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Survey on adverse events associated with drug therapy for breast cancer patients

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Abstract

Background In the breast cancer treatment, there may be a gap between patients' information needs and physicians' perceptions. To address this issue, we conducted a comprehensive questionnaire survey aimed to assess the specific information needs of patients regarding the adverse events (AEs) associated with treatment.

Methods A web-based questionnaire survey (UMIN000049280: Registered on October 31, 2022) was conducted in patients with a history of breast cancer treatment. Responses were obtained regarding AEs experienced, AEs for which remedies were identified, AEs patients sought to prevent, and pre-treatment information on AEs patients desired to have.

Results Data from 435 breast cancer patients were analyzed. The most common AEs reported included hair loss (93.3%), malaise/fatigue (89.4%), nail changes (83.2%), dysgeusia (69.0%), leukopenia/white blood cell decreased (65.1%), neuropathy (62.3%), and nausea/vomiting (61.4%). Financial anxiety was reported in 35.2% of the participants. AEs for which a minority of patients found effective solutions included neuropathy (20.3%), financial anxiety (21.6%), edema (24.3%), joint pain (26.0%), and malaise/fatigue (26.7%). Patients expressed the greatest desire to avoid hair loss (34.7%), followed by nausea/vomiting (23.7%), interstitial lung disease/pneumonitis (5.5%), malaise/fatigue (5.1%), and dysgeusia (5.1%). The most commonly requested pre-treatment information regarding AEs was their duration, followed by prevention methods, management strategies, time to onset, and the impact on daily life.

Conclusions This survey highlights the existence of significant unmet medical needs among breast cancer patients, due to the inadequate solutions available for managing AEs associated with various therapeutic agents. In addition, the survey revealed that patients have different information needs regarding different types of AEs.

Keywords Breast cancer, Adverse events, Questionnaire survey, PRO, Patients' need

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Introduction

Standard treatments for breast cancer include surgery, drug therapy, and radiation therapy for early breast cancer; drug therapy and local therapy for locally advanced breast cancer; and multidisciplinary treatment with a focus on drug therapy for metastatic or recurrent breast cancer [1]. Previously, endocrine therapy, chemotherapy, and antibody drugs were the mainstays of breast cancer drug therapy. In recent years, however, cyclin-dependent kinase 4/6 (CDK4/6) inhibitors, antibody-drug conjugates (ADCs), and immunotherapies such as anti-PD-L1 antibodies have emerged, requiring consideration of drug-induced adverse events (AEs), which are less common with conventional therapy [2–4]. AEs affect patients, not only decreasing their quality of life (QOL) but also hindering the continuation of treatment. Therefore, the management of AEs is important in current cancer treatments [5].

Patient-centered care has a long history, beginning with the Picker/Commonwealth Program published in 1987, and in 1993 Cleary et al. reported that 11% of patients did not express their opinions about their treatment to the physicians, and 7% did not receive the satisfying answers from the physicians [6]. In Japan, the 2018 Basic Plan for the Promotion of Cancer Control by the Ministry of Health, Labour and Welfare sets "Realization of patient-centered cancer care" as a goal and states that patients, healthcare professionals, medical insurers, employers, academic societies, patients' association and mass media should work together toward this goal [7]. The common AEs of chemotherapy for breast cancer include hair loss, fatigue, taste disorder, and skin and nail problems. In addition to these physical AEs, anxiety about cancer or treatment can also be considered as drug therapy-related AEs [8]. In a survey of the patients received chemotherapy for breast cancer and the healthcare providers, the patients reported that the most burdensome AE was hair loss, followed by skin and nail problems, and weariness/fatigue, and AEs most concerning to physicians were fever, followed by numbness in hands and legs, and nausea/vomiting [9]. This report also indicates that while healthcare professionals believe that they provide adequate information to patients, patients feel that they are not adequately informed [9]. Basch et al. pointed out that AEs are not assessed by the patient's own experience, but by the physician's impression of the patient's symptoms, and that there is a gap in perceptions of AEs between patient and physician [10]. This gap is an issue that needs to be addressed in patient-centered care. At the 6th International Consensus Conference for Advanced Breast Cancer held in Lisbon in November 2021, it was advocated that patient tolerability is important in the perception of AEs and that patients need to be given more consideration in understanding AEs [11]. In light of these considerations, we conducted a questionnaire survey to elucidate the perception of AEs among patients with a history of breast cancer treatment. This study was registered in the Japanese Clinical Trials Registry on October 31, 2022 (UMIN000049280).

Patients and methods

Patients

This survey was conducted among the breast cancer patients using QLife, Inc. website "Gan Plus" (https://cancer.qlife.jp/) and "Gan Support" (https://gansupport.jp/). Inclusion criteria were as follows: (1) currently undergoing treatment or post-treatment follow-up for breast cancer; (2) diagnosis of breast cancer in 2002 or later; (3) prior treatment with chemotherapy, molecular targeted agents, or immune checkpoint inhibitors for breast cancer; (4) age 18 years or older; (5) breast cancer stage I-IV at initial diagnosis; and (6) provided web-based informed consent for participation in the survey. Exclusion criteria were as follows: (1) declared non-participation in the survey prior to data fixation; (2) those involved in market research, advertising and marketing, news media, healthcare professionals, and pharmaceutical companies; and (3) unable to complete the questionnaire independently. The target number of participants for the survey was 500.

