Assessment of Acute Stress Disorder of Young and Middle-Aged Patients With Acute Myocardial Infarction And Analysis of The Influencing Factors

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Abstract

Background: Young and middle-aged people are considered a vulnerable group to experience acute stress disorder (ASD) after acute myocardial infarction (AMI). This study aims to explore influencing factors to ASD in young and middle-aged groups.

Methods: 190 patients of 18–60 years of age with acute myocardial infarction were enrolled in this study. We assessed the association between ASD and demographic data, adult attachment, and social support.

Results: A total of 190 young and middle-aged people were investigated in this study. Among them, 65 cases were positive for acute stress disorder, with a positive rate of 34.21%. Multivariate stepwise regression showed that attachment-related anxiety, distribution of criminal vessels, perceived support, complications, and attachment-related avoidance are the main factors affecting acute stress disorder of young and middle-aged patients with AMI.

Conclusions: The incidence of acute stress disorder in young and middle-aged patients with AMI is high. We should strengthen social support and pay attention to the psychological state of patients in the process of follow-up cardiac rehabilitation to improve their ability to deal with acute stress events and actively participate in postoperative cardiac rehabilitation.

Introduction

Acute myocardial infarction (AMI) is a severe type of coronary heart disease. As a traumatic event, AMI can cause acute stress disorder (ASD) such as anxiety, depression, numbness, and stress response, leading to increased sympathetic excitability. High sympathetic excitability causes corresponding pathophysiological changes, finally promoting or aggravating myocardial infarction and heart failure. Most people's symptoms of ASD may improve after a few weeks or months. However, some people cannot recover. They repeatedly suffer from numbness, avoidance, intrusion, and other symptoms, eventually developing posttraumatic stress disorder (PTSD).

PTSD is a severe mental health problem, which has received much attention in stress, while ASD in the early stage of trauma is often ignored. ASD is defined as the emotional, physical, and dissociative reaction during a traumatic event and lasts for less than one month. People with ASD usually have behaviors such as crying and despair of life. In addition to affecting people's psychological state, ASD can also cause physiological changes such as pain and decreased resistance and seriously damage the quality of life.

The prevalence of ASD has been reported in 18% of patients with acute coronary syndromes (ACS), such as AMI. ASD is associated with impaired quality of life and adverse cardiovascular consequences after ACS. Age is a predictor of ASD, and Ghada et al. found that the risk of ASD in young people after traumatic events is more significant than that in the elderly. As the central part of the social labor force, the young and middle-aged people are in a necessary period of career development. The impact of disease on their life and economy is significantly more significant than that of other age groups. However, the
symptoms of ASD after AMI and the influencing factors of individual susceptibility in young and middle-aged people remain unclear. Therefore, it is necessary to explore further the psychological stress response of young and middle-aged AMI patients.

Another factor that was found to play a significant role in psychological distress is the individual’s social support. Social support refers to social connections with other individuals, groups, and the larger community. According to Norris’s social support deterioration deterrence model, social support plays a "cushion" protective role in stress response. The more social support individuals get, the less they are affected by stress events. Therefore, AMI may aggravate the severity of ASD symptoms by jeopardizing the social support systems for young and middle-aged people.

Adult attachment patterns are the basis of human relationships, modifying the association between social support and psychological distress. As a traumatic event, AMI can activate the patient’s attachment system. Attachment, as an intimate and lasting emotional connection between individuals and others, plays an essential role in cognition, emotion, and social behavior. In the current related studies, the effect of attachment on ASD in young and middle-aged AMI patients has not been explained. Therefore, this study intends to explore the current situation of ASD in young and middle-aged patients with AMI. More specifically, this study aims to establish the severity of ASD and predictors of psychological distress among AMI patients.

**Methods**

**Sample and Study Design**

In this study, the convenience sampling method was used to select the patients with acute myocardial infarction hospitalized in the Department of Cardiology of a University Affiliated Hospital in Hangzhou, China. Inclusion criteria: (1) diagnosed with AMI; (2) aged between 18 and 60 years old. Exclusion criteria: (1) complicated with other serious diseases or serious complications; (2) dementia or other psychiatric diseases; (3) hearing impairment or communication impairment; (4) experienced traumatic events within half a year. The questionnaires were disseminated from January 2019 to December 2020. The questionnaire was written in Chinese and was conducted by a researcher fluent in Mandarin and the local dialects.

