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Research article

Associations among resilience, hope, social support, stress, and anxiety severity in Chinese women with abnormal cervical cancer screening results

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ABSTRACT

This study was to explore the resilience level and its potential correlates and further to evaluate the influence of these resilience-centred variables on anxiety severity among Chinese women with abnormal cervical cancer screening results. One hundred and seventy-five subjects completed self-administered questionnaires to collect relevant variables. The level of resilience of our sample is moderate (70.57 ± 12.14). The data identified hope (β = 0.218), social support (β = 0.247) and perceived stress (β = -0.320) as independent associates for resilience. Finally, among variables, only perceived stress is found to have a direct and positive influence on anxiety severity. Interventions on these variables can be effective for resilience promotion in this population. In addition, anxiety should be preferentially intervened in through the alleviation of perceived stress.

1. Introduction

Cervical cancer poses a considerable threat to women's health [1, 2, 3]. The higher incidence of this disease in China is considered to be related to increased prevalence of human papillomavirus (HPV) infection, changing patterns of sexual behaviour, inadequate screening, smoking, and use of oral contraceptives [4]. Cervical cancer screening significantly reduces morbidity and mortality by the early diagnosis and intervention in disease progression [5]. Currently, HPV detection and the Thinprep cytologic test (TCT) are widely used in China for cervical cancer primary screening, either alone or in combination [6]. Screening of this disease can be psychologically taxing. A previous study found that women who had been subjected to cervical cancer screening had increased psychological distress [7]. However, some people can maintain and regain their health despite setbacks and traumatic situations. This discrepancy might be attributed to varying levels of resilience, a subject's ability to adapt in the face of adverse external events [8].

Resilience is an especially significant concept in psychology, and research on resilience is essential for individuals with abnormal screening results because many studies, both descriptive and interventional, show that resilience is associated with people's well-being [9, 10, 11, 12, 13]. Resilience helps alleviate psychological distress [14] and anxiety severity [15] among clinical samples. In contrast, a lack of resilience is closely related to higher psychological disorders [16]. According to the resilience model proposed by Rutter and colleagues, resilience is dynamically shaped by the interaction between individual personality characteristics and environmental factors [17]. However, extant research neglects to evaluate the mental health and resilience level of women with abnormal cervical cancer screening results. Therefore, this research aims to fill this knowledge gap and provide perspective on how these women maintain a good mood and a positive attitude towards the follow-up examination.

Individual resilience is shaped and built on the basis of two crucial factors: individual psychological qualities and the social environment. For example, an increasing number of studies find that hope, social support, and/or perceived stress are closely associated with resilience [15, 18, 19, 20]. Of these three variables, hope is an important psychological quality, whereas social support and stress are critical social environment factors. As one of the more striking psychological capitals and an important psychological construct in positive psychology, hope gives individuals the ability to mentally maintain a positive status and helps them persevere through hard situations and maintain their mental health. Accumulating evidence confirms that hope is significantly protective for various mental disorders [21, 22]. In addition, hope is also protective for individuals' resilience [23, 24]. Stress refers to the experience of distress when confronted with unpleasant threats or stressors

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Table 1. Demographic and clinical characteristics and the level of resilience of women with abnormal cervical cancer screening results (n = 175).

