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RESEARCH

Current status of lymphedema-related health information-seeking behavior and its associated factors among postoperative breast cancer patients: a cross-sectional study

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Abstract

Background Health information-seeking behavior (HISB) among postoperative breast cancer (BC) patients significantly contributes to lymphedema prevention and management, enhancing patients' self-care abilities and health outcomes. Identifying factors associated with HISB can provide scientific evidence and practical insights for developing effective information-seeking-focused health education programs for this population.

Objective This study aimed to investigate the current status of lymphedema-related HISB and identify factors associated with HISB among postoperative breast cancer patients.

Methods A cross-sectional study involving 196 patients was conducted from December 2024 to January 2025 at the Department of Breast Surgery in a tertiary hospital in Hangzhou, Zhejiang Province. Data collection utilized the General Information Questionnaire, the Upper Extremity Lymphedema Knowledge, Attitude, and Practice (KAP) scale, and the HISB Scale. Multiple linear regression was employed to identify factors associated with HISB among participants.

Results The mean HISB score related to lymphedema among the 196 postoperative BC patients was 178.21 he25.02. Multiple linear regression analysis revealed that the total KAP score was significantly associated with HISB (B5.0.850, 95% CI: 0.673 to 1.027, $\beta = 0.621$, p .60.001). In addition, patients who reported "unknown" axillary lymph node dissection status had significantly lower HISB scores compared with those who reported 0 nodes removed (B .001)15.467, 95% CI: − 28.321 to − 2.614, p .60.019). The final model explained 40.2% of the variance in HISB (adjusted R^2 .00.323, p .30.001).

Conclusion Healthcare providers may consider assessing whether patients can report their axillary lymph node dissection status and providing clarification for those who report "unknown" status; however, this finding is based on a comparison with the 0-node reference group and should be interpreted cautiously.

Implication for practice This study describes HISB scores and associated factors among postoperative BC patients lymphedema-related HISB, including lymphedema knowledge and reporting "unknown" axillary lymph node dissection status compared with reporting 0 nodes removed. These findings can inform healthcare providers in refining patient-centered health education and communication strategies, thereby enhancing patient engagement and self-management capabilities.

Trial registration Chinese Clinical Trial Registry, ChiCTR2500112931. Retrospectively registered on 21 November 2025. This manuscript reports the quantitative component of a registered mixed-methods study.

Keywords Breast cancer · Lymphedema · Health information-seeking behavior · Nursing care

Introduction

According to the most recent GLOBOCAN 2024 estimates, female breast cancer remains the most commonly diagnosed malignancy among women worldwide, accounting for approximately 2.43 million new cases and 694,000 deaths in 2024 [4]. Breast cancer-related lymphedema (BCRL), a common postoperative complication, results from structural damage to the lymphatic system, impairing the return

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of interstitial fluid [17]. The incidence of BCRL varies depending on the surgical method, extent of radiotherapy, timing of follow-up, and diagnostic measurement methods, with peak occurrence between 12 and 30 months after surgery, affecting approximately 20% to 50% of patients [6, 26]. Lymphedema is a chronic condition characterized by progressive swelling and functional impairment of the affected limbs [19], leading to physical pain, psychological distress, economic burdens [34], and significantly impacting patients' quality of life. In recent years, public online interest in lymphedema has risen substantially, as evidenced by Google Trends analyses showing increasing search volumes for terms such as "lympheodema" and "arm swelling after mastectomy" [5], highlighting the growing need for accessible patient education in the digital health era. Current research on managing BCRL emphasizes improved surgical techniques, such as optimized axillary lymph node dissection [21], and preventive rehabilitation [26]. However, existing studies frequently overlook the necessity of long-term, lifelong self-management strategies crucial for preventing onset or alleviating symptoms of BCRL. Studies indicate a general lack of awareness about BCRL among postoperative BC patients [33], possibly attributable to insufficient patient education regarding BCRL management [1] or inadequate information provision by healthcare providers [14]. However, few studies have specifically examined HISB in the context of lymphedema risk perception and discharge education among postoperative BC patients in the Chinese clinical setting. This gap is particularly relevant because the postoperative period provides an important opportunity for delivering lymphedema prevention education, as patients must assume greater responsibility for risk monitoring and self-care after leaving the hospital [16, 23, 31]. Patients' understanding of their individual risk factors is essential for motivating proactive information-seeking and self-management behaviors. Therefore, timely delivery of educational resources and social support is critical for effectively preventing and managing BCRL.

