

Family Functioning Affected by Adolescent Idiopathic Scoliosis in China: a Cross-sectional Survey

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Abstract

Backgrounds: Adolescent idiopathic scoliosis(AIS) is a common chronic disease in youths, presenting with spinal deformity. Previous studies reported that family functioning of family members will be affected after a child is diagnosed with a chronic health condition. Family functioning would be evaluated in AIS patients and their parents in this study.

Methods: 54 AIS patients (age=14.9±1.9 years old; F:M=51:3) who underwent conservative or surgical treatments in our hospital from April 2017 to March 2018, and their parents (age=43.0±4.1 years old; F:M=40:14) were enrolled in this study. Family functioning of both the patients and their parents was evaluated using McMaster family assessment device (FAD). The relationship of family functioning between the patients and their parents was first accessed using paired-samples t-test. Family functioning was defined to be “Unhealthy” if the family FAD scores (the mean scores of the patients and their parents) were above the cut-off. The potential risk factors of the unhealthiest subscales were analyzed using the chi-squared test or the independent t-test. Then, the effects of independent risk factors were analyzed using the logistic regression model if more than two risk factors were identified.

Results: There is no significant difference between the AIS patients (1.90±0.42~2.23±0.32) and their parents (1.92±0.35~2.21±0.29) in all seven subscales ($p \geq 0.05$). The scores of the parents were moderately/strongly correlated with those of the AIS patients in all seven subscales ($r = 0.456 \sim 0.696$, $p < 0.05$). 20.4% to 87.0% of the families experienced unhealthy family functioning, and affective involvement (57.4%), and behavior control (87.0%) were the unhealthiest subscales with the mean scores above the cut-off. Coronal imbalance ($p = 0.041$, Odds ratio [OR]=3.685) was the independent risk factor of unhealthy affective involvement.

Conclusions: 20.4%~ 87.0% families reported unhealthy family functioning, especially for affective involvement and behavior control. Coronal imbalance (body image) was an independent risk factor of unhealthy affective involvement. These facts suggest a potential need of the family for assistance with establishing and maintaining near-normal daily routines after a child is diagnosed with AIS. Medical workers should provide some practical suggestions for AIS families to improve their family functioning.

Background

Adolescent idiopathic scoliosis(AIS) is the most common spinal deformity with the prevalence rate of 2% to 3%[1, 2]. AIS is defined to be a lateral curvature of the spine of unknown cause with a Cobb angle of more than 10° that occurs in adolescents aged 10 to 18 years[3]. It usually aggravates during adolescence before skeletal maturation. AIS, a chronic illness, not only cause the patient’s cosmetic deformity but also alters its mental health and lifestyle[4-6]. Otherwise, AIS can also affect family, such as causing parental anxiety and depression of the patient, increasing burden on the family budget, and altering intrafamilial relationships[7, 8].

Family functioning indicates the ability of families to cope with stress[9]. It is also one of the indicators of the family's mental health and quality of life. When a child is diagnosed with a chronic health condition, the family functioning of its members will be affected[10]. Meanwhile, the family also affects the child's chronic health condition in turn. Therefore, it is very important to measure family functioning for a better understanding of the family's responses to the child's chronic health condition. To measure it, there are several tools have been developed[11]. Among them, McMaster family assessment device (FAD), first proposed in 1983, is one most widely used self-report questionnaire for both clinical and non-clinical individuals and families[12, 13]. It has been translated into 27 languages for different populations and different cultures, including Chinese[13, 14].

AIS, as a chronic health condition, may affect the family functioning of the patient and their parents. Impaired family functioning may have a potential impact on the adolescent patient's medical condition and treatment choice. Therefore, it is necessary to: access the FAD subscales for both AIS patients and their parent; investigate the relationship of the FAD subscales between AIS patients and their parent; identify the potential risk factors of the impaired FAD subscales.

Methods

Samples

This cross-sectional survey was conducted in the Department of Orthopaedic Surgery and Department of Rehabilitation in the authors' hospital between April 2017 and April 2018. A total of 54 families with a child (aged from 12 to 17years) diagnosed with AIS were finally enrolled in this survey according to the flowchart of Figure 1. Each family has one patient and one matched parent participating in the study. All participants were orally informed, and the parents signed informed consent.

