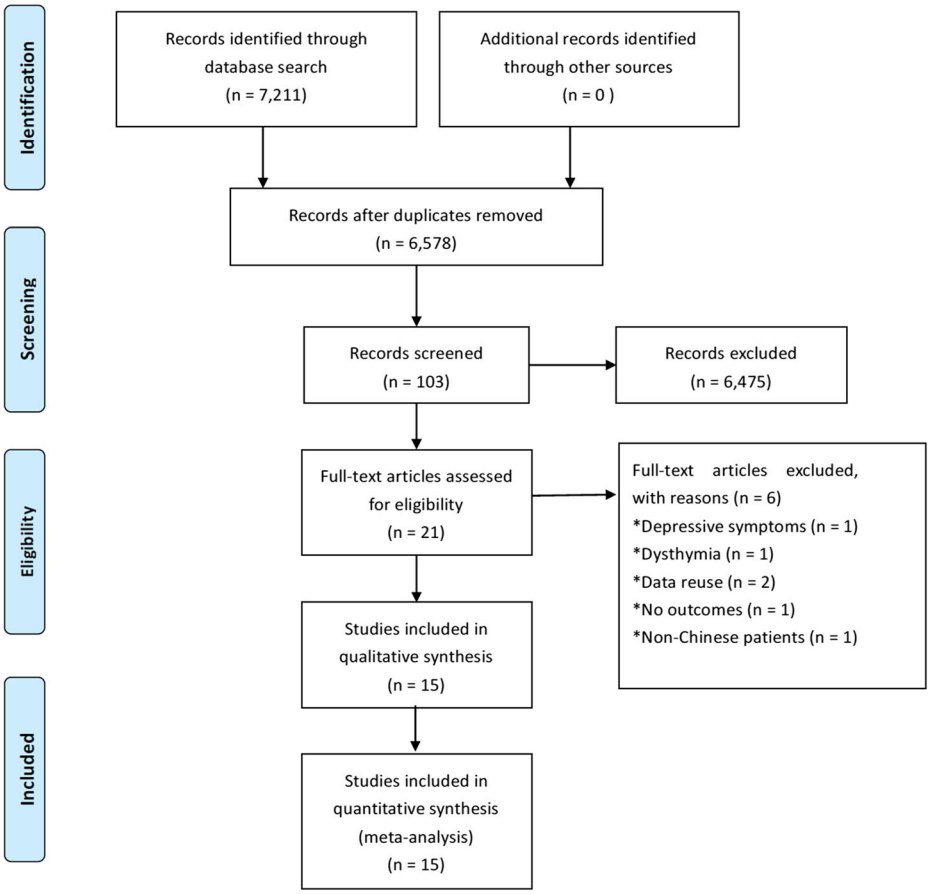

Fig. 1 Flow chart of study selection

Table 1 Characteristics of the studies included in the meta-analysis

No.	First author (Publication Year)	Study Site	Survey Year	Response rate (%)	Sample Size	Age (Years), Mean	Male (%)	Rural (%)	Married (%)	Junior middle school and above (%)	MDD n (%)	Seek for medical help; n(%)	Quality score	References
1	Jie (2017)	Gansu	2014	99.4	2416	70.3	51.8	84.3	71.6	NR	93 (3.9)	15 (16.1)	7	[37]
2	Liu (2017)	Wuhan	2014	78.6	1572	70.5	49.5	49.3	83.5	30.0	102 (6.5)	4 (3.9)	7	[20]
3	Guo (2017)	Gansu, Qinghai	2011	89.0	7602	57.6	47.4	30.8	81.9	61.2	1265 (16.7)	182 (14.4)	8	[26]
4	Ou (2016)	Guangdong	NR	NR	2400	NR	49.5	57.9	NR	49.6	113 (4.7)	73 (64.6)	6	[38]
5	Gupta (2016)	Nationwide	2012	NR	19,994	NR	NR	NR	NR	NR	1170 (5.9)	97 (8.3)	6	[39]
6	Yu (2015)	Nationwide	2004	NR	512,891	51.5	41.0	NR	NR	NR	3281 (0.6)	1561 (47.6)	6	[19]
7	Peng (2013)	Heilongjiang	NR	85.0	10,165	32.6	50.7	NR	70.6	72.7	208 (2.1)	36 (17.3)	8	[40]
8	Ye (2013)	Zhejiang	2010	86.5	1937	69.6	41.8	76.4	72.5	43.4	88 (4.5)	2 (2.3)	7	[41]
9	Sun (2011)	Shanghai	2010	92.0	3311	73.6	32.5	33.3	69.3	47.2	118 (3.6)	5 (4.2)	8	[42]
10	Duan (2010)	Shenzhen	2005	80.0	7134	32.5	50.7	NR	59.7	NR	553 (7.8)	54 (9.8)	8	[43]
11	Gui (2010)	Hu'nan	2007	69.3	7347	49.7	45.7	100	84.1	37.4	140 (1.9)	19 (13.6)	7	[44]
12	Ma (2009)	Beijing	2003	76.3	4767	NR	45.9	44.7	78.1	82.6	253 (5.3)	84 (33.2)	7	[45]
13	Lee (2009)	Beijing, Shanghai	2001	74.7	5201	NR	48.7	NR	NR	NR	94 (1.8)	21 (22.7)	5	[46]
14	Ma (2008)	Beijing	2003	96.2	1601	NR	46.7	30.2	70.7	36.8	127 (7.9)	32 (25.2)	7	[47]
15	Cui (2008)	Hebei	2004	86.3	20,716	44.0	49.9	87.1	NR	NR	608 (2.9)	76 (13.0)	7	[48]

