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Review Article

Comparing the Cost-Effectiveness of Herbal Medicines with Chemical Medicines

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Abstract

Herbal medicines and chemical medicines are both commonly used in the treatment of a variety of ailments. However, the cost-effectiveness of these remedies has remained a controversial topic. This review aims to compare the cost-effectiveness of herbal medicines to chemical medicines. Likewise, a comprehensive search was conducted on reputable databases, including PubMed, Web of Science, and Scopus, using relevant keywords. The search methodology encompassed the utilization of specific Medical Subject Headings (MeSH) terms, namely "herbal medicine," "plant extracts," "phytotherapy," "cost-benefit analysis," "cost savings," "economics, pharmaceutical," "comparative effectiveness research," "therapeutics," "pharmaceutical preparations," and "chemistry, pharmaceutical." The search was restricted to articles published in English within the time span of January 2010 to December 2022. The selection process involved both systematic and subjective approaches, with the most relevant articles identified based on the researcher's expertise. Out of the initial 41 articles, only 9 were found to be eligible for inclusion in the study after a thorough analysis. Thus, only a few studies met the criteria for inclusion in this review. The results indicated that herbal medicines possess the capacity to offer economically viable alternatives to conventional pharmaceuticals. However, the diversity in research methodologies and outcomes poses challenges in establishing conclusive findings. It is noteworthy that while herbal medicines are more cost-effective, they may also induce side effects that are contingent upon the specific herb and the individual's health condition. Consequently, the inclusion of adverse effects associated with herbal medicines and plant extracts should be considered when conducting cost-effectiveness analyses.

Keywords: Plant preparations, Pharmacology, Costs and cost analysis, Adverse effects

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Introduction

Herbal medicines and plant extracts have been used for centuries due to their medicinal properties. In recent years, there has been a growing interest in the use of natural remedies as alternatives to conventional pharmaceuticals. This topic has been widely discussed in both scientific and non-scientific circles (1, 2). The question of whether herbal medicines are less effective and have fewer side effects than chemical medicines has been raised, but there is no clear answer to this question. One reason is the proliferation of diseases and

chemical drugs, as well as the wide range of plants and herbal remedies used by individuals. This complexity has made it challenging to establish clear and scientific comparisons (3-5). Since herbal medicines are generally considered to be treatments with lower costs and fewer side effects, a positive perception of this field of medicine has been developed among the general public (6). However, the toxicity of herbal medicines should be particularly dealt with. Although they are generally considered safe and effective, they can have adverse effects or may not be effective at all (7, 8). In contrast, chemical drugs are known to be more effective, but they are also more expensive. Thus, the choice of treatment depends on the specific situation and the individual's needs (3, 9). At the community level, herbal medicines are generally viewed positively. However, caution should be exercised as there are potential side effects related to their use. These side effects include allergic reactions, interactions with medications, toxicity, hormonal effects, gastrointestinal effects, and central nervous system effects (10, 11). Allergic reactions may occur in individuals who are allergic to specific herbs. This can result in skin rashes, hives, and difficulty in breathing. Herbal medicines may also interact with prescription and over-the-counter medications, leading to adverse effects or reduced effectiveness of the medication. Toxicity is another concern, as some herbs can be toxic when taken in high doses or over extended periods of time. For instance, kava can cause liver damage, while the use of comfrey can lead to liver damage and cancer (12). Furthermore, certain herbs can have hormonal effects, which can be beneficial in some cases, but may also have adverse effects in others. For example, black cohosh has been linked to liver damage, and soy can interfere with thyroid function. Gastrointestinal side effects such as nausea, vomiting, and diarrhea are also possible with the use of certain herbs. Lastly, some herbs can affect the central nervous system, leading to dizziness, sedation, or stimulation. (12, 13). Hence, this study aims to provide a general and concise comparison of the cost and effectiveness of herbal and chemical drugs for various diseases and medications. Although it is preferable to compare the two most restricted categories of drugs for each disease separately, the aim of this article was to offer a comprehensive overview of these two drug categories.

