

## RESEARCH ARTICLE

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# Cost-Effectiveness Analysis of Two Chemotherapy Regiments FAC vs. Taxane for Operable Breast Cancer Patients in Indonesia

Agusdini Banun Saptaningsih<sup>1</sup>, Umi Sa'adatun Nikmah<sup>2</sup>, Teguh Aryandono<sup>3</sup>, Iwan Dwiprahasto<sup>4</sup>, Jarir At Thobari<sup>2,4\*</sup>

## Abstract

**Background:** Breast cancer is the deadliest cancer among women worldwide including Indonesia. Both FAC and Taxane-based chemotherapies are often used for patients with early node-positive breast cancer. However, the study regarding the cost-effectiveness of those regiments is still rare. This study aims to analyze the cost-effectiveness of Taxane versus FAC in the Indonesia setting. **Methods:** Twenty-four patients with stage I-IIIa breast cancer who had received surgery, FAC or Taxane-based adjuvant chemotherapy, and radiation were included in this study. Health-related quality of life was assessed using INA-BCHRQoL. INA-BCHRQoL was mapped to the EuroQoL 5D (EQ-5D) index calculator to get the utility score. All direct cost was retrieved from electronic medical records and hospital information system. Whereas, a questionnaire was designed to collect information about society cost from patients. ICER was counted to summarize the cost-effectiveness of two chemotherapy regiments (Taxane versus FAC). A sensitivity analysis was done to assess the uncertainty result. **Results:** The results showed there was no significant difference between the score of quality of life and utility in respondents who received FAC chemotherapy and Taxane-based chemotherapy. However, in terms of cost, Taxane was 6.5 times higher than the FAC group per patient for chemotherapy drugs only. Moreover, the total cost of treatments in Taxane-based chemotherapy was approximately 3.7 times more costly than the counterpart in the FAC arm ( $p=0.000$ ). Taxane-based chemotherapy dominated with ICER IDR 765.213.092 per QALY gained. Overall, FAC was found more cost-effective compared to the Taxane regiment. **Conclusion:** FAC represents the value of money compared to Taxane-based for breast cancer patients with stage I-IIIa in Indonesia.

**Keywords:** Breast cancer- chemotherapy- cost-effectiveness- FAC- Taxane

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## Introduction

Breast cancer is the most frequent cancer occurred and highest cause of cancer-related death among women worldwide including Indonesia (Ferlay et al., 2013). Indonesia is recognized as the top 10 and top 5 highest for breast cancer-related incidence and mortality in the world, consecutively (Ferlay et al., 2013). Moreover, the age-standardized breast cancer incidence rate and the mortality rate increased recently to 42.1 and 17.0 per 100,000, respectively (Ferlay et al., 2019).

Breast cancer in Indonesia is mostly detected in the advanced stages of cancer (Ng et al., 2011). Since metastatic breast cancer is incurable, managing disease using surgery, chemotherapy, and or radiotherapy is significantly important in prolonging survival and

improving patient's quality of life (Cherny et al., 2018; Cardoso et al., 2017). A study showed that adjuvant therapy decreases the risk of relapse and death from breast cancer (Early Breast Cancer Trialists' Collaborative Group, 2005).

Cancer can cause several complications and has different effects on the quality of life. Also, studies showed that each chemotherapy treatment with different doses has different effects on patients' utility (Hornberger and Best, 2005). Consequently, the current intervention on breast cancer should not only focus on disease control but also to sustain and improve the QOL of women with breast cancer. The adoption of different chemotherapy regimens for patients with breast cancer into oncologic practice should benefit not only clinically but also economic impacts on cancer management (Shih and Halpern, 2008).

<sup>1</sup>Directorate of Pharmaceutical Production and Distribution, Directorate General of Pharmaceuticals and Medical Devices, Ministry of Health of the Republic of Indonesia, Indonesia. <sup>2</sup>Clinical Epidemiology and Biostatistics Unit (CE&BU), Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Indonesia. <sup>3</sup>Department of Surgery, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Indonesia. <sup>4</sup>Department of Pharmacology and Therapy, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Indonesia. \*For Correspondence: j.atthobari@ugm.ac.id

Indonesia faces the challenge of increasing health expenditures, as nominal health spending has been steadily increasing in the last eight years, by 222% overall (Mahendradhata et al., 2017). Thus, evaluating cost-effectiveness is critical in creating reasonable trade-off decisions among sustainable access to such effective health technology which could improve existence and the limited health budget, especially for resource-constrained countries such as Indonesia. Both FAC and Taxane-based chemotherapies are often used for patients with early-stage breast cancer in Indonesia (Ng et al., 2011; Aragon and Fitria, 2015). The cost-effectiveness of FAC and Taxane have been proven in many studies (Rapoport et al., 2007; Lee et al., 2009; Bastani and Kiadaliri, 2012), however, those findings do not automatically apply to Indonesia. The differences in patient and population characteristics and health care systems between countries exist. Furthermore, only a few cost-effectiveness analyses have been conducted in Indonesia which compared chemotherapy regimens among breast cancer patients. Therefore, we did an economic evaluation to observe the cost-effectiveness of adjuvant chemotherapy with FAC comparative to Taxane in terms of cost per quality-adjusted life-year (QALY) gained.

