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Research Article
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Factors associated with self-rated mental health in mothers of children and adolescents with autism spectrum disorder

Yanan ZHAO[1,2], Huiyun FAN[3], Rong ZHANG[4,5,6,7]✉, Xiaoying ZHENG[8]✉

[1]*School of Public Health, Peking University, Beijing 100191, China*
[2]*Faculty of Health and Wellness, City University of Macau, Macau 999078, China*
[3]*Institute of Population Research, Peking University, Beijing 100871, China*
[4]*Neuroscience Research Institute, Peking University, Beijing 100191, China*
[5]*Department of Neurobiology, School of Basic Medical Sciences, Peking University, Beijing 100191, China*
[6]*Key laboratory for Neuroscience, Ministry of Education / National Health and Family Planning Commission, Beijing 100191, China*
[7]*Autism Research Center, Peking University Health Science Centre, Beijing 100191, China*
[8]*School of Population Medicine and Public Health, Chinese Academy of Medical Sciences / Peking Union Medical College, Beijing 100730, China*

Abstract: The rising demand for child care is putting a strain on parents of children with autism spectrum disorder (ASD), particularly the mothers. This study investigated Chinese mothers of children with ASD and examined the factors associated with maternal mental health. An online national survey was completed by the parents of 5077 ASD children and adolescents aged 0–17 years. A total of 28.0% of the mothers reported poor mental health status. Mothers with children aged 10–13 years had a lower chance of having poor mental health status than mothers with children aged 0–2 years (odds ratio (OR) 0.63, 95% confidence interval (CI) 0.43–0.91). Mothers of children with high-functioning autism were less likely to have poor mental health status than those of children with low-functioning autism (OR 0.76, 95% CI 0.62–0.94). Having children with comorbidities was related with a higher risk of poor mental status (OR 1.56, 95% CI 1.35−1.81), as were having conflicts with other family members (OR 1.44, 95% CI 1.22–1.70) and providing full-time care (OR 1.22, CI 1.06–1.41). A higher-than-average family income was associated with lower risk of having poor mental health status (OR 0.70, 95% CI 0.58–0.82). Factors related to the children and family, and providing full-time care, have a significant effect on mothers' mental health status. Reducing obstacles to work and social interaction, as well as tackling the financial burden of raising an ASD child, may help improve the well-being of mothers.

Key words: Autism spectrum disorder (ASD); Mother; Mental health status; Influencing factor

1 Introduction

Autism spectrum disorder (ASD) is a range of neurodevelopmental disorders that are characterized by the following core deficits: impairments in social interaction and communication and restricted and repetitive behaviors (American Psychiatric Association, 2013). It has been reported that parents of children with ASD have poor mental health and well-being (Estes et al., 2009; Hall and Graff, 2010; Whitmore, 2016). These families have higher stress levels (Hayes and Watson, 2013). According to Miller et al. (2015) and Whitehead (2016), these families were more likely to experience financial difficulties, social isolation, unmet health-care needs, poor work results, and increased time commitments for providing healthcare. A change in career status and financial burdens could also trigger negative psychological states (Falk et al., 2014).

Mothers in these families were found to be more stressed and to have more negative mental health outcomes than fathers due to their disproportionate duty to care for their disabled child (Hastings, 2003; McStay et al., 2014). Several factors have been recognized as important for maternal mental health, including a child's age, gender, diagnostic severity, and family

✉ Xiaoying ZHENG, zhengxiaoying@sph.pumc.edu.cn
Rong ZHANG, zhangrong@bjmu.edu.cn
Xiaoying ZHENG, https://orcid.org/0009-0006-6982-3816
Rong ZHANG, https://orcid.org/0000-0002-6889-5571
Yanan ZHAO, https://orcid.org/0000-0002-1532-3641

