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# Prevalence of depressive disorders and associated demographic characteristics in Shandong: an epidemiological investigation

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**Funding source**:

1. Shandong Province Science and Technology Development Fund (2014GSF118002)

2. Shandong Medical and Health Science and Technology Development Grant (2015WS0254)

**Declarations of interest:** None

**Abstract**

**Background:** Depression ischaracterized by debilitating symptoms and high recurrence rates, and there are relatively few large-scale epidemiological surveys of depressive disorders conducted in Shandong since 2005. Data from the largest Epidemiological Survey of Mental Disorders conducted in 2015 in Shandong were collected to investigate the prevalence of depressive disorders and associated demographic characteristics in general adult population. **Methods:** Amulti-stage stratified cluster sampling method was adopted to select residents and a two-stage screening and assessment process was used to define the prevalence and characteristics of depressive disorders. Respondents were initially screened using the General Health Questionnaire followed by a structured clinical interview using the DSM-IV criteria. **Results:**  Among 27,489 respondents who completed the survey, 1,277 respondents met the diagnostic criteria for depressive disorders. The adjusted prevalence in the last month was 4.86%, among which the prevalence of major depressive disorder, dysthymia, and unspecified depressive disorder were 2.32%, 1.78%, and 0.75%, respectively. 40.35% of depression patients had moderate or severe functional impairment and only 10.65% of patients had visited a psychiatric service. Univariate and multivariate analyses revealed that age, gender, occupation, education, marital status, and urban/rural living were associated with the prevalence. **Limitations:** The key limitation is that this is a cross-sectional survey therefore cannot draw any causal relationship between risk factors and disease progression. **Conclusions:** Findings from this largest epidemiological study reveal current prevalence of depressive disorders and associated demographic factors and offers opportunities for policy makers and health-care professionals to improve mental health provision in Shandong.

**Keywords:** Prevalence, Depression, Depressive disorders, Demographic characteristics, Social function

**1. Introduction**

Depressive disorders are one of the most common mental illnesses, and currently over 300 million people worldwide are suffering from depression, accounting for about 4.4% of the world's total population. According to the latest statistical report from the World Health Organization (WHO), the global prevalence of depressive disorders increased by 18% during the decade of 2005-2015 [[[1]](#endnote-1)]. Contributing factors are bio-psycho-social and include rapid economic change as well as the experience of increased work-life stress that parallels a decade long intensification of activities in the workplace. Also reported by WHO [[[2]](#endnote-2)], the disability rate of depressive disorders is higher than that of physical diseases in both developed and developing countries, and often patients with depressive disorders are often under-treated. Because of its high recurrence rate [[[3]](#endnote-3)] and high disability rate [[[4]](#endnote-4)], depressive disorders have risen to the third place in the global burden of disease, resulting in an economic cost of more than one trillion dollars [ 1].

At present, there is wide variation in the global reports on the prevalence of depressive disorders. The findings from the work conducted by the International Consortium of Psychiatric Epidemiology (ICPE) across 10 countries[[[5]](#endnote-5)] showed that the lifetime prevalence of depressive disorders ranged from 3% in Japan to 16.9% in the United States, and the monthly prevalence ranged from 0.9% in Japan to 4.6% in the United States. Another study found [[[6]](#endnote-6)] that the prevalence of depressive disorders was related to the level of economic development of the country, with annual prevalence rates ranging from 8.1% in low- and middle-income countries to 29.3% in high-income countries, and that both personal and environmental factors contributing to the disease development and progression. In China, the prevalence of depressive disorders has increased in recent years due to the rapid development in economy, the accelerated pace of people's life, and the change in the traditional family structure of "one child". A national cross-sectional epidemiological survey conducted in 2012 by Huang et al. [[[7]](#endnote-7)] showed that the lifetime prevalence of depressive disorders was 6.9%, with the lifetime prevalence of major depressive disorder, dysthymia and unspecified depressive disorder being 3.9%, 1.5% and 2.9%, respectively. In order to understand the deferent landscape in the prevalence of depressive disorders in different countries and regions, to improve the rational allocation of medical resources to reduce the prevalence and disease burden, it is important to collect country and regional specific epidemiological data.