Methods

This is a web-based questionnaire survey targeted patient with a history of breast cancer treatment. The participants accessed the web questionnaire system of QLife, Inc., and answered each question. Patient background information regarding age, medical history, cancer stage, recurrence, type of medical institution, employment status, marital status, and household and personal income was collected. Data were collected regarding experiences, solutions, intention to avoid, and desired information for 18 types of AEs (nausea/vomiting, diarrhea, constipation, dysgeusia, stomatitis, malaise/fatigue, skin and nail changes, hair loss, edema, neuropathy, leukopenia/white blood cell (WBC) decreased, fever, interstitial lung disease/pneumonitis, joint pain, depression/poor concentration, insomnia, and financial anxiety), and desired information for 7 types of AEs (nausea/vomiting, malaise/fatigue, stomatitis, hair loss, leukopenia/WBC decreased, skin and nail changes, neuropathy). For each AE, data on time to onset, duration, incidence rate by severity, details of daily life disruption, control methods, prevention methods, rate of recovery, time from withdrawal to recovery, experienced person's story, and treatment costs were collected.

Statistics

Descriptive statistics were expressed as n, %, and mean values. Fisher's exact test was used to evaluate the relationships between the followings; (1) changes in employment status and financial anxiety, (2) income and financial anxiety, (3) cancer status and AEs patients wanted to avoid, and (4) experiences of AEs and information patients wanted to know. The significance level was set at $p<0.05$ both sides. Statistics were performed using IBM SPSS Statistics ver. 18.0.1.0/29/0.0.0 software (IBM).

Results

Patient characteristics

Of the 686 patients who initially consented, 435 met the inclusion criteria after exclusion of 251 individuals (Supplemental Fig. 1). Patients in their 50s (48.3%) were the most common age group, with chemotherapy (92.0%), surgery (90.8%), and hormonal therapy (65.5%) being the most common breast cancer treatments (Table 1). Molecular targeted agents and immune checkpoint inhibitors were administered to 48.5% and 3.0% of patients, respectively. At diagnosis, 46.9% were in stage II and 23.7% were in stage I. Patients were primarily treated in general hospitals (42.1%) or university hospitals (29.2%). At the time of cancer diagnosis, 31.0% of patients were regular employees, 20.9% were part-time employees, and 19.1% were homemakers. Approximately 53.8% experienced changes in employment status due to cancer. 70.3% were married and 17.0% were unmarried. Household income was distributed as follows: 36.3% had > 3.7 to ≤ 7.7 million Japanese yen (JPY), 27.4% had > 7.7 to ≤ 11.6 million JPY, and 14.3% had > 1.55 to ≤ 3.7 million JPY.

AEs experienced

The most common AEs reported were hair loss (93.3%), malaise/fatigue (89.4%), nail changes (83.2%), dysgeusia (69.0%), leukopenia/WBC decreased (65.1%), skin changes (64.6%), neuropathy (62.3%), and nausea/vomiting (61.4%), respectively (Fig. 1).

AEs for which solutions were found

The percentages of patients who found a solution to the AE was 69.6% for constipation, 66.7% for nausea/vomiting, 58.9% for diarrhea, 55.6% for stomatitis, and 48.8% for fever, with a higher trend for symptoms for which effective supportive care was available (Fig. 3). The AEs with low percentage of patients finding a solution were neuropathy (20.3%), financial anxiety (21.6%), edema (24.3%), joint pain (26.0%), and fatigue (26.7%).

AEs that patients wanted to avoid

The AEs that patients commonly wanted to avoid were hair loss (34.7%), nausea/vomiting (23.7%), interstitial lung disease/pneumonitis (5.5%), malaise (5.1%) and dysgeusia (5.1%), respectively (Fig. 4). Regarding nausea/vomiting (68.7% for under 50 vs. 53.8% for over 50, $p=0.004$) and financial anxiety (29.9% vs. 18.9%, $p=0.013$), the percentages of patients who wanted to avoid them were significantly higher in patients aged under 50 than in those over 50 (Table 2). Regarding nail changes (13.4% for under 50 vs. 23.3% for over 50, $p=0.020$), neuropathy (27.6% vs. 37.9%, $p=0.039$), and joint pain (11.9% vs. 21.3%, $p=0.022$), the percentages of patients who wanted to avoid them were significantly higher in patients aged 50 or older than in those under 50 (Table 2). For all 18 AEs, there was no significant difference in the percentages of patients who wanted to avoid each AE between patient with recurrence/metastasis and other (data not shown). Among the 118 patients who experienced cancer recurrence, the most common AE they wanted to avoid was hair loss, followed by nausea/vomiting, leukopenia/WBC decreased, malaise/fatigue, and interstitial lung disease/pneumonitis (Supplemental Fig. 2). There was no significant difference in the proportion of AEs that patients wanted to avoid between patients with recurrence/stage IV and the rest.

