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ORIGINAL ARTICLE

Symptoms of attention deficit hyperactivity disorder and quality of life of mothers of school-aged children: The roles of child, mother, and family variables

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Abstract This study examined the impact of inattention and hyperactivity symptoms in children and mothers, opposition problems in children, maternal depression, and perceived family support on the quality of life (QOL) of mothers. Mothers of children in one elementary school were contacted. The relationship between sociodemographic variables, the levels of inattention and hyperactivity symptoms in children and mothers, oppositional symptoms in children, maternal depression, perceived family support, and maternal QOL were examined. Three hundred and eighty-two participants were included in this study. Consistent factors related to the mother's QOL in the four domains were maternal depression, perceived family support, and housing status after controlling for several family, maternal, and child variables. Maternal QOL was more related to her own and family factors including maternal inattention, hyperactivity and depression symptoms, perceived family support, and housing status, instead of

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parent-rated inattention and hyperactivity symptoms of the child. Screening for maternal inattention, hyperactivity and depression symptoms, and mental health services for these mothers are warranted based on these findings.

Introduction

Recent health surveys have reported increasing prevalence rates of attention deficit hyperactivity disorder (ADHD) progressively in the USA, that is 7.8% in 2003 and 9.5% in 2007 [1]. Children with ADHD have also been reported to have wide-ranging functional impairments, lower quality of life (QOL), diminished family functioning, and hindered parental well-being [2,3]. QOL has become increasingly important in health care practice and related research. Nevertheless, very few studies have discussed the impact of childrens' symptoms (i.e., inattention, hyperactivity, and opposition) on the QOL of parents. One study from the USA national survey showed that children with ADHD had a profound negative effect on parents' QOL as compared to unaffected controls [4]. Another study in Hong Kong also showed that parents of children with ADHD had a worse QOL as compared with the community norm [5].

A social ecological systems model proposes that stress on any person in the family may influence the well-being of all family members [6,7]. Studies of QOL of parents of children with ADHD, however, did not take into account the effect of the parents' own inattention, hyperactivity, and depression symptoms and perceived family support. A previous study showed that ADHD was related to a mothers' psychological stress in Taiwan [8]. Therefore, the present study strived to investigate the impact of inattention and hyperactivity symptoms in children and in mothers, opposition problems in children, and maternal depression on the mother's QOL in Taiwan. In addition, we examined if family support buffers the negative impact of child and maternal inattention and hyperactivity, the child's opposition, as well as maternal depression on maternal QOL.

Methods

Participants

This study was conducted at an elementary school in Taichung City, Taiwan, from April 2009 to June 2009. Half of the classes in the school from Grade 1 to Grade 6 were randomly selected. A total of 634 questionnaires were sent to the parents; 581 caregivers responded and 398 agreed to participate. Three hundred and eighty-two mothers who signed informed consent letters and completed the questionnaires were enrolled in this study, with a return rate of 60.3%.

Instruments

1. The Swanson, Nolan, and Pelham rating scale version IV was used to measure child's AD, HD, ODD (Results section, in Tables 1, 2, 3).
2. The World Health Organization Quality of life -BREF was used t o measure maternal QOL (Results section, in Tables 2, 3).
3. Adult ADHD self-report Scale was used to measure mother's AD and HD (Results section, in Tables 1, 2, 3).
4. Chinese version of the Center for Epidemiologic Studies Depression Scale was used to measure mother's depression (Results section, in Tables 1, 2, 3).
5. The Family Adaptation, Partnership, Growth, Affection, Resolve was used to measure maternal perception of family support (Results section, in Tables 1, 2, 3).

The Swanson, Nolan, and Pelham rating scale version IV
The 26-item Swanson, Nolan, and Pelham rating scale version IV (SNAP-IV) assesses the core symptoms of ADHD as defined by the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) and has been found to have good psychometric properties in Taiwan [9,10]. Higher scores for inattention, hyperactivity/impulsivity, and opposition subscales of SNAP-IV meant more symptoms.