Shandong Province, located on the eastern coast of China, is a province with a large population, and strong economic and agricultural development. In order to understand the prevalence of mental disorders in the province, and to improve the utilization of mental health service and resources, four provincial large scale epidemiological surveys were conducted in 1984, 1994, 2004 and 2015, which provide reliable data and evidence for government policy making in Shandong. The data presented in this study were obtained from the latest and largest epidemiological survey conducted in 2015. This survey covered a wider range of regions than previous surveys and recruited the largest number of respondents. The aim of this study was to evaluate the prevalence of depressive disorders in Shandong, and to explore associated demographic characteristics, social functioning, and the use of psychiatric services.

**2. Methods**

**2.1 Study population**

Shandong Province has a total of 16 [cities](https://baike.baidu.com/item/%E5%9C%B0%E7%BA%A7%E5%B8%82/2089621) and a land area of 155,800 square kilometers. There are around 101.53 million people currently living in Shandong which makes it the second most densely populated province in China. Its gross domestic product (GDP) ranked third in the country [[[8]](#endnote-8)]. The population selected for this study were residents (18 years above) who had lived continuously for 6 months or more within the 16 cities in Shandong. The sample size required for this survey was calculated based on the latest data in schizophrenia, which has a relatively low prevalence rate [7], the prevalence of schizophrenia in China is approximately *p* = 0.006 with an allowable error δ = 0.001, setting the first type of error α = 0.05, and according to the sample size formula, the sample size required for the survey was 22,911. To account for a dropout rate of 20%, the sample size required for this survey was set at 28,000.

**2.2 Sampling method**

A multi-stage stratified cluster sampling method was adopted, with sampling carried out at three levels: county, town, and village. According to the proportion of the resident population in Shandong, 34 streets and 62 towns from 21 districts and 28 counties within 16 cities were randomly selected, 1 village or neighbourhood committee was randomly selected from each street or town, 300 households were randomly selected from each village or neighbourhood committee, and 1 resident aged 18 or above was randomly selected from each household as the survey subject. Because the population of a few villages was less than 300 households, the actual total sampling population consisted of 27,917 study subjects. The identification number for each respondent consists of seven digits, with the first four digits being the location number and the last three digits being the study number.

**2.3 Survey instruments**

We used a two-stage screening and assessment process to define the prevalence and characteristics of depressive disorders.

*Screening tools (stage 1)*: The general health questionnaire (GHQ-12) [[[9]](#endnote-9)-,[[10]](#endnote-10), [[11]](#endnote-11)] and related questions were used to screen the population for mental disorders. Each of the 12 items was scored, with a score of 1 for "worse than usual" or "much worse" and a score of 0 for the other two items. Those who met one of the following conditions were considered to be at high risk: (1) total GHQ-12 score ≥1; (2) presence of other risk factors as described in the GHQ-related questions, including: inability to complete the screening due to physical or mental illness, or hospitalization for physical illness in the past year.

*Diagnostic tools(stage 2)*: The American Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) [[[12]](#endnote-12)] of the Axis I Disorders with Clinical Stereotype Examination (Structured Clinical Interview for DIS-IV, SCID-I/P) [ [[13]](#endnote-13),[[14]](#endnote-14) ] was used for diagnostic interview. Social functioning status was assessed using the Global Assessment Function (GAF) scale for DSM-IV Axis V. Those who met the Axis I diagnosis of depressive disorders with a score ≤60 was defined as having moderate or severe functional impairment [ [[15]](#endnote-15)].

**2.4 Site survey**

The field survey was conducted from November 2015 to April 2016, and the research team consisted of medical and nursing staff from psychiatric hospitals or psychiatric departments of general hospitals across 16 cities in Shandong. Surveys were conducted by face-to-face interviews during home visit including registration of household information followed by random sampling to identify survey respondents. Face-to-face interviews were conducted after written informed consent received from survey respondents, and on-site surveys were conducted in two stages: screening and validation of diagnosis. The *first stage* of screening was conducted by a psychiatric nurse using the GHQ-12 and its related questions questionnaire. The *second stage* of the diagnostic interview was completed by a psychiatrist using the SCID-I/P for all positive screeners and 10% of randomly selected negative screeners (i.e., those with the study tail number 1).