Financial anxiety

Financial anxiety was observed in 35.2% of patients (Fig. 1) and correlated significantly with lower personal annual income (≤ 3.7 million JPY: 40.9%, > 3.7 to ≤ 7.7 million JPY: 22.5%, > 7.7 to ≤ 11.6 million JPY: 25.0%, and > 11.6 million JPY: 10.0%, $p=0.002$) (Fig. 2). The patients whose employment status changed due to cancer experienced significantly more financial anxiety than those that did not change (40.6% vs. 28.9%, $p=0.012$), and the proportion of the patients experiencing financial anxiety tended to increase with a decrease in personal annual income. The patients wishing to avoid financial anxiety accounted for 25.4% with personal annual incomes of ≤ 3.7 million JPY, with a trend of higher preference among individuals with lower personal annual income (Fig. 2).

Information patients wanted to know about AEs

For 7 AEs (nausea/vomiting, malaise/fatigue, stomatitis, hair loss, leukopenia/WBC decreased, skin and nail changes, and neuropathy), the common items that patients wanted to know about were the duration of AEs (mean: 57.4%), prevention methods (52.9%), control methods (48.1%), time to onset (34.9%), details of daily life disruption (31.9%), and incidence of grade 3 AEs (18.0%) (Fig. 5). Regarding nausea/vomiting, the information that patients commonly wanted to know were duration, prevention methods, control methods, time to onset, and details of daily life disruption. For any of 12 items (duration, prevention methods, control methods, time of onset, details of daily life disruption, incidence of grade 1, 2, or 3 AEs, experienced person's story, rate of recovery, time from withdrawal to recovery, and treatment costs for AEs), there was no significant difference in the proportion of patients wanted to know between

Table 1 Patient characteristics

N		**435**
Age, n (%)		
	30’s	10 (2.3)
	40’s	124 (28.5)
	50’s	210 (48.3)
	60’s	80 (18.4)
	70’s	11 (2.5)
Medical history, n (%)		
	Surgery	395 (90.8)
	Hormone therapy	285 (65.5)
	Chemotherapy	400 (92.0)
	Molecular targeted drugs	211 (48.5)
	Immune checkpoint inhibitors	13 (3.0)
	Radiation therapy	239 (54.9)
	Breast reconstruction surgery	85 (19.5)
	Other	18 (4.1)
Stage at initial diagnosis, n (%)		
	Stage I	103 (23.7)
	Stage II	204 (46.9)
	Stage III	83 (19.1)
	Stage IV	45 (10.3)
Recurrence, n (%)		
	No	317 (72.9)
	Yes	118 (27.1)
Type of medical facility receiving treatment, n (%)		
	Cancer center	74 (17.0)
	University hospital	127 (29.2)
	General hospital	183 (42.1)
	Clinic	51 (11.7)
Employment status at diagnosis, n (%)		
	Company employee (regular employment)	135 (31.0)
	Company employee (non-regular employment)	27 (6.2)
	Temporary worker	16 (3.7)
	Part-time worker	91 (20.9)
	Public servant	30 (6.9)
	Self-employed	38 (8.7)
	Housewife’unemployed	83 (19.1)
	Student	1 (0.2)
	Other	14 (3.2)
Changes in employment status due to cancer, n (%)		
	Yes	234 (53.8)
	No	201 (46.2)
Marital status, n (%)		
	Married	306 (70.3)
	Unmarried	74 (17.0)
	Divorce	48 (11.0)
	Bereavement	7 (1.6)
Household annual income [million JPY], n (%)		
	> 11.6	48 (11.0)
	> 7.7 to ≤ 11.6	119 (27.4)
	> 3.7 to ≤ 7.7	158 (36.3)
	> 1.55 to ≤ 3.7	62 (14.3)
	> 1.30 to ≤ 1.55	9 (2.1)
	≤ 1.30	39 (9.0)

Table 1 (continued)

N		**435**
Personal annual income [million JPY], n (%)		
	> 11.6	10 (2.3)
	> 7.7 to ≤ 11.6	20 (4.6)
	> 3.7 to ≤ 7.7	102 (23.4)
	> 1.55 to ≤ 3.7	86 (19.8)
	> 1.30 to ≤ 1.55	21 (4.8)
	≤ 1.30	196 (45.1)