## Materials and Methods

### Model overview

This is an economic evaluation study done to evaluate the cost-effectiveness analysis of Taxane and FAC in breast cancer patients. This study applied the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist (Additional file 1). In order to model the short-term cost-effectiveness of FAC versus Taxane, a 2-year time horizon of Decision Tree (DT) model was used (Figure 1).

### Study Settings and Study Populations

All patients with stage I-IIIa breast cancer who had undergone surgery, FAC or Taxane-based adjuvant chemotherapy, and radiation were included in this study. The study was done between January 2011 and December 2012 at Dharmas National Cancer Hospital, Indonesia. This hospital is known as a top referral cancer hospital and provides a major research and education facility in Indonesia (Mardela et al., 2017). We studied patients with these two regimens which are mostly used in Indonesia particularly this hospital.

### Inclusion and Exclusion Criteria

The inclusion criteria for the study population were women who were diagnosed with breast cancer stage I to IIIa, confirmed by pathology and anatomy (PA) assessment or cytology test, received surgery combined with fluorouracil, Doxorubicin and cyclophosphamide (FAC)- or Taxane-based chemotherapy. These two regimens were the most used in Indonesia particularly this hospital. The exclusion criteria were patients who were in the middle of their scheduled radiation treatment or refused to participate in this study.

### Outcome Measurement

Quality-Adjusted Life Years (QALY) was used as a health outcome measured in this study. Overall, -before treatment, at the end of chemotherapy, and after radiation-, the HRQoL of patients was evaluated by seven trained interviewers using a questionnaire of Indonesia Breast Cancer Health-Related Quality of Life (INA-BCHRQoL) which was validated previously. The INA-BCHRQoL questionnaire was developed by incorporating not only the generic variables such as physical, psychological, and social but also spiritual variables as it is suitable for the Indonesian population in order to provide a comprehensive HRQoL measurement for breast cancer patients (Septianingsih et al., 2018). As the scores in INA-BCHRQoL were not utility-based, these scores were mapped to EuroQoL 5D (EQ-5D) index calculator using equations in score utility developing country (Zimbabwe) and score utility developed country (Japan) (EuroQol Research Foundation, 2018). Life year gain was calculated using a breast cancer treatment outcome calculator. Then, differences in utility scores between different points of time were calculated and multiplied in a related time period to get QALY gained for each group.

### Cost Measurement

Total health care costs were estimated from a payer perspective for each medical claim paid according to clinical pathways. We measured total cost including the direct cost (treatment/ medical cost) and indirect cost (non-medical cost). Direct cost comprised of adjuvant therapy, other relevant drugs, physicians' visits, consultation with other specialists, hematological and radiological exams, and admissions in the hospital during the treatment. Whereas, indirect cost i.e society cost comprised of waiting cost, production cost, and transportation. The direct cost was retrieved from electronic medical records and hospital information systems. Whereas, a questionnaire was designed to collect information about society cost from patient. The time horizon of the study was 24 months and all data were gathered for this period. All costs are expressed in Indonesian Rupiah by 2012 currency rate (1 rupiah: 0.000071 USD). Cost data is based on sources assessed between 2011 and 2012, hence there is no need for adjusting unit costs and using discount rate.

### Incremental Cost-Effectiveness Ratio

The use of incremental cost-effectiveness ratios enables the cost of achieving a health benefit by treatment to be assessed compared to similar ratios calculated for other health interventions. Having measured and valued the costs and outcomes, the incremental cost-effectiveness ratio (ICER) was calculated as follows:

$$\text{ICER} = \frac{\text{Cost Taxane} - \text{Cost FAC}}{\text{QALY Taxane} - \text{QALY FAC}}$$

In the nominator, the differences in average costs per patient in the two groups were calculated. This figure, then, was divided on differences in QALY between two groups to get the cost per QALY gained of Taxane compared with FAC.

### Sensitivity Analysis

Uncertainty in costs and utility measurement was assessed for alternative utility weight allocation scenarios. To assess the robustness of the study results, a sensitivity analysis was performed.