**2.5 Quality control**

The study received approval from Shandong Ministry of Health ethics committee. All research staff involved attended a 14-day training in Shandong Mental Health Centre prior to the start of the survey. During the training, a mock test of the on-site survey process was completed, and a consistency test of the screening and diagnostic instruments was administered. All interviews were recorded during the study, and six psychiatrist registrars were assigned to each site for quality control through both on-site visit and audio sampling. In addition, quality control was also carried out through double retests. Stage 1 Screening retest: 10% of subjects (those with study tail number 1) were randomly selected for GHQ retesting during the first 4 weeks of the survey in each site; after 4 weeks, 2% of subjects (those with study tail numbers 55 and 66) were selected for GHQ retesting. Stage 2 diagnostic retest: SCID-I/P retest was administered to all subjects 2 weeks prior to the survey and 2% of the randomly selected subjects were retested after the survey. The SCID retest was repeated independently by a masked interviewer, as shown in Figure 1.

**2.6 Statistical analysis**

Same statistical analysis was conducted as reported by Phillips et al. in our 2005 survey[15]. Results of participants who completed the SCID assessment were weighted up to project to the total number of individuals in each research site. Within each cluster (neighbourhood or village), the initial weight for each of the three risk strata was the number of individuals in the population that the cluster represented, multiplied by the proportion of people screened in the cluster who were in the specified risk strata, divided by the number of completed SCID interviews in the strata (ie, the inverse of the sampling fraction). This weight was further adjusted to reduce the effect of extreme weights; those greater than 2 SD above the average weight were cut off at 2 SD above the mean. We obtained poststratification weights for each research site so that the final weights accounted for the location of residence (urban or rural) and for the age in each sampling frame. Post stratification weights were adjusted to ensure that their combined weights indicated the total population of Shandong aged 18 years or older. Poststratification weights were used in the analysis. The complex survey procedures in SPSS were used to estimate the prevalence of depressive disorders, disability associated with each type of disorder, and proportion of individuals who sought health care. SEs estimated with Taylor series linearisation were adjusted for unequal sampling fractions within each risk stratum and for possible homogeneity within each cluster (880 urban neighbourhoods and 397 rural villages). Binary and multinomial logistic regression models within the complex survey module were used to compare prevalence rates by sex and urban versus rural residence. Logistic regression analysis was used to identify demographic characteristics associated with depressive disorders, and both univariate and multivariate analyses were conducted using the "input method", with *a* two-sided *p* < 0.05 indicating a statistically significant difference. The study sample was adjusted by age, sex, and urban or rural residence based on the population constitution of the Sixth National Census; therefore, the study survey sample has good representation.

**3. Results**

**3.1 General demographic characteristics**

The survey population initially approached was 27,917, of which 27,489 respondents agreed to take part and completed the survey, with a response rate of 98.47%. The mean age of respondents was 54.28 years (SD=15.03), 59% were female, and details about the general demographic characteristics are shown in Table 1. There were 7,482 positive Phase I screeners, representing 27.22% of all participants. A total of 9,047 individuals were interviewed for the SCID-I/P diagnosis, and 1,277 met the DSM-IV axis I depressive disorder diagnosis (one-month prevalence) after adjustment.

**3.2 Prevalence of depressive disorders**

The adjusted one-month prevalence rate for depressive disorders was 4.86%, which was the third highest among all types of mental disorders after substance use disorders and anxiety disorders. The prevalence rates for major depressive disorder, dysthymia , and unspecified depressive disorder were 2.32% (681 cases), 1.78% (337 cases), and 0.75% (259 cases), respectively. The prevalence of depressive disorders in men and women was 3.48% and 5.78%, respectively. The prevalence of depressive disorders in urban and rural areas was 4.36% and 5.53%, respectively. The details are shown in Table 2.

