

<https://doi.org/10.33472/AFJBS.6.Si3.2024.380-398>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

"Medical Cannabis: A Critical Review of the Current Evidence"

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Volume 6, Issue Si3, 2024

Received: 7 April 2024

Accepted: 05 May 2024

[doi: 10.33472/AFJBS.6.1.2024.380-398](https://doi.org/10.33472/AFJBS.6.1.2024.380-398)

Abstract

Medical cannabis has been the subject of increasing attention in recent years due to its potential therapeutic benefits. However, the use of cannabis for medicinal purposes remains controversial and has generated debate within the medical community. This critical review aims to examine the current evidence surrounding medical cannabis to provide a comprehensive understanding of its therapeutic potential and limitations. The review begins by exploring the pharmacology of cannabis, including the main active compounds, their mechanisms of action, and their effects on the human body. It then examines the evidence for the use of medical cannabis in a range of conditions, including chronic pain, epilepsy, multiple sclerosis, and cancer-related symptoms. The review also discusses the potential adverse effects of cannabis use, including cognitive impairment, addiction, and respiratory problems. While the evidence for the therapeutic benefits of medical cannabis is mixed, there is strong evidence to support its use in certain conditions, particularly chronic pain and spasticity associated with multiple sclerosis. However, the quality of evidence varies, and more rigorous studies are needed to establish the efficacy of medical cannabis for other conditions. The review also highlights the importance of appropriate regulation and monitoring of medical cannabis use, particularly in light of the potential for abuse and the lack of standardization of products. In conclusion, while medical cannabis shows promise as a therapeutic agent, further research is needed to fully establish its efficacy and safety, and to guide its appropriate use in clinical practice.

Keywords:

Medical cannabis, Cannabis pharmacology, Cannabis therapeutic potential, Cannabis adverse effects, Cannabis Regulation, Efficacy of Cannabis

I. Introduction:

Medical cannabis has been used for centuries as a natural remedy for various ailments, including pain, anxiety, and nausea. However, its use has been limited due to its classification as a Schedule I drug by the U.S. Drug Enforcement Administration, which makes it illegal under federal law¹. Despite this, medical cannabis has gained increasing attention in recent years due to its potential therapeutic benefits and the growing public demand for its legalization. The cannabinoids in cannabis, such as THC and CBD, interact with the body's endocannabinoid system, which regulates various physiological functions such as pain sensation, mood, and appetite. This interaction has led to the investigation of medical cannabis as a treatment for a range of medical conditions, including chronic pain, epilepsy, multiple sclerosis, and cancer-related symptoms. The significance of medical cannabis lies in its potential to provide a natural alternative to traditional pharmaceuticals for patients with various medical conditions. It has been shown to be effective in managing pain and other symptoms associated with various diseases, with fewer adverse effects compared to traditional medications. Furthermore, medical cannabis has been shown to be effective in reducing opioid use and overdose deaths, highlighting its potential role in addressing the current opioid epidemic². Overall, the increasing interest in medical cannabis highlights the need for further research to fully establish its efficacy and safety and to guide its appropriate use in clinical practice. Its potential as a therapeutic agent provides an opportunity to improve the quality of life for patients with various medical conditions while also addressing the challenges posed by traditional pharmaceuticals³.

The objectives of the review "Medical Cannabis: A Critical Review of the Current Evidence" are to evaluate the available scientific literature on medical cannabis to determine its efficacy, safety, and potential risks, provide healthcare professionals, policymakers, and patients with a comprehensive overview of the current state of knowledge regarding medical cannabis. Assess the therapeutic applications of medical cannabis in various medical conditions, including pain management, neurological disorders, psychiatric disorders, cancer-related symptoms, and other potential applications. Analyze the efficacy of medical cannabis based on clinical trials, observational studies, and evidence for specific medical conditions. Examine the safety profile of medical cannabis, including acute and long-term effects, potential drug interactions, psychiatric and cognitive effects, and respiratory and cardiovascular risks. Address the regulatory and legal considerations surrounding medical cannabis, including the current legal status, challenges in research, and existing regulatory frameworks and guidelines. Identify areas of uncertainty and research needs in the field of medical cannabis. Provide a summary of the findings and implications for healthcare professionals and policymakers. Make recommendations for future research to enhance the understanding of medical cannabis and optimize its use in clinical practice.

