Psychosocial factors associated with anxious depression

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ABSTRACT

Background: Anxious depression is a common subtype of major depressive disorder (MDD) associated with adverse outcomes and severely impaired social function. The aim of this study was to explore the relationships between child maltreatment, family functioning, social support, interpersonal problems, dysfunctional attitudes, and anxious depression.

Methods: Data were collected from 809 MDD patients. The Hamilton Anxiety Scale (HAMA), Hamilton Depression Scale-17 (HAMD-17), Family Assessment Device (FAD), Childhood Trauma Questionnaire (CTQ), Social Support Rating Scale (SSRS), Interpersonal Relationship Integrative Diagnostic Scale (IRIDS), and Dysfunctional Attitudes Scale (DAS) were administered and recorded. Anxious depression was defined as an anxiety/somatization factor score ≥ 7 on the HAMD-17. Chi-squared tests, Mann-Whitney U tests, distance correlations, and structural equation models were used for data analysis.

Results: Two-fifths of MDD patients had comorbid anxiety, and there were significant differences in child maltreatment, family functioning, social support, interpersonal problems, and dysfunctional attitudes between groups. Of these factors, interpersonal relationships were most related to anxiety in MDD patients, and dysfunctional attitudes mediated the relationship between interpersonal relationships and anxiety in MDD patients.

Limitations: This study used cross-sectional data with no further follow-up to assess patient outcomes. This study did not include information about pharmacological treatments. A larger sample size is needed to validate the results.

Conclusions: Psychosocial factors were significantly associated with anxious depression. Interpersonal relationships and dysfunctional attitudes have a direct effect on anxious depression, and interpersonal relationships also mediate the effects of anxious depression via dysfunctional attitudes.

1. Introduction

Major depressive disorder (MDD) is highly prevalent and incurs a major burden on both the individual and society (Charlson et al., 2019; Kessler et al., 2009; Levav and Rutz, 2002). Anxious depression, a common subtype of MDD (prevalence 45.7 %–75.0 %) (Andrade et al., 2003; Fava et al., 2008; Kessler et al., 2005; Kessler et al., 2015; Lamers et al., 2011), is defined as MDD with a high level of anxiety. Anxiety and depression may have a common underlying pathophysiology, which is supported by epidemiological data (Fava et al., 2004; Sandi and Richter-Levin, 2009; Wiethoff et al., 2010). Patients with anxious depression have more severe and persistent depressive symptoms (Fichter et al., 2010; McLaughlin et al., 2006; Murphy et al., 1986). A study of college students showed that elevated anxiety or depression might each be

associated with increases in the frequency of suicidal thoughts, while elevations on both together convey additional risk (Norton et al., 2008). Furthermore, patients with co-existent anxiety and depression consistently have reduced responses to antidepressants (Fava et al., 2008), poor compliance with medication (Stein et al., 2006), and severely impaired social function (Sherbourne et al., 1996). These studies suggest that there may be differences between MDD patients with and without anxiety and that targeting and personalizing treatment to specific patient subgroups may be beneficial.

Mental illnesses are multifactorial disorders associated with psychosocial factors including child maltreatment (Lindert et al., 2014), family functioning (Koutra et al., 2014), social support (Xu et al., 2018), interpersonal problems (Triscoli et al., 2019), and dysfunctional attitudes (Beevers et al., 2003; Jarrett et al., 2012). Severe child

