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Analysis of potential categories of quality of life of transcatheter aortic valve replacement patients and discussion of their influencing factors

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Abstract

Background The prevalence of aortic valve stenosis is on the rise, primarily due to an aging population. Transcatheter Aortic Valve Replacement (TAVR) has emerged as an effective treatment option, especially for patients at high surgical risk. However, the variation in post-TAVR quality of life across patient groups warrants further examination to understand the contributing factors.

Objective This study aims to evaluate the quality of life in patients post-TAVR, characterize distinct patient group profiles, and identify key factors that influence their quality of life.

Methods From July 2023 to September 2024, 215 TAVR patients were recruited via convenience sampling. Data on sociodemographics and quality of life were gathered using the TAVR-specific quality of life scale. Latent variable growth modeling helped identify quality of life categories and predict influencing factors.

Results Three categories of TAVR patients were identified based on quality of life: the "High quality of life—high health status" group, the "Medium quality of life—intermediate health" group, and the "Low quality of life—low health status" group. Logistic regression analysis revealed that sleep quality, self-efficacy, and performance on the 30-s chair sit-to-stand test were significant predictors of quality of life.

Conclusion There is considerable variability in the quality of life among TAVR patients. Tailored health management strategies based on specific patient profiles can potentially improve outcomes in these populations.

Keywords Transcatheter aortic valve replacement, Quality of life, Latent category analysis

Introduction

Aortic valve stenosis is a prevalent degenerative heart valve disease among the elderly, with its incidence rising due to an aging population and extended life expectancy in China [1]. Previous studies have indicated that aortic stenosis is a cardiovascular condition characterized by a poor prognosis, with mortality rates of up to 8% within 3 months and 36% within 3 years for untreated patients [2]. The resulting disease burden presents a substantial challenge to the healthcare system [3–5].

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Transcatheter aortic valve replacement (TAVR) is a minimally invasive treatment method where a prosthetic aortic valve is inserted via interventional catheterization and secured to restore the function of the diseased valve, offering an effective option for elderly patients who cannot tolerate surgical valve replacement [6, 7]. The TAVR procedure is minimally invasive, easier to perform, allows quicker recovery, and results in fewer complications. Large-scale clinical studies have confirmed TAVR's effectiveness in reducing both short- and long-term mortality among patients with aortic stenosis Despite the significant improvement in patient survival rates due to TAVR, challenges remain in restoring cardiac function post-surgery [8, 9]. Postoperative survival and mortality rates as outcome indicators are no longer sufficient under the human-centered medical model, emphasizing the need for greater focus on patients' quality of life.

With advancements in medical standards and a deeper social understanding of health, the focus of medical care has shifted from mere survival to enhancing overall health and quality of life. The definition of health now encompasses more than the absence of disease or physical frailty, incorporating physical, psychological, and social well-being [10]. Health-related quality of life as a multidimensional measure reflects an individual's or group's health status and has become a key evaluation index for patient-reported outcomes, serving as a reference for clinical trials, health technology assessments, and drug evaluations. Currently, systematic and in-depth research on the quality of life of TAVR patients is lacking, and individual variations in quality of life among TAVR patients remain underexplored, with limited studies available. Latent Class Analysis (LCA) provides a method to identify potential heterogeneity in the quality of life among the TAVR population and explore intergroup differences in greater detail. Therefore, this study aims to use latent class analysis to investigate the distribution patterns of quality of life levels in TAVR patients and their influencing factors.

Methods

Study design and participants

This study employed a convenience sampling method from July 2023 to September 2024 to recruit patients attending outpatient follow-up after undergoing Transcatheter Aortic Valve Replacement (TAVR). The inclusion criteria were: (1) history of TAVR; (2) patient was conscious and able to cooperate; and (3) patient provided informed consent and voluntarily participated in the study. Exclusion criteria were: (1) active disease stage; (2) diagnosed mental disorders; (3) severe impairments in language, vision, hearing, or other communication abilities; (4) Patients who underwent PCI after coronary angiography.

Ethical approval for the study was granted by Bengbu Medical University. According to Kendall's principle [11], the sample size should be 10 to 20 times the number of independent variables. Given the 15 independent variables in this study and an anticipated 20% rate of invalid responses, the target sample size was calculated to range from 180 to 360 participants. A total of 215 patients were ultimately included in the study.

