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Reciprocal relationship between abortion stigma and depressive symptoms among women who underwent termination of pregnancy for fetal anomalies: a cross-lagged panel study

Huiting Peng[1,2], Xi Li[3], Lihong Zeng[4], Ying Wang[4], Yaohan Wang[4], Chunxiang Qin[1,5*] and Yang Chen[1*]

Abstract

Introduction This study aimed to examine the interactions between abortion stigma and depressive symptoms among women who underwent termination of pregnancy for fetal anomalies over time.

Methods This study is a longitudinal, observational study with two measurement points. A total of 241 women with fetal anomalies filled out the Individual Level Abortion Stigma Scale and the Edinburgh Postnatal Depression Scale before and after terminating pregnancy. Cross-lagged panel analysis was conducted to analyze the interactions between abortion stigma and depressive symptoms over time.

Results The level of abortion stigma before terminating pregnancy positively influenced depressive symptoms after terminating pregnancy ($\beta = 0.12$, $P < 0.05$). The depressive symptoms before terminating pregnancy positively influenced the level of abortion stigma after terminating pregnancy($\beta = 0.08$, $P < 0.05$).

Conclusions Abortion stigma and depressive symptoms before terminating pregnancy should be evaluated, and comprehensive intervention must be taken to alleviate them. Healthcare professionals need to pay attention to the reciprocal relationships between abortion stigma and depressive symptoms and seek intervention to reduce both

Keywords Abortion stigma, Depressive symptoms, Termination of pregnancy, Fetal anomalies

*Correspondence:
Chunxiang Qin
chunxiangqin@csu.edu.cn
Yang Chen
214614075@qq.com
[1]Department of Nursing, The Third Xiangya Hospital, Central South University, Changsha 410013, China
[2]Department of Gynecology, Hunan Maternal and Child Health Hospital, Changsha 410008, China
[3]The First Affiliated Hospital of Hunan College of TCM, Zhuzhou 412000, China
[4]Xiangya School of Nursing, Central South University, Changsha 410013, China
[5]Health management Medicine Center, The Third Xiangya Hospital, Central South University, Changsha 410013, China

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Introduction

Developments in antenatal screening, prenatal ultrasound, and genetic testing have enabled the early detection of a broader spectrum of fetal anomalies (FAs) [1, 2]. When diagnosed with FAs, 81%--90% of women decide on terminating pregnancy (TP) [3–5]. TP due to FAs can be a major traumatic event in a woman's life [6–9]. Li et al. reported that the incidence of depressive symptoms before TP was 65.6% [10], and that of depressive symptoms after TP was between 31.9% and 42.2% [11], higher than the 10-20% incidence observed in women after spontaneous [12]. In certain cases, depressive symptoms in women with FAs have been found to persist for years [7, 10, 13], impacting the well-being and safety of the woman and her family [14–16].

Stigma is perceived as an attribute that extensively discredits an individual, reducing him or her "from a whole and usual person to a tainted, discounted one, and others in society mark these people as undesirable" [17]. The process of stigmatization unfolds when factors, such as labeling, stereotyping, separation, loss of status, and discrimination, come together in a situation of power [18]. Norris et al. pointed out that abortion may be experienced as a blemish on individual character or even as a social demotion into the category of "bad girls and fallen women" [19]. Kumar, Hessini, and Mitchell described abortion stigma as "a negative attribute ascribed to women who seek to terminate a pregnancy that marks them, internally or externally, as inferior to ideals of womanhood" [20]. There are some cultural differences between China and other countries when it comes to abortion. First, terminating unplanned pregnancies is permitted by Chinese laws and is culturally accepted. From 1982 to 2016, China implemented the family planning policy, which permitted couples to have only one child, termination of unplanned pregnancies among married women became widespread and socially accepted. In this background, women who terminate an unplanned pregnancies are rarely discriminated against and condemned by others. According to the 2021 China Health Statistics Yearbook, from 2014 to 2020, the average number of abortions in China exceeded 9.5 million annually [21]. Second, in China, traditional beliefs about abortion and women's roles and responsibilities have led to the stigmatization of women who underwent termination of pregnancy for FAs. Women tend to attribute the cause of FAs to their own defects [11]. Third, initially the Individual Level Abortion Stigma Scale (ILAS) applied all causes of abortion and did not distinguish between unplanned pregnancies and FAs. In 2018, Hanschmidt et al. studied the current status of abortion stigma in Germany for terminated pregnancies due to FAs [13]. In 2022, Li et al. conducted a study on the current status of abortion stigma in China for terminated pregnancies due to FAs [22]. Both studies demonstrated good reliability and validity for the use of ILAS in women who underwent termination of pregnancy for FAs. Overall, women who underwent termination of pregnancy due to FAs face unique challenges compared with those who chose abortions for other reasons, including complex diagnoses of FAs, abandonment of a highly desired pregnancy, and unique forms of bereavement [9, 13, 20, 23]. These problems could greatly exacerbate negative feelings that women may face with a TP for FAs. Qualitative studies have shown that women who underwent termination of pregnancy for FAs are widely affected by abortion stigma [9, 23]. Some scholars have speculated that abortion stigma may be a key factor in the persistence of depressive symptoms [9, 13, 23]. Some cross-sectional studies have investigated the effect of abortion stigma on depressive symptoms among women with FAs after TP. Most of these studies suggested that depressive symptoms are one of the negative outcomes of the stigmatization of abortion [13, 24]. Meanwhile, in cross-sectional studies investigating the effect of depressive symptoms on stigma, those among cohabiting relatives of patients with epilepsy [25] and people bereaved through suicide [26] have shown that depressive symptoms contribute to high levels of stigma. As is well known, cross-sectional studies could not clarify interaction between depressive symptoms and abortion stigma over time. Longitudinal studies could answer this question to some extent.

Stigma was a predictor of future depressive symptoms in some longitudinal studies among parents of children with autism spectrum disorder [27], women engaged in commercial sex work [28], and patients with schizophrenia spectrum disorder [29]. Researchers believe that stigma may heighten the negativity and frequency of self-devaluation, elicit feelings of inferiority, disempowerment, and powerlessness, and further cause individuals to lose hope for the future, abandon their goals, thus contributing to depression or exacerbation of depressive symptoms [30, 31]. In addition, stigma could lead to social withdrawal behaviors, impair an individual's ability to receive social support, and further worsen depressive symptoms [32]. Meanwhile, depression was the only associated and predictive factor of self-stigma in a longitudinal study of patients with Parkinson's disease [33]. Those results suggested that the relationship between stigma and depressive symptoms may be bidirectional. To the authors' knowledge, no longitudinal studies exploring the temporal relationship between abortion stigma and depressive symptoms among women who underwent termination of pregnancy for fetal anomalies have been reported.

