Childhood maltreatment and suicidal ideation in Chinese children and adolescents: the mediation of resilience

Xue Chen[1,2,*], Linling Jiang[3,*], Yi Liu[3], Hailiang Ran[1], Runxu Yang[3], Xiufeng Xu[3], Jin Lu[3] and Yuanyuan Xiao[1]

[1] School of Public Health, Kunming Medical University, Kunming, China
[2] The Second Affiliated Hospital, Kunming Medical University, Kunming, China
[3] The First Affiliated Hospital, Kunming Medical University, Kunming, China
[*] These authors contributed equally to this work.

ABSTRACT

Background. Childhood maltreatment could increase the risk of suicidal ideation (SI) in adolescents. However, the mediation of resilience in this association remains unclear.

Methods. A population-based cross-sectional study has been done among 3,146 Chinese adolescents. We collected relevant information from the study participants by using self-administered questionnaire. Chinese version of the Childhood Trauma Questionnaire (CTQ), the Resilience Scale for Chinese Adolescents (RSCA), and the Beck Scale for Suicide Ideation (BSSI) were used to measure childhood maltreatment, resilience, and SI, respectively. Univariate and multivariate binary Logistic regression models were employed to estimate crude and adjusted associations between childhood maltreatment, resilience, and SI. Path analysis has subsequently been performed to measure the mediation of resilience in this association.

Results. Multivariate Logistic regression models revealed that compared to non-abused counterparts, adolescents who had ever experienced any type of childhood maltreatment was 1.74 times likely to report SI. Among the specific types of childhood maltreatment, emotional abuse showed the strongest association with SI (adjusted OR = 3.01, 95% CI [2.37–3.82]). Path model suggested that over one-third (39.8%) of the total association between childhood maltreatment and SI was mediated via resilience. Emotion regulation and interpersonal assistance were the most prominent mediators among all dimensions of resilience.

Conclusions. Resilience played as a significant mediator in the association between childhood maltreatment and SI. Resilience-oriented intervention measures could be considered for suicidal risk prevention among abused Chinese adolescents.

INTRODUCTION

Suicide is one leading cause of death among adolescents worldwide (*WHO, 2018*). The suicidality model emphasizes the continuous developmental stages in sequence: suicidal ideation (SI), suicide plan, suicide attempt, and finally, completed suicide (*Sveticic & De Leo, 2012*). Based on this theory, suicidal risk evolves from low to high with the

progression along this path (*Szanto et al., 2003*). From this point of view, SI can be seen as an imminent precursor of the subsequent suicide action, thus identifying suicide ideators is critical for effective suicide intervention.

SI can be influenced by multiple indicators among adolescents, like age, gender, mental disorders, educational levels, social support, interpersonal difficulties, and family conflict (*Ahorsu et al., 2020*; *Salama et al., 2020*; *Xiao et al., 2019*). In addition, a large body of studies suggested that childhood maltreatment is a salient risk factor for SI (*Falgares et al., 2018*; *Stickley et al., 2020*). Childhood maltreatment is defined as the abuse or neglect of children under the age of 16 (*Centers for Disease Control and Prevention (CDC), 2017*). It has been corroborated that childhood maltreatment can significantly increase future risk of affective disorders, such as depression, anxiety, borderline personality disorder, behavioral problems, or even suicide (*Rehan et al., 2017*; *Rafiq, Campodonico & Varese, 2018*; *Fry, McCoy & Swales, 2012*).

Childhood maltreatment is also a concern in China. Previous studies have revealed that 36.6% of the Chinese population reported physical child abuse experience (*Ji & Finkelhor, 2015*), the prevalence of childhood sexual abuse was 24.8% and 17.6% for female and male college students (*Chen et al., 2010*). Although the positive association between childhood abuse and SI has been well established, mechanism underneath this association, specifically, possible mediators in this association, remains unclear.
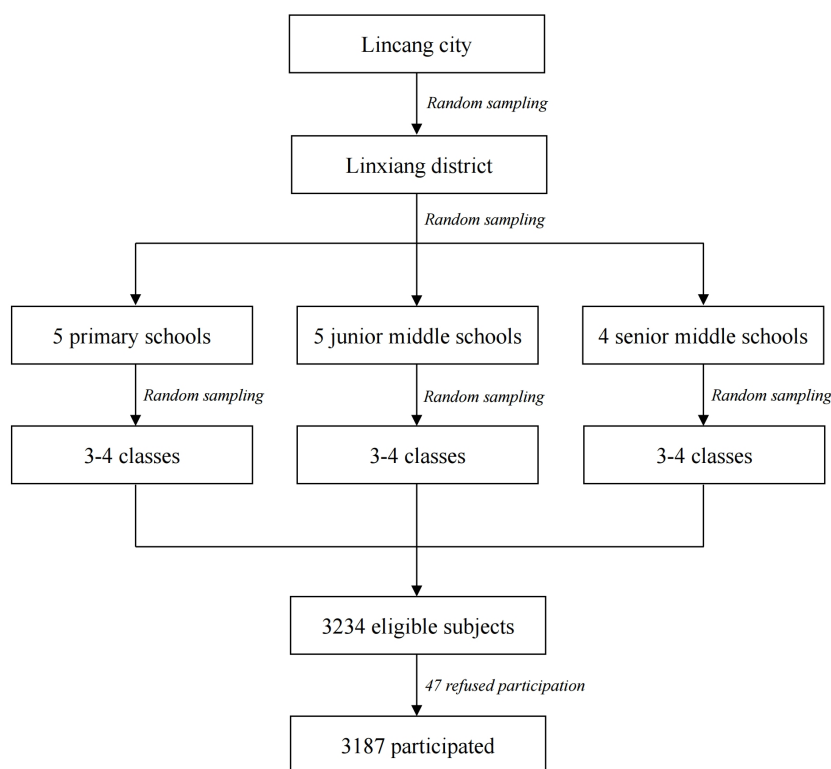
In the field of psychology, resilience has been defined as the ability to thrive in hardships or to recover from negative events (*De Terte & Stephens, 2014)*). Adolescent resilience is a multi-layer concept, which contains characteristics from individual level (such as goal concentration, emotion regulation, positive perception), family level (such as family support), and social environment level (such as interpersonal assistance) (*Olsson et al., 2003*). Prior studies suggested that children with childhood maltreatment experience had significantly lower psychological resilience (*Dubowitz et al., 2016*); meanwhile, it has been corroborated that psychological resilience level was significantly associated with the occurrence of SI (*Cong et al., 2019*). Therefore, it is logical to suspect that resilience may play as a mediator in the association between childhood maltreatment and SI. However, to our best knowledge, existing literature did not thoroughly investigate this hypothesis among Chinese adolescents.