Variables	n (%)	Resilience		
		Mean (SD)	t/F	P
Age				
<30 years	20 (11.4)	66.95 (12.03)	1.088	0.339
30–50 years	101 (57.7)	71.33 (12.35)		
>50 years	54 (30.9)	70.50 (11.75)		
Marriage				
Single/divorced/widowed	26 (14.9)	71.65 (10.93)	0.492	0.624
Married/cohabitation	149 (84.1)	70.38 (12.36)		
Education				
Middle school or lower	81 (46.3)	69.40 (11.79)	0.931	0.396
High or secondary school	39 (22.3)	70.59 (12.90)		
College or university	55 (31.4)	72.29 (12.11)		
Income				
<3000	102 (58.3)	67.7 7 (12.25)	-3.730	<0.001
≥3000	73 (41.7)	74.48 (10.91)		
Job status				
Regular employee	80 (45.6)	68.58 (11.43)	4.640	0.011
Retirement	38 (21.7)	68.87 (12.24)		
Unemployed/temporary workers	57 (32.6)	74.51 (12.29)*		
Residence				
Rural	48 (27.4)	69.56 (12.74)	-0.675	0.501
Urban	127 (72.6)	70.95 (11.93)		
Smoking				
Yes	14 (8.0)	65.64 (13.89)	-1.591	0.113
No	161 (92.0)	71.00 (11.93)		
Drinking alcohol				
Yes	23 (13.1)	69.57 (14.32)	-0.426	0.671
No	152 (86.9)	70.72 (11.82)		
Menopause				
Yes	55 (31.4)	70.16 (12.11)	-0.300	0.764
No	120 (68.6)	70.76 (12.20)		
HPV vaccination				
Yes	10 (5.7)	76.20 (7.96)	1.516	0.131
No	165 (94.3)	70.23 (12.28)		
Type of results				
TCT positive	18 (10.3)	74.56 (11.92)	1.017	0.387
HPV positive	62 (35.4)	71.10 (12.43)		
Both TCT and HPV positive	74 (42.3)	69.78 (11.96)		
Don't know which type	21 (12.0)	68.38 (12.08)		
Abnormal vaginal or contact bleeding				
Yes	52 (29.7)	71.31 (10.60)	0.521	0.603
No	123 (70.3)	70.26 (12.76)		
Family history				
Yes	38 (21.7)	67.95 (13.72)	-1.376	0.175
No	137 (78.3)	71.30 (11.61)		

Note: *P < 0.05 vs. Regular employee group.

Table 2. Descriptive statistics and correlations among continuous variables (n = 175).

	Means	SD	Resilience	Hope	Social support
Resilience	70.57	12.14	1		
Hope	37.91	4.58	0.556***	1	
Social support	66.17	11.77	0.510***	0.626***	1
Perceived stress	12.61	6.10	-0.522***	-0.499***	-0.333***

Note: ***P < 0.001 (two-tailed).

and presents as perceived helplessness and a decrease in self-efficacy. Increased stress perception is frequently found to be related to increased negative emotional status. Many extant studies also confirm that resilience mediates the influence of perceived stress on mental disorders [25]. According to the *stress-buffering hypothesis*, perceived social support may help decrease psychological stress when individuals experience traumatic events [26]. In line with this, a recent study revealed a close and negative correlation between social support and COVID-19 pandemic-related PTSD risk [27]. Increasing evidence also posits the resilience mediates the interaction between social support and psychological problems [24, 28, 29].

Currently, resilience levels and their influencing factors in women with abnormal cervical cancer screening results are unclear. To address this issue, we include all the psychological factors listed above as well as diverse demographic and clinical variables. Considering that anxiety severely and negatively affect people's quality of life [30], we also seek to evaluate the influence of these resilience-centred variables on anxiety severity.

2. Methods

2.1. Participants

One hundred and seventy-five women were conveniently enrolled in this study when they visited a hospital for further testing due to previous screen-positive results. The inclusion criteria were (1) aged ≥20 years and (2) having screen-positive results within the prior week based on TCT and/or HPV detection. Exclusion criteria were (1) previous experience of major traumatic or stressful events, (2) a history of psychiatric disorders or cognitive impairment, (3) a severe physical illness or other malignancies or end-stage disease, or (4) difficulties with expression, understanding, and communication.

2.2. Measurement of resilience

A Chinese version of the Resilience Scale-14 (RS-14) was used for measurement of the two dimensions of resilience: personal competence and acceptance of self and life [31]. The total score of this instrument ranges from 14-98. RS-14 total scores of ≤63, between 64-73, and ≥74 were defined as low, moderate, and high resilience level, respectively [31, 32]. This instrument has confirmed psychometrics [31, 32, 33].

2.3. Measurement of hope

The 12-item Herth Hope Index (HHI) was used for measurement of the three dimensions of hope: temporality and future (1, 2, 6, 11), positive readiness and expectancy (4, 7, 10, 12), and interconnectedness (3, 5, 8, 9) [34]. The HHI total score ranges from 12-48, with 12–23, 24–35, and 36–48 being defined as low, medium, and high levels of hope, respectively. The Chinese version of this instrument has confirmed psychometric properties [21, 32, 35, 36].

