

Article

Study of Factors Influencing Early Kinesiophobia in Older Patients after Coronary Artery Bypass Grafting in China

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Abstract

Background: Kinesiophobia is highly prevalent among postoperative cardiac patients. Early identification of kinesiophobia in patients who have undergone coronary artery bypass grafting (CABG) can improve their ability to participate in physical activities. However, there is limited research on the factors influencing kinesiophobia in older patients during the early stages after CABG. To investigate the factors influencing early kinesiophobia in older patients after coronary artery bypass grafting and to examine the correlation between these factors and social support and rehabilitation exercise self-efficacy. **Methods:** Using convenience sampling, 117 older patients who underwent coronary artery bypass grafting in the cardiac surgery ward of a tertiary grade A hospital in Bengbu City from October 2022 to September 2023 were analyzed. The survey was conducted on-site using a general information questionnaire, the Chinese version of the Tampa Scale for Kinesiophobia Heart (TSK-SV Heart), the Cardiac Exercise Self-Efficacy Instrument (CESEI), the Social Support Rating Scale (SSRS), and the pain assessment scale. Single-factor analysis, multifactor regression analysis, and Spearman's correlation analysis were employed. **Results:** Among the 117 older patients in the early postoperative phase following coronary artery bypass grafting, the incidence of kinesiophobia was 73.5%. Single-factor analysis revealed that education level, medical expense coverage, place of residence, and pain scores were significantly associated with kinesiophobia ($p < 0.05$). Multifactor regression analysis identified age and monthly income as factors influencing cardiac exercise self-efficacy ($p < 0.05$). Age, education level, medical expense coverage, and monthly income affected patient social support ($p < 0.05$). Spearman's correlation analysis revealed significant negative correlations among cardiac exercise self-efficacy, social support, and kinesiophobia level ($p < 0.001$). **Conclusion:** The incidence of early kinesiophobia is relatively high among older patients after coronary artery bypass grafting. Educational level, medical expense coverage, place of residence, and postoperative pain were influential factors. Both cardiac exercise self-efficacy and social support have a significant

impact on kinesiophobia in patients. Therefore, clinical healthcare professionals should prioritize older patients undergoing postcoronary artery bypass grafting with lower educational levels and monthly incomes. Effective and evidence-based clinical interventions can be tailored based on these influencing factors and their correlations to promote active participation in rehabilitation exercises and improve patient outcomes in the early postoperative phase.

Keywords

older patients; coronary artery bypass grafting; kinesiophobia; correlation

Introduction

As of 2020, the incidence of coronary heart disease among people in China aged 60 and above was 27.8%. The coronary heart disease mortality rate was 126.91 per 100,000 individuals in urban areas and 135.88 per 100,000 individuals in rural areas, thus exhibiting an increasing trend [1]. Coronary artery bypass grafting (CABG) is a surgical procedure performed when one or more coronary arteries become narrowed or blocked due to atherosclerosis, causing insufficient blood supply by using veins or arteries acquired during surgery to create bypasses around atherosclerotic blockages. CABG is the performance of surgery under on-pump support and cardiac arrest, and its surgical methods are mature. The surgery aims to improve health-related quality of life, especially regarding mental and physical functions, and prolong life [2]. Exercise has been demonstrated to enhance outcomes in older patients with various cardiac disorders [3]. However, patients who have undergone surgery, especially older individuals, may still experience reduced cardiac function, decreased activity tolerance, and kinesiophobia [4]. Kinesiophobia stems from negative emotions such as worry and anxiety, potentially leading to overly protective avoidance of rehabilitative exercise and excessive, irrational fear of physical activity [5]. As a result of anxiety, patients may consciously choose to reduce or avoid exercise [6]. Over time, kinesiophobia can result in diminished physical functioning,

heightened susceptibility to depression, and reduced overall quality of life [7]. However, current research into kinesiophobia in patients who have undergone CABG is still in its early stages, both nationally and internationally [8]. Moreover, researchers have yet to explore the assessment and intervention strategies of kinesiophobia. Therefore, further exploration of kinesiophobia among patients aged 60 and above who have undergone CABG is warranted.

Design and Methods

Setting and Sampling

The current descriptive study adopted a cross-sectional design. A total of 117 patients who underwent CABG under cardiopulmonary bypass at a tertiary grade A hospital in Bengbu City, Anhui Province, were selected as the subjects. The patients were successfully extubated orally during treatment in the care unit with professional medical care. They remained emotionally stable throughout the perioperative period without the use of sedative drugs. Additionally, there were no occurrences of chest tightness or shortness of breath. Researchers conducted the survey in person within 48 hours after patients were transferred from the intensive care unit to the general ward.

