Healthcare Disparity

Prevalence and Socioeconomic Status Correlation of Depressive Symptoms among Children Living in Urban Beijing

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Abstract

Background: **The prevalence of depressive symptoms among children is rapidly increasing all over the world. The objective of this study was to investigate the prevalence of depressive symptoms and its socioeconomic characteristics among children living in urban Beijing of China.**

Methods: **A total of 4643 students in the third and fourth grades from 10 primary schools of urban Beijing were randomly selected to complete the Children's Depression Inventory (CDI). Information of socioeconomic status was collected using a self-administered questionnaire by the student's parents. All statistical analyses were performed with the SAS 9.2 for Windows (SAS Institute Inc, Cary, NC).**

Results: **The prevalence of depressive symptoms in children aged 7-12 years was 11.6%, which included 14.7% among boys and 8.3% among girls. The children aged 11-12 years had a significantly higher prevalence of depressive symptoms (18.7%) as compared to the younger ones. The likelihood of depressive symptoms in children tended to increase significantly with the decreasing in their father's education level, mother's education level, and family income level. A significantly higher likelihood of depressive symptoms was also observed among children whose parents were farmers, unemployed, self-employed, or those whose fathers were waiters and/or whose mothers were soldiers or policewomen.**

Conclusions: **Depressive symptoms are common in children living in urban Beijing, especially among children in families with low socioeconomic status.**
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Key Words: *Depression, children, China, socioeconomic*

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Background

Depression is a common emotional problem in children and adolescents and can persist into adulthood,[1] which hampers healthy development, and even leads to other co-morbid factors such as suicide attempts and disruptive behaviors.[2,3] The World Health Organization has forecasted that depression would become the second most important factor of death and disability in 2020; mental illnesses account for more collective disability burden in developed countries than any other group of illnesses including cancer and heart disease.[4]

It has been proved that there is a relationship between social culture and depression,[5,6] while family environment has been shown to have an important impact on children's depression

at various stages of development[7]. Parenting behaviors, perceptions, and psychosocial risk all play a significant role in the mental health development of young children;[8] children with parents of lower socioeconomic status (SES) show more mental health problems than those from families with higher SES.[9] Thus, it is important to understand the effects of family SES on children's depression.

Children' depressive symptoms have been studied among psychologists, educators, and social workers in other fields in China.[10] However, the association between children's depressive symptoms and family income, parents' occupation, and parents' education level are still seldom studied in China.

The purpose of the present study was to investigate the prevalence of depressive symptoms among children living in urban Beijing and its association with family socioeconomic status.

Materials and Methods

Subjects

A sample of 4643 primary school students from urban Beijing was selected using multistage random sampling in 2005. In the first step, 2 communities were randomly selected according to geographical distinction. In the second step, 10 primary schools in similar situations were selected from each community. In the third step, all classes from the third and fourth grades of each primary school were selected and used as sample units. Parents were informed about the study and were given the opportunity to refuse their children to participate. The children's depression inventory (CDI, Chinese version) scores of 4543 (97.8%) students were collected, and 179 (3.9%) of these responses were excluded because of missing or invalid information.

Ethical approval

The study was approved by the Chinese Ethical Review Committee of the National Institute for Nutrition and Food Safety in China and the Dutch Medical Ethical Review Committee of Wageningen University (METC-WU) in the Netherlands. Both written and oral consent were obtained from the parent and child, respectively.

Measurements of depressive symptoms

The children' depression inventory (CDI) developed by Kovacs[11] has most often been used to measure depressive symptoms in normal children. The self-report form is a symptom-oriented scale suitable for school-age children, which may require the lowest level of any measure of depression. It contains 27 item scales and three choices for each item corresponding to three levels of symptomatology—0 (absence of symptom), 1 (mild or probable symptom), or 2 (definite symptom). The total score can range from 0 to 54, where a higher score reflects greater symptomatology. Children with scores higher than 20 were considered to have depressive symptoms. The CDI cut-off rate of 20 was identified in the original manual as most appropriate in general screening.

