Level of Disability and Coping Strategies in Post-Operative Brachial Plexus Injury: Impacts on Mental Health

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ABSTRACT

Background: The results of Brachial Plexus Injury (BPI) surgery often remain unsatisfactory, leading to ongoing disability and associated distress, manifested as depression and Post-Traumatic Stress Disorder (PTSD) in patients. Unfortunately, there is no available data on this issue in Indonesia.

Purpose: This study aims to investigate the correlation between the degree of disability and coping mechanisms on the incidence of depression and PTSD in post-operative BPI (PO-BPI) patients

Methods: This observational analytic study utilized a cross-sectional design with consecutive sampling. The study population comprised BPI patients who had undergone surgery at Dr. Soetomo General Academic Hospital, Surabaya, at least six months prior. Research measurement tools included the DASH-score for degree of disability, BriefCope for coping mechanisms, the MINI-test for depression, and the Post-Traumatic Stress Disorder Checklist for Civilians (PCL-C) for PTSD. All instruments were distributed online within the BPI community. Statistical analysis was conducted using the chi-square test, contingency coefficient (CC), and logistic regression in the SPSS software.

Results: Of the 31 respondents, the majority were male (71%), with a mean age of 37.19 years. Most BPI injuries were right-sided (67.7%), with at least one operation performed (54.8%) more than six months prior (77.4%). The majority of disabilities were moderate (77.4%), and the majority used emotion-focused coping mechanisms (51.6%). The incidence of depression was 38.7% and PTSD was 51.6%. There was no significant correlation between the degree of disability and depression ($p = 1.000$) or PTSD ($p = 0.833$), and no association between coping mechanisms and depression ($p = 0.355$) or PTSD ($p = 0.209$).

Conclusion: There are likely many other factors influencing the incidence of depression and PTSD in PO-BPI patients that were not studied. Further research is needed to explore these additional factors.

Keywords: post-operative brachial plexus injury, coping mechanisms, depression, PTSD.

INTRODUCTION

Traumatic Brachial Plexus Injury (BPI) is an injury that affects the brachial plexus, a group of peripheral nerves, resulting in weakness and disability in the motor and sensory functions of the upper extremities.[1] Nearly 75% of cases occur due to motor vehicle accidents and the rise of extreme sports, which pose a risk of injury, particularly among active young people. BPI often leads to chronic pain (70-86%), causing patients to experience significant disability and dependence on others.[2] The most effective treatment for BPI is surgery to restore motor and sensory functions.[3,4] While many post-operative brachial plexus injury (PO-BPI) patients show functional improvement, factors such as delays in the decision to operate, the involvement of multiple nerves in the injury, high injury severity, and non-compliance with motor training,[1,5,6] result in one-third of patients experiencing no functional improvement,[1,2] and one-fifth experiencing permanent disability.[1]

PO-BPI patients often suffer from psychiatric disorders, such as depression and, in some cases, Post-Traumatic Stress Disorder (PTSD), leading to various psychosocial challenges and a reduced quality of life.[7,8] At Dr. Soetomo General Academic Hospital in Surabaya, among 41 recorded PO-BPI patients, 10 (24.4%) experienced depression, with suicide risk in 3 (7.3%), and 2 (4.87%) suffered from PTSD.[9] Patients generally expect optimal and holistic outcomes from surgery.

However, many PO-BPI patients dissatisfied with their surgical outcomes face various psychosocial issues, such as altered body image affecting their social relationships and job performance, potentially leading to job loss. These patients often use coping mechanisms to adapt to these challenges. A study by Franzblau, which included 12 PO-BPI patients, demonstrated that utilizing more adaptive coping mechanisms—specifically, problem-focused strategies to overcome post-operative challenges and seeking social support—can help patients accommodate their limitations, even if the post-operative functional improvement is minimal, thus preventing depression and PTSD.[10] This suggests that the degree of disability in PO-BPI patients and the coping mechanisms they employ are related to the incidence of depression and PTSD.

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MATERIALS AND METHODS

This observational analytical study was conducted on BPI patients who underwent surgery at Dr. Soetomo General Academic Hospital, Surabaya, using a cross-sectional design and consecutive sampling. The study took place in Surabaya, a community base for BPI patients, from March 2020 to September 2023. The sample population consisted of patients who had undergone BPI surgery at Dr. Soetomo General Academic Hospital at least six months prior to the time of sampling. The independent variables were the degree of disability and coping mechanisms, measured using the DASH and BriefCope questionnaires. The dependent variables included depression and PTSD, assessed using the MINI-test and PCL-C. All questionnaires were distributed online to the community of registered patients at Dr. Soetomo General Academic Hospital. Statistical data were analyzed using the chi-square test, contingency coefficient (CC), and logistic regression with the SPSS software.