JPY: Japanese yen

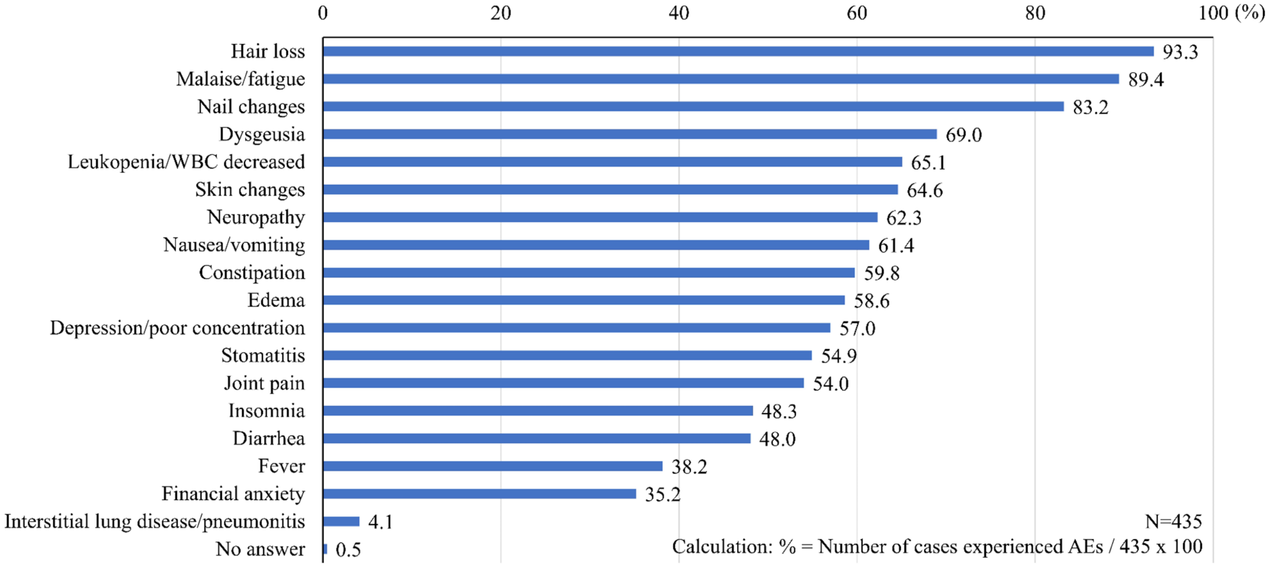

Fig. 1 Percentage of AEs experienced. Responses were obtained for AEs experienced from a list of 18 options*, with multiple choices allowed. *nausea/vomiting, diarrhea, constipation, dysgeusia (no taste, feels bad to eat), stomatitis (pain or discomfort in or around the mucous membranes of the mouth), malaise/fatigue, skin changes (skin redness, unevenness, and pigmentation, etc.), nail changes (discoloration, deformation, and thinning, etc.), hair loss, edema, neuropathy (numbness), leukopenia/WBC decreased, fever, interstitial lung disease/pneumonitis, joint pain, depression/poor concentration, insomnia (can not sleep, waking up at night, sleepiness during the day), financial anxiety (financial concerns regarding treatment costs)

patients with and without experience of nausea/vomiting (Supplemental Fig. 3a). Regarding malaise/fatigue, the information that patients commonly wanted to know were duration, control methods, prevention methods, details of daily life disruption, and time to onset (Fig. 5). Patients who experienced malaise/fatigue were significantly more interested in control methods (51.2% vs. 28.3%, $p=0.005$) and the incidence of grade 1 AEs (13.1% vs. 2.2%, $p=0.029$) than patients without experience (Supplemental Fig. 3b). Regarding stomatitis, the information that patients commonly wanted to know were prevention methods, duration, control methods, time to onset, and details of daily life disruption (Fig. 5). Patients who had experienced stomatitis were significantly more interested about control methods than those who had not (61.5% vs. 46.4%, $p=0.002$) (Supplemental Fig. 3c). Regarding hair loss, patients were interested in duration, prevention methods, time to onset, control methods, experienced person's story, and rate of recovery (Fig. 5). Patients without hair loss experience were more concerned about the incidence of grade 2 AEs (20.4% vs. 44.8%, $p=0.005$) and details of daily life disruption (14.3% vs. 31.0%, $p=0.028$) than those who had experienced it (Supplemental Fig. 3d). Regarding leukopenia/WBC decreased, patients were commonly interested in details of daily life disruption, control methods, duration, prevention methods, incidence of grade 2 AEs, and time to onset (Fig. 5). There were no significant differences in the proportion of patients who wanted to know about any of the 12 items between patient who had experienced leukopenia/WBC decreased and those who had not (Supplemental Fig. 3e). Regarding skin changes and nail changes, patients were interested in prevention methods, duration, control methods, rate of recovery, time to onset, and details of daily life disruption (Fig. 5). Patients who had experienced skin changes were more interested in prevention methods (62.6% vs. 51.3%, $p=0.025$) and control methods (54.8% vs. 41.6%, $p=0.009$) than those who had