Aiming to address this issue in this cross-sectional study, we intended to estimate the possible mediation of resilience in the association between childhood maltreatment and SI in a large group of Chinese adolescents. We put forward two hypotheses: (1) Different types of childhood maltreatment experiences are significantly but discordantly associated with increased risk of SI; (2) Resilience exerts prominent mediation in the association between childhood maltreatment and SI.

MATERIALS & METHODS

Participants

A cross-sectional survey was conducted in Lincang, western China Yunnan province from December 1 to December 13, 2019. Participants were selected using a multistage simple

```
┌─────────────────┐
│   Lincang city  │
└─────────────────┘
    Random sampling
┌─────────────────┐
│ Linxiang district│
└─────────────────┘
    Random sampling
┌──────────────┐   ┌──────────────────┐   ┌──────────────────┐
│5 primary     │   │5 junior middle   │   │4 senior middle   │
│schools       │   │schools           │   │schools           │
└──────────────┘   └──────────────────┘   └──────────────────┘
 Random sampling     Random sampling        Random sampling
┌──────────────┐   ┌──────────────────┐   ┌──────────────────┐
│  3-4 classes │   │   3-4 classes    │   │   3-4 classes    │
└──────────────┘   └──────────────────┘   └──────────────────┘

        ┌────────────────────────┐
        │  3234 eligible subjects│
        └────────────────────────┘
            47 refused participation
        ┌────────────────────────┐
        │   3187 participated    │
        └────────────────────────┘
```

Figure 1 **The process for sampling and study participants selection.**
Full-size ⬚ DOI: 10.7717/peerj.11758/fig-1

random cluster sampling method. In stage one, we randomly chose Linxiang district from a total of eight districts within Lingcang; in stage two, five primary schools, five junior middle schools, and four senior middle schools were selected randomly; at last, three to four classes were randomly selected in each chosen school based on the required sample size. All eligible students in these classes were preliminarily included. The process for sampling and study participants selection was shown in Fig. 1. The questionnaires were self-administered by respondents. When filling in the questionnaires, any confusion of the respondents can be consulted immediately at sites. To avoid any potential information lost, each completed questionnaire was also carefully reviewed immediately by pre-trained quality control personnel.

Adolescents aged above 10 and below 18 were eligible study subjects, the rationale for a lower limit of 10 was based on the finding that a child cannot well understand the concept of suicide until the age of 10 (*Mishara, 1999*). Children and adolescents were further screened by using the following exclusion criteria: (1) Illiterate; (2) Physically ill, cannot finish the survey; (3) Auditory dysfunction or language disorder; (4) Unconscious or delirious, cannot clearly express oneself. The presence of criteria (2)–(4) had been carefully evaluated by professional clinicians deployed at the survey sites. Prior to the survey, written consents were obtained from both the participants and their legal guardians. The study protocol

was reviewed and approved by the Third People's Hospital of Lincang Ethics Committee (Approval number: 2019-01).

Measurements
General characteristics
General characteristics of the participants, mainly demographics (gender, age, ethnicity, residence, grade, study style) and socioeconomic status (father's age, mother's age, father's education level, mother's education level, family income, marital status of the parents), were collected by using a self-developed questionnaire.

Childhood maltreatment
Chinese version of the Childhood Trauma Questionnaire (CTQ), a self-report scale of 28 items, was used to assess childhood physical abuse (PA), emotional abuse (EA), sexual abuse (SA), physical neglect (PN), and emotional neglect (EN). A 5-point scale rated answers are used for each question: 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = very often. The total score for each type of maltreatment ranges between 5 and 25. The following recommended cut-offs were used to dichotomize study subjects: 8 for PA, 9 for EA, 6 for SA, 8 for PN, 10 for EN (*Bernstein et al., 1994*). The Chinese version of CTQ showed acceptable reliability (*Zhao et al., 2005*).

SI
We used Chinese version of the Beck Scale for Suicide Ideation (BSSI) to assess lifetime SI of the participants (*Beck, Steer & Ranieri, 1988*). BSSI is one of the few suicide assessment instruments that possess predictive validity for completed suicide (*Zhang & Brown, 2007*). Participants with one of the following two conditions were defined as suicide ideator: (1) Answered "Weak" or "Moderate to strong" to the question "Desire to make active suicide attempt"; (2) Answered "Would leave life/death to chance" or "Would avoid steps necessary to save or maintain life" to the question "Passive suicidal desire" (*Xiao et al., 2019*).

Resilience
The 27-item Resilience Scale for Chinese Adolescents (RSCA) was used to evaluate the five dimensions of resilience (goal concentration, emotion regulation, positive perception, family support, and interpersonal assistance). RSCA was designed by *Hu & Gan (2008)*, and its reliability and validity have been corroborated in Chinese adolescents. The higher combined RSCA score reflects a higher level of resilience. The Cronbach's α for RSCA based on our analytical sample was 0.82 (Bootstrap 95% CI [0.80–0.83]).

Statistical analysis
Descriptive statistics were used to describe and compare general characteristics. We used univariate and multivariate binary Logistic regression models to explore the crude and adjusted associations between childhood maltreatment, resilience, and SI. At first, univariate model was used to screen for prominent demographic and socioeconomic covariates of SI at a lower significance level of 0.10. Prominent variables discerned by univariate models were further included into the subsequent multivariate models.