It is generally believed that the number of observations is at least 5-10 times of that of the variables. Considering a 10% loss-of-follow-up rate with the 30 items in the Stanford Acute Stress Reaction Questionnaire (SASRQ), the sample size was 165-330. In the current study, a total of 203 questionnaires were disseminated, with 190 completed questionnaires returned, with an effective rate of 93.6%. The average age of the subjects was 49.99±8.07 years, ranging from 23 to 60 years.

**Research ethics**

This study was approved by the ethics committee of the Affiliated Hospital of Hangzhou Normal University (IRB’s registration number: 2019 Ethics 02-HS-46). This study complies with the international declaration of
Helsinki, the ethical examination and Approval Measures for biomedical research involving human beings (Implementation), and the requirements of relevant laws and regulations. There is no person under 18 in this study, so informed consent was obtained from all subjects.

**Measures**

**Demographics**

Demographic characteristics include gender, marital status, education level, occupation, payment method, number of stent implantation, complications, cardiac function (Killip classification), distribution of criminal vessels, and disease awareness.

**Stanford Acute Stress Reaction Questionnaire (SASRQ)**

The 30-item Stanford Acute Stress Reaction Questionnaire (SASRQ) measured participants’ ASD\(^{13}\). The questionnaire includes dissociation (10 items, mainly evaluating cognitive changes such as memory loss, the decline in environmental clarity and emotional changes such as numbness and lack of emotional response), reexperiencing of trauma (6 items, mainly evaluating physiological reactions such as physical symptoms caused by traumatic events and behavioral changes such as forced thinking of repeated unnecessary memory of traumatic events), avoidance (6 items, mainly assessing behavioral changes such as being away from others and avoiding things related to trauma events), anxiety and hyperarousal (6 items, mainly assessing behavioral changes such as sleep changes and panic attacks, cognitive changes such as decreased attention and emotional changes such as tension, anxiety, and irritability), and function impairment (2 items, mainly evaluating physiological reactions such as impairment of physical function). SASRQ is scored on a 5-point Likert scale ranging from 0 (not experienced) to 5 (very often experienced). The score range is 0-150 points. The total score of SASRQ $\geq 40$ is positive for acute stress disorder. The higher the score, the more serious the acute stress disorder of the patient. The Cronbach's $\alpha$ coefficient of the scale was 0.87-0.95.

**Experiences in Close Relationships Inventory (ECR)**

Adult attachment was assessed using the Experiences in Close Relationships Inventory (ECR)\(^{14}\). ECR produces two scores: attachment-related avoidance and attachment-related anxiety scores. There are 36 questions on the scale, which adopts the 7-level scoring method. Strongly disagree, disagree, somewhat disagree, not sure, somewhat agree, agree, and strongly agree is recorded as 1-7 points respectively, of which 3, 15, 19, 22, 25, 27, 29, 31, 33, and 35 items are scored in reverse. The sum of odd item scores is the score of attachment-related avoidance, and even item score is the score of attachment-related anxiety. The higher the score, the higher the degree of attachment-related anxiety or avoidance. The Cronbach's $\alpha$ coefficient of the scale was 0.79-0.82.

**Social Support Rating Scale (SSRS)**
Xiao’s Social Support Rating Scale (SSRS) was utilized to measure social support. The scale has ten items, including objective support (3 items), perceived support (4 items), and support utilization (3 items). The score range is 12-66 points. The score below 35 points indicates a low level of social support, 35-45 points indicates a moderate level of social support, and the score greater than 45 points indicates a high level of social support. The scale has presented impressive validity and reliability in the Chinese population (Cronbach’s α=0.949).