Procedures

The questionnaires were completed when waiting for surgery or before undergoing exercise treatment. General demographic and familial structure questions were answered by parents after they completed the FAD. All image data were measured by two spinal surgeons based on X-ray images.

Instruments

To assess family functioning, we used the modified FAD in Chinese, which is a 60-item self-report measure scored on a four-point scale (1~4 points: from strongly agree to strongly disagree)[14]. It consists of 7 subscales, including problem solving (the family's ability to resolve problems), communication (the exchange of information among family members), roles (patterns of behavior for handling basic family functions and whether these functions are clearly and equitably assigned), affective responsiveness (the ability of family members to experience appropriate affect), affective involvement (the extent of interest of family members in each other), behavior control (the way in which a family expresses and maintains standards for the behavior of its members) and general functioning (the

overall health of the family)[12]. The questionnaire is designed to apply to family members over the age of 12[15]. These subscales have excellent internal consistencies (0.72~0.92) and test-retest reliabilities (0.66~0.76)[12, 16].

Statistical

All data were described as means \pm standard deviations or proportions. The relationships of 7 FAD subscale scores between the AIS patients and their parents were first assessed using paired-samples t-test. Family FAD subscale scores were defined to be the mean scores of the patients and their parents. They were used to discriminate between “healthy” and “unhealthy” family functioning according to the cut-off values established by Miller et al[16]. The potential risk factors of the unhealthiest subscales were first analyzed using the chi-squared test for the categorical data and the independent t-test for the measurement data. Then, the effects of independent risk factors were analyzed using the logistic regression model if more than two risk factors were identified. All the data were analyzed using IBM SPSS (version 22.0), and $P < 0.05$ was considered statistically significant.

Results

General characteristics

A total of 54 families, including 54 AIS patients (female : male=51:3) and 54 parents (female : male =40:14), were enrolled in this study. The mean ages of the patients and their parents were 14.9 ± 1.9 years old and 43.0 ± 4.1 years old, respectively. The mean Cobb angle of the major curve is $43.3^\circ \pm 17.8^\circ$. The other general characteristics of the samples are summarized in Table 1.

FAD results

The mean FAD scores of both AIS patients and their parents were shown in Table 2. There is no significant difference between the AIS patients ($1.90 \pm 0.42 \sim 2.23 \pm 0.32$) and their parents ($1.92 \pm 0.35 \sim 2.21 \pm 0.29$) in all seven subscales ($p \geq 0.05$). All seven subscale scores of the parents were moderately/strongly correlated with those of the AIS patients ($r = 0.456 \sim 0.696$, $p < 0.05$). Family FAD scores, the average scores of the patients and their parents, were ranged from 1.91 ± 0.36 to 2.22 ± 0.28 . 20.4% to 87.0% of the families experienced unhealthy family functioning in subscales such as problem solving (20.4%), communication (37.4%), roles (31.5%), affective responsiveness (42.6%), affective involvement (57.4%), behavior control (87.0%) and general functioning (38.9%). Affective involvement ($2.13 \pm 0.31 > 2.1$) and behavior control ($2.22 \pm 0.28 > 1.9$) were the unhealthiest subscales with the mean scores above the corresponding cut-offs for disruption.

Risk factors

To detect the risk factors of unhealthy families in affective involvement and behavior control subscales, all the potential risk factors were first compared between healthy and unhealthy families using the chi-squared test or the independent t-test (Table 3). In affective involvement subscale, coronal imbalance and

brace treatment were significantly associated with unhealthy families ($p=0.014$ & 0.037 , respectively). The binary logistic regression results further revealed that only coronal imbalance ($p=0.041$, Odds ratio [OR]=3.685) was the independent risk factor of unhealthy families in affective involvement subscale (Table 4). No risk factor was identified for unhealthy families in the behavior control subscale.

Discussion

Analyses of FAD scores in this current study showed that there was no significant difference and were moderate or strong agreements on all seven subscales between the AIS patients and their parents (Table 2). It demonstrated that parents and their adolescent patients had similar experiences of family functioning. For both of them, the FAD subscales with dichotomized answer categories can provide psychometric valid estimates of family functioning[11]. Therefore, family FAD score can be defined as the average score of the adolescent patient and their parent.

