RESEARCH ARTICLE

The positive effect of social support on psychological distress among Chinese lung cancer patients: The mediating role of self-esteem

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Abstract

Aim: To investigate the effect of social support on psychological distress among Chinese lung cancer patients and clarify the mediating role of self-esteem.

Design: A cross-sectional descriptive correlational survey of 441 Chinese lung cancer patients was designed.

Methods: Self-esteem was supposed to play a mediating role in the association between social support and psychological distress. We collected demographic information, the Distress Thermometer, Multidimensional Scale of Perceived Social Support and Rosenberg Self-Esteem Scale.

Results: Our revised model demonstrated an acceptable fit to the data ($\chi^2 = 37.489$, comparative fit index (CFI) = 0.965, Tucker-Lewis index (TLI) = 0.926, root mean square error of approximation [RMSEA] = 0.099). Social support had a direct effect on self-esteem and psychological distress, and self-esteem had also a direct effect on psychological distress. Meanwhile, self-esteem also partially mediated the relationship between social support and psychological distress among Chinese lung cancer patients.

KEYWORDS
lung cancer, psychological distress, self-esteem, social support, structural equation model

1 | INTRODUCTION

Lung cancers remain ranking the first position in incidence and mortality among all cancers in China (Liu et al., 2018) and even worldwide (Siegel et al., 2018). It is reported that patients with lung cancer will experience a great deal of negative psychological problems, of which psychological distress has been reported to have the highest of incidence (Zabora et al., 2001) due to the negative impact from several aspects such as low 5-year survival rate and undetermined aetiologies (Goldstraw et al., 2016). Psychological distress among cancer patients has been extensively investigated, and several studies suggested that it may be negatively associated with several adverse outcomes such as interruption of treatment strategies and poor physical health status (Kroenke et al., 2013). Therefore, it is imperative to investigate all potential factors which have protective effects on psychological distress among lung cancer patients for the purpose of developing precisely effective intervention programme.

Xu Tian and Yanfei Jin have contributed equally to this work as joint first author.

Social support, as an important positive source of coping negative conditions, has been reported to be negatively associated with psychological distress among cancer patients, and several studies even found social support can improve the adverse effects resulted from psychological distress (Burnette et al., 2017; Demirtepe-Saygili & Bozo, 2011; Schulz & Schwarzer, 2004; Teixeira & Pereira, 2013; Tuinman et al., 2006). However, some studies have also suggested no statistically significant positive association between social support and psychological distress among cancer patients (Matzka et al., 2016; Oancea et al., 2018). To date, few researches have been performed to investigate the relationship between social support and psychological distress among lung cancer patients, and the latest one suggested that social support can significantly and directly predict the level of psychological distress (Lv et al., 2020). Nevertheless, the specified association between social support and psychological distress among lung cancer patients has not yet been completely determined due to scattered evidence, and the potential mechanisms of social support against psychological distress have also not yet been further investigated. These issues eventually limited nursing practitioners to develop reliable intervention programmes which have protective effects on psychological distress among lung cancer patients.

2 | BACKGROUND

Issued data approximately revealed, around the world, 2,100,000 new lung cancer cases and 1,800,000 lung cancer-related deaths (Bray et al., 2018). Lung cancer has obviously become the prevalent cause threatening public health worldwide as the increasing in incidence and mortality (Siegel et al., 2018). Similarly, lung cancer has also been reported as one of the leading cancer-related reasons of causing death (Liu et al., 2018). Those patients who were diagnosed with cancer will experience a series of distressing conditions such as adverse symptoms, interruption of treatment strategies and decreased health-related quality of life (QoL), which are all determined to be associated with psychological distress (Kroenke et al., 2013). It is reported that the 5-year survival rate of lung cancer patients is still to stay low, and the aetiologies of lung cancer have not yet been completely clarified (Goldstraw et al., 2016). As a result, patients with lung cancer experience several significant negative psychological symptoms, of which psychological distress has been defined as the critical adverse outcome which can negatively affect psychological and physical health and QoL (Zabora et al., 2001). For example, one study suggested that 44.12% lung cancer patients experienced psychological distress (Lynch et al., 2010), and another study found 51.0% participants suffered from elevated distress (Chambers et al., 2015). It is important to note that studies focused on Chinese lung cancer patients reported an incidence of psychological distress between 30.00%–73.00% (Pi et al., 2020) although a conclusive incidence is not yet clear.