**Statistical Analysis**

Data was examined with SPSS Statistics 22.0 (IBM Corp., Armonk, NY, USA). Demographic characteristics, ASD, social support, and adult attachment using observed values, percentages, quartile, means, and standard deviations are all described. The differences in the participants’ ASD based on demographic characteristics were analyzed using the nonparametric rank-sum test. The relationship between social support, adult attachment, and ASD was assessed using Spearman's correlation coefficients. Additionally, influencing factors of participants’ ASD were evaluated using multiple linear regression. The dependent variable was set as ASD, and the independent variables were set as perceived support, complications, attachment-related avoidance, and attachment-related anxiety.

**Results**

**Preliminary Analysis**

A total of 190 young and middle-aged people were investigated in this study. Among them, 65 cases were positive for acute stress disorder, with a positive rate of 34.21%. Since the total score and each dimension of acute stress disorder do not conform to the normal distribution, it is described by median (M) and interquartile spacing (P25, p75) (see Table 1). The results showed that the main symptoms of acute stress disorder were hyperarousal, reexperiencing, and dissociation. Table 2 shows the differences in the participants’ ASD based on the demographic characteristics of the study participants. The results showed that ASD was significantly correlated with complications (Z = -2.639, p = 0.008), distribution of criminal vessels (H = 25.840, p < 0.001), and disease awareness (H = 7.949, p = 0.019). Post-hoc comparisons revealed that participants with complications, blocked circumflex branch of heart, and complete ignorance of AMI had a higher total score of the SASRQ.
Table 1
Score of acute stress disorder in young and middle-aged patients with acute myocardial infarction(n=190)

| Variables           | Items | Points\[M(P25, P75)\] |
|---------------------|-------|------------------------|
| Total SASRQ         | 30    | 35.00(25.00,42.00)     |
| dissociation        | 10    | 8.00(4.00,15.00)       |
| Reexperiencing      | 6     | 7.00(3.00,10.00)       |
| Hyperarousal        | 6     | 12.00(8.00,18.00)      |
| Avoidance           | 6     | 2.00(0.00,7.00)        |
| Function impairment | 2     | 5.00(4.00,5.00)        |

Note: SASRQ: Stanford Acute Stress Reaction Questionnaire
| Variables                  | Subgroups                          | n  | Total SASRQ          | Statistical value | P     |
|----------------------------|------------------------------------|----|----------------------|-------------------|-------|
| **Gender**                 | Male                               | 175| 35.00 [25.00, 42.00] | Z = -0.491        | 0.623 |
|                           | Female                             | 15 | 35.00 [33.00, 49.00] |                   |       |
| **Marital status**         | Married                            | 178| 35.00 [20.75, 75.00] | H = 2.985         | 0.611 |
|                           | Single                             | 8  | 52.00 [28.75, 48.75] |                   |       |
|                           | Widowed/Divorced                   | 4  | 36.00 [29.25, 109.50]|                   |       |
| **Education level**        | Primary school and below           | 58 | 39.00 [26.50, 65.00] | H = 6.051         | 0.195 |
|                           | Junior high school                 | 73 | 36.00 [25.00, 45.50] |                   |       |
|                           | High school                        | 36 | 30.50 [25.00, 37.00] |                   |       |
|                           | Junior college                     | 12 | 27.50 [21.75, 37.00] |                   |       |
|                           | Bachelor degree or above           | 11 | 34.00 [24.00, 39.00] |                   |       |
| **Profession**             | Farmer                             | 37 | 36.00 [24.50, 45.50] | H = 8.698         | 0.122 |
|                           | Worker                             | 94 | 35.00 [25.00, 41.00] |                   |       |
|                           | Self-employed                      | 17 | 41.00 [30.00, 107.00]|                   |       |
|                           | Cadre                              | 2  | 22.50 [21.00, ]      |                   |       |
|                           | Retired                            | 13 | 37.00 [24.50, 66.00] |                   |       |
|                           | Others                             | 27 | 33.00 [25.000, 42.00]|                   |       |
| **Payment Method**         | Pay the costs themselves           | 13 | 36.00 [27.00, 62.75] | H = 2.930         | 0.234 |
|                           | New Rural Cooperative Medical System| 80| 35.00 [21.50, 41.00] |                   |       |
|                           | Provincial and municipal medical insurance | 97| 35.50 [24.50, 42.00] |                   |       |
| **Number of stent implantation** | 1                               | 123| 36.00 [25.00, 42.00] | H = 3.835         | 0.280 |
|                           | 2                                 | 53 | 35.00 [23.00, 41.50] |                   |       |
|                           | 3                                 | 10 | 39.00 [23.75, 65.50] |                   |       |
|                           | ≥3                                | 4  | 26.50 [21.25,34.00]  |                   |       |
| **Complications**          | NO                                 | 159| 35.00 [24.00, 41.00] | Z = -2.639        | **0.008** |
|                           | YES                               | 31 | 41.00 [33.00, 73.00] |                   |       |