The interaction between an individual member and the family system, crucial to the maintenance of family health, is complex and operates in both directions[17]. Once a child is diagnosed with a chronic health condition, the family will be affected[10]. Meanwhile, the family will also affect the child's health condition vice versa[10]. Family functioning plays a central role in keeping family members' health, disease prevention and health promotion of families[25]. Unhealthy family functioning raises the risk of significant emotional and behavioral problems in children and is associated with worse treatment outcomes[24]. The result of this study indicates that some family functioning dimensions of 20.4%~87.0% families were disturbed by AIS. Therefore, understanding the impact of AIS on families is essential for family empowerment and the development of medical interventions and family support.

Among 7 FAD subscales, affective involvement and behavior control were the unhealthiest subscales with the mean family score above the suggested healthy cut-off and more than 50% unhealthy families. Affective involvement is concerned with the extent to which family members are interested in and place value on each other's activities and concerns[12]. It refers not only to what the family does together but also to the level of participation between family members[15]. The healthiest families have intermediate levels of involvements, and either too little or too much will contribute to a high (unhealthy) score of affective involvement [17]. Therefore, this result disclosed that over half AIS families experience difficulties expressing and being receptive to others' emotions between adolescent patients and their parents after a child is diagnosed with AIS.

To find the risk factors of unhealthy families in affective involvement, coronal imbalance and brace treatment were identified using univariate analysis. But the result of multivariate further confirmed that brace treatment was a confounding factor, not an independent risk factor. This finding agrees with previous studies which showed that brace treatment is not related to serious psychosocial difficulties[8, 18, 19]. At last, only coronal imbalance was an independent risk factor of unhealthy families in affective involvement. Coronal imbalance may reduce the AIS patient's satisfaction with body image, leading to low self-esteem, psychological distress, and impairment in daily functioning[18, 20]. These individual

reactions might be related to being difficult in expressing and accepting others' emotions between AIS patients and their parents, causing an unhealthy score of affective involvement.

Behavior control mainly assesses the way in which a family expresses and maintains standards for the behavior of its members[12]. It reflects the extent to which the family creates and abides by a certain set of rules governing appropriate member behavior[21]. Poor BC can be associated with emotional issues (anxiety and depression) of children and their parents[21, 22]. Previous studies have suggested that the emotion of AIS patients and their parents can be negatively affected by AIS[5, 7]. It may explain why behavior control is the worst FAD subscale for AIS families (the most proportion of unhealthy families). The relationship between emotional issues and poor BC should be evaluated in the future.

Concerning the limitations of this work, only one parent was included in this study, and it couldn't illustrate the relationship of family functioning between fathers and mothers. Also, the emotional issues of family members were not evaluated in this study. Thus, it couldn't further offer the more relationship between emotion and family functioning. Finally, the sample size was still limited, and a multi-center study should be further performed in the future.

Conclusion

In families with AIS patients, family functioning presented a moderate/strong agreement between AIS children and their parents. 20.4%~ 87.0% families reported unhealthy family functioning in seven FAD dimensions, especially for affective involvement and behavior control with over half unhealthy families. Coronal imbalance (body image) was an independent risk factor of affective involvement. These facts suggest a potential need of the family for assistance with establishing and maintaining near-normal daily routines after a child is diagnosed with AIS. Therefore, medical workers should provide some practical suggestions for AIS families to improve their family functioning when they come to see a doctor, such as praising the child's good behavior, maintaining respect for each other, strengthening communication and so on.

Abbreviations

AIS: Adolescent Idiopathic Scoliosis

FAD-McMaster family assessment device

OR: Odds Ratio

95%CI: 95% Confidence Interval

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of Peking Union Medical College Hospital(S-K384). Written informed consent was obtained from all participants.

Consent for publication

This manuscript does not contain data relating to any particular individual participants.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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No funds were received in support of this work.

Authors' contributions

All authors made substantive intellectual contributions to this study to qualify as authors. YH and TL contributed to acquisition of data, analysis of data, statistical analysis, and interpretation of results. WY contributed to acquisition of data. HW and JS contributed to study design, study coordination, and manuscript preparation. All authors read and approved the final manuscript.