Childhood maltreatment and resilience were analyzed separately in model 1 and 2, then collectively in model 3. Based on the results of univariate and multivariate models, hypothetical path models were constructed to evaluate the mediation of resilience in the association between childhood maltreatment and SI.

All analyses were performed by using the R software (Version 3.6.2). Possible inter-correlation which caused by clustering sampling design was adjusted for by using R analytical packages for survey data, such as "survey" and "lavaan. survey". The significance level was set as $p < 0.05$, two-tailed.

RESULTS

General features of study participants

A total of 3,234 eligible adolescents were identified by using the inclusion and exclusion criteria, 47 students cannot participate because they asked for sick leave, with a survey response rate of 98.5%. Among the respondents, 3,146 provided valid and complete information, and the effective response rate was 97.3%. Characteristics of all included participants were displayed in Table 1. A total of 1,091 adolescents reported SI, accounted for 34.7% (95% CI [28.4%–48.0%]). Besides, a higher prevalence of SI was observed in girls. CTQ scores for all five types of childhood maltreatment were significantly higher for suicidal ideators ($p < 0.01$). The mean of combined resilience score was 93.9 for all participants, and suicidal ideators showed lower scores in all five dimensions of resilience ($p < 0.01$).

Associations between childhood maltreatment, resilience, and SI

Based on the cut-offs provided above for different dimensions of CTQ, 2,181 adolescents reported at least one type of childhood maltreatment, accounting for 69.3% (95% CI [61.9%–76.0%]). We used the median of RSCA (94) to dichotomize study participants as no commonly used cut-off for RSCA has been recommended. Gender, age, grade, study style, ages of both parents, education level of father, and marital status of the parents were significant covariates included into the subsequent multivariate models. The fitting results of the final multivariate model (Multivariate 3 in Table 2) indicated that: grade, study style, marital status of the parents were significantly associated with SI, participants of higher grade, were day students, whose parents were divorced, re-married, or widowed were observed increased risk of SI. Moreover, after adjusted for prominent covariates, for adolescents who had ever experienced childhood maltreatment, the odds of SI was 1.91 times (95% CI [1.51–2.41]) compared to non-abused adolescents; participants with a higher level of resilience (RSCA score ≥ 94) were 80% less likely (95% CI [74%–84%]) to report SI than participants with a lower level of resilience (RSCA score < 94).

Considering of the positive relationship between childhood maltreatment and SI, we further investigated the associations between different types of child maltreatment and SI, and the results were summarized in Fig. 2: all types of maltreatment were associated with prominently increased odds of SI, particularly, adolescents who had experienced emotional abuse showed the highest SI risk (adjusted OR = 3.01, 95% CI [2.37–3.82]), followed by emotional neglect (adjusted OR = 1.78, 95% CI [1.35–2.36]), sexual abuse (adjusted OR

Table 1 Major characteristics of the study participants, Lincang, China, 2019.

Features	SI	Non-SI	All
Gender (*N*, %): Girls	697 (63.89)	1,012 (49.25)	1,709 (54.32)
Age (Mean (SE))	13.74 (0.06)	13.09 (0.05)	13.31 (0.04)
Ethnicity (*N*, %)			
Han	728 (66.73)	1,384 (67.35)	2,112 (67.13)
Yi	127 (11.64)	238 (11.58)	365 (11.60)
Dai	82 (7.52)	128 (6.23)	210 (6.68)
Other	154 (14.12)	305 (14.84)	459 (14.59)
Residence (*N*, %)			
Township	491 (45.00)	1,026 (49.93)	1,517 (48.22)
Village	600 (55.00)	1,029 (50.07)	1,629 (51.78)
Grade (*N*, %)			
Primary school	300 (27.50)	832 (40.49)	1,132 (35.98)
Junior high school	378 (34.64)	691 (33.63)	1,069 (34.00)
Senior high school	413 (37.86)	532 (25.89)	945 (30.04)
Study style (*N*, %)			
Day students	368 (33.73)	913 (44.43)	1,281 (40.72)
Boarding students	723 (66.27)	1,142 (55.57)	1,865 (59.28)
Father's age (Mean (SE))	42.76 (0.18)	42.02 (0.13)	42.27 (0.10)
Mother's age (Mean (SE))	39.94 (0.16)	39.25 (0.11)	39.49 (0.09)
Father's education level (*N*, %)			
Elementary school and below	343 (31.44)	542 (26.37)	885 (28.13)
Junior high school and above	633 (58.02)	1,299 (63.21)	1,932 (61.41)
Missing or unknown	115 (10.54)	214 (10.41)	329 (10.46)
Mother's education level (*N*, %)			
Elementary school and below	401 (36.76)	676 (32.90)	1,077 (34.23)
Junior high school and above	617 (56.55)	1,199 (58.35)	1,816 (57.72)
Missing or unknown	73(6.69)	180(8.76)	253(8.04)
Marital status of the parents (*N*, %)			
Married	909 (83.32)	1,797 (87.45)	2,706 (86.01)
Divorced	87 (7.97)	130 (6.33)	217 (6.90)
Re-married	62 (5.68)	78 (3.80)	140 (4.50)
Widowed	33 (3.02)	47 (2.29)	80 (2.54)
Family income (*N*, %)			
Stable	981 (89.92)	1,926 (93.72)	2,907 (92.40)
Unstable	108 (9.90)	128 (6.23)	236 (7.50)
Childhood maltreatment (CTQ sores, Mean (SE))			
Emotional abuse	8.66 (0.11)	6.33 (0.04)	7.13 (0.05)
Physical abuse	6.59 (0.08)	5.82 (0.04)	6.09 (0.04)
Sexual abuse	5.54 (0.05)	5.22 (0.02)	5.33 (0.02)
Emotional neglect	11.75 (0.15)	9.43 (0.09)	10.23 (0.08)
Physical neglect	8.03 (0.09)	6.83 (0.05)	7.25 (0.05)