Measures

Sociodemographic and clinical characteristics

Based on expert consultations, literature reviews, and previous studies, we designed a general demographic information questionnaire. The questionnaire included at least the patient's age, gender, education level, place of residence and exercise frequency.

Self-Efficacy for Managing Chronic Disease scale (SEMCD)

This scale was developed by Lorig and other international scholars and is typically used to assess the self-efficacy of patients with chronic diseases [12]. It evaluates self-efficacy in symptom management and co-morbidity management, comprising a total of six items. The scale measures patients' confidence in their ability to manage fatigue, pain, emotional distress, and other symptoms, as well as their confidence in utilizing non-medication strategies to mitigate the disease's impact. Additionally, it assesses their confidence in performing tasks and activities that may reduce the necessity of medical consultations. A 10-point scale was employed, with 1 indicating no confidence at all and 10 indicating complete confidence. The average score across all items reflects the patient's level of self-efficacy, with higher scores indicating greater self-efficacy. The scale demonstrated a Cronbach's alpha coefficient of 0.91, and the Chinese version was adapted by the School of Public Health, Fudan University [13].

Pittsburgh Sleep Quality Index scale

The Pittsburgh Sleep Quality Index (PSQI), developed by Buysse et al., consists of seven dimensions: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of hypnotic medications, and daytime dysfunction, comprising a total of 24 items. Each item is assigned a score ranging from 0 to 3, resulting in a total score that ranges from 0 to 21, where higher scores indicate poorer sleep quality. The scale demonstrates a Cronbach's alpha of 0.709, indicating acceptable internal consistency [14].

EQ- 5D- 5L scale

The EQ- 5D- 5L scale, developed by the European Society for Quality of Life, encompasses five dimensions: mobility, self-care, daily activities, pain/discomfort, and anxiety/depression. Each dimension is divided into five levels: no difficulty (1), a little difficulty (2), moderate difficulty (3), severe difficulty (4), and inability to carry out activities (5), with higher values indicating a more severe condition, Additionally, the EQ- 5D- 5L scale includes the EQ visual analogue scale (EQ-VAS), which scores overall health on a scale from 0 to 100, where higher scores represent better overall health [15]. The use of this scale is officially authorized by the EQ- 5D- 5L, registration number 63279.

30s chair stand test (30-CST)

The 30-s chair sit-stand test (30-CST) indirectly assesses lower limb muscular strength and endurance. It is an improved version of the traditional chair sit-stand test, which measures how many times a subject can transition from sitting to standing within 30 s, using a chair height of 43 cm. The 30-CST generates lower joint loads on the lower limbs, making it less damaging and more broadly applicable across various populations [16]. The 30- CST has been shown to have good reliability and validity in assessing lower limb muscle strength [17].

Grip strength

Upper limb muscle strength was measured using a grip strength meter, where a higher measurement value indicates stronger upper limb muscle strength. Grip strength was assessed separately for the left and right hands using the EH201R type electronic grip strength meter from Guangdong Zhongshan Xiangshan Weighing Apparatus Co., Ltd. Subjects were instructed to stand with their feet naturally apart and arms hanging down, ensuring that the grip strength meter did not touch their body. Swinging the arms and squatting were prohibited during exertion. Three measurements were taken for each hand, and the maximum value was recorded in kilograms (kg), retaining two decimal place [18].

Statistical analysis

Mplus 8.3 software was utilized for latent growth mixture modeling (LGMM) analysis, gradually increasing the number of categories and comparing fit indicators between models to identify the best model based on both practical significance and statistical criteria. The primary fit indicators include the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and the corrected Bayesian Information Criterion (aBIC), where smaller values indicate better model fit. The Entropy of Information ranges from 0 to 1, and the closer to 1, the more accurate the classification. Model comparisons were conducted using the Likelihood Ratio Test (LMR) and the Bootstrap-based Likelihood Ratio Test (BLRT), with *p*-values of less than 0.01 considered significant. A *p*-value of less than 0.05 indicates that the fit of the Kth model is superior to that of the K- 1 th model.