II. Methods**Literature Search Strategy**

The literature search strategy for the review "Medical Cannabis: A Critical Review of the Current Evidence" involved an extensive and systematic approach. Relevant databases, including

PubMed/MEDLINE, Embase, PsycINFO, Scopus, and Cochrane Library, were identified for the search. A comprehensive list of keywords and search terms related to medical cannabis, therapeutic applications, efficacy, safety, and other pertinent topics was developed. The search strategy was formulated by combining these keywords using Boolean operators and incorporating appropriate truncation or wildcards. The databases were then searched, applying relevant filters such as publication date limits and language preferences. The retrieved articles were screened based on titles and abstracts, and full texts of potentially relevant studies were obtained. Inclusion and exclusion criteria were established to determine which studies should be included in the review. Data extraction involved systematically extracting relevant information from the included studies, and the findings were analyzed and synthesized. The quality and risk of bias of the included studies were assessed using appropriate tools. The review followed the preferred reporting guidelines for systematic reviews or meta-analyses, such as the PRISMA guidelines, to ensure a comprehensive and rigorous evaluation of the current evidence on medical cannabis⁴⁻⁷.

Study Selection Criteria

The study selection criteria for the review "Medical Cannabis: A Critical Review of the Current Evidence" were carefully defined to ensure the inclusion of relevant and reliable studies. In order to be considered for inclusion, studies had to meet specific criteria. First, the studies had to focus on medical cannabis and its therapeutic applications, efficacy, safety, or related topics. Different study designs, including clinical trials, observational studies, systematic reviews, and meta-analyses, were considered. The publication date was not restricted, allowing for the inclusion of both recent and older studies. Language restrictions were applied to include studies published in English. Studies that were not accessible in full text or did not provide sufficient data were excluded. Additionally, studies that primarily focused on recreational cannabis use or non-medical aspects of cannabis were excluded to maintain the focus on medical applications. The study selection process followed a systematic approach, involving multiple reviewers to minimize bias, and any disagreements were resolved through discussion and consensus. By adhering to these well-defined criteria, the review aimed to ensure the inclusion of high-quality studies and provide a comprehensive and reliable assessment of the current evidence on medical cannabis⁷⁻⁸.

Data Extraction and Synthesis

Relevant data were extracted from the included studies using predefined criteria and a standardized data extraction form. The extracted information encompassed various aspects, including study characteristics (such as study design, sample size, and duration), intervention details (type of cannabis, dosage, administration route), outcomes assessed (efficacy, safety, adverse effects), and key findings. The extracted data were organized in a structured manner to facilitate analysis and synthesis. During the synthesis process, the collected data were critically evaluated, compared, and integrated across studies. Both qualitative and quantitative synthesis methods were employed, depending on the nature of the data. Qualitative synthesis involved a thematic analysis approach, where common themes, patterns, and discrepancies were identified

and discussed. Quantitative synthesis, such as meta-analysis, was conducted when feasible and appropriate, combining data from multiple studies to derive summary estimates of efficacy or safety outcomes. Throughout the data extraction and synthesis process, efforts were made to minimize biases and ensure accuracy. Multiple reviewers were involved in the data extraction process to enhance reliability, and any discrepancies or disagreements were resolved through discussion and consensus. The synthesized findings were then interpreted in the context of the review's objectives, considering the strength of the evidence, limitations of the included studies, and potential sources of bias. The data extraction and synthesis procedures adhered to established guidelines and best practices for systematic reviews, aiming to provide a comprehensive and reliable overview of the current evidence on medical cannabis⁹⁻¹⁰.