**3.3 Analysis of factors associated with the prevalence of depressive disorders**

Both logistic univariate and multifactorial analysis revealed that age, gender, rural/urban, marital, employment and education were associated with the prevalence of depressive disorders as shown in Table 3. The age group above 60 years was more likely to develop depressive disorders than the lower age group, female than male, rural than urban, single than non-single, unemployed than employed, and low education than high education.

**3.4 Social functioning and use of health service**

Only 10.65% of patients with depressive disorders have been seen by a psychiatric health care provider, with the highest rate of major depressive disorder being 14.83%. 40.35% of patients with depressive disorders had moderate or higher functional impairment. See Table 4 for details.

**4. Discussion**

**4.1 Prevalence of depressive disorders**

This is the largest epidemiological survey of depressive disorders conducted in Shandong, one of the most densely populated provinces in China. The survey found that the overall prevalence of depressive disorders among general adult population in Shandong Province was 4.86%, which was lower than 5.73% reported in the previous survey in 2004[[[16]](#endnote-16)]. However, there was an increase in the prevalence of major depressive disorder comparing to the previous survey (2.32% vs. 1.50%), whereas there was a decline in the prevalence of both dysthymia and unspecified depressive disorder compared with the previous survey in 2004 (1.78% vs. 1.99%, 0.75% vs. 2.24%). Comparing the prevalence of depressive disorders in Shandong to other regions in China, it was found that the prevalence of depressive disorders was lower than the prevalence rates in Fujian Province (4.86% vs 7.2%) [[[17]](#endnote-17) ] and higher than the prevalence rates in Jiangxi Province (4.86% vs 1.51%) [[[18]](#endnote-18) ]. The prevalence of major depressive disorder in Shandong was in line with the finding reported in a nationwide survey in China (2.066%) by Phillips et al. [15]  and a recent survey in Liaoning Province in 2015 (2.39%) [20], but it was lower than Fujian Province (2.32% vs 3.35%) [ [[19]](#endnote-19)], however, it was higher than Hebei Province (0.9%) [[[20]](#endnote-20)], Beijing City (1.10%) [ [[21]](#endnote-21)], and a systematic review analysis of the prevalence of major depressive disorder across 12 provinces in China (1.6%) [[[22]](#endnote-22)]. The prevalence of dysthymia was lower than that reported by Phillips et al. (1.78% vs. 2.03%) [15] and higher than those of Liaoning province (1.78% vs. 0.58%) [20]; the prevalence of unspecified depressive disorder was lower than that reported by Phillips [15] et al. (0.75% vs 2.04%) and the Liaoning provincial survey (0.75% vs 0.88%) [20]. Possible reasons for the differences in prevalence include (i) differences in economy and socio-cultural environment between different regions or provinces. (ii) different screening tools and diagnostic criteria used. (iii) Survey respondents: with increasing number of migrant workers in recent years, young male workers leave rural area which has led to high proportion of elderly women and children in the rural area in this survey.

Compared to other countries in the world, the prevalence of major depressive disorder in this study was similar to the findings of the United States (2.2%) [27] but lower than that of reported globally (4.7%) [[[23]](#endnote-23)] and in countries like Czech Republic (3.96%) [[[24]](#endnote-24) ] and Australia (3.2%) [[[25]](#endnote-25)]. The prevalence of dysthymia is higher than that of Australia (0.9%) [ 26] and Czech Republic (1%) [25] . The differences in prevalence rates may be related to factors such as economic status, socio-cultural environment across different countries. In addition, there are still stigma about mental illness in China, the stereotypes and prejudice that result from misconceptions about mental illness have led to reluctance to both the diagnosis and the use of psychiatric service [[[26]](#endnote-26)], which contributes to the low prevalence rate.

**4.2 Sociodemographic factors associated with depressive disorders**

Sociodemographic factors have been found to be important risk factors for the development of depressive disorders [[[27]](#endnote-27)]. In this study, factors such as age, gender, urban/rural residency, education, marital and occupational status were significantly associated with the prevalence of depressive disorders. This is in line with the World Health Survey (WHS) conducted across 53 countries worldwide, which also suggest that low economic status, being female, low education level, living alone are associated with increased prevalence of depressive disorders [[[28]](#endnote-28)].