RESULTS

Data collection from PO-BPI respondents was conducted in September 2022 using questionnaires distributed via Google Forms. The total number of respondents in this study was 39, and 31 met the inclusion criteria. A more detailed description of the demographics of PO-BPI respondents is provided in Table 1.

Table 1. Demographic characteristics of po-bpi respondents

Demographic Data	Category	n (%)
Sex	Male	22 (71.0%)*
	Female	9 (29.0%)
Religion	Islam	29 (93.5%)*
	Christianity	2 (6.5%)
Ethnicity	Javanese	24 (77.4%)*
	Chinese	1 (3.2%)
	Tionghoa	1 (3.2%)
	Madurese	1 (3.2%)
	Sundanese	2 (6.5%)
	Others	2 (6.5%)
Domicile	Surabaya	6 (19.4%)
	Outside Surabaya, in Java	20 (64.5%)*
	Island Outside Java	5 (16.1%)
Educational background	Elementary school	1 (3.2%)
	Junior High School/ equivalent	2 (6.5%)
	Senior High School/ Vocational High School/ equivalent	13 (41.9%)*
	Diploma III	1 (3.2%)
	Bachelor/Profession	14 (45.2%)
Marital Status	Married	21 (67.7%)*
	Not Married	10 (32.3%)
Post-Traffic Accident Economic Status (subjectively by research subjects)	Worsened	22 (71.0%)*
	Improved	4 (12.9%)
		5 (16.1%)
Difficulty Working with Hands	Difficult	27 (87.1%)*
	Not difficult	4 (12.9%)
Living situation	Alone	2 (6.5%)
	With Spouses	8 (25.8%)
	With Parents	14 (45.2%)*
	With Family	7 (22.6%)
Getting Support	Yes	27 (77.4%)*
	No	4 (22.6%)
Support Figure	None	8 (25.8%)
	Family	15 (48.4%)*
	Outside Family	1 (3.2%)
	Family & Outside Family	7 (22.6%)

*) indicates the largest number

The researchers analyzed the items on the coping mechanism, degree of disability, and depression instruments. The logistic regression analysis of coping mechanisms and degree of disability on the incidence of depression revealed that depression could not be explained in relation to coping mechanisms and the degree of disability. Neither variable was significant in relation to the incidence of depression, indicating no relationship between depression and coping mechanisms or the degree of disability, as displayed in Table 2.

Table 2. Correlation between Coping Mechanisms and the Degree of Disability on the Incidence of Depression in PO-BPI Respondents

Degree of Disability (n%)	Coping Mechanism	Depressed (n%)	Not Depressed (n%)
Minimal 4 (100.0%)	Problem-Focused	0 (0.0%)	0 (0.0%)
	Emotion-Focused	1 (25.0%)	1 (25.0%)
	Combined	0 (0.0%)	2 (50.0%)*
Moderate 24 (100.0%)	Problem-Focused	0 (0.0%)	1 (4.2%)
	Emotion-Focused	7 (29.2%)	7 (29.2%)
	Combined	3 (12.5%)	6 (25.0%)
Severe 3 (100.0%)	Problem-Focused	0 (0.0%)	0 (0.0%)
	Emotion-Focused	0 (0.0%)	0 (0.0%)
	Combined	1 (33.3%)	2 (66.6%)*
Total: 31 (100%)		12 (38.7%)	19 (61.3%)*

*) indicates the largest number

Logistic regression analysis revealed that PTSD cannot be explained by coping mechanisms and the degree of disability. Neither variable was significant in relation to the incidence of PTSD, indicating no relationship between PTSD and coping mechanisms or the degree of disability, as displayed in Table 3. The logistic regression analysis, conducted with a 95% confidence interval (CI) and followed by the Backward Stepwise (LR) method using SPSS 23, confirmed that there was no correlation between coping mechanisms and the degree of disability with the incidence of PTSD in PO-BPI patients in this study, even after excluding up to 10 items of insignificant variables.