Setting and Participants

This study employed convenience sampling. Patients who underwent CABG under cardiopulmonary bypass from October 2022 to September 2023 at a tertiary grade A hospital in Bengbu City, Anhui Province, were selected.

The inclusion criteria were as follows: (1) aged ≥ 60 years; (2) patients who underwent CABG; (3) patients who were stable postoperatively and transferred back to the ward within 48 hours; (4) informed consent obtained and voluntary participation in this study.

The exclusion criteria were as follows: (1) those with severe mental illnesses or cognitive impairments; (2) individuals with severe postoperative dyskinesia; and (3) having psychiatric and neurological problems.

The estimated sample size for this study was calculated based on 18 variables, ranging from 5 to 10 times the number of independent variables, resulting in a required sample size of 90 to 180 participants.

Research Tools

General Demographic and Disease-Related Information Questionnaire

A questionnaire was employed to collect general demographic and disease-related data, including gender, age, educational level, health insurance payment method, average monthly family income, graft number, comorbidities, etc.

The Tampa Scale for Kinesiophobia Heart (TSK-SV Heart) was used in this study. It has been adapted from the TSK in patients with chronic back pain by Bäck *et al.* in Sweden [9]. The TSK-SV Heart consists of 17 items across four dimensions: Perceived danger for heart problem, avoidance of exercise, fear of injury, and dysfunctional self. It employs the Likert scale with scores ranging from 1 to 4, representing “strongly disagree” to “strongly agree”. The total score ranges from 17 to 68, and a score of ≥ 38 indicates the presence of kinesiophobia, with higher scores indicating higher levels of kinesiophobia. The Cronbach’s α coefficient for this scale in the study was 0.848.

The Social Support Rating Scale (SSRS) is a questionnaire that assesses the social support levels of patients following CABG surgery [10]. Moreover, it is divided into dimensions such as subjective support, objective support, and the degree of utilizing social support. The total score ranges from 11 to 72, with higher scores indicating a higher level of social support. In this study, the Cronbach’s α coefficient for the scale was 0.793.

Hickey *et al.* [11] developed the Cardiac Exercise Self-Efficacy Instrument (CESEI) to assess the confidence of patients participating in cardiac rehabilitation programs to engage in exercise. The researchers translated and revised the Chinese version of the CESEI in 2021 [12]. It comprises 16 items in a single dimension and uses a Likert 5-point scale. The total score ranges from 16 to 80, with higher scores indicating higher self-efficacy for cardiac exercise rehabilitation. Cronbach’s α coefficient for the scale was 0.939.

Pain was assessed using the Numerical Rating Scale (NRS), which ranges from 0 to 10. A score of 0 indicates no pain, while a score of 10 represents excruciating, intolerable pain. Higher scores indicate more severe pain.

Data Collection

The questionnaires were administered within one week of the CABG with cardiopulmonary bypass. All respondents had been transferred from the intensive care unit to the general ward, and their condition had stabilized. After obtaining informed consent, researchers distributed the questionnaires on-site and utilized a question-and-answer format for data collection. All completed questionnaires were collected on the spot and organized by two researchers. In total, 120 questionnaires were distributed, and three invalid questionnaires were excluded, resulting in 117 collected questionnaires.

Statistical Methods

IBM SPSS (Version 26.0, IBM Corporation, NY, USA) software was employed for the analysis. Descriptive statistics, including the mean $\pm$ standard deviation, were used to describe early postoperative kinesiophobia after CABG and the status of self-efficacy for cardiac exer-

Table 1. General information survey and single-factor analysis of kinesiophobia (cases (percentage, %)).