Patients' health information-seeking behavior (HISB) serves as a fundamental approach enabling active acquisition of health knowledge and involvement in decision-making, significantly influenced by health beliefs (knowledge, attitudes, and behaviors) and risk perceptions [13]. Within the framework of the health belief model, HISB represents proactive patient-driven health behavior motivated by perceived disease threat and self-efficacy [24]. Furthermore, family-related characteristics may influence patients' access to health information and their engagement in health-seeking behaviors [21, 38]. Therefore, this cross-sectional study aimed to: 1) describe the current status of lymphedema-related HISB among postoperative BC patients; and 2) identify factors associated with HISB, including health beliefs (knowledge, attitudes, and behaviors) and demographic/clinical characteristics, to provide evidence for developing targeted health education interventions. The findings may inform the development of targeted health education strategies to improve lymphedema-related HISB and self-management behaviors in this patient population.

Method

Study design

This cross-sectional study aimed to evaluate lymphedema-related HISB among postoperative BC patients and identify its associated factors.

Participants

This cross-sectional study was conducted between December 2024 and January 2025. Using a convenience sampling method, patients were consecutively recruited from the Department of Breast Surgery at a tertiary hospital in Hangzhou, Zhejiang Province. A total of 230 potentially eligible patients were approached; 196 completed the survey and were included in the final analysis (response rate, 85.2%). The remaining 34 patients were excluded due to refusal to participate ($n = 18$), incomplete questionnaires ($n = 9$), or failure to meet inclusion criteria ($n = 7$). Of the 196 included participants, 112 completed paper-based questionnaires and 84 completed electronic questionnaires via the Questionnaire Star platform. Inclusion criteria were: (1) age $\geq$ 18 years; (2) having undergone their first-ever breast cancer-related surgery (i.e., the current operation was the patient's first breast cancer surgery, and the patient had no history of prior breast cancer surgery); (3) pathologically confirmed BC diagnosis, with awareness of the diagnosis; (4) clear consciousness, no barriers to understanding Chinese, basic reading skills, and ability to use a cell phone; (5) no history of other malignant tumors or serious chronic diseases; (6) voluntarily signed informed consent. Exclusion criteria encompassed the following: (1) severe organ dysfunction (heart, liver, kidney); (2) limb dysfunction or amputation; (3) foreign nationality, psychiatric illness, or involvement in medical disputes. Questionnaires with repetitive consecutive identical answers, incomplete entries, or completion times of less than two minutes were excluded.

Measures

General information questionnaire

A researcher-developed questionnaire was used to collect demographic and disease-related information.

Upper extremity lymphedema knowledge, attitude, and practice (KAP) scale

The Upper Extremity Lymphedema Knowledge, Attitude, and Practice (KAP) Scale was developed by [28] to assess lymphedema-related prevention knowledge (10 items), attitudes (7 items), and behaviors (6 items) across three dimensions, using a 5-point Likert scale. Higher scores indicate better knowledge, attitudes, and self-management behaviors. The scale's reliability was demonstrated by a Cronbach's α of 0.931, a split-half reliability of 0.875, and a test-retest reliability of 0.91. The scale also showed a significant correlation with the validated lymphedema Breast Cancer Questionnaire (LBCQ) [2] ($r = 0.78$, $p < 0.001$) [8]. In this study, Cronbach's α was 0.816.

Health information-seeking behavior (HISB) scale

The HISB scale was originally developed by [37] for patients with cardiovascular disease and was subsequently adapted for Chinese patients with chronic conditions by [30] through rigorous translation and cultural adaptation procedures, including forward translation, back-translation, and pilot testing. Although the scale was not originally developed specifically for breast cancer-related patients, its content (attitudes, information needs, information sources, and barriers) is generic to chronic disease populations and has been used in similar patient groups. The scale comprises 43 items across four dimensions: attitudes toward information-seeking (6 items), information needs (14 items), information sources (15 items), and barriers to accessing health information (8 items). It employs a 5-point Likert scale, with higher scores reflecting greater HISB. In this study, Cronbach's α was 0.815.