NR, not report. MDD, Major depressive Disorder

Treatment Rate of MDD

The pooled treatment rate of MDD was 19.5% (95% CI: 10.7%–28.4%, $I^2 = 99.2\%$; Fig. 2). Of the 15 studies, 9 reported treatment rates in psychiatric hospitals; the pooled treatment rate was 5.2% (95% CI: 2.8%–7.5%, $I^2 = 88.2\%$; Fig. 3). Four studies reported data regarding the use of antidepressants, with a pooled figure of 6.9% (95% CI: 3.3%–10.5%, $Q = 53.11$, $I^2 = 94.4\%$).

Subgroup and Meta-Regression Analyses

Subgroup analyses revealed that the treatment rate of MDD was highest in eastern areas (21.2%, 95% CI: 12.4%–29.9%), followed by western (14.5%, 95% CI: 12.6%–16.4%) and middle areas of China (11.4%, 95% CI: 2.8%–20.1%). Compared to those younger than 60 years (24.2%, 95% CI: 12.9%–35.5%), depressed patients ≥60 years had a lower treatment rate across medical services (9.5%, 95% CI: 3.2%–15.7%). However, the differences across the abovementioned subgroups did not reach significance ($P > 0.05$; Table 2). Meta-regression analyses revealed that study quality ($\beta = 0.131$, $t = 4.02$, $P = 0.028$) and male gender ($\beta = 0.006$, $t = 3.51$, $P = 0.039$) were positively and significantly associated with higher treatment rate for MDD.

Publication Bias and Sensitivity Analysis

Although the funnel plot showed slight asymmetry (Supplementary Fig. 1), Egger's test did not support publication bias ($t = -0.16$, $P = 0.872$). Sensitivity analysis did not