Table 1 (*continued*)

Features	SI	Non-SI	All
Resilience (RSCA scores, Mean (SE))			
Combined score	84.29 (0.46)	98.96 (0.34)	93.87 (0.30)
Goal concentration (Dimension 1)	15.48 (0.14)	18.12 (0.11)	17.21 (0.09)
Emotional regulation (Dimension 2)	17.58 (0.16)	23.02 (0.11)	21.14 (0.10)
Positive perception (Dimension 3)	13.20 (0.11)	13.78 (0.09)	13.58 (0.07)
Family support (Dimension 4)	19.67 (0.11)	21.36 (0.08)	20.78 (0.06)
Interpersonal assistance (Dimension 5)	18.36 (0.17)	22.67 (0.11)	21.18 (0.10)

Notes.
CTQ, Childhood Trauma Questionnaire; SI, Suicidal ideation; RSCA, the combined score of Resilience Scale for Chinese Adolescents.

Table 2 Results of multivariate regression models for associated factors of SI.

Covariates	Multivariate 1 OR (95% CI)	Multivariate 2 OR (95% CI)	Multivariate 3 OR (95% CI)
Age (+1 year)	1.12 (1.04, 1.20)	1.12 (1.04, 1.21)	1.11 (1.02, 1.21)
Father's age (+5 years)	1.00 (0.85, 1.19)	1.04 (0.87, 1.25)	1.02 (0.85, 1.23)
Mother's age (+5 years)	1.08 (0.93, 1.25)	1.06 (0.93, 1.21)	1.09 (0.95, 1.26)
Gender (Ref: Boys)			
Girls	2.09 (1.76, 2.47)	1.96 (1.67, 2.31)	2.07 (1.78, 2.42)
Grade (Ref: Primary school)			
Junior high school and above	2.15 (1.37, 3.36)	1.70 (1.12, 2.58)	1.91 (1.16, 3.15)
Study style (Ref: Day students)			
Boarding students	0.56 (0.47, 0.67)	0.65 (0.53, 0.80)	0.63 (0.51, 0.78)
Father's education level (Ref: Elementary and below)			
Junior high school and above	0.96 (0.79, 1.16)	1.07 (0.90, 1.27)	1.10 (0.93, 1.29)
Marital status of the parents (Ref: Married)			
Other	1.48 (1.09, 2.02)	1.62 (1.08, 2.43)	1.52 (1.02, 2.27)
Childhood maltreatment (Ref: No)			
Yes	3.00 (2.45, 3.69)		1.91 (1.51, 2.41)
Resilience (Ref: RSCA scores <94)			
RSCA scores $\geq$ 94		0.17 (0.14, 0.22)	0.20 (0.16, 0.26)

Notes.
RSCA, the combined score of Resilience Scale for Chinese Adolescents.

= 1.68, 95% CI [1.21–2.33]), physical abuse (adjusted OR = 1.53, 95% CI [1.24–1.88]), and physical neglect (adjusted OR =1.34, 95% CI [1.14–1.56]).