Statistical analysis was conducted using SPSS 26.0 software. Measurement data were summarized using mean and standard deviation or median and interquartile range, while categorical data were presented as frequency and percentage. For univariate analysis, the Chi-square (χ^2) test or Fisher's exact test was employed for unordered categorical data, and the Kruskal–Wallis H test was used for ordered categorical data. Multivariate logistic regression was performed to analyze the influencing factors affecting the quality of life in patients undergoing transcatheter aortic valve replacement (TAVR), with a significance level set at $\alpha = 0.05$.

Results

Statistical analysis

A total of 215 study subjects were included in the baseline survey, with a mean age of 74.31 ± 5.96 years (range: 57 to 86 years). The mean BMI was 23.35 ± 3.40 kg/m^2, and participants completed an average of 9.59 ± 4.61 times on the 30-CST. Left hand grip strength averaged 13.93 ± 5.53 kg, while right hand grip strength averaged 14.80 ± 5.44 kg. The mean self-efficacy score was 5.03 ± 2.46, and the mean PSQI score was 7.38 ± 4.61. Of the participants, 131 were male and 84 were female. Living arrangements included 31 individuals living alone and 184 living with others. Exercise habits varied, with 53 participants never exercising, 53 exercising 1–2 times per week, and 109 exercising 3 or more times per week. Co-morbidity was present in 189 participants, while 26 had no co-morbidities. Polypharmacy was reported in 146 individuals, while 69 were not on multiple medications. There were 33 smokers and 182 non-smokers, along with 23 alcohol consumers and 192 non-consumers. Educational attainment was primarily low, 135 had elementary school education or below, 50 completed middle school, 21 graduated from high school, and 9 attained college-level education or higher.

Latent class analysis of quality of life

In setting up a model with 1 to 4 categories, the results indicate that as the number of categories increases, the values of the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and adjusted Bayesian Information Criterion (aBIC) decrease. Additionally, the Entropy value varies. Based on the fitted indicator values and the practical significance of the potential categories,

Table 1 Model fit indices for latent profile analysis

Profile	*AIC*	*BIC*	*aBIC*	*Entropy*	*LMR P-value*	*BLRT P-value*	Sample size by profile based on most likely membership
1	5826.113	5853.078	5827.728	-	-	-	1
2	4853.318	4890.395	4855.538	0.992	< 0.001	< 0.001	0.808/0.192
3	**4830.507**	**4577.696**	**4533.333**	**0.987**	**0.0055**	**0.0071**	**0.602/0.221/0.177**
4	4536.507	4593.808	4539.938	0.689	0.500	0.500	0.331/0.291/0.177/0.221

Bold row was the chosen model

AIC Akaike Information Criterion, *BIC* Bayesian Information Criterion, *aBIC* adjusted BIC, *LMR* Lo-Mendell Rubin Adjusted Likelihood Ratio Test, *BLRT* Bootrapped Likelihood Ratio Test