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socioeconomic status (SES). Compared to parents of older children with ASD, parents of younger children with ASD have reported higher levels of stress (Schieve et al., 2011). Severe symptoms in the child increase the likelihood of anxiety and depression in the parents (Barroso et al., 2018; Yorke et al., 2018). Mothers of boys with ASD report poorer mental health and higher stress compared to mothers of girls with ASD (Zablotsky et al., 2013). Mothers with a lower SES were found to have considerably worse mental health (Zhou et al., 2019; Nahar et al., 2022). In addition, a mother's employment status and social support can affect her mental health. Working mothers may experience increased stress as a result of juggling competing work and family responsibilities (Zhou et al., 2018; Limbers et al., 2020), and are more likely to choose full-time child care than fathers (Gau et al., 2012). Mothers of children with ASD usually report poorer levels of family cohesion (Higgins et al., 2005). Improved outcomes for families with children with ASD are also linked to social support from friends and family (Zablotsky et al., 2013; Whitehead, 2016). Involvement of grandparents can provide various forms of support including instrumental and emotional assistance, which are positively associated with general family functioning and quality of life for caregivers (Lee and Gardner, 2010; Sullivan et al., 2012; Kaczmarek, 2021). Social support is an environmental variable that may serve as a protective factor for parental mental health and well-being.

Higher subjective well-being has been linked to better health and longevity, as well as improved social relationships, work performance, and creativity (Diener et al., 2018). Parental life quality is closely related to child well-being and development (Eiser et al., 2005; Lee et al., 2009), as well as family functioning (Pisula and Porębowicz-Dörsmann, 2017). It is critical to investigate the mental health of mothers because maternal mental health issues have been linked to the rehabilitation of children of all ages. The impact of employment status, child demographics, social support, and child personality on the mental health status of mothers with ASD children should be investigated.

Research from China has special cultural implications, because Chinese women are under high social expectations to care for family members. It is the moral responsibility of family members in Chinese culture to care for people with disabilities (Chiu et al., 2015). Traditional family roles of "men outside and women inside" are deeply ingrained in Chinese culture. Mothers were traditionally the primary caregivers (Yang et al., 2016). Now that people with ASD live longer than they did before (Buescher et al., 2014) and the number of children diagnosed with ASD in China is increasing (Sun et al., 2013; Zhou et al., 2020), the number of caregivers living with ASD is increasing as well and is expected to rise further in the coming decades. Several studies in China have examined the mental health and quality of life of mothers of children with ASD and identified key influencing factors. For instance, survey results revealed that unemployed mothers had poorer mental health than part-time and full-time working mothers (Wu et al., 2023). Working mothers were more confident in dealing with stress and more likely to seek social support than non-working mothers. Risk factors for poor quality of life included older maternal age and lower family income (Wei et al., 2018). Family SES was directly related to maternal quality of life (Chen and Lian, 2022). When the marriage connection was not harmonious, the woman's mental health suffered the most; and the more children a mother had, the greater the parental pressure she experienced (Wu et al., 2023). Building upon this growing body of literature, this study aims to further contribute by examining the mental health status of mothers of children with ASD across a large sample size and a wide age range of children. The primary goal of this study was to explore maternal mental health status and the secondary goal was to determine the associated factors.

2 Methods

2.1 Participants

The data for this study came from the Survey on Family Circumstances and Demand for Support and Resources among Autistic Children in China (FCDSR). This was a survey distributed to patients who engage in the ALSOLIFE online community (https://www.alsolife.com). As one of China's largest online communities for parents of children with ASD, the website enables over 200 000 parents to exchange information about the disease, therapies, symptoms, and comorbidities. Online access to the survey was offered from Sept. 15, 2020 to Sept. 30, 2020. The details of the survey have been described elsewhere

(Zhao et al., 2023). Only minor language modifications were made based on the findings of a pilot field survey (n=20), which revealed that respondents largely comprehended the questionnaire.