Mediation of resilience in maltreatment-SI association

Based on the previous analytical results, a hypothetical path model was put forward to illustrate the associations between childhood maltreatment, SI, and resilience. The path model justified that 39.8% of the association was mediated via resilience. Then we fitted a series of path model for 5 types of childhood maltreatment separately: after controlled for other related factors, EA, EN, and PN were indirectly associated with SI through resilience,
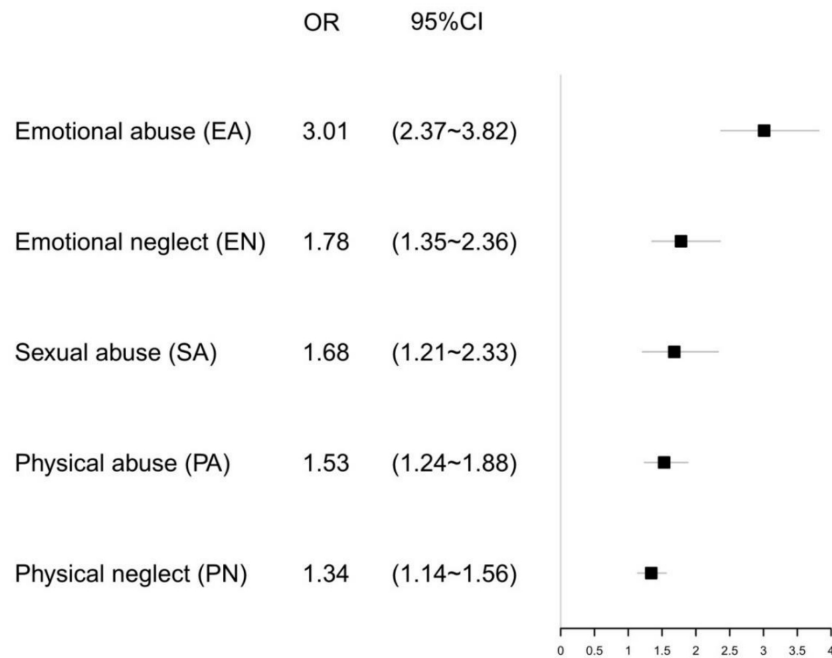
Figure 2 Adjusted ORs with 95% CIs of SI (suicidal ideation) for types of childhood maltreatment. Adjusted for age, gender, study style, marital status of the parents, father's education level.
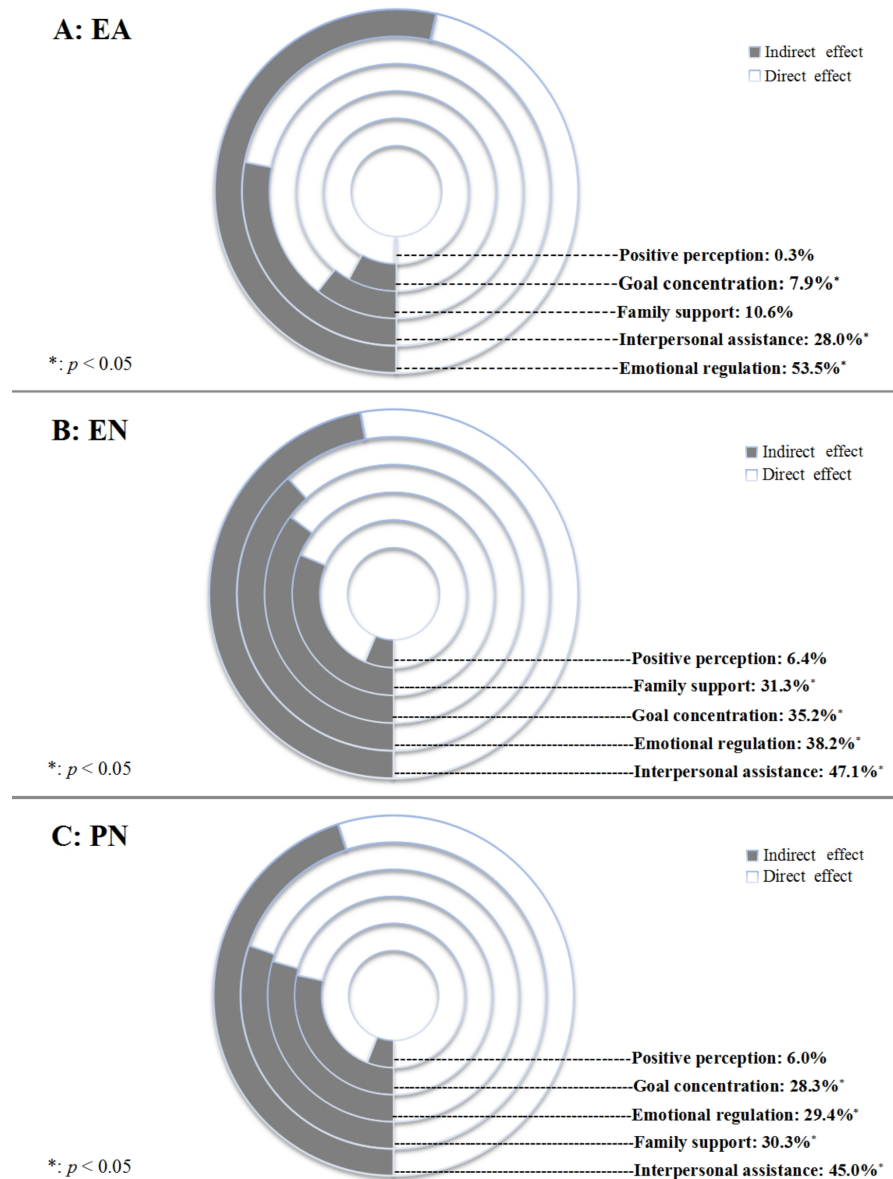
Full-size ⊡ DOI: 10.7717/peerj.11758/fig-2
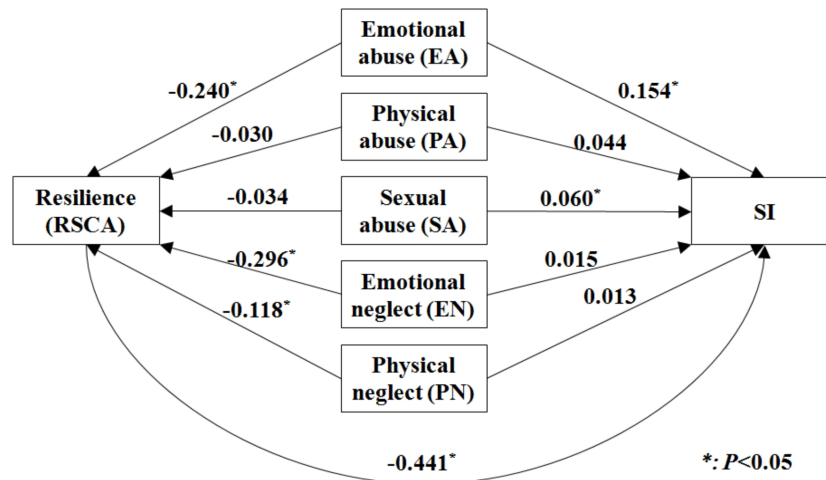
Figure 3 The hypothetical path model of five types of childhood maltreatment, resilience and SI.

Full-size ⊡ DOI: 10.7717/peerj.11758/fig-3

especially for EN and PN, as their direct associations with SI became insignificant after adjusted for the mediation of resilience (Fig. 3).

We further discussed the mediation of resilience in the association between EA, EN, PN, and SI by using its dimensions. Results showed that except for positive perception, the other four dimensions of resilience were salient mediators. Emotion regulation showed the

Figure 4 **Proportion of mediating effect in association of EA, PA, PN and SI by different dimensions of resilience.** EA, Emotional abuse; PA, Physical abuse. PN: Physical neglect.

strongest mediation for individuals who had exposed to EA, whereas for EN and PN, the strongest mediator was interpersonal assistance (Fig. 4).

DISCUSSION

In this cross-sectional study of 3,146 Chinese children and adolescents, we found a strong association between childhood maltreatment and SI, and among all types of childhood maltreatment, emotional abuse showed the strongest association with SI. More importantly, as hypothesized, resilience prominently mediated the association between childhood

maltreatment and SI: accounted for 39.8% of the total association. When dissecting resilience by using its dimensions, emotion regulation and interpersonal assistance were the most prominent mediators. The major findings of our study can help understand the intimate relationship between childhood maltreatment and SI, shed new light in the prevention of suicidal behaviors which stem from the past child abuse experiences among Chinese children and adolescents.