## Results

### Characteristics of Participants

Twenty-four patients (10 FAC-based chemotherapy and 14 taxane-based chemotherapy) were included in the main study from January 2011 until December 2012. In the FAC group, most of the patients (90%) aged 40 years and above, had lower education level (60% had high school or lower diploma) while patients in the Taxane-based combination therapy apparently have different characteristics as most of them were older than 40 years old (79%) and had a higher education level (64%). However, most of the patients are housewife for both groups (60% for FAC-based-group and 50% for the Taxane-based group) (Table 1). In the clinical aspect, the patients on the FAC-based group were mostly diagnosed at the stage of IIB (50%) while in the Taxane-based group most of them were diagnosed at the stage of IIIA, however, both groups mostly received Modified Radical Mastectomy (MRM) and didn't have health insurance.

Table 2 showed that the cost of treatment of the Taxane-based group was higher compared to the counter group (FAC). The length of stay of patients in the Taxane group was found longer compared to FAC groups.

Table 3 shows the total cost of drugs consumed in both treatment groups. Overall, chemotherapy drug was found as the main component of the total cost of drug treatments of breast cancer patients. The taxane group was approximately 3.7 times more costly than the counterpart in the FAC arm. Moreover, in terms of the chemotherapy drugs only, the cost of the Taxane group was 6.5 times the FAC group per patient. It can be seen from Table 3 in both groups, that these cost differences were found statistically significant ( $p=0.000$ ). Table 4 shows that society's cost including transportation, productivity, and waiting cost of

Table 1. Patient's Characteristic

Patient's Characteristic	FAC (n=10)	Taxane (n=14)	Total (n=24)
Age			
< 40	1 (10)	3 (21)	4 (17)
≥ 40	9 (90)	11 (79)	20 (83)
Education level (%)			
< High school	6 (60)	5 (36)	11 (46)
> high school	4 (40)	9 (64)	13 (54)
Stadium (%)			
I	0 (0)	1 (7)	1 (4)
IIA	2 (20)	4 (29)	6 (25)
IIB	5 (50)	4 (29)	9 (38)
IIIA	3 (30)	5 (35)	8 (33)
Occupation (%)			
Housewife	6 (60)	7 (50)	13 (54)
Private sector	1 (10)	3 (21)	4 (17)
Public sector	3 (30)	4 (29)	7 (29)
Types of surgery			
MRM	5 (50)	8 (57)	13 (54)
Mastectomy	2 (20)	3 (21)	5 (21)
BCT	3 (30)	3 (21)	6 (25)
Payer			
JPS/Gakin	6 (60)	7 (50)	13 (54)
Askes/Jamkesmas	4 (40)	6 (43)	10 (42)
Others	0 (0)	1 (7)	1 (4)

the Taxane group was 2.5 times higher compared to the counterpart in the FAC group.

### Quality of Life and Utility Score

Table 5 shows the mean values of INA-BCHRQoL scores which were used to map to EQ-5D in a developing country and developed country. Before the onset of treatment in two groups, the INA-BCHRQoL score in the FAC group was lower in physical and social domains but