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maltreatment is usually defined as severe physical, emotional, or sexual abuse and/or severe physical and emotional neglect by adults. Maltreated children are more likely to suffer from psychiatric disorder over the course of their lifetime, especially major depression and anxiety disorders (Anda et al., 2002; Cougle et al., 2010; Danese et al., 2009; Teicher and Samson, 2013). The more severe the abuse and neglect, the more likely the abused individuals are to show symptoms of depression and anxiety. Families with a depressed family member are reported to suffer from decreased family functioning in many domains including problem solving, communication, and family roles (Song et al., 2019; Weinstock et al., 2006). Social support represents a broad construct that refers to emotional help (e.g., providing empathy, discussing feelings), informational help (e.g., advice, suggestions), instrumental help (e.g., assistance with tasks), and companionship (e.g., social interaction and inclusion) offered by one individual to another (Blais and Renshaw, 2012). Social support plays a key role in maintaining an individual's health, and poor social support has a negative impact on health (Elsenbruch et al., 2007). In addition, social support is an important factor reported to reduce the incidence of depression and anxiety (Nasser and Overholser, 2005; Xu et al., 2018). Depression is associated with difficulties in interpersonal relationships and the degree of interpersonal problems (McEvoy et al., 2013; McFarquhar et al., 2018), and individuals with severe depression have more interpersonal problems than those with less severe or mild depression (McFarquhar et al., 2018). Individuals with severe depression also have more negative attitudes towards social touch (Triscoli et al., 2019). Depression severity and dysfunctional attitudes are positively associated but revert to normal during remission, and the magnitude of dysfunctional thinking is predictive of a subsequent depressive relapse (Beevers et al., 2003; Jarrett et al., 2012). All of these psychosocial factors are associated with depression, but their relationship with anxious depression has not been thoroughly investigated.

The two objectives of this study were to: 1) investigate the prevalence of comorbid anxiety in MDD patients and determine whether there are differences in sociopsychological factors in individuals with MDD with and without anxiety; and 2) study the relationship between child maltreatment, family functioning, social support, interpersonal problems, and dysfunctional attitudes and anxious depression.

2. Materials and methods

2.1. Participants

This study was based on data from the Chinese "Early-warning System and Comprehensive Intervention for Depression" (ESCID) project collected between April 2019 and April 2022. The target populations were outpatients and inpatients with MDD, two experienced psychiatrists diagnosed all participants and met the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) diagnostic criteria for MDD. All patients were also screened with the Mini-International Neuropsychiatric Interview 5.0.0(Lecrubier et al., 1997). The clinicians evaluating the scales were all strictly trained for consistency. The exclusion criteria were: 1) severe physical illness or craniocerebral trauma; 2) a previous diagnosis of bipolar disorder; 3) schizophrenia or any other psychotic disorder; and 4) severe cognitive impairment.

All participants were informed of the purpose of the study and agreed to participate, and the Ethics Committee of Renmin Hospital of Wuhan University approved the study protocol.

2.2. Measures

Demographic information including gender, age, education, occupation, and relationship status were collected along with clinical symptoms and social psychological variables using seven questionnaires: the Hamilton Anxiety Scale (HAMA), the Hamilton Depression Scale-17 (HAMD-17), the Family Assessment Device (FAD), the

Childhood Trauma Questionnaire (CTQ), the Social Support Rating Scale (SSRS), the Interpersonal Relationship Integrative Diagnostic Scale (IRIDS), and the Dysfunctional Attitudes Scale (DAS).

HAMD-17 is commonly used by clinicians to evaluate the severity of depressive symptoms and to guide treatment (Bagby et al., 2004; Hamilton, 1960; Williams, 1988). The 17 items of HAMD-17 are rated on a five- or three-point scale. Anxious depression was defined as an anxiety/somatization factor (includes six items from the HAMD-17: the items for psychic anxiety, somatic anxiety, gastrointestinal somatic symptoms, general somatic symptoms, hypochondriasis, and insight) score ≥ 7 on the HAMD-17. Depression severity was measured with the HAMD-17 subtotal score (not including the items used to identify anxious depression) (Lin et al., 2014).

HAMA is a 14-item scale designed to assess and quantify the severity of physical and psychological symptoms of anxiety. The 14 items include psychic (anxious mood, tension, fears, insomnia, difficulties in concentration and memory, depressed mood, and behavior during interview) and somatic (general somatic symptoms: muscular, sensory, cardiovascular symptom, respiratory symptoms, gastrointestinal symptoms, genitourinary symptoms, and other autonomic symptoms) anxiety items. Each item is rated on a five-point scale, with each item contributing 0–4 points to the total HAMA score (Hamilton, 1959; Thompson, 2015).