Sample size

Using convenience sampling, the required sample size was estimated using the formula $N = Z^2\sigma^2/e^2$ for descriptive purposes, with σ estimated as 25 based on a pilot sample ($n = 20$) and e set at 5.0, yielding a minimum of 96 participants. Considering a 20% attrition rate, the target sample was set at approximately 120. For the primary analysis (multiple linear regression), the achieved sample of 196 participants exceeds the recommended 10–15 cases per independent variable [12]. With up to 23 predictor variables (including dummy variables) in the final model, the current sample provides adequate statistical power. The final sample comprised 196 participants.

Data collection and ethical approval

This study strictly adhered to ethical research standards. Consent was obtained from all participants prior to the study. Participants were comprehensively informed regarding the study's purpose, procedures, potential risks and benefits, and their right to withdraw at any time. Written informed consent was provided by each participant. Participant anonymity was ensured throughout the study by employing unique identifiers instead of personal data. All collected data were handled confidentially and securely stored. For electronic data collected via Questionnaire Star, secure data transmission and storage protocols were utilized to safeguard participant information. Paper-based questionnaires were stored in locked cabinets with restricted access. The study was approved by the Ethics Committee of the First Affiliated Hospital, Zhejiang University School of Medicine (IIT20240734B) and conducted in accordance with the ethical standards outlined in the Declaration of Helsinki and its subsequent amendments. The reporting method adheres to the STROBE checklist to ensure transparency and completeness of the research presentation. Questionnaires with incomplete responses (> 5% missing items) or completion times of less than 2 min were excluded prior to analysis. For the remaining questionnaires, no item-level missing data were present.

Data analysis

Axillary web syndrome was excluded from the multivariable regression model due to extremely sparse category distribution (only one participant in the unresolved category), which precluded stable estimation. Data entry and statistical analyses were conducted using SPSS 25.0. Categorical data were described using frequencies and percentages (%), whereas normally distributed continuous data were presented as mean ± standard deviation (SD). Independent samples t-tests and one-way analyses of variance (ANOVA) were employed to compare groups. Variables found to be significant ($p < 0.05$) in univariate analyses,

along with clinically relevant variables identified from the literature (age, educational level, and KAP score), were entered simultaneously as independent variables into a multiple linear regression model using the enter method, with the lymphedema-related HISBscore serving as the dependent variable. This combined approach ensured that important clinical covariates were retained in the final model even if they did not reach statistical significance in univariate analyses. Prior to model estimation, we checked for multicollinearity using variance inflation factor (VIF), with a threshold of VIF < 10 indicating no serious multicollinearity. Residual diagnostics (normality, linearity, and homoscedasticity) were also examined. All statistical tests were two-sided, and p-values < 0.05 indicated statistical significance.

Results

General characteristics of survey respondents

This study enrolled 196 postoperative BC patients. Consistent with disease demographics, the majority were female (99.49%, $n = 195$), and males represented 0.51% ($n = 1$). Participants ranged in age from 28 to 76 years, with a mean age of 50.00 ± 13.996 years. Additional demographic details are summarized in Table 2 in the Appendix.

Current status of lymphedema-related HISB in postoperative BC patients and univariate analysis results

The mean HISB scale score for lymphedema among postoperative BC patients was 178.21 ± 25.02. The mean scores for each dimension were as follows: health information-seeking attitude, 26.03 ± 4.44; information needs, 63.18 ± 9.48; information sources, 56.87 ± 10.07; and barriers to accessing information, 32.13 ± 6.71. The possible score range, mean scores, and observed range for the total HISB scale and each dimension are presented in Table 1. Univariate analysis revealed statistically significant differences in lymphedema-related HISB scores among postoperative BC patients based on educational level, number of household members, number of axillary lymph nodes removed, radiotherapy site, discharge instructions, axillary web syndrome, and awareness of lymphedema-related clinics ($p < 0.05$; Table 3 in the Appendix). No statistically significant differences were found for marital status or monthly family income ($p > 0.05$).

Table 1 HISB scale scores and dimension scores ($n = 196$)

Dimension	Possible range	Mean ± SD
Total HISB	43–215	178.216 ± 25.022
Attitude towards information-seeking	6–30	26.039 ± 4.441
Information needs	14–70	63.187 ± 9.482
Information sources	15–75	56.872 ± 10.065
Barriers to accessing information	8–40	32.133 ± 6.710

Correlation analysis between HISB and lymphedema knowledge in postoperative BC patients

Pearson correlation analysis revealed that the total HISB score was positively correlated with the total KAP score ($r = 0.871$, $p < 0.001$). However, HISB showed a significant negative correlation with age ($r = -0.810$, $p < 0.001$). However, HISB showed no significant correlations with BMI ($r = -0.050$, $p = 0.669$), postoperative duration ($r = 0.029$, $p = 0.639$), chemotherapy sessions ($r = 0.066$, $p = 0.293$), or radiotherapy sessions ($r = 0.157$, $p = 0.559$). The correlation matrix is provided in Table 4 in the Appendix.