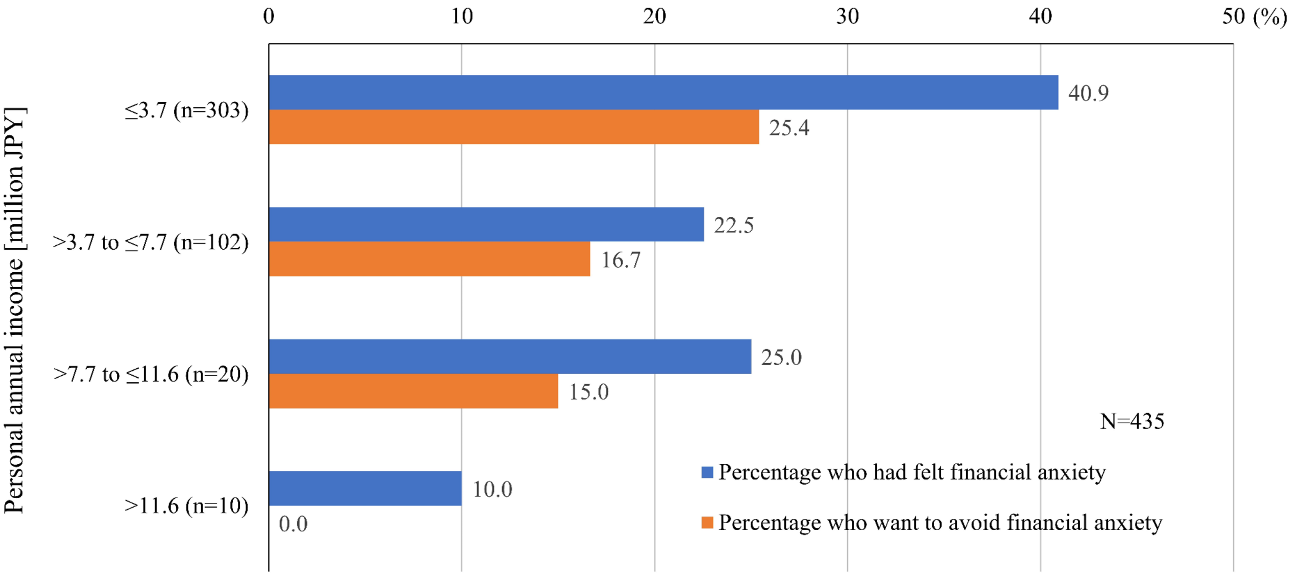

Fig. 2 Percentage of financial anxiety by personal annual income. The percentage of respondents who answered that they had felt financial anxiety or want to avoid financial anxiety by personal annual income

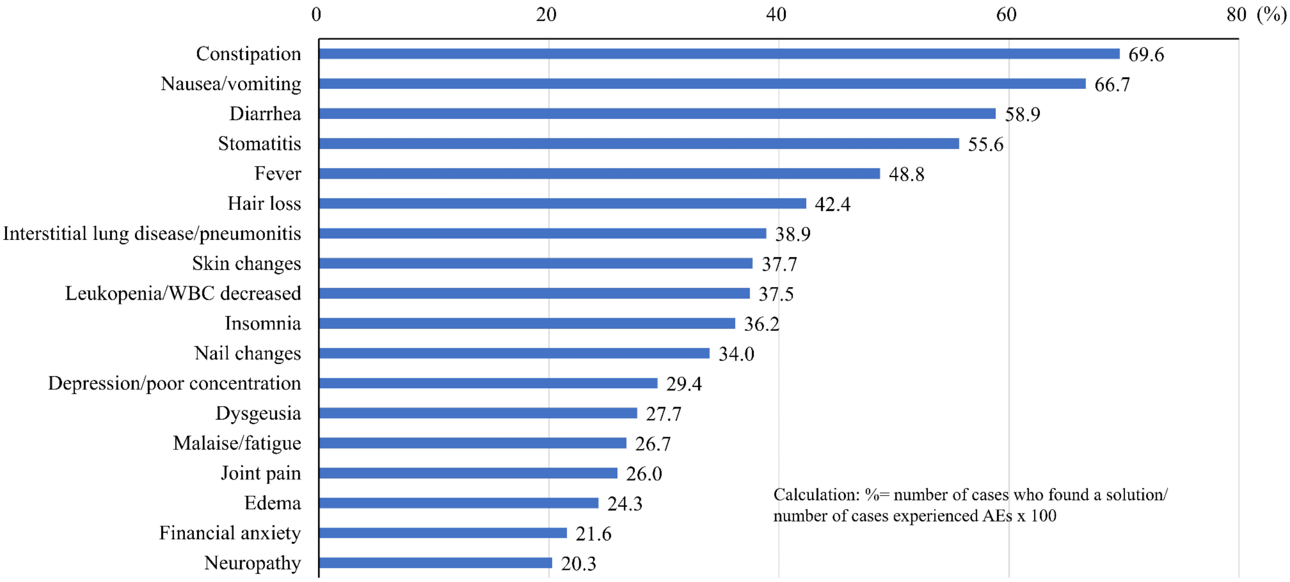

Fig. 3 Percentage of AEs for which a solution was found. Respondents selected AEs they experienced for which they found a solution (manageable or acceptable)

not (Supplemental Fig. 3f). There were no significant differences in the proportion of patients wanted to know about the 12 items between patients who had experienced nail changes and those who had not (Supplemental Fig. 3g). Regarding neuropathy, patients commonly wanted to know about duration, prevention methods, control methods, details of daily life disruption, time to onset, and rate of recover (Fig. 5). Patients who had experienced neuropathy were more interested in duration (72.0% vs. 53.7, $p<0.001$) and rate of recovery (35.1% vs. 21.3%, $p=0.002$) and less concerned about the time to onset (25.8% vs. 39.0%, $p=0.005$) compared to patients without neuropathy experience (Supplemental Fig. 3h).

Discussions

The most common AEs reported in this survey, such as hair loss (93.3%), malaise/fatigue (89.4%), nail changes (83.2%), dysgeusia (69.0%), and leukopenia/WBC decreased (65.1%), were consistent with AEs caused by chemotherapy, the standard treatment for breast cancer [8, 9]. Among these, both hair loss and nail changes affected appearance, and the percentages of those who