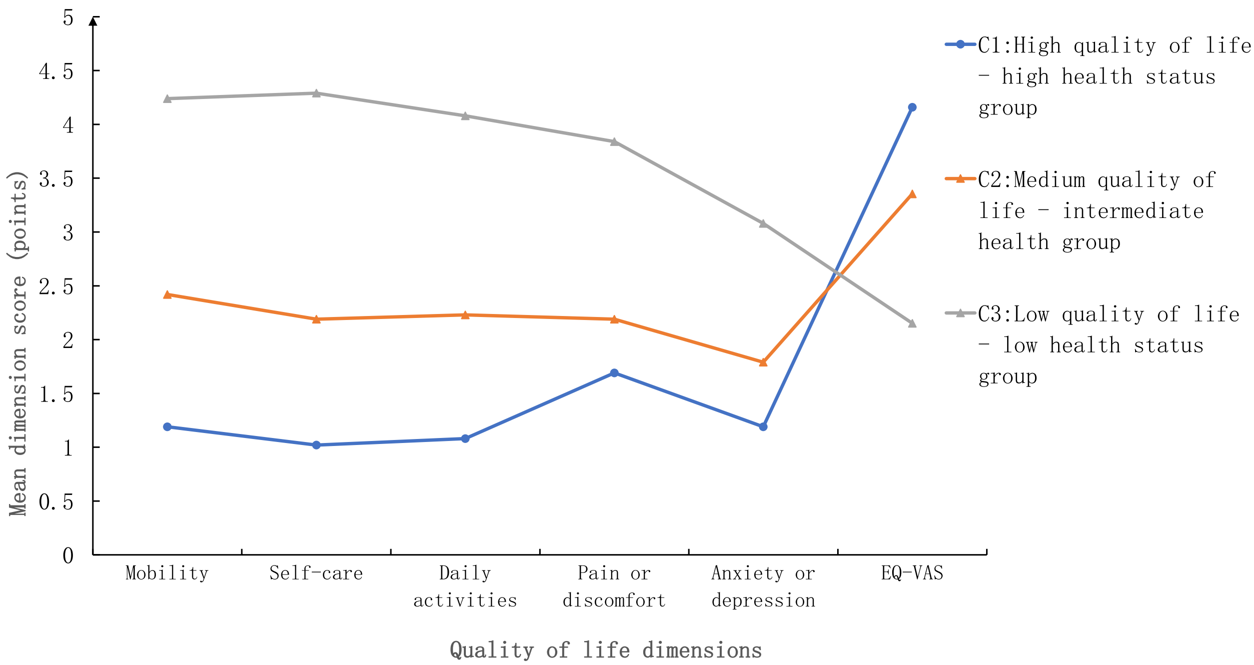

Fig. 1 Category analysis of quality of life in TAVR patients

the final selection of 3 categories was determined to be the optimal model (see Table 1).

Analysis of potential categories of quality of life

Since the EQ-VAS scores range from 0 to 100 and the EQ-5D- 5L scores range from 1 to 5, we reduced the range of EQ-VAS values by an equal factor of 20 for better presentation in Fig. 1. The results of the Latent Growth Mixture Model (LGMM) for the three categories are illustrated in Fig. 1. Patients with Transcatheter Aortic Valve Replacement (TAVR) in the C1 group exhibited the lowest scores in mobility, self-care, daily activities, pain or discomfort, and anxiety or depression, while scoring the highest in EQ-VAS. This group was designated the "High quality of life—high health status group", accounting for 60% of the total. The C2 group represented 22% of TAVR patients, with medium scores across all dimensions, and was thus labeled the "Medium quality of life—intermediate health group". Finally, the C3 group, comprising 18% of TAVR patients, achieved the highest scores in mobility, self-care, daily activities, pain or discomfort, and anxiety or depression, but had the lowest EQ-VAS scores, earning the designation "Low quality of life—low health status group", Table 2 shows the distribution of quality of life across each dimension.

Univariate analysis of potential TAVR quality of life categories

The results of the univariate analysis indicated that the type of residence, BMI, frequency of physical, number

Table 2 The distribution of each dimension of quality of life in TAVR patients

Level	Mobility	Self-care	Daily activities	Pain/discomfort	Anxiety/depression
No difficulty	104 (48.4)	127 (59.1)	121 (56.3)	56 (26.0)	120 (55.8)
A little difficulty	53 (24.7)	40 (18.6)	43 (20.0)	105 (48.8)	66 (30.7)
Moderate difficulty	24 (11.2)	11 (5.1)	20 (9.3)	24 (11.2)	18 (8.4)
Severe difficulty	21 (9.8)	25 (11.6)	21 (9.8)	19 (8.8)	4 (1.9)
Inability to carry out	13 (6.0)	12 (5.6)	10 (4.7)	11 (5.1)	7 (3.3)

of 30-s chair sits and stands, polypharmacy, smoking, SEMCD, left-handed grip strength, right-handed grip strength, and PSQI were statistically significant among the different category groups, as shown in Table 3.

Multifactorial analysis of potential quality of life categories of TAVR patients

A multivariate logistic regression was performed using the variables that showed statistically significant differences in the univariate analysis as independent variables, with quality of life category as the dependent variable, and the "High quality of life—high health status" group as the reference group. Model fit was evaluated using the likelihood ratio test ($\chi^2 = 219.488$, $P < 0.001$). Results indicated that higher PSQI scores were associated with an increased likelihood of being categorized in the "Medium quality of life—intermediate health" group compared to the "High quality of life—high health status" group. Additionally, a higher number of repetitions in the 30-s chair sit-to-stand test was linked to a greater likelihood of being classified in the "High quality of life—high health status" group. Furthermore, patients in the "Low quality of life—low health status" group showed a higher probability of transitioning to the "High quality of life—high health status" group with increased self-efficacy, higher repetitions in the 30-s chair sit-to-stand test, and improved PSQI scores. See Table 4 for details.