2.4. Measurement of perceived social support

The 12-item Multidimensional Scale of Perceived Social Support (MSPSS) [37] was used for measurement of this variable. The total score ranges from 12-84, with 12–36 being a low, 37 to 60 an intermediate, and 61 to 84 a high support level. The Chinese version of the MSPSS has confirmed psychometric properties [38, 39].

2.5. Measurement of perceived stress

A Chinese version of the Perceived Stress Scale-10 (PSS-10) was used to measure perceived pressure [40]. The PSS-10 assesses people's perceived stress due to unpredictability, uncontrollability, or overload in their lives. The total scale score is 0–40, with higher scores indicating higher stress perception. The Chinese version demonstrates good psychometric properties [41, 42].

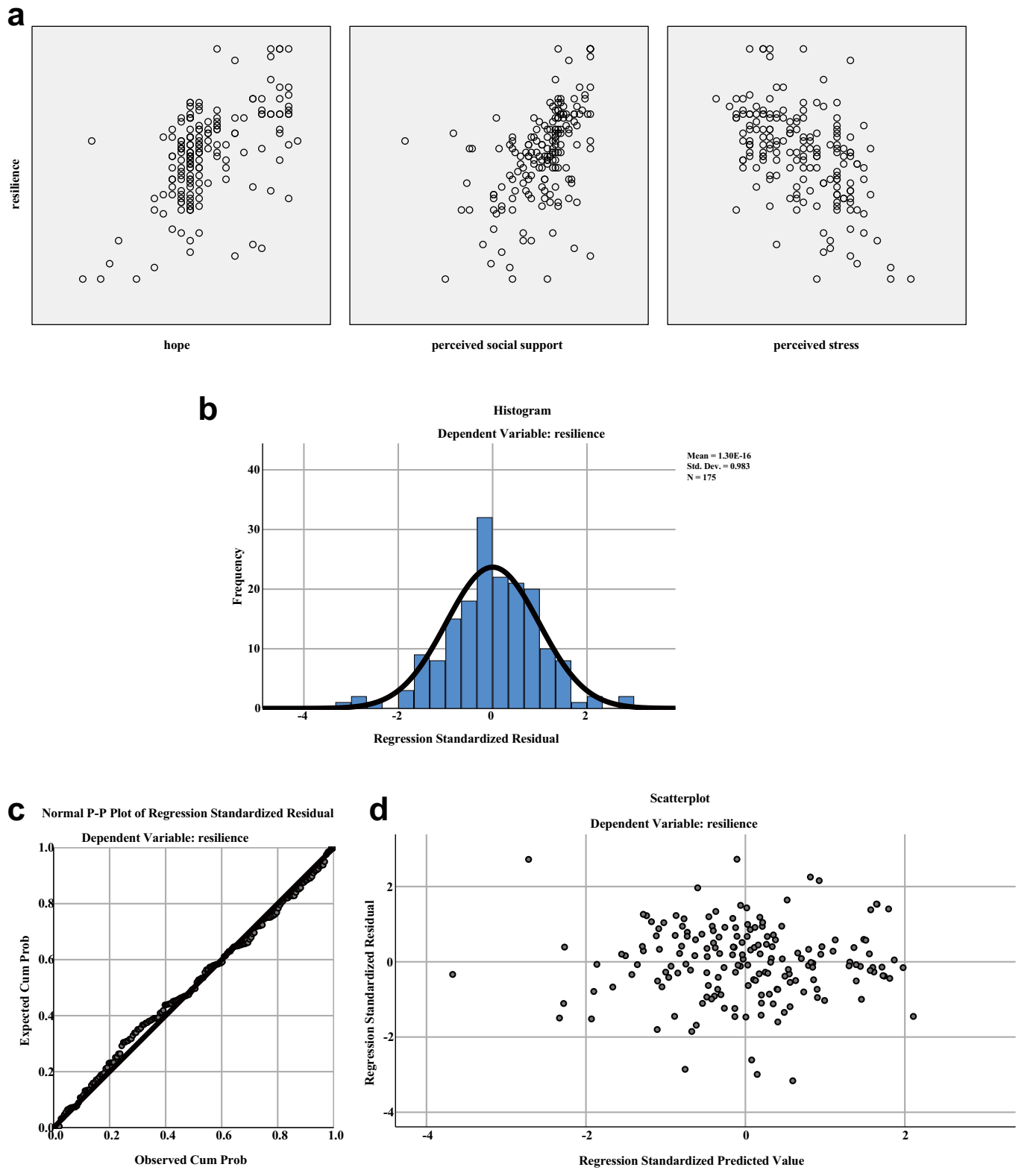

Figure 1. Multiple linear regression assumption test for data linear tendency, normality, homoscedasticity, and independence. (a) Linear tendency scatterplot, (b) Histogram of residual, (c) P–P plot, and (d) Residual scatterplot.