In the current study, we found that SI was prevalent among Chinese children and adolescents, as a lifetime prevalence of 34.7% has been found. This result was comparable to a previous study (32%) (*Tan, Xia & Reece, 2018*). Based on the analytical results, all types of childhood maltreatment were significantly and positively associated with SI. The positive connection between childhood maltreatment and SI is well supported by existing literature. First, childhood maltreatment could disturb the hypothalamic–pituitary–adrenal axis. It has been found that adult women with childhood abuse experience had higher plasma cortisol levels than non-abused individuals, and elevated cortisol is an identified risk factor for future SI (*Shalev et al., 2019*). Second, childhood maltreatment impairs cognitive function (*Miller & Esposito-Smythers, 2013*), and it has been repeatedly verified that cognitive impairment is directly associated with SI (*Pu, Setoyama & Noda, 2017*).

The results of path model revealed that over one-third of the association between childhood maltreatment and SI was inversely mediated via resilience. Although no studies on exactly the same topic can be compared with, it has been disclosed that resilience significantly mitigated suicidal risk associated with childhood trauma (*Poole, Dobson & Pusch, 2017*; *Meng et al., 2018*). Two common perspectives currently exist regarding to the concept of resilience: the trait-oriented perspective and the process-oriented perspective, and the latter is more widely accepted by researchers, for it emphasizes that resilience is a process of, or the outcome of, or the capacity for successful adaptation after setbacks. In other words, resilience can be modified. *Fergus & Zimmerman (2005)* have proposed that internal "assets" (such as perceived ability, coping strategies, self-efficacy) and external "resources" (typically different types of social support) are particularly critical in building up resilience of the adolescents.

Among all five types of childhood maltreatment, resilience played a significant mediation role in their associations with SI only for EA, EN, and PN. Especially for EN and PN, as their direct associations with SI were completely mediated by resilience. After careful literature review, we have not identified any studies that attempted to discuss and compare the mediation of resilience in associations between different types of childhood maltreatment and SI among adolescents. However, a previous study found that, among all types of child abuse, ego-resiliency only significantly mediated the relationships between EA, PN, EN and three psychological symptoms (depression, self-harm behaviors, anxiety) (*Hong, 2017*). Emotional neglect in adolescents may lead to shame, behavioral avoidance, and a dysfunctional attachment style, which then will increase the risk of depression and anxiety, two recognized risk factors of SI (*Lee et al., 2018*).

Interpersonal assistance, suggested by our analytical results, was the strongest mediator in the association between childhood neglect (either EN or PN) and SI among the 5 dimensions of resilience measured in RSCA. For children and adolescents, the most

prominent interpersonal relationship involves friends at school (*Eccles & Roeser, 2011*). Therefore, interpersonal assistance that we measured in this study was largely peer support. In fact, friends and peers are critical in the development of social relationships and interpersonal connectedness during the stage when children and adolescents begin to form bonds outside of their families (*Gorrese & Ruggieri, 2012*). Thus, close friends and peers logically become the primary source of intimacy and social support at this stage of life (*Wilkinson, 2004*). Peer support has been identified as a protective factor against psychological problems, especially depression, among children and adolescents (*Stice et al., 2011*; *Mizuta et al., 2017*). *Yearwood et al. (2019)* have found that higher level of peer support could mitigate internalizing and externalizing psychopathological symptoms associated with abuse and neglect experience in adolescents. Besides, by surveying 8,778 Chinese adolescents, *Cui et al. (2010)* observed that the lack of peer support was significantly related to increased risk of SI. However, it is highly possible that the relationship between interpersonal support and SI can be inverse, as our analysis was based on cross-sectional data, and this possible inverse association can also be supported by previous publications (*Wiklander, Samuelsson & Asberg, 2003*). Nevertheless, under any situation, the importance of interpersonal assistance, especially peer support, should be recognized when designing and implementing SI prevention strategies for adolescents who had experienced childhood neglect.

Another important finding is that, for all dimensions of resilience, emotion regulation presented the strongest mediation in the association between EA and SI. Besides, emotional regulation also played a salient role in mediating the relationship between child neglect and SI. All these findings suggest that improving emotion regulation ability can be another promising way to help adolescents suffering from EA, EN and PN antagonize the risk of SI. Fortunately, some effective intervention programs targeting at optimizing emotion regulation and emotional competence among adolescents have already been implemented, such as Mastering emotions technique (MEMT) (*Patel, Nivethitha & Mooventhan, 2018*), emotional schema therapy (*Bradley et al., 2011*), Integrative Body-Mind Training (IBMT) (*Tang, Tang & Posner, 2016*). However, as they seldomly been used in Chinese adolescents, their effectiveness in preventing child abuse related SI should be further discussed.

The following limitations of our study should be noticed. At first, all our analytical results were based on cross-sectional data, therefore, our major findings, especially the positive mediation of resilience in maltreatment-SI association are to be further corroborated by future longitudinal studies with large sample sizes. Another limitation is that, as we only adjusted for limited confounders when fitting the path model, residual confounding will exist inevitably. Besides, childhood maltreatment was ascertained by self-reporting, so the possibility of recall bias and information covering caused by stigma cannot be eliminated. Finally, we chose study participants from a single city of Yunnan province, as they may not be representative to the entire Chinese children and adolescent population, the extrapolation of study results should be made with caution.

Despite all limitations stated above, our study is among the first attempts in investigating the mediation of resilience in the association between childhood maltreatment and SI in Chinese adolescents. The large sample size provides further consolidation to the validity

of the results. Our major findings suggest that building up psychological resilience, especially strengthening emotion regulation skills and consolidating interpersonal support, might be useful in reducing the risk of future suicide among Chinese adolescents who were childhood maltreatment victims. The long-term effect of resilience in mediating the association between childhood maltreatment and SI is to be corroborated by future prospective studies.

CONCLUSIONS

In conclusion, this population-based cross-sectional study revealed a strong association between childhood maltreatment and SI, moreover, resilience played as a positive mediator in this association. Among the five dimensions of resilience, emotion regulation and interpersonal assistance presented the strongest mediation. Our findings suggested that resilience-oriented strategies could be effective in reducing the risk of childhood maltreatment related suicidal behaviors among Chinese children and adolescents, especially intervention measures focusing on strengthening emotion regulation skills and consolidating social support.