2.2 Data collection

Families who satisfied the following requirements were recruited. The child was between 0 and 17 years old and was diagnosed with ASD or suspected (for children under three years old) of having ASD at a hospital. The existing research has found that symptoms of ASD can be detected before the age of one year (Chawarska et al., 2007; Guthrie et al., 2013). This sample included several children aged 0–1 year, with the minimum age being ten months. In addition to using scale measurement and expert medical diagnosis, the facility was equipped with diagnostic qualifications and adhered to the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5) standard. Exclusion criteria were ASD individuals with severe comorbidities such as physical disability or cerebral palsy. Samples with obvious errors or omissions were also excluded from the study. There were 8014 households investigated, with 5077 (63.35%) ultimately included. The selection procedure is depicted in Fig. 1. The gender ratio and distribution of family locations in this study were in line with China's general population distribution. A total of 380 cities or districts and 31 Chinese provinces were included (Tables S1 and S2).

2.3 Measures

2.3.1 Dependent variable

The term "self-rated mental health status" is used in this study to describe negative mental health status. We asked respondents to rate their subjective mental state or sense of well-being during the previous four weeks using a 5-point Likert scale with 1=extremely poor, 2=poor, 3=average, 4=good, and 5=very good. The answers were divided, with 2 being the cut-off score for poor mental health status. A single-item question was used in previous studies by Kim et al. (2011) and Ide et al. (2022), and has been reported to be reliable and feasible (Ivarsson et al., 2011). While our approach may impact the accuracy of the evaluation, our goal was to preliminarily understand the overall mental health status of the study population, and we believed that the 5-point scale allowed us to do this in an efficient manner.

2.3.2 Independent variable

The options for workforce participation were "work" and "non-work." We used the term "non-work" in this study to refer to mothers who were either unemployed or out of the labor force. In order to further distinguish the effects of different employment types, we constructed four employment status variables, namely "full-time," "flexible," "overtime," and "a long leave of absence." Full-time work generally refers to a person being formally employed, working 40 h per week, and enjoying corresponding wages, social insurance, and welfare benefits (complying with the Labor Law of the People's Republic of China). Flexible work refers to a situation in which working hours or workplaces are not fixed, and are usually less than 30 h a week. Overtime work refers to a situation with more than 40 working hours a week. We created two variables for full-time housewives: "involuntary" and "voluntary" to distinguish the reasons for not working. "Involuntary" resignation meant resigning after finding that their child had been diagnosed

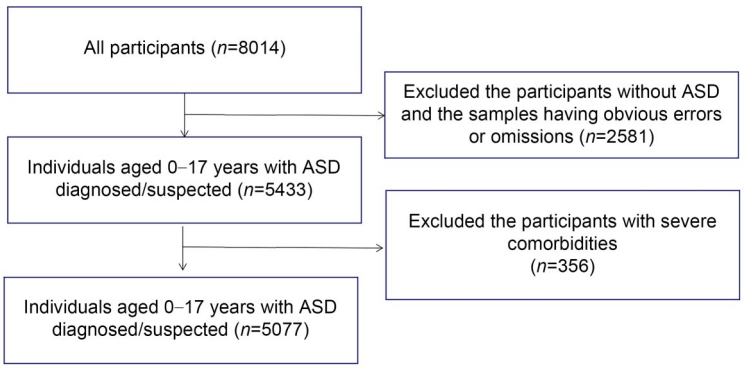

Fig. 1 Flow chart of selection procedure. ASD: autism spectrum disorder.

with ASD and they could no longer work outside the home while taking care of the child. "Voluntary" refers to respondents who resigned before their child's diagnosis of ASD or remained unemployed for other reasons after the child's birth.

The availability of intergenerational family care (from grandparents) to give assistance and the number of information sources are both ways to measure social support, so "grandparents' assistance" and "information channels" were added as control variables. We measured informal social support using intergenerational care because it was the primary source of support for children with disabilities, particularly Chinese children (Yang et al., 2016). Background information was collected on children's age, gender, ASD severity, the presence or absence of comorbidities, the number of children in the family, the mother's education level, and the family's annual income.