The FAD is clinically useful for identifying levels of satisfaction in multiple domains of family life and was designed to evaluate the six dimensions of the McMaster model of family functioning (Epstein et al., 1978). The first six scales of FAD assess problem solving, communication, roles, affective responsiveness, affective involvement, and behavior control, while the seventh scale assesses general functioning (Epstein et al., 1978; Mansfield et al., 2015). Higher scores are associated with poorer family functioning.

The CTQ assesses the degree to which individuals have experienced childhood maltreatment during their entire childhood (Bernstein et al., 1997; Bernstein et al., 2003). Three types of abuse (emotional, physical, and sexual) and two types of neglect (emotional and physical) are measured by presenting participants with five statements about each type of childhood maltreatment with responses given on a 0 (never) to 4 (very often) scale. The aggregated scores for each subscale thus range from 0 to 20, with higher scores indicative of greater abuse severity. Based on the responses, the abuse experience was regarded as severe with scores ≥ 8 on sexual abuse items, ≥ 13 on emotional abuse items, ≥ 10 on physical abuse items, ≥ 10 on physical negligence items, and ≥ 15 on emotional negligence items (Zhang, 2005).

The SSRS was used to evaluate perceptions about social support and satisfaction with that social support. The SSRS was developed by Xiao (Xiao, 1993) based on the Chinese environment and culture. The scale has been widely used in Chinese populations with high reliability and validity. The SSRS is divided into three clinical subscales: objective support, subjective support, and utilization of support. The higher the score, the better the social support.

IRIDS is a 28-question diagnostic scale to assess interpersonal behavioral distress, with each question answered "yes" or "no". To examine the degree of interpersonal relationship distress, the scale has four dimensions of distress triggered by: interpersonal conversation, interpersonal friendship, interpersonal interactions, and contact with the opposite sex (heterosexual interactions) (Zheng, 1999). All factors were categorized into severe problems (≥ 5 points on the heterosexual interactions subscale, and ≥ 6 on the remaining subscales), a few problems (3–4 points on the heterosexual interactions subscale, and 3–5 points on the remaining subscales), and no problem (0–2 total points).

The DAS is the main scale used in cognitive vulnerability research, especially for depression (Oliver et al., 2006). In most clinical studies of the efficacy of cognitive therapy, the DAS is used to assess the cognitive pattern of depression (Weissman, 1979). The DAS scoring is based on a 7-point scale in which 1 = totally agree and 7 = totally disagree. The score ranges from 40 to 280, and the total score for a normal population

is ≤130 (Weissman, 1979).

2.3. Statistics

Data were analyzed using Statistical Package for the Social Sciences (SPSS) v26.0 (IBM Statistics, Armonk, NY). Descriptive statistics were used to describe the sociodemographic characteristics, and the sociodemographic and clinical characteristics of the anxious depression and non-anxious depression groups were compared using Mann-Whitney U tests for continuous data and chi-squared tests for categorical data. The medians and interquartile ranges were used for non-normally distributed data, and frequencies and percentages were used for count data. Statistical significance was set at $p < 0.05$ (two-tailed). Spearman's correlations were used to analyze the relationships between significantly different psychosocial factors for MDD patients with or without anxiety. Distance correlation (DC-SIS) in the R software package (v4.2.0; https://www.r-project.org/), which calculates the distance between quantitative variables and compares the correlation between the characteristic variable and the target variable, was used to evaluate which factors were more relevant to anxiety in MDD patients (Li et al., 2012).

Mplus (v8.3; http://www.statmodel.com/) was used to build a structural equation model (SEM) with gender, occupation and drug doses as covariates. Standardized direct, indirect, and total effects were estimated for all pathways. A 95 % bootstrap confidence interval (CI) was calculated with 5000 bootstrapped samples to examine the significance of direct and indirect effects. In SEM, several criteria, such as root mean squared error of approximation (RMSEA) values <0.08 and comparative fit index (CFI) and Tucker Lewis index (TLI) values >0.90, indicate better models (Hu and Bentler, 1999).