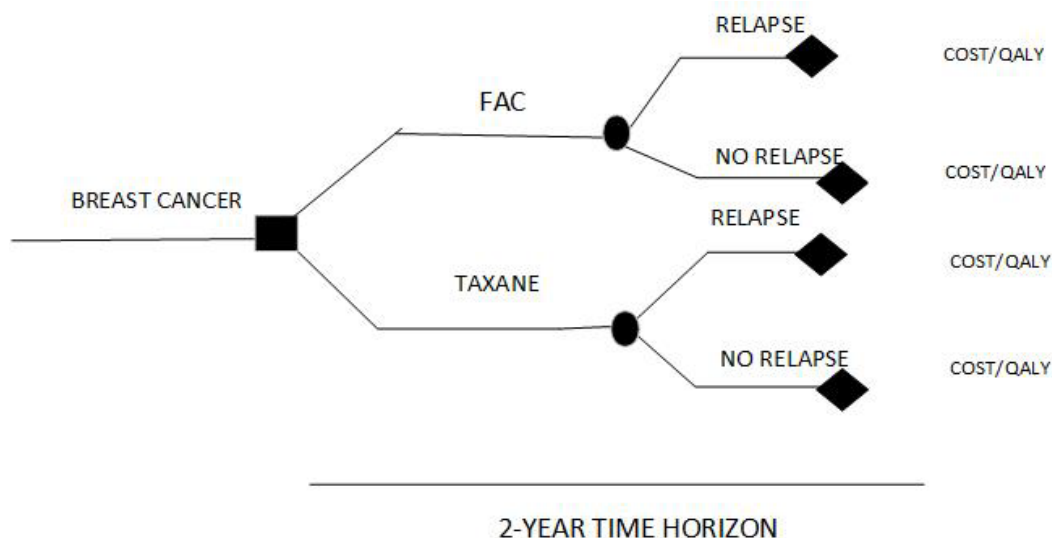


Figure 1. Decision Tree Model of Breast Cancer

Table 2. The Total Cost of Treatments

Cost Component	Cost of Treatment (IDR)				p-value
	FAC	%	TAXANE	%	
Administration	204.9±370.57		1391.9 ± 1833.3257		0.059
Registration	368.3±126.89		503.8 ± 348.0041		0.256
Diagnostic Procedure	8282±22564.44		10089.6 ± 6085.0912		0.38
Clinical Pathology	3052	0.37	3,373,202	0.35	
Anatomical Pathology	2127	0.26	2,811,071	0.26	
Radiological Pathology	2536	0.31	3,736,605	0.32	
Visits during a chemotherapy cycle	6208.2±1861.78		7840.3 ± 3728.4806		0.217
Consults with the other specialists	2883	0.46	3846.3		
Doctors	1961.78	0.32	2,845,157		
Pharmacist	1364	0.22	1,148,886		
Hospitalization	134.25±965.71		3299.9 ± 2917.2524		0.054
Inpatient	1343		3,484,154	0.979	
Outpatient			226,175	0.021	
Medical procedures	34756.2±9392.79		38553.3 ± 13356.654		0.449
Surgery	15435.54	0.444	16577.72	0.430	
Radiotherapy	19025	0.547	21095	0.547	
Rehabilitation	69.44	0.002	569.95	0.015	
Blood bank	1138.78	0.007	695	0.005	

was higher than the Taxane group in psychological and spiritual domains. Both groups experienced deprivation after chemotherapy. However, after radiotherapy, the patients in both groups had improvements in their utility and reached the same level as before the chemotherapy. In repeated measures analysis which measured the time effects, the changes in physical, psychological, and spiritual domain and utilities score in both groups were found significant ( $p < 0.05$ ) (Figure 2). A similar trend was found in both groups. Nevertheless, as can be seen from Table 5, there were no significant differences in INA-BCHRQoL scores in all dimensions and utility

values between two groups before and after chemotherapy ( $p > 0.05$ ).

*Cost-Effectiveness Analysis*

Life year gain (LYG) in the Taxane group was found slightly higher compared to the FAC group (6.62 vs 6.35). In contrast, the utility score of the Taxane group based on EQ5D-mapping was less compared to the counter group (0.69 vs 0.71). As a result, the QALY of Taxane was slightly higher compared to the FAC group (4.60 vs 4.48). Table 6 showed that cost/QALY of FAC arm was IDR 28,955,004 to gain one additional year whereas the

