

Health-related quality of life outcomes between non-steroid and steroid aromatase inhibitors and switching hormone therapy in postmenopausal women with ER+ breast cancer

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Abstract

Adjuvant hormone therapy can affect the quality of life of postmenopausal breast cancer patients with the estrogen receptor (ER+). This study aimed to measure the outcomes of health-related quality of life (HRQoL) in postmenopausal women with ER+ breast cancer receiving non-steroidal aromatase inhibitors (NSAI), steroidal aromatase inhibitors (SAI), and hormone change therapy (Switch). This cross-sectional study was conducted by interviewing women with postmenopausal ER+ breast cancer. The EQ-5D-5L instrument was used to measure and compare utility scores among patients who received NSAI, SAI, and switch therapy. As a result, the average utility score EQ-5D-5L for NSAI is 0.864 (SD = 0.117), significantly different ($p = 0.025$) from SAI 0.777 (SD = 0.211) and switch 0.776 (SD = 0.071). The conclusion is that NSAI, SAI, and Switch significantly affected HRQoL in postmenopausal breast cancer patients with ER+. NSAI has a better quality of life compared to SAI and Switch.

Keywords

aromatase inhibitors, breast cancer, EQ-5D-5L, ER+, HRQoL

Introduction

The fifth leading cause of death in the world is breast cancer. Breast cancer is diagnosed in more than 1.1 million women annually, accounting for 1.6% of fatalities (Belete et al. 2022). According to the World Health Organization (WHO), there will be 24 million more cancer deaths in 2035 (Moradinazar

et al. 2019). Breast cancer is the leading cause of cancer death in the Republic of Indonesia, with a mortality rate of 17.1 per 100,000 people, according to data from the Indonesian Ministry of Health for 2021. Most cancer patients in Indonesia are diagnosed at the age of 55 or older. However, about 19.22% and 0.79% of cancer cases occurred in patients aged 45 years and 18 years, respectively (Solikhah et al. 2022).

Numerous endocrine therapies are available, including progestins, luteinizing hormone-releasing hormone (LHRH) agonists, pure ER antagonists, non-steroidal and steroidal aromatase inhibitors, and selective estrogen receptor modulators (SERMs). These therapies are crucial in the treatment of breast cancer. With longer treatment durations, a growing number of breast cancer survivors, and an increase in the number of young women receiving this kind of care, the long-term effects of endocrine therapy are becoming more and more significant (Buijs et al. 2008).

In patients with hormone receptor-positive breast cancer, which represents 70% of total breast cancer, one of the mainstays of treatment is adjuvant hormone therapy (AHT), which can suppress hormone production (non-steroid aromatase inhibitors and steroid aromatase inhibitors) or interfere with hormone receptor signaling (selective estrogen receptor modulators) (Andreu et al. 2022). Hormone therapy reduces the chance of breast cancer recurrence by up to 40% and death by one-third. (Marschner et al. 2019) Aromatase inhibitor treatment lasts 5 to 10 years, so patients must deal with long-term medical interventions, potential side effects, and accompanying psychological discomfort, all of which can significantly impact the quality of life (QoL) (Marschner et al. 2019, Andreu et al. 2022). However, previous studies have focused more on breast cancer patients with HR+/HER2- (Mitra et al. 2016; Wood et al. 2017b; Criscitiello et al. 2021; Cardoso et al. 2024).

The primary goals of treatment for all breast cancer patients are tumor elimination and prevention of metastatic recurrence while maintaining quality of life (Criscitiello et al. 2021). Measuring patient quality of life is needed to improve health outcomes and evaluate therapeutic management (Setyowibowo et al. 2018a; Koboto et al. 2020b). This is done to contextualize the impact of the disease and the treatment given to the patient, which can make it easier to find information on problems affecting patient treatment, improve the healing process, determine treatment decisions, and serve as an economic evaluation of long-term research and the cost-effectiveness of new health technologies (Stefanovic et al. 2017; Riis et al. 2019). Furthermore, there is evidence that patient symptoms can affect HRQOL during treatment (Reed et al. 2012; Shin et al. 2016; Wood et al. 2017a, 2017b; Lazarewicz et al. 2019; Avis et al. 2020).

