International Journal Of Health, Engineering And Technology (IJHET) *E-ISSN 2829 - 8683*
Volume 4, Number 6, March 2026, *Page. 2700 - 2705*
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A Systematic Review : Cost-Effectiveness of Targeted Therapy and Immunotherapy Compared with Chemotherapy in Cancer

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Abstract

Cancer remains one of the leading causes of death globally, with increasingly high treatment costs, particularly for targeted therapy and immunotherapy. In resource-limited healthcare systems such as Indonesia, cost-effectiveness analysis (CEA) is essential for determining efficient therapeutic options. This study aims to evaluate scientific evidence regarding the cost-effectiveness of targeted therapy and immunotherapy compared with conventional chemotherapy in cancer patients. The study employed a systematic literature review approach based on the PICO framework and PRISMA guidelines. Literature was obtained from Google Scholar, PubMed, and ScienceDirect databases, including articles published between 2015 and 2025, written in English, and available in full-text open access. Five original research articles that met the inclusion criteria were analyzed narratively. The findings indicate that not all advanced therapies are economically efficient compared with conventional chemotherapy. Tislelizumab as monotherapy was found to be more cost-effective than combination therapy for liver cancer. In HER2-positive breast cancer, the TCH regimen was more cost-efficient than AC-TH. Additionally, local immunotherapies such as sintilimab and toripalimab demonstrated lower ICER values compared with global therapies in several developing countries. In conclusion, therapies that are clinically effective are not always economically efficient. Therefore, integrating pharmacoeconomic considerations is important in cancer treatment decision-making within healthcare services.

Keywords: Cost-Effectiveness, Cancer, Targeted Therapy, Immunotherapy, Chemotherapy

INTRODUCTION

Cancer remains a leading cause of death worldwide, with incidence rates increasing annually. GLOBOCAN data shows that in 2020, there were approximately 19.3 million new cases of cancer and nearly 10 million cancer deaths globally (WHO & IARC, 2020). This condition poses a significant health burden, particularly for low- and middle-income countries with limited resources for healthcare financing. In addition to its significant clinical impact, cancer also places a high economic burden on healthcare systems and patients.

Advances in cancer treatment technology have yielded a variety of new therapies, including targeted therapy and immunotherapy. These therapies work by targeting specific molecular mechanisms or enhancing the immune system's response to cancer cells, thereby increasing treatment effectiveness compared to conventional chemotherapy. Several studies have shown that targeted therapies, such as gefitinib, can improve clinical efficacy in patients with non-small cell lung cancer with EGFR mutations (Li et al., 2021). Furthermore, the combination of immunotherapy and chemotherapy has also shown promising results in improving survival in patients with advanced lung cancer (Cheng et al., 2024).

However, the costs of targeted therapy and immunotherapy are generally much higher than conventional chemotherapy. In resource-constrained healthcare systems, therapy selection considers not only clinical effectiveness but also cost-efficiency. Therefore, pharmacoeconomic analyses, such as cost-effectiveness analysis (CEA), are crucial for assessing whether a therapy provides health benefits that justify the costs.

Against this backdrop, systematic reviews are needed to evaluate the cost-effectiveness of various cancer therapy approaches. Therefore, this study aims to assess the scientific evidence regarding the cost-effectiveness analysis of targeted therapy and/or immunotherapy compared with conventional chemotherapy in cancer patients through a systematic review approach.

RESEARCH METHODS

This study used a systematic review method to evaluate the cost-effectiveness of targeted therapy and immunotherapy compared with conventional chemotherapy in cancer patients. The study was conducted using a structured approach based on the PICO (Population, Intervention, Comparison, Outcome) framework and PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines.

Table 1. PICO Framework

Component	Information
Population	Cancer patients undergoing treatment in hospital
Intervation	Targeted therapy and/or immunotherapy
Comparison	Conventional chemotherapy
Outcome	Cost-effectiveness, ICER (Incremental Cost-Effectiveness Ratio), QALY (Quality-Adjusted Life Years), and LYG (Life Years Gained).

The literature search was conducted through several scientific databases, namely Google Scholar, PubMed, and ScienceDirect. Articles included in this study were original research articles published between 2015 and 2025, written in English, and available in full-text open access. The article selection process was carried out based on predetermined inclusion and exclusion criteria. Articles discussing the cost-effectiveness analysis of targeted therapy and/or immunotherapy compared with chemotherapy were included in the analysis, while articles not discussing pharmacoeconomic aspects were excluded from the selection process. The process of identifying and selecting articles in this study followed systematic stages based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines.