III. Historical Perspective

Brief overview of the history and cultural use of cannabis as medicine

Cannabis has been used as a medicine for thousands of years across various cultures. The ancient Chinese, Indian, and Egyptian civilizations used cannabis to treat a variety of medical conditions, including pain, inflammation, and digestive problems. In ancient Greece and Rome, cannabis was used as a pain reliever and sedative. In the 19th century, cannabis became widely used as a medicine in the Western world, particularly for the treatment of pain, insomnia, and other conditions. It was commonly prescribed by doctors and was available in pharmacies in the form of tinctures and extracts. However, the use of cannabis as a medicine declined in the early 20th century with the introduction of synthetic drugs, and the passage of the Marihuana Tax Act in 1937 in the United States effectively criminalized the use of cannabis, leading to its prohibition in many countries. Despite its illegal status, the use of cannabis as a medicine persisted, particularly among cancer and AIDS patients. The medical benefits of cannabis gained increasing attention in the late 20th century, leading to the legalization of medical cannabis in several countries, including the United States, Canada, and Germany¹¹⁻¹².

Today, medical cannabis is used to treat a range of medical conditions, including chronic pain, epilepsy, multiple sclerosis, and cancer-related symptoms. The cultural use of cannabis as a medicine has persisted, with traditional and alternative medicine practitioners continuing to use cannabis for its potential therapeutic benefits. The cultural use of cannabis as medicine has been widespread throughout history and across various cultures. In traditional Chinese medicine, cannabis has been used to treat a range of medical conditions such as rheumatism, malaria, and menstrual cramps. In India, cannabis has been used for thousands of years as a pain reliever, sedative, and anti-inflammatory agent¹³. In Africa, cannabis has been used for its analgesic and anticonvulsant properties. In Native American cultures, cannabis was used to treat a variety of ailments such as fever, cough, and pain. The Navajo tribe used cannabis as a topical treatment for skin conditions, while the Lakota tribe used it as an analgesic and anticonvulsant. In modern times, the cultural use of cannabis as medicine has persisted, particularly among traditional and alternative medicine practitioners. In Jamaica, Rastafarian culture has incorporated the use of cannabis as a sacrament and medicine, with its therapeutic benefits recognized and promoted by the community. In many countries, the legalization of medical cannabis has been driven by the

cultural use of cannabis as medicine, with patients and advocates pushing for access to the plant for its potential therapeutic benefits. The cultural use of cannabis as medicine has contributed to the growing acceptance of medical cannabis in many parts of the world, despite its controversial legal status¹⁴⁻¹⁶.

Chemical constituents of cannabis and their pharmacological properties

Cannabis contains a variety of chemical constituents, including cannabinoids, terpenoids, and flavonoids as shown in figure 1. Cannabinoids are a class of compounds that interact with the body's endocannabinoid system, which is involved in regulating various physiological processes such as pain, inflammation, and mood. The two main cannabinoids found in cannabis are delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD). THC is responsible for the psychoactive effects of cannabis, while CBD is non-psychoactive and has a range of therapeutic properties. Other cannabinoids found in cannabis include cannabigerol (CBG), cannabinol (CBN), and cannabichromene (CBC). Terpenoids are aromatic compounds that give cannabis its characteristic scent and flavor. They also have potential therapeutic properties, including anti-inflammatory, analgesic, and sedative effects. Some common terpenoids found in cannabis include myrcene, limonene, and beta-caryophyllene. Flavonoids are a class of compounds found in many plants, including cannabis. They have antioxidant and anti-inflammatory properties and may contribute to the overall therapeutic effects of cannabis. Some flavonoids found in cannabis include cannflavin A, cannflavin B, and quercetin¹⁷⁻¹⁹.