3. Results

3.1. Sample characteristics

809 patients diagnosed with MDD were enrolled and were divided into an anxious depression group ($n = 326$, 40.3 %) and non-anxious depression group ($n = 483$, 59.7 %) according to the presence or absence of anxiety-related characteristics.

Table 1 shows the sociodemographic and clinical characteristics of the 809 patients. Most patients were female ($n = 609$, 75.3 %), unmarried ($n = 745$, 92.1 %), college students ($n = 628$, 77.6 %), and had an undergraduate education ($n = 680$, 84.1 %). Patients had a mean age of 22.0. Of the participants, 713 (88.1 %) had a dysfunctional attitude, 198 (24.5 %) had experienced emotional abuse, 125 (15.5 %) had

Table 1
Differences in psychosocial factors between MDD patients with and without anxiety.

Scale	Factor	Degree	Non-anxious depression group	Anxious depression group	Total	p-Value
Total			483 (59.7 %)	326 (40.3 %)		
Gender	Male		133 (27.5 %)	67 (20.6 %)	200 (24.7 %)	0.024*
	Female		350 (72.5 %)	259 (79.4 %)	609 (75.3 %)	
Age			22.00 (19, 23)	21.96 (19, 23)	21.98 (19,23)	0.590
Relationship status	Married		36 (7.5 %)	28 (8.6 %)	64 (7.9 %)	0.784
	Unmarried		447 (92.5 %)	298 (91.4 %)	745 (92.1 %)	
Occupation	Unemployed		388 (80.3 %)	240 (73.6 %)	628 (77.6 %)	0.025*
	Professional		95 (19.7 %)	86 (26.4 %)	181 (22.4 %)	
Education level	High school or lower		16 (3.3 %)	15 (4.6 %)	31 (3.8 %)	0.645
	Undergraduate		4.8 (84.5 %)	272 (83.4 %)	680 (84.1 %)	
	Postgraduate or higher		59 (12.2 %)	39 (12.0 %)	98 (12.1 %)	
Depression severity			9.83 (6,14)	15.34 (13,18)	12.05 (8,16)	<0.001*
Dysfunctional attitude		No	75 (15.5 %)	21(6.4 %)	96 (11.9 %)	<0.001*
		Yes	408 (84.5 %)	305 (93.6 %)	713 (88.1 %)	
Childhood maltreatment	Emotional abuse	No	328 (79.1 %)	229 (70.2 %)	611 (75.5 %)	0.004*
		Yes	101 (20.9 %)	97 (29.8 %)	198 (24.5 %)	
	Physical abuse	No	420 (87.0 %)	264 (81.0 %)	684 (84.5 %)	0.021*
		Yes	63 (13.0 %)	62 (19.0 %)	125 (15.5 %)	
	Sexual abuse	No	427 (88.4 %)	276 (84.7 %)	703 (86.9 %)	0.122
		Yes	56 (11.6 %)	50 (15.3 %)	106 (13.1 %)	
	Emotional neglect	No	301 (62.3 %)	178 (54.6 %)	479 (59.2 %)	0.028*
		Yes	182 (37.7 %)	148 (45.4 %)	330 (40.8 %)	
	Physical neglect	No	354 (73.3 %)	214 (65.6 %)	568 (70.2 %)	0.020*
		Yes	129 (26.7 %)	112 (34.4 %)	241 (29.8 %)	
Interpersonal relationships	Troubles in conversation	0–2	131 (27.1 %)	50 (15.3 %)	181 (22.4 %)	<0.001*
		3–5	260 (53.8 %)	222 (68.1 %)	437 (54.0 %)	
		6-	92 (19.0 %)	99 (30.4 %)	191 (23.6 %)	
	Making friends	0–2	87 (18.0 %)	17 (5.2 %)	104 (12.9 %)	<0.001*
		3-5	195 (40.4 %)	120 (36.8 %)	315 (38.9 %)	
		6-	201 (41.6 %)	189 (58.0 %)	390 (48.2 %)	
	Manners	0–2	277 (57.3 %)	142 (43.6 %)	419 (51.8 %)	<0.001*
		3–5	179 (37.1 %)	155 (47.5 %)	334 (41.3 %)	
		6–	27 (5.6 %)	29 (8.9 %)	56 (6.9 %)	
	Heterosexual interactions	0–2	232 (48.0 %)	129 (39.6 %)	361 (44.6 %)	0.059
		3–4	157 (32.5 %)	122 (37.4 %)	279 (34.5 %)	
		5-	94 (19.5 %)	75 (23.0 %)	169 (20.9 %)	
Social support	Objective support		8.81 (7,11)	8.19 (6,10)	8.56 (7,10)	0.002*
	Subjective support		17.05 (14,20)	16.08 (14,19)	16.66 (14,19)	0.002*
	Utilization of support		6.51 (5,8)	6.21 (5,7)	6.38 (5,7)	0.048*
Family assessment device	Problem solving		13.64 (12, 15)	14.22 (13,16)	13.87 (12,15)	0.001*
	Communication		22.40 (19,25)	23.62 (21,27)	22.89 (20,26)	<0.001*
	Roles		25.24 (23,28)	26.42 (24,29)	25.71 (23,28)	<0.001*
	Affective responsiveness		15.78 (13,18)	16.51 (14,18)	16.07 (14,18)	0.002*
	Affective involvement		17.26 (16,19)	17.49 (16,19)	17.35 (16,19)	0.157
	Behavior control		21.46 (20,23)	21.90 (21,23)	21.64 (20,23)	0.026*
	General functioning		27.44 (24,31)	29.26 (25,33)	28.17 (24,32)	<0.001*