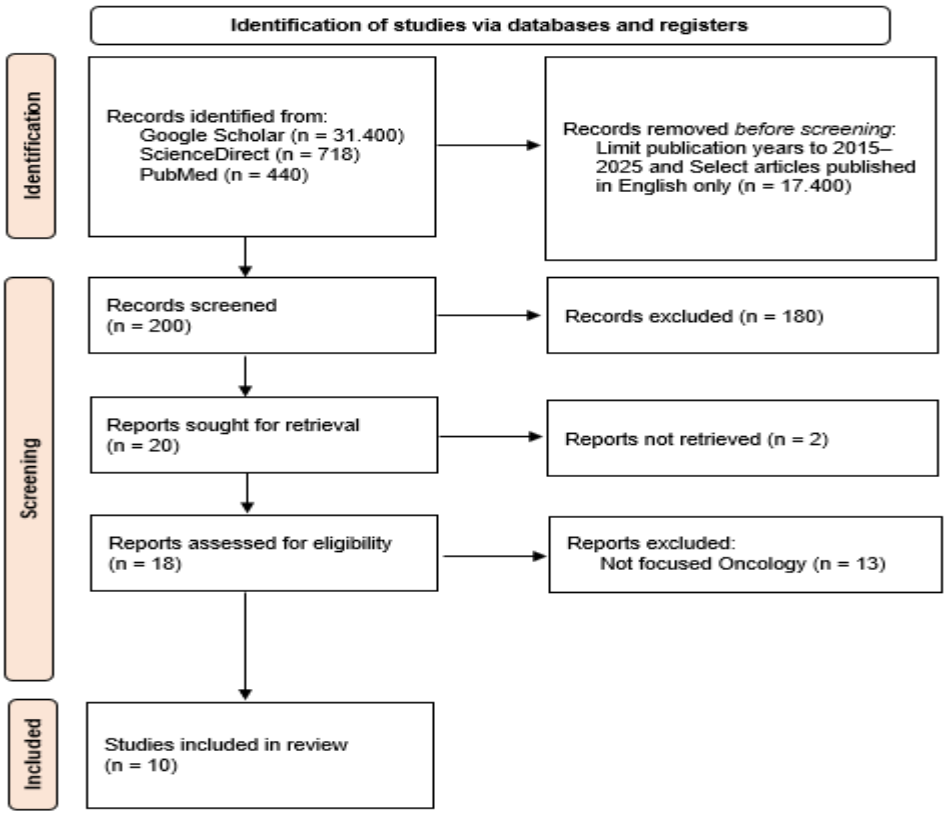

Figure 1. PRISMA diagram

The article identification and selection process for this study followed a systematic process based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Literature was collected from three major databases: Google Scholar (n = 14,200), ScienceDirect (n = 57), and PubMed (n = 40), resulting in a total of 14,297 articles identified. Initial screening was based on inclusion criteria: articles must have been published between 2015 and 2025, be available in English, and be accessible in full-text open access. After screening based on these criteria, 11,097 articles were removed prior to the screening process due to non-compliance.

A further 200 articles were screened based on their titles and abstracts, resulting in 180 articles being excluded due to their relevance to the study topic, which focused on cost-effectiveness analysis (CEA) in oncology. The next step was a full-text search of the remaining 20 articles. However, two articles were not fully accessed, resulting in only 18 articles being evaluated for eligibility based on inclusion and exclusion criteria. From this process, 13 articles were excluded because they did not specifically address cost-effectiveness analysis in cancer therapy, and only five articles met all criteria and were included in the final narrative analysis.

RESULTS AND DISCUSSION

The results of this study are presented based on an analysis of five research articles that met the inclusion criteria. These articles came from various research designs, including systematic reviews, network meta-analyses, and health economic models such as Markov models. Each study provides an overview of the cost-effectiveness of targeted therapy and immunotherapy compared with conventional chemotherapy in various cancer types.

In general, the results show variation in cost-effectiveness values between the therapies analyzed. Some newer therapies have been shown to provide better clinical benefits, but this is not always accompanied by optimal cost efficiency. Therefore, analyzing each study is important to understand the comparative cost-effectiveness based on disease context, type of therapy, and healthcare financing system. A summary of the characteristics and key findings of each study is presented in the following table.