Materials and Methods

To obtain a comprehensive understanding of various drugs and diseases under consideration, a methodical search was performed to identify the most suitable and significant articles. To increase the validity of the results, a systematic search should be conducted among databases, and specific words with a structured search should be used. Thus, a systematic literature search was conducted using PubMed, Scopus and Web of Science. The search strategy included the following Medical Subject Headings (MeSH) terms: "herbal medicine," "plant extracts," "phytotherapy," "cost-benefit analysis," "cost savings," "economics, pharmaceutical," "comparative effectiveness research," "therapeutics," "pharmaceutical preparations," and "chemistry, pharmaceutical." The search was restricted to articles published in English from January 2010 to December 2022.

Inclusion/exclusion criteria**:** Studies conducted in English within the defined time span were included in the study. Studies that were excluded from the study included abstracts, seminars, and anything other than full-text manuscripts (Table 1).

Table 1: The Search Strategy Used in Databases.

Database	Search strategy	N
PubMed	(("herbal medicine"[mesh] or "plant extracts"[mesh] or "phytotherapy"[mesh]) and ("cost-benefit analysis"[mesh] or "cost savings"[mesh] or "economics, pharmaceutical"[mesh]) and ("comparative effectiveness research"[mesh] or "therapeutics"[mesh])) and ("preparations")	18
Scopus	title-abs-key("cost-effectiveness" and "herbal medicine" and "plant extracts" and "pharmaceutical preparations")	14
Web of Science	ts=("cost-effectiveness" and "herbal medicine" and "plant extracts" and "pharmaceutical preparations")	9

Subsequently, to prioritize the articles with respect to the study's research objectives, a subjective approach was adopted based on the researcher's expertise and judgment to identify the most relevant articles. This selection process was not systematic in nature.

Results and Discussion

A comprehensive search was conducted on renowned databases such as PubMed, Web of Science, and Scopus using relevant keywords to identify suitable articles. The selection process involved both systematic and subjective approaches, with the most relevant articles identified based on the researcher's expertise (Figure 1). Out of the initial 41 articles, only 9 articles were eligible for inclusion in the study after a comprehensive analysis. The nine articles included in the study evaluated the cost-effectiveness of herbal medicines and plant extracts in treating various conditions. Most of the literature that was identified evaluated the cost-effectiveness of herbal medicines and plant extracts in treating various health conditions such as diabetes, hypertension, and depression. Different methods were used to evaluate cost-effectiveness, including cost-benefit analysis and cost savings analysis. However, it is important to note that the quality of evidence among these studies varies, with some studies having methodological limitations. The findings of this review suggest that herbal medicines and plant extracts may serve as cost-effective alternatives to conventional pharmaceuticals for treating various conditions. The majority of research studies suggest that herbal medicine and plant extracts are associated with cost savings when compared with conventional pharmaceuticals.

As previously stated, the extracted articles encompassed a broad spectrum of applications that employed diverse methodological approaches. Consequently, this section presents a summary of the methods and results of these studies, culminating in a conclusion based on the primary objective of this research.

A study investigated the health economic significance of the traditional Chinese medicine clinical pathway in the treatment of mild acute pancreatitis. The results showed that the clinical pathway can ensure therapeutic effects, reduce the average length of stay, decrease medical costs, and increase patient satisfaction (14). Another study observed and analyzed the clinical efficiency and pharmacoeconomics of Xiaozhong Zhitong Decoction in preventing deep venous thrombosis in major orthopedic operations. The results showed that Xiaozhong Zhitong Decoction has a better clinical impact on preventing deep venous thrombosis in major orthopedic operations with higher safety and reliability, and also has a better cost-effectiveness ratio (15). Moreover, a study evaluated the efficacy and cost-effectiveness of a plant-derived wound dressing (ONE) in scalp wounds with the exposed bone. The results showed that ONE is a simple-to-use and safe treatment option for scalp wounds with the exposed bone, and treatment costs can be favorably compared with those published for other treatment modalities (16). In conclusion, these studies suggest that alternative and traditional medical options can be cost-effective and beneficial for patients.