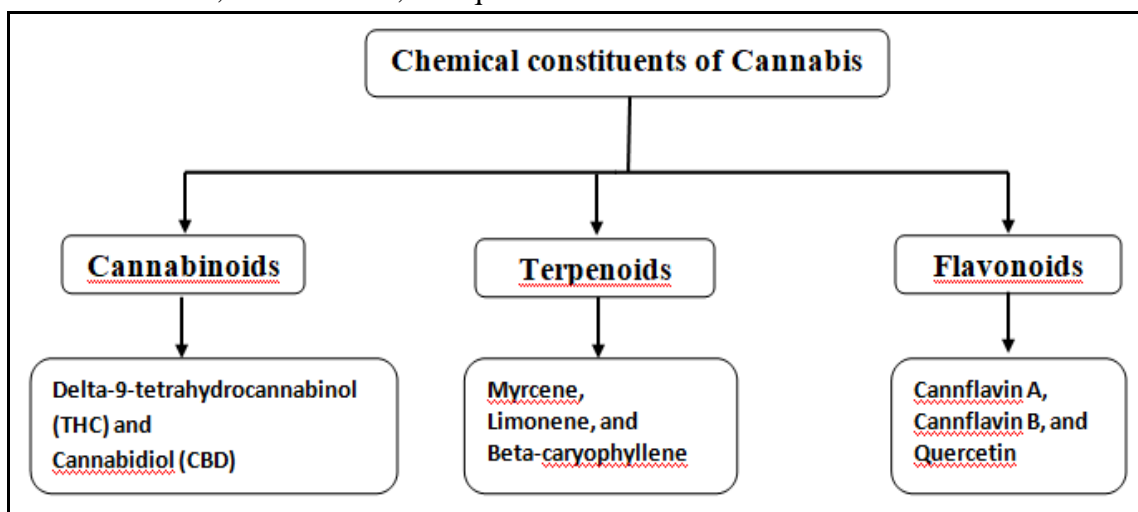


Figure no: 01 Chemical constituents of Cannabis

The chemical constituents of cannabis and their interactions with the body's endocannabinoid system are thought to contribute to the plant's potential therapeutic benefits. However, the exact mechanisms of action are not fully understood, and more research is needed to fully elucidate the pharmacological properties of cannabis. Cannabis has a range of potential pharmacological properties due to its interaction with the body's endocannabinoid system. Some of the potential therapeutic effects of cannabis include: Pain relief, Anti-inflammatory effects, Neuroprotective effects, Anti-anxiety effects, Appetite stimulation, Antiemetic effects, Sleep aid etc. While cannabis has potential therapeutic benefits, it is important to note that its use may also have

adverse effects such as impaired cognitive function, short-term memory loss, and risk of addiction. The pharmacological properties of cannabis are complex, and more research is needed to fully understand its potential therapeutic benefits and risks²⁰⁻²².

