

Assessment of Medical Knowledge on Cannabinoid-Based Medicine

Evaluación del conocimiento médico sobre la medicina derivada de cannabinoides

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Abstract

Objective: To assess the knowledge of medical residents regarding cannabinoid-derived medicine. **Methods:** An anonymous survey administered to professionals affiliated to medical specialty programs of the Center for Research and Teaching in Health Sciences at the Autonomous University of Sinaloa, based at the Civil Hospital of Culiacán. **Results:** Of the 71 medical residents surveyed, 93% recognized the medical use of cannabinoids, but 77.5% did not receive professional training on the subject. Consequently, 83.1% did not feel prepared to prescribe them, and 23.9% lacked knowledge about the endocannabinoid system. Additionally, 93% considered medical training in this field necessary. Regarding regulation, 88.7% were unfamiliar with the *Reglamento de la Ley General de Salud en Materia de Control Sanitario para la Producción, Investigación y Uso Medicinal de la Cannabis y sus Derivados Farmacológicos* (Regulation of the General Health Law on Sanitary Control for the Production, Research, and Medicinal Use of Cannabis and its Pharmacological Derivatives). **Conclusion:** There is a broad acceptance of the therapeutic use of cannabinoids; however, insufficient training and an unawareness normative among the surveyed medical residents highlight the need to strengthen education in cannabinoid medicine as an emerging theme in Mexico.

Keywords: Cannabinoid-Based Medicine; Cannabinoids; Endocannabinoids; Health Knowledge

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Resumen

Objetivo: evaluar el conocimiento de los médicos residentes sobre la medicina derivada de cannabinoides. **Métodos:** se aplicó una encuesta anónima a profesionales afiliados a los programas de especialidades médicas del Centro de Investigación y Docencia en Ciencias de la Salud de la Universidad Autónoma de Sinaloa, con sede en el Hospital Civil de Culiacán. **Resultados:** de los 71 médicos residentes encuestados, 93% reconoció la utilidad medicinal de los cannabinoides, pero 77.5% no ha recibido formación profesional al respecto. En consecuencia, 83.1% no se siente preparado para prescribirlos y 23.9% carece de conocimiento sobre el sistema endocannabinoide. Además, 93% consideró necesaria la formación médica en este campo. En términos de regulación, 88.7% desconoce el reglamento de la Ley General de Salud en Materia de Control Sanitario para la Producción, Investigación y Uso Medicinal del Cannabis y sus Derivados Farmacológicos. **Conclusión:** existe una aceptación mayoritaria sobre la utilidad terapéutica de los cannabinoides; sin embargo, la insuficiente formación y el desconocimiento normativo entre los médicos residentes encuestados evidencian la necesidad de fortalecer la educación en medicina cannabinoide como un tema emergente en México.

Palabras clave: cannabis medicinal, cannabinoides, endocannabinoides, conocimiento en salud.

Introduction

Cannabis is a plant that has accompanied humanity for thousands of years due to its medical, recreational, and ritual applications. Among its main species are

Cannabis sativa and *Cannabis indica*; nonetheless, hybridization processes have given rise to numerous varieties and subspecies, which contributes to great diversity. In this article, the term cannabis will be used generally to refer to all of them.

In the United States, cannabis was part of the pharmacopeia in 1850. Similarly, in Mexico, the first Mexican Pharmacopeia, published in 1846, mentioned cannabis, and later its therapeutic properties were recognized.^{1,2} However, by 1942, it was removed from the United States pharmacopeia. Subsequently, in 1970, cannabis was classified in Schedule I of the Controlled Substances Act, restricting its acquisition for research purposes, and limiting the development of medicinal studies.