A study aimed to examine the effectiveness and safety of Ukgansangajinpibanha (UGSJB), an herbal medicine used in South Korea and Japan for the treatment of ASD in children aged 4-6 years. The trial was a randomized, double-blinded, placebo-controlled clinical trial with 120 participants in each group. The study examined the effects of UGSJB on behavior, social maturity, quality of life, and parental stress using outcome measures such as the childhood autism rating scale, autism behavior checklist, and parenting stress index. The study also evaluated the economic value of UGSJB in treating ASD. The results of this study clinically approved the safety, efficiency, and economic significance of UGSJB in children with ASD (17). Chronic obstructive pulmonary disease (COPD) affects millions of people worldwide, and while many therapies exist to relieve symptoms and reduce mortality, little data is available on the most cost-effective treatment for COPD patients. A study aimed to make a comparison between the effectiveness and economic evaluation of three treatments for COPD, i.e. conventional western medicine, traditional Chinese medicine (TCM), and a combination of both. A randomized, controlled trial was carried out on 360 patients, with 120 patients in each group. The outcome determinants included the frequency and duration of acute exacerbations, lung function, dyspnea, exercise capacity, quality of life, and economic evaluation.

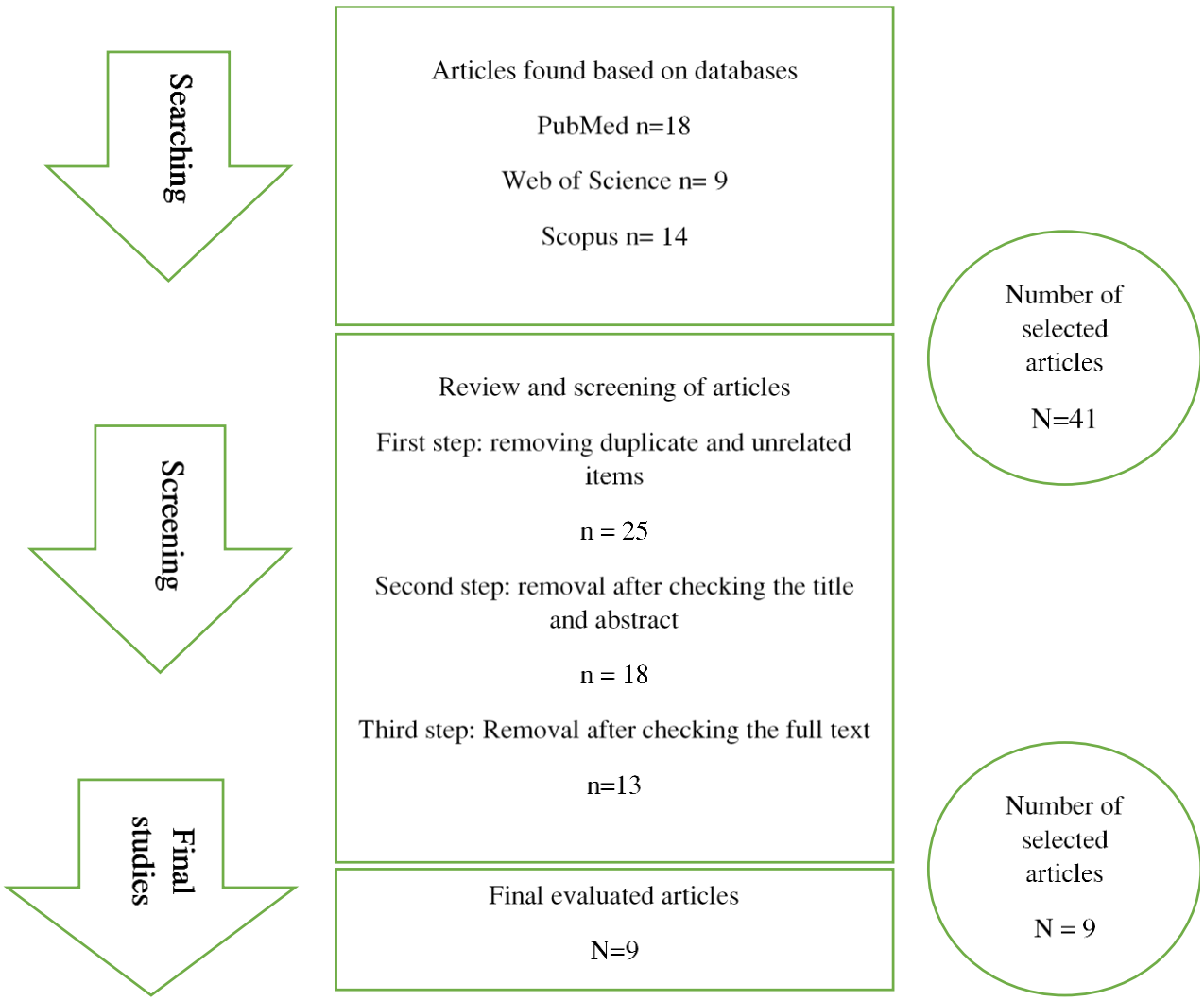

Figure 1. Flowchart of the Study Selection Process.