* *p*-value is <0.05.

experienced physical abuse, 106 (13.1 %) had experienced sexual violence, 330 (40.8 %) had experienced emotional neglect, and 241 (29.8 %) had experienced physical neglect. 191 (23.6 %) had serious difficulties in conversation, 390 (48.2 %) had serious difficulties in making friends, 56 (6.9 %) had serious manner disturbances, and 169 (20.9 %) had difficulties in heterosexual communication.

Compared with non-anxious depression patients, patients with anxious depression had higher DAS scores, and there were statistically significant differences between anxious and non-anxious groups in conversation ($p < 0.001$), making friends ($p < 0.001$), and manners ($p < 0.001$) values on the IRIDS scale. There were also significant differences between groups in emotional abuse ($p = 0.004$), physical abuse ($p = 0.021$), emotional neglect ($p = 0.028$), and physical neglect ($p = 0.020$) on the CTQ scale. The SSRS scale showed greater difficulties and troubles in subjective support ($p = 0.002$), objective support ($p = 0.002$), and utilization of support ($p = 0.048$) between groups. The FAD scale showed differences in problem solving ($p < 0.001$), communication ($p < 0.001$), roles ($p < 0.001$), affective responsiveness ($p = 0.002$), behavior control ($p = 0.026$), and general functioning ($p < 0.001$) between MDD patients with and without anxiety.

3.2. Correlations between psychosocial factors

The full pattern of correlations is summarized in Table 2. Anxiety, cognitive dissonance, childhood maltreatment, interpersonal relationships, and family functioning were positively correlated, while social support were negatively correlated with anxiety, dysfunctional attitudes, childhood maltreatment, interpersonal relationships, and family functioning.

3.3. Distance correlation

Interpersonal relationships (0.368) were calculated to be the most relevant to anxiety in MDD patients, followed by cognitive dissonance (0.346), child maltreatment (0.263), familial relationships (0.258), and social support (0.265).

3.4. Effects of childhood maltreatment, interpersonal relationships, family functioning, and social support on anxiety in depressed patients

Based on the results of distance correlation analysis, the structural equation model assumes the following: (1) Dysfunctional attitude, child maltreatment, family functioning and social support may mediate the effects of anxiety in MDD patients on interpersonal relationships. (2) Child maltreatment, family functioning and social support may mediate the effects of anxiety in MDD patients on dysfunctional attitude. (3) Family functioning and social support may mediate the effects of anxiety in MDD patients on child maltreatment. (4) Social support may mediate the effects of anxiety in MDD patients on family functioning.