This led many countries to prohibit the production, distribution, and possession of cannabis, including Mexico. Nevertheless, over time, countries such as the Netherlands, Canada, the United States, and Uruguay have regulated its use and commercialization.³ Currently, more than 36 countries permit the medical use of cannabis, and at least 16 additional countries have regulatory policies under development or implementation phase.⁴

In Mexico, the approval in 2021, of the Regulation on Sanitary Control for the Production, Research, and Medicinal Use of Cannabis and its Pharmacological Derivates represented a significant change in its regulation.⁵ In this new scenario, understanding adverse effects and strengthening health education becomes essential.

Nevertheless, still doubts persist about the safety and efficacy of cannabinoid therapies, including possible counterindications and pharmacologi-

cal interactions associated with their consumption. The lack of specific medical training has also kept the topic under constant discussion within the sanitary field. Despite many health professionals express strong support for the regulation of medical cannabis and cannabinoid-derived medicine, many still face limitations in their knowledge and confidence to prescribe or advise on these treatments, largely because most did not receive sufficient training on this topic during their professional education.^{6,7}

In this context, it is fundamental to determine the perception and the level of knowledge of health professionals regarding the use of cannabinoid-derived medicine. Therefore, this study aimed to assess medical residents' knowledge with the purpose of generating information that contributes to the development of effective public policies and informed decision-making in the national health-care and sanitary system.

Methods

A descriptive cross-sectional study was conducted through an electronic survey to medical residents at the Center for Research and Teaching in Health Sciences of the Autonomous University of Sinaloa at the Civil Hospital of Culiacan, from January 1 to February 15, 2024. Participant recruitment was carried out by sending the survey form exclusively to the institutional email accounts of the medical residents working at the institution, thereby ensuring that only medical trainees responded.

The sample size corresponds to all medical residents who met the inclusion criteria: being licensed resident physicians enrolled in a clinical specialty program, agreeing to participate through

informed consent, and having an active institutional email at the hospital. Those who did not complete the entire survey were excluded.

The survey, consisting of 16 questions with multiple-choice, polytomous, and dichotomous, was adapted from surveys used in previous studies to assess needs, opinions, and knowledge among health professionals, including physicians and medical students. These adaptations were based by needs identified during national forums on cannabinoid medicine, as well as postgraduate courses on cannabinoid pharmacology for physicians.

The research team consisted of professors and researchers with experience in cannabinoid medicine and cannabis regulation in Mexico. The study was approved by the Research Ethics Committee of the Center for Research and Teaching in Health Sciences of the Autonomous University of Sinaloa at the Civil Hospital of Culiacan, registration number 149-2023. The informed consent was required from all participants, ensuring confidentiality and anonymity of the data, in accordance with the International Ethical Guidelines of the Council for International Organizations of Medical Sciences (CIOMS) (2016), the Declaration of Helsinki and *Reglamento de la Ley General de Salud en Materia de Investigación para la Salud* (Regulation of the General Health Law on the Subject of Health Research). This was a non-risk study, with voluntary and anonymous participation.

Data collection was conducted through an electronic survey. Variables registered included sociodemographic data, professional education on medicinal use of cannabinoids, level of knowledge about the endocannabinoid system, opinions regarding medical use

of cannabinoids, and on the regulation of cannabinoids for medical use.

The variables included in the questionnaire were treated according to their nature, responses such as “strongly agree”, “agree”, “I don’t know”, “disagree”, “strongly disagree” correspond to a five-point Likert scale, were considered polytomous variables, which allow capturing gradients of opinion and were analyzed individually, without grouping or transformation. On the other hand, “yes” and “no” responses were classified as dichotomous variables. The questions included dichotomous and polytomous items were treated individually. Dichotomous items were analyzed through frequency distribution and percentages, to explore response patterns and establish relationship between questions.

Results

One hundred and eighty-one resident physicians were invited to participate in the survey on knowledge and opinion about the medical use of cannabinoids. Of these, 106 accepted the informed consent and began completing the questionnaire; later, the participation of 35 resident physicians who did not complete the survey in its entirety was eliminated. Finally, the sample of 71 medical residents was analyzed.