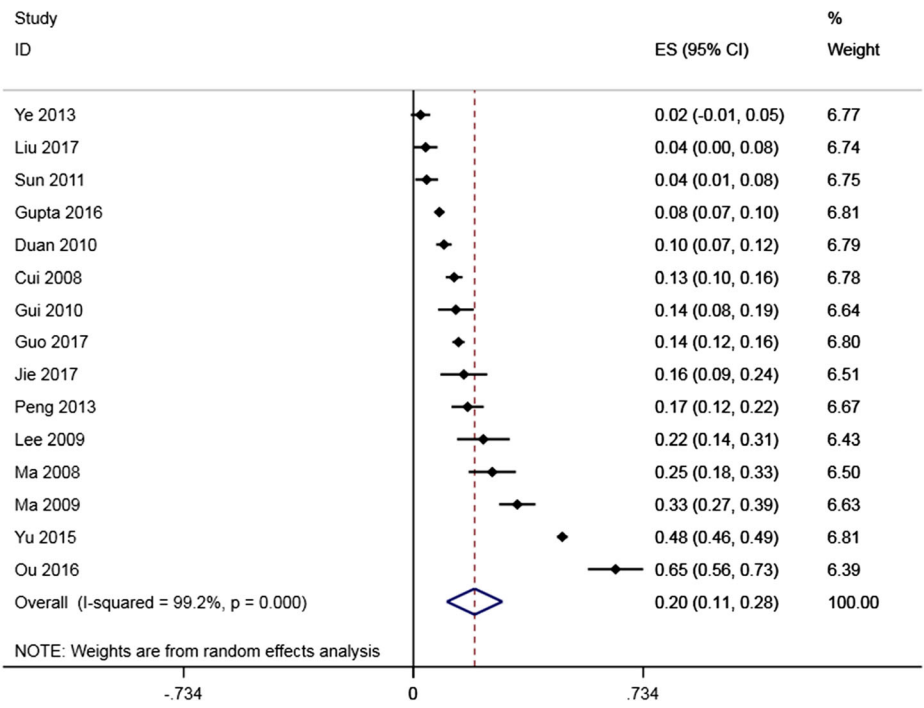

Fig. 2 Forest plot of pooled treatment rate of MDD in China

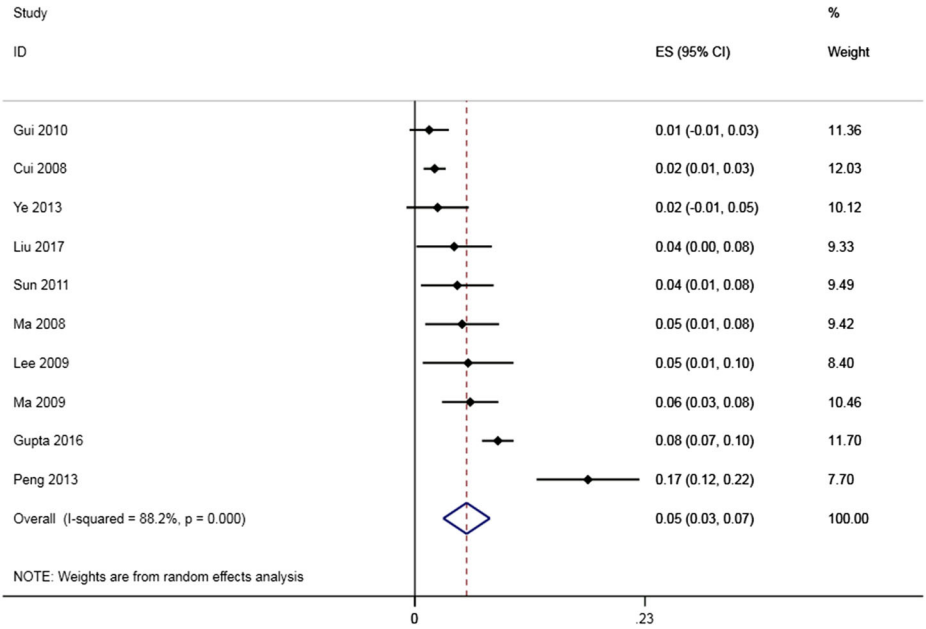

Fig. 3 Forest plot of pooled treatment rate of MDD in psychiatric hospitals in China

reveal any outlying study that could significantly change the primary results (Supplementary Fig. 2).

Discussion

To the best of our knowledge, this was the first meta-analysis to examine the pooled treatment rate of MDD patients based on epidemiological studies in China. We found that the pooled treatment rate for MDD was 19.5% (95% CI: 10.7%–28.4%) and only 5.2% (95% CI: 2.8%–7.5%) of MDD patients received treatment in psychiatric hospitals.

The pooled treatment rate in this study (19.5%; 95% CI: 10.7%–28.4%) was higher than the reported proportion for patients with mood disorders (8.3%) in a multicenter survey [49], and also the figure (11%) for patients with psychiatric disorders in the WHO world mental health survey of China [50]. The relatively higher treatment rate in this study could be due to several reasons. First, compared to other severe psychiatric disorders, MDD is associated with less stigma and discrimination in China; therefore MDD patients could be more likely to seek and receive treatment. Second, in the past years a greater number of mental health professionals have been trained and mental health services have been expanded. For example, there were only 16,103 psychiatrists and psychiatric registrars (1.24 per 100,000 population), and 557 psychiatric hospitals with 129,314 psychiatric beds (9.95 per 100,000) in 2004. By 2015 there were 27,733 psychiatrists and psychiatric registrars (2.02 per 100,000 population), and 2936 mental