2.6. Measurement of anxiety

The anxiety assessment was conducted using the 20-item Zung Anxiety Self-Assessment Scale (SAS) [43]. When using SAS to quantify and evaluate anxiety, researchers should convert the original score into a standardized score (raw score *1.25) [43,44]. Studies have shown that the upper limit of normal in Chinese population is a standardized score below 50 [45]. The total score of 50–59, 60–69, and 70 or more indicate mild, moderate, and severe anxiety, respectively [46]. The SAS has been well validated in Chinese cultural context [47, 48, 49].

Table 3. Multiple regression analysis of the results of resilience ($n = 175$).

	Regression coefficient (β)	t	*p*	VIF
Constant		4.471	<0.001	
Income	0.105	1.467	0.144	1.526
Job status (regular employee*)				
Retirement	-0.045	-0.691	0.491	1.252
Unemployed/temporary workers	-0.043	-0.561	0.575	1.780
Hope	0.218	2.617	0.010	2.077
Perceived social support	0.247	3.307	0.001	1.660
Perceived stress	-0.320	-4.689	<0.001	1.392

Note: *Reference group; $R^2 = 0.437$; adjusted $R^2 = 0.416$.

Table 4. Results of anxiety scores per resilience, hope, and perceived social support ($n = 175$).

Variables	N	Anxiety Mean (SD)	F/t	*P*
Level of resilience				
≤63	44	45.82 (7.67)	11.023	<0.001
64–73	58	40.09 (7.30)		
≥74	73	39.34 (7.99)		
Level of hope				
12-23	0	——	5.201	<0.001
24-35	44	46.27 (8.71)		
36-48	131	39.52 (6.99)		
Level of perceived social support				
12-36	4	50.00 (16.87)	8.933	<0.001
37-60	40	44.75 (7.36)		
61-84	131	39.87 (7.39)		

2.7. Data analyses

Data are presented as the mean, standard deviation (SD), number (N), and percentage (%). One-way analysis of variance (ANOVA) plus Bonferroni's post hoc analysis, and *t* test are used for intergroup comparison. Pearson correlation analysis Cochran–Mantel–Haenszel (CMH) test were used for analysis of association between variables. The correlation strength among variables was evaluated using commonly accepted criteria: $0.1<|r|<0.3$ (weak), $0.3<|r|<0.5$ (moderate), and $|r|>0.5$ (strong). The linear regression analysis assumption, including the presence of a linear relationship between the outcome and predicting variables, as well as data normality, homoscedasticity, independence and non-multicollinearity based on variance inflation factor (VIF) [50] was checked prior to the application of multiple linear regression. Finally, structural equation modelling (SEM) was employed for comprehensive analysis of relationship among variables, with a bootstrap procedure used for analysis of the mediating effect. A $P < 0.05$ is considered statistically significant.

3. Results

3.1. General information and resilience level of the participants

In this study, there were 175 participants, 20 cases less that 30 years, 101 cases ranging from 30 to 50 years, and 54 cases over 50 years. Monthly income ($p < 0.001$) and job status ($p < 0.05$) were significantly associated with resilience level. Those with a higher income were more resilient. Compared with regular employees and retired participants, unemployed or temporary workers exhibited higher resilience levels ($p < 0.05$). Table 1 gives the detailed comparison regarding resilience level per the general information. The resilience scores of our sample ranged from 38 to 98 (70.57 ± 12.14), with scores of 49.96 ± 8.96 and 20.61 ± 3.57 for the personal competence dimension and the self- and life-acceptance dimension, respectively.

3.2. Correlation analysis

Table 2 shows that resilience was positively and strongly associated with hope and perceived social support, and negatively and strongly correlated with perceived stress. Hope had a strong positive correlation with social support and a moderate negative correlation with perceived stress. A moderate negative association between social support and perceived stress was also revealed (all $p < 0.001$).