Cross-lagged panel analysis is used to examine the interrelationships between different variables over time. By analyzing the follow-up data collected at two or

more timepoints, the direction of interaction between variables is estimated while controlling for correlations within timepoints. It is widely used in various fields at present [34–36]. The present study aimed to investigate the temporal relationship between abortion stigma and depressive symptoms among women who underwent termination of pregnancy for fetal anomalies with the use of cross-lagged panel analysis.

Methods

Design and participants

A longitudinal, observational study was conducted, in which all variables of interest were measured at two timepoints with a 1-month interval. Considering that before and 1-month after TP are critical periods for women's psychological changes and for healthcare professionals to intervene with women [11], the two time points before and 1-month after TP were selected for investigation.

Participants were recruited between August and December 2020 through a convenience sample from the departments of obstetrics and gynecology at two general hospitals and maternity and child-specialized hospitals in Changsha, China. Pregnant women diagnosed with FAs were invited to participate if they met the following inclusion criteria: (1) decision to undergo TP, (2) age of at least 18 years, (3) fluency in Mandarin, (4) access to the internet and telephone, and (5) provision of informed consent. The exclusion criteria included: (1) the presence of life-threatening comorbidities, (2) a history of serious mental illness (e.g., severe depression, anxiety) as diagnosed by a psychologist, and (3) refusal to participate. A total of 265 women met the inclusion criteria.The first and second exclusion criteria were identified by medical history review.

Procedure

Trained investigators administered the questionnaires for the survey. All participants obtained a detailed explanation of the purpose of the study and relevant information and signed an informed consent form before the survey. The first survey was conducted 24–48 h after hospitalization and before TP (T1). All the participants were invited to complete the questionnaire in an individual room. The study team member collected the questionnaire after the preliminary examination. Then, a WeChat contact was established, and electronic questionnaires were sent through WeChat 1 month after TP (T2) for the second survey. In addition, a modified Dillman's (1983) procedure [37] was used to minimize non-response. First, documents were sent by WeChat. Second, non-responders received a personalized reminder for the first time after 3 days and a second reminder (formal letter) after 5 days. If still no response was received, it was considered a drop-out.

Measures

The demographic characteristics included age, residence, educational level, whether they are from an only-child family, employment status, family monthly income, medical insurance, religion, number of pregnancies, gestational age in weeks, number of children, whether they had an abortion due to an unplanned pregnancy, and history of pregnancy with abnormal outcomes.

Abortion stigma was measured using the Individual Level Abortion Stigma Scale (ILAS) [38]. ILAS consisted of 20 items with four dimensions as follows: worries about judgment, isolation, self-judgment, and social condemnation. The first 10 items of this scale were measured using a four-point Likert scale (item scores ranging from 0 to 3), and the second 10 items were measured using a five-point Likert scale (item scores ranging from 0 to 4). The total score was computed by the average of the items (total score range from 0 to 3.5). Higher scores indicated more severe stigma. The original scale demonstrated good reliability and validity, with a Cronbach's alpha coefficient of 0.88 (Cockrill et al.,2013). Li et al. [39] translated and revised the Chinese version. In the present study, the Cronbach's alpha coefficients for internal consistency were 0.92 and 0.94 for T1 and T2, respectively.

Depressive symptoms were assessed using the Edinburgh Postnatal Depression Scale (EPDS) [40]. EPDS consisted of 10 items, and each item was scored on a four-point scale (total score ranging from 0 to 30). Higher scores indicated more severe depressive symptoms. In the present study, the Cronbach's alpha coefficients were 0.81 and 0.78 for T1 and T2, respectively.

Data analysis

The occurrence of occasional dropout is inevitable when conducting longitudinal research [41]. In the present study, missing data were addressed using full information maximum likelihood. Hence, all primary analyses were performed on the full sample of 241 participants.

First, the baseline characteristics of the study sample were presented using descriptive statistics, including frequencies and percentages for categorical variables (such as education level) and means and standard deviations for continuous variables (such as age and gestational age). Independent-sample T-tests were used to assess whether the EPDS and ILAS scores differed significantly between two independent groups (such as education level). One-way ANOVA was used to investigate whether the EPDS and ILAS scores differed significantly between multiple independent groups (such as age). Independent-sample T-tests were used to investigate whether the EPDS and ILAS scores differed significantly between T1 and T2.

Pearson's product–moment correlation was used to analyze the intercorrelations between depressive symptoms and stigma at two timepoints. A p-value of 0.05

was used as the cutoff for statistical significance. Data were analyzed with SPSS version 26.0 (IBM Corporation, Armonk, NY, USA).

For this longitudinal study, cross-lagged path analysis using structural equation modeling was conducted. A good model fit was indicated given the following: Chi-square statistic/degree of freedom ($\chi 2/df$) < 3, goodness-of-fit index (GFI), comparative fit index (CFI), Tucker–Lewis index (TLI) > 0.90, and root-mean-square error of approximation (RMSEA) < 0.08. Variables that were significantly associated in the univariate analysis were controlled for in these analyses. Cross-lagged analyses were conducted using AMOS 24.0 (IBM Corporation, Armonk, NY, USA).