The World Health Organization Quality of Life-BREF
The World Health Organization Quality of Life-BREF (WHOQOL-BREF) is a 26-item questionnaire used to measure respondents' subjective feelings of their QOL [11]. Two items of local importance (i.e., feeling respected and favorite food accessibility) have been added to the Taiwanese version, and it has been found to have good psychometric properties including reliability and validity [12,13]. The Taiwanese version of the WHOQOL-BREF is rated on a five-point scale and scored over four domains: Physical Capacity, Psychological Well-being, Social Relationship, and Environment. A higher score indicates a higher QOL.

Adult ADHD Self-report Scale
The Adult ADHD Self-report Scale (ASRS) is an 18-item scale that measures the frequency of DSM-IV adult ADHD symptoms over the previous 6 months. The ASRS consists of two subscales, inattention and hyperactivity/impulsivity. Items over the past 6 months were rated on a five-point Likert scale [14]. The Chinese version of ASRS was translated and validated in a Taiwanese sample of 4329 adults [15].

Chinese version of The Centre for Epidemiologic Studies Depression Scale

The Chinese version of The Centre for Epidemiologic Studies Depression Scale (CESD-C) is a 20-item self-rating scale to assess levels of depressive symptoms during the previous week [16,17]. The sensitivity and specificity of the CESD-C in screening depression in community participants were 92% and 91%, respectively, with a classification rate of 91.8% at a cut-off point of 15 [16]. Mothers with CESD-C scores $>$ 16 were screened as depressed.

The Family Adaptation, Partnership, Growth, Affection, Resolve

The Family Adaptation, Partnership, Growth, Affection, Resolve (Family APGAR) was used to evaluate the satisfactory level of support and communication in the family [18,19]. A higher score indicates poor support and communication. The Chinese version of Family APGAR has been validated and found to be a reliable and valid instrument in Taiwan [18,19].

Procedure

The Research Ethics Committee (iInstitutional rReview bBoard, IRB) of the Tsaotun Psychiatric Center approved this study prior to the start of data collection. Half of the classes at the school from Grade 1 to Grade 6 were randomly selected, and a package of questionnaires along with an informed consent letter was taken home by the students. After being completed by the mother at home, the questionnaires were returned to the teachers by the students.

Data analysis

Independent sample *t* test and Pearson Correlation Coefficient statistics were used to examine the association of sociodemographic and clinical variables with maternal QOL. Multiple regression analyses were employed to investigate the relationship between the four domains of QOL and the maternal rating of the child's inattention, hyperactivity, and oppositional symptoms with statistically significant variables in the association of sociodemographic and clinical variables with four domains of maternal QOL in Model 1. Maternal inattention and hyperactivity symptoms and depression were further adjusted in Model 2, and finally perceived family support in Model 3. Data analyses were performed using SPSS version 16.0 (SPSS Inc., Chicago, IL, USA). An alpha level of 0.05 was used to determine statistical significance.

Results

Participants' characteristics

Among the 382 participants, the average child's age was 10.03 years and maternal age was 39.10 years. About half of the children were reported as having allergic rhinitis, and 25.68% of mothers were screened positively for depression. Most of the participants came from a two-parent family and 19.79% of the families rented a place to stay. The sociodemographic characteristics of the participants are presented in Table 1.

Table 1 Sociodemographic characteristics of the study participants.

Variable	*N*	Mean (SD)
Age of father (y)	365	42.39 (4.74)
Age of mother (y)	382	39.10 (4.33)
Age of child (y)	378	10.03 (1.63)
Number of children	382	2.07 (0.71)
Child AD symptom	381	8.52 (5.22)
HD symptom	382	5.95 (5.04)
OD symptom	382	6.76 (4.71)
Maternal AD symptom	380	12.84 (5.50)
HD symptom	380	8.53 (4.93)
Family support	379	9.90 (3.77)
Variable	***N***	**%**
Boy	193	50.66
Full-time job (father)	335	91.53
Full-time job (mother)	241	63.93
Education (college or above, father)	199	53.78
Education (college or above, mother)	199	52.51
Renting house	75	19.79
Two-parent family	329	92.68
Allergic rhinitis	178	47.98
Maternal depression	94	25.68

AD = attention deficit; HD = hyperactivity/impulsivity; OD = opposition defiance; SD = standard deviation.