Discussion

In this study, the quality of life among 215 TAVR patients was assessed using latent category analysis, resulting in three distinct categories: "High quality of life—high health status group", "Medium quality of life—intermediate health group", and "Low quality of life—low health status group". The "High quality of life—high health status" group comprised 60% of participants, the "Medium quality of life—intermediate health" group 22%, and the "Low quality of life—low health status" group 18%, demonstrating notable heterogeneity in quality of life across these groups. The average EQ-VAS score of 72.51 ± 19.30 is consistent with findings from Maeda et al. [19] and Del et al. [20]. Compared to traditional open-heart surgery, TAVR involves less trauma and offers quicker recovery times, allowing patients to resume normal life more rapidly. These factors collectively underscore the effectiveness of TAVR in enhancing patients' quality of life.

In the pain or discomfort dimension, only 26% of patients reported no pain or discomfort, while the majority experienced pain or discomfort following TAVR. One possible reason is that long-term aortic valve stenosis exerts chronic pressure on the heart, resulting in myocardial hypertrophy or fibrosis [21]. Despite the resolution of valve stenosis through TAVR, structural changes in the myocardium may persist, leading to chest pain or cardiac discomfort. Another contributing factor is that many TAVR patients are elderly and frequently have concomitant coronary artery disease [22, 23]. Although the aortic stenosis has been resolved, insufficient coronary blood supply may still trigger angina pectoris or chest discomfort, particularly during exercise or emotional stress. Therefore, alleviating pain and enhancing patient comfort should be primary objectives in post-TAVR care. Assessing the source, location, and severity of pain, and developing a personalized pain management plan, alongside psychological support and rehabilitation guidance, can effectively improve patients' overall quality of life, help them better adapt to postoperative life, and enhance long-term rehabilitation.

High PSQI scores were more likely to be categorized in the medium quality of life group compared to the high quality of life group, and they were also more likely to be categorized in the low quality of life group compared to the high quality of life group. The quality of sleep in TAVR patients is significantly correlated with their overall quality of life, consistent with the findings reported by Imamura et a.l [24]. Large cohort studies have shown that sleep problems (e.g., short or long sleep duration, sleep awakenings, insomnia) are associated with cardiovascular disease episodes and cardiovascular disease mortality [25]. Sleep is an important part of the body's recovery process, and studies have shown that a good night's sleep promotes the recovery of strength and energy and helps to reduce anxiety and depressive symptoms [26]. In contrast, sleep disorders may negatively affect the general health of patients after aortic valve replacement, increasing the risk of delirium and thus affecting the long-term

Table 3 Univariate analysis of each latent category of quality of life in TAVR patients