To further examine the nature of this relationship, we calculated the correlations between HISB and the three individual KAP dimensions. HISB was correlated with the knowledge dimension ($r = 0.742$, $p < 0.001$), the attitude dimension ($r = 0.785$, $p < 0.001$), and the practice/behavior dimension ($r = 0.837$, $p < 0.001$). The practice dimension showed the strongest correlation with HISB, suggesting that the overall association between HISB and the total KAP score ($r = 0.871$) may be partly driven by behavioral components.

Multiple linear regression analysis of factors associated with lymphedema-related HISB in postoperative BC patients

In this study, the lymphedema-related HISB score in postoperative BC patients was used as the dependent variable, while variables showing statistical significance in the univariate analyses were included as independent variables in a multiple linear regression model. Assignments for categorical independent variables are shown in Table 5 in the Appendix; continuous variables were entered as original values. Multivariate analysis indicated that the total upper limb lymphedema KAP score was significantly associated with HISB ($B = 0.850$, $\beta = 0.621$,

$p < 0.001$). Among the axillary lymph node dissection categories, the "unknown" category was significantly associated with lower HISB scores compared with the reference group of 0 nodes ($B = -15.467$, $p = 0.019$). No other variables reached statistical significance in the final model (all p values > 0.05). The model explained 40.2% of the variance in HISB (adjusted $R^2 = 0.323$). Detailed regression results are presented in Table 6 in the Appendix.

Discussion

In this cross-sectional study of 196 postoperative breast cancer patients, the mean total lymphedema-related HISB score was 178.21 ± 25.02 (possible range 43–215). Because no validated interpretative threshold is available for this scale, we report the score descriptively and do not classify it as low, moderate, or high. In multivariable analysis, the total KAP score and reporting "unknown" axillary lymph node dissection status compared with reporting 0 nodes removed were independently associated with HISB.

Notably, several variables significant in univariate analyses (e.g., education, household size, discharge instructions) did not retain significance after adjustment for KAP score. This attenuation suggests that the associations between these sociodemographic factors and HISB may be partly explained by differences in KAP scores. However, formal mediation analysis was not conducted in this cross-sectional study, and the observed pattern should be interpreted with caution. Future longitudinal research is needed to examine whether KAP score mediates the relationship between these factors and HISB.

Current status and univariate analysis of lymphedema-related HISB in postoperative BC patients

The mean total HISB score for lymphedema in postoperative BC patients was 178.21 ± 25.02. This score was higher than the mean score reported by [18]. Because no validated interpretative threshold is available for this scale, the score is reported descriptively and is not categorised as limited or adequate. This finding may relate to patients' insufficient understanding of lymphedema-associated risks [25], where inadequate knowledge weakens trust in professional information and consequently diminishes patients' motivation to actively seek health information [3]. The mean attitude score was 26.03 ± 4.44. This pattern may suggest that knowledge level influences patients' attitudes toward lymphedema complications [25]; however, no validated threshold is available to classify this score as low or high. The mean information needs score was 63.18 ± 9.48. Individual differences were observed, consistent with [22], indicating varied urgency in seeking health information among patients. Patients' awareness of lymphedema's potential impact on quality of life after surgery heightened their demand for information regarding signs and symptoms, self-care behaviors, treatment options, access to healthcare services, and coping strategies for anxiety [9]. The mean information sources score was 56.87 ± 10.07. Patients reported using a range of health information sources. Health education provided by healthcare providers partially influenced patients' information choices, indicating limitations in available sources. While some patients depended heavily on specific information channels, others explored multiple sources. However, the information provided by healthcare providers often does not fully satisfy patient needs, prompting patients to seek relevant information through social networks and other channels [11, 17]. Unfortunately, such information is frequently fragmented and insufficient to adequately support patient decision-making [11]. In this study, the mean barriers score was 32.13 ± 6.71. Variability in scores was observed, suggesting individual differences in the type and severity of obstacles encountered. Common barriers included complex information, technological challenges (e.g., unfamiliarity with the Internet), financial constraints (e.g., inability to afford information access), and as identified in a qualitative study by [27]. In addition, inadequate family support hindered some patients' ability to manage these obstacles, with several reporting insufficient time and energy to concentrate on lymphedema care [38]. Postoperative BC patients reported information needs related to lymphedema, while barriers to accessing information and restricted information sources were also observed. Economic factors (34.69% of patients had a monthly household income below 5000 RMB) and technological barriers (22.96% of patients resided in rural townships) were identified as potential barriers. This finding aligns with barriers identified by [17]. Therefore, healthcare providers should adopt stratified support strategies to effectively address and mitigate these postoperative information barriers.