Table 3. Correlation between Coping Mechanisms and the Degree of Disability on the Incidence of PTSD in PO-BPI Respondents

Degree of Disability (n%)	Coping Mechanism	PTSD (n %)	Non-PTSD (n %)
Minimal 4 (100.0%)	Problem-Focused	0 (0.0%)	0 (0.0%)
	Emotion-Focused	1 (25.0%)	1 (25.0%)
	Combined	1 (25.0%)	1 (25.0%)
Moderate 24 (100.0%)	Problem-Focused	1 (4.2%)	0 (0.0%)
	Emotion-Focused	9 (37.5%)*	5 (20.8%)
	Combined	3 (12.5%)	6 (25.0%)
Severe 3 (100.0%)	Problem-Focused	0 (0.0%)	0 (0.0%)
	Emotion-Focused	0 (0.0%)	0 (0.0%)
Combined		1 (33.3%)	2 (66.6%)*
Total: 31 (100%)		16 (51.6%)	15 (48.4%)

*) indicates the largest number

Correlation test with chi-square showed no relationship between the degree of disability and the incidence of depression in this study (p = 1.000). Table 4 shows that only 33% of respondents with severe disabilities experienced depression, indicating that an increase in the degree of disability does not affect depression in PO-BPI cases. The correlation test with chi-square also showed no relationship between the degree of disability and the occurrence of PTSD in this study (p = 0.833), as further analyzed in Table 4, which shows that 2 respondents (66.7%) with severe disabilities did not experience PTSD. This suggests that there may be other potential factors that were not examined.

Table 4. Relationship between the degree of disability and the incidence of depression and PTSD in PO-BPI respondents

Relationship between the degree of disability and the incidence of depression in PO-BPI respondents				
Disability	Depression	No Depression	Total	*p*
Minimal	1 (25.0%)	3 (75.0%)*	4 (100%)	1,000
Moderate	10 (41.7%)	14 (58.3%)*	24 (100.0%)	
Severe	1 (33.3%)	2 (66.7%)*	3 (100.0%)	
Total	12 (38.7%)	19 (61.3%)	31 (100.0%)	
Relationship between the degree of disability and the incidence of PTSD in PO-BPI respondents				
Disability	PTSD	No PTSD	Total	*p*
Minimal	2 (50,0%)	2 (50,0%)	4 (100%)	0,838
Moderate	13 (54,2%)*	11 (45,8%)	24 (100%)	
Severe	1 (33,3%)	2 (66,7%)*	3 (100%)	
Total	16 (51,6%)	15 (48,4%)	31 (100%)	

*) represents the majority.

The chi-square correlation test also found no relationship between the subject's coping mechanism and the incidence of depression in this study (p = 0.355). Upon further examination, Table 5 shows that respondents who used a problem-focused coping mechanism had 100% no depression, although this was observed in only one respondent. The chi-square test also indicated no relationship between the subject's coping mechanism and the incidence of PTSD in this study (p = 0.209). Upon further analysis, Table 5 shows that respondents who used a combination of coping mechanisms had a potential to reduce the risk of PTSD.

Table 5. Relationship between coping mechanism and incidence of depression and PTSD in PO-BPI respondents.

Relationship between coping mechanism and incidence of depression in PO-BPI respondents				
Coping	Depression	No Depression	Total	*p*
Problem-focused	0 (0,0%)	1 (100,0%)*	1 (100,0%)	0,355
Emotion-focused	8 (50,0%)	8 (50,0%)	16 (100,0%)	
Combination	4 (28,6%)	10 (71,4%)*	14 (100,0%)	
Total	12 (38,7%)	19 (61,3%)	31 (100,0%)	
Relationship between coping mechanism and incidence of PTSD in PO-BPI respondents				
Coping	PTSD	No PTSD	Total	*p*
Problem-focused	1 (100,0%)*	0 (0,0%)	1 (100,0%)	0,209
Emotion-focused	10 (62,5%)*	6 (37,5%)	16 (100,0%)	
Combination	5 (35,7%)	9 (64,3%)*	14 (100,0%)	
Total	16 (51,6%)	15 (48,4%)	31 (100,0%)	

*) represents the majority.

DISCUSSION

Correlation between Coping Mechanisms and the Degree of Disability on the Incidence of Depression in PO-BPI Patients

Depression is closely related to significant impacts on the health service sector, both in terms of disease course and therapy. Its function also declines.[11] Pre-operative BPI patients in the 18-64 age group who have previously experienced depression are at risk of suffering from depression for one year after surgery.