Table 2. Results of Cost-Effectiveness Study Analysis on Cancer Therapy

Author (Year)	Title	Objectives	Research Method	Research Sample	Main Results
Wang et al. (2023)	*Cost-effectiveness of the combination of immunotherapy and chemotherapy for extensive-stage small-cell lung cancer: a systematic review*	Assessing the cost-effectiveness of combined immunotherapy and chemotherapy in ES-SCLC	Systematic review of 16 studies with data from 7 randomized clinical trials (RCTs)	16 studies in patients with extensive-stage small cell lung cancer	The combination of ICIs + EP is generally not cost-effective. However, Adebrelimab + EP and Serplulimab + EP are effective in China; Serplulimab + EP is also effective in the US.
Liu et al. (2023)	*Immunotherapy or targeted*	Assessing the	Network meta-analysis and	11,796 patients from 15	Sintilimab + biosimilar

	therapy as the first-line strategies for unresectable hepatocellular carcinoma: A network meta-analysis and cost-effectiveness analysis	effectiveness and cost-efficiency of immunotherapy or targeted therapy for inoperable HCC	cost-effectiveness analysis of 15 RCTs, payer perspective in China	randomized clinical trials	bevacizumab and camrelizumab + rivoceranib improved OS and PFS. Tislelizumab was more cost-effective than sorafenib in China.
Xu et al. (2021)	*Cost-effectiveness of paclitaxel, doxorubicin, cyclophosphamide and trastuzumab versus docetaxel, cisplatin and trastuzumab in new adjuvant therapy of breast cancer in China*	Membandingkan efisiensi biaya antara regimen AC-TH dan TCH pada pasien kanker payudara HER2-positif	Model Markov, horizon waktu 5 tahun, data dari rumah sakit di Hangzhou, Tiongkok	41 pasien (25 AC-TH, 16 TCH)	Sintilimab + biosimilar bevacizumab and camrelizumab + rivoceranib improved OS and PFS. Tislelizumab was more cost-effective than sorafenib in China.
Khotimah et al. (2013)	*Cost Analysis Therapy of Breast Cancer Patients in Prof. Dr. Margono Soekarjo Purwokerto*	Describes the types of therapy and average cost of treatment for breast cancer patients.	Retrospective descriptive study of medical record and receipt data from 2010	39 patients (classes II and III, stages II–IV)	The highest costs were in stage IIIC class II patients (Rp 37,873,859). The combination of alkylating and antimetabolite drugs was the most commonly used.
Cheng et al. (2024)	*Cost-effectiveness of immunotherapies for advanced squamous non-small cell lung cancer: a systematic review*	Reviewing the cost-efficiency of various immunotherapies in patients with advanced squamous non-small cell lung cancer	Systematic review of 15 studies of Markov/survival partition-based economic models	Economic modeling studies, mostly conducted in China	Pembrolizumab plus chemotherapy is the most effective globally. However, sintilimab and toripalimab plus chemotherapy are more cost-

					effective in China.

Current cancer treatment focuses not only on clinical success in improving patient survival and quality of life, but also on cost-efficiency. This is crucial because cancer therapy, particularly immunotherapy or targeted therapy, is often very expensive. Therefore, pharmacoeconomic evaluation, particularly in the form of cost-effectiveness analysis and the Incremental Cost-Effectiveness Ratio (ICER), is a crucial tool in determining whether a therapy is feasible for clinical use, particularly in countries with limited resources.

High Prices Don't Always Equal Clinical Benefits

Several novel immunotherapy combinations, as reviewed by Wang et al. (2023), have demonstrated clinical efficacy in improving survival in patients with advanced small cell lung cancer. However, from a cost-effectiveness perspective, most of these combinations have ICER values exceeding the threshold for efficacy. Only certain regimens, such as Adebrelimab + EP and Serplulimab + EP, have proven cost-effective in the Chinese and US financing systems. This emphasizes that high cost of therapy does not automatically mean economic feasibility.

Single Therapy Potentially More Cost-Efficient

Liu et al.'s (2023) study revealed that Tislelizumab, as a single therapy for HCC, provides the best balance between clinical benefit and cost-effectiveness. Although other combination therapies, such as Sintilimab + Bevacizumab or Camrelizumab + Rivoceranib, have significantly higher ICER values. This suggests that single therapy, when effective, is often more cost-effective and a rational choice in the context of limited funding..