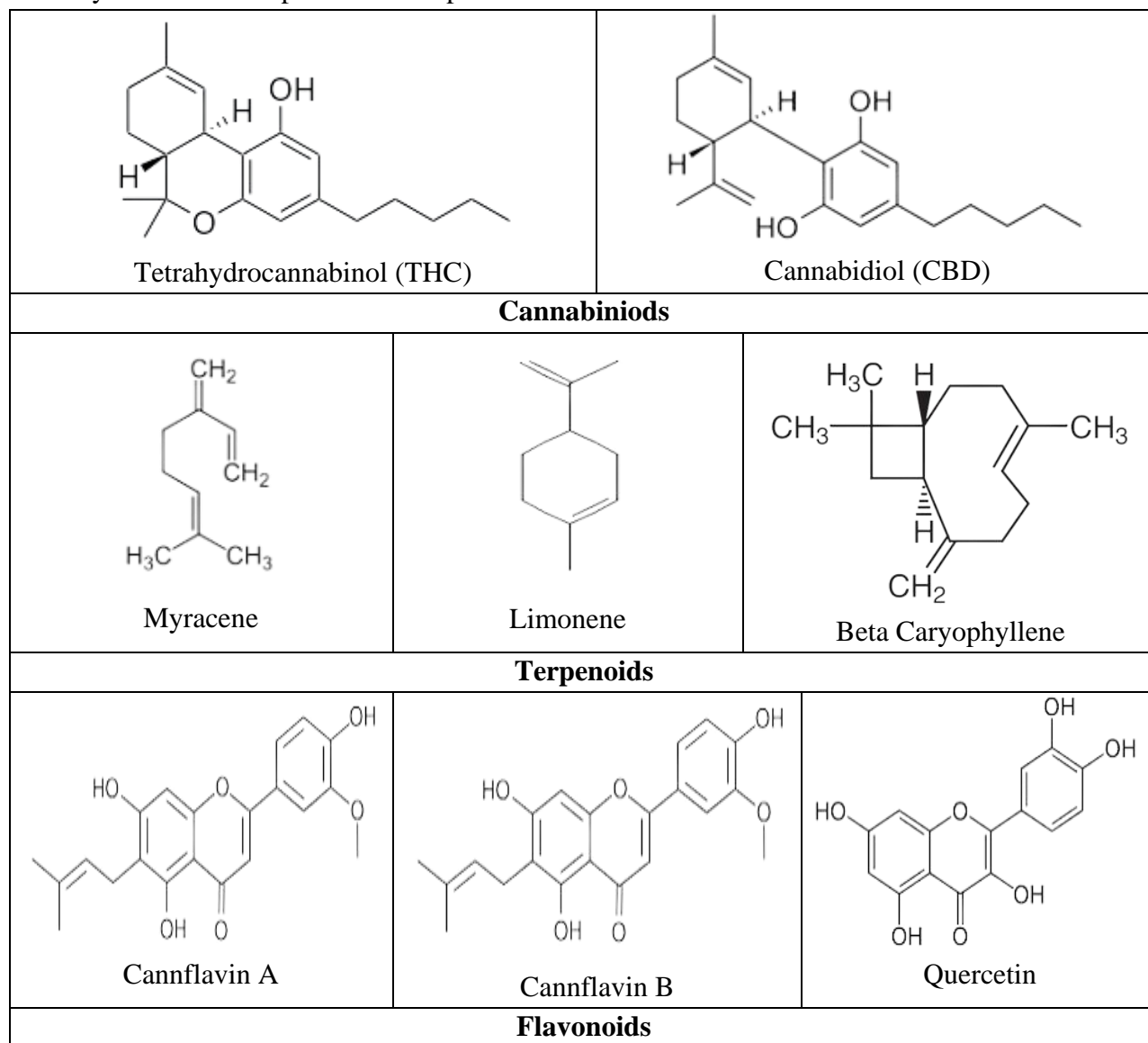


Figure No: 02 Chemical Structure of constituents of Cannabis

Cannabinoids and Their Mechanisms of Action

The endocannabinoid system (ECS) is a complex signaling system within the human body that plays a crucial role in regulating a range of physiological processes, including mood, appetite, pain sensation, and immune function. The ECS is comprised of three main components: endocannabinoids (cannabinoid-like molecules produced by the body), receptors (proteins that bind to endocannabinoids and cannabinoids), and enzymes (that regulate the synthesis and degradation of endocannabinoids). Cannabinoids, including the phytocannabinoids found in cannabis, interact with the endocannabinoid system by binding to cannabinoid receptors. The

two main types of cannabinoid receptors are CB1 and CB2 receptors. CB1 receptors are primarily found in the central nervous system, while CB2 receptors are primarily found in immune cells and peripheral tissues. The main endocannabinoids are anandamide and 2-arachidonoylglycerol (2-AG), which are synthesized and released by neurons in response to various stimuli. Once released, endocannabinoids bind to CB1 and CB2 receptors, leading to a range of physiological effects. Cannabinoids found in cannabis, such as THC and CBD, can also bind to CB1 and CB2 receptors, as well as other receptors in the body. THC primarily binds to CB1 receptors in the brain, leading to the psychoactive effects associated with cannabis use. CBD, on the other hand, has a more complex mechanism of action and interacts with a range of receptors, including CB1 and CB2 receptors, as well as serotonin and GABA receptors^{20, 23-25}. The mechanisms of action of cannabinoids and the endocannabinoid system are complex and not yet fully understood. However, research suggests that the interaction between cannabinoids and the endocannabinoid system plays a crucial role in the potential therapeutic effects of cannabis, including pain relief, anti-inflammatory effects, and neuroprotective effects. Further research is needed to fully elucidate the mechanisms of action of cannabinoids and the endocannabinoid system, and to develop safe and effective cannabinoid-based therapies²⁶⁻²⁷.

