

RESEARCH ARTICLE

Acute stress disorder in patients with accidental traumatic fractures: What can we do

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Abstract**Aim:** To evaluate the potential influencing factors of acute stress disorder (ASD) in patients with accidental traumatic fractures to provide evidence for clinical nursing care.**Design:** A retrospective study.**Methods:** Patients with traumatic fractures treated in our hospital from 1 January 2020 to 30 November 2021 were included. The characteristics of ASD and no ASD patients were assessed.**Results:** A total of 468 patients with traumatic fractures were included, the incidence of ASD was 28.20%. Logistic regression analysis showed that age ≤ 50 years (OR2.918, 95% CI1.994~3.421), female (OR2.074, 95% CI1.489~3.375), AIS-ISS at admission ≥ 20 (OR3.981, 95% CI2.188~5.091), VAS at admission ≥ 7 (OR2.804, 95% CI2.027~3.467), introverted personality (OR1.722, 95% CI1.314~2.432) and CD-RISC at admission ≤ 60 (OR3.026, 95% CI2.338~4.769) were the risk factors of ASD in patients with traumatic fractures (all $p < .05$).**Conclusions:** The development of ASD in patients with traumatic fractures is affected by multiple factors. Medical workers should take early and timely management and nursing measures for related risk factors to reduce the occurrence of ASD.**KEYWORDS**

acute stress disorder, care, factors, nursing, traumatic fracture

1 | BACKGROUND

Traumatic fractures are fractures caused by various exogenous traumatic events. They are characterized by suddenness and unpredictability (Johnsen et al., 2021; Li et al., 2021b). They not only cause physical and cognitive damage to the individual, but also have an impact on their psychology, causing strong stress response, but when encountering frustration and adversity, not all individuals will have psychological problems or stress disorders, and some people will adapt well after stress (Xiao et al., 2020). Acute stress disorder (ASD) refers to the stress symptoms that occur within 2–28 days after an individual is exposed to a traumatic event such as natural disasters,

violent attacks, or major traffic accidents, which can finally develop into post-traumatic stress disorder (PTSD) (Joseph et al., 2020; McMinn et al., 2020). Therefore, the early identification and nursing care of ASD is vital to the prognosis of patients with accidental traumatic fractures.

Post-traumatic stress disorder has attracted much attention because it is a kind of irreversible mental disorder. At present, the researches on psychological stress disorder of fracture patients mainly focus on PTSD, and there is a lack of research reports on the related effects of ASD. Previous studies (Jiang et al., 2018; Ni et al., 2013; Wang et al., 2021b) have pointed out that ASD has a predictive effect on PTSD. Screening and early intervention care for ASD

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can effectively prevent the occurrence of PTSD (Fan et al., 2020). Therefore, this study aimed to analyse the clinical characteristics of patients with traumatic fractures, to identify related factors affecting the occurrence of ASD in patients with traumatic fractures, and to provide evidence support for the psychological care of patients with traumatic fractures.

2 | METHODS

2.1 | Ethical consideration

In this study, all methods were performed in accordance with the relevant guidelines and regulations. This present study had been checked and verified by the ethical committee of our hospital (approval number:), and written informed consents had been obtained from all the included patients. An investigator explained what the investigation was about and questions were answered. It was indicated that they could drop the investigation if they were unwilling to be involved.

2.2 | Patients

In this study, patients with traumatic fractures treated in our hospital from 1 January 2020 to 30 November 2021 were selected as the research population. The selection criteria for patients were as follows: (i) All fractures were caused by traumatic events, and they were treated in our hospital for the first time after trauma; (ii) Patients were ≥ 18 years old, have clear consciousness and normal cognitive ability, and could understand the questionnaire and related scales independently or with the help of the researcher; (iii) Patients were well informed and willing to participate in this study. The exclusion criteria for patients in this study were: (i) Patients with mental retardation and communication disorders; (ii) Central nervous system disorders caused by acute trauma, long-term or intermittent coma, and mental disorders; (iii) Patients who were unwilling to participate in this study.

2.3 | Diagnosis of ASD

The diagnosis of ASD was conducted according to the Stanford acute stress reaction questionnaire (SASRQ) score (Association, A.P., 2013). SASRQ was one of the commonly used tools in the international assessment of ASD. It contained 30 items, which respectively constitute symptoms such as separation, continuous repeated experience of traumatic events, avoidance of traumatic events, increased anxiety or alertness, and impairment of social function. Each item was scored from 0 to 5 points. When SASRQ score > 57 points, it could be diagnosed as ASD.