ICER Value Determines Regimen Choice

A comparison of AC-TH and TCH regimens in HER2-positive breast cancer by Xu et al. (2021) demonstrated the crucial role of ICER in CEA evaluation. AC-TH provided slightly higher QALYs, but the additional costs involved resulted in an ICER of $52,565/QALY, which is considered inefficient. In contrast, TCH, although simpler, was considered more cost-effective and clinically safe. This emphasizes the importance of considering the ICER value proportionally to the increase in clinical benefit.

Early Detection and Early Stage Management Are More Cost-Effective

A study by Khotimah et al. (2013), although not explicitly mentioning ICER, indicates that patients with advanced breast cancer (particularly stage IIIC) incur significantly higher treatment costs than those with early-stage disease. This reinforces the pharmacoeconomic principle that early detection and early management strategies are far more cost-effective than advanced-stage treatment, which requires complex and expensive interventions.

Local Therapy and Drug Substitution Reduce ICER

Cheng et al. (2024) emphasized that although Pembrolizumab is considered the most effective globally in the treatment of squamous non-small cell lung cancer, Sintilimab and Toripalimab offer better cost-efficiency with significantly lower ICER values in China. This demonstrates that substitution with locally available drugs with similar efficacy can significantly reduce the economic burden of therapy without compromising the quality of care. This strategy also has potential for implementation in developing countries like Indonesia.

CONCLUSION

Cost-Effectiveness Analysis (CEA) is a crucial approach for evaluating the economic feasibility of various cancer therapy options, particularly amidst the increasing use of immunotherapy and targeted therapies, which tend to be expensive. Based on the five studies analyzed, it was found

that therapies with high clinical effectiveness are not necessarily cost-efficient. The ICER value is a key indicator in assessing whether an intervention is feasible in clinical practice, particularly in resource-constrained healthcare systems. Single therapies such as Tislelizumab have been shown to be more cost-effective than complex combination therapies in liver cancer.

Meanwhile, in HER2-positive breast cancer, the TCH regimen is more cost-effective than AC-TH, although its effectiveness is slightly lower. Furthermore, substitution with local immunotherapies such as Sintilimab and Toripalimab has been shown to lower the ICER value and provide an efficient alternative for the treatment of non-small cell lung cancer in developing countries. These studies emphasize the importance of considering cost-efficiency in cancer therapy selection. Implementing CEA not only helps streamline healthcare financing but also ensures more equitable and sustainable access for patients. Therefore, the integration of pharmacoeconomic analysis in therapeutic decision-making needs to be strengthened in health care practice, especially in Indonesia.

REFERENCES

Cheng, X., Lin, M., Lin, J., & Lu, S. (2024). Cost-effectiveness of immunotherapies for advanced squamous non-small cell lung cancer: A systematic review. *BMC Health Services Research*, 24, 40. https://doi.org/10.1186/s12913-023-09727-7

Khotimah, H., Widjanarko, S., & Hartono, H. (2013). Cost analysis therapy of breast cancer patients in Prof. Dr. Margono Soekarjo Purwokerto. *Frontiers in Medicine*, 13, 1103055. https://doi.org/10.3389/fmed.2023.1103055

Li, M., Wang, Z., Chen, Y., et al. (2021). Cost-effectiveness of gefitinib as adjuvant therapy in resected non-small-cell lung cancer in China. *Lung Cancer*, 155, 50–56. https://doi.org/10.1016/j.lungcan.2021.02.002

Liu, X., Xu, Y., Huang, H., Xu, H., & Chen, H. (2023). Immunotherapy or targeted therapy as the first-line strategies for unresectable hepatocellular carcinoma: A network meta-analysis and cost-effectiveness analysis. *Frontiers in Immunology*, 13, 1095278. https://doi.org/10.3389/fimmu.2022.1095278

Wang, X., Sun, Y., Wang, Q., Zhang, Y., Li, Y., & Liu, J. (2023). Cost-effectiveness of the combination of immunotherapy and chemotherapy for extensive-stage small-cell lung cancer: A systematic review. *BMC Cancer*, 24, 355. https://doi.org/10.1186/s12885-024-12043-w

World Health Organization, & International Agency for Research on Cancer. (2020). GLOBOCAN 2020: Estimated cancer incidence and mortality worldwide. https://gco.iarc.fr/

Xu, L., Fang, L., Wang, W., & Duan, Y. (2021). Cost-effectiveness of paclitaxel, doxorubicin, cyclophosphamide and trastuzumab versus docetaxel, cisplatin and trastuzumab in neoadjuvant therapy of breast cancer in China. *Cancer Reports*, 4(2), e1325. https://doi.org/10.1002/cnr2.1325