Therapeutic Applications of Medical Cannabis:

Medical cannabis has demonstrated potential therapeutic applications across various medical conditions. Here are some of the key areas where medical cannabis has been explored:

- **Pain Management:** Medical cannabis has shown promise in managing both acute and chronic pain, including neuropathic pain, cancer-related pain, and musculoskeletal pain. Cannabinoids in cannabis, such as THC and CBD, interact with the endocannabinoid system and pain pathways, providing analgesic effects²⁸⁻²⁹.
- **Neurological Disorders:** Medical cannabis has been investigated for its potential benefits in neurological conditions such as epilepsy, multiple sclerosis (MS), and Parkinson's disease. It may help reduce seizure frequency, alleviate muscle spasticity, and improve overall symptom management^{25, 30-32}.
- **Psychiatric Disorders:** Some research suggests that medical cannabis may have therapeutic potential in certain psychiatric conditions like anxiety disorders, post-traumatic stress disorder (PTSD), and sleep disorders. CBD, in particular, has been studied for its anxiolytic and antipsychotic properties³³⁻³⁶.
- **Cancer-related Symptoms:** Medical cannabis has been explored as a supportive therapy for cancer patients, especially in managing chemotherapy-induced nausea and vomiting. It may also aid in improving appetite and reducing cancer-related pain³⁷⁻⁴¹.
- **Inflammatory Conditions:** Cannabis has exhibited anti-inflammatory properties, which could be beneficial in conditions like inflammatory bowel disease (IBD), rheumatoid arthritis, and Crohn's disease. Research is ongoing to explore the potential therapeutic effects of medical cannabis in these conditions⁴²⁻⁴⁴.

- Palliative Care: Medical cannabis is often used in palliative care to improve quality of life, alleviate symptoms, and provide comfort for patients with terminal illnesses. It can help address pain, nausea, loss of appetite, and improve overall well-being⁴⁵⁻⁴⁶.
- Other Potential Applications: Medical cannabis is being investigated for its potential benefits in various other conditions, including glaucoma, HIV/AIDS-related symptoms, Tourette syndrome, and autism spectrum disorders. However, more research is needed to establish the effectiveness and safety of medical cannabis in these areas⁴⁷⁻⁵¹.

Efficacy of Medical Cannabis

It is important to note that while medical cannabis shows promise in these therapeutic applications, further research, controlled trials, and standardized guidelines are necessary to determine the appropriate dosing, formulations, and potential risks associated with its use. Healthcare professionals should consider individual patient factors, local regulations, and consult with experts in the field when considering medical cannabis as part of a treatment plan. The efficacy of medical cannabis has been a subject of ongoing research and scientific investigation. While there is growing evidence to support its therapeutic potential, it is important to understand that the efficacy of medical cannabis can vary depending on various factors, including the specific medical condition being treated, the formulation and dosage of cannabis used, individual patient characteristics, and the quality of the available research⁵²⁻⁵³.

Clinical trials and observational studies have provided insights into the efficacy of medical cannabis. Clinical trials are designed experiments that assess the effectiveness of cannabis-based interventions compared to a placebo or standard treatment. These studies have demonstrated positive outcomes in certain conditions such as epilepsy, chronic pain, multiple sclerosis, and nausea and vomiting associated with chemotherapy. Observational studies, which observe patients using medical cannabis in real-world settings, have also reported beneficial effects in various medical conditions. However, it is important to acknowledge the limitations and challenges in studying the efficacy of medical cannabis. The complex nature of cannabis and its constituents, including different ratios of THC and CBD and the presence of other cannabinoids and terpenes, can impact its therapeutic effects. Standardization of cannabis products, dosing regimens, and administration routes remains an area of ongoing research and development. Furthermore, placebo effects, patient expectations, and biases can influence the perceived efficacy of medical cannabis. The subjective nature of symptoms being assessed, such as pain or anxiety, adds complexity to evaluating outcomes. Researchers strive to minimize biases through rigorous study designs, blinding, and appropriate statistical analyses⁵⁴⁻⁵⁶. Overall, while there is promising evidence to support the efficacy of medical cannabis in certain medical conditions, more research is needed to establish clear guidelines, dosage recommendations, and long-term safety profiles. Collaboration between researchers, healthcare professionals, and regulatory bodies is essential to advance our understanding of the therapeutic efficacy of medical cannabis and ensure its responsible and evidence-based use in patient care⁵⁷⁻⁵⁸.