Note: H: Kruskal-Wallis H Test; Z: Mann-Whitney U Test.
| Variables                  | Subgroups         | n   | Total SASRQ       | Statistical value | P     |
|---------------------------|-------------------|-----|-------------------|-------------------|-------|
| Killip classification     | Class I           | 168 | 35.00[25.00,42.00]| H=1.242           | 0.741 |
|                           | Class II          | 12  | 36.00[28.00,52.25]|                   |       |
|                           | Class III         | 4   | 38.50[30.00,60.50]|                   |       |
|                           | Class IV          | 6   | 31.50[20.75,47.00]|                   |       |
| Distribution of           | Left main trunk   | 16  | 41.00[28.50,54.25]| H=25.840          | <0.001|
| criminal vessels          | Anterior descending branch | 135 | 34.00[24.00,39.00]|                   |       |
|                           | Right coronary artery | 27  | 56.00[35.00,75.00]|                   |       |
|                           | Circumflex artery | 12  | 69.00[37.50,78.75]|                   |       |
| Disease awareness         | Totally unknown   | 57  | 39.00[25.00,67.00]| H=7.949           | 0.019 |
|                           | Partially know    | 51  | 36.00[25.00,42.00]|                   |       |
|                           | Totally know      | 82  | 34.00[24.00,37.50]|                   |       |

Note: H: Kruskal-Wallis H Test; Z: Mann-Whitney U Test.

**Relationships between ASD, social support, and adult attachment**

In this study, the score of social support was (36.01 ± 9.72) points, of which the score of objective support was (8.83 ± 2.76) points, the score of perceived support was (20.23 ± 5.89) points, the score of support utilization was (6.94 ± 2.77) points. Besides, the score of attachment-related anxiety was (48.06 ± 14.83) points, and the score of attachment-related avoidance was (63.44 ± 13.57) points. The correlations between ASD, social support and adult attachment are displayed in Table 3. ASD revealed a significant negative correlation with social support ($r = -0.334, p < 0.01$), objective support ($r = -0.291, p < 0.01$), perceived support ($r = -0.313, p < 0.01$), and support utilization ($r = -0.251, p < 0.01$). Additionally, ASD demonstrated a significant positive correlation with attachment-related avoidance ($r = 0.374, p < 0.05$) and attachment-related anxiety ($r = 0.402, p < 0.05$).
Table 3
Correlations between ASD, social support, and adult attachment (n=190, r)

| Variables                      | Dissociation | Reexperiencing | Hyperarousal | Avoidance | Function Impairment | ASD  |
|--------------------------------|--------------|----------------|--------------|-----------|--------------------|------|
| Social support                 | -0.237**     | -0.212**       | -0.244**     | -0.317**  | -0.227**           | -0.334** |
| Objective support              | -0.274**     | -0.156*        | -0.143*      | -0.269**  | -0.126             | -0.291** |
| Perceived support              | -0.196**     | -0.166*        | -0.256**     | -0.297**  | -0.214**           | -0.313** |
| Support utilization            | -0.197**     | -0.236**       | -0.194*      | -0.249**  | -0.219**           | -0.251** |
| Attachment-related Avoidance   | 0.311**      | 0.256**        | 0.249**      | 0.289**   | 0.175*             | 0.374** |
| Attachment-related anxiety     | 0.201**      | 0.386**        | 0.341**      | 0.223**   | 0.178*             | 0.402** |