Table 2 Subgroup analysis of treatment rate of MDD in China

Subgroup	Categories (Number of Studies)	Prevalence of MDD (%)	95% Confidence Interval (%) [Lower, Upper]	Sample size	Events	I^2 (%)	*P within subgroup*	*Q (P across subgroups)*
Areas	Eastern (8)	21.2	[12.4, 29.9]	47,067	350	97.3	<0.001	1.117 (0.773)
	Middle (3)	11.4	[2.8, 20.1]	19,084	59	89.6	<0.001	
	Western (2)	14.5	[12.6, 16.4]	10,018	197	0.0	0.658	
	Nationwide (2)	27.9	[10.6, 66.4]	532,885	1658	99.9	<0.001	
Older adults (<60 years)	No (10)	24.2	[12.9, 35.5]	598,217	2206	99.4	<0.001	3.344 (0.067)
	Yes (5)	9.5	[3.2, 15.7]	10,873	58	89.8	<0.001	
Sample size #	<5201 (7)	21.0	[8.6, 33.3]	18.004	215	97.8	<0.001	0.016 (0.898)
	≥5201 (8)	18.3	[5.9, 30.6]	591,050	2049	99.5	<0.001	
Response rate (%)#	<85.7 (6)	16.4	[8.8, 23.9]	36,186	218	93.9	<0.001	2.205 (0.332)
	≥85.7 (6)	11.9	[6.6, 17.3]	37,583	315	93.1	<0.001	
Study duration (months) #	<4.5 (6)	19.2	[13.2, 25.2]	33,652	392	92.3	<0.001	1.531 (0.465)
	≥4.5 (6)	14.5	[−4.8, 33.9]	542,843	1666	99.6	<0.001	
Married (%)#	<72.0 (6)	13.7	[8.6, 18.9]	31,974	161	86.2	<0.001	2.914 (0.233)
	≥72.0 (4)	13.2	[3.2, 23.2]	15,878	272	97.3	<0.001	
Junior middle school and above (%)#	<42.7 (4)	10.6	[2.4, 18.8]	12,457	57	92.9	<0.001	2.394 (0.302)
	≥42.7 (5)	26.2	[13.2, 39.1]	28,245	380	97.9	<0.001	
Living rural areas (%)#	<53.6 (5)	15.8	[7.1, 24.5]	18,853	307	96.1	<0.001	0.251 (0.882)
	≥53.6 (5)	21.4	[8.0, 34.7]	34,816	188	97.7	<0.001	

$P < 0.05$ was considered statistically significant. #: using median splitting method

health services with approximately 433,000 psychiatric beds (31.5 per 100,000) [51] nationwide, which increases the access to mental health services for patients with psychiatric disorders including MDD. Third, the first National Mental Health Law of China [52] promoted the expansion of mental health services provided by general hospitals and community health centers. Numerous physicians in general hospitals and general practitioners in community health centers have received training in psychiatry to provide mental health services. This is consistent with our finding that most MDD patients sought help outside of psychiatric hospitals.

Treatment rate and help-seeking behaviors of MDD patients are associated with social-economic and cultural factors, health policy, available mental health services, psychiatric stigma, discrimination, and health insurance coverage [53, 54], all of which could help explain the relatively lower MDD treatment rate in China compared to counterparts in developed countries and territories. For example, the treatment rate of depression in older people was 81.4% in the USA [55] and the figure in adult patients with MDD was 53.7% in Hong Kong [56]. In China, due to stigma and discrimination many depressed patients are less likely to disclose their symptoms to interviewers, which leads to an underestimated MDD prevalence. For instance, Gupta et al. [39] found that only 8.3% of MDD respondents were diagnosed by psychiatrists in China, while the corresponding figure was 48.8% in the US (48.8%) [57]. In traditional Chinese society, even though many patients are aware of psychiatric symptoms, they are more likely to consider self-medication and seek help from their friends and relatives instead of mental health professionals due to stigma and discrimination.

Meta-regression analyses revealed that male patients with MDD were more likely to receive treatment, which is opposite to the findings in Western countries that both the prevalence and treatment rate of MDD are significantly higher in women than in men [58, 59]. In Chinese society, men are expected to provide economically for their family, while women are mainly responsible for housework. Depressive episodes may negatively affect the ability of males to work and fulfill their financial obligations. Therefore, they may be more likely seek help from health professionals. In contrast, poor performance on housework in women with MDD could be tolerated in many Chinese families [60]. The association of the higher treatment rate with higher quality studies might be due to the greater ability of higher quality studies to detect MDD.