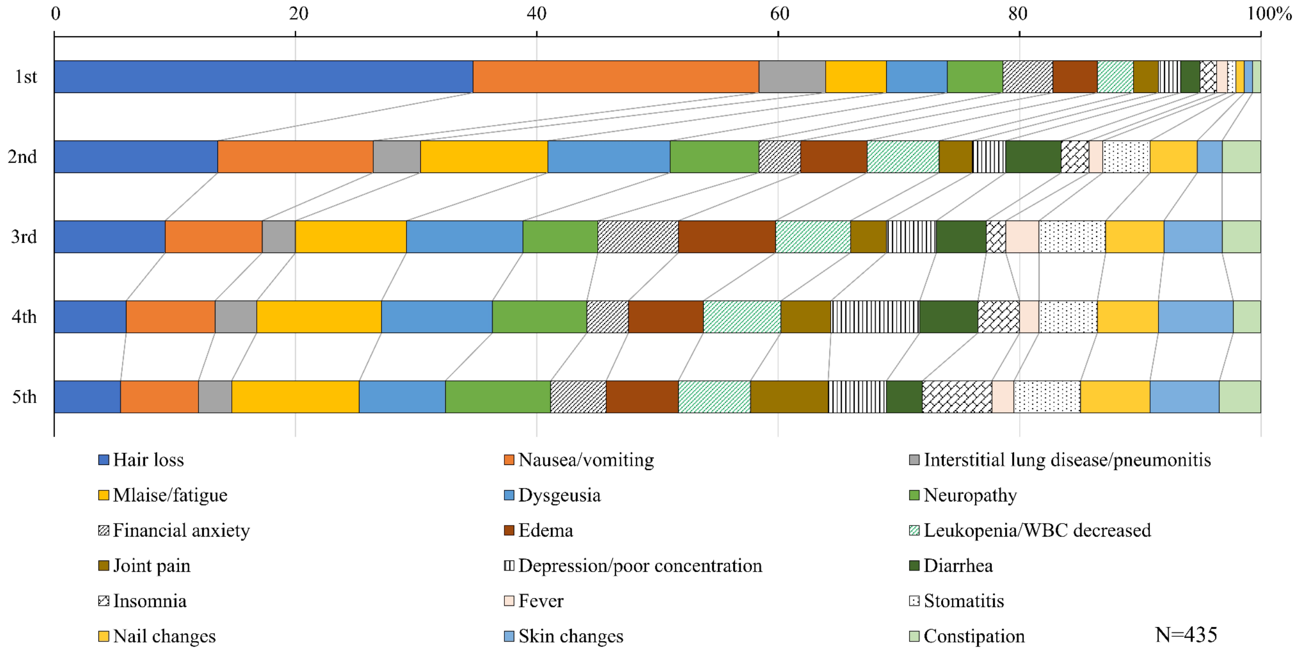

Fig. 4 Percentage of AEs that patients want to avoid by selection order. Respondents selected 5 AEs that they want to avoid (1st is the AE they most want to avoid)

Table 2 Percentage of AEs that patients want to avoid by age category

	n (%)		*p* value < 0.05
	Age < 50 years old	Age ≥ 50 years old	
Nausea/vomiting	92 (68.7)	162 (53.8)	0.004
Diarrhea	23 (17.2)	56 (18.6)	–
Constipation	18 (13.4)	38 (12.6)	–
Dysgeusia	53 (39.6)	126 (41.9)	–
Stomatitis	25 (18.7)	64 (21.3)	–
Malaise/fatigue	64 (47.8)	135 (44.9)	–
Skin changes	30 (22.4)	55 (18.3)	–
Nail changes	18 (13.4)	70 (23.3)	0.020
Hair loss	89 (66.4)	211 (70.1)	–
Edema	41 (30.6)	87 (28.9)	–
Neuropathy	37 (27.6)	114 (37.9)	0.039
Leukopenia/WBC decreased	35 (26.1)	85 (28.2)	–
Fever	9 (6.7)	27 (9.0)	–
Interstitial lung disease/ pneumonitis	26 (19.4)	54 (17.9)	–
Joint pain	16 (11.9)	64 (21.3)	0.022
Depression/poor concentration	29 (21.6)	62 (20.6)	–
Insomnia	25 (18.7)	38 (12.6)	–
Financial anxiety	40 (29.9)	57 (18.9)	0.013

WBC: white blood cell, Comparison among age groups on AEs patients want to avoid. The cutoff value was set at 50 years to account for changes in female hormone levels due to menopause

found a solution was low at 42.4% and 34.0%, respectively. Hair loss is is usually reversible, but in rare cases, it may be permanent [12]. Pozo-Kaderman et al. reported that many breast cancer patients consider hair loss to be more distressing than mastectomy [13]. Changes in appearance have a significant impact on work and social relationships. The fact that only 42.4% of patients found a solution to hair loss suggests that existing methods may not fully satisfy patients. For patients experiencing appearance-related AEs due to cancer treatment, addressing appearance-related concerns is critical to reducing the overall burden.

The AEs that many breast cancer patients wanted to avoid included malaise/fatigue (89.4%) and dysgeusia (69.0%). However, the percentage of patients for whom solutions were identified was relatively low at 26.7% for malaise/fatigue and 27.7% for dysgeusia. The management of malaise/fatigue and dysgeusia represents unmet medical needs in cancer treatment, with no effective supportive care currently available. In particular, patients who experienced malaise/fatigue demonstrated a significantly greater need for information about control methods compared to those who did not experience malaise/fatigue. Malaise/fatigue is considered as a significant burden for patients, and this finding suggests that many patients are actively seeking ways to manage it. Moreover, a study by Sakai et al. highlighted a discrepancy between the perceptions of patients and physicians, with patients considering weariness/fatigue to be very distressing, whereas physicians often consider it to be less important [9]. Based on these facts, it can be concluded