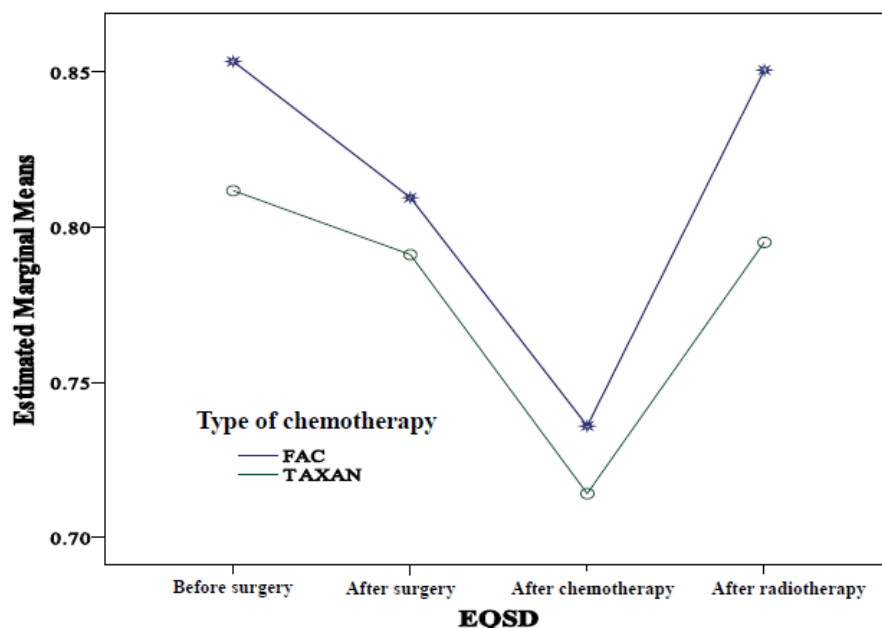


Figure 2. Diagram of Cost-Effectiveness Analysis

Table 3. The Total Cost of Drugs Consumed

Drugs Cost Component	Cost of Treatment (IDR)0		p-value
	FAC	Taxane	
Surgery	1,976,233	2,495,438	
Hospital stay	3,358,450.00±4,957,390.76	3,555,071.43±4,078,079.99	0.916
Chemotherapy	9,218,849	60,269,342	
Pre-chemotherapy	655,600 ±1,130,432	1,959,764±1,800,500	0.112
Visits during chemotherapy cycle	3,345,350 ± 2,006,804	3,682,714±4,673,911	0.153
Radiotherapy	290	250	
Total	19,470,701± 5,870,878	70,430,863± 24,374,175	0.000

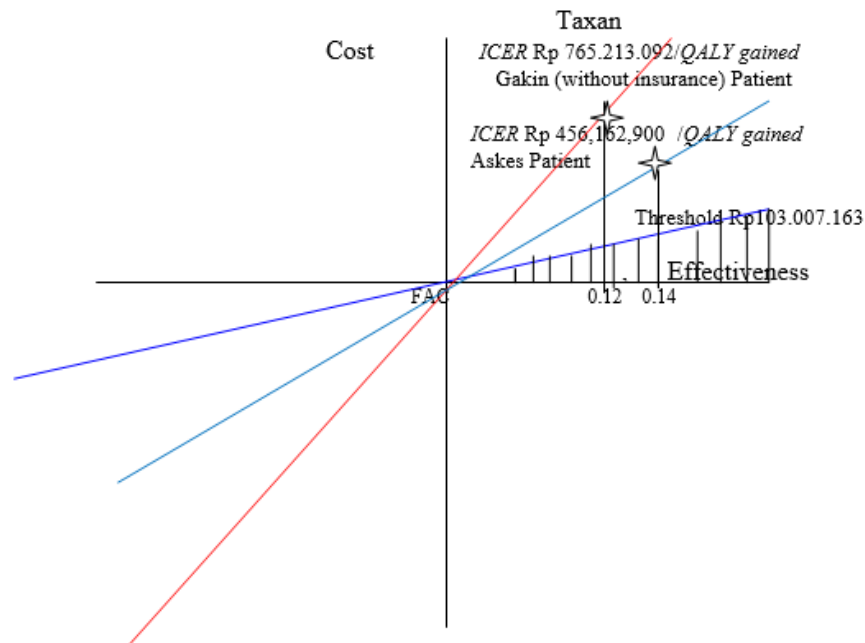


Figure 3. Cost-Effectiveness Plane

Taxane group spent IDR 48,161,736 to gain one additional year. The cost/ QALY of chemotherapy in the Taxane group was approximately 2 times more costly than the FAC group. ICER of chemotherapy of Taxane compared to FAC in patients without insurance (Keluarga Miskin; Gakin):

$$= (\text{Rp } 221,543,987 - \text{Rp } 129,718,416) / (4.60 - 4.48)$$

$$= 91,825,571 / 0.12$$

$$= \text{Rp } 765,213,092 / \text{QALY gained.}$$

The cost-effectiveness diagram showed that the Taxane regimen was more expensive and less effective than FAC. The ICER of Taxane-based chemotherapy was approximately seven times the threshold (equal with a triple of Indonesian GDP). The FAC was more

Table 4. The Indirect Cost of Patients

Cost Component per-Day	Utilization	FAC			Taxane			
		Patient	Family	Total	Utilization	Patient	Family	Total
Transportation (in-town)	420 times for patient 240 for family	94	64.7	55,008,000	569 (patient)	100	100	113,800,000
Transportation (out-town)	5 times for patient	1,200,000	-	6,000,000	46 (patient)	1,240,000	1,150,000	109,940,000
Foods	288 (patient) 243 (family)	38	49.375	22,942,125	553 (patient) 499 (family)	44	40.555	44,568,945
Productivity	211 (patient) 104 (family)	142	168	47,570,000	211 (patient) 104 (family)	178	140	52,118,000
Waiting Cost	42 (patient) 85 (family)	25	17.5	2,537,500	245 (patient) 145 (family)	46	19.3	14,068,500
Total		1,499,000	299.575	134,057,625		1,608,000	1,449,855	334,495,445
Total of each patient	13,405,763				23,892,532			
		12,513,800±22,285,193			31,454,714±38,032,884			