The strengths of this meta-analysis included a large sample size and inclusion of epidemiological studies with strong study designs which could increase the generalizability of the findings. However, some limitations need to be acknowledged. First, like previous studies [61–64], heterogeneity was high although we performed subgroup analyses in an attempt to overcome it. Second, special populations, such as depressed pregnant women and children and adolescents, were not included in this study. Third, some factors related to antidepressant treatment, such as income, access to mental health services and health insurance, were not analyzed due to insufficient data in included studies.

In summary, this meta-analysis found that the treatment rate for MDD in China was low, especially for women. Considering the negative impact of MDD on health and daily life, public education regarding the importance of treatment and greater access to mental health services should be promoted. Since most people with MDD were treated outside of psychiatric hospitals, providing continuing mental health training to clinicians in general hospitals and community medical centers is recommended.

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Compliance with Ethical Standards

Conflict of Interest The authors have no conflicts of interest concerning this article.

Human and Animal Rights All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent NA.

References

1. Ferrari A, Somerville A, Baxter A, et al. Global variation in the prevalence and incidence of major depressive disorder: a systematic review of the epidemiological literature. Psychol Med. 2013;43(3):471–81.
2. Steel Z, Marnane C, Iranpour C, et al. The global prevalence of common mental disorders: a systematic review and meta-analysis 1980-2013. Int J Epidemiol. 2014;43(2):476–93.
3. Kleinman A. Culture and depression. N Engl J Med. 2004;351(10):951–3.
4. Compton WM, Conway KP, Stinson FS, et al. Changes in the prevalence of major depression and comorbid substance use disorders in the United States between 1991-1992 and 2001-2002. Am J Psychiatry. 2006;163(12):2141–7.
5. Zhong XM, Dong M, Wang F, et al. Physical comorbidities in older adults receiving antidepressants in Asia. Psychogeriatrics : the official journal of the Japanese Psychogeriatric Society. 2018;18(5):351–6.
6. Phillips MR, Liu H, Zhang Y. Suicide and social change in China. Cult Med Psychiatry. 1999;23(1):25–50.
7. Lee S, Tsang A, Zhang MY, et al. Lifetime prevalence and inter-cohort variation in DSM-IV disorders in metropolitan China. Psychol Med. 2007;37(1):61–71.
8. Gu L, Xie J, Long J, et al. Epidemiology of major depressive disorder in mainland China: a systematic review. PLoS One. 2013;8(6):e65356.
9. Fröjd SA, Nissinen ES, Pelkonen MU, et al. Depression and school performance in middle adolescent boys and girls. J Adolesc. 2008;31(4):485–98.
10. Buysse DJ, Angst J, Gamma A, et al. Prevalence, course, and comorbidity of insomnia and depression in young adults. Sleep. 2008;31(4):473–80.
11. Lynch FL, Clarke GN. Estimating the economic burden of depression in children and adolescents. Am J Prev Med. 2006;31(6):143–51.
12. Penninx BW. Depression and cardiovascular disease: Epidemiological evidence on their linking mechanisms. Neurosci Biobehav Rev. 2017;74(Pt B):277–86.
13. Kendler KS, Gardner CO, Fiske A, et al. Major depression and coronary artery disease in the Swedish twin registry: phenotypic, genetic, and environmental sources of comorbidity. Arch Gen Psychiatry. 2009;66(8):857–63.
14. Cassano GB, Rucci P, Frank E, et al. The mood spectrum in unipolar and bipolar disorder: arguments for a unitary approach. Am J Psychiatry. 2004;161(7):1264–9.
15. Karyotaki E, Smit Y, Holdt Henningsen K, et al. Combining pharmacotherapy and psychotherapy or monotherapy for major depression? A meta-analysis on the long-term effects. J Affect Disord. 2016;194:144–52.
16. Bijl RV, de Graaf R, Hiripi E, et al. The prevalence of treated and untreated mental disorders in five countries. Health affairs (Project Hope). 2003;22(3):122–33.
17. Demyttenaere K, Bruffaerts R, Posada-Villa J, et al. Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization world mental health surveys. JAMA. 2004;291(21):2581–90.