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Tables

Table 1. The general characteristics of the samples (54 patient- parent pairs).

Variables	Value
Age of patients (years/old)	14.9±1.9
Sex of patients Male	3(5.6%)
Female	51(94.4%)
Brace treatment Yes	15(27.8%)
No	39(72.2%)
Cobb angle of the major curve(°)	43.3±17.8
Shoulder height Equal	22(40.7%)
Unequal	32(59.3%)
Coronal imbalance Yes	22(40.7%)
No	32(59.3%)
Age of parents (years old)	43.0±4.1
Sex of parents Male	14(25.9%)
Female	40(74.1%)
Health insurance Yes	43(79.6%)
No	11(20.4%)
Residence City	47(87.0%)
Country	7(13.0%)
Marriage of parents Married	49(90.7%)
Divorced	4(7.4%)
Widowed	1(1.9%)
Household income ≤¥4000/month	14(25.9%)
¥4000~¥8000/month	23(42.6%)
≥¥8000/month	17(31.5%)
Job of parent Yes	34(63.0%)
No	20(37.0%)
Education of parent Junior high school	19(35.2%)
Senior high school	16(29.6%)
University	19(35.2%)

Table 2. FAD scores of the AIS patients and their parents.

Subscales	Mean (SD)			P values	Correlation coefficient	Cut-off	Unhealthy families
	Patients	Parents	Families				
PS	1.98(0.42)	1.98(0.38)	1.98(0.36)	0.933	0.645**	2.2	11(20.4%)
CM	2.12(0.42)	2.05(0.38)	2.09(0.34)	0.219	0.468**	2.2	20(37.4%)
RL	2.19(0.31)	2.21(0.29)	2.20(0.27)	0.564	0.633**	2.3	17(31.5%)
AR	2.15(0.46)	2.19(0.49)	2.17(0.43)	0.532	0.596**	2.2	23(42.6%)
AI	2.11(0.34)	2.15(0.39)	2.13(0.31)	0.458	0.456*	2.1	31(57.4%)
BC	2.23(0.32)	2.20(0.34)	2.22(0.28)	0.537	0.522**	1.9	47(87.0%)
GF	1.90(0.42)	1.92(0.35)	1.91(0.36)	0.743	0.696**	2.0	21(38.9%)

*P<0.05; **P<0.001.

Table 3. Univariate analysis results of risk factors for unhealthy Affective Involvement or Behavior Control.

Variables	Affective Involvement		p	Behavior Control		p
	≤2.1(n=23)	>2.1(n=31)		≤1.9(n=7)	>1.9(n=47)	
Age of patients (years old)	14.4±1.8	15.3±1.8	0.067	14.1±1.5	15.0±1.9	0.262
Cobb angle of major curve (°)	39.2±21.0	46.3±14.6	0.148	40.3±16.7	43.7±18.1	0.636
Disease course (months)	15.1±20.9	21.7±22.5	0.276	15.1±21.5	19.5±22.1	0.632
Sex of patients Male	2(66.7%)	1(33.3%)	0.569*	1(33.3%)	2(66.7%)	0.346*
Female	21(41.2%)	30(58.8%)		6(11.8%)	45(88.2%)	
Planned surgery Yes	9(31.0%)	20(69.0%)	0.064	4(13.8%)	25(86.2%)	1.000*
No	14(56.0%)	11(44.0%)		3(12.0%)	22(88.0%)	
Shoulder height Equal	4(33.3%)	8(66.7%)	0.462	1(8.3%)	11(91.7%)	1.000*
Unequal	41(45.2%)	7(54.8%)		6(14.3%)	36(85.7%)	
Coronal imbalance Yes	5(22.7%)	17(77.3%)	0.014	1(4.5%)	21(95.5%)	0.220*
No	18(56.3%)	14(43.8%)		6(18.8%)	26(81.3%)	
Brace treatment Yes	3(20.0%)	12(80.0%)	0.037	2(13.3%)	13(86.7%)	1.000*
No	20(51.3%)	19(48.7%)		5(12.8%)	34(87.2%)	
Parenthood Mother	17(41.5%)	24(58.5%)	0.766	7(17.1%)	34(82.9%)	0.176
Father	6(46.2%)	7(53.8%)		0(0.0%)	13(100.0%)	
Education of parent Primary/Junior school	7(36.8%)	12(63.2%)	0.529	2(10.5%)	17(89.5%)	1.000*
Senior school/University	16(45.72%)	19(54.3%)		5(14.3%)	30(85.7%)	
Job of parent Yes	16(47.1%)	18(52.9%)	0.387	4(11.8%)	30(88.2%)	1.000*
No	7(35.0%)	13(65.0%)		3(15.0%)	17(85.0%)	
Health Insurance Yes	16(38.1%)	26(61.9%)	0.177*	5(11.9%)	37(88.1%)	0.626*
No	7(63.6%)	4(36.4%)		2(18.2%)	9(81.8%)	
Residence City	19(41.3%)	27(58.7%)	0.451*	6(13.0%)	40(87.0%)	1.000*
Countryside	4(57.1%)	3(42.9%)		1(14.3%)	6(85.7%)	
Marriage of parents	21(42.9%)	28(57.1%)	1.000*	7(14.3%)	42(85.7%)	1.000*