3.3. Multiple linear regression analysis

Linear relations between the outcome variable and independent continuous variables is visualized in Figure 1a. The normality of the data is confirmed by a histogram of residuals (Figure 1b) and P–P plots (Figure 1c), while homoscedasticity and independence are confirmed by scatterplots (Figure 1d). In addition, a Durbin-Watson value of 1.972 also supported the independence of the data. All these results indicate that multiple linear regression analysis was suitable for the following analysis. For dichotomous variables (monthly income), values were assigned to the categories (<3000 = 1, and ≥3000 = 2). Dummy variables were set for unordered multicategorical variables (job status) (reference item: job status = regular employee). For quantitative variables, continuous values were directly used for analysis. Table 3 reveals that hope ($p = 0.010$), perceived social support ($p = 0.001$), and perceived stress ($p < 0.001$) were the main factors influencing the resilience of people with abnormal early screening results for cervical cancer.

3.4. Relationship between resilience-centred variables and anxiety

Table 4 presents significant differences in anxiety for different levels of resilience, hope, and perceived social support among those with abnormal cervical cancer screening results, respectively (all $p < 0.001$). The CMH test revealed linear trends between resilience ($\chi^2 = 8.378$, $p = 0.004$), hope ($\chi^2 = 17.283$, $p < 0.001$), perceived social support ($\chi^2 = 8.918$, $p = 0.003$), and anxiety. The linear trend between anxiety and perceived stress was also confirmed by Pearson's correlation analysis ($r = 0.681$, $p < 0.001$).

3.5. Mediating model analysis

SEM was used to for mediating effect analysis. An excellent model fit was achieved, as evidenced by the relative chi-square (χ^2/df) = 1.482; the Comparative Fit Index (CFI) = 0.990; the Tucker-Lewis Index (TLI) = 0.983; and the Root Mean Squared Error of Approximation (RMSEA) = 0.053.

The final model (Figure 2) shows that hope ($p = 0.005$) and social support ($p = 0.003$) were positively related to resilience, whereas stress was negatively correlated with resilience ($p < 0.001$). As shown in Table 5, among variables, only perceived stress was found to have a direct and positive influence on anxiety severity (direct effect value, 0.913).

4. Discussion

We herein found that Chinese women with abnormal cervical cancer screening results had moderate resilience. Among others, monthly income and job status were associated with resilience. Hope, perceived social support, and perceived stress were significant predictors of resilience. Our findings suggested that the resilience level of our sample was affected both by individual psychological qualities, such as hope, and social environment factors, such as social support and stress. However, among all these resilience-centred variables, only perceived stress was strongly correlated with increased anxiety severity. All these findings