18. Olfson M, Blanco C, Marcus SC. Treatment of adult depression in the United States. JAMA Intern Med. 2016;176(10):1482–91.
19. Yu C, Lyu J, Chen Y, et al. Epidemiology of major depressive episodes among Chinese adults aged 30–79 years: data from the China Kadoorie Biobank (in Chinese). ZHLXBXZZ. 2015;36(1):52–6.
20. Liu XJ, Zhou Y, Dong L, et al. A survey of major depression among elderly population in Wuhan (in Chinese). Chin Ment Health J. 2017;11:851–6.
21. Chin WY, Chan KT, Lam CL, et al. Help-seeking intentions and subsequent 12-month mental health service use in Chinese primary care patients with depressive symptoms. BMJ Open. 2015;5(1):e006730.
22. Liang D, Mays VM, Hwang WC. Integrated mental health services in China: challenges and planning for the future. Health Policy Plan. 2018;33(1):107–22.
23. Desai HD, Jann MW. Major depression in women: a review of the literature. J Am Pharm Assoc (Wash). 2000;40(4):525–37.
24. Chen Y, Bennett D, Clarke R, et al. Patterns and correlates of major depression in Chinese adults: a cross-sectional study of 0.5 million men and women. Psychol Med. 2017;47(5):958–70.
25. Shidhaye R, Mendenhall E, Sumathipala K, et al. Association of somatoform disorders with anxiety and depression in women in low and middle income countries: a systematic review. Int Rev Psychiatry. 2013;25(1):65–76.
26. Guo J, Liu C, Wang X, et al. Relationships between depression, pain and sleep quality with doctor visits among community-based adults in north-West China. Public Health. 2017;147:30–8.
27. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Open Med. 2009;3(3):e123–30.
28. Boyle MH. Guidelines for evaluating prevalence studies. Evid Based Ment Health. 1998;1(2):37–9.
29. Pringsheim T, Jette N, Frolkis A, et al. The prevalence of Parkinson's disease: a systematic review and meta-analysis. Mov Disord. 2014;29(13):1583–90.
30. Loney PL, Chambers LW, Bennett KJ, et al. Critical appraisal of the health research literature: prevalence or incidence of a health problem. Chronic Dis Can. 1998;19(4):170–6.
31. Ibrahim AK, Kelly SJ, Adams CE, et al. A systematic review of studies of depression prevalence in university students. J Psychiatr Res. 2013;47(3):391–400.
32. Parker G, Beresford B, Clarke S, et al. Technical report for SCIE research review on the prevalence and incidence of parental mental health problems and the detection, screening and reporting of parental mental health problems. University of York: Social Policy Research Unit; 2008.
33. Higgins JP, Thompson SG, Deeks JJ, et al. Measuring inconsistency in meta-analyses. BMJ. 2003;327(7414):557–60.
34. Rotenstein LS, Ramos MA, Torre M, et al. Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: a systematic review and meta-analysis. Jama. 2016;316(21):2214–36.
35. Zhang ZZ. Evolution and Evaluation of the Chinese Economic Regions Division(in Chinese). Journal of Shanxi University of Finance and Economics(Higher Education Edition). 2010;13(02):89–92.
36. Egger M, Davey Smith G, Schneider M, et al. Bias in meta-analysis detected by a simple, graphical test. BMJ. 1997;315(7109):629–34.
37. Jie R, Wang GP, Ding ZJ, et al. Investigation of major depression disorder in the people over 60 years old in Tianshui (in Chinese). Int J Geriatr. 2017;38(6):259–62.
38. Ou QM, Deng SL, Zhai WG. Epidemiological investigation and efficacy analysis of the influencing factors of depression in Huizhou, Guangdong province in 2015 (in Chinese). Modern Diagnosis and Treatment. 2016;11:2066–8.
39. Gupta S, Goren A, Dong P, et al. Prevalence, awareness, and burden of major depressive disorder in urban China. Expert Rev Pharmacoecon Outcomes Res. 2016;16(3):393–407.
40. Peng J, Sun D, Song Y. Investigation on the treatment rates of depression in Mudanjiang city. China Journal of Modern Medicine (in Chinese). 2013;23(5):108–10.
41. Ye MJ, Zhong SZ, Lin CY, et al. Prevalence, influencing factors and help-seeking style of depression among elderly population in Wenzhou area (in Chinese). Chin J Public Health. 2013;29(01):8–11.
42. Sun XR, Qu ZF, Jiang Q, et al. Investigation the epidemiology of senile depression in community of Pudong New Area, Shanghai (in Chinese). Medical Journal of Chinese People's Health. 2011;23(9): 1078–1080,1119.
43. Duan WD, Liu TB, Hu CY, et al. Cross-sectional survey of depressive disorder in Shenzhen City in 2005 (in Chinese). Chinese Journal of Psychiatry. 2010;43(4):211–6.
44. Gui LH, *Epidemiology Study on Depression among Rural Residents in Liuyang (in Chinese)*. 2010, Central South University.