EuroQol-5 dimensions (EQ-5D-5L) were used in this study to evaluate the quality of life of breast cancer patients. The EQ-5D-5L questionnaire is a generic questionnaire that uses the utility of the set of values to determine the patient's health state. This questionnaire was created in Europe (developed by The EuroQol Group) and has since been used in many nations worldwide, including Indonesia. EQ-5D-5L comprises five domains and five patient condition levels (Devlin and Krabbe 2013). This questionnaire can also be used to assess the quality of life of breast cancer patients (Devlin and Krabbe 2013). An individual's response to components of his life, particularly bodily, mental, activity, and sociocultural, is referred to as his quality of life (Devlin and Krabbe 2013; Di Maio et

al. 2020). Data on health-related quality of life (HRQoL) can help with treatment recommendations in the future (Buijs et al. 2007). However, to date, real-world HRQOL data have typically focused on patients with advanced or metastatic breast cancer or included a limited cohort of patients with early-stage breast cancer (Reed et al. 2012; Shin et al. 2016; Hamer et al. 2017; Wood et al. 2017a, 2017b; Lazarewicz et al. 2019; Avis et al. 2020). Therefore, more extensive studies are needed in patients with early- and late-stage ER+ breast cancer. In particular, it is essential to evaluate HRQOL in disease-free patients who have undergone ER+ breast cancer surgery to better understand HRQOL at this critical stage of their treatment and to provide context for future evaluations. This study aimed to compare the quality of life of postmenopausal women with ER+ breast cancer who received NSAI, SAI, or Switch in Indonesia using the instrument of the EQ-5D-5L questionnaire.

Methods

Study design and participants

This study is a cross-sectional study conducted by interview using a standardized and validated assessment tool (EQ-5D-5L) in postmenopausal women with ER+ breast cancer who received NSAI, SAI, or Switch in Indonesia. Eighty-six patients met the inclusion and exclusion criteria as postmenopausal women with ER+ breast cancer aged 50–65 years who had undergone surgery, received systemic therapy in the form of chemotherapy and hormone therapy with NSAI, SAI, or Switch from 2015 to 2020, and were willing to participate in this research. Patients who agreed were given and signed informed consent before the interview began.

Data collection

Patients who met the inclusion criteria were interviewed between July and September 2021, and data from patient medical records were used to collect clinical data such as age, education, medical interventions, and health status. The Indonesian version of the EQ-5D-5L instrument was used to assess the patient's HRQOL. Because the EQ-5D-5L instrument is available in Indonesian (Grup Qol Euro 2021), the utility value (EQ-5D index score) in this study was derived using the set of Indonesian values (Purba et al. 2017). Descriptive analysis was used to provide HRQOL regarding patient health status, VAS, and utility scores. The data were analyzed anonymously.

Ethics

This study was approved by the Research Ethics Committee of Universitas Padjadjaran, Indonesia (approval number 823/UN6.KEP/EC/2020). Written informed consent was obtained from all study participants.

Measurement of health-related quality of life outcomes

The HRQOL results in postmenopausal women with ER+ breast cancer who received NSAI, SAI, or Switch were measured using EQ-5D-5L to measure preferences related to health status in these patients. The EQ-5D-5L instrument is administered to patients after or while undergoing hormone treatment or when this study ends and includes a descriptive system of five dimensions of quality of life: mobility, self-care, usual activities, pain or discomfort, anxiety, or depression. The elements also consist of a visual analog scale (VAS) at predetermined intervals. The EQ-5D-5L questionnaire is administered when the patient visits or controls the hospital or is performed during a visit to the patient's home. VAS scale scores are determined using values assigned to the Indonesian population from 0 to 100, where 0 is the worst and 100 is the best (Purba et al. 2017). The health status of postmenopausal women with ER+ breast cancer obtained through the EQ-5D-5L instrument is used to calculate the quality-adjusted life year (QALY) of patients who receive NSAI, SAI, or Switch, then compared between the three groups.