2.4 Statistical analysis

Normally distributed data are described as mean± standard deviation (SD). The factors influencing mental health status were discovered using logistic regression models. Odds ratios (ORs) and 95% confidence intervals (CIs) were used to report associations between predictors and independent variables. All anticipated expenditures were translated to US dollar (USD) values in Jan. 2021, when USD 1 was worth around CNY 6.49. SPSS 22.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for all statistical analyses.

3 Results

3.1 Demographic characteristics

This study included 5077 households. The majority of the children (84.3%) were boys, with a mean age of 4.1 years (SD: 1.1 years), and the leading severity level was middle function (40.4%). A total of 24.1% of the children had comorbidities such as attention-deficit hyperactivity disorder (ADHD) and epilepsy (EP). There were 34.2% working mothers and 65.8% non-working mothers, and most of the mothers had higher education degrees (college degree or above) (66.1%). A total of 14.5% of mothers reported conflicts with other family members and 28.8% of mothers had received childcare helps from their children's grandparents. The median family income was USD 18 490.0 (interquartile range: 9224.9, 23 112.5). Further details about the study population were provided in Table 1.

Table 1 Characteristics of the children's and mothers' demographics (*n*=5077)

Characteristics	Value
Children's demographics	
Age (years)[a]	4.1±1.1
Gender (*n* (%))	
Boy	4278 (84.3)
Girl	799 (15.7)
ASD severity (*n* (%))	
LFA	1196 (23.6)
MFA	2052 (40.4)
HFA	908 (17.9)
Undetermined	921 (18.1)
Comorbidity (*n* (%))	
No	3851 (75.9)
Yes	1226 (24.1)
Only child (*n* (%))	
No	2504 (49.3)
Yes	2573 (50.7)
Mothers' characteristics	
Employment status (*n* (%))	
Work	1735 (34.2)
Full-time	821 (16.2)
Flexible work	628 (12.4)
Overtime work	52 (1.0)
A long leave of absence	234 (4.6)
Non-work	3342 (65.8)
Other reasons	527 (10.4)
Take care of child	2815 (55.4)
Higher education degree (*n* (%))	
No	1720 (33.9)
Yes	3357 (66.1)
Conflicts in family (*n* (%))	
No	4341 (85.5)
Yes	736 (14.5)
Grandparents' assistance (*n* (%))	
No	3613 (71.2)
Yes	1464 (28.8)
Information channels (*n* (%))[b]	
<3	3186 (62.8)
⩾3	1891 (37.2)
Poor mental health (*n* (%))	
No	3656 (72.0)
Yes	1421 (28.0)
Family income (USD)[c]	18 490.0 (9224.9, 23 112.5)

[a] Data are expressed as mean±standard deviation; [b] Including TV programs, newspapers, books, the Internet, WeChat, QQ groups, and others; [c] Data are expressed as median (interquartile range). ASD: autism spectrum disorder; LFA: low-functioning autism; MFA: middle-functioning autism; HFA: high-functioning autism.

3.2 Influencing factors

A total of 1421 mothers (28.0%) had poor mental health status (Table 2). The poorest mental health status was in the child with low-functioning autism (LFA) group (31.6%). There were 428 working mothers (24.7%) with poor mental health status, compared to 993 non-working mothers (29.7%) (P<0.001). The logistic regression model results showed that the unemployed mothers had higher odds of poor mental status compared to employed mothers (OR 1.22, 95% CI 1.06–1.41; Table 3). Compared with mothers of 0–2-year-old children, mothers of 10–13-year-old children had a lower risk of poor mental health status (OR 0.63, 95% CI 0.43–0.91). Compared with mothers of children with LFA, mothers of children with high-functioning autism (HFA) had a lower risk of poor mental health status (OR 0.76, 95% CI 0.62–0.94). Having children with comorbidities was associated with a greater likelihood of poor mental health status (OR 1.56, 95% CI 1.35–1.81), and so was having conflicts with other family members (OR 1.44, 95% CI 1.22–1.70). Above-average family income was linked with a lower likelihood of poor mental health status (OR 0.70, 95% CI 0.58–0.82). Child gender, the number of children in the household, the mother's education level, assistance from grandparents, or the number of information channels was not significantly associated with maternal mental health status.