Association between mother's QOL and sociodemographic and clinical variables

The four domains of maternal QOL scores were significantly associated with maternal age, levels of education, inattention, hyperactivity and depression symptoms, child's levels of inattention, hyperactivity, and opposition symptoms, family residence status, paternal levels of education, and perceived family support. Mothers who were older and screened negatively with depression, had higher education and less inattention and hyperactivity symptoms, and more perceived family support had higher QOL. Mothers who rated their child as having more inattention, hyperactivity, and opposition symptoms and lived in rented accommodation had worse QOL in all four domains. The associations of sociodemographic and clinical variables with maternal QOL are reported in Table 2.

To further evaluate the impact of the child's (i.e., attention, hyperactivity, and opposition symptoms), maternal (i.e., attention, hyperactivity, and depression) and family (level of support) variables on maternal QOL, multiple regression models were performed separately for four domains of maternal QOL.

When the child's attention, hyperactivity, and opposition symptoms were adjusted with the significant sociodemographic and clinical variables, the child's levels of attention and opposition symptoms were both significant in the psychological and environment domains of maternal

Table 2 Association of sociodemographic and clinical variables with maternal quality of life (QOL).

Statistical variable		Domain of QOL							
		Physical capacity		Psychological well-being		Social relationship		Environment	
		r		*r*		*r*		*r*	
Pearson correlation									
Age (child)		−0.005		0.069		0.057		0.033	
Age (mother)		0.149**		0.137**		0.169**		0.192***	
Age (father)		0.041		0.058		0.069		0.047	
Number of children		−0.021		−0.015		0.059		0.043	
Child AD symptom		−0.226***		−0.310***		−0.241***		−0.291***	
HD symptom		−0.204***		−0.230***		−0.204***		−0.239***	
OD symptom		−0.243***		−0.320***		−0.246***		−0.282***	
Maternal AD symptom		−0.340***		−0.394***		−0.313***		−0.369***	
HD symptom		−0.305***		−0.375***		−0.270***		−0.343***	
Family support		−0.337***		−0.479***		−0.483***		−0.449***	
t test		Mean (SD)	*t*	Mean (SD)	*t*	Mean (SD)	*t*	Mean (SD)	*t*
Sex of child	Boy ($n = 193$)	15.05 (1.88)	−1.60	12.61 (2.00)	−0.86	14.27 (2.25)	−0.69	14.02 (2.09)	−2.09*
	Girl ($n = 188$)	15.37 (1.99)		12.79 (1.98)		14.43 (2.29)		14.48 (2.19)	
Allergic rhinitis	Yes ($n = 178$)	15.01 (2.09)	−1.73	12.43 (2.12)	−2.69**	14.05 (2.31)	−2.34*	14.07 (2.19)	−1.29
	No ($n = 193$)	15.37 (1.80)		12.98 (1.79)		14.60 (2.22)		14.35 (2.11)	
Job (father)	Full time ($n = 335$)	15.30 (1.92)	1.36	12.77 (2.00)	1.50	14.47 (2.28)	1.87	14.40 (2.06)	2.07*
	Part time or no work ($n = 31$)	14.80 (2.06)		12.22 (1.79)		13.68 (2.01)		13.59 (2.22)	
Job (mother)	Full time ($n = 241$)	15.362 (1.91)	1.81	12.90 (1.94)	2.64**	14.51 (2.20)	1.76	14.39 (2.01)	1.62
	Part time or housewife ($n = 136$)	14.99 (1.92)		12.34 (2.07)		14.08 (2.41)		14.00 (2.37)	
Education (father)	College or above ($n = 199$)	15.52 (1.81)	2.90**	12.91 (1.95)	1.99*	14.66 (2.09)	2.46*	14.81 (1.87)	4.91***
	High school or below ($n = 171$)	14.94 (2.03)		12.50 (2.03)		14.09 (2.41)		13.74 (2.23)	
Education (mother)	College or above ($n = 199$)	15.57 (1.84)	3.81***	13.01 (2.02)	3.30**	14.70 (2.24)	3.18**	14.78 (1.89)	5.06***
	High school or below ($n = 180$)	14.82 (1.98)		12.34 (1.93)		13.97 (2.26)		13.68 (2.28)	
Maternal depression	Screen negative ($n = 272$)	15.73 (1.75)	9.68***	13.34 (1.56)	11.83***	14.98 (1.93)	10.15***	14.89 (1.81)	10.38***
	Screen positive ($n = 94$)	13.75 (1.62)		10.99 (1.92)		12.57 (2.13)		12.55 (2.06)	
Marital status	Single ($n = 26$)	15.03 (2.17)	0.57	12.59 (1.68)	0.36	13.69 (2.60)	1.54	13.73 (2.61)	1.39
	Not single ($n = 329$)	15.26 (1.95)		12.73 (2.01)		14.40 (2.25)		14.34 (2.12)	
Renting house	Renting house ($n = 75$)	14.23 (1.79)	−5.03***	11.97 (2.08)	−3.58***	13.36 (2.42)	−4.28***	12.76 (2.00)	−7.22***
	Own house ($n = 304$)	15.45 (1.91)		12.88 (1.92)		14.59 (2.18)		14.63 (2.00)	