The CDI factors are labeled as Negative Mood, Interpersonal problems, Ineffectiveness, Anhedonia, and Negative Self-Esteem. Negative Mood reflects feeling sad, feeling like crying, worrying about "bad things," being bothered or upset by things, and being unable to make up one's mind. Interpersonal problems reflect problems and difficulties in interactions with people, including trouble getting along with people, social avoidance, and social isolation. Ineffectiveness reflects the negative evaluation of one's ability and school performance. Anhedonia reflects "endogenous depression" including impaired ability to experience pleasure, loss of energy, problems with sleep and appetite, and a sense of isolation. Negative Self-Esteem reflects low self-esteem, self-dislike, feelings of being unloved, and a tendency to have thoughts of suicide. The factors are scored by summing the responses to the questions that constitute each factor.[11]

The Chinese version of CDI has been shown to have good test-retest reliability, internal consistency, and construct validity.[12] The questionnaire was handed out in the classroom and was self-administered by the students.

Socioeconomic status

Socioeconomic status in the present study included family income, parents' occupation and education level.

Family income was expressed as monthly household income per capita. It was divided into 6 levels—below 500, 500–999, 1000–1499, 1500–2499, 2500–4999, and above 5000 RMB/month/person, based on current exchange rate, which was <$74, $74-146, $147-220, $221-367, $368-734 and ≥$735 per person per month, respectively.

Occupations were divided into 13 different categories according to the standard of the China Bureau of Statistics[13]—cadres, workers, staff members of companies, teachers, soldiers or policemen, the self-employed, salesmen, laid-off persons or the unemployed, doctors, engineers, waiters or waitresses, farmers, and others.

Education backgrounds were divided into 5 levels—illiteracy or primary, junior middle school, senior middle school or high school, technical school or college, and university or above.

A self-administered questionnaire was handed out, to collect the information of the average monthly household income per capita, occupations, and education levels from the children' parents.

Statistic Analysis

The age and puberty adjusted means and standard error of subscales and total scores of CDI were calculated by using a general linear model factorial analysis with Tukey post-hoc comparisons between boys and girls, after controlling the random effect of schools. Considering the complex study design, random-effects logistic regression model was used to compare the fixed effect on the likelihood of depression

symptom after controlling the random effect. The fixed effects included sex, age, family income, parent's occupation and educational level. While the randomization was at the school level, implementation was at the class level. Thus, the classroom in schools was treated as two levels random effects. It was considered significant if the *P* value < 0.05. All statistical analyses were done with the SAS 9.2 for Windows (SAS Institute Inc, Cary, NC).

Table 1. The Means of CDI Total Score and its Subscales.*

	Boys	Girls	*P*
Total score	10.67±0.17	8.26±0.17	<0.0001
Negative Mood	2.37±0.05	1.93±0.05	<0.0001
Interpersonal problems	1.60±0.03	1.20±0.03	<0.0001
Ineffectiveness	1.76±0.04	1.15±0.04	<0.0001
Anhedonia	2.95±0.06	2.39±0.06	<0.0001
Negative Self-Esteem	1.98±0.04	1.58±0.04	<0.0001

*The age and puberty status adjusted means and standard error, general linear model factorial analysis with Tukey post-hoc comparisons between boys and girls. The classroom in schools was treated as a random effect.

Results

Totally, 4364 students (2284 boys vs. 2080 girls) aged 7–12 years completed the questionnaires.

Mean scores of total CDI and its subscales

The mean value of the total CDI score was 9.73±0.11, which was 10.67±0.17 among boys and 8.26±0.17 among girls, with significant difference (*P*<0.001). As shown in **Table 1**, compared with the girls, the boys obtained not only significantly higher total score and but also all the CDI sub-scales.

Age and sex difference

The prevalence of children's depressive symptoms was 11.6% (boys 14.7% vs. girls 8.3%), which was significantly higher in boys than that in girls. After considering the relative effect of other variables, the boys had 76% (95%CI: 48%~109%) more likelihood of depressive symptoms than the girls. The children aged 11-12 years had a higher prevalence of depressive symptoms (18.7%) compared to the younger ones (7- yrs: 13.8%, 9 yrs: 11.5%, 10 yrs: 10.5%). The likelihood of depression symptoms was almost doubled among the students aged 11-12 years compared to their counterparts aged 10 years old (**Table 2**).