Statistical analysis

The data was analyzed using the IBM Statistical Package for Social Sciences (SPSS) version. Descriptive statistics were used to provide an overview of the characteristics of postmenopausal women with ER+ breast cancer. Individual data from EQ-5D-5L were used to calculate the percentage of problem levels on each quality-of-life dimension in postmenopausal female patients with ER+ breast cancer who received NSAI, SAI, or switch.

The utility index EQ-5D-5L and the EQ-VAS score by degree of disability in patients treated with NSAI, SAI,

or Switch are shown as median (bottom-upper quartile), mean, 95% confidence interval, standard deviation (SD), standard error (SE), and categorical variables expressed as frequencies and percentages. Cronbach's alpha was assessed for each scale to check the reliability of the scale's internal consistency. The Kolmogorov-Smirnov test contains the normality of continuous data. Differences in the mean health utility index for each characteristic of the patient given NSAI, SAI, or Switch were analyzed by univariate analysis of variance for normally distributed data, and differences in mean VAS values were analyzed using the non-parametric Kruskal-Wallis test for data not normally distributed. A p-value of 0.05 was used to assess the degree of significance. A multiple correlation test was used to examine the degree of proximity (simultaneous) link between all independent variables (age, education, clinical stage, health status, and adjuvant hormones) on the utility score. Furthermore, Spearman's correlation coefficient was utilized to determine the level of relationship between all scales.

Results

Characteristics of the patients

Eighty-six breast cancer patients met the inclusion and exclusion criteria and were willing to complete the EQ-5D-5L questionnaire to measure their quality of life. Table 1 shows the characteristics of breast cancer patients. There were 44 (51.16%) breast cancer patients who received NSAI, 26 (30.23%) patients who received SAI, and 16 (18.60%) patients who received switch therapy. The age of most patients with ER+ breast cancer is in the 50–55 age range, with several patients, as many as 38 (44.2%), the highest level of patient education is high school, as many

Table 1. Characteristics of the participants.

Characteristics	All samples (n = 86)	NSAI (n = 44)	SAI (n = 26)	Switch (n = 16)
	n (%)	n (%)	n (%)	n (%)
Age (years)				
50–55	38 (44.2)	19 (43.2)	11 (42.3)	8 (50.0)
56–60	32 (37.2)	16 (36.4)	9 (34.6)	7 (43.8)
> 60	16 (18.6)	9 (20.5)	6 (23.1)	1 (6.3)
Education				
Elementary school	15 (17.4)	7 (15.9)	4 (15.4)	4 (25.0)
Secondary school	14 (16.3)	7 (15.9)	4 (15.4)	3 (18.8)
High school	43 (50.0)	22 (50.0)	16 (61.5)	5 (31.3)
University	14 (16.3)	8 (18.2)	2 (7.7)	4 (25.0)
Clinical stage				
I	2 (2.3)	–	2 (7.7)	–
IIa	2 (2.3)	2 (4.5)	–	–
IIb	16 (18.6)	11 (25.0)	3 (11.5)	2 (12.5)
IIIa	42 (48.8)	23 (52.3)	12 (46.2)	7 (43.8)
IIIb	24 (27.9)	8 (18.2)	9 (34.6)	7 (43.8)
State of health				
Disease-free survival	54 (62.8)	31 (70.5)	14 (53.8)	9 (56.3)
Relapsed	32 (37.2)	13 (29.5)	12 (46.2)	7 (43.8)

Note: NSAI = non-steroid aromatase inhibitors; SAI = steroid aromatase inhibitors; Switch = switch adjuvant hormone therapy.

*descriptive statistic test.

as 43 (50.0%) people, and the most patients are in stage IIIa, as many as 42 (48.8%). Based on health status, the most common disease is disease-free survival for up to 54 (62.8%) people.