As stated above, cancer patients with higher psychological distress will persistently experience several serious adverse outcomes such as lower compliance with treatment, worsen psychological health and decreased QoL (Akizuki et al., 2003). Therefore,

What does this paper contribute to the wider global clinical community

1. Social support was negatively associated with psychological distress in lung cancer patients and also be suggested to have a protective effect on psychological distress as a positive source.
2. Self-esteem also negatively affects psychological distress as a positive personal character which is critically important to rebuild self-role in society.
3. Social support relieves adverse outcomes resulted from psychological distress through enhancing the level of self-esteem among lung cancer patients.

psychological distress has been cited as a predictor of adverse psychosomatic symptoms (Gundelach & Henry, 2016; Rana et al., 2015; Riba et al., 2019). Social support is defined as a positive source to address negative conditions and thus has been extensively cited as an essential element of the psychological intervention programme for the purpose of improving psychological status (Kim & Jang, 2020). Most of studies have revealed that social support can relieve the negative effects caused by psychological distress (Burnette et al., 2017; Demirtepe-Saygili & Bozo, 2011; Schulz & Schwarzer, 2004; Teixeira & Pereira, 2013; Tuinman et al., 2006). For example, Burnette and colleagues found that social support was negatively associated with psychological distress in 377 cancer caregivers (Burnette et al., 2017). Moreover, Min and colleagues also found a negative relationship between social support and psychological distress (Min et al., 2013). However, more studies should be conducted to further establish the association between social support and psychological distress among lung cancer patients because limited numbers of studies investigated this question.

Self-esteem is defined as a positive personal character which is critically important to rebuild self-role in society (Curbow et al., 1990). A higher self-esteem is benefit to cope with the physical and psychological stress resulted from diseases and treatments (Pearlin et al., 1981). Some studies have suggested a negative association between self-esteem and psychological distress in cancer patients (den Heijer et al., 2011; Kobayashi et al., 2008; Rodin et al., 2009). For example, Rodin and colleagues found that low self-esteem plays a risk factor for psychological distress in 406 patients with metastatic gastrointestinal or lung cancer (Rodin et al., 2009). Certainly, the specified relationship between self-esteem and psychological distress is still needed to be further investigated due to inadequate numbers of eligible studies.

After interpreting the previous findings, we can believe that social support and self-esteem are the major social and psychological variables which can affect psychological distress among patients with lung cancer, respectively. Additionally, some studies also revealed a potential association between social support and self-esteem in cancer patients although this association was still

conflicting (Li et al., 2015; Tuinman et al., 2006; Wang et al., 2014; Xiaoyun & Fenglan, 2020). More importantly, as a positive individual source, social support was regarded as the motive power of enhancing self-esteem and eventually relieving adverse effects of distress. Therefore, we speculated that self-esteem may act as a mediating role in the relationship between social support and psychological distress. However, published studies only simply investigated the associative relationship between social support and self-esteem, and the potential relationship of these two variables to psychological distress among patients with lung cancer remains not clear. Therefore, we designed the current survey study to comprehensively investigate the impact of social support and self-esteem on psychological distress among Chinese lung cancer patients and then further clarify the role of self-esteem as mediators of an effects.

3 | STUDY

3.1 | Design

We performed the current survey study with a descriptive and correlational design. We reported all results in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist, developed by the EQUATOR Network (Enhancing the Quality and Transparency Of health Research) (see Appendix S1) (von Elm et al., 2014).

3.2 | Ethical approval

Our protocol has been approved by our hospital's Institutional Review Board (IRB) before initiation of the formal survey. The formal survey was conducted when all potential candidates were informed about the objectives and process of our study. All patients made a response to major investigator that they agree to participate in this survey voluntarily.