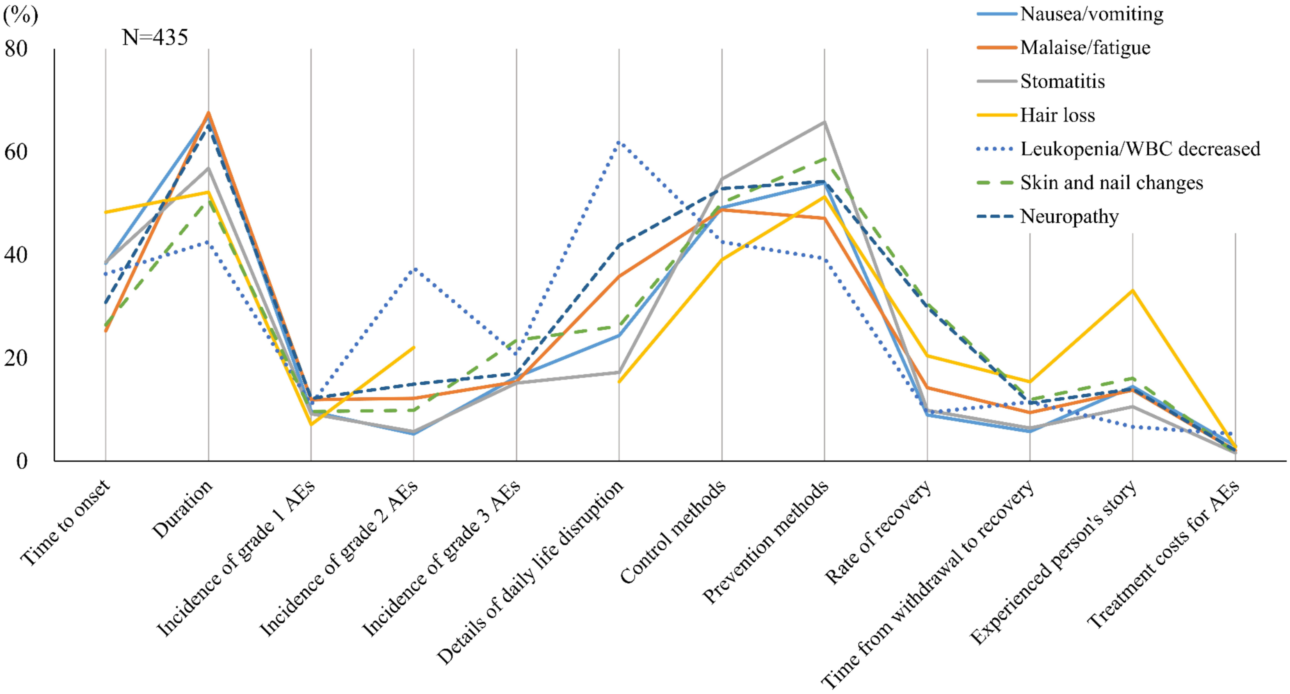

Fig. 5 Percentage of AEs information that the patients wanted to know (multiple answers). Respondents answered the information they wanted to know about each AE (nausea/vomiting, malaise/fatigue, stomatitis, hair loss, leukopenia/WBC decreased, skin and nail changes, and neuropathy) before treatment from a list of 12 items (multiple choices allowed). Regarding stomatitis, skin and nail changes, and hair loss, visual information such as photographs were presented as choices. The definition of AEs by Grade in CTCAE ver. 5.0 was modified to make the wording easier for respondents to understand, and the questionnaire was conducted. Nausea/vomiting, malaise/fatigue, stomatitis, and neuropathy; grade1: intervention not indicated, grade 2: limiting age appropriate instrumental activities of daily living (ADL), grade 3: limiting self care ADL. Hair loss; grade 1: a different hair style may be required to cover the hair loss, but it does not require a wig or hair piece to camouflage, grade 2: a wig or hair piece is necessary if the patient desires to completely camouflage the hair loss, grade 3: none. Leukopenia/WBC decreased; grade 1: abnormal laboratory values that do not affect anticancer therapy, grade 2: abnormal laboratory values that require a reduced dose of anticancer drugs, grade 3: abnormal laboratory values that require withdrawal of anticancer drugs. Skin and nail changes; grade 1: skin and nail changes intervention not indicated, grade 2: changes in a limited area or changes that require general treatment, grade 3: changes that require specialized treatment

that malaise/fatigue should be recognized as a critical AE, and developing therapeutic strategies for malaise/fatigue is an important issue.

The proportions of patients who found solutions to neuropathy (20.3%) and financial anxiety (21.6%) were also low, indicating unmet needs for patients. Regarding neuropathy, there was a strong demand for information on duration, prevention methods, and control methods. Future research should prioritize the development of supportive care for drug-induced neuropathy.

In this survey, more than one third of patients experienced financial anxiety. In Japan, private insurance and the National Health System allow patients to receive a certain level of medical care. However, in cases where the cost of medical care is a burden, de-escalation of treatment [14, 15] and reduction of medical costs using generic drugs [16] may contribute to a reduction in patient anxiety.