Table 2 Characteristics of mothers with poor mental health status

Characteristics	*n* (%)	χ^2	*P* value
Overall	1421 (28.0)		
Children's demographics			
Age of child (years)			
0–2 (*n*=312)	94 (30.1)	5.050	0.282
3–5 (*n*=2721)	762 (28.0)		
6–9 (*n*=1664)	476 (28.6)		
10–13 (*n*=312)	74 (23.7)		
14–17 (*n*=68)	15 (22.1)		
Gender of child			
Boy (*n*=4278)	1195 (27.9)	0.041	0.830
Girl (*n*=799)	226 (28.3)		
ASD severity			
LFA (*n*=1196)	378 (31.6)	20.876	<0.001
MFA (*n*=2052)	566 (27.6)		
HFA (*n*=908)	207 (22.8)		
Undetermined (*n*=921)	270 (29.3)		
Comorbidity			
No (*n*=3851)	995 (25.8)	36.627	<0.001
Yes (*n*=1226)	426 (34.7)		
Only child			
No (*n*=2504)	732 (29.2)	2.725	0.102
Yes (*n*=2573)	689 (26.8)		
Mothers' characteristics			
Employment status			
Work (*n*=1735)	428 (24.7)	22.427	<0.001
Non-work (*n*=3342)	993 (29.7)		
Higher education degree			
No (*n*=1720)	538 (31.3)	18.918	<0.001
Yes (*n*=3357)	883 (26.3)		
Conflicts in family			
No (*n*=4341)	1157 (26.7)	26.523	<0.001
Yes (*n*=736)	264 (35.9)		
Grandparents' assistance			
No (*n*=3613)	1061 (29.4)	11.791	<0.001
Yes (*n*=1464)	360 (24.6)		
Information channels[a]			
<3 (*n*=3186)	933 (29.3)	7.122	0.008
≥3 (*n*=1891)	488 (25.8)		
House income			
Below average (*n*=1338)	454 (33.9)	48.780	<0.001
Around average (*n*=1684)	492 (29.2)		
Above average (*n*=2055)	475 (23.1)		

[a] Including TV programs, newspapers, books, the Internet, WeChat, QQ groups, and others. ASD: autism spectrum disorder; LFA: low-functioning autism; MFA: middle-functioning autism; HFA: high-functioning autism.

3.3 Predictors of mothers' poor mental health in two groups

Regression was carried out for the working mothers and non-working mothers. Mothers who were on a long leave (OR 1.69, 95% CI 1.28–2.24; Table 4) were 1.69 times likely to have poor mental health status than those who had full-time jobs. Mothers who were non-working because of the demands of caring for their child with ASD (OR 1.42, 95% CI 1.07–1.87) were 1.42 times likely to have poor mental health status than those who had left work for other reasons. In the work group, mothers of children aged 6–9 years (OR 0.62, 95% CI 0.41–0.94) and 10–13 years (OR 0.58, 95% CI 0.34–0.99) had better mental health status compared to mothers of children aged 0–2 years. For working mothers, the level of the children's functioning was influential, with HFA (OR 0.68, 95% CI 0.51–0.92) and middle-functioning autism (MFA; OR 0.72, 95% CI 0.55–0.93) children impacting maternal mental health status less than LFA children. However, for non-working mothers, we did not find a significant association between ASD severity and mental health status. Mothers of children with comorbidities were more likely to have poor mental health status than mothers of children without comorbidities (OR 1.77, 95% CI 1.42–2.22 in the work group, and OR 1.42,

Table 3 Logistic regression analyses for variables predicting poor mental status in mothers