3.3 | Participants

We recruited all potentially eligible lung cancer patients from two tertiary hospitals and five secondary hospitals in Chongqing, China between September 2018 and August 2019. Sample size was estimated based on the principle of minimum numbers needed to perform structural equation modelling (SEM) (Tinsley & Tinsley, 1987). We designed the following inclusion criteria to enrol eligible patients: (a) adult patients diagnosed with lung cancer with pathologic or histologic investigation; (b) have healthy listening and ability of independently reading, understanding and writing; (c) did not include in other studies which have similar study aims with the current study; (d) made a effective response about informed consent. Patients with serious physical diseases, mental disorder and consciousness disorder were excluded from the scope of the current study. A total of 450 lung cancer patients were

recruited in the survey, and eventually 441 valid questionnaires were used in the final analysis, with a valid response rate of 98.0%.

3.4 | Data collection

The leading investigator in the current study determined targeted patients with convenience sampling. The investigator informed all patients about the details of the study aims, specified process, and patients' rights to decline and to withdraw from the study at any time with no negative consequences. Meanwhile, all patients were also informed that all data we collected from them will be protected strictly and only academic use of collected data. Before initiating the formal survey, we performed a pilot survey to test the feasibility of the questionnaire survey. Patients were required to independently answer all questionnaires.

3.5 | Instruments

3.5.1 | Demographic information sheet

The demographic information sheet was developed by the leading investigator (X.T.). Potential demographic variables which may have impact on psychological distress were identified from published literature and the consensus of the panel discussion. A total of 12 demographic variables were eventually identified in this study, including age, gender, educational level, work status, marital status, residence, home income, family history (yes or no), smoking history (yes or no), drinking history (yes or no), surgery history (yes or no), pain and TNM stage.

3.5.2 | Psychological distress

Psychological distress was measured with Chinese version of Distress Thermometer (DT) in the current study. The DT is a single item with an 11-point scale (0 and 10 represents no distress and extreme distress, respectively) in a thermometer format (Riba et al., 2019). The psychometric properties of DT have been extensively tested in several studies and all confirmed the value of DT to measure the level of psychological distress (Bui et al., 2005; Hong et al., 2015; Kornblith et al., 2001). Patients will be treated to have clinically significant distress when reported a score of 4 or above (Donovan et al., 2014; Tang et al., 2011). The optimal cut-off point of Chinese version of DT was also to be 4 (Hong et al., 2015).

3.5.3 | Social support

Social support was measured with the Chinese version of 12-item Multidimensional Scale of Perceived Social Support (MSPSS) in the current study (Yang et al., 2009), in which social support was divided into the following three aspects: support from family, friends

and others (Zimet et al., 1988). This instrument was answered with a 7-point Likert scale (1 = very strongly disagree to 7 = very strongly agree). Total score of the perceived social support ranges from 12–84 points. Psychological properties of MSPSS have been tested, with a coefficient alpha value of 0.81–0.98 for each subscale (Zimet et al., 1990). Reliability Cronbach alpha was 0.90 in this study.

3.5.4 | Self-esteem

In this study, we measured self-esteem with the Chinese version of the 10 items Rosenberg Self-Esteem Scale (RSES), which has been validated and reported to have a Cronbach's alpha of 0.88. The RSES is the most widely applied self-report instrument designed to measure global self-esteem, which should be understood as an individual's overall evaluation of worthiness as a human being (Rosenberg, 1986). Patients were requested to answer the instrument with a four-point Likert scale. A higher score indicates a higher level of self-esteem (Rosenberg, 1989). In this study, the Cronbach's alpha of the Chinese version of RSES was 0.937. Self-esteem was parcelled to produce two categories with item parcelling method (Yang et al., 2010) for the final analysis because common method bias resulted from method effects may negatively affect the model fit (Tomas & Oliver, 1999).

3.6 | Data analysis

We completed all statistical analyses with the Statistical Package for Social Sciences (Chicago, Illinois) and IBM AMOS 21.0 (Chicago, Illinois). Descriptive statistics were used to summarize patients' characteristics and scores of psychological distress, social support and self-esteem. The Kolmogorov–Smirnov test indicated a skew distribution about the score of psychological distress, social support and self-esteem, and thus Spearman rank correlation was conducted to investigate the associations among psychological distress, social support and self-esteem. Bootstrap test was conducted to test a mediating effect of self-esteem in the relation of social support and psychological distress. The criteria of fit index used in testing of how well the structural equation model should fit for recommendation. According to Schreiber (2017) (Schreiber, 2017), the chi-square (χ^2) test value should not be statistically significant ($p > .05$), $1 < \chi^2/$ degrees of freedom (df) < 3, goodness of fit index (GFI) > 0.90, adjusted goodness of fit index (AGFI) > 0.90, comparative fit index (CFI) ≥ 0.90, incremental fit index (IFI) > 0.90, normed fit index (NFI) > 0.90 and root mean square error of approximation (RMSEA) < 0.05. A p value of .05 was considered to be statistical significance (two-tailed).