NOTE: **P<0.01; *P<0.05

Factors influencing ASD

The factors independently related to ASD were determined using multivariate regression. The multiple linear regression analysis was carried out with ASD total score as the dependent variable and the factors of statistical significance in nonparametric rank-sum test and correlation analyses as the independent variables. The dummy variables were set for categorical variables (the values of the independent variables are shown in Table 4, α_{inclusion} = 0.05, α_{exclusion} = 0.10). The results revealed a significant regression model (F = 11.404, p < 0.001), with an adjusted coefficient of determination (adjusted R^2) of 0.331 for the power interpretation of the model. According to the comparison of absolute values among the standardized regression coefficients of variables, the contribution of independent variables to ASD of patients was sequenced as attachment-related anxiety > distribution of criminal vessels > perceived support > complications > attachment-related avoidance (see Table 5).
Table 4
Evaluation of independent variables

| Independent variables | Evaluation method |
|-----------------------|-------------------|
| Complications         | Yes = 0, No = 1    |
| Distribution of criminal vessels | The dummy variables were set with the baseline of “Left main trunk”.
|                       | Dummy variable $X_1$ (Left main trunk = 0, Anterior descending branch = 1, Right coronary artery = 0, Circumflex artery = 0) |
|                       | Dummy variable $X_2$ (Left main trunk = 0, Anterior descending branch = 0, Right coronary artery = 1, Circumflex artery = 0) |
|                       | Dummy variable $X_3$ (Left main trunk = 0, Anterior descending branch = 0, Right coronary artery = 0, Circumflex artery = 1) |
| Disease awareness     | The dummy variables were set with the baseline of “Totally unknown”.
|                       | Dummy variable $X_4$ (Totally unknow = 0, Partially know = 1, Totally know = 0) |
|                       | Dummy variable $X_5$ (Totally unknow = 0, Partially know = 0, Totally know = 1) |
| Objective support     | Numerical variable |
| Perceived support     | Numerical variable |
| Support utilization   | Numerical variable |
| Attachment-related avoidance | Numerical variable |
| Attachment-related anxiety | Numerical variable |
Table 5
Multivariate stepwise regression results of ASD (n=190)

| Variables                                           | Regression coefficient | Standard error | Standardized regression coefficient | t     | p   |
|-----------------------------------------------------|------------------------|----------------|-------------------------------------|-------|-----|
| (Constant)                                          | 15.752                 | 13.175         | -                                   | 1.196 | 0.233 |
| Distribution of criminal vessels                     |                        |                |                                     |       |     |
| (reference: “Left main trunk”)                       |                        |                |                                     |       |     |
| Anterior descending branch                           | 0.349                  | 5.900          | 0.006                               | 0.059 | 0.953 |
| Right coronary artery                                | 18.052                 | 6.626          | 0.247                               | 2.725 | 0.007 |
| Circumflex artery                                    | 12.659                 | 8.043          | 0.121                               | 1.574 | 0.117 |
| Disease awareness (reference: “Totally unknown”)     |                        |                |                                     |       |     |
| Partially know                                       | -3.135                 | 4.230          | -0.055                              | -0.741| 0.460 |
| Totally know                                         | -3.746                 | 4.093          | -0.073                              | -0.915| 0.361 |
| Attachment-related anxiety                            | 0.377                  | 0.115          | 0.219                               | 3.291 | 0.001 |
| Attachment-related avoidance                          | 0.294                  | 0.133          | 0.156                               | 2.212 | 0.028 |
| Perceived support                                    | -0.668                 | 0.299          | -0.154                              | -2.230| 0.027 |
| Complications                                        | 9.600                  | 4.313          | 0.139                               | 2.226 | 0.027 |

Note: Coefficient of determination: $R^2 = 0.363$, adjusted $R^2 = 0.331$, $F = 11.404$, $p < 0.001$.

Discussion

This study examined the relationship between the severity of ASD symptoms and adult attachment and social support in young and middle-aged AMI patients, considering the potential impact of demographics, the severity of coronary heart disease, and medical expenses. A total of 34.21% of participants developed ASD after PCI, which is higher than previously reported\(^4\). Roland found that AMI patients with ASD or PTSD were younger than those who did not, although their coronary heart disease severity was mild\(^17\). This report confirmed that young and middle-aged people are more likely to show ASD after experiencing cardiovascular events. As the primary labor force of the society and the central pillar of the family's economic source, the young and middle-aged bear the burden of children's education and elderly care. AMI makes participants temporarily lose their ability to work and economic income. Loss of financial resources can easily cause participants to have negative emotions such as anxiety and depression, resulting in psychological stress disorder.