Results

Sample characteristics

265 women met the inclusion criteria. 16 women refused to participate in the study; and 5 women had a history of major depression; 3 women refused to fill out family monthly income or pregnancy history. Therefore, 241 valid questionnaires were collected (91% response rate). The participants at T1 were invited to participate at T2, of whom 236 participated (97.93%). All participants had a mean age of 28.19 ± 6.04 years (range of 21–40 years). Most TP occurred in the second trimester, between 16 and 28 weeks of gestation (70.95%, 21.09 ± 5.49, range of 12–32). Approximately half of the respondents lived in urban areas. More than half (55.18%) of the women had a university education. The majority of women had medical insurance (84.65%) and no religious belief (81.74%). Nearly half (47.30%) of women only had one pregnancy. The majority had no children or only one child (97.10%). 30.71% of women had a history of voluntary abortion at less than 14 weeks, 25.72% of women had a pregnancy history with abnormal outcome, including ectopic pregnancy(13.28%), premature birth(11.20%) and stillbirth(1.24%). No one had a history of pregnancy with FAs. The results of the univariate analysis showed a significant difference in EPDS scores in accordance with age ($F = 14.62$, $P < 0.001$), gestational age ($F = 26.09$, $P < 0.001$). Moreover, a significant difference was found in the ILAS scores in accordance with age ($F = 3.40$, $P < 0.05$), gestational age ($F = 3.80$, $P < 0.05$), residence ($T = -2.60$, $P < 0.05$), and religion ($T = 2.14$, $P < 0.05$), as shown in Tables 1 and 2.

Preliminary analyses

The EPDS scores at T1 and T2 ranged from 1 to 26 (13.84 ± 6.76) and from 0 to 26 (10.69 ± 7.43). The ILAS scores at T1 and T2 ranged from 0 to 3.2 (1.02 ± 0.67) and from 0 to 3.5 (1.40 ± 0.73). EPDS scores significantly dropped one month after TP ($T = 4.87$, $P < 0.001$) but ILAS scores significantly rose ($T = -5.95$, $P < 0.001$). The scores of each dimension of ILAS significantly rose one month after TP ($T = -1.95$ to 7.15, $P < 0.05$). (Table 3).

Pearson's correlations showed that abortion stigma at T1 was positively correlated with depressive symptoms at T1 ($r = 0.47$, $P < 0.001$), abortion stigma at T2 ($r = 0.55$, $P < 0$ 0.001), and depressive symptoms at T2 ($r = 0.19$, $P < 0.05$). Depressive symptoms at T1 were positively correlated with depressive symptoms at T2 ($r = 0.51$, $P < 0.001$) and abortion stigma at T2 ($r = 0.15$, $P < 0.05$). Abortion stigma at T2 was positively correlated with depressive symptoms at T2 ($r = 0.43$, $P < 0.001$). Table 4.

Cross-lagged path analyses

All significant standardized cross-lagged effects and cross-lagged paths are presented in Figs. 1 and 2. Variables (age, gestational age, residence, and religion) that were significantly associated in the univariate analysis were controlled as covariates in the analysis. The control variables are not displayed in the figures.

The first cross-lagged model linking abortion stigma and depressive symptoms (Fig. 1) had an excellent fit to the data ($\chi^2/df = 1.918$, RMSEA = 0.068, CFI = 0.959, TLI = 0.943, IFI = 0.960). Stability coefficients were moderate in strength, with 0.44 for abortion stigma and 0.48 for depressive symptoms ($P < 0.01$). Regarding the cross-lagged paths, abortion stigma before TP positively influenced depressive symptoms after TP ($\beta = 0.12$, $P < 0.05$). Depressive symptoms before TP, in turn, positively influenced abortion stigma after TP ($\beta = 0.08$, $P < 0.05$).

The second cross-lagged model was specified linking each dimension of abortion stigma and depressive symptoms separately (Fig. 2) and had an excellent fit to the data ($\chi 2/df = 2.115$; RMSEA = 0.068; CFI = 0.974; TLI = 0.930, IFI = 0.975). Stability coefficients were moderate in strength, ranging from 0.32 (worries about judgment) to 0.42 (EPDS). Regarding the cross-lagged paths, each dimension of abortion stigma before TP positively influenced depressive symptoms after TP (β:0.06 to 0.13, $P < 0.05$). depressive symptoms before TP, in turn, positively influenced abortion stigma-related isolation ($\beta = 0.06$, $P < 0.05$) and self-judgment ($\beta = 0.09$, $P < 0.05$) after TP.

Discussion

This study is the first to longitudinally examine the relationships between abortion stigma and depressive symptoms among women who underwent termination of pregnancy for fetal anomalies over time (before and after terminating the pregnancy). The results showed that there was a bidirectional relationship between abortion stigma and depressive symptoms. Further analysis indicated that all dimensions of abortion stigma before TP could positively influence depressive symptoms after TP, while depressive symptoms before TP specifically

Table 1 Demographic characteristics of participants and univariate analysis of depressive symptoms