Table 5. INA-BCHRQoL Score (Scale Value) and Utility Score of Patients Before- and After Chemotherapy

Type of Measurements	Pre-chemotherapy			After Chemotherapy			After Radiotherapy		
	FAC	Taxane	p value	FAC	Taxane	p value	FAC	Taxane	p value
INA-BCHRQoL Physical domain (Scale Value)	60.30±5.62	61.57±3.18	0.49	53.50±5.97	54.71±4.21	0.564	61.00±4.24	62.29±1.33	0.296
INA-BCHRQoL Psychological domain (Scale Value)	51.20±6.05	46.43±10.52	0.212	49.10±7.59	44.21±9.25	0.184	51.90±4.31	45.79±9.63	0.075
INA-BCHRQoL Social domain (Scale Value)	11.20±1.40	11.21±0.89	0.976	11.10±1.52	10.93±1.27	0.767	11.60±0.97	11.00± 1.18	0.199
INA-BCHRQoL Spiritual domain (Scale Value)	26.00±0.94	26.00±1.66	1.000	26.00±0.94	25.86±1.66	0.809	26.20±1.03	26.00±1.47	0.715
Utility EQ5D developing country	0.81±0.20	0.79 ±0.21	0.834	0.74 ±0.24	0.71±0.21	0.816	0.85±0.20	0.80±0.13	0.421
Utility EQ5D developed country	0,79 ± 0,22	0,75 ± 0,21	0.143	0,67 ± 0,26	0,68 ± 0,25	0.905	0,81± 0,19	0,75± 0,11	0.387

Table 6. QALY and Cost/QALY

	FAC	Taxane
Cost	129,718,416	221,543,987
Average utility developing and developed country	0.705	0.695
Life year gain	6.35	6.62
QALY	4.48	4.60
Cost/QALY	28,955,004	48,161,736

cost-effective compared to Taxane-based chemotherapy (Figure 3).

*Sensitivity Analysis*

We also conducted a sensitivity analysis using the Askes patient scenario (Figure 3). Sensitivity analysis showed that the mean of QALY of the lowest score in the FAC group was 4.23 and 4.37 in the Taxane group. The cost of illness in the FAC group was 69,434,591 which was around half of the Taxane group. Therefore, the incremental cost counted was 456,162,900 QALY gained for Taxane-based group toward the FAC-based group. In terms of provider perspective, the lowest cost of treatment in the FAC group was 55,164,547 and the lowest cost of treatment in the Taxane group was 93,536,922. The lowest score of QALY in the FAC group was 3.99 and 4.25 in the Taxane group. In results, the incremental cost was 147,586,057 QALY gained Taxane toward FAC. FAC was still most cost-effective, respectively, maximizing QALYs given the threshold.

**Discussion**

The present study evaluated a cost-effectiveness of Taxane-based chemotherapy versus FAC chemotherapy in breast cancer patients with clinical stage IA to IIIA in Dharmais Hospital, Indonesia. To our knowledge, this is the first study published in the full economic evaluation of chemotherapy regimens in breast cancer patients in Indonesia. According to the result, the majority respondents aged above 40 years. This is suitable for the

study was done previously mentioned that the majority of breast cancer patients in Indonesia by age median 47 years old (Ng et al., 2011). The level of education was found as one factor that contributes to the awareness and continuity of patients in compliance with chemotherapy. Regarding the cancer stage, the majority participants were in stage IIB.

The FAC group scored higher in the quality of life measurement using INA-BCHRQoL and utility score compared to the counter arm (Taxane). Due to the limited sample involved, this result was insignificant. A study was done in Iran, however, showed HRQoL in the FAC group was found significantly higher compared to Taxane-based chemotherapy (Bastani and Kiadaliri, 2012). Since INA-BCHRQoL cannot be directly used to measure utility, it has been mapped to EQ5D.

The total cost of treatments found taxane-based chemotherapy appears 2.5 times more costly than FAC for 6 cycles of chemotherapy. The length of stay was predicted as one factor that contributes to the higher expense of patients in the Taxane-based group in this study. It might happen due to the adverse effect of Taxane regiment which was more serious compared to non-Taxane (Ghershi et al., 2015). In terms of drug only, Taxane was 6.5 times costly than the FAC regiment. Another study also mentioned that the Taxane-based regiment requires 7 times more expenses compared to the FAC regiment (Wolowacz et al., 2008). The indirect cost of the Taxane-based group was found 2.5 times higher than the FAC group, similar to a study done in Iran which mentioned that participants who took a Taxane-based regiment spent 3 times higher than the counter arm (FAC) (Bastani and Kiadaliri, 2012).