Disease factors

The present study showed that postoperative BC patients who reported "unknown" axillary lymph node dissection status had significantly lower HISB scores ($B = -15.467$, $p = 0.019$), compared with those who reported zero

nodes removed. This contrast specifically compares the "unknown" category with the reference category of 0 nodes removed, rather than comparing patients who were aware versus unaware of their surgical history. This finding suggests an association between uncertainty regarding specific surgical details and less active health information-seeking. However, given the cross-sectional design, this association cannot be interpreted causally. "Unknown" status may reflect limited health literacy, poor recall, insufficient patient-provider communication, or lower general engagement with health information. Reverse directionality is also plausible—patients who are less engaged with health information may be simply less likely to recall or report their surgical details.

From a theoretical perspective, the Health Belief Model [15] suggests that patients' perceptions of disease severity and personal susceptibility influence their motivation to seek health information. Patients who report "unknown" axillary lymph node dissection status may experience ambiguity regarding their personal risk factors, which could paradoxically reduce their engagement in information-seeking due to a lack of clear perceived threat or self-efficacy. This observation aligns with the concept of "health literacy"—patients with limited knowledge about their own disease status may be less equipped to seek and utilize health information effectively [39].

Furthermore, a longitudinal study by [20] identified an inverted U-shaped relationship between disease perception intensity and efficacy in health information use: moderately elevated perceptions of disease threat (e.g., through educational interventions regarding postoperative complications) promoted information-seeking behaviors ($\beta = 0.32$, $p < 0.001$), while excessively heightened threat perceptions (e.g., misinformation-induced anxiety) negatively impacted adherence behaviors ($\beta = -0.18$, $p = 0.032$). This observation supports Li's (2024) concept of a "perception-behavior conversion threshold," highlighting the importance of balancing risk communication with patient empowerment [36].

The observed association between reporting "unknown" nodal status (vs 0 nodes removed) and lower HISB suggests that healthcare providers should consider assessing whether patients can report their axillary lymph node dissection status. Patients who report "unknown" status may benefit from further assessment of their information needs and comprehension of postoperative care, rather than assuming that providing additional information alone will improve HISB.

Lymphedema-related HISB in postoperative BC patients is influenced by multiple factors

Sociodemographic and clinical factors in univariate analyses

In univariate analyses, several sociodemographic and clinical factors—including age, educational level, household size, and discharge instruction status—were associated with HISB. Younger patients and those from larger households tended to report higher HISB scores, while patients who did not receive structured discharge instructions also showed higher HISB scores in unadjusted comparisons. However, after adjustment for KAP score and other covariates in the multivariable model, none of these factors remained statistically significant.

This pattern suggests that the associations between these sociodemographic factors and HISB may be largely explained by their relationship with lymphedema-related knowledge and health literacy. Rather than exerting independent effects, these factors may influence information-seeking indirectly through patients' disease-specific knowledge and self-management practices. The observed association between lack of discharge instructions and higher HISB in unadjusted analyses may reflect a compensatory information-seeking behavior among patients who did not receive formal guidance, although this interpretation remains speculative given the cross-sectional design.

By contrast, in the adjusted model, two factors remained significantly associated with HISB: the total KAP score and reporting "unknown" axillary lymph node dissection status compared with reporting 0 nodes removed. These findings are discussed in detail below.

These findings suggest several potential directions for clinical practice. Improving patients' lymphedema-related knowledge through structured education may enhance their active engagement in health information-seeking. In addition, assessing whether patients can report their axillary lymph node dissection status may help identify those who need more tailored informational support. However, given the cross-sectional nature of this study, these implications should be considered preliminary. Future intervention studies are needed to evaluate whether knowledge-enhancing strategies and individualized communication approaches can effectively improve HISB and self-management outcomes in this population.