Name of variable	High quality of life—high health status group (*n* = 129)	Medium quality of life—intermediate health group (*n* = 48)	Low quality of life—low health status group (*n* = 38)	Test statistic	*P*-value
Age (in years)	75 (71, 77)	75 (71.25,82)	75 (71.50,79)	2. 699[1)]	0.259
Gender				0.632[3)]	0.729
Male	81 (62.8)	27 (56.3)	23 (60.5)		
Female	48 (37.2)	21 (43.8)	15 (39.5)		
Type of Residence				30.666[3)]	< 0.001
Live alone	8 (6.2)	7 (14.6)	16 (42.1)		
Live with others	121 (93.8)	41 (85.4)	22 (57.9)		
BMI (kg/m2)	23.92 (21.80,25.83)	24.14 (21.63,27.08)	21.68 (18.82,24.93)	8.655[1)]	0.013
Frequency of Physical activity (≥ 30 min) per week				111.533[3)]	< 0.001
Never exercise	7 (5.4)	15 (31.3)	31 (81.6)		
Once or twice a week	28 (21.7)	20 (41.7)	5 (13.2)		
3 times or more per week	94 (72.9)	13 (27.1)	2 (5.3)		
30 s chair sit-to-stand test (times)	12 (10,14)	8 (3,9)	3.5 (2.75,8.0)	98.080[1)]	< 0.001
Co-morbidity				5.593[3)]	0.061
Yes	108 (83.7)	46 (95.8)	35 (92.1)		
No	21 (16.3)	2 (4.2)	3 (7.9)		
Polypharmacy				15.612[3)]	< 0.001
Yes	75 (58.1)	37 (77.1)	34 (85.9)		
No	54 (41.9)	11 (22.9)	4 (10.5)		
Smoking				13.005[3)]	0.001
Yes	16 (12.4)	4 (8.3)	13 (34.2)		
No	113 (87.6)	44 (91.7)	25 (65.8)		
Drinking alcohol				2.028[3)]	0.363
Yes	14 (10.9)	3 (6.3)	6 (15.8)		
No	115 (89.1)	45 (93.8)	32 (84.2)		
Educational level				13.086[2)]	0.300
Primary school and below	81 (62.8)	34 (70.8)	20 (52.6)		
Junior high school	29 (22.5)	9 (18.8)	12 (31.6)		
High school	17 (13.2)	1 (2.1)	3 (7.9)		
University and above	2 (1.6)	4 (8.3)	3 (7.9)		
SEMCD	6.5 (5.00,8.00)	4.09 (3.00,5.58)	1.00 (1.00,3.00)	87.247[1)]	< 0.001
Left hand grip strength (kg)	15.50 (12.90,19.30)	11.53 (7.38,14.23)	8.00 (5.60,10.56)	80.083[1)]	< 0.001
Right hand grip strength (kg)	16 (13.42,20.30)	12.65 (8.78,15.89)	9.04 (6.70–13.54)	59.456[1)]	< 0.001
PSQI	4 (3.00,5.00)	9 (7.25,13.00)	14 (13.00,15.00)	101.771[1)]	< 0.001

BMI body mass index, *SEMCD* Self-Efficacy for Managing Chronic Disease Scale, *PSQI* Pittsburgh Sleep Quality Index Scale

[1)] Kruskal–Wallis

[2)] Fisher test

[3)] One-way ANOVA

prognosis of patients [27]. In addition, sleep disorders are prevalent in the TAVR population, with one study noting that approximately ¼ of TAVR patients exhibit symptoms of insomnia [28]. The reason for this consideration may be due to the generally advanced age of the TAVR population, and the prevalence of sleep disorders increases with age [29]. On the other hand, although TAVR surgery relieves aortic valve dysfunction, problems such as cardiac remodeling and cardiac ejection dysfunction due to long-term valve alterations can drive and induce clinical heart failure [30], which is significantly associated with sleep disorders [31]. Therefore, healthcare professionals

Table 4 Logistic regression analysis was used to analyze the influencing factors of quality of life in TAVR patients

Independent variable	Independent variable	*β*	*SE*	*Waldχ^2*	*P*	*OR*	*95%CI*
C2 vs C1	Intercept	0.867	2.109	0.169	0.681	-	-
	PSQI	0.268	0.082	10.687	0.001	1.307	1.113–1.534
	30 s chair sit-to-stand test (times)	– 0.44	0.116	14.318	< 0.001	0.644	0.513–0.809
C3 vs C1	Intercept	1.673	3.095	0.292	0.589	-	-
	SEMCD	– 0.643	0.232	7.651	0.006	0.526	0.334–0.829
	30 s chair sit-to-stand test (times)	– 0.384	0.159	5.85	0.016	0.681	0.499–0.930
	PSQI	0.446	0.12	13.922	< 0.001	1.563	1.236–1.979

SEMCD Self-Efficacy for Managing Chronic Disease Scale, *PSQI* Pittsburgh Sleep Quality Index Scale

should pay attention to sleep in the TAVR population, screen and assess the sleep-disordered population in a timely manner, and improve the sleep quality of the target population through pharmacologic or nonpharmacologic intervention strategies [29, 32].

Individuals with high self-efficacy were more likely to be categorized in the high quality of life group compared to those in the high quality of life group. Self-efficacy refers to an individual's confidence and belief in his or her ability to accomplish tasks or overcome challenges in a given situation [33]. This confidence not only influences individuals' behavioral choices, but also largely determines how they respond to stress and challenges. Studies have shown [34, 35], that patients with high self-efficacy tend to adopt healthier lifestyles, including a balanced diet, moderate exercise, and regular medical follow-up. These good lifestyle habits not only contribute to physical recovery, but also provide support at the psychological level, which further improves the quality of life after surgery [35]. In addition, high self-efficacy can effectively reduce negative emotions such as anxiety and depression in patients with chronic diseases [36]. The alleviation of such emotions is crucial for patients' mental health, as there is a close interaction between mental health and physical health. Therefore, enhancing patients' self-efficacy may be considered an important intervention strategy in the TAVR population. This strategy can be achieved in a variety of ways, such as providing positive mood enhancement interventions [37], group interventions [38], and motivational interviewing [39], but how effective it is in the TAVR population needs to be further validated.