EQ-5D-5L dimensions

The frequency of responses for each item on the EQ-5D-5L dimension is shown in Table 2, and the distribution of the five levels is shown in Fig. 1. The distribution of patients with no problem answers in all dimensions of EQ-5D is mobility 87.2%, self-care 94.2%, usual activities 82.6%, pain or discomfort 37.2%, and anxiety or depression 26.7%. The proportion of patients who reported having a slight problem at a subtle level was in the anxiety or depression dimension (44.2%), followed by the pain or discomfort dimension (41.9%), usual activities (16.3%), mobility (10.5%), and self-care (4.7%). The proportion of patients who reported having problems at a moderate level was anxiety or depression (25.6%), pain or discomfort (20.9%), mobility, self-care, and usual activities (1.2%). Patients who reported having problems with severe levels were in anxiety or depression (3.5%), and 1.2% were unable to walk on the mobility dimension.

EQ-5D-5L and EQ-VAS scores

Based on Table 3, the average utility score of EQ-5D-5L for NSAI is 0.864 (SD = 0.117), and the average score of EQ-VAS is 83.11 (SD = 9.578). The average utility score EQ-5D-5L for SAI and Switch was 0.777 (SD = 0.211) and 0.776 (SD = 0.071), respectively, and the mean scores for SAI and Switch EQ-VAS were 76.35 (SD = 10.822) and 76.25 (SD = 7.416).

Table 4 shows the utility scores for EQ-5D-5L and the VAS scores for each categorical variable. The EQ-5D-5L utility score in the age category shows that patients aged 50 to 55 years have an average utility score of 0.832 (SD = 0.188) with an average VAS score of 81.37 (SD = 9.730), higher than those aged 56 to 60 years and older than 60 years. Patients with a university education level had significantly the highest average score, with an average utility score of 0.856 (SD = 0.109) and an average VAS score of 83.21 (SD = 10.489). Patients with clinical stage I at diagnosis had the highest average score, with an average utility score of 0.910 (SD = 0.127) and an average VAS score of 90.00 (0.000). The mean utility score for disease-free survival was the highest in the health status of postmenopausal breast cancer patients, namely 0.844 (SD = 0.176), and the highest average VAS score was 82.57 (SD = 0.076).

Table 2. Self-reported health response frequencies of the items in each dimension of EQ-5D-5L.

Dimension		All samples (n = 86)	NSAI (n = 44)	SAI (n = 26)	SWITCH (n = 16)
		n (%)	n (%)	n (%)	n (%)
Mobility					
1	No problems	75 (87.2)	41 (93.2)	22 (84.6)	12 (75.0)
2	Slight problems	9 (10.5)	3 (6.8)	2 (7.7)	4 (25.0)
3	Moderate problems	1 (1.2)	–	1 (3.8)	–
4	Severe problems	–	–	–	–
5	Unable to walk around	1 (1.2)	–	1 (3.8)	–
Self-care					
1	No problems	81 (94.2)	42 (95.5)	23 (88.5)	16 (100.0)
2	Slight problems	4 (4.7)	2 (4.5)	2 (7.7)	–
3	Moderate problems	1 (1.2)	–	1 (3.8)	–
4	Severe problems	–	–	–	–
5	Unable to wash or dress	–	–	–	–
Usual Activities					
1	No problems	71 (82.6)	39 (88.6)	21 (80.8)	11 (68.8)
2	Slight problems	14 (16.3)	4 (9.1)	5 (19.2)	5 (31.3)
3	Moderate problems	1 (1.2)	1 (2.3)	–	–
4	Severe problems	–	–	–	–
5	Unable to do usual activities.	–	–	–	–
Pain/discomfort					
1	No pain/discomfort	32 (37.2)	19 (43.2)	9 (34.6)	4 (25.0)
2	Slight pain/discomfort	36 (41.9)	18 (40.9)	11 (42.3)	7 (43.8)
3	Moderate pain/discomfort	18 (20.9)	7 (15.9)	6 (23.1)	5 (31.3)
4	Severe pain/discomfort	–	–	–	–
5	Extreme pain/discomfort	–	–	–	–
Anxiety/depression					
1	No anxiety/depressed	23 (26.7)	16 (36.4)	4 (15.4)	3 (18.8)
2	Slightly anxious/depressed	38 (44.2)	21 (47.7)	14 (53.8)	3 (18.8)
3	Moderate anxious/depressed	22 (25.6)	7 (15.9)	5 (19.3)	10 (62.5)
4	Severe anxious/depressed	3 (3.5)	–	3 (11.5)	–
5	Extreme anxious/depressed	–	–	–	–