Limitations

This study has several limitations due to its single-center and cross-sectional design. The sample, primarily drawn from a tertiary hospital in Hangzhou, may introduce selection bias and might not adequately represent broader patient populations. The cross-sectional approach provides only a single-time-point assessment, precluding the establishment of causal relationships between associated factors and HISB among postoperative BC patients. Future research should adopt multicenter, longitudinal designs and include participants from diverse geographic regions and economic backgrounds to enhance the representativeness and generalizability of findings. It is also essential to conduct comparative analyses between urban and rural populations to better understand the influence of geographic disparities on HISB related to lymphedema in this patient group. Additionally, the predominance of female participants (99.49%) reflects the epidemiology of breast cancer in this setting; however, it also means that the findings may not be directly generalizable to the small population of male breast cancer patients. Given the epidemiological reality of breast cancer, achieving a sex-balanced sample would be neither feasible nor representative. Future multicenter studies should aim to include more diverse patient populations to confirm the observed associations across different demographic subgroups. In conclusion, despite offering valuable insights, the present study's limitations should be acknowledged. Future multicenter longitudinal studies with more representative samples are needed to clarify the dynamics of HISB, examine urban–rural differences more thoroughly, and elucidate the causal mechanisms among related variables. Where feasible, future studies should also include sufficient numbers of male breast cancer patients to examine whether the observed associations apply to this subgroup.

Additionally, the correlation between HISB and the practice/behavior dimension of the KAP scale ($r=0.837$) suggests some conceptual overlap between the two instruments, as both include items related to active health management. This overlap may have modestly inflated the observed association between HISB and the total KAP score ($r=0.871$). However, the substantial correlations with the knowledge ($r=0.742$) and attitude ($r=0.785$) dimensions indicate that the relationship extends beyond shared behavioral content. Future research should consider using more differentiated measures to better distinguish information-seeking from general self-management behaviors.

Conclusion

In summary, this study demonstrated that lymphedema-related HISB among postoperative BC patients is significantly associated with total KAP score and reporting "unknown" axillary lymph node dissection status compared with reporting 0 nodes removed. Healthcare providers may consider assessing whether patients can report their axillary lymph node dissection status and providing clear, individualized information for those who report "unknown" status. Additionally, refining communication models between healthcare providers and patients is crucial to address existing gaps between information supply and patient demand. These strategies may ultimately promote proactive lymphedema-related HISB and self-management behaviors among postoperative BC patients.

Appendix

Table 2 Demographic characteristics of postoperative BC patients ($n = 196$)

Name	Options	Frequency	Percentage (%)
Genders	Male	1	0.510
	Female	195	99.490
Marital status	Unmarried	6	3.061
	Married	174	88.776
	Divorced	8	4.082
	Widowed	8	4.082
Academic qualifications	Junior high school and below	60	30.612
	High School/Junior College	49	25.000
	University college	12	6.122
	Undergraduate	39	19.898
	Postgraduate and above	36	18.367
Number of household members	1 person	29	14.796
	2 persons	27	13.776
	3 persons	34	17.347
	4 persons	50	25.510
	5 or more persons	56	28.571
Residence	Provincial capital city	62	31.633
	Municipal city	40	20.408
	County-level city	49	25.000
	Township and village	45	22.959
Monthly family income	< 3000	29	14.796
	3001 ~ 5000	39	19.898
	5001 ~ 10,000	55	28.061
	≥ 10,001	73	37.245
Medical insurance	Provincial/Municipal insurance	167	85.204
	New Agricultural Cooperative	24	12.245
	Others	5	2.551
Axillary lymph node dissections	Unknown	29	14.796
	0	25	12.755
	1–4	39	19.898
	5–9	6	3.061
	10–14	44	22.449
	≥ 15	53	27.041
Surgical procedure	Total unilateral mastectomy	93	47.449
	Bilateral mastectomy	70	35.714
	Breast-conserving surgery	26	13.265
	Breast reconstruction	7	3.571
Radiotherapy site	Unknown	23	11.735
	Breast/chest wall	68	34.694
	Axilla	2	1.020
	Chest wall + axilla	56	28.571
	No postoperative radiotherapy	47	23.980
High blood pressure	Yes	25	12.755
	No	171	87.245
Discharge instructions	Yes	100	51.020
	No	96	48.980