The prevalence of depressive disorders is higher among women than men in the current survey, which is consistent with is consistent with a number of national and international studies [14, 15, 20,[[29]](#endnote-29)]. Research have shown that gender differences in the prevalence of depressive disorders may be related to biological and psychosocial factors [[[30]](#endnote-30)]. First, mood is influenced by the hypothalamic-pituitary-gonadal system [ [[31]](#endnote-31),[[32]](#endnote-32) ] and studies have found [[[33]](#endnote-33) ] that the high prevalence of depressive disorders in females may be related to estrogen and that mood changes are influenced by the menstrual cycle, whereas such changes do not occur in males. Evidence from studies in primates and rodents also support the role of estrogen in the development of depression [ [[34]](#endnote-34), [[35]](#endnote-35)]. In addition, the inequality in social status and economic income between men and women makes women more vulnerable to experience psychological and emotional problems [[[36]](#endnote-36).39,40].

The prevalence of depressive disorders in rural residents of Shandong Province is higher than that in urban areas in the current survey which is consistent with a number of previous studies [14, 15,[[37]](#endnote-37) ]. However, some studies have reported a higher prevalence of depressive disorders in urban areas [ [[38]](#endnote-38),[[39]](#endnote-39) ], while the study conducted in Australia have found no significant difference in prevalence between urban and rural areas [26]. It has been suggested that differences in population composition and risk factors associated with mental disorders between urban and rural areas may contribute to the differences in prevalence [ [[40]](#endnote-40)].

**4.3 Social functioning and use of health service**

Major depressive disorder has been reported as the leading cause of disability in European countries [41]. Wittchen et al [ [[41]](#endnote-41)] also reported major depressive disorder as one of the four leading causes of disability in a study of 27 European countries [[[42]](#endnote-42) ]. In line with these studies, the high rate of impaired social functioning was found associated with major depressive disorder in the current study. It has been reported that 15.6% of patients with depressive disorders in Hong Kong experienced severe functional impairment and distress, 45.6% experienced moderate functional impairment and distress, and only 24.3% of patients received psychiatric care [[[43]](#endnote-43) ]. A study conducted in Beijing reported that 33.1% of depressive disorder patients had received treatment [47 ]. The current study indicated that more than 40% of patients with depressive disorders in Shandong had moderate or higher functional impairment, and only 10% of them had visited a psychiatric service, and the consultation rates were significantly lower than those in Beijing and Hong Kong. The reason for this may be related to the fact that as a large agricultural province in Shandong, there are still strong stigma about mental disorders and patients and their carers are reluctant to visit a psychiatric service and seek any professional advice on diagnosis and treatment. The World Health Organization, through a survey of the mental health situation in 17 countries around the world, pointed that one of the greatest unmet needs in health care in China is the need for treatment of mental disorders [ [[44]](#endnote-44)]. In recent years, there has been significant improvement in psychiatric service in Shandong including increasing number of psychiatric staff and hospital beds, more work is needed to improve awareness of mental health and reduce stigma in both social and personal context [ [[45]](#endnote-45)].

**4.4 Limitations**

It should be noted that there are several limitations in the current study. Firstly, this study is a cross-sectional survey therefore cannot explain the causal relationship between risk factors and disease progression; Secondly, due to tight time schedule, only a limited number of risk factors related to depressive disorders were examined, other factors such as personality trait, social support, and other lifestyle factors were not explored. Lastly, in terms of use of health care service, only medical visits were investigated, whereas detailed information about treatment was not collected.

**5. Conclusions**

Prevalence of depression presented in this study is from the recent largest epidemiological study conducted in Shandong in recent years. The survey examined the current prevalence of depressive disorders and revealed associated demographic characteristics. The survey also indicates high social dysfunction associated with depression and poor use of psychiatric services in these patients. The findings from this survey provides new evidence and offers opportunities for policy makers and health-care professionals to improve mental health provision in Shandong. More research to follow-up and monitor the course, treatment, and prognosis of patients with depressive disorders is warranted.

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