Note: NSAI = non-steroid aromatase inhibitors; SAI = steroid aromatase inhibitors; SWITCH = switch adjuvant hormone therapy.

*descriptive statistic test

Table 3. EQ-5D-5L and EQ-VAS scores, based on adjuvant hormone therapy.

Adjuvant hormone therapy	EQ-5D-5L scores						VAS scores					
	Mean	SD	95% CI of mean		SE	p-value	Mean	SD	95% CI of mean		SE	p-value
			Lower	Upper					Lower	Upper		
NSAI (n = 44)	0.864	0.117	0.829	0.900	0.017	0.025*	83.11	9.578	80.20	86.03	1.444	0.007*
SAI (n = 26)	0.777	0.211	0.691	0.862	0.041		76.35	10.822	71.98	80.72	2.122	
Switch (n = 16)	0.776	0.071	0.738	0.814	0.017		76.25	7.416	72.30	80.20	1.854	

Note: NSAI = non-steroid aromatase inhibitors; SAI = steroid aromatase inhibitors; Switch = adjuvant hormone therapy change.
 *descriptive statistic test; analysed using Univariate Analysis of Variance; and Kruskal-Wallis test; correlation is significant at the 0,05 level (*p ≤ 0,05)

Table 4. EQ-5D-5L and EQ-VAS scores, according to patient characteristics.

Characteristics	EQ-5D-5L scores						VAS scores					
	Mean	SD	95% CI of mean		SE	p-value	Mean	SD	95% CI of mean		SE	p-value
			Lower	Upper					Lower	Upper		
Age (years)												
50–55	0.832	0.188	0.770	0.894	0.031	0.257	81.37	9.730	78.17	84.57	1.578	0.228
56–60	0.815	0.099	0.779	0.851	0.018		77.50	9.791	73.97	81.03	1.731	
> 60	0.810	0.147	0.732	0.888	0.037		80.63	11.383	74.56	86.69	2.846	
Education												
Elementary school	0.718	0.143	0.639	0.797	0.037	0.000*	74.67	8.550	69.93	79.40	2.207	0.040*
Secondary school	0.805	0.077	0.760	0.849	0.021		77.14	11.387	70.57	83.72	3.043	
High school	0.852	0.169	0.799	0.904	0.026		81.33	9.506	78.40	84.25	1.450	
University	0.856	0.109	0.793	0.919	0.029		83.21	10.489	77.16	89.27	2.803	
Clinical stage												
I	0.910	0.127	-0.234	2.054	0.090	0.215	90.00	0.000	90.00	90.00	0.000	0.154
Ia	0.878	0.061	0.332	1.424	0.043		87.50	3.536	55.73	119.27	2.500	
Ib	0.848	0.098	0.796	0.900	0.025		80.81	9.676	75.66	85.97	2.419	
IIa	0.839	0.138	0.796	0.882	0.021		80.00	10.592	76.70	83.30	1.634	
IIb	0.761	0.195	0.679	0.843	0.039		77.25	9.723	73.14	81.36	1.985	
State of health												
Disease-free survival	0.844	0.176	0.796	0.892	0.024	0.076	82.57	10.069	79.83	85.32	1.370	0.001*
Relapsed	0.784	0.087	0.753	0.815	0.015		75.09	8.414	72.06	78.13	1.487	
Died	-	-	-	-	-		-	-	-	-	-	

Note. NSAI = non-steroid aromatase inhibitors; SAI = steroid aromatase inhibitors; SWITCH = switch adjuvant hormone therapy.
 *Descriptive statistic test; analyzed using univariate analysis of Variance and Kruskal-Wallis test; correlation is significant at the 0.05 level (*p ≤ 0.05).