Characteristics	*N* = 241 (%) T1	EPDS at T1 M ± SD	t or F	*P*	*N* = 236(%) T2	EPDS at T2 M ± SD	t or F	*P*
Age								
≤ 25	53 (21.9%)	11.32 ± 5.14	14.62**	**0.00**	52 (22.03%)	8.86 ± 6.08	6.71**	**0.00**
26–30	107 (44.4%)	13.42 ± 4.47			105 (44.49%)	9.68 ± 7.85		
31–35	63 (26.14%)	15.21 ± 4.36			62 (26.27%)	12.04 ± 6.95		
≥ 35	18 (7.47%)	18.94 ± 4.96			17 (7.21%)	16.90 ± 7.28		
Residence								
Urban	157 (65.15%)	13.32 ± 4.56	0.61*	0.54	155 (65.68%)	11.17 ± 6.26	1.36*	0.17
Rural	84 (34.85%)	12.93 ± 5.06			81 (34.32%)	9.79 ± 9.23		
Only child								
Yes	125 (51.87%)	13.49 ± 3.94	−1.72*	0.09	122 (51.69%)	11.12 ± 6.46	0.91*	0.36
No	116 (48.13%)	14.22 ± 2.56			114 (48.31%)	10.23 ± 8.34		
Education								
Three-year college or below	108 (44.81%)	13.39 ± 5.275	0.16**	0.57	106 (44.92%)	10.92 ± 6.65	0.12**	0.88
Bachelor's degree	104 (43.15%)	13.62 ± 5.574			102 (43.22%)	10.47 ± 7.50		
Master's degree or above	29 (12.03%)	14.00 ± 5.352			28 (11.86%)	10.37 ± 8.66		
Employment status								
Unemployed	51 (21.16%)	11.84 ± 5.58	1.25*	0.21	49 (20.76%)	11.66 ± 6.58	1.03*	0.31
Employed	190 (78.84%)	10.33 ± 7.61			187 79.24%)	10.43 ± 7.63		
Monthly income (RMB per person per month)								
≤ 5000	146 (67.63%)	13.49 ± 5.76	0.01*	0.99	143 (60.59%)	11.17 ± 6.32	1.24*	0.22
> 5000	95 (32.37%)	13.48 ± 5.15			93 (39.41%)	9.95 ± 8.85		
Medical insurance								
None	37 (15.35%)	13.49 ± 5.76	-0.09*	0.93	35 (14.83%)	11.68 ± 6.15	0.89*	0.36
Yes	204 (84.65%)	13.57 ± 5.34			201 (85.17%)	10.46 ± 7.65		
Religious belief								
None	197 (81.74%)	13.78 ± 5.31	1.35*	0.18	195 (82.63%)	11.68 ± 6.15	1.03*	0.31
Yes	44 (18.26%)	12.57 ± 5.73			41 (17.37%)	10.34 ± 7.26		
Number of pregnancies								
one time	114 (47.30%)	13.22 ± 4.92	1.01**	0.37	112 (47.46%)	10.87 ± 7.19	0.68**	0.50
two times	86 (35.68%)	13.51 ± 5.75			84 (35.59%)	10.81 ± 7.37		
three times and above	41 (17.01%)	14.61 ± 5.88			40 (16.95%)	9.32 ± 8.10		
Gestational age, weeks								
≤ 16	48 (19.92%)	10.90 ± 2.11	26.09**	**0.00**	47 (19.92%)	9.76 ± 8.04	2.96**	**0.02**
16 W^{+1}–20	98 (40.66%)	13.57 ± 3.33			97 (41.10%)	10.24 ± 7.31		
20 W^{+1}–24	58 (24.07%)	14.71 ± 2.32			57 (24.15%)	9.66 ± 6.41		
24 W^{+1}–28	15 (6.22%)	18.07 ± 3.96			13 (5.51%)	11.23 ± 7.22		
> 28	22 (9.13%)	16.27 ± 2.61			22 (9.32%)	15.49 ± 7.50		
Number of children								
0	145 (60.17%)	13.57 ± 5.06	0.01**	0.99	143 (60.59%)	10.81 ± 7.22	0.08**	0.93
1	89 (36.93%)	13.53 ± 5.97			88 (37.29%)	10.42 ± 7.63		
≥ 2	7 (2.90%)	13.86 ± 5.31			5 (2.12%)	10.96 ± 7.25		
Pregnancy history with abnormal outcome								
None	179 (74.27%)	13.37 ± 5.04	0.98**	0.40	176 (74.58%)	10.72 ± 7.65	0.09**	0.96
Premature birth	27 (11.20%)	14.35 ± 4.49			26 (11.02%)	10.74 ± 6.82		
Stillbirth	3 (1.24%)	15.24 ± 5.13			3 (1.27%)	10.67 ± 6.35		
Ectopic pregnancy	32 (13.28%)	12.38 ± 3.05			31 (13.13%)	9.95 ± 7.19		
Voluntary abortion at less than 14 weeks								
No	167(69.29%)	13.44 ± 3.58	0.04*	0.85	164(69.49%)	10.60 ± 7.48	0.06*	0.95
Yes	74(30.71%)	13.56 ± 5.44			72(30.51%)	10.64 ± 7.30		

Means (M), standard deviations (SD); * Independent-sample t-test; ** One-way ANOVA; $P < 0.05$ was considered statistically significant

Note: Pregnancy history with abnormal outcome refers to terminated pregnancy for FAs, preterm birth, stillbirth, and ectopic pregnancy. An Only child refers to a woman has no siblings of the same father or mother

Table 2 Demographic characteristics of participants and univariate analysis of abortion stigma

Characteristics	*N* = 241 (%) T1	ILAS at T1 M ± SD	t or F	*P*	*N* = 236 (%) T2	ILAS at T1 M ± SD	t or F	*P*
Age								
≤ 25	53 (21.9%)	0.83 ± 0.53	3.40**	**0.02**	52 (22.03%)	0.86 ± 0.51	17.99**	**0.00**
26–30	107 (44.4%)	1.04 ± 0.55			105 (44.49%)	1.59 ± 0.79		
31–35	63 (26.14%)	1.08 ± 0.59			62 (26.27%)	1.46 ± 0.56		
≥ 35	18 (7.47%)	0.75 ± 0.55			17 (7.21%)	0.81 ± 0.60		
Residence								
Urban	157 (65.15%)	0.82 ± 0.81	−2.60*	**0.01**	155 (65.68%)	1.33 ± 0.76	−2.08*	**0.04**
Rural	84 (34.85%)	1.10 ± 0.78			81 (34.32%)	1.53 ± 0.67		
Only child								
Yes	125 (51.87%)	0.91 ± 0.77	−1.29*	0.20	122 (51.69%)	1.39 ± 0.72	−0.17*	0.87
No	116 (48.13%)	1.04 ± 0.80			114 (48.31%)	1.41 ± 0.74		
Education								
Three-year college or below	108 (44.81%)	0.76 ± 0.74	1.57**	0.21	106 (44.92%)	1.30 ± 0.68	1.81**	0.17
Bachelor's degree	104 (43.15%)	0.95 ± 0.80			102 (43.22%)	1.48 ± 0.80		
Master's degree or above	29 (12.03%)	0.86 ± 0.85			28 (11.86%)	1.46 ± 0.69		
Employment status								
Unemployed	51 (21.16%)	0.85 ± 0.83	−0.57*	0.57	49 (20.76%)	1.40 ± 0.66	−0.11*	0.91
Employed	190 (78.84%)	0.92 ± 0.77			187 79.24%)	1.41 ± 0.75		
Monthly income (RMB per person per month)								
≤ 5000	146 (67.63%)	1.01 ± 0.79	1.23*	0.22	143 (60.59%)	1.40 ± 0.75	-1.17*	0.86
> 5000	95 (32.37%)	0.87 ± 0.97			93 (39.41%)	1.42 ± 0.70		
Medical insurance								
None	37 (15.35%)	0.74 ± 0.80	−1.74*	0.08	35 (14.83%)	1.40 ± 0.70	0.01*	0.99
Yes	204 (84.65%)	0.96 ± 0.69			201 (85.17%)	1.40 ± 0.74		
Religious belief								
None	197 (81.74%)	1.05 ± 0.61	2.14*	**0.03**	195 (82.63%)	1.46 ± 0.74	2.58*	**0.01**
Yes	44 (18.26%)	0.83 ± 0.65			41 (17.37%)	1.14 ± 0.69		
Number of pregnancies								
one time	114 (47.30%)	0.96 ± 0.74	0.82**	0.44	112 (47.46%)	1.29 ± 0.69	2.94**	0.06
two times	86 (35.68%)	0.81 ± 0.97			84 (35.59%)	1.54 ± 0.76		
three times and above	41 (17.01%)	0.84 ± 0.81			40 (16.95%)	1.39 ± 0.77		
Gestational age, weeks								
≤ 16	48 (19.92%)	0.63 ± 0.40	3.80**	**0.01**	47 (19.92%)	1.07 ± 0.71	3.84**	**0.01**
16 W^{+1}–20	98 (40.66%)	0.80 ± 0.42			97 (41.10%)	1.44 ± 0.69		
20 W^{+1}–24	58 (24.07%)	0.84 ± 0.51			57 (24.15%)	1.45 ± 0.69		
24 W^{+1}–28	15 (6.22%)	0.88 ± 0.68			13 (5.51%)	1.63 ± 0.70		
> 28	22 (9.13%)	1.09 ± 0.58			22 (9.32%)	1.67 ± 0.89		
Number of children								
0	145 (60.17%)	0.82 ± 0.78	0.45**	0.64	143 (60.59%)	1.41 ± 0.69	0.64**	0.94
1	89 (36.93%)	0.72 ± 0.79			88 (37.29%)	1.39 ± 0.79		
≥ 2	7 (2.90%)	0.76 ± 0.67			5 (2.12%)	1.31 ± 0.87		
Pregnancy history with abnormal outcome								
None	179 (74.27%)	0.69 ± 0.40	0.40**	0.75	176 (74.58%)	1.35 ± 0.74	1.51**	0.21
Premature birth	27 (11.20%)	0.73 ± 0.57			26 (11.02%)	1.61 ± 0.56		
Stillbirth	3 (1.24%)	0.95 ± 0.82			3 (1.27%)	1.91 ± 0.47		
Ectopic pregnancy	32 (13.28%)	0.68 ± 0.54			31 (13.13%)	1.45 ± 0.78		
Voluntary abortion at less than 14 weeks								
No	167(69.29%)	0.64 ± 0.47	0.21	0.65	164(69.49%)	1.40 ± 0.75	-0.26	0.80
Yes	74(30.71%)	0.67 ± 0.42			72(30.51%)	1.43 ± 0.68		