Parents' Occupation

As shown in **Table 2**, farmers' children showed the highest prevalence of depressive symptoms (22.0%). Farmer's children had three times likelihood of depressive symptoms than their counterparts whose parents were cadres after controlling the effect of other factors. The likelihood of depressive symptoms was doubled among children whose parents were unemployed. Other groups with high risk were children whose fathers were waiters and/or whose mothers were soldiers or policewoman.

Table 2. Prevalence and Odds Ratio of Depressive Symptoms among Children with Different Status.*

	N	%	Crude Odds Ratio (95%CI)	Adjusted Odds ratio (95%CI)
Sex				
Boy	2284	14.7	1.75(1.47-2.09)	1.89(1.53-2.33)
Girl	2080	8.3	Ref.	Ref.
Age				
7-8	617	13.8	1.43(1.08-1.88)	1.95(1.28-2.98)
9	1994	11.5	1.12(0.91-1.38)	1.41(1.05-1.89)
10	1646	10.5	Ref.	Ref.
11-12	107	18.7	1.85(1.10-3.11)	1.94(1.10-3.43)

(**Table 2** - continued)

	N	%	Crude Odds Ratio (95%CI)	Adjusted Odds ratio (95%CI)
Father's occupation				
Farmers	83	22.9	3.42(1.88-6.22)	3.50(1.91-6.41)
Waiters	106	16.0	2.20(1.20-4.03)	2.28(1.24-4.20)
Unemployed	221	15.4	2.09(1.30-3.38)	2.27(1.39-3.68)
Self-employed	585	13.5	1.80(1.22-2.66)	1.84(1.24-3.73)
Salesman	31	12.9	1.71(0.57-5.10)	1.76(0.58-5.30)
Doctors	53	11.3	1.47(0.59-3.63)	1.48(0.60-3.67)
Others	260	9.6	1.23(0.73-2.05)	1.27(0.75-2.14)
Teachers	44	9.1	1.15(0.39-3.37)	1.14(0.39-3.34)
Staff in company	729	8.9	1.13(0.75-1.69)	1.17(0.78-1.76)
Soldiers or policeman	197	8.6	1.09(0.61-1.96)	1.12(0.62-2.03)
Engineers	224	8.0	1.01(0.57-1.79)	1.03(0.58-1.83)
Workers	645	7.6	0.94(0.63-1.54)	1.64(1.11-2.43)
Cadres	538	8.0	Ref.	Ref.
Mother's occupation				
Farmers	125	21.6	4.06(2.29-7.21)	4.21(2.36-7.51)
Soldiers or policewoman	27	18.5	3.35(1.18-9.52)	3.34(1.16-9.58)
Unemployed	300	14.7	2.54(1.54-4.17)	2.61(1.58-4.31)
Self-employed	433	14.1	2.42(1.51-3.87)	2.56(1.59-4.11)
Waitress	171	11.7	1.95(1.07-3.57)	2.06(1.12-3.78)
Salesman	215	11.6	1.94(1.10-3.42)	2.09(1.18-3.70)
Doctors	184	11.4	1.90(1.05-3.44)	1.90(1.05-3.45)
Workers	466	11.2	1.85(1.15-2.99)	1.90(1.17-3.07)
Staff in company	790	10	1.64(1.05-2.56)	1.68(1.07-2.64)
Others	219	9.6	1.56(0.87-2.82)	1.64(0.91-2.98)
Engineers	99	8.1	1.30(0.57-2.94)	1.29(0.57-2.94)
Teachers	246	6.9	1.10(0.59-2.04)	1.14(0.61-2.14)
Cadres	441	6.4	Ref.	Ref.
Family Income Level (Chinese Yuan/Person/Month)				
<500	526	17.3	2.76(1.52-5.00)	2.34(1.29-4.24)
500-999	923	11.5	1.55(0.87-2.79)	1.47(0.82-2.63)
1000-1499	415	9.9	1.28(0.68-2.43)	1.25(0.66-2.36)
1500-2499	915	9.5	1.22(0.68-2.21)	1.16(0.64-2.10)
2500-4999	826	9.6	1.23(0.68-2.24)	1.15(0.63-2.08)
≥5000	174	8.1	Ref.	Ref.
Father's education				
Illiteracy or primary	85	15.3	1.99(1.05-3.77)	2.04(1.08-3.88)
Junior middle school	574	15.2	1.51(0.80-2.83)	2.07(1.48-2.88)
Senior middle/high school	1149	11.3	1.39(0.75-2.590	1.48(1.09-1.99)
Technical school/college	988	10.4	1(0.53-1.90)	1.34(0.98-1.83)
University or above	922	8.2	Ref.	Ref.