45. Ma X, Xiang YT, Cai ZJ, et al. Prevalence and socio-demographic correlates of major depressive episode in rural and urban areas of Beijing. China Journal of Affective Disorders. 2009;115(3):323–30.
46. Lee S, Tsang A, Huang YQ, et al. The epidemiology of depression in metropolitan China. Psychol Med. 2009;39(5):735–47.
47. Ma X, Xiang YT, Li SR, et al. Prevalence and sociodemographic correlates of depression in an elderly population living with family members in Beijing, China. Psychol Med. 2008;38(12):1723–30.
48. Cui LJ, Su KQ, Jiang QP, et al. The prevalence of major depression disorders in Hebei Province from 2004 to 2005 (in Chinese). Chinese Journal of Psychiatry. 2007;40(03):140–3.
49. Phillips MR, Zhang J, Shi Q, et al. Prevalence, treatment, and associated disability of mental disorders in four provinces in China during 2001–05: an epidemiological survey. Lancet (London, England). 2009;373(9680):2041–53.
50. Wang PS, Aguilar-Gaxiola S, Alonso J, et al. Use of mental health services for anxiety, mood, and substance disorders in 17 countries in the WHO world mental health surveys. Lancet (London, England). 2007;370(9590):841–50.
51. Xiang YT, Ng CH, Yu X, et al. Rethinking progress and challenges of mental health care in China. World Psychiatry. 2018;17(2):231–2.
52. Xiang YT, Yu X, Ungvari GS, et al. China's National Mental Health law: a 26-year work in progress. Lancet. 2012;379(9818):780–2.
53. Phillips MR. Can China's new mental health law substantially reduce the burden of illness attributable to mental disorders? Lancet (London, England). 2013;381(9882):1964–6.
54. Tsang HW, Angell B, Corrigan PW, et al. A cross-cultural study of employers' concerns about hiring people with psychotic disorder: implications for recovery. Soc Psychiatry Psychiatr Epidemiol. 2007;42(9):723–33.
55. Cole MG, Yaffe MJ. Pathway to psychiatric care of the elderly with depression. Int J Geriatr Psychiatry. 1996;11(2):157–61.
56. Lee S, Tsang A, Kwok K. Twelve-month prevalence, correlates, and treatment preference of adults with DSM-IV major depressive episode in Hong Kong. J Affect Disord. 2007;98(1–2):129–36.
57. Kessler RC, Birnbaum HG, Shahly V, et al. Age differences in the prevalence and co-morbidity of DSM-IV major depressive episodes: results from the WHO world mental health survey initiative. Depress Anxiety. 2010;27(4):351–64.
58. Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). Jama. 2003;289(23):3095–105.
59. Pedrelli P, Borsari B, Lipson SK, et al. Gender differences in the relationships among major depressive disorder, heavy alcohol use, and mental health treatment engagement among college students. J Stud Alcohol Drugs. 2016;77(4):620–8.
60. Chen F. A modern interpretation of "the domestic wife and social husband". Journal of Yuxi Teachers College. 2003;12:18–21.
61. Winsper C, Ganapathy R, Marwaha S, et al. A systematic review and meta-regression analysis of aggression during the first episode of psychosis. Acta Psychiatr Scand. 2013;128(6):413–21.
62. Long J, Huang G, Liang W, et al. The prevalence of schizophrenia in mainland China: evidence from epidemiological surveys. Acta Psychiatr Scand. 2014;130(4):244–56.
63. Li Y, Cao XL, Zhong BL, et al. Smoking in male patients with schizophrenia in China: a meta-analysis. Drug Alcohol Depend. 2016;162:146–53.
64. Mata DA, Ramos MA, Bansal N, et al. Prevalence of depression and depressive symptoms among resident physicians: a systematic review and meta-analysis. JAMA. 2015;314(22):2373–83.

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