2.4 | Data collection

Two authors collected the following data from the medical record, including age, gender, body mass index (BMI), alcohol drinking, smoking, hypertension, diabetes, hyperlipidaemia, marital status, family monthly income and trauma history. Besides, we adopted a questionnaire survey method, in which two uniformly trained investigators conducted a face-to-face survey on the potentially identified patients who met the inclusion criteria. The time for psychological evaluation was 2–28 days from injury for investigation. A questionnaire survey was conducted after dinner, when the patient's emotional state was relatively stable and the environment was relatively quiet. The following scales were evaluated for included patients:

- Abbreviated injury scale-injury severity score (AIS-ISS (Weiting, 1994)): AIS-ISS was used to assess the severity of the injury. The specific method was to divide the injured person's body into head and neck, face, chest, abdomen and pelvic internal organs, limbs and pelvis, body surface, and calculated the square sum of the highest AIS scores of the three most severe injuries of the injured body to determine the severity. The higher the score, the more traumatic the patient had.
- Pain visual analogue scale (VAS) (Chiarotto et al., 2019): The VAS score was between 0 and 10, with a score of 0 indicating "painless" and a score of 10 indicating "the most severe pain that is unbearable". The higher the score, the higher the pain level of patients.
- Conner-Davidson resilience scale (CD-RISC): This scale was compiled by Conner in 2003. It mainly measured the individual's tolerance and the ability to adjust one's own behaviour under stress conditions (Shin et al., 2018). This study used the Chinese version of the CD-RISC translated and revised by Chinese scholars (Tu & Jianxin, 2007). There were 25 items in total, with three-dimensional scales suitable for the Chinese population, named tenacity, strength, and optimism. Likert 5 levels were used for scoring, with a total score of 0–100 points. The higher the CD-RISC score, the better the psychological flexibility of the patient.

2.5 | Statistical methods

We used SPSS 23.0 software to process the collected data. Counting data were expressed in frequency and rate, and chi-square test was used for comparison between groups. Measurement data were expressed by mean \pm standard deviation, *t* test was used for comparison between groups, and rank sum was used for rank data. Pearson correlation analysis was conducted to evaluate the correlation of ASD and characteristics. Logistic regression analysis was conducted to screen the risk factors of ASD in patients with traumatic fractures. In this study, $p < .05$ was considered as the difference was statistically significant.

3 | RESULTS

3.1 | The characteristics of included patients

A total of 468 patients with traumatic fractures were included, of whom 132 patients had the ASD, the incidence of ASD in patients with traumatic fractures was 28.20%. As shown in Table 1, there were significant differences in the age, gender, AIS-ISS at admission, VAS at admission, personality, age \leq 50years, female, AIS-ISS \geq 20, VAS at admission \geq 7, introverted personality and CD-RISC at admission between ASD and no ASD patients (all $p < .05$), no significant differences in the BMI, alcohol drinking, smoking, hypertension, diabetes, hyperlipidaemia, marital status, family monthly income and trauma history between ASD and no ASD patients were found (all $p > .05$).

3.2 | Pearson correlation analysis

As indicated in Table 2, Pearson correlation analysis indicated that age($r = .523$), gender($r = .481$), AIS-ISS at admission($r = .626$), VAS at admission($r = 0.599$), personality($r = .609$), and CD-RISC at admission($r = .728$) were correlated with ASD (all $p < .05$).

3.3 | Risk factors of ASD

The variable assignments of multivariate logistic regression were presented in Table 3. As indicated in Table 4, logistic regression analysis showed that age \leq 50years(OR2.918, 95% CI1.994~3.421), female(OR2.074, 95% CI1.489~3.375), AIS-ISS at admission \geq 20(OR3.981, 95% CI2.188~5.091), VAS at admission \geq 7(OR2.804, 95% CI2.027~3.467), introverted personality(OR1.722, 95% CI1.314~2.432), and CD-RISC at admission \leq 60(OR3.026, 95% CI2.338~4.769) were the risk factors of ASD in patients with traumatic fractures (all $p < .05$).

4 | DISCUSSIONS

Traumatic fractures are common critical illnesses in orthopaedic department with different severity and prognosis. ASD is a stress response that occurs after a severe trauma in the body, including disturbances in consciousness, cognition, memory orientation, psychomotor behaviour, and sleep (Bryant, 2018; Fanai & Khan, 2021; Shahrour & Dardas, 2020). Patients may experience insomnia, loss of appetite, dreaminess, irritability, depression, and self-consciousness (Bolton et al., 2021). The most serious patients