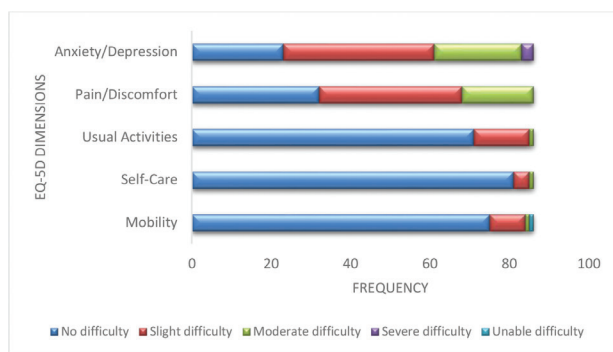


Figure 1. The distribution of five levels in EQ-5D among the respondents.

Based on the boxplot in Fig. 2, most of the middle scores show: 1) the NSAI utility score is in the range 0.813–0.980, with a maximum score of 1.000 and a minimum score of 0.450 and a variance value of 0.014; 2) the SAI utility score is in the range 0.728–0.857, with a maximum score of 1.000 and a minimum score of -0.072, and a variance value of 0.045; 3) the Switch utility score is in the range 0.710–0.822, with a maximum score of 0.921 and a minimum score of 0.661, and a variance value of 0.005.

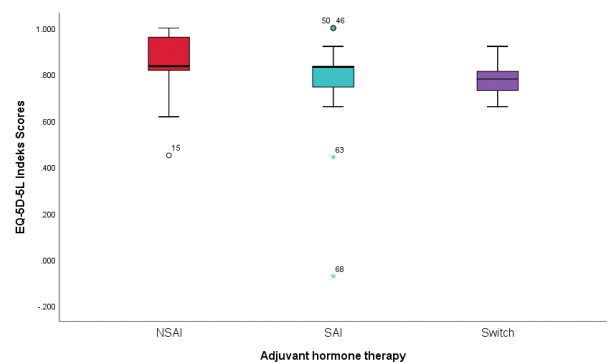


Figure 2. Median EQ-5D-5L scores based on adjuvant hormone therapy.

Variable relationship with a health utility score

The relationship of all variables (age, education, clinical stage, health status, and adjuvant hormone therapy) with the statistics-based health utility score shows a significant value (Sig. Change in F Change = 0.001), with a Pearson’s correlation value of R = 0.465. The correlation between age and utility score has a significant value of 0.247 (more than 0.05)

and a correlation coefficient of -0.126. The correlation between education and utility scores has a substantial value of 0.000 (less than 0.05) with a coefficient of 0.421. The respective correlations of clinical stage, health state, and hormone therapy adjuvant to the utility score had significant values of 0.007, 0.002, and 0.000 (all less than 0.05), with correlation coefficients of -0.291, -0.330, and -0.385, respectively.

Table 5. Relationship between variables and health utility scores.

Variable	Sig. (2-tailed)	Correlation-coefficient
Age	0.247	-0.126
Education	0.000	0.421
Clinical stage	0.007	-0.291
State of health	0.002	-0.330
Hormon adjuvant	0.000	-0.385

* Spearman test

Discussion

This is the first study using EQ-5D-5L to evaluate HRQoL of patients with breast cancer + ER in postmenopausal women in one of the national referral hospitals in Indonesia. These results provide insight into the differences in the quality of life of postmenopausal patients with ER+ breast cancer who received NSAI, SAI, or switch. Previous studies have shown that EQ-5D-5L is an acceptable instrument for health status in Indonesia (Purba et al. 2017, Setyowibowo et al. 2018b). As we all know, using non-Indonesian preference weights can lead to biased estimates when conducting Indonesian cost-utility analysis, possibly due to cultural differences (Su et al. 2019). The availability of Indonesian preferences made the EQ-5D-5L a perfect fit for this study. Valid health utility values of postmenopausal women with ER+ breast cancer can provide essential baseline data for the cost-utility analysis of ER+ breast cancer in postmenopausal women in a referral hospital in Indonesia.