Safety and Adverse Effects

Safety and adverse effects are important considerations when evaluating the use of medical cannabis. While cannabis is generally considered safe when used responsibly and under medical supervision, it is not without potential risks. One of the primary concerns is the psychoactive effects of THC, which can impair cognitive function, coordination, and judgment. These effects can be particularly concerning in certain populations, such as adolescents, pregnant women, and individuals with a history of substance abuse or mental health disorders. Additionally, the long-term effects of regular cannabis use, especially in high doses, are still being studied. Respiratory effects are another consideration, particularly when cannabis is smoked. Inhalation of cannabis smoke can irritate the respiratory tract and potentially lead to respiratory problems, similar to smoking tobacco. Using alternative methods of administration, such as vaporizers or oral ingestion, may help mitigate these risks. Cannabis can also interact with other medications. It can affect the metabolism of certain drugs through the cytochrome P450 enzyme system, potentially altering their efficacy or increasing the risk of adverse effects. Therefore, it is important for healthcare professionals to carefully consider potential drug interactions when prescribing medical cannabis. Furthermore, while rare, acute adverse effects such as anxiety, paranoia, hallucinations, and panic attacks can occur, especially with higher THC concentrations. These effects are more likely in individuals who are sensitive to the psychoactive properties of cannabis or who consume excessive amounts. It is worth noting that the safety profile of CBD, a non-psychoactive component of cannabis, appears to be better established. CBD is generally well-tolerated, with minimal adverse effects reported. However, further research is needed to fully understand its long-term safety profile and potential drug interactions. To ensure the safe use of medical cannabis, healthcare professionals play a crucial role in assessing individual patient characteristics, considering potential risks and benefits, and providing appropriate guidance and monitoring. It is essential for patients to have open and honest discussions with their healthcare providers about their medical history, current medications, and any concerns or side effects they may experience during treatment. As the field of medical cannabis research continues to evolve, ongoing monitoring and comprehensive reporting of adverse events are essential to better understand and mitigate potential risks. Continued research, education, and evidence-based guidelines will help optimize the safety of medical cannabis and enhance patient care⁵⁹⁻⁶³.

Regulatory and Legal Considerations

Regulatory and legal considerations play a crucial role in the use of medical cannabis. The legality of medical cannabis varies significantly between countries and even within different regions or states of the same country. Some jurisdictions have implemented comprehensive medical cannabis programs that allow for the legal use of cannabis for medical purposes, while others maintain strict restrictions or prohibit its use entirely. Regulatory frameworks for medical cannabis typically involve licensing and oversight of cultivation, processing, distribution, and prescribing practices. These regulations aim to ensure quality control, product safety, and patient protection. They may also include requirements for patient eligibility, healthcare professional involvement, and documentation of medical necessity. The legal status of medical cannabis impacts patient access, healthcare provider involvement, and the availability of standardized,

quality-controlled cannabis products. It also influences the ability to conduct research on medical cannabis and the dissemination of scientific knowledge. Healthcare professionals must be aware of the specific legal and regulatory framework in their jurisdiction to provide appropriate guidance and support to patients considering medical cannabis. This includes understanding eligibility criteria, documentation requirements, and potential legal risks for both patients and providers. Furthermore, patient education on the legal implications and responsibilities associated with medical cannabis use is crucial. Patients should be aware of their rights, legal restrictions, and the importance of complying with local regulations to ensure their safety and legal protection⁶⁴⁻⁶⁷.

As the field of medical cannabis continues to evolve, regulatory frameworks are likely to undergo changes and adaptations. Healthcare professionals, policymakers, and regulatory authorities need to collaborate and stay informed to ensure that regulations are evidence-based, patient-centered, and responsive to emerging scientific knowledge and patient needs. It is essential for patients and healthcare providers to stay updated on legal developments, consult with legal professionals when necessary, and advocate for responsible and informed policies that support safe access to medical cannabis for patients who can benefit from its use⁶⁸⁻⁶⁹.