Item		Kinesiophobia		χ^2 value	<i>p</i> -value
		None (n = 31)	Present (n = 86)		
Gender	Male	20 (64.5)	48 (55.8)	0.709	0.400
	Female	11 (35.5)	38 (44.2)		
Age (years)	60–69 years	23 (74.2)	47 (54.7)	4.844	0.089
	70–79 years	8 (25.8)	32 (37.2)		
	80 years and above	0 (0)	7 (8.1)		
Education level	Middle school or below	14 (45.2)	81 (94.2)	35.870	<0.001
	High school and above	17 (54.8)	5 (5.8)		
Medical expense payment	Employee medical insurance	9 (29.0)	4 (4.7)	13.714	<0.001
	Resident medical insurance	22 (71.0)	82 (95.3)		
Living arrangement	Living alone	1 (3.2)	8 (9.3)	4.022	0.134
	Living with spouse	27 (87.1)	59 (68.6)		
	Living with children	3 (9.7)	19 (22.1)		
Residence	Urban	8 (25.8)	3 (3.5)	13.325	<0.001
	Rural	23 (74.2)	83 (96.5)		
Average monthly family income (USD)	USD <540	1 (3.2)	9 (10.5)	5.804	0.055
	USD 540–770	18 (58.1)	61 (70.9)		
	USD >770	12 (38.7)	16 (18.6)		
Number of comorbidities	0	12 (38.7)	21 (24.4)	3.702	0.295
	1	12 (38.7)	47 (54.7)		
	2	7 (22.6)	16 (18.6)		
	≥3	0 (0)	2 (2.3)		
Number of grafts	1–3 grafts	15 (48.4)	40 (46.5)	0.032	0.858
	>3 grafts	16 (51.6)	46 (53.5)		
Pain score (points)	1–3 points	23 (74.2)	46 (53.5)	4.038	0.044
	4–7 points	8 (25.8)	40 (46.5)		

Table 2. Binary logistic regression analysis kinesiophobia.

Variable	β	Standard error	Wald	<i>p</i>	OR	95% CI
Education level	−4.088	1.624	6.333	0.012	0.017	0.001–0.405
Medical expense payment	3.354	4.763	0.496	0.481	28.622	0.003–324075.708
Living arrangement	3.069	2.326	1.742	0.187	21.530	0.226–2054.054
Pain score	1.371	1.033	1.762	0.184	3.940	0.520–29.836
SSRS	−3.176	1.029	9.521	0.002	0.042	0.006–0.314
CESEI	−0.105	0.121	0.762	0.383	0.900	0.711–1.140

OR, odds ratio; CI, confidence interval; SSRS, the Social Support Rating Scale; CESEI, the Cardiac Exercise Self-Efficacy Instrument.

cise and social support. Influencing factors of early post-operative kinesiophobia after CABG were analyzed using *t*-tests and analysis of variance (ANOVA). Multiple linear stepwise regression analyses assessed cardiac exercise self-efficacy and social support scores. Binary logistic regression analysis was conducted to explore the factors influencing kinesiophobia in patients. The regression coefficient, obtained after standardizing both the independent and dependent variables, represents the magnitude of the effect of each unit change in that independent variable on the dependent variable.

Spearman's correlation analysis was utilized to examine the correlations between kinesiophobia, social support, and cardiac exercise self-efficacy.

Results

Univariate Analysis of Kinesiophobia Total Scores

Among the 117 surveyed patients, the kinesiophobia score was 44.27 ± 5.74 , with 86 patients scoring ≥ 38 , resulting in a kinesiophobia incidence of 73.5%. The results

Table 3. Assignment of independent variables.

Independent variables	Assignment
Gender	1 = Male; 2 = Female
Age	1 = 60–69 years; 2 = 70–79 years; 3 = 80 years and above
Education level	1 = Middle school or below; 2 = High school and above
Medical expense payment	1 = Employee medical insurance; 2 = Resident medical insurance
Living arrangement	1 = Living alone; 2 = Living with spouse; 3 = Living with children
Residence	1 = Urban; 2 = Rural
Average monthly family income	1 = USD <540; 2 = USD 540–770 ; 3 = USD >770
Number of comorbidities	1 = 0; 2 = 1; 3 = 2; 4 = 3 or more
Number of grafts	1 = 1–3 grafts; 2 = >3 grafts
Pain score	1 = 1–3 points; 2 = 4–7 points

Table 4. Multifactor analysis of cardiac exercise self-efficacy.

Independent variables	Unstandardized coefficients		Standardized coefficients	<i>t</i>	Significance	95% CI	
	<i>B</i>	Standard error	<i>Beta</i>			Lower limit	Upper limit
Constant	22.816	3.024		7.545	0.000	16.823	28.808
60–69 years	-	-	-	-	-	-	-
70–79 years	-3.111	1.282	-0.201	-2.427	0.017	-5.652	-0.571
80 years and above	-3.695	2.569	-0.119	-1.438	0.153	-8.785	1.396
USD <540	-	-	-	-	-	-	-
USD 540–770	9.724	2.180	0.620	4.461	0.000	5.404	14.043
USD >770	10.830	2.588	0.629	4.185	0.000	5.702	15.957

Table 5. Multifactor analysis of social support.