4 | RESULTS

4.1 | Demographic characteristics

441 study participants had an average age of 59.48 years (SD = 9.93, range = 33–84). The majority of patients (N = 315, 71.4%) were

male. One hundred and sixty-eight patients (38.1%) had undergone surgery. The majority of patients (N = 330, 74.8%) were diagnosed at the IV stage. The demographic disease characteristics are shown in Table 1.

4.2 | Relationships between psychological distress, social support and self-esteem

Overall, median score of psychological distress was 2 with an interquartile range of from 2–3. Medium score of social support and self-esteem was 66 (61–70) and 28 (26–29), respectively. Table 2 documented the results of correlation analyses of psychological distress, social support and self-esteem. The results of the Spearman rank correlation analyses showed social support ($r = -0.444$) and self-esteem ($r = -0.112$) were all negatively related to psychological distress, and social support was positively associated with self-esteem ($r = 0.178$).

4.3 | The mediating effect of self-esteem on the relationship between social support and psychological distress

Structural equation modelling (*SEM*) with maximum likelihood was used to analyse the path correlations which were presented in Table 3 and Figure 1. The results showed a better fitness between construct model and the data ($\chi^2 = 37.489$, $df = 7$, GFI = 0.974, AGFI = 0.923, CFI = 0.974, IFI = 0.966, NFI = 0.958, RMSEA = 0.099 [90% CI, 0.000–0.075]).

As illustrated, social support had significant direct effects on psychological distress ($\beta = -0.710$, $p = .001$) and self-esteem ($\beta = -0.510$, $p = .002$) among Chinese lung cancer patients. Meanwhile, self-esteem had significant direct effects on psychological distress ($\beta = -0.273$, $p = .004$). The results of the bias-corrected bootstrap method indicated that the indirect pathways between social support and psychological distress through self-esteem were also significant. The results from bootstrap test for significance of indirect pathways were summarized in Table 3. The results indicated that self-esteem plays a partial mediator in the relationship between social support and psychological distress among Chinese lung cancer patients.

5 | DISCUSSION

5.1 | Main findings

The aim of the present study is to examine the influence of social support on psychological distress among Chinese lung cancer patients and determine whether self-esteem mediating the association between social support and psychological distress. Our current study stemmed from a fact that the mechanism by which social

TABLE 1 Characteristics of participants (N = 441)

Characteristics	Frequency	Per cent (%)	Mean rank of psychological distress score
Gender			
Male	315	71.4	219.51
Female	126	28.6	224.71
Age (years)			
18–39	12	2.7	266.00
40–49	57	12.9	249.26
50–59	141	32.0	218.64
≥60	231	52.4	213.13
Nationality			
Han nationality	435	98.6	220.44
Minority nationality	6	1.4	261.75
Educational level			
Primary	120	27.2	215.34
Junior high	180	40.8	208.43
Senior high	84	19.1	243.55
University	57	12.9	228.42
Work status			
Not working	198	44.9	217.48
Working	54	12.2	254.50
Retired	189	42.9	215.12
Marital status			
Married	438	99.3	220.21
Divorced/Widowed	3	0.7	336.50
Payment Method			
Medical insurance	429	97.3	221.58
Self-payment	12	2.7	200.38
Residence			
Urban	306	69.4	216.96
Rural	135	30.6	230.17
Household income			
<20,000	39	8.8	259.77
20,000–50,000	123	27.9	204.87
50,000–100,000	192	43.5	207.38
>100,000	87	19.8	256.48
Family history			
No	387	87.8	224.99
Yes	54	12.2	192.42
Smoking history			
No	159	36.1	218.00
Yes	282	63.9	222.69
Drinking history			
No	237	53.7	211.18
Yes	204	46.3	232.40
Surgery			

TABLE 1 (Continued)

Characteristics	Frequency	Per cent (%)	Mean rank of psychological distress score
No	273	61.9	216.76
Yes	168	38.1	227.89
Pain			
No pain	183	41.5	207.33
Mild	174	39.5	233.41
Moderate	81	18.4	227.67
Severe	3	0.06	155.00
TNM stage			
I	42	9.5	247.79
II	21	4.8	387.07
III	48	10.9	212.38
IV	330	74.8	208.28

support influences psychosocial distress among lung cancer patients is not yet clear.