However, the Taxane-based group was found higher in QALY. In this study, the cost of illness of FAC chemotherapy was lower compared to Taxane-based, however, the QALYs in the Taxane-based group were higher. According to WHO, an intervention was considered cost-effective if the intervention, per QALY avoided, was less than three times the national annual GDP per capita (Marseille et al., 2014). Looking in the Indonesia context, the intervention costs should be less than IDR 103,007,163 (equal to USD 3,557) to be cost-

effective. ICER of chemotherapy of Taxane compared to FAC was IDR 765,213,092 per QALY gained. According to sensitivity analysis, Taxane-based chemotherapy was found higher in QALY and cost of illness compared to the FAC group. In addition, other studies also mentioned that FAC is not cost-effective compared to Taxane-containing regimens (Lee et al., 2009; Martin-Jimenez et al., 2009; Au et al., 2009). In contrast, our study showed that FAC is particularly more cost-effective compared to Taxane-based chemotherapy regimens. This result was similar to previous study done in Iran (Bastani and Kiadaliri, 2012). The difference of result is due to the differences in time horizon of studies. The previous studies modeled 5-10 years and life time horizon of costs and effects of these treatments (Martin et al., 2005; Mittmann et al., 2010), whereas, this study only has 2 year-time horizons.

This study has some limitations. Firstly, the number of samples was limited due to the location of study chosen, which was Dharmais, a referral hospital for all cancer patients from all regions in Indonesia. Thus, the patients who visit this hospital are mostly in advance stages of breast cancer and early stage ones were rarely found. Secondly, the short study period affects in capturing full effect of these treatments over life time. Thus, long-term economic evaluation model of this study should be conducted in Indonesia. Moreover, the results cannot be generalized to other settings. Thirdly, since INA-BCRHQoL is a new tool and validated by a limited sample, only five attributes of INA-BCRHQoL can be mapped to the EQ-5D index calculator to get a utility score. In addition, the utility score was estimated by mapping and might not represent Indonesian patients. Lastly, the data regarding cost and cost-effectiveness threshold that was used reflects the Indonesian context and cannot be directly applied in other countries.

In conclusions, overall, according to stated assumptions and limitations, this result proves that FAC is a cost-effective option for patients in early node-positive breast cancer compared to Taxane-based chemotherapy.

#### List of Abbreviations

FAC : 5-fluorouracil, doxorubicin, cyclophosphamide  
 INA-BCHRQoL : Indonesian- Breast Cancer Health Related Quality of Life  
 QALY : Quality-Adjusted Life Year  
 HRQoL : Health Related Quality of Life  
 ICER : Incremental Cost-Effectiveness Ratios  
 GDP : Gross Domestic Products

#### Author Contribution Statement

A.B.S.: conceptualization, execution, analysis of data, wrote the first draft of manuscript. U.S.N.: wrote the final manuscript with input from all authors and worked on technical details. J.A.T.: developed the theoretical framework, contributed in review, editing, and final approval of manuscript. T.A., I.D., J.A.T.: supervised and provided expert advise based on their medical expertise. All authors have fulfilled the criteria of authorship and the manuscript has been read and approved for submission by all the named authors.

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##### Consent for Publication

Not applicable.

##### Ethics Approval and Consent to Participate

This study has been approved by The Committee of The Medical Research Ethics of The “Dharmais” Cancer Hospital with reference no. 027/PEP/04/2010.

##### Availability of Data

The authors declare that the data supporting the findings of this study are available within the article.

##### Conflicts of Interest

The authors declare that they have no conflicts of interests.