Characteristics	OR	95% CI
Gender of child		
Boy	1.00	Reference
Girl	1.02	0.86–1.21
Age of child (years)		
0–2	1.00	Reference
3–5	0.85	0.66–1.11
6–9	0.82	0.63–1.09
10–13	0.63**	0.43–0.91
14–17	0.58	0.31–1.10
ASD severity		
LFA	1.00	Reference
MFA	0.89	0.76–1.05
HFA	0.76**	0.62–0.94
Comorbidity		
No	1.00	Reference
Yes	1.56***	1.35–1.81
Undetermined	0.94	0.77–1.14
Employment status		
Work	1.00	Reference
Non-work	1.22**	1.06–1.41
Only child		
No	1.00	Reference
Yes	1.03	0.91–1.17
Higher education degree		
No	1.00	Reference
Yes	0.95	0.82–1.09
Conflicts in family		
No	1.00	Reference
Yes	1.44***	1.22–1.70
Grandparents' assistance		
No	1.00	Reference
Yes	0.94	0.81–1.10
Information channels[a]		
<3	1.00	Reference
≥3	0.90	0.79–1.03
House income		
Below average	1.00	Reference
Around average	0.87	0.74–1.02
Above average	0.70***	0.58–0.82

[a] Including TV programs, newspapers, books, the Internet, WeChat, QQ groups, and others. ** P<0.01, *** P<0.001. OR: odds ratio; CI: confidence interval; ASD: autism spectrum disorder; LFA: low-functioning autism; MFA: middle-functioning autism; HFA: high-functioning autism.

Table 4 Logistic regression analyses for variables predicting poor mental status in mothers in two groups

Characteristics	Work group		Non-work group	
	OR	95% CI	OR	95% CI
Work state				
Full-time	1.00	Reference		
Flexible	1.16	0.93–1.46		
Overtime	1.28	0.70–2.32		
A long leave	1.69***	1.28–2.24		
Leave work reason				
Others			1.00	Reference
Take care of child			1.42**	1.07–1.87
Gender of child				
Boy	1.00	Reference	1.00	Reference
Girl	1.08	0.82–1.41	0.98	0.78–1.22
Only child				
No	1.00	Reference	1.00	Reference
Yes	0.95	0.78–1.16	1.10	0.93–1.31
Age of child (years)				
0–2	1.00	Reference	1.00	Reference
3–5	0.79	0.53–1.18	0.89	0.62–1.26
6–9	0.62**	0.41–0.94	0.97	0.67–1.40
10–13	0.58*	0.34–0.99	0.61	0.36–1.04
14–17	0.50	0.21–1.16	0.61	0.23–1.63
Comorbidity				
No	1.00	Reference	1.00	Reference
Yes	1.77***	1.42–2.22	1.42***	1.17–1.71
ASD severity				
LFA	1.00	Reference	1.00	Reference
MFA	0.72**	0.55–0.93	1.00	0.81–1.22
HFA	0.68**	0.51–0.92	0.77	0.58–1.04
Undetermined	0.74	0.53–1.03	1.11	0.87–1.41
House income				
Below average	1.00	Reference	1.00	Reference
Around average	0.77	0.59–1.03	0.91	0.75–1.11
Above average	0.63***	0.49–0.82	0.74**	0.60–0.92
Higher education degree				
No	1.00	Reference	1.00	Reference
Yes	1.11	0.85–1.46	0.87	0.73–1.04
Conflicts in family				
No	1.00	Reference	1.00	Reference
Yes	1.34**	1.03–1.75	1.48***	1.19–1.85
Grandparents' assistance				
No	1.00	Reference	1.00	Reference
Yes	1.03	0.84–1.27	0.88	0.69–1.14
Information channels[a]				
<3	1.00	Reference	1.00	Reference
≥3	0.91	0.75–1.12	0.87	0.73–1.04

[a] Including TV programs, newspapers, books, the Internet, WeChat, QQ groups, and others. * P<0.05, ** P<0.01, *** P<0.001. OR: odds ratio; CI: confidence interval; ASD: autism spectrum disorder; LFA: low-functioning autism; MFA: middle-functioning autism; HFA: high-functioning autism.