(**Table 2** - continued)

	N	%	Crude Odds Ratio (95%CI)	Adjusted Odds ratio (95%CI)
Mother's education				
Illiteracy or primary	150	20.0	2.88(2.00-4.15)	2.86(1.76-4.62)
Junior middle school	571	14.9	2.50(1.81-3.46)	2.05(1.45-2.92)
Senior middle/high school	919	11.8	2.00(1.46-2.74)	1.57(1.13-2.19)
Technical school/college	1326	9.4	1.62(1.16-2.27)	1.14(0.83-1.55)
University or above	762	8.1	Ref.	Ref.

*random-effects Logistic regression model, the fixed effects included sex, age, family income, parent's occupation and educational level, while the classroom in schools was treated as a random effect variable. Statistical P trend was calculated by introducing the categorical variable as continuous into the logistic regression model.

Family Income Level

The prevalence of depressive symptoms was 17.3% among children in poor families, which was 8.1% among children whose family income above 5000 Chinese RMB/person/month (735 US Dollars). The crude odds ratio was 2.76 (95%CI: 1.52-5.00) among children in poor families compared to their counterparts in rich families. After adjusted the relative effect of sex, age, parent's occupation and education, the odds was attenuated but kept significant (odds ratio 2.34, 95%CI: 1.29-4.24). The likelihood of depressive symptoms increased with the decreasing of family income level as shown in **Table 2**.

Parent's Educational Level

The lower the mother's educational level, the higher were the likelihood of depressive symptoms (Table 2). The prevalence of depressive symptoms was 20.0% among children whose mothers were illiterate or whose mothers' education level was at the primary level, which was *2.88* times (95% CI: 2.00-4.15*)* more than that among children whose mothers' education level was at the university level or above. Adjustment of the relative effect of sex, age, parent's occupation and education attenuated the association between mother's educational level and likelihood of depression symptom among children. *S*imilar association was found between children's depressive symptoms and the fathers' education level. The lower the fathers' educational level, the higher was the likelihood of depressive symptoms among their children.

Discussion

The mean CDI total score of the children in Beijing was 9.7, which was similar to another study conducted in Beijing.[12] Yu and Li introduced CDI into China on 2000. The mean CDI score was 10.5 in his study population that included primary students and middle school students aged 8-15 years.[12] Nevertheless, the Chinese children scored much higher compared with some studies in Western countries, which showed that the mean CDI total score of children was less than 7.0.[14-16] Given that a majority of couples in urban Beijing have only one child, the parents become extremely impatient for their child's success and push their children to compete with their counterparts. In addition, the pressure of academic performance and entrance examinations may increase the risks of children developing depressive symptoms. Chinese children were unwilling to inform others about events that induced emotional changes.[17] Pablo et al. reported that the high prevalence of negative mood and ineffectiveness was a marker of severity of depression in adolescents.[18] In our analysis of CDI subscale scores, we found that negative mood and negative self-esteem were the highest-scored subscales and were closely correlated (r = 0.81 and 0.80) with the total score.