Independent variables	Unstandardized coefficients		Standardized coefficients	<i>t</i>	Significance	95% CI	
	<i>B</i>	Standard error	<i>Beta</i>			Lower limit	Upper limit
Constant	3.103	4.591		0.676	0.501	-5.997	12.203
60–69 years	-	-	-	-	-	-	-
70–79 years	-1.754	0.551	-0.233	-3.181	0.002	-2.846	-0.661
80 years and above	-1.949	1.104	-0.129	-1.765	0.080	-4.138	0.239
Education level	2.178	0.740	0.238	2.943	0.004	0.711	3.646
Medical expense payment	5.124	1.566	0.451	3.272	0.001	2.020	8.227
USD <540	-	-	-	-	-	-	-
USD 540–770	2.902	0.931	0.380	3.116	0.002	1.056	4.748
USD >770	3.520	1.115	0.420	3.156	0.002	1.309	5.731

of univariate analysis for patients with and without kinesiophobia indicated that educational level, health care payment methods, place of residence, and pain scores were statistically significant factors associated with the occurrence of kinesiophobia ($p < 0.05$) (Table 1).

Multifactorial Analysis of Total Kinesiophobia Scores

The results of regression analysis showed that literacy and using social support were influencing factors in the patients' exercise anxiety ($p < 0.05$) (Table 2). When the patient's literacy level was high school and above, the probability of suffering from exercise anxiety was 0.202 times higher than when the patient's literacy level was junior high school or lower, and the probability of suffering from kinesiophobia increased by 0.042 times for every 1-point increase in the patient's social support score.

Multifactor Analysis of Influencing Factors of Kinesiophobia

Binary logistic regression analysis was conducted to explore the factors influencing kinesiophobia in patients. Their original numerical values were used for continuous variables, while categorical variables were assigned (Table 3).

Multifactor Analysis of Cardiac Exercise Self-Efficacy

The regression analysis revealed that age and monthly income were factors influencing cardiac exercise self-efficacy ($p < 0.05$) (Table 4).

Table 6. Correlation between kinesiophobia and scores on various scales.

Variable	Score ($\bar{x} \pm s$)	R value	p-value
CESEI scores	35.36 $\pm$ 7.37	-0.446	<0.001
SSRS scores	25.84 $\pm$ 3.59	-0.694	<0.001

Multifactor Analysis of Social Support Scores

The regression analysis revealed that age, educational level, healthcare payment methods, and monthly income were factors influencing patients' social support ($p < 0.05$) (Table 5).

Correlations between TSK-SV Heart-C Scores, CESEI Scores, and SSRS Scores

Spearman's correlation analysis indicated a significant negative correlation between cardiac exercise self-efficacy, social support, and kinesiophobia levels ($p < 0.001$) (Table 6).

Discussion

Kinesiophobia in Older Patients at an Early Stage after CABG

In this study, the kinesiophobia score in older patients at an early stage after CABG was 44.27 ± 5.74 , with a median score of 46, indicating a relatively high level. The scores in this study were higher than those in a previous study, which reported a kinesiophobia score of 30.15 ± 10.56 in older patients at an early stage after CABG [13]. The primary reason for this difference is that this study focused on patients aged 60 and above, with a kinesiophobia incidence of 73.5%. For patients aged 80 and above, the kinesiophobia incidence was 100%. This is consistent with the findings of previous studies [14], indicating that patient age is positively correlated with kinesiophobia levels. Older patients may be more fearful of physical harm during exercise due to their poor physical condition, leading to higher kinesiophobia scores. Healthcare providers should pay special attention to older patients in postoperative rehabilitation, provide education, and encourage them to engage in early exercise activities.

The Impact of Educational Level, Pain, and Healthcare Payment Methods on Kinesiophobia in Older Patients at an Early Stage after CABG

(1) The present study showed that among the sociodemographic variables, the level of education serves as an important factor in kinesiophobia [15]. Patients with higher education levels and those residing in urban areas tend to have lower levels of kinesiophobia. This could be because older individuals with higher education levels tend to experience

decreased self-esteem as they age. Patients possess a better understanding, and urban-dwelling patients have access to more social networking resources, enabling them to maintain regular physical activity after the onset of illness. (2) Pain impacts physical activity, anxiety, and quality of life. The development of kinesiophobia in patients may affect their quality of life and functional exercise [16]. The pain intensity, the frequency of weekly pain episodes, and the duration of pain are associated with kinesiophobia levels. Studies have reported that acupuncture therapy can significantly alleviate pain caused by surgical trauma in sternotomy heart surgery patients, both postoperatively and in the long term [17]. (3) Personal healthcare payment is a risk factor for kinesiophobia, with higher payments being associated with higher levels of kinesiophobia [18]. Due to the need for long-term care and costly healthcare payments, coronary heart disease patients often bear a heavy economic burden. Moreover, patients with higher personal payment costs may be more concerned about the risks associated with accidents to avoid incurring additional medical expenses.