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.
AD = attention deficit; HD = hyperactivity/impulsivity; OD = opposition defiance; SD = standard deviation.

Table 3 Multiple regression for maternal quality of life (QOL).

Domain of QOL[a]													
Variables/models		Physical capacity			Psychological well-being			Social relationship			Environment		
		1[b]	2[c]	3[d]	1[b]	2[c]	3[d]	1[b]	2[c]	3[d]	1[b]	2[c]	3[d]
Child	AD symptom	−0.035	−0.003	0.003	−0.079**	−0.036	−0.020	−0.044	−0.013	0.008	−0.063*	−0.019	−0.008
	HD symptom	0.010	−0.001	−0.004	0.051	0.036	0.034	−0.002	−0.020	−0.023	0.020	0.011	0.007
	OD symptom	−0.072**	−0.020	−0.014	−0.133***	−0.067*	−0.057*	−0.097**	−0.038	−0.024	−0.084**	−0.033	−0.022
Mother	AD symptom		−0.050*	−0.044*		−0.048*	−0.033***		−0.065*	−0.046		−0.055*	−0.042
	HD symptom		−0.042	−0.040		−0.062*	−0.060*		−0.013	−0.010		−0.052*	−0.049*
	Depression		−1.329***	−1.246***		−1.801***	−1.652***		−1.469***	−1.267***		−1.374***	−1.200***
Family support				−0.069**			−0.148***			−0.200***			−0.131***

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.
AD = attention deficit; HD = hyperactivity/impulsivity; OD = opposition defiance.
[a] All models were adjusted with significant sociodemographic and clinical variables associated with the specific domain of maternal QOL.
[b] Additional adjustment for child level of AD, HD, and OD symptoms.
[c] Additional adjustment for maternal AD and HD symptoms and screening status of depression.
[d] Additional adjustment for perceived family support.

QOL (Table 3, Model 1); however, in the physical and social domains, only the level of opposition symptoms was significant. When adding the level of maternal inattention and hyperactivity symptoms and depression into Model 2, the child's opposition symptoms and maternal attention and hyperactivity symptoms as well as depression were significant predictors in the psychological domain of maternal QOL; maternal attention and hyperactivity symptoms as well as depression in the environment domain; and maternal attention symptoms and depression in the physical and social domains were noted. When maternal perceived family support was finally added in Model 3, the child's level of opposition symptoms, maternal attention and hyperactivity symptoms and depression, and perceived family support were significant predictors in the psychological domain; maternal attention symptoms and depression and perceived family support in the physical domain; maternal hyperactivity symptoms and depression and perceived family support in the environment domain; and maternal depression and perceived family support in the social domain.

Discussion

To the best of our knowledge, this is the first report exploring the role of maternal inattention and hyperactivity symptoms, depression, and perceived family support in the relationship between inattention, hyperactivity, and opposition symptoms in children and maternal QOL. The main findings of the present study showed that a child's inattention and opposition symptoms were associated with maternal QOL. However, when maternal inattention and hyperactivity symptoms, maternal depression, and perceived family support were sequentially adjusted, the child's inattention symptoms were no longer a significant predictor of maternal QOL. Consistent factors related to the mother's QOL in the four domains were maternal depression, perceived family support, and residence status after controlling for several family, maternal, and child variables. Perceived family support did not buffer the effect of the child's inattention, hyperactivity, and opposition symptoms, as well as maternal inattention, hyperactivity, and depression on their QOL.