The hypothesis was that each treatment would have beneficial effects on COPD patients, but the combination of conventional medicine and TCM might be the most effective and cost-efficient procedure. The results of the present study provide significant information to help patients, clinicians, and decision-makers determine efficient treatment procedures for COPD (18). In this regard, the following results were observed in other studies. A pharmacoeconomic investigation of Cyclamen europaeum (CE) in the management of acute rhinosinusitis (ARS) in Spain was conducted using data from the PROSINUS study. The study compared the effectiveness and cost-effectiveness of CE versus other therapies in the management of ARS and showed that CE given as monotherapy was more effective than other monotherapies and combination therapies, with lower indirect costs and a lower cost per cured patient (19). Another study investigated the clinical efficiency and pharmacoeconomic effect of the co-administration of Wusih capsules and tacrolimus on the reduction of the tacrolimus dose while maintaining a similar therapeutic impact on patients with membranous nephropathy. The study found that the co-administration of WZCs and tacrolimus could decrease the dose of tacrolimus and reduce the costs incurred by patients within the identical therapeutic window to that observed for treatment with tacrolimus alone (20). Furthermore, a study examined the cost-effectiveness of a combination of CTx and Viscum album L. (VA) in

comparison with CTx alone for stage IV non-small cell lung cancer patients in a hospital in Germany. The study found that the simultaneous use of chemotherapy and VA was clinically efficient and comparably cost-effective to chemotherapy alone in the patient samples examined from the hospital's perspective (21). A study investigated if the preventive utilization of cranberry capsules in long-term care facility residents is cost-effective depending on the urinary tract infection (UTI) risk. The study found that in high-UTI-risk residents, taking cranberry capsules might be efficient in preventing UTIs. However, is not likely to be cost-effective in the examined dosage, frequency, and setting, whereas in low-UTI-risk LTCF residents, taking cranberry capsules twice daily is neither effective nor cost-effective (22).

These studies provide evidence supporting the efficacy and cost-effectiveness of herbal medicines in various contexts. Herbal medicines can interact with prescription drugs in several ways, potentially affecting the safety and effectiveness of both the herbal remedy and the medication (23). For example, herbs such as ginkgo, garlic, and ginger can increase the risk of bleeding when taken with blood-thinning medications such as warfarin and aspirin (24). St. John's wort can interfere with the effectiveness of antidepressant medications such as selective serotonin reuptake inhibitors (SSRIs) and tricyclic antidepressants (25). Similarly, some herbs such as ginseng and licorice can affect blood pressure and may interact with medications used to manage hypertension (26) . Herbs such as Echinacea and St. John's wort may interact with medications used to suppress the immune system such as cyclosporine (27). Moreover, herbs such as valerian and kava can have sedative effects and may interact with medications used to induce sleep or reduce anxiety (27). It is important to consult a healthcare provider before using herbal medicines if you are taking prescription medications. The healthcare provider can help you determine if herbal medicines are safe and appropriate for you, and provide guidance on potential interactions and side effects (28) However, further research is required to confirm these findings and to establish standardized methods for evaluating the cost-effectiveness of these natural remedies (29, 30).

Given the extensive array and diversity of pharmaceuticals used in the treatment of various ailments, the task of comparing two groups of herbal and chemical drugs across a broad spectrum of diseases and drawing definitive conclusions is inherently challenging and intricate. Certainly, if the study was restricted to a single drug or a specific disease, it could yield a more definitive and conclusive outcome.

Conclusion

Overall, this systematic review provides evidence supporting the potential cost-effectiveness of herbal medicines and plant extracts in pharmaceutical preparations. However, the quality of evidence is limited, and further research is required to confirm these findings and establish standardized methods for evaluating the cost-effectiveness of these natural remedies. While herbal medicines can offer potential health benefits, it is important to recognize that they can also have potential side effects. The specific side effects depend on the type of herb and the individual's health status. It is also of high significance to take into account the potential adverse effects of herbal medicines and plant extracts in cost-effectiveness analyses.

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Conflict of Interest

The author declare that they have no conflict of interest.

Founding

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