Means (M), standard deviations (SD); * Independent-sample t-test; ** One-way ANOVA; $P < 0.05$ was considered statistically significant

Note: Pregnancy history with abnormal outcome refers to terminated pregnancy for FAs, preterm birth, stillbirth, and ectopic pregnancy. An Only child refers to a woman has no siblings of the same father or mother

Table 3 EPDS and ILAS scores of the participants at T1 and T2 ($n=241$)

		T1 (M ± SD)	T2 (M ± SD)	t	*P*
EPDS		13.84 ± 6.76	10.69 ± 7.43	4.87	0.00
ILAS		1.02 ± 0.67	1.40 ± 0.73	−5.95	0.00
	WAJ	0.72 ± 0.63	0.85 ± 0.82	-1.95	0.05
	I	0.88 ± 0.53	1.27 ± 0.66	-7.15	0.00
	SJ	1.66 ± 1.03	2.07 ± 0.82	-4.84	0.00
	SC	0.59 ± 0.79	1.12 ± 1.13	-5.97	0.00

WAJ, worries about judgment; I, isolation; SJ, self-judgment; SC, social condemnation

Means (M), standard deviations (SD), $P<0.05$ was considered statistically significant

Table 4 Correlations between stigma and depressive symptoms across T1 and T2 ($N=241$)

	T1 ILAS	T1 EPDS	T2 ILAS
T1 ILAS	-		
T1 EPDS	0.47**	-	
T2 ILAS	0.55**	0.15*	-
T2 EPDS	0.19*	0.51**	0.43**

*$P<0.05$; **$P<0.01$

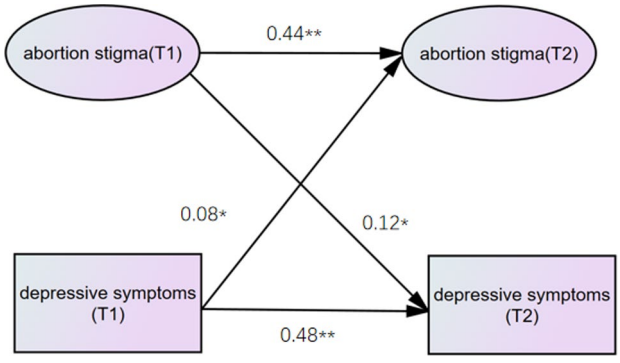

Fig. 1 Cross-lagged path model linking abortion stigma and depressive symptoms before and after terminating the pregnancy among women with FAs. age, gestational age, residence and religion are included as covariates. All path coefficients are standardized. * refer to $p<0.05$, ** refer to $p<0.01$. Model fitting index:$\chi^2/df=1.918$, RMSEA = 0.068, CFI = 0.959, TLI = 0.943, IFI = 0.960

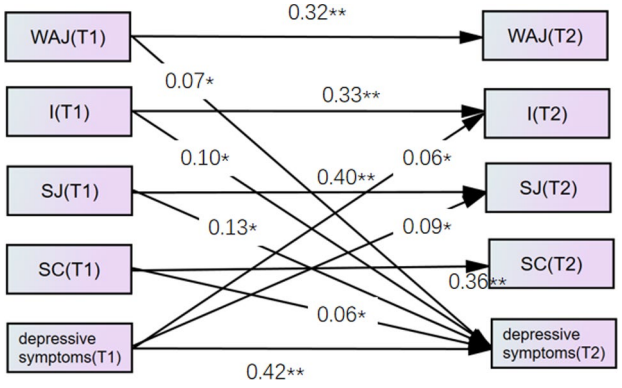

Fig. 2 Cross-lagged path model linking each dimension of abortion stigma and depressive symptoms before and after terminating the pregnancy among women with FAs. age, gestational age, residence and religion are included as covariates. WAJ, worries about judgment; I, isolation; SJ, self-judgment; SC, social condemnation. All path coefficients are standardized. * refer to $p<0.05$, ** refer to $p<0.01$. Model fitting index:$\chi2/df=2.115$, RMSEA = 0.068, CFI = 0.974, TLI = 0.930, IFI = 0.975

impacted the abortion stigma-related isolation and self-judgment dimensions after TP. The cross-lagged effect of abortion stigma on depressive symptoms was stronger than that of depressive symptoms on abortion stigma.