Correlation Analysis of Cardiac Exercise Self-Efficacy in Older CABG Patients

The results of this survey indicate a significant negative correlation between rehabilitation exercise self-efficacy and kinesiophobia scores among older CABG patients in the early postoperative period. These differences are statistically significant ($p < 0.001$), suggesting that higher self-efficacy in rehabilitation exercise is associated with lower levels of kinesiophobia in older CABG patients in the early postoperative phase. This implies that the psychological level of kinesiophobia in older CABG patients in the early postoperative period can influence their exercise behavior. Good exercise self-efficacy can empower patients to enhance their subjective initiative and boost their motivation and willingness to engage in physical activities [19]. This correlation may be due to post-CABG patients often having concerns that exercise might increase the cardiac workload and the risk of complications such as angina and heart failure. Additionally, open-heart surgery is associated with high surgical risks and potential postoperative complications such as incision infections. These concerns and fears about their health conditions lead to higher kinesiophobia scores [15]. Hence, clinical interventions should target these controllable factors to enhance patients' self-efficacy in rehabilitation exercises, reduce their self-perceived burdens, improve postoperative exercise compliance, consolidate surgical outcomes, and facilitate patient recovery [20].

Correlation Analysis of Social Support in Older CABG Patients during the Early Postoperative Period

The results of this survey reveal that kinesiophobia scores in older CABG patients during the early postoperative period exhibit a significant negative correlation with total social support scores and the scores of all three social support dimensions. This observation aligns with the findings of a study conducted by Qin *et al.* [21]. The rationale is that these patients tend to rely more on their families and friends during their hospitalization. A robust social support system can help alleviate kinesiophobia [22]. Primary caregivers play a crucial role in enhancing the clinical outcomes of heart surgery patients through their companionship and efforts. In addition to providing essential medical care knowledge and education, healthcare professionals should work to improve the skills of caregivers and enhance their caregiving behavior and attitude [23]. By paying attention to the social support of older CABG patients and bolstering health education for family members, we can better assist patients in coping with kinesiophobia.

Conclusion

This study revealed a high incidence of kinesiophobia among older patients during the early postoperative period following CABG. It summarized the contributing factors to kinesiophobia and observed significant negative correlations between cardiac exercise self-efficacy, social support, and kinesiophobia levels. Clinical healthcare professionals should strengthen the assessment of kinesiophobia in older patients during the early post-CABG period, differentiate and identify it promptly, and take appropriate measures for early intervention to solidify the surgical treatment outcomes and promote patient recovery [24,25]. Emphasizing social support and encouraging patients to participate in early physical activities according to their subjective willingness can reduce the incidence of kinesiophobia.

Limitation

This research was limited to a single tertiary grade A hospital in Anhui Province, with a relatively modest sample size, introducing some limitations. Future studies could expand the sample size and consider multicenter research to validate the relationship between kinesiophobia and its occurrence in older patients during the early postoperative period. This will provide further robust theoretical support for clinical cardiac rehabilitation.

Availability of Data and Materials

The supporting data and materials for the findings of this study can be obtained from the corresponding author upon request, subject to reasonable conditions.

Author Contributions

QY: The primary designer of the research project, responsible for determining the direction, objectives, and Writing — Review and editing. YL: Conceptualization, Methodology, Investigation, Formal analysis, Writing — Original draft, Writing — Review and editing. FY and JL: Conceptualization, Supervision, Validation, Writing — Review and editing. JY and LF: Their contributions encompass the conception and design of the work, the acquisition of data, formal analysis, and interpretation of data for the work. All authors have approved the final manuscript and participated sufficiently in the work to take public responsibility for appropriate portions of the content. They have also committed to being accountable for all aspects of the work, ensuring that any questions regarding its accuracy or integrity are addressed.

Ethics Approval and Consent to Participate

The patients involved in the study all signed informed consent forms. The study was approved by the Research Ethic Committee of the First Affiliated Hospital of BengBu Medical University (2022206). The researchers introduced the participant to the study and the principle of confidentiality.

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Conflict of Interest

The authors declare no conflict of interest.

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