Maternal QOL was more related to the mother's own variables and family factors instead of parent-rated inattention and hyperactivity symptoms of the child. Mothers who screened positive for depression, perceived less family support, and lived in rented accommodation showed worse maternal QOL. For the specific QOL domains, mothers with more inattention symptoms had worse physical QOL; those with more hyperactivity symptoms had worse environmental QOL; those with more hyperactivity and inattention symptoms and a child with more oppositional symptoms had worse psychological QOL.

Consistent with studies of parental QOL of children with developmental disorders or chronic medical conditions [20—23], the present study found an association between maternal depression and QOL across all four domains. Children with ADHD have been shown to be significantly associated with higher levels of depression among mothers [24,25], and maternal distress is associated with dysfunctional parenting practice and maladjustment of the child

[26,27]. Recent studies in Taiwan found that depressed mothers exhibited a flat affect when communicating with their children with ADHD [27], while maternal affection served as a buffer for children with attention problems from developing social adjustment problems [28]. Self-care of mothers is important when working towards maintaining the mental health and well-being of the whole family [6]. Depression prevention, screening, and intervention may be important when attempting to improve the QOL of the mothers of elementary school-aged children, and may be potentially related to the long-term health and well-being of both the mothers and their children [27,29].

Family support is considered a significant predictor of maternal QOL. However, in our study, it did not buffer the negative effect of maternal depression, inattention, and hyperactivity symptoms on maternal QOL. The stressor/support specificity model of the buffering process, which argued that support will be effective only when it provides the resources for fulfilment of the coping requirements elicited by stressful events, may explain this nonsignificant finding. In addition to family support, mothers with depression and more inattention and hyperactivity symptoms may need informational and emotional supports from friends or others with similar experience and professional support to provide effective strategies for coping with the impact of maternal depression, inattention, and hyperactivity as well as opposition behavior in children.

The present study also noted the association between lower socioeconomic status (i.e., living in rented accommodation) and QOL. This result was consistent with previous studies of adults with ADHD and borderline IQ (low income) [30,31] and parents of children with ADHD (lower educational level, low household income) [5]. It has been hypothesized that people with a higher socioeconomic status can have better access to relevant information and treatment strategies in dealing with the stress caused by inattention, hyperactivity, and depression [5].

The mother's QOL in the psychological domain was related to the child's opposition symptoms instead of attention and hyperactivity. Reviews of parenting in children with ADHD have found greater stress within the family of children with ADHD comorbid with oppositional problems than that of children with ADHD only [24,25]. In addition, maternal psychological problems are more likely to be associated with oppositional problems than with ADHD [32].

In the final model (Model 3) when all child, maternal, and family variables were considered, maternal inattention symptoms were predictive in their physical and psychological QOL and hyperactivity symptoms in the psychological and environmental QOL. One recent review concluded that symptoms of ADHD in adults exert a substantial negative impact on daily life, including work, social life, and relationships [33]. Most studies investigated how overall ADHD symptom severity impacted on adult QOL [34,35], but they did not address the role of inattention and hyperactivity symptoms separately and adjust the role of comorbid depression, contextual factors such as levels of inattention, hyperactivity, and opposition symptoms in children, and perceived family support on specific domains of QOL as we did in the present study. Adults with ADHD are more likely to have children with ADHD [36]. ADHD and comorbidity in mothers and children may lead to a cycle of difficulties [25,37]. Future studies may need to include children and mothers with ADHD and investigate how child and maternal ADHD subtype, comorbidity of oppositional defiant disorder in the child, maternal depression, and family function interact to impact maternal QOL.