The results of this study supported and extended the results of previous cross-sectional studies [13, 22], where abortion stigma and depressive symptoms were found to influence each other. Abortion stigma before TP could positively influence depressive symptoms after TP, and conversely, depressive symptoms before TP could also positively impact abortion stigma after TP. At present, no longitudinal studies on abortion stigma and depressive symptoms are available, but many longitudinal studies on HIV-related stigma and depressive symptoms have been reported. A longitudinal study of 272 children orphaned by AIDS and 249 children of HIV-positive parents in rural China found a unidirectional relationship among perceived stigma, enacted stigma, and depressive symptoms. The order of the effects is enacted stigma → depressive symptoms → perceived stigma → enacted stigma [42]. A prospective cohort study of HIV-infected people found a moderate relationship between clinical depression and increases in internalized stigma over time [32]. Meanwhile, many longitudinal studies found that HIV stigma positively predicts depressive symptoms [43, 44]. The results of these studies suggested a reciprocal relationship between stigma and depressive symptoms over time.

Further analysis indicated that all dimensions of abortion stigma at T1 could positively influence depressive symptoms at T2, among which the self-judgment dimension had the strongest effect on depressive symptoms at T2. Previous studies confirmed that stigma diminishes women's self-esteem and self-efficacy [45] and undermines personal goals and social relationships [46]. These are all risk factors of depressive symptoms [11, 47, 48]. Hence, women with high abortion stigma may have lower self-esteem, lower self-efficacy, loss of personal goals, and insufficient social support, ultimately leading to depressive symptoms.

On the other hand, depressive symptoms at T1 positively influenced abortion stigma-related isolation and self-judgment dimensions at T2. The results of this qualitative study support the hypothesis that women who receive a diagnosis of a FA may be led to self-blame, believing 'my physical defect caused this fetal anomaly' and may also experience more conflict about the decision to terminate the pregnancy. These distressing emotions may contribute to depressive symptoms [11]. Depressive

symptoms could cause individuals to exhibit negative cognitive attentional bias, where individuals tend to focus on negative stimuli in the world and negative thoughts in the mind, and interpret neutral information negatively [49]. This phenomenon may cause women to focus on negative self-judgment in their minds, thus finally leading to an increased level of stigma.

Limitations

This study has several limitations. First, the use of a convenient sampling method may introduce selection bias. Participants were recruited from a single clinical setting in Changsha, Hunan Province, which limits the representativeness of the sample. This approach likely oversampled urban populations with better access to healthcare and excluded individuals from remote rural areas or regions with varying socioeconomic and medical resource levels. Consequently, the generalizability of findings to broader populations, particularly those in resource-limited or high-income settings, should be interpreted with caution. Second, the study was conducted in Changsha, a city with moderate healthcare and economic development. Most participants were urban residents, which, combined with the convenience sampling strategy, further restricts the extrapolation of results to populations in areas with advanced medical systems, extreme economic disparities, or geographically isolated regions. Third, due to the lack of routine psychological screening in China's general population, we could only exclude women with documented psychiatric diagnoses from medical records. Undiagnosed mental health conditions or transient psychological distress (e.g., anxiety or subclinical depression) might have confounded the observed associations between abortion stigma and depressive symptoms. Finally, a longitudinal control group should be included to compare the effect of abortion stigma on depressive symptoms in women with and without FAs.

Conclusion and clinical implications

In summary, this study provides longitudinal evidence of the bidirectional relationships between abortion stigma and depressive symptoms among women who underwent termination of pregnancy for fetal anomalies over time. The findings provide important implications for healthcare providers: first, abortion stigma may exacerbate depressive symptoms after terminating pregnancy for FAs. Clinicians should carefully consider their attitudes toward women with FAs, support women in viewing the termination experience objectively, and encourage open communication with family and friends to alleviate abortion stigma and, consequently, reduce depressive symptoms; second, depressive symptoms may intensify abortion stigma. Healthcare providers should assess and address both abortion stigma and depressive symptoms before terminating pregnancy for fetal anomalies. It is very important for promoting women's mental health.

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Author contributions

H.P: made substantial contributions to conception and design, and acquisition of data, and analysis and interpretation of data, Involved in drafting the manuscript and revising it critically for important intellectual content, and given final approval of the version to be published; C.Q: made substantial contributions to conception and design, and revising the draft critically for important intellectual content, and given final approval of the version to be published; Y.C: analysis and interpretation of data, and revising the draft critically for important intellectual content; X.L: acquisition of data, and analysis and interpretation of data; L.Z: analysis and interpretation of data, and revising the draft critically for important intellectual content; Y.W: analysis and interpretation of data, and revising the draft critically for important intellectual content; Yh.W: analysis and interpretation of data, and revising the draft critically for important intellectual content; Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content.

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Data availability

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

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Review Committee of the Nursing and Behavioral Medicine Research of Central South University (ethics review number: E2020126). All participants provided informed consent in accordance with the Declaration of Helsinki. Also, all methods were performed in accordance with the relevant guidelines of the journal. They were guaranteed the right to withdraw from the research at any time and the confidentiality of their personal information.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. Shaw J, Scotchman E, Chandler N, Chitty LS. PREIMPLANTATION GENETIC TESTING: Non-invasive prenatal testing for aneuploidy, copy-number variants and single-gene disorders. Reproduction. 2020;160(5):A1–11. https://doi.org/10.1530/REP-19-0591.
2. Kowalczyk K, Bartnik-Głaska M, Smyk M, et al. Prenatal diagnosis by array comparative genomic hybridization in fetuses with cardiac abnormalities. Genes. 2021;12(12). https://doi.org/10.3390/genes12122021.
3. Hume H, Chasen ST. Trends in timing of prenatal diagnosis and abortion for fetal chromosomal abnormalities. Am J Obstet Gynecol. 2015;213(4):545.e1-4. https://doi.org/10.1016/j.ajog.2015.06.008