Table 2 (continued)

Name	Options	Frequency	Percentage (%)
Axillary web syndrome	Unknown	95	48.469
	Has not occurred	100	51.020
	Occurred not unresolved	1	0.510
Awareness of local Lymphedema-related clinics or resources	Unknown	66	33.673
	No/Unaware	38	19.388
	Yes/Aware	92	46.939
Total		196	100.0

Table 3 Current status and univariate analysis of lymphedema-related HISB in postoperative BC patients ($n = 196$)

Variant		HISB Score (Mean ± SD)	*T/F*	*p*
Marital status	Unmarried	187.000 ± 21.799	2.251	0.084[a]
	Married	178.805 ± 25.330		
	Divorced	179.875 ± 19.759		
	Widowed	157.000 ± 16.027		
Academic qualifications	Junior high school and below	197.183 ± 13.760	71.776	< 0.001[c]
	High school/Junior college	191.510 ± 13.315		
	College diploma	178.583 ± 6.473		
	Undergraduate	155.231 ± 22.827		
	Postgraduate or higher	153.250 ± 15.870		
Number of persons in the household	1 person	149.759 ± 20.865	80.500	< 0.001[c]
	2 persons	154.556 ± 24.472		
	3 persons	166.206 ± 12.067		
	4 persons	194.980 ± 10.493		
	≥ 5 persons	196.661 ± 11.662		
Monthly family income	< 3000	169.724 ± 29.946	2.223	0.087[a]
	3001 ~ 5000	174.026 ± 26.795		
	5001 ~ 10,000	181.836 ± 24.432		
	≥ 10,001	181.082 ± 21.514		
Number of lymph nodes cleared	Unknown	155.862 ± 21.648	42.912	< 0.001[c]
	0	158.760 ± 22.952		
	1–4	162.462 ± 19.347		
	5–9	180.167 ± 9.475		
	10–14	196.227 ± 10.852		
	≥ 15	196.019 ± 15.076		
Radiotherapy site	Unknown	162.696 ± 31.326	2.801	0.027[b]
	Breast/chest wall	179.471 ± 23.416		
	Axilla	186.500 ± 3.536		
	Chest wall + axilla	182.375 ± 26.252		
	No postoperative radiotherapy	178.660 ± 20.346		
Discharge instructions	Yes	160.430 ± 21.366	-14.924	< 0.001[c]
	No	196.729 ± 11.386		
Axillary web syndrome	Unknown	158.705 ± 20.457	134.829	< 0.001[c]
	Has not occurred	196.870 ± 10.813		
	Occurred, unresolved	SD not applicable		
Awareness of local Lymphedema clinics/ resources	Unknown	169.015 ± 26.130	8.942	< 0.001[c]
	No/Unaware	176.868 ± 31.081		
	Yes/Aware	185.359 ± 18.628		

HISB, health information-seeking behavior; *BC*, breast cancer

[a] $p < 0.1$ bp < 0.05 [c] $p < 0.001$

Table 4 Correlations between lymphedema-related HISB and selected variables in postoperative breast cancer patients ($n = 196$)

	HISB	Total KAP score	Age	BMI	Postoperative duration (months)	Chemotherapy sessions	Radiotherapy
HISB	1						
Total KAP score	0.871[c]	1					
Age	−0.810[c]	−0.594[c]	1				
BMI	−0.050	−0.071	0.100	1			
Postoperative duration (months)	0.029	0.033	−0.053	0.027	1		
Chemotherapy sessions	0.066	0.026	−0.102	0.045	0.178[b]	1	
Radiotherapy	0.157	0.134[a]	−0.175[b]	0.037	0.105	0.338[c]	1

HISB, Health Information-Seeking Behavior; *KAP*, knowledge, attitude, and practice; *BC*, breast cancer

[a]$p < 0.1$ bp < 0.05 [c]$p < 0.001$

Table 5 Coding methods for categorical variables ($n = 196$)

Self-variable	Reference category
Education level	Junior high school and below
Number of household members	1 person
Number of axillary lymph nodes removed	0 nodes
Radiotherapy site	No postoperative radiotherapy
Discharge instructions received	Yes
Axillary web syndrome	Has not occurred
Awareness of local Lymphedema-related clinics/resources	Aware