The chi-squared test of model fit was 558.173, degrees of freedom = 194, χ^2/df 2.877, RMSEA estimate 0.048, 90 % CI 0.044–0.053, CFI 0.953, and TLI 0.943, indicating a good fit. As shown in Table 3 and Fig. 1, interpersonal relationships had a direct effect on anxiety in depressed patients (95%CI 0.192–0.543) as well as on dysfunctional attitudes (95%CI 0.695–0.800) and social support (95%CI -0.660 –

Table 2
Correlations between psychosocial factors.

	HAMA	DAS	CTQ	SSRS	IRIDS	FAD
HAMA	1					
DAS	0.374**	1				
CTQ	0.282**	0.235**	1			
SSRS	−0.244**	−0.311**	−0.306**	1		
IRIDS	0.394**	0.611**	0.292**	−0.404**	1	
FAD	0.269**	0.272**	0.619**	−0.382**	0.343**	1

** At 0.01 level (two-tailed), the correlation was significant.

Table 3
Relationships between multiple variables in the structural equation model.

Relationship	Estimate	SE	p-Value	CI Lower 2.5 %	CI Upper 2.5 %
I → AN	0.357	0.090	<0.001*	0.192	0.543
D → AN	0.163	0.073	0.026*	0.015	0.300
S → AN	−0.004	0.070	0.954	−0.136	0.136
F → AN	0.039	0.064	0.539	−0.090	0.158
C → AN	0.061	0.064	0.339	−0.064	0.184
I → S	−0.488	0.087	<0.001*	−0.660	−0.320
D → S	0.0450	0.082	0.583	−0.113	0.210
C → S	−0.175	0.067	0.008*	−0.308	−0.050
F → S	−0.163	0.068	0.016*	−0.293	−0.031
I → F	0.121	0.064	0.060	−0.008	0.242
D → F	0.075	0.059	0.199	−0.044	0.188
C → F	0.650	0.029	<0.001*	0.592	0.705
I → C	0.372	0.078	<0.001*	0.217	0.523
D → C	−0.053	0.075	0.483	−0.195	0.100
I → D	0.751	0.027	<0.001*	0.695	0.800
I → D → AN	0.123	0.055	0.027*	0.053	0.866
I → C → AN	0.023	0.025	0.361	−0.084	0.290
I → S → AN	0.002	0.035	0.956	−0.287	0.241
I → F → AN	0.005	0.009	0.596	−0.030	0.120
I → D → C → AN	−0.002	0.006	0.668	−0.089	0.015
I → D → S → AN	0.000	0.005	0.979	−0.047	0.035
I → C → S → AN	0.000	0.005	0.958	−0.039	0.038
I → F → S → AN	0.000	0.002	0.962	−0.012	0.014
I → D → F → AN	0.002	0.005	0.656	−0.013	0.071
I → C → F → AN	0.009	0.016	0.556	−0.078	0.162
I → D → C → S → AN	0.000	0.001	0.976	−0.008	0.006
I → D → F → S → AN	0.000	0.001	0.969	−0.006	0.009
I → C → F → S → AN	0.000	0.003	0.960	−0.023	0.024
I → D → C → F → AN	−0.001	0.003	0.759	−0.049	0.009
I → D → C → F → S → AN	0.000	0.001	0.976	−0.005	0.004
D → C → AN	−0.003	0.007	0.666	−0.025	0.004
D → S → AN	0.000	0.007	0.979	−0.013	0.010
D → F → AN	0.003	0.007	0.656	−0.004	0.020
D → C → S → AN	0.000	0.001	0.975	−0.002	0.002
D → F → S → AN	0.000	0.001	0.969	−0.002	0.002
D → C → F → AN	−0.001	0.004	0.757	−0.014	0.003
D → C → F → S → AN	0.000	0.001	0.976	−0.001	0.001
C → S → AN	0.001	0.013	0.957	−0.074	0.072
C → F → AN	0.026	0.042	0.540	−0.153	0.278
C → F → S → AN	0.000	0.008	0.958	−0.042	0.044
F → S → AN	0.001	0.012	0.958	−0.063	0.065

Abbreviations: I, interpersonal relationships; D, dysfunctional attitude; C: childhood maltreatment; F, family functioning; S, social support; AN, anxiety in MDD patients; SE, standard error; CI, confidence interval.
* p-value is <0.05.