4. Johnson CY, Honein MA, Dana Flanders W, Howards PP, Oakley GP Jr, Rasmussen SA. Pregnancy termination following prenatal diagnosis of anencephaly or spina bifida: a systematic review of the literature. Birth Defects Res Clin Mol Teratol. 2012;94(11):857–63. https://doi.org/10.1002/bdra.23086.
5. Xie D, Liang C, Xiang Y, Wang A, Xiong L, Kong F, Li H, Liu Z, Wang H. Prenatal diagnosis of birth defects and termination of pregnancy in Hunan Province, China. Prenat Diagn. 2020;40(8):925–30. https://doi.org/10.1002/pd.5648.
6. Kersting A, Kroker K, Steinhard J, Hoernig-Franz I, Wesselmann U, Luedorff K, Ohrmann P, Arolt V, Suslow T. Psychological impact on women after second and third trimester termination of pregnancy due to fetal anomalies versus women after preterm birth–a 14-month follow up study. Arch Womens Ment Health. 2009;12(4):193–201. https://doi.org/10.1007/s00737-009-0063-8.
7. Kersting A, Kroker K, Steinhard J, Lüdorff K, Wesselmann U, Ohrmann P, Arolt V, Suslow T. Complicated grief after traumatic loss: a 14-month follow up study. Eur Arch Psychiatry Clin Neurosci. 2007;257(8):437–43. https://doi.org/10.1007/s00406-007-0743-1.
8. Korenromp MJ, Page-Christiaens GC, van den Bout J, Mulder EJ, Hunfeld JA, Potters CM, Erwich JJ, van Binsbergen CJ, Brons JT, Beekhuis JR, Omtzigt AW, Visser GH. A prospective study on parental coping 4 months after termination of pregnancy for fetal anomalies. Prenat Diagn. 2007;27(8):709–16. https://doi.org/10.1002/pd.1763.
9. Kamranpour B, Noroozi M, Bahrami M. Psychological experiences of women with pregnancy termination due to fetal anomalies: a qualitative study from the perspective of women, their spouses, and healthcare providers in Iran. Reprod Health. 2020;17(1):109. https://doi.org/10.1186/s12978-020-00959-y.
10. Li Y, Tang S, Lu J, Huang C, Peng H, Xie J, Borjigen A, Liu M, Qin C. Prevalence and factors associated with depressive symptomatology among women before termination of pregnancy for fetal anomaly. J Psychosoc Nurs Ment Health Serv. 2020;58(12):43–50. https://doi.org/10.3928/02793695-20200921-01.
11. Qin CX. Construction of cognitive response model and related factors of depressive symptoms in women who underwent termination of pregnancy for fetal anomaly [D]. Changsha: Xiangya School of Nursing, Central South University, 2018.
12. Falana SD, Carrington JM. Postpartum depression: are you listening?? Nurs Clin North Am. 2019;54(4):561–7. https://doi.org/10.1016/j.cnur.2019.07.006.
13. Hanschmidt F, Treml J, Klingner J, Stepan H, Kersting A. Stigma in the context of pregnancy termination after diagnosis of fetal anomaly: associations with grief, trauma, and depression. Arch Womens Ment Health. 2018;21(4):391–9. https://doi.org/10.1007/s00737-017-0807-9.
14. Battle DE. Diagnostic and statistical manual of mental disorders (DSM). Codas. 2013;25(2):191–2. https://doi.org/10.1590/s2317-17822013000200017.
15. Mikšić Š, Miškulin M, Juranić B, Rakošec Ž, Včev A, Degmečić D. Depression and Suicidality during Pregnancy. Psychiatr Danub. 2018;30(1):85–90. https://doi.org/10.24869/psyd.2018.85. PMID: 29546863.
16. Davalos DB, Yadon CA, Tregellas HC. Untreated prenatal maternal depression and the potential risks to offspring: a review. Arch Womens Ment Health. 2012;15(1):1–14. https://doi.org/10.1007/s00737-011-0251-1.
17. Goffman E, Stigma. Notes on the management of spoiled identity. New York: Prentice-Hall; 1963.
18. Link BG, Phelan JC, Conceptualizing Stigma. Annual Rev Sociol. 2001;27(1):363–85. https://doi.org/10.1146/annurev.soc.27.1.363.
19. Norris A, Bessett D, Steinberg JR, Kavanaugh ML, De Zordo S, Becker D. Abortion stigma: a reconceptualization of constituents, causes, and consequences. Womens Health Issues. 2011 May-Jun;21(3 Suppl):S49–54. https://doi.org/10.1016/j.whi.2011.02.010.
20. Kumar A, Hessini L, Mitchell EM. Conceptualising abortion stigma. Cult Health Sex. 2009;11(6):625–39. https://doi.org/10.1080/13691050902842741.
21. National Health Commission. 2021 China Health Statistics Yearbook. China Union Medical University Press. 2021.
22. Li X, Peng H, Hu S, Xie J, Qin C. How does stigma influence depressive symptoms among women who underwent termination of pregnancy for foetal anomaly: A path analysis. J Clin Nurs. 2023;32(7–8):1410–20. https://doi.org/10.1111/jocn.16372. Epub 2022 May 17.
23. Maguire M, Light A, Kuppermann M, Dalton VK, Steinauer JE, Kerns JL. Grief after second-trimester termination for fetal anomaly: a qualitative study. Contraception. 2015;91(3):234–9. https://doi.org/10.1016/j.contraception.2014.11.015.
24. Lotto R, Armstrong N, Smith LK. Care provision during termination of pregnancy following diagnosis of a severe congenital anomaly - A qualitative study of what is important to parents. Midwifery. 2016;43:14–20. https://doi.org/10.1016/j.midw.2016.10.003.
25. Tedrus GMAS, Pereira RB, Zoppi M. Epilepsy, stigma, and family. Epilepsy Behav. 2018;78:265–8. https://doi.org/10.1016/j.yebeh.2017.08.007.
26. Scocco P, Preti A, Totaro S, Corrigan PW, Castriotta C, SOPROXI Team. Stigma, grief and depressive symptoms in help-seeking people bereaved through suicide. J Affect Disord. 2019;244:223–30. https://doi.org/10.1016/j.jad.2018.10.098.
27. Yip CCH, Chan KKS. Longitudinal impact of public stigma and courtesy stigma on parents of children with autism spectrum disorder: the moderating role of trait mindfulness. Res Dev Disabil. 2022;127:104243. https://doi.org/10.1016/j.ridd.2022.104243.
28. Nabunya P, Byansi W, Damulira C, Bahar OS, Jennings Mayo-Wilson L, Tozan Y, Kiyingi J, Nabayinda J, Braithwaite R, Witte SS, Ssewamala FM. Predictors of depressive symptoms and post traumatic stress disorder among women engaged in commercial sex work in Southern Uganda. Psychiatry Res. 2021;298:113817. https://doi.org/10.1016/j.psychres.2021.113817.
29. Pellet J, Golay P, Nguyen A, Suter C, Ismailaj A, Bonsack C, Favrod J. The relationship between self-stigma and depression among people with schizophrenia-spectrum disorders: A longitudinal study. Psychiatry Res. 2019;275:115–9. https://doi.org/10.1016/j.psychres.2019.03.022.
30. Chan KKS, Lam CB. Trait mindfulness attenuates the adverse psychological impact of stigma on parents of children with autism spectrum disorder. Mindfulness. 2017;8(4):984–94. https://doi.org/10.1007/s12671-016-0675-9.
31. Serchuk MD, Corrigan PW, Reed S, Ohan JL. Vicarious stigma and Self-Stigma experienced by parents of children with mental health and/or neurodevelopmental disorders. Community Ment Health J. 2021;57(8):1537–46. https://doi.org/10.1007/s10597-021-00774-0.
32. Takada S, Weiser SD, Kumbakumba E, Muzoora C, Martin JN, Hunt PW, Haberer JE, Kawuma A, Bangsberg DR, Tsai AC. The dynamic relationship between social support and HIV-related stigma in rural Uganda. Ann Behav Med. 2014;48(1):26–37. https://doi.org/10.1007/s12160-013-9576-5.
33. Lin J, Ou R, Wei Q, Cao B, Li C, Hou Y, Zhang L, Liu K, Shang H. Self-Stigma in Parkinson's disease: A 3-Year prospective cohort study. Front Aging Neurosci. 2022;14:790897. https://doi.org/10.3389/fnagi.2022.790897.
34. Hsueh YC, Chen CY, Hsiao YC, Lin CC. A longitudinal, cross-lagged panel analysis of loneliness and depression among community-based older adults. J Elder Abuse Negl 2019 Aug-Dec;31(4–5):281–93. https://doi.org/10.1080/08946566.2019.1660936
35. Zainal NH, Newman MG. A cross-lagged prospective network analysis of depression and anxiety and cognitive functioning components in midlife community adult women. Psychol Med. 2022;53(9):1–12. https://doi.org/10.1017/S0033291722000848.
36. Lac A, Donaldson CD. Sensation seeking versus alcohol use: evaluating Temporal precedence using cross-lagged panel models. Drug Alcohol Depend. 2021;219:108430. https://doi.org/10.1016/j.drugalcdep.2020.108430.
37. Dillman DA. Mail and other self-administered questionnaires. In: Rossi PH, Wright JD, Anderson AB, editors. Handbook of survey research. New York: Academic; 1983. pp. 359–77.
38. Cockrill K, Upadhyay UD, Turan J, Greene Foster D. The stigma of having an abortion: development of a scale and characteristics of women experiencing abortion stigma. Perspect Sex Reprod Health. 2013;45(2):79–88. https://doi.org/10.1363/4507913.
39. Li Qian Q, Chunxiang P, Huiting et al. Sinicization and reliability and validity evaluation of individual-level shame scale for induced labor [J]. Contemp Nurse. 2022;29(12):1–6.
40. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh postnatal depression scale. Br J Psychiatry. 1987;150:782–6. https://doi.org/10.1192/bjp.150.6.782.
41. Jelicić H, Phelps E, Lerner RM. Why missing data matter in the longitudinal study of adolescent development: using the 4-H study to understand the uses of different missing data methods. J Youth Adolesc. 2010;39(7):816–35. https://doi.org/10.1007/s10964-010-9542-5.
42. Chi P, Li X, Zhao J, Zhao G. Vicious circle of perceived stigma, enacted stigma and depressive symptoms among children affected by HIV/AIDS in China. AIDS Behav. 2014;18(6):1054–62. https://doi.org/10.1007/s10461-013-0649-z.
43. Garrido-Hernansaiz H, Alonso-Tapia J. Predictors of anxiety and depression among newly diagnosed people living with HIV: A longitudinal study. Scand J Psychol. 2020;61(5):616–24. https://doi.org/10.1111/sjop.12621.
44. Logie CH, Marcus N, Wang Y, Kaida A, O'Campo P, Ahmed U, O'Brien N, Nicholson V, Conway T, de Pokomandy A, Fernet M, Loutfy M, CHIWOS Research Team. A longitudinal study of associations between HIV-related stigma, recent violence and depression among women living with HIV in a Canadian