Variables	ASD group (n = 132)	No ASD group (n = 336)	t/ χ^2	p
Age(y)	42.12 \pm 14.04	59.39 \pm 9.85	14.901	.032
Male/female	52/80	231/105	1.077	.009
BMI (kg/m ²)	23.42 \pm 5.19	22.99 \pm 4.73	3.013	.081
Alcohol drinking	48(36.36%)	121(36.01%)	1.784	.077
Smoking	40(30.30%)	96(28.57%)	2.105	.114
Hypertension	75(56.82%)	185(55.06%)	1.984	.059
Diabetes	47(35.61%)	94(27.98%)	1.545	.088
Hyperlipidaemia	15(11.36%)	37(11.01%)	1.204	.107
Marital status			2.045	.093
Married	102(77.27%)	264(78.57%)		
Unmarried/divorced	30(22.73%)	72(21.43%)		
AIS-ISS at admission	24.64 \pm 9.11	15.04 \pm 6.23	5.826	.004
VAS at admission	8.91 \pm 2.01	5.25 \pm 3.14	1.844	.012
Personality			1.719	.006
Introverted	98(74.24%)	155(46.13%)		
Outgoing	34(25.76%)	181(53.87%)		
Family monthly income (RMB)			3.125	.086
\geq 6,000	68(51.52%)	169(50.29%)	2.955	.094
<6,000	71(53.79%)	177(52.68%)		
Trauma history	22(16.67%)	44(13.10%)	1.327	.107
CD-RISC at admission	51.19 \pm 17.04	68.66 \pm 20.43	9.721	.014

TABLE 1 The characteristics of included patients

Abbreviations: AIS-ISS, abbreviated injury scale-injury severity score; ASD, acute stress disorder; BMI, body mass index; CD-RISC, Conner-Davidson resilience scale; VAS, visual analogue scale.

are nonsense, restlessness, constant crying, delusion and even coma (Al Ali et al., 2021; Barnes et al. 2021; (Wang et al., 2021c)). These symptoms are often accompanied by abnormal behaviour (Bernhard

et al. 2021). Therefore, it is of great significance to analyse its risk factors and take targeted intervention measures. The results of this present study have found that the incidence of ASD in patients with traumatic fractures is 28.20%, and age ≤ 50 years, female, AIS-ISS at admission ≥ 20 , VAS at admission ≥ 7 , introverted personality, CD-RISC at admission ≤ 60 are the risk factors of ASD in patients with traumatic fractures. Early prevention and nursing care targeted on those risk factors are needed to reduce the ASD in patients with traumatic fractures.

TABLE 2 Pearson correlation analysis of ASD and characteristics

Variables	r	p
Age(y)	.523	.008
Gender	.481	.014
BMI (kg/m ²)	.065	.091
Alcohol drinking	.101	.106
Smoking	.184	.094
Hypertension	.077	.113
Diabetes	.082	.036
Hyperlipidaemia	.128	.089
Marital status	.204	.061
AIS-ISS at admission	.626	.011
VAS at admission	.599	.006
Personality	.609	.022
Family monthly income (RMB)	.171	.068
Trauma history	.124	.083
CD-RISC at admission	.728	.031

Abbreviations: AIS-ISS, abbreviated injury scale-injury severity score; ASD, acute stress disorder; BMI, body mass index; CD-RISC, Conner-Davidson resilience scale; VAS, visual analogue scale.

TABLE 3 The variable assignments of multivariate logistic regression

Factors	Variables	Assignment
ASD	Y	Yes = 1, No = 2
Age (y)	X ₁	$\leq 50 = 1$, $> 50 = 2$
Gender	X ₂	Female = 1, male = 2
AIS-ISS at admission	X ₃	$\geq 20 = 1$, $< 20 = 2$
VAS at admission	X ₄	$\geq 7 = 1$; $< 7 = 2$
Personality	X ₅	Introverted = 1, outgoing = 2
CD-RISC at admission	X ₆	$\leq 60 = 1$, $> 60 = 2$

Abbreviations: AIS-ISS, abbreviated injury scale-injury severity score; ASD, acute stress disorder; CD-RISC, Conner-Davidson resilience scale; VAS, visual analogue scale.

TABLE 4 Logistic regression analysis on the risk factors of ASD

Variables	β	Wald	OR	95% CI	p
Age ≤ 50 years	.168	0.103	2.918	1.994–3.421	.022
Female	.184	0.119	2.074	1.489–3.375	.009
AIS-ISS at admission ≥ 20	.195	0.123	3.981	2.188–5.091	.007
VAS at admission ≥ 7	.179	0.112	2.804	2.027–3.467	.043
Introverted personality	.145	0.106	1.722	1.314–2.432	.018
CD-RISC at admission ≤ 60	.169	0.153	3.026	2.338–4.769	.021

Abbreviations: AIS-ISS, abbreviated injury scale-injury severity score; ASD, acute stress disorder; CD-RISC, Conner-Davidson resilience scale; CI, confidence interval; OR, odds ratio; VAS, visual analogue scale.