ADDITIONAL INFORMATION AND DECLARATIONS

Competing Interests

The authors declare there are no competing interests.

REFERENCES

Ahorsu DK, Adjaottor ES, Yeboah FA, Opoku Y. 2020. Mental health challenges in academia: comparison between students of the various educational levels in Ghana. *Journal of Mental Health* **13**:1–8 DOI 10.1080/09638237.2020.1739253.

Beck AT, Steer RA, Ranieri WF. 1988. Scale for suicide ideation: psychometric properties of a self-report version. *Journal of Clinical Psychology* **44(4)**:499–505 DOI 10.1002/1097-4679(198807)44:4<499::aid-jclp2270440404>3.0.co;2-6.

Bernstein DP, Fink L, Handelsman L, Foote J, Lovejoy M, Wenzel K, Sapareto E, Ruggiero J. 1994. Initial reliability and validity of a new retrospective measure of child abuse and neglect. *American Journal of Psychiatry* **151(8)**:1132–1136 DOI 10.1176/ajp.151.8.1132.

Bradley B, Westen D, Mercer KB, Binder EB, Jovanovic T, Crain D, Wingo A, Heim C. 2011. Association between childhood maltreatment and adult emotional dysregulation in a low-income, urban, African American sample: moderation by oxytocin receptor gene. *Development and Psychopathology* **23(2)**:439–452 DOI 10.1017/s0954579411000162.

Centers for Disease Control and Prevention (CDC). 2017. Child abuse and neglect prevention. *Available at https://www.cdc.gov/ViolencePrevention/childmaltreatment/* (accessed on 30 September 2017).

Chen JQ, Han P, Lian GL, Dunne M. 2010. Prevalence of childhood sexual abuse among 2508 college students in 6 provinces of China. *Zhonghua Liu Xing Bing Xue Za Zhi* **31(8)**:866–869.

Cong EZ, Wu Y, Cai YY, Chen HY, Xu YF. 2019. Association of suicidal ideation with family environment and psychological resilience in adolescents. *Zhongguo Dang Dai Er Ke Za Zhi* **21(5)**:479–484.

Cui S, Cheng Y, Xu Z, Chen D, Wang Y. 2010. Peer relationships and suicide ideation and attempts among Chinese adolescents. *Child: Care, Health and Development* **37(5)**:692–702.

De Terte I, Stephens C. 2014. Psychological resilience of workers in high-risk occupations. *Stress and Health* **30(5)**:353–355 DOI 10.1002/smi.2627.

Dubowitz H, Thompson R, Proctor L, Metzger R, Black MM, English D, Poole G, Magder L. 2016. Adversity, maltreatment, and resilience in young children. *Academic Pediatrics* **16(3)**:233–239 DOI 10.1016/j.acap.2015.12.005.

Eccles JS, Roeser RW. 2011. Schools as developmental contexts during adolescence. *Journal of Research on Adolescence* **21(1)**:225–241 DOI 10.1111/j.1532-7795.2010.00725.x.

Falgares G, Marchetti D, Manna G, Musso P, Oasi O, Kopala-Sibley DC, De Santis S, Verrocchio MC. 2018. Childhood maltreatment, pathological personality dimensions, and suicide risk in young adults. *Frontiers in Psychology* **9**:806 DOI 10.3389/fpsyg.2018.00806.

Fergus S, Zimmerman MA. 2005. Adolescent resilience: a framework for understanding healthy development in the face of risk. *Annual Review of Public Health* **26**:399–419 DOI 10.1146/annurev.publhealth.26.021304.144357.

Fry D, McCoy A, Swales D. 2012. The consequences of maltreatment on children's lives: a systematic review of data from the East Asia and Pacific Region. *Trauma Violence & Abuse* **13(4)**:209–233 DOI 10.1177/1524838012455873.

Gorrese A, Ruggieri R. 2012. Peer attachment: a meta-analytic review of gender and age differences and associations with parent attachment. *Journal of Youth and Adolescence* **41(5)**:650–672 DOI 10.1007/s10964-012-9759-6.

Hong CH. 2017. The moderating effect of ego-resilience and the mediating effect of social support in the relationship between abuse experience and complex PTSD. *The Korean Journal of Developmental Psychology* **30(1)**:1–19.

Hu Y, Gan Y. 2008. Development and psychometric validity of the resilience scale for chinese adolescents. *Acta Psychologica Sinica* 902–912 (In Chinese).

Ji K, Finkelhor D. 2015. A meta-analysis of child physical abuse prevalence in China. *Child Abuse & Neglect* **43**:61–72 DOI 10.1016/j.chiabu.2014.11.011.

Lee SW, Bae GY, Rim HD, Lee SJ, Chang SM, Kim BS, Won S. 2018. Mediating effect of resilience on the association between emotional neglect and depressive symptoms. *Psychiatry Investigation* **15(1)**:62–69 DOI 10.4306/pi.2018.15.1.62.

Meng X, Fleury MJ, Xiang YT, Li M, D'Arcy C. 2018. Resilience and protective factors among people with a history of child maltreatment: a systematic review. *Social Psychiatry and Psychiatric Epidemiology* **53(5)**:453–475 DOI 10.1007/s00127-018-1485-2.

Miller AB, Esposito-Smythers C. 2013. How do cognitive distortions and substance-related problems affect the relationship between child maltreatment and adolescent suicidal ideation? *Psychology of Violence* **3(4)**:340–353 DOI 10.1037/a0031355.

Miller AB, Jenness JL, Oppenheimer CW, Gottleib ALB, Young JF, Hankin BL. 2017. Childhood emotional maltreatment as a robust predictor of suicidal ideation: a 3-year multi-wave, prospective investigation. *Journal of Abnormal Child Psychology* **45(1)**:105–116 DOI 10.1007/s10802-016-0150.