#### References

- Aragón AOE, Fitria DASN (2015). Gambaran pola terapi kanker payudara dengan kemoterapi pasien jaminan kesehatan Nasional Di RSUP Dr Sardjito Yogyakarta. *J Admiration*, **1**, 1-8.
- Au HJ, Golmohammadi K, Younis T, et al (2009). Cost-effectiveness analysis of adjuvant docetaxel, doxorubicin, and cyclophosphamide (TAC) for node-positive breast cancer: modeling the downstream effects. *Breast Cancer Res Treat*, **114**, 579-87.
- Bastani P, Kiadaliri AA (2012). Cost-utility analysis of adjuvant therapies for breast cancer in Iran. *Int J Technol Assessment Health Care*, **28**, 110-4.
- Cardoso F, Costa A, Senkus E, et al (2017). 3rd ESO-ESMO international consensus guidelines for advanced breast cancer (ABC 3). *Ann Oncol*, **28**, 16-33.
- Cherny NI, Paluch-Shimon S, Berner-Wygoda YJBCT (2018). Palliative care: needs of advanced breast cancer patients. *Breast Cancer (Dove Med Press)*, **2018**, 231.
- Ferlay J, Soerjomataram I, Ervik M, et al (2013). GLOBOCAN 2012 v1.0, cancer incidence and mortality worldwide: IARC CancerBase No. 11. J Lyon, France: International agency for research on cancer. 2016.
- Ferlay J, Colombet M, Soerjomataram I, et al (2019). Estimating the global cancer incidence and mortality in 2018: GLOBOCAN sources and methods. *Int J Cancer*, **144**, 1941-53.
- Early Breast Cancer Trialists' Collaborative Group (2005). Effects of chemotherapy and hormonal therapy for early breast cancer on recurrence and 15-year survival: an overview of the randomised trials. *Lancet*, **365**, 1687-717.
- EuroQoL Research Foundation (2018). EQ-5D-3L User Guide.
- Gherzi D, Willson ML, Chan MMK, et al. (2015). Taxane-containing regimens for metastatic breast cancer. *Cochrane Database Sys Rev*, **2015**.
- Hornberger JC, Best JH (2005). Cost utility in the United States of rituximab plus cyclophosphamide, doxorubicin, vincristine, and prednisone for the treatment of elderly patients with diffuse large B-cell lymphoma. *J Cancer Interdisciplinary Int J Am Cancer Soc*, **103**, 1644-51.
- Lee SG, Jee YG, Chung HC, et al (2009). Cost-effectiveness *Asian Pacific Journal of Cancer Prevention, Vol 23* **1153**

- analysis of adjuvant therapy for node positive breast cancer in Korea: docetaxel, doxorubicin and cyclophosphamide (TAC) versus fluorouracil, doxorubicin and cyclophosphamide (FAC). *Breast Cancer Res Treat*, **114**, 589-95.
- Mahendradhata Y, Trisnantoro L, Listyadewi S, et al (2017). The Republic of Indonesia health system review.
- Mardela AP, Maneewat K, Sangchan H (2017). Breast cancer awareness among Indonesian women at moderate-to-high risk. *Nurs Health Sci*, **19**, 301-6.
- Marseille E, Larson B, Kazi DS, Kahn JG, Rosen S (2014). Thresholds for the cost-effectiveness of interventions: alternative approaches. *Bull World Health Organization*, **93**, 118-24.
- Martin M, Pienkowski T, Mackey J, et al (2009). Adjuvant docetaxel for node-positive breast cancer. *N Engl J Med*, **352**, 2302-13.
- Martin-Jimenez M, Rodriguez-Lescure A, Ruiz-Borrego M, Segui-Palmer MA, Brosa-Riestra M (2009). Cost-effectiveness analysis of docetaxel (Taxotere) vs. 5-fluorouracil in combined therapy in the initial phases of breast cancer. *Clin Transl Oncol Official Publication of the Federation of Spanish Oncology Societies and of the National Cancer Institute of Mexico*, **11**, 41-7.
- Mittmann N, Verma S, Koo M, Alloul K, Trudeau M (2010). Cost effectiveness of TAC versus FAC in adjuvant treatment of node-positive breast cancer. *Curr Oncol*, **17**, 7.
- Ng CH, Pathy NB, Taib NA, et al (2011). Comparison of breast cancer in Indonesia and Malaysia – A Clinico-Pathological Study Between Dharmais Cancer Centre Jakarta and University Malaya Medical Centre, Kuala Lumpur. *Asian Pac J Cancer Prev*, **12**, 2943-6.
- Rapoport B, Moodley S, Jacobs C, et al (2007). P180 A cost effectiveness analysis of adjuvant chemotherapy for node positive early breast cancer in South Africa: docetaxel, doxorubicin and cyclophosphamide (TAC) versus 5-fluorouracil, doxorubicin and cyclophosphamide (FAC). *Breast J*, **16**, S64.
- Saptaningsih AB, Setiawan D, Rivany R, et al (2018). The development of quality of life questionnaire for Indonesian Breast Cancer Patients: INA-BCHRQoL. *Asian Pac J Cancer Prev*, **19**, 1269-75.
- Shih YCT, Halpern MT (2008). Economic evaluations of medical care interventions for cancer patients: how, why, and what does it mean?. *CA Cancer J Clin*, **58**, 231-44.
- Wolowacz SE, Cameron DA, Tate HC, Bagust A (2008). Docetaxel in combination with doxorubicin and cyclophosphamide as adjuvant treatment for early node-positive breast cancer: a cost-effectiveness and cost-utility analysis. *J Clin Oncol*, **26**, 925-33.



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