For stomatitis, patients highly needed the information about prevention methods, duration, and control methods. Paplomata et al. reported that the incidence of stomatitis caused by everolimus, a mammalian target of rapamycin (mTOR) inhibitor also used in breast cancer, was approximately 50% [17]. Furthermore, the incidence of stomatitis caused by datopotamab deruxtecan (Dato-DXd), an anti-TROP2 ADC currently in development [18], has been reported to be approximately 80% (10% for ≥grade 3) [19]. The AE profile of ADCs is considered to be similar to those of chemotherapy. Therefore, ADCs, even molecular targeted agents, require the same level of AE management as chemotherapy. Steroid mouthwashes [20] and professional oral care [21] reduce the incidence of stomatitis. In addition to considering these treatments, the development of supportive care for stomatitis is an important issue.

Recently, the importance of patient-reported outcomes (PROs) in the perioperative period of breast cancer has been reported [22–24]. However, few studies have focused on patients with metastatic or recurrent breast cancer. In Japan, the PRO-MOTE study evaluating the benefit of PRO monitoring in patients with recurrent cancer, including breast cancer (UMIN000042447) and the PRO-DUCE study evaluating PRO monitoring in patients with breast cancer treated with T-DXd (jRCTs031200387) are ongoing and these results are expected.

This survey revealed the discrepancies between patients and physicians regarding perceptions of AEs, the impact of AEs from patients' perspective, and the information patients wanted to know about AEs. These findings are believed to contribute to reducing the burden on patients and to developing treatment and supportive care against AEs. However, achieving these medical advances requires knowledge-based clinical practice. Palaia et al. reported that in patients with iatrogenic menopausal due to salpingo-oophorectomy, hormone replacement therapy (HRT) not only improves menopausal symptoms but also improves long-term prognosis, and its clinical usefulness is clear [25, 26], however, HRT is rarely actually used in those patients, indicating a gap between theory and practice [27]. The findings from our survey also need to be reflected in clinical practice to reduce the gap between theory and practice in order to improve patients' QOL. Furthermore, currently, it is possible to reduce the risk of cancer through a combination of screening, vaccinations, lifestyle, and risk factor management [28]. Prevention aims to prevent the occurrence of cancer or to detect cancer early and provide effective treatment [28]. Early detection of cancer could help prevent physically demanding treatments and potentially reduce AEs. Therefore, we believe that in addition to cancer prevention, providing appropriate treatment and management of AEs will improve QOL of breast cancer patients.

The major three strengths of this survey are as follows: (1) collected detailed information from a large sample of 435 patients with breast cancer, (2) addressed a critical aspect of breast cancer treatment by focusing on the AEs that significantly impact patients' QOL, (3) demonstrated gaps between patients and physicians in the perception of AEs through a detailed analysis of 18 common AEs in breast cancer treatment.

This survey has the following limitations. First, as this was a web-based questionnaire survey, there is a possibility of selection bias related to information technology literacy. Therefore, the results of this study cannot be generalized to older breast cancer patients or those with low information technology literacy. Second, because this survey was conducted at a single point in time and was based on patients' responses based on their memories, recall bias and information bias cannot be ruled out. Third, this survey included patients diagnosed with breast cancer after 2002, the year when clinical application of trastuzumab, an anti-human epidermal growth factor receptor type 2 (HER2) monoclonal antibody, began in Japan. There is a possibility that the information provided to patients about cancer treatment as standard therapy might be different between the era around 2002 and the current. Fourth, this survey was conducted in Japan and may lack racial and geographic diversity. Fifth, patients with breast cancer who were treated with either chemotherapy, molecular targeted agents, or immune checkpoint inhibitors participated; therefore, the results cannot be generalized to all drug-treated patients. Sixth, this study was a self-reported questionnaire survey, and AEs were reported by patients themselves, not by medical records. Seventh, this survey was intended to investigate the relationship between financial anxiety and employment status but the life insurance was not considered.

Conclusion

The survey results showed that there are still several unmet medical needs due to inadequate solutions for AEs in breast cancer treatment. Furthermore, it became clear that patients' need for information about AEs tends to differ depending on the type of AE. It is up to the primary care physician to provide each patient with decision support. We believe that the results of this survey will contribute to advances in clinical research and breast cancer care.

Abbreviations

ADCs	Antibody-Drug Conjugates
AEs	Adverse Events
JPY	Japanese yen
QOL	Quality Of Life
WBC	White Blood Cell

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12905-024-03355-x.

Supplementary Material 1

Supplementary Material 2

Supplementary Material 3

Supplementary Material 4

Supplementary Material 5

Supplementary Material 6

Supplementary Material 7

Supplementary Material 8

Supplementary Material 9

Supplementary Material 10

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Author contributions

FH, RN, RM, TI, TY, AA, NS and SO contributed to the study design. FH, RN, RM, TI, TY, NS and SO contributed to questionnaire development, and interpretation. AN performed data collection and analysis. All authors revised the manuscript, approved the final version of the manuscript to be published, and agreed to be accountable for all aspects of the work.

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Data availability
The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.Corresponding author: Fumikata Hara.

Declarations

Ethics approval and consent to participate
The survey was approved by the Ethical Review Board (Medical Corporation TOUKEIKAI Kitamachi Clinic ERB) and conducted in accordance with the ethical principles of the Declaration of Helsinki (revised 2013) and in compliance with the Ethical Guidelines for Life Sciences and Medical Research Involving Human Subjects (revised 2022), and the Act on the Protection of Personal Information in Japan. Informed consent was obtained from all individual participants included in the survey via the web-based survey system.

Consent for publication
Not applicable.

Competing interests
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