Our study showed that right coronary artery occlusion was associated with ASD. Although no in-depth research is conducted here, this may be because acute inferior myocardial infarction is often caused by the
right coronary and circumflex artery occlusion. The incidence rate of acute inferior myocardial infarction with right ventricular infarction is high, leading to a higher level of creatine kinase isozyme. Patients’ clinical and long-term prognosis is poor, and they can still feel obvious physical discomfort after PCI. Repeated chest discomfort makes the patient continuously exposed to the fear of disease, resulting in stress disorders such as tension and panic. In addition, the more serious the illness is, the more medical expenses are, and the longer the postoperative work delay is. Patients’ perceived social support decreases when the economy affects regular treatment and life. Similar to previous studies, social support protects negative emotions. According to the social support deterioration deterrence model proposed by Norris et al., social support, as an external protective factor, plays an essential role in buffering the adverse effects of the stress response. Social support includes the visible and objective material or emotional support obtained from social network relationships and the emotional experience that individuals feel respected, supported, and understood in society. Many studies have shown that perceived social support is more natural and effective for individuals and can better predict the level of individual mental health. As a supportive resource, perceived social support can promote communication between participants and their families, releasing participants’ fear caused by AMI. Participants do not blindly guess the illness condition, which can make them actively face the disease pressure and alleviate the symptoms of ASD.

Notably, this study showed a positive correlation between attachment-related anxiety, attachment-related avoidance, and ASD. The reason is that the sudden AMI is double stress of physiology and psychology for young and middle-aged patients, which activates their attachment system, and the difference of attachment types affects their problem-solving behavior, thus affecting the severity of ASD. Patients with a high score of attachment-related anxiety are eager to get help from others, but they generally lack self-confidence and worry about abandonment. Therefore, they often exaggerate the stress events they encounter to attract attention from others, which increases their psychological pressure. From the physiological level, patients with high attachment-related anxiety scores will secrete more cortisol in the face of stress events. Previous studies have shown that excess cortisol may induce major depression disorder. In addition, patients with high attachment-related avoidance scores usually treat others with a negative attitude, and they believe that their interpersonal relationship is unreliable, unable to initiate, or even avoid asking others for help. Girme et al. suggested that low-to-moderate practical support from one’s partner increased distress risk among avoidant participants. Therefore, young and middle-aged patients with acute myocardial infarction with high attachment-related avoidance scores will not actively seek help from medical staff and family members and avoid communicating with others. On the contrary, participants with low attachment-related avoidance scores will actively seek to improve their stress resistance. The stronger their stress resistance, the lower the level of acute stress response.

This study has several limitations. First, participants in this study were recruited using the convenient sampling method. Therefore, the study sample may not represent all young and middle-aged AMI patients in China. However, our recruitment samples were collected from a general hospital, and the results still have strong universality. However, in the future, we can consider collecting samples from different regions to explore the ASD symptoms further and influencing factors of young and middle-aged AMI patients.
Second, cross-sectional data analysis can not be directly used to explain causality. Longitudinal studies may be needed in the future to confirm our findings in this study.

Despite these limitations, this study still presents acute psychological reactions related to AMI and related factors that can reduce ASD symptoms (such as adult attachment and social support). It is essential to identify risk and protective factors in the early treatment of AMI to prevent future ASD. Existing research reports also can provide reference significance. First, since the severity of AMI is related to ASD, medical personnel can reduce negative emotions by continuously improving the first aid process of AMI and minimizing complications. In addition, it is suggested that medical staff should evaluate adult attachment and social support as soon as possible, adjust the nursing plan in time, and encourage family members to participate in the treatment process to prevent the occurrence of ASD\textsuperscript{22}.

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**Statement of authorship**

All authors contributed satisfactorily to take responsibility for the content of this manuscript and have read and approved the final version.

**Conflict of interest**

Authors declare no conflicts of interest.

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