Married						
Divorced/widowed	2(40.0%)	3(60.0%)		0(0%)	5(100.0%)	
Income <8000 rmb/month	12(33.3%)	24(66.7%)	0.052	4 (11.1%)	32(88.9%)	0.674*
≥8000 rmb/month	11(61.1%)	7(38.9%)		3(16.7%)	5(83.3%)	

* Fisher exact test.

Table 4. Binary logistic regression results of unhealthy Affective Involvement (Method = Enter).

Variables	p	Odds ratio (OR)	95% confidence interval (CI)
Coronal imbalance	0.041	3.685	1.052~12.909
Brace treatment	0.109	3.332	0.766~14.500

Figures

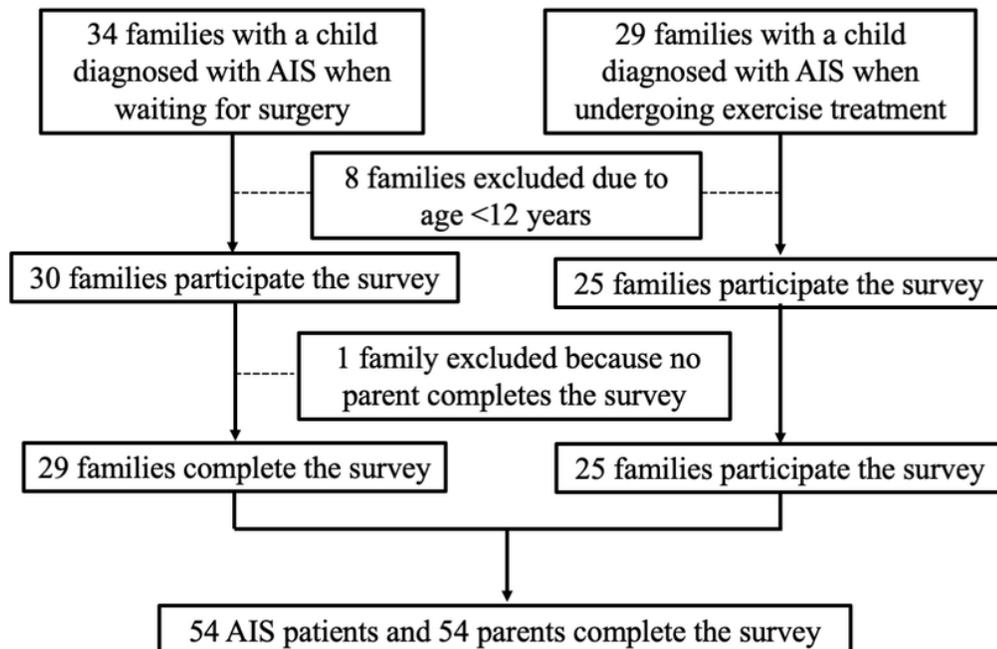


Figure 1

Study participation diagram. AIS=Adolescent Idiopathic Scoliosis.

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