In the current study, we found a directly negative correlation between social support and psychological distress among Chinese lung cancer patients, which was consistent with findings from previous studies (Burnette et al., 2017; Matzka et al., 2016). Social support has been identified as a protective source on distress and psychosocial adjustment (Schulz & Schwarzer, 2004). A great deal of studies has established the importance of involving social support sources such as caregivers, spouses, or partners in educational and psychosocial intervention regimes (Keefe et al., 2005). Studies which were performed to investigate the influencing factors on psychological distress also consistently indicated that social support is one of the most important factors of reducing the severity of psychological distress (Shen et al., 2018; Wang et al., 2018). One study focusing on breast cancer patients also suggested that a higher level of social support was associated with higher benefit when a critical threshold of social support was reached (Mallinckrodt et al., 2012). Therefore, intervention programmes involving professional and non-professional social supports such as health coaching and a web-based programme (Yun et al., 2020) should be adapted for lung cancer patients for the purpose of relieving the unfavourable consequences resulted from psychological distress and then improve the quality of life.

Meanwhile, our current study based on correlation analysis and structural equation modelling suggested a negative association between self-esteem and psychological distress in Chinese lung cancer patients, which was consistent with previous findings in other cancer patients (den Heijer et al., 2011; Kobayashi et al., 2008; McAteer & Gillanders, 2019; Rodin et al., 2009; Xiaoyun & Fenglan, 2020). For example, McAteer and colleagues found that self-esteem negatively predicted outcomes of distress in prostate cancer patients (McAteer & Gillanders, 2019). Self-esteem is defined as satisfaction with oneself or as the attitudes and feelings one has towards oneself (Tuinman et al., 2006). In fact, self-esteem plays a protective role through relieving negative emotions and improving psychological status (Neel et al., 2015). Patients with higher self-esteem will experience lower psychological distress; however, one with lower self-esteem will face significantly higher psychological distress due to more negative self-awareness (Baer et al., 2006). Study focused on Chinese male nursing students also established that self-esteem was a negative predictor of psychological distress (Feng et al., 2019). Therefore, it is critically important to enhance self-esteem of lung cancer patients in order to further enhance the patients' ability of coping adverse conditions and eventually relieve the negative effects of psychological distress on quality of life.

Additionally, in this study, we also found that self-esteem partially mediated the relationship between social support and psychological distress, with a negative correlation between perceived stress and psychological distress. Unfortunately, there is still no published study to investigate the mediating role of self-esteem between social support and psychological distress. Nevertheless, Feng

TABLE 2 Spearman correlation coefficient of study variables (N = 441)

Variables	Score (Median ± Quartile)	Psychological distress	Social support	Self-esteem
Psychological distress	2 (2–3)	1.000		
Social support	66 (61–70)	−0.444[**]	1.000	
Self-esteem	28 (26–29)	−0.112[*]	0.178[*]	1.000

[*]p < .05.

[**]p < .01.