This study found that the majority of patients with ER+ breast cancer (44.2%) were between the ages of 50 and 55, which is consistent with a study that found that the incidence of breast cancer increases with age and peaks between the ages of 50 and 55 (Widodo et al. 2017; Cheng et al. 2018; Anwar et al. 2019). According to one study, the average age of patients diagnosed with breast cancer was 55.52 years (Leong et al. 2010; Ou et al. 2019). In this study, the highest degree of education among patients with ER+ breast cancer was high school (50.0%). Patients' level of education is related to their knowledge about a condition and health behavior, both in terms of applying a healthy lifestyle to prevent health risks (breast cancer) and knowledge activities in detecting breast cancer (Toulasik et al. 2019). Most patients (48.8%) were at stage IIIa of the disease. This is because people tend to seek health facilities after experiencing disturbing health complaints; ignorance is the main reason for delay and noncompliance with treatment; and the government does not have an organized screening program, so breast cancer has entered

the category of advanced-stage breast cancer (Toulasik et al. 2019; Nsaful et al. 2022; Fernandes et al. 2023).

Descriptive statistics show that the differences in the number or percentage of patients who did not have problems with the self-care dimension of adjuvant hormone therapy were NSAI 42 (95.5%), SAI 23 (88.5%), and Switch 16 (100%). This study aligns with a study that reported the highest number in the self-care dimension (62.5%), with the answer being no problem (Wallwiener et al. 2016). The proportion of patients who reported having the highest problem was in the anxiety or depression dimension. The difference in the number or percentage level of small anxious or depressed patients on adjuvant hormone therapy was NSAI 21 (47.7%), SAI 14 (53.8%), and Switch 3 (18.8%). A study reported that 81 (47.6%) had problems in the anxiety or depression dimension (Abu Farha et al. 2017), and another study reported that 58% said they had mild to moderate anxiety or depression (Wallwiener et al. 2016). The EQ-5D-5L questionnaire identifies pain and anxiety or depression as significant stressors. This condition is caused by the side effects of therapy and hair loss (Wallwiener et al. 2016). There is one patient (1.2%) who was unable to walk in the mobility dimension, namely on adjuvant hormone therapy with SAI 1 (3.8%). Pain and insomnia are the domains of quality of life most affected in patients with breast cancer (Yusoff et al. 2022).

NSAI has an average utility score of EQ-5D-5L of 0.864, significantly (0.025), making it the highest average utility score compared to the average utility score in SAI of 0.777 and Switch of 0.776. Likewise, the average VAS score of 83.11 for NSAI is significantly higher (0.007) than the average VAS score of 76.35 for SAI and 76.25 for Switch. A study says the NSAI has a QALY value of 11.12, higher than the SAI of 9.9124 (Hind et al. 2007). Research with different results states that NSAI has a QALY value of 1,447 for letrozole and 1,496 for anastrozole, less than the SAI QALY value of 1,608 for exemestane (Sabale et al. 2017).

The utility score EQ-5D-5L with age 50–55 has a higher average utility score and VAS than age 56–60 and age >60, but it is not significantly different ($p = 0.257$). In a study, the results showed that patients aged 50 to 59 had a utility value of 0.91 and a VAS value of 89.35, higher than patients who were younger (aged 30–39) and older (aged 60–69 and > 70) (Yusoff et al. 2022). Patients with a university education level had significantly the highest mean utility score of 0.856 ($p = 0.000$) and an average VAS score of 83.21 ($p = 0.040$). This research is supported by research that shows a significant difference between patients with high levels of education who have a better quality of life than patients with low levels of education because they have better access to information sources (Liu et al. 2017; Park et al. 2011). Breast cancer patients with elementary to high school education levels showed lower quality of life results than patients with higher education than high school ($p = 0.012$) (Mursyid et al. 2019). Patients with clinical stage I at diagnosis