95% CI 1.17–1.71 in the non-work group). Mothers in a above-average income family had a less odds of poor mental health status compared to mothers in a below-average income family (OR 0.63, 95% CI 0.49–0.82 in the work group, and OR 0.74,95% CI 0.60–0.92 in the non-work group). Mothers in a family having conflicts had a higher odds of poor mental health status than mothers in a family without conflicts (OR 1.34, 95% CI 1.03–1.75 in the work group, and OR 1.48, 95% CI 1.19–1.85 in the non-work

group). Children gender, the number of children in household, the mother's education level, assistance from grandparents, or the number of information channels was not significantly associated with self-rated maternal mental status in both groups.

4 Discussion

This study examined the self-reported mental health status of mothers of children with ASD in China. It was the first study to explore the factors associated with maternal self-rated mental health in China using a large sample size and a wide age range of children.

Our findings on maternal psychological status were not encouraging. A total of 28.0% of mothers of children or adolescents with ASD self-reported having a poor mental health status. This is in accord with Gatzoyia et al. (2014), who discovered that 34.2% of parents of child with ASD had clinical symptoms of depression. Davis and Carter (2008) also found that 25% of parents had depression symptoms. In their study, non-working mothers were 1.22 times likely to have poor mental health than working mothers. The main consequence of not working is a decrease in family income (Myers et al., 2009; Fletcher et al., 2012). In this study, we discovered that 15.5% of fathers chose to overwork. Another study by Myers et al. (2009) reported that co-parents tended to increase their working hours to alleviate financial stress.

Long-term-leave mothers were 1.69 times likely to have poor mental health than full-time working mothers, demonstrating that long-term full-time home care was associated with negative maternal mental health. According to existing research, taking extended leave has a negative impact on mothers' mental health (Hauge et al., 2015). Mothers with flexible work schedules do not feel better than full-time working mothers. As previous studies have found, flexible work arrangements can be unreasonable and stressful in China (Chou et al., 2018). Paid work serves an important function for mothers who have a disabled child, and is linked to better mental health. More research is needed to verify this. Mothers who do not work involuntarily in order to take care of children are more likely to have poor mental health. This emphasizes the critical role of mothers in caregiving as well as the potential negative impact of additional caregiving responsibilities. Previous research has found that involuntarily unemployed mothers have a lower quality of life than voluntarily unemployed mothers (Chou et al., 2018), which was confirmed by this study.

Social support is associated with better maternal mental health, while conflicts with family members are associated with negative maternal mental health. According to previous research, one of the important factors for resilience is family members cooperating with each other for the child's well-being (Bayat, 2007). Caregivers report feeling misunderstood by family members, which becomes a source of stress (Celia et al., 2020). In our results, the information or assistance provided by grandparents has no significant impact on the mental health of mothers. However, we only tested a small portion of informal social supports in this study, and did not investigate the distinction between the quantity and quality of support, or as the difference between actual and perceived support (Haber et al., 2007). No significant direct relationships were found, so social support might have an indirect effect on maternal mental health through other variables. Reducing conflicts within the family and working outside the home appear to be two protective factors for mental health. Individual traits, such as psychological resilience (Cardelle-Pérez et al., 2024) and problem-focused coping strategies (Vernhet et al., 2019), could potentially buffer the impact of caregiving challenges on maternal mental health. Future research should aim to identify protective factors, as well as investigate how they interact with risk factors in shaping overall psychological outcomes.

We found that the chance of having poor mental health decreases as children grow older, which is in line with earlier studies (Rosenthal et al., 2013; Bourke-Taylor et al., 2022). One possible explanation is that long-term caregiving could cause a mother to accept the role and develop better coping skills, according to the adaptation model (Lazarus and Folkman, 1984). More research is needed to better understand how parental stress manifests in parents of very young children with ASD, and how to best support these parents. ASD severity and comorbidities were related to maternal mental health, which is also consistent with previous studies (Estes et al., 2013; Zablotsky et al., 2013). While we evaluated the presence of ADHD and EP, we did not collect information on other situations such as language and communication deficits, severe self-injurious or aggressive behaviors, or sleep problems. Adolescents and young adults with

ASD, in particular, may have behavioral problems that impair caregivers' well-being (Adler et al., 2015). A more extensive investigation of comorbidity is required in the future. Understanding the unique challenges faced by this subset of caregivers can inform the development of targeted interventions and support services tailored to their specific needs.