The higher the number of 30 s chair sit and stands, the easier it is to be categorized into the high quality of life group compared to other groups. The 30 s chair sit and stand experiment reflects patients' lower limb muscle strength levels. In this study, the results of the univariate analysis demonstrated that grip strength, an indicator of upper extremity muscle strength, was statistically significant. However, in the multifactorial analysis, the grip strength difference did not achieve statistical significance. This suggests that while grip strength is a valid measure of upper extremity muscle strength, its impact on quality of life was less significant than that of lower extremity strength in the multifactorial analysis. This aligns with the findings of Jarson et al. [40], who found that lower limb muscle strength had a more substantial association with quality of life compared to upper limb strength, as patients with strong lower limb muscles could better perform daily activities such as walking, stair climbing, and self-care. Moreover, it has been suggested that robust lower limb muscle strength supports balance and reduces fall risk, thereby facilitating rehabilitation [41]. Postoperative rehabilitation often necessitates physical exercise, and sufficient lower extremity strength is fundamental for improving exercise adherence. Additionally, enhancing lower extremity strength can bolster patients' self-confidence and self-efficacy, increasing motivation for daily challenges. Furthermore, studies have shown [42] that physical activity enhances both physiological and cognitive functions. Encouraging patients to engage in targeted lower extremity plyometric training can significantly enhance quality of life in the TAVR population. Brisk walking [43], resistance training [44], and Tai Chi [18] have demonstrated significant effects on balance, lower limb muscle strength, gait, cardiorespiratory function, and overall quality of life in older adults. Medical personnel should integrate lower limb muscle strength training as a key element in rehabilitation programs and tailor exercises to individual patient needs, enabling more confident participation in daily activities and enhancing quality of life in the TAVR population.

Limitations

This study was conducted at a single tertiary care hospital, and is not a large-scale study, which may result in limited research strength and restrict the generalizability of the findings. To enhance the robustness of the results, future research could benefit from a multicenter study design. Such an approach would allow for a more extensive longitudinal observation of TAVR patients across different settings and populations. By collecting data from multiple sites, researchers could gather a larger and more diverse sample, providing stronger evidence to support the development of targeted quality of life interventions aimed at improving outcomes for the TAVR population.

Conclusion

In this study, the quality of life of TAVR patients was systematically categorized into three distinct groups: "High quality of life—high health status group", "Medium quality of life—intermediate health group", and "Low quality of life—low health status group". This categorization was achieved through potential category analysis, a method that allows for a nuanced understanding of patient well-being. Among the patients assessed, those exhibiting poor sleep quality, low self-efficacy, and a reduced number of chair sit-to-stand counts were significantly more likely to be placed in the low quality of life group.

These findings suggest that specific factors, such as sleep disturbances, confidence in one's abilities (self-efficacy), and lower extremity muscle strength, play crucial roles in determining the overall quality of life for patients undergoing TAVR. Consequently, it is essential for clinicians to prioritize these areas in their care strategies. By focusing on improving sleep quality, enhancing self-efficacy, and promoting lower extremity strength through targeted interventions, healthcare providers can make substantial strides in enhancing the quality of life for individuals in the TAVR population.

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Clinical trial number
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Authors' contributions
Mingming Tang: Writing – review & editing, Writing – original draft,Methodology, Investigation, Formal analysis, Data curation, Conceptualization. DongMei Wang,YongXia Chen: Investigation, Data curation. Fang Xue, Nana Zhang,Jun Wang,Peng Zhao: Investigation, Data curation. Tong Zhou: Writing – review & editing, Supervision,Methodology, Conceptualization.All authors reviewed the manuscript.

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Data availability
The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Approvals were given the ethics committee in Bengbu Medical University LK no.286. The study complied with the Declaration of Helsinki and the participants' informed consent was obtained.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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