Mishara BL. 1999. Conceptions of death and suicide in children ages 6-12 and their implications for suicide prevention. *Suicide & Life-Threatening Behavior* **29(2)**:105–118.

Mizuta A, Suzuki A, Yamagata Z, Ojima T. 2017. Teachers' support and depression among Japanese adolescents: a multilevel analysis. *Social Psychiatry and Psychiatric Epidemiology* **52(2)**:211–219 DOI 10.1007/s00127-016-1320-6.

Olsson CA, Bond L, Burns JM, Vella-Brodrick DA, Sawyer SM. 2003. Adolescent resilience: a concept analysis. *Journal of Adolescence* **26(1)**:1–11 DOI 10.1016/S0140-1971(02)00118-5.

Patel NK, Nivethitha L, Mooventhan A. 2018. Effect of a Yoga Based Meditation Technique on Emotional Regulation, Self-compassion and Mindfulness in College Students. *Explore-the Journal of Science and Healing* **14(6)**:443–447 DOI 10.1016/j.explore.2018.06.008.

Poole JC, Dobson KS, Pusch D. 2017. Childhood adversity and adult depression: the protective role of psychological resilience. *Child Abuse & Neglect* **64**:89–100 DOI 10.1016/j.chiabu.2016.12.012.

Pu S, Setoyama S, Noda T. 2017. Association between cognitive deficits and suicidal ideation in patients with major depressive disorder. *Scientific Report* **7(1)**:11637 DOI 10.1038/s41598-017-12142-8.

Rafiq S, Campodonico C, Varese F. 2018. The relationship between childhood adversities and dissociation in severe mental illness: a meta-analytic review. *Acta Psychiatrica ScandInavica* **138(6)**:509–525 DOI 10.1111/acps.12969.

Rehan W, Antfolk J, Johansson A, Jern P, Santtila P. 2017. Experiences of severe childhood maltreatment, depression, anxiety and alcohol abuse among adults in Finland. *PLOS ONE* **12(5)**:e0177252 DOI 10.1371/journal.pone.0177252.

Salama E, Castaneda AE, Suvisaari J, Rask S, Laatikainen T, Niemela S. 2020. Substance use, affective symptoms, and suicidal ideation among Russian, Somali, and Kurdish migrants in Finland. *Transcultural Psychiatry* DOI 10.1177/1363461520906028.

Shalev A, Porta G, Biernesser C, Zelazny J, Walker-Payne M, Melhem N, Brent D. 2019. Cortisol response to stress as a predictor for suicidal ideation in youth. *Journal of Affective Disorders* **257**:10–16 DOI 10.1016/j.jad.2019.06.053.

Stice E, Rohde P, Gau J, Ochner C. 2011. Relation of depression to perceived social support: Results from a randomized adolescent depression prevention trial. *Behaviour Research and Therapy* **49(5)**:361–366 DOI 10.1016/j.brat.2011.02.009.

Stickley A, Waldman K, Ueda M, Koyanagi A, Sumiyoshi T, Narita Z, Inoue Y, DeVylder JE, Oh H. 2020. Childhood neglect and suicidal behavior: findings from

the National Comorbidity Survey Replication. *Child Abuse & Neglect* **103**:104400 DOI 10.1016/j.chiabu.2020.104400.

Sveticic J, De Leo D. 2012. The hypothesis of a continuum in suicidality: a discussion on its validity and practical implications. *Mental Illness* **4(2)**:e15 DOI 10.4081/mi.2012.e4.

Szanto K, Mulsant BH, Houck P, Dew MA, Reynolds CF. 2003. Occurrence and course of suicidality during short-term treatment of late-life depression. *Archives of General Psychiatry* **60(6)**:610–617 DOI 10.1001/archpsyc.60.6.610.

Tan L, Xia T, Reece C. 2018. Social and individual risk factors for suicide ideation among Chinese children and adolescents: A multilevel analysis. International. *Journal of Psychology* **53(2)**:117–125 DOI 10.1002/ijop.12273.

Tang YY, Tang R, Posner MI. 2016. Mindfulness meditation improves emotion regulation and reduces drug abuse. *Drug and Alcohol Dependence* **163**:S13–S18 DOI 10.1016/j.drugalcdep.2015.11.041.

WHO. 2018. LIVE LIFE: preventing suicide. *Available at* https://www.who.int/publications/i/item/live-life-preventing-suicide (accessed on 2 June 2021).

Wiklander M, Samuelsson M, Asberg M. 2003. Shame reactions after suicide attempt. *ScandInavian Journal of Caring Sciences* **17(3)**:293–300 DOI 10.1046/j.1471-6712.2003.00227.

Wilkinson RB. 2004. The role of parental and peer attachment in the psychological health and self-esteem of adolescents. *Journal of Youth and Adolescence* **33**:479–493 DOI 10.1023/B:JOYO.0000048063.59425.20.

Xiao Y, Chen Y, Meng Q, Tian X, He L, Yu Z, Wang Y. 2019. Suicide ideation and suicide plan in Chinese left-behind children: prevalence and associated factors. *Journal of Affective Disorders* **257**:662–668 DOI 10.1016/j.jad.2019.07.072.

Yearwood K, Vliegen N, Chau C, Corveleyn J, Luyten P. 2019. When do peers matter? The moderating role of peer support in the relationship between environmental adversity, complex trauma, and adolescent psychopathology in socially disadvantaged adolescents. *Journal of Adolescence* **72**:14–22 DOI 10.1016/j.adolescence.2019.02.001.

Zhang J, Brown GK. 2007. Psychometric Properties of the Scale for Suicide Ideation in China. *Archives of Suicide Research* **11(2)**:203–210 DOI 10.1080/13811110600894652.

Zhao XF, Zhang YL, Li FL, Zhou YF. 2005. Evaluation on reliability and validity of Chinese version of childhood trauma questionnaire. *Chinese Journal of Clinical Rehabilitation* **16**:209–211 (In Chinese).