There are a number of limitations of this study. First, all families were invited to participate in this study and completed an electronic questionnaire, which did not allow for control stratification in sampling. More rigorous sampling survey methods should be adopted in the future to improve on our research. Second, the use of a single self-report question to measure mental health status is a limitation. While pragmatic for an initial exploratory investigation, this approach lacks the psychometric rigor of validated and multi-item mental health instruments. However, different research topics have different requirements for the accuracy of the tools. If an in-depth investigation into this topic is required, it should employ comprehensive and standardized scales to more reliably and validly assess mental health. Supplementing self-reports with clinical evaluations would also strengthen subsequent studies. Despite the drawbacks, these preliminary data have great practical significance for the understanding of families with ASD children. Third, social support is commonly defined by a scale, which is more accurate and reflects several elements of social support. This study was conducted during the coronavirus disease 2019 (COVID-19) pandemic, when social support was restricted. As a result, we only measured social support in terms of grandparents' involvement and information channels. However, social support was more systematic, so we only captured a portion of the picture. We did not specifically compare mental health between mothers who shared caregiving responsibilities with their spouses and those who were the primary caregivers for their children with ASD. The potential protective effects of spousal support on maternal mental health are important. Future studies should explicitly examine the presence or absence of spousal involvement in caregiving. In addition, it is crucial to emphasize that this study did not collect information on the availability or use of support services offered by government agencies or non-governmental groups. Access to such support systems may act as a buffer against mental health issues. Understanding the role of formal social support provisions may guide policies and activities targeted at improving the well-being of caregivers of children with ASD. Fourth, we did not go into detail about the roles of grandparents. Instrumental assistance is not the same as emotional support, and assistance delivered with a heavy dose of conflict can reduce the positive impact of the assistance provided. More research will be required in the future. Fifth, the cross-sectional design of the study does not allow for causal relationships to be established. Health and employment status can influence psychology, just as it can influence them in turn. Individuals with ASD are more likely to have parents with preexisting psychiatric disorders, which may further contribute to the challenges. Future research would benefit from more sophisticated modeling techniques to investigate the ways in which the variables interact.

5 Conclusions

This study reports on self-rated negative mental health outcomes for mothers of children with ASD in China. We used national survey data that represented widely different social backgrounds and sociodemographic characteristics. Maternal mental health status was associated with familial, child-related, and full-time caregiving factors. The well-being of mothers of children with ASD may be enhanced by removing barriers to employment and social engagement and by addressing the financial strain of raising a child with ASD. Mothers with good mental health are more likely to have positive perceptions of their children and are more successful at reframing problems associated with their children's disabilities. Subjective well-being is beneficial to both an individual's and a society's effective functioning, so it is critical to track people's subjective psychological state in order to maximize their potential.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Author contributions

Yanan ZHAO designed the data collection instruments, collected data, performed the data analysis, and wrote and edited the manuscript. Rong ZHANG and Xiaoying ZHENG contributed to the study design, data analysis, and writing and editing of the manuscript. Huiyun FAN coordinated data collection and reviewed the manuscript. All authors have read and approved the final manuscript, and therefore, have full access to all the data in the study and take responsibility for the integrity and security of the data.

Compliance with ethics guidelines

Yanan ZHAO, Huiyun FAN, Rong ZHANG, and Xiaoying ZHENG declare that they have no conflict of interest.

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2013. Informed consent was obtained from all families for being included in the study. This study was approved by the ethics committee of Peking University Institutional Review Board (No. IRB00001052-20016).

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Supplementary information

Tables S1 and S2