cohort study. J Int AIDS Soc. 2019;22(7):e25341. https://doi.org/10.1002/jia2.25341.
45. Oliveira SE, Carvalho H, Esteves F. Internalized stigma and quality of life domains among people with mental illness: the mediating role of self-esteem. J Ment Health. 2016;25(1):55–61. https://doi.org/10.3109/09638237.2015.1124387.
46. Yanos PT..Written-off: mental health stigma and the loss of human potential. UK: Cambridge University Press; 2018.
47. Mlawer F, Hubbard JA, Bookhout MK, Moore CC. Levels and instability of daily Self-Esteem in adolescents: relations to depressive and anxious symptoms. Res Child Adolesc Psychopathol. 2021;49(8):1083–95. https://doi.org/10.1007/s10802-021-00802-3.
48. Cho S, Bulger M. Social Support and Depressive Symptoms among Trauma-Impacted Older Adults. J Evid Based Soc Work (2019). 2021 Jul-Aug;18(4):371–378. https://doi.org/10.1080/26408066.2020.1866729
49. Mennen AC, Norman KA, Turk-Browne NB. Attentional bias in depression: Understanding mechanisms to improve training and treatment. Curr Opin Psychol. 2019;29:266–73. https://doi.org/10.1016/j.copsyc.2019.07.036.

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