TABLE 3 Bias-corrected bootstrap test for all indirect pathways

Pathway	Direct effects	Indirect effects	Total effects	Risk-corrected Bootstrap test	p value
psychological distress ← social support	−0.710	0.139	−0.571	−0.404 (−0.725, −0.298)	.001
psychological distress ← self-esteem	−0.273	0.000	−0.273	−0.861 (−4.160, −0.274)	.004
self-esteem ← social support	−0.510	0.000	−0.510	−0.092 (−0.166, −0.018)	.002
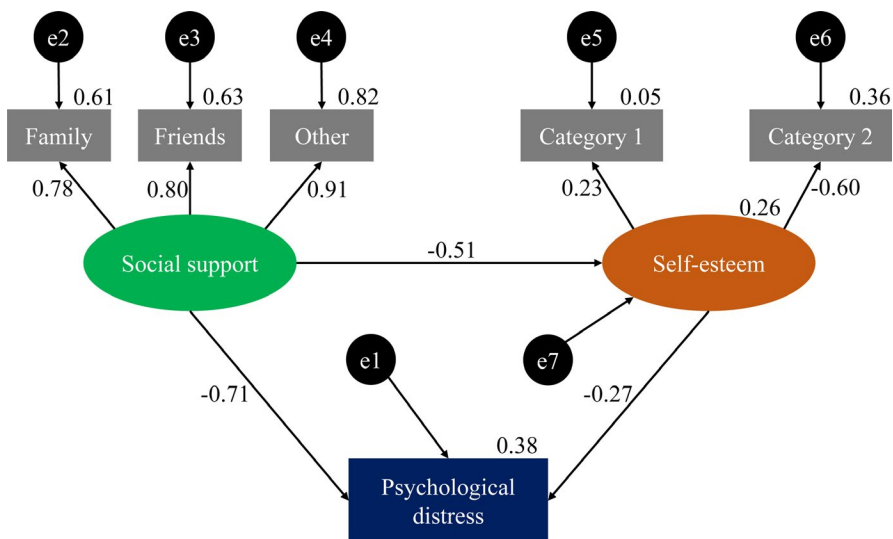
FIGURE 1 A path diagram of direct and indirect influences of social support and self-esteem on psychological distress among Chinese lung cancer patients (N = 441)

and colleagues found an indirect effect of self-esteem on psychological distress through perceived social support in Chinese nursing students (Feng et al., 2018), which was consistent with our finding. Higher perceived social support can enhance the level of self-esteem through improving self-awareness, and as a positive psychological source of coping negative conditions (Wang et al., 2014), self-esteem can inspire patients to seek external positive support for the purpose of enhancing self-awareness, and eventually relieve the level of psychological distress (Routledge, 2012). So, it is essential to emphasize the role of enhancing the level of self-esteem when interpreting the positive effects of social support on psychological distress. Moreover, psychological intervention programmes for involving elements of enhancing self-esteem should be developed in order to enhance the protective effects of social support on psychological distress.

5.2 | Limitations

Despite the fact that the current study identified several valuable findings, several limitations must be further interpreted. First and foremost is that the causal relationship between the proposed variables cannot be established due to the nature of cross-sectional survey design. We therefore suggested future longitudinal study to prospectively clarify the association among social support, self-esteem, and psychological distress and then determine the mechanism of social support relieves the negative consequences resulted

from psychological distress. Second, convenience sampling was used to recruit eligible patients in the current study rather than random sampling method, which causes our sample is not representative. Third, social support, self-esteem and psychological distress were all measured with self-reported questionnaires in the current study, which made our results to be inflated due to subjective bias from participants and investigators. Additional studies considering physiological assessment and ecological momentary assessment should be conducted.

6 | CONCLUSIONS

Social support and self-esteem had direct negative effects on psychological distress among Chinese lung cancer patients, and self-esteem partially mediating the positive effect of social support on psychological distress.

7 | RELEVANCE TO CLINICAL PRACTICE

This study enhanced our understanding on the association among social support, self-esteem and psychological distress in lung cancer patients. From our current findings, practitioners can enhance the benefits of social support programmes through improving the level of self-esteem of lung cancer patients and eventually reduce the adverse consequences caused by psychological distress.

AUTHOR CONTRIBUTIONS

Xu Tian, Yanfei Jin, Hui Chen, Ling Tang and Maria F. Jiménez-Herrera involved in substantial contributions to conception, design and acquisition of data. Xu Tian and Maria F. Jiménez-Herrera involved in analysis and interpretation of data. Xu Tian, Yanfei Jin and Maria F. Jiménez-Herrera involved in drafting the manuscript or revising it critically for important intellectual content. All authors finally approved the version to be submitted.

ETHICAL APPROVAL

The protocol of the current study has been approved by the ethics commission of the Chongqing University Cancer Hospital with an identifier of CUCH_P20180225. Oral informed consent has been obtained from all patients before performing the formal survey and all questionnaires were answered anonymously.

DATA AVAILABILITY STATEMENT

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

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