PO-BPI patients who experience depression often have a more severe degree of disability and higher pain intensity.[7,8] However, in this study, respondents with depression also experienced mild or moderate degrees of disability. This may be because these patients continue to experience pain from BPI that is not fully resolved by surgery, which is a risk factor for depressive symptoms. The prevalence of moderate to severe depression is 20-26%.[7,8] The presence of depression in PO-BPI patients can interfere with and prolong the rehabilitation process, reducing the effectiveness of motor function recovery. In other words, depression worsens disability. It has been found that 10 out of 37 (27%) PO-BPI patients experienced severe depression. Depression can also occur due to low satisfaction with surgical results, changes in body image perception, prolonged hospitalizations, inability to return to work, and social isolation, all of which can worsen disability.[11]

When individuals face obstacles, they use coping mechanisms to overcome their situation. Initially, they may use problem-focused coping to improve their condition. Those who feel in control of their emotions are less likely to experience depression than those who feel everything is beyond their control. Additionally, supportive coping resources, such as social support, younger age, education, and employment, are associated with better emotional adjustment. However, if an individual uses emotion-focused coping and believes they cannot overcome their obstacles, it can trigger or worsen depression.[10] This theory aligns with one of the researchers' findings, where one man used problem-focused coping and did not experience depression.

The increase in depression among men who use emotion-focused coping is influenced by masculinity, which often leads them to believe they need fewer people. It has been suggested that men seeking emotional support and advice from friends or expressing their dissatisfaction to others is associated with feminine emotion-focused coping mechanisms that contribute to distress. This is consistent with previous research, which has found that crying as an expression of sadness is socially normative for women but not for men. Additionally, men may be more likely to abuse substances because they are more likely to engage in perceived "externalized" masculinity.[12]

Correlation between Coping Mechanisms and the Degree of Disability on the Incidence of PTSD in PO-BPI Patients

Patients are at risk of experiencing PTSD one to three months after injury, which can significantly increase the risk of disability after 12 months.[13] To obtain optimal research results, researchers considered a period of 6 months after surgery to minimize PTSD bias related to the injury period.[4] While PO-BPI can improve disability conditions, the potential for higher PTSD levels is significant when the injury mechanism involves more than one nerve compared to isolated nerve injuries.[14]

Two studies indicate that PTSD decreases over time with improvements in motor function and quality of life, although this was not further examined in this study as it was not the focus. Individuals with PTSD may experience greater disability in the healthcare sector if they lack information and face uncertainty about their recovery, have physical symptoms, feel misunderstood, or are dissatisfied with treatment. Those who use emotion-focused coping are more likely to experience PTSD, especially if coping resources are not supportive. PTSD is often associated with constant pain memories, making emotional coping more dominant. Reducing pain levels can help eliminate PTSD incidents.[10,13,14] In this study, a profile emerged of young female respondents in their mid-20s using emotional coping, revealing the onset of PTSD due to anxiety from dissatisfaction with insufficient information about their uncertain recovery. This mismatch between expectations and reality, coupled with a lack of supportive resources, contributed to their PTSD.

CONCLUSION

Interestingly, this study found that PO-BPI patients with severe disability who used a combination of coping strategies had a 100% potential for experiencing PTSD. No previous study has evaluated this specific aspect. Due to the lack of significant results, the researchers assumed that other factors not studied here might support the occurrence of PTSD. These factors could include other psychosocial influences rather than just coping mechanisms or the degree of disability.

For PO-BPI patients with moderate disability, those using emotional coping strategies had a 37.5% occurrence of PTSD. In contrast, those using problem-focused coping had a much lower PTSD occurrence rate of 4.2%. Using a combination of coping strategies resulted in a 12.5% PTSD occurrence. For patients with mild disabilities, both emotion-focused and combined coping strategies led to a 25% occurrence of PTSD. Emotion-focused coping does not significantly help in avoiding PTSD. It would be more beneficial for PO-BPI patients to use problem-focused coping to deal with their disability, reducing the potential for PTSD.

Authorship Contribution: All authors contributed to article preparation and paper revision and have collectively assumed responsibility for all aspects of this study.

Acknowledgements: I would like to express my sincere gratitude to Rama Ananditia Putra, a fellow orthopedist, for his invaluable collaboration and contributions to this research. His insights and dedication have greatly enriched the outcome of this study, and I am deeply appreciative of his support throughout this project

Potential Conflicts of Interest: None

Competing Interest: None

Acceptance Date: 22-08-2024

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