−0.320). Interpersonal relationships also had an effect on anxiety in MDD patients via dysfunctional attitude (95%CI 0.053–0.866). Child maltreatment had a direct effect on social support (95%CI -0.308--0.050), as did family functioning (95%CI 0.592–0.705), but not anxiety in depressive patients (95%CI -0.064–0.184).

4. Discussion

To our best knowledge, this study is the first large-scale, multicenter study to explore the multiple effects of dysfunctional attitudes, child maltreatment, social support, interpersonal relationships, and family relationships on patients with anxious depression in China. Notably, MDD patients with anxiety accounted for 40.3 % of the total number of MDD patients, and there were significant differences in psychosocial factors in MDD patients with and without comorbid anxiety.

Previous studies have shown that patients with anxious depression are significantly more likely to be female, older, unemployed, less educated, more severely depressed, and to have suicidal ideation and more severe depression (Fava et al., 2004; Lin et al., 2014). In our study, the proportion of women and the depression severity were greater in the
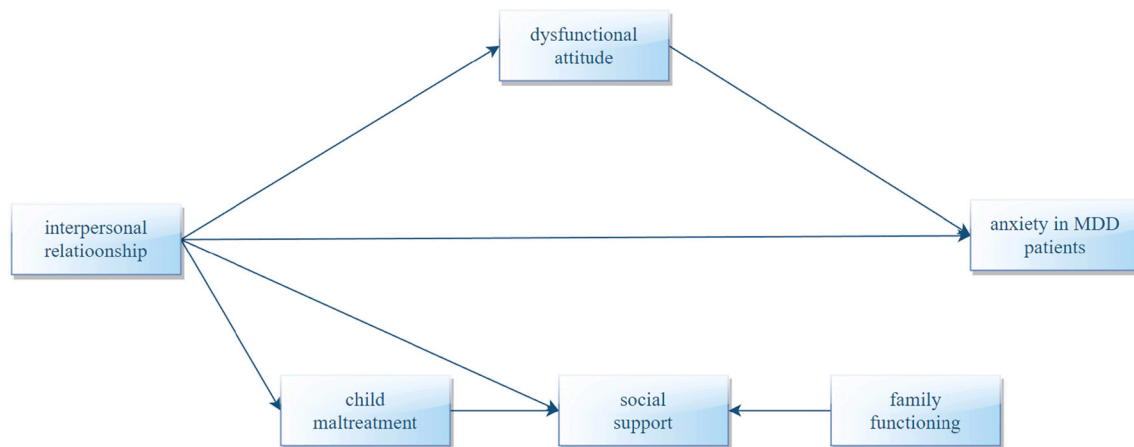
Fig. 1. Structural equation model.
The solid line represents a significant relationship between the two variables.

anxious depression group, consistent with previous studies. However, compared with MDD patients without anxiety, more patients in the anxious depression group were employed and there were no significant differences in age, education level, or marital status between anxious and non-anxious depression subjects. These differences can be explained by the fact that our sample is primarily a college student population.