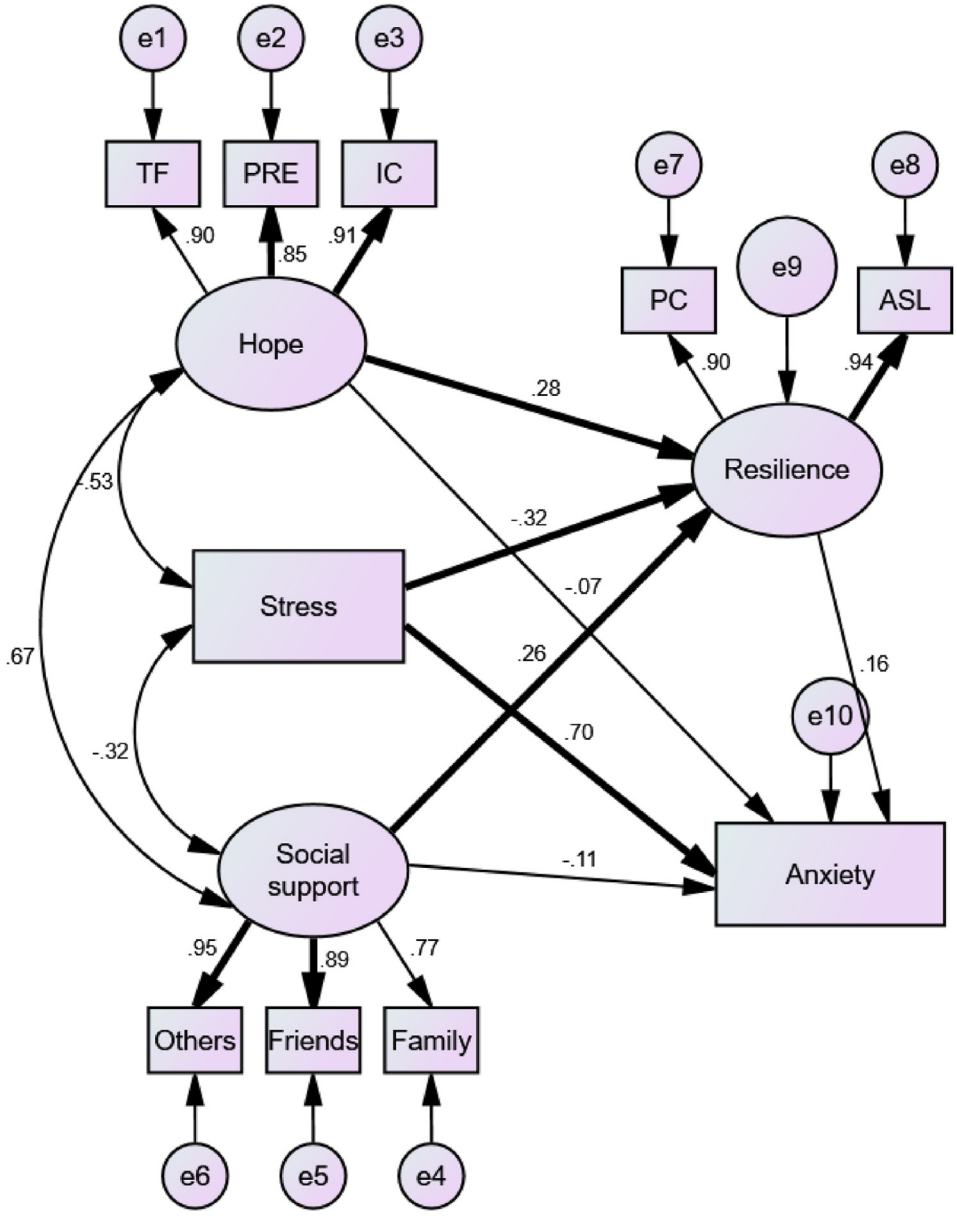

Figure 2. Path diagram for resilience-mediated associations among hope, perceived stress, social support, and anxiety. Path coefficients on bold arrow-lines are significant as per preset statistical threshold ($p < 0.05$). TF: temporality and future; PRE, positive readiness and expectancy; IC, interconnectedness; PC: personal competence; ASL: acceptance of self and life.

inform further interventions to alleviate mental problems among this special population.

The participants had a moderate level of resilience. Our study is important because of the lack of studies regarding the level of resilience among this population. Many potentially important nonpsychological and psychological factors of resilience were included in this study to explore the determinants of resilience. According to the regression analysis results, resilience was dominantly affected by three psychological factors: hope, perceived social support, and perceived stress, which in combination explain 41.6% of the variance. This finding can help clinical and psychological practitioners develop scientific and effective regimens to improve resilience of the affected women.

The close relation between hope and resilience has been well documented elsewhere. For example, it has been previously reported that hope is positively associated with resilience in nurses, patients with metastatic colorectal cancer, adolescents/young cancer patients, oral cancer patients, and newly diagnosed breast cancer women [32, 51, 52, 53, 54]. Hope encompasses positive expectations for the future. Evidence from many prior research suggests that hope functions in many aspects of mental and physical health [55]. Therefore, it is crucial for a person to have hope in their life after being informed of an abnormal cervical cancer screening result, which can motivate them to make efforts in the present and the future. These results suggest that hope intervention is potentially promising for increase of resilience in this population.

Our study also showed that perceived social support was strongly associated with resilience, as seen in other populations [56]. Social support helps individuals maintain emotional balance when confronted with adversities [57]. Social relationships such as family and friends are critical protective factors for resilience [58, 59]. Perceived social support helps adults effectively cope and adapt to life changes [60]. Accumulating evidence has shown that a cancer diagnosis is an important stressor triggering physical and psychological distress among affected individuals [61]. As such, abnormal cervical cancer screening results are expected to have a negative impact on affected women. Thus, spiritual and material

Table 5. Mediating effect analysis based on bootstrap procedure.