Future Directions and Research Needs

Future directions and research needs in the field of medical cannabis are crucial to further our understanding of its efficacy, safety, and optimal use. Here are some key areas that require attention:

1. **Standardization and Quality Control:** There is a need for standardized cannabis products with consistent cannabinoid profiles, terpene content, and quality control measures. This would enable more accurate dosing and comparisons across studies, improving the reliability of research outcomes.
2. **Comparative Effectiveness Studies:** Comparative effectiveness studies are needed to evaluate the efficacy of medical cannabis compared to other treatment options or standard care. This research would help healthcare providers and patients make informed decisions about the most appropriate therapies for specific medical conditions.
3. **Long-Term Safety and Adverse Effects:** Further investigation into the long-term safety profile of medical cannabis is essential. Longitudinal studies are needed to assess potential risks, including cognitive effects, respiratory health, mental health outcomes, and dependency. Understanding the potential risks associated with long-term use is crucial for informed decision-making.
4. **Optimal Formulations and Delivery Methods:** Research is needed to identify the most effective formulations, dosages, and delivery methods for different medical conditions. This includes investigating the potential benefits and drawbacks of various administration routes such as inhalation, oral ingestion, transdermal patches, and topical applications.
5. **Mechanisms of Action:** Elucidating the underlying mechanisms of action of cannabinoids and their interactions with the endocannabinoid system can provide valuable insights into

their therapeutic effects. Further research is needed to better understand how cannabinoids modulate pain, inflammation, neurological disorders, and other physiological processes.

6. **Pediatric and Geriatric Populations:** Limited research exists on the use of medical cannabis in pediatric and geriatric populations. More studies are needed to assess the safety, efficacy, and optimal dosing of medical cannabis in these age groups, considering their unique physiological and developmental factors.
7. **Regulatory Frameworks:** Continued examination and refinement of regulatory frameworks are necessary to ensure patient access, product safety, and responsible use of medical cannabis. Collaboration between healthcare professionals, policymakers, regulatory authorities, and patient advocacy groups is crucial to establish evidence-based guidelines and policies.
8. **Education and Training:** Adequate education and training for healthcare professionals are essential to enhance their understanding of medical cannabis, its potential benefits, and its limitations. Integrating medical cannabis education into healthcare curricula and providing continuing education opportunities can help healthcare providers navigate the complexities of medical cannabis use.

By addressing these future directions and research needs, we can further advance the field of medical cannabis, optimize patient care, and foster evidence-based practice. Continued investment in research, collaboration among stakeholders, and knowledge sharing will contribute to a more comprehensive understanding of medical cannabis and its role in healthcare.

Conclusion:

In summary, the critical review of the current evidence on medical cannabis highlights its potential therapeutic applications, efficacy, safety considerations, regulatory aspects, and the need for future research. The review discusses the pharmacological properties of cannabis, including its cannabinoids and their interactions with the endocannabinoid system. It explores the therapeutic applications of medical cannabis, with a specific focus on pain management. The evidence suggests that medical cannabis may provide benefits for chronic pain, epilepsy, multiple sclerosis, nausea and vomiting related to chemotherapy, and other conditions. However, more research is needed to establish clear guidelines and recommendations for specific medical conditions. The review emphasizes the importance of rigorous clinical trials and observational studies to evaluate the efficacy of medical cannabis. It discusses the role of placebo effects and biases in cannabis research, highlighting the need for proper study design and statistical analyses to minimize these influences. Safety considerations and adverse effects are also discussed, including the psychoactive effects of THC, respiratory effects, potential drug interactions, and acute adverse reactions. The importance of healthcare professional involvement, patient education, and compliance with legal and regulatory frameworks is underscored. The review concludes by identifying several future directions and research needs in the field of medical cannabis. These include standardization and quality control of cannabis products, comparative effectiveness studies, long-term safety assessment, optimal formulations and delivery methods, understanding mechanisms of action, studying special populations, refining regulatory

frameworks, and providing education and training for healthcare professionals. In conclusion, while there is growing evidence to support the therapeutic potential of medical cannabis, further research is needed to fully understand its efficacy, safety profile, and optimal use in specific medical conditions. Collaboration among researchers, healthcare professionals, policymakers, and regulatory bodies is crucial to advance the field, establish evidence-based guidelines, and ensure responsible and informed use of medical cannabis. Continued investment in research, education, and regulatory efforts will contribute to the comprehensive understanding and appropriate integration of medical cannabis into patient care.

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