Previous studies have highlighted the role of negative cognition in depression and anxiety. Beck hypothesized that negative cognition plays a key role in the development of depression, and that cognitive behavioral therapy reduces depression and anxiety by changing dysfunctional attitudes (such as dependence and perfectionism) (Hankin et al., 2004). Miranda and Persons found that naturally occurring negative emotions are associated with the occurrence of dysfunctional attitudes (Miranda and Persons, 1988; Miranda et al., 1990). Studies by Hedlund and Rude (1995) also showed that dysfunctional cognitive processes can be activated by non-negative emotional states, which also suggests that dysfunctional attitudes are important in anxious depression. Our research shows that dysfunctional attitudes have a direct effect on anxious depression. Although this study does not show a causal relationship between anxiety, depression, and dysfunctional attitudes, treatments for cognition such as Mindfulness-based Cognitive Therapy may benefit these patients (Hofmann and Gomez, 2017).

Early life adversity may increase vulnerability to stress and increase the risk of stress-related psychiatric disorders (Heim and Nemeroff, 2001; Nikkheslat et al., 2020). Adolescents exposed to adverse childhood experiences are at increased risk of health problems across the lifespan, including anxiety and depression (Bellis et al., 2019; Macalli et al., 2021). Moreover, early life adversity is associated with increased resistance to treatment, severe symptoms, and frequent recurrences (Opel et al., 2019). We found that anxious depression patients had experienced more adverse childhood events than non-anxious depression patients. Our study also revealed no significant differences in sexual abuse history in MDD patients with or without anxiety. Although depressed patients with or without anxiety had significant differences in their history of child maltreatment, in structural equation models, child maltreatment was not directly related to anxiety in depressed patients. Psychotherapy for child maltreatment is now used in some populations (Lee and Brown, 2022), but further research is needed to establish how best to treat patients with anxious depression.

We found that depressed patients with or without anxiety had significant differences in conversing, making friends, and manners. In in structural equation models, interpersonal relationships were not only directly related to anxiety in MDD patients but also mediated the effects of anxiety in MDD patients via dysfunctional attitudes. Springer suggested that interpersonal disorders may reduce remission rates with anxiety treatment (Springer et al., 2018). It has been shown that

interpersonal psychotherapy improves the prognosis of patients with depression or anxiety (Chen et al., 2020; van Bronswijk et al., 2021). Therefore, we hypothesize that interpersonal relationships may be an important factor determining the severity of depression and anxiety and treatment success.

There were strong correlations between family functioning, social support, and quality of life. Anxiety disorder is associated with reduced family functioning and poorer quality of life in Chinese patients (Wang et al., 2016). We found that the anxious depression group had impaired family functioning in all seven FAD subscales, and MDD patients with anxiety scored higher than those without anxiety in the other six dimensions of family functioning except for affective involvement. Although no study has yet evaluated the effect of family-centered psychotherapy on anxious depression, studies focusing on depression or anxiety as the study outcome have shown that family-centered psychotherapy is helpful (Esposito-Smythers et al., 2019; Wood et al., 2006). Therefore, therapies that address family functioning may help to improve treatment outcomes in patients with anxious depression, although this still needs further research.

We also found that patients with anxious depression had a less social support. Although the results of SEM suggest that it is not a good predictor of anxious depression, a high level of support has been shown to help individuals cope with life stresses and act as a protective factor for depression and anxiety (Johnson-Esparza et al., 2021). Therefore, increased social support may be a helpful component of treatment in patients with anxious depression.

5. Limitations

There are several limitations to this study. First, our study was a cross-sectional study with no further follow-up to assess patient outcomes. Second, this study was a retrospective study with possible recall bias. Third, this study did not include information about pharmacological treatments. Fourth, most of subjects were colleges students and were young and unmarried. It might have bias to extend the results of the study to patients in general psychiatric patients and general population, a larger sample size is needed to validate the results.

6. Conclusion

We show that MDD patients with and without anxiety have significant differences in dysfunctional attitudes, childhood abuse, interpersonal relationships, social support, and family functioning. Interpersonal relationships mediated the effects of anxiety in MDD patients via dysfunctional attitudes.

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CRediT authorship contribution statement

Study conception and design: EZ, SM, ZL.
Data acquisition: EZ, SM, LK, NZ, PW, WW, ZN, MC, JX, SS, LY, DX.
Analysis and interpretation of data: EZ.
Drafting: EZ, SM, ZL.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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