The occurrence of ASD is related to gender, age, personality and the degree of pain. Women are more prone to psychological problems and even mental disorders after being stimulated by stress events (Parker et al., 2021). The current explanations for the differences in psychological problems between men and women after traumatic events may be related to the differences in the memory coding of disasters and the cognition of pictograms between the different genders (Ginty et al., 2021; Nelson et al., 2021). In trauma injuries, women show stronger memory coding and more obvious negative cognition than men (Hayashi et al., 2021; Rosenfeld & Ford, 2010). The risk of ASD in young patients is higher than that in men and middle-aged and elderly patients. This may be related to the fact that middle-aged and elderly patients have undertaken more social responsibilities and experienced experiences, so their psychological endurance has gradually increased, and they have lower psychological responses to trauma than young patients (Belcaro et al., 2018; Johnson et al., 2019). Introverted patients are often unwilling to communicate with others, their thoughts tend to be pessimistic, and they are more inclined to be impatient, anxious, and worried in the face of sudden stress events (LaRose et al. 2021; Wallace et al., 2013). They have stronger emotional responses to strong stimuli and have difficulty adapting to changes (Weber et al., 2021). Therefore, the risk of ASD is greater in patients with those factors.

Patients with strong pain perception are at higher risk of ASD. Previous studies (Bicen et al., 2021; Eckert et al., 2020) have pointed out that pain is an unpleasant emotional experience. At the same time, it can also be used as a source of stress to cause patients to produce other adverse emotional experiences, and cause patients to produce varying degrees of acute stress responses by affecting emotions, cognition, and physiological and psychological processes (Johnson et al., 2020). It is suggested that it is very necessary to take corresponding measures to reduce pain to improve the patient's

discomfort and relieve the irritation, depression and other negative emotions caused by pain in the process of clinical care (Nayak et al., 2019). Identifying and understanding the influencing factors are very important to the early prevention and nursing care of ASD. Previous studies (Melcer et al., 2019; Mona et al., 2019) have pointed out that the patient's trauma history, complications, and degree of trauma can damage important functions of the body, loss of self-care, self-reliance, and social function, resulting in more serious ASD. Fear, anxiety and depression during injury can cause brain atrophy (Qiong et al., 2015). Its parts are mainly concentrated in the hippocampus, prefrontal lobe and amygdala, causing changes in the structure and function of the central nervous system, various memory loss and emotional changes, and then causing ASD (Allene et al., 2021; Lefebvre et al., 2021). Early alert and nursing care of patients with higher pain perception are needed in clinical practice.

The psychological elasticity of patients with traumatic fracture needs to be further improved. Based on the attribute that psychological resilience can be stimulated from difficult situations, medical staff can be empowered from multiple channels, multiple links, and multiple angles to improve the population's ability to cope with stress changes, to reduce the possibility of ASD (Armand et al., 2021; Javelot & Weiner, 2021; Zhang et al., 2021). At the same time, great attention should be paid to women, young and middle-aged, introverted, and painful patients by improving the level of psychological flexibility, exploring the source of strength for individual growth, minimizing the negative impact of adversity on individuals, and find the most suitable conditions for growth and development, to making sure the individual get the best physical and mental health (Li et al., 2021a; Wang et al., 2021a).

Several limitations in this present study should be considered. Firstly, the time for psychological evaluation was in a large range during the hospital stay of patients, which might influence the findings. Secondly, the factors included for analyses were limited, and there can be some other factors influencing ASD development, which need further investigations in the future. Thirdly, our study was a single-centre study, the sample size is not large, future studies with a larger sample size and multi-sites are needed to further elucidate the potentially influencing factors of ASD traumatic fractures.

5 | CONCLUSIONS

In conclusion, we have found that ASD is very common in patients with traumatic fractures. For patients with age ≤ 50 years, female, AIS-ISS at admission ≥ 20 , VAS at admission ≥ 7 , introverted personality, CD-RISC at admission ≤ 60 , they may have higher risks of ASD. Interventions and nursing care for such patients should be strengthened in clinical practice to reduce the occurrence of ASD. In clinical nursing care, we should pay special attention to elderly female patients, timely observe the patients' conditions and assess the pain level of fracture patients, and effectively relieve the psychological concerns of patients, so as to reduce the occurrence of ASD in patients with traumatic fractures.

AUTHOR CONTRIBUTIONS

Z L, L W designed research; Z L, L W, F T, S G, X L conducted research; Z L, L W analysed data; Z L wrote the first draft of the manuscript; Z L had primary responsibility for the final content. All authors read and approved the final manuscript.

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None.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

DATA AVAILABILITY STATEMENT

All data generated or analyzed during this study are included in this published article. #10;

ETHICAL APPROVAL

Ethics approval and In this study, all methods were performed in accordance with the relevant guidelines and regulations. This present study had been checked and verified by the ethical committee of our hospital (approval number: A20096).

CONSENT TO PARTICIPATE

Written informed consents had been obtained from all the included patients.

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