Some researchers found that the prevalence of depressive symptoms among boys was higher than among girls,[19,20] while others discovered that girls had significantly higher scores than boys.[18,21-23] In addition, no significant gender differences were found in some studies.[13,24-27] Compared to the girls, a higher prevalence of depressive symptoms among boys in all age groups was found in present study. The traditional concept of emphasis on males and contempt for females has had profound impacts on people in China; parents and the community have greater expectations from boys, which put more pressure on them. Biological and physiological differences are also important factors for the gender differences in depression.[28] In a study conducted among children aged 8–11 years, Wu et al concluded that boys with emotional instability, impetuosity, and maladjustment to society and reality were more prone to be depressed than were girls.[29]

Among girls, the prevalence of depressive symptoms has been reported increased from childhood to adolescence.[28] A meta-analysis study suggested that girls' depression scores remained steady from ages 8 to 11 and then increased between ages 12 and 16, and boys' CDI scores were stable from ages 8 to16 except for a high CDI score at age 12.[30] Higher prevalence of depression symptoms in younger

children was also found in Korean children.[31] While among Chinese children, Tang indicated that the prevalence of depression symptom decreased from age 6 to age 10 and then increased at the age of 11.[24] Similar trend was found in present study that both the younger and the older children had higher prevalence of depression symptom. For the grades 3 and 4 of present study, the normally age range was 8 to 10 years old and they do be the majority of present sample population. Having entered the school at too young age may be one reason for the higher odds of depression symptoms in younger children. Meanwhile, the escalation of symptoms among the older children may be caused by the physiological changes in puberty.[32]

It has been proved that mental and physical health was closely related to socioeconomic inequality,[33] especially in low and middle-income countries.[34,35] Also, depression accelerated the deterioration of other diseases such as cardiovascular disease, diabetes, obesity, and cancer,[36] which placed a larger health burden on individuals with lower socioeconomic status.[37] Some studies[38,39] suggested that children from families with a lower socioeconomic status were more prone to display higher prevalence of depression and lower state of health, compared to the children from families with a higher socioeconomic status. The Luciana study also revealed that low household income and social inequalities present at birth had a major impact on common mental disorders; the unemployment and poor education of the parents increased the risk of mental disorders.[40] Our results revealed that the lower the parents' education level and family income level, the higher was the children's likelihood of depressive symptoms, consistent with the previous studies.[31,41] Parents with a low education level were less sensitive to psychological changes in children and could not offer necessary support to their children, which may affect the development of depressive symptoms. The association between education, occupation, and income levels of the family with the prevalence of depressive symptoms among children was apparent.[1,42]

Farmers and unemployed families may also be poor families. But after controlling the relative effect of family income and other relative factors, farmers and unemployed parents' children still show higher likelihood of depression symptoms. Present study may still highlight the special concerns for family with special occupations, though the problem of confounding still remains. Parents with a lower SES or of certain occupation may display a higher prevalence of depression. Parental depression can have both an environmental and genetic impact on children's behavior and depression, and even modulates depression severity as children grow into adolescence.[43-45] This merit further studies in the future as we did collect the information of depression among parents. Also, the family environment may predict or moderate responses to acute treatments among depressed adolescents,[46] while less support was offered to children in low family SES, influencing their development. Hence, special concerns should be paid attention to children from families of low socioeconomic status and families with certain occupation of parents.

One limitation of the present article is that it measured the children's symptoms only using a self-report questionnaire. It may be more meaningful to make use of a questionnaire with parents and teachers as well and to make an interview diagnosis to confirm the status of children's depressive symptoms.[47,48] In addition, this study was carried out only in urban Beijing; a nationwide survey should be launched in the next step. It is not clear whether the study suffered from systematic errors from possible under- or over-reporting problems in answering the questions in the CDI scores between children with different socioeconomic status. It is difficult to determine the net effect and direction of biases in our final results because there was no validation study to assess whether the degree of these errors differs between comparison groups, which merit further research in this field.

In conclusion, low socioeconomic status was associated with a high likelihood of children's depressive symptoms in urban Beijing. Special concerns should be addressed in the case of worsening the socioeconomic inequality.

Author's contribution

XS performed the data analysis, result interpretation, and manuscript writing. DW was responsible for the study design, field work, and manuscript editing. JW contributed to the manuscript writing and revision. XH contributed to the study design, organization, and field work. SD participated in the field activities and manuscript editing. YL was the principal investigator and contributed to the study design, field work, data analysis, result interpretation, manuscript writing, and editing. All the authors read and approved the final version of the manuscript. The authors declared no conflict of interest.

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