Inconsistent with previous studies [4,5], the present study showed that maternal QOL was more related to maternal and family variables than the inattention and hyperactivity symptoms of the child. Including maternal ADHD symptoms and depression and family function in this study may account for the inconsistent results. In addition, children with ADHD in the study of Xiang and colleagues [5] were recruited from an outpatient clinic where they received treatment. Participants in the present study were recruited from a school and might represent a wider range and overall a lesser degree of ADHD symptoms and did not receive any intervention for their inattention and hyperactivity symptoms. Also, the levels of inattention and hyperactivity symptoms of the children were rated by mothers in this study whereas ADHD in children was diagnosed using DSM-IV in Xiang's study [5]. Lee and colleagues [4] surveyed a large and representative sample but measured QOL through limited sets of QOL questions rather than by a well-established QOL instrument.

We further examined whether and how the responding rate, 60.3% in this study, may skew the relationship between maternal QOL and inattention and hyperactivity symptoms of children and their mothers. Mothers with the highest levels of inattention and hyperactivity symptoms may not return the questionnaires and could perhaps encompass a large proportion of the nonrespondents. If this assumption is sustained, participants in this study are mostly mothers with middle or low levels of inattention and hyperactivity symptoms. Nevertheless, their inattention and hyperactivity status was still found to consistently and significantly interfere with their QOL. A higher response rate coupled with severe maternal inattention and hyperactivity symptoms might provide similar or even more significant results.

Adding maternal variables in the model of maternal QOL (Model 2), the effect of child inattention and opposition problems (Model 1) were eliminated and no longer statistically significant except for opposition problems in maternal psychological QOL. It is possible that the experience of caring for a child with inattention and opposition problems is not directly related to poor maternal QOL, but rather is related to the increased levels of depression, inattention, and hyperactivity experienced by the mothers. However, since all child and maternal measures were rated by the mothers themselves, it is likely that mothers with more depressive symptoms negatively biased the reports of their child's ADHD and opposition symptoms [38]. Mothers with depression appear to be less attentive to their child's positive behaviors [27,39].

Strengths and limitations

The present findings are of interest in that they draw attention to the consistently poor influence of child and maternal inattention and hyperactivity symptoms, maternal depression, and family context (i.e., family support and

socioeconomic level) on the mother's QOL. The findings suggest a need to improve the awareness of students' inattention and opposition symptoms in school and to identify high-risk mothers (i.e., depression, inattention, and hyperactivity) so as to provide essential support and intervention for these students and their mothers. Inattention is a common symptom in children with developmental disabilities [40,41]. Future studies may need to evaluate the impact of the child's level of inattention on parental QOL of children with developmental disabilities. Clinicians also need to monitor inattention and hyperactivity symptoms and depression of mothers. Screening, assessments, and interventions for depression, inattention, and hyperactivity in mothers are important areas for professionals working in school systems to consider. The effect of treatment for inattention and opposition symptoms in children on QOL in mothers is also important for further research.

There are several limitations regarding this study that are worth considering. First, the large sample dataset was based on a school sample. The lack of a clinical sample implies the need for further replication of the findings in this study with participants with clinical diagnoses of ADHD. Therefore, it is important not to generalize the findings of this study to children with a clinical diagnosis of ADHD. Second, the measures of maternal and child inattention and hyperactivity, child opposition, maternal depression, and perceived family support are determined only by maternal self-report measures, and most of the results could be due to shared method variance. Future studies may use a multi-informant approach and include clinical samples of children with ADHD diagnosed by structured interviews and teachers' ratings of ADHD and opposition symptoms in children. Third, other maternal mental health factors (e.g., anxiety) and the father's level of inattention and hyperactivity, which might be significant to maternal QOL, are not assessed in this study. Fourth, because the participants of the present study are mothers of children from a single school with a limited response rate, these results may be prone to selection bias and generalization of the findings may be limited. Fifth, this study adopted a cross-sectional design that encompasses the problem of reverse causality, such as the relationship between inattentive and hyperactive symptoms and the QOL of mothers. Mothers with poor QOL or depression may exaggerate their children's and their own inattention and hyperactivity symptoms. For these reasons, further research using a longitudinal design, recruiting a sample drawn from multiple schools, and assessing the impact of other parental risk factors (e.g., paternal depressive, inattentive, and hyperactive symptoms) on maternal QOL are required. In addition, studies investigating the effect of inattention and opposition treatment on the QOL of mothers are also needed.

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