Variables	Effect	Point estimate	SE	Bootstrap	
				Bias-corrected 95%CI	Percentile 95%CI
Hope	Total effect	-0.136	0.479	-1.094–0.802	-1.043–0.846
	Direct effect	-0.365	0.507	-1.439–0.634	-1.365–0.668
	Indirect effect	0.230	0.189	-0.028–0.705	-0.054–0.671
Social support	Total effect	-0.164	0.223	-0.590–0.256	-0.581–0.300
	Direct effect	-0.266	0.230	-0.712–0.180	-0.707–0.185
	Indirect effect	0.102	0.088	-0.006–0.360	-0.019–0.317
Stress	Total effect	0.846	0.086	0.678–1.010	0.684–1.015
	Direct effect	0.913	0.096	0.720–1.090	0.725–1.095
	Indirect effect	-0.067	0.043	-0.166–0.006	-0.156–0.013

support from family, friends, and other essential people are needed to increase the population's motivation towards life and better acceptance of reality, which results in higher resilience. In this regard, it is recommended that medical staff encourage family members and friends to offer more companionship and support, thereby improving resilience and women's ability to adapt to their state of hardship or affliction.

Stress significantly affects people's quality of life [62] and is connected with many adverse health outcomes, such as cardiovascular events [63, 64], mental illness [65], metabolic syndrome [66, 67, 68], and mortality [69, 70, 71]. We herein found that perceived stress by women with abnormal cervical cancer screening results had a significant negative impact on their resilience. The negative association between these two variables has also been previously confirmed [20]. Alleviation of stress perception seems essential to resilience improvement in this population.

Resilience is a transdiagnostic protector against mental disorders and a decreasing quality of life among individuals faced with diverse adversities [72, 73, 74, 75, 76]. Recently it was revealed that resilience helped alleviate health-related worries in women with an increased risk for breast or ovarian cancer [77]. Resilience is also an important source of healthy adaptation for people despite encountering difficulties [78]. Social support has been documented to reduce the severity of anxiety of nurses, medical students, residents, and colorectal cancer patients [79, 80, 81, 82]. Hope is negatively associated with anxiety among advanced heart disease patients and community dwellers suffering from COVID-19 outbreaks [83, 84]. Thus, targeting "resilience-centred" variables is expected to be effective in mental health improvement among women with unfavourable screening results for cervical cancer.

Anxiety is a prevailing psychological distress among population [85, 86]. We hypothesized that targeting resilience and its determinants could help alleviate anxiety severity among this population. Unexpectedly, the SEM results of this study showed that only perceived stress was significantly correlated with anxiety severity among women with abnormal cervical cancer screening results, which was inconsistent with our previous findings regarding patients with cervical spondylosis [24]. Interventions towards anxiety among this population should be preferentially focused on stress-buffering strategies rather than on those targeting resilience, hope, or social support. Despite this, given the significance of all these studied psychological variables in the modulation of individual emotional status and mental health, we cannot exclude the possibility that resilience and its associates, including perceived stress, have an impact on other mental concerns, which warrants future investigation.

This research has three main limitations. Firstly, the small sample size limits its representativeness. Secondly, due to the self-reported nature of the survey, bias is inevitable. Thirdly, selecting participants from one clinical setting (hospital) might limit the generalizability of the findings.

5. Conclusions

The resilience level was moderate in women with abnormal cervical cancer screening results. Their resilience level was significantly associated with hope, perceived social support, and perceived stress. Among variables, only perceived stress had a direct and positive influence on anxiety severity. Interventions on these psychological variables could be effective in promoting resilience among this special population, and anxiety should be preferentially intervened in by alleviation of perceived stress.

Declarations

Author contribution statement

Xue Wang: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Suyan Wang: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

Dan Yang; Yuying Chu; Yuanyuan Hao: Performed the experiments; Contributed reagents, materials, analysis tools or data.

Hongliang Dai: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

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Data availability statement

Data will be made available on request.

Declaration of interest's statement

The authors declare no conflict of interest.

Additional information

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