had the highest mean utility and VAS scores but were not significantly different ($p = 0.215$). The results of this study are supported by research results that state that patients with stage 1 breast cancer have a utility value of 0.72 (0.55–0.85), which is better compared to patients with advanced stages, who have a utility value of 0.67 (0.51–0.81) (Abu Farha et al. 2017). The cancer stage is directly related to the patient's quality of life. Patients with advanced-stage cancer will have more physically severe problems compared to patients with early-stage cancer. These problems can then affect the psychological aspects of the patient, causing the patient's quality of life to decrease (Rudiyo et al. 2012). This study produced an average utility score for disease-free survival of 0.844 (SD = 0.176), which aligns with a study that obtained an average utility score for disease-free survival of 0.850 (Djalalov et al. 2015). This study's average utility score for recurrence was 0.784 (SD = 0.087), in line with a study that produced an average utility score for locoregional, including contralateral recurrence, of 0.72530 (Djalalov et al. 2015). Based on group representation: 1) NSAI has a group with a majority of medium- to high-utility scores; 2) SAI has a group with a majority of medium- to low-utility scores; 3) Switch has groups with lower middle and upper middle utility scores. Based on this, NSAI has higher uniformity in the middle group. Thus, boxplots can better visualize the majority group.

The relationship of all variables (age, education, clinical stage, health status, and adjuvant hormone therapy) with the statistics-based health utility score shows a significant value (Sig. Change in F Change = 0.001), which means that there is a correlation between all variables simultaneously on the utility score. The Pearson correlation value is $R = 0.465$, which means that the level of correlation between all variables simultaneously on the utility score has a moderate correlation category.

There is no significant correlation (0.247) between age and utility score for breast cancer patients. This result is consistent with research that shows that age has no significant correlation with quality of life ($p = 0.826$) (Park et al. 2011). The strength of the correlation between age and utility score is weak (-0.126), and the relationship between age and utility score is not unidirectional. There is a significant correlation (0.000) between education and utility scores for people with breast cancer. The strength of the correlation between education and utility scores is sufficient (0.421), and the relationship between education and utility scores is unidirectional. Different results stated that education was not significantly correlated with quality of life ($p = 0.81$) (Yusoff et al. 2022). There is a significant correlation (0.007, 0.002, and 0.000) between clinical stage, health state, and adjuvant hormone therapy and the utility scores of breast cancer patients. The correlation coefficients are -0.291, -0.330, and -0.385, respectively, meaning that the strength of the correlation between clinical stage, health state, and the adjuvant of hormone therapy to the utility score is sufficient, and the correlation is not unidirectional.

Different results state that the cancer stage does not correlate significantly with quality of life ($p = 0.125$) (Abu Farha et al. 2017).

One limitation of the evaluation is that while the EQ-5D-5L is a reliable instrument for assessing HRQoL, it may lack the sensitivity needed to fully capture all the nuances of HRQoL that are specific to breast cancer patients, especially regarding the particular side effects of hormone therapy. This study may only measure health-related quality of life (HRQoL) at a specific time, so it does not capture the long-term changes in HRQoL that may occur during and after hormone therapy.

Conclusion

The findings of this study indicate that many patients with breast cancer do not have problems in the self-care dimension. However, there are the most significant problems on the anxiety or depression dimension, especially in SAI with a slightly anxious or depressed level. The results of this study provide data on NSAI, which has significantly the highest average utility score of EQ-5D-5L and EQ-VAS compared to SAI and switch hormone therapy.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statements

The authors declared that no clinical trials were used in the present study.

The authors declared that no experiments on humans or human tissues were performed for the present study.

The authors declared that no informed consent was obtained from the humans, donors or donors' representatives participating in the study.

The authors declared that no experiments on animals were performed for the present study.

The authors declared that no commercially available immortalised human and animal cell lines were used in the present study.

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Data availability

All of the data that support the findings of this study are available in the main text.

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