All categorical variables were entered as dummy variables with the indicated reference category. Variables that were statistically significant in univariate analyses were entered into the multiple regression model. Continuous variables (age, KAP total score, chemotherapy sessions) were entered as continuous values

Table 6 Multiple linear regression analysis of lymphedema-related HISB in postoperative BC patients ($n = 196$)

Variable	Unstandardized coefficient B	Standard error (SE)	Standardized coefficient β	t	*p*-value	95% CI for B	VIF
(Intercept)	129.087	17.403	–	7.418	**< 0.001**	94.736, 163.437	–
Total KAP score	0.850	0.090	0.621	9.491	**< 0.001**	0.673, 1.027	1.233
Age	−0.221	0.186	−0.090	−1.192	0.235	−0.588, 0.145	1.625
Chemotherapy sessions	0.337	0.463	0.051	0.729	0.467	−0.577, 1.251	1.399
Education (high school/junior college) a	−0.336	4.430	–	−0.076	0.940	−9.081, 8.408	–
Education (college diploma) a	−0.994	5.235	–	−0.190	0.850	−11.328, 9.341	–
Education (undergraduate) a	−0.599	4.748	–	−0.126	0.900	−9.971, 8.773	–
Education (postgraduate and above) a	−5.614	9.436	–	−0.595	0.553	−24.239, 13.012	–
Household size (2 persons) b	1.662	7.612	–	0.218	0.827	−13.363, 16.686	–
Household size (3 persons) b	−8.858	7.109	–	−1.246	0.214	−22.890, 5.174	–
Household size (4 persons) b	−11.629	7.436	–	−1.564	0.120	−26.307, 3.049	–
Household size (≥ 5 persons) b	−4.783	7.420	–	−0.645	0.520	−19.429, 9.863	–
Lymph nodes (1–4 nodes) c	−9.830	6.289	–	−1.563	0.120	−22.243, 2.584	–
Lymph nodes (5–9 nodes) c	−14.535	7.514	–	−1.935	0.055	−29.366, 0.295	–
Lymph nodes (10–14 nodes) c	−4.195	8.626	–	−0.486	0.627	−21.222, 12.831	–
Lymph nodes (≥ 15 nodes) c	−7.803	6.829	–	−1.143	0.255	−21.281, 5.676	–
Lymph nodes (unknown) c	−15.467	6.512	–	−2.375	**0.019**	−28.321, −2.614	–
Radiotherapy site (breast/chest wall) d	−3.736	4.204	–	−0.889	0.375	−12.034, 4.563	–
Radiotherapy site (axilla) d	9.771	15.573	–	0.627	0.531	−20.969, 40.510	–
Radiotherapy site (chest wall + axilla) d	0.886	4.747	–	0.187	0.852	−8.485, 10.257	–
Radiotherapy site (unknown) d	3.850	5.704	–	0.675	0.501	−7.409, 15.110	–
Discharge instructions (No) e	5.635	4.718	–	1.194	0.234	−3.677, 14.948	–
Awareness of clinics (Not aware) f	4.540	4.440	–	1.023	0.308	−4.224, 13.304	–
Awareness of clinics (Unknown) f	2.150	3.745	–	0.574	0.567	−5.241, 9.542	–

[a]Reference: Junior high school and below; [b]Reference: 1 person; [c]Reference: 0 nodes; [d]Reference: No postoperative radiotherapy; [e]Reference: Yes (received discharge instructions); [f]Reference: Aware

$R^2 = 0.402$; Adjusted $R^2 = 0.323$; $F = 5.036$, $p < 0.001$. All VIF values were < 2, indicating no serious multicollinearity. Bold indicates statistical significance ($p < 0.05$)

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Data availability Any statement written in the manuscript will be replaced by this statement and it will be the one we publish. The data of this study include participants' personal privacy information (e.g. [specific details such as disease diagnosis, family information etc.]). Data availability statement The data are not publicly available due to the privacy protection principle based on the requirements of the Ethics Committee, and are available only on the basis of the conditions of the ethical review. Please contact corresponding author if needed.

Declarations

Statistics The authors affirmed that the methods used in the data analyses are suitably applied to our data within our study design and context.

Reporting method The reporting method follows the STROBE checklist to ensure transparency and completeness in the presentation of the research.

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Competing interests The authors declare no competing interests.

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