Regarding the sociodemographic profile of the participants, 47 were men (66.2%) and 24 were women (33.8%). Age ranged from 26 to 35 years old. Concerning religion, 49 residents (69%) reported practicing the Catholic religion, 19 (26.8%) declared having no religion, and 3 (4.2%) identified with a Protestant/Evangelical Christian religion.

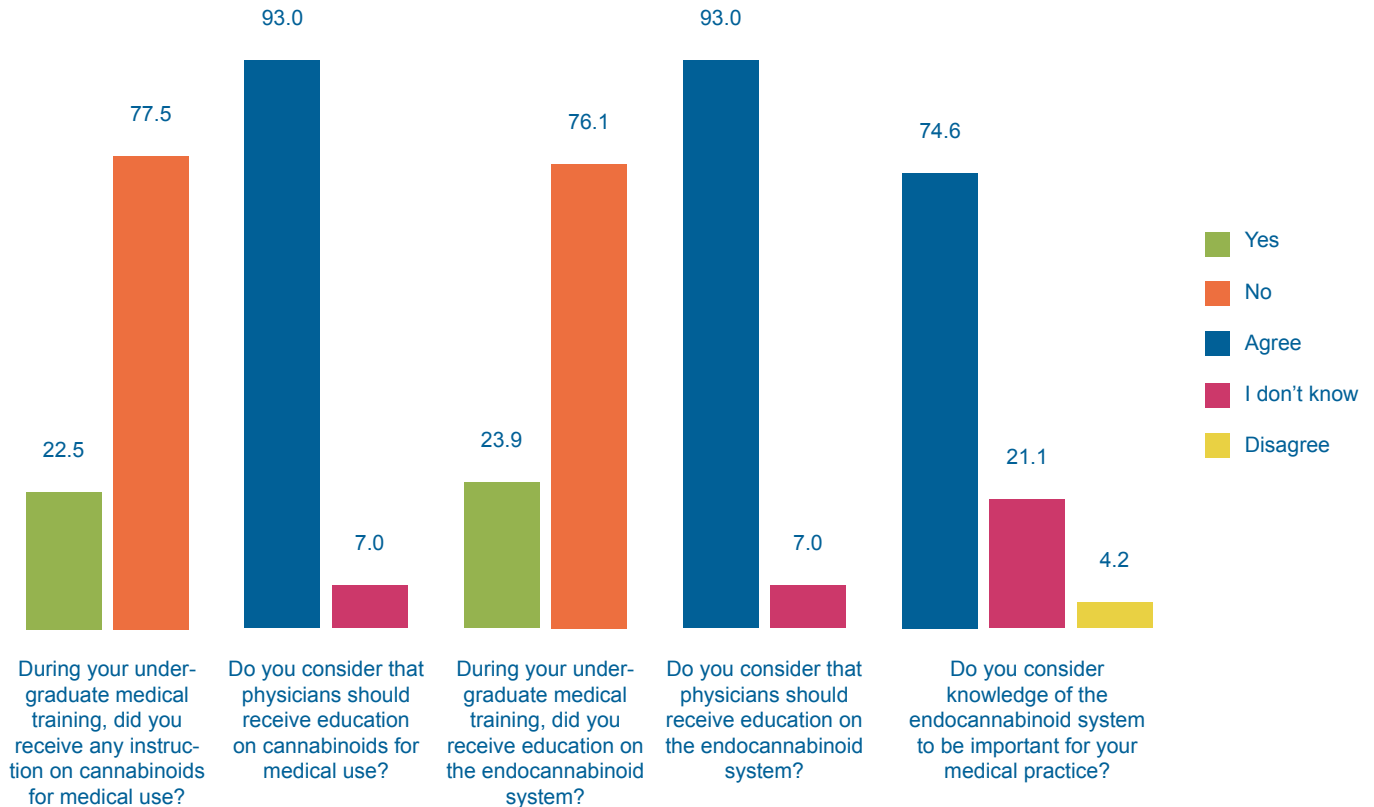
Concerning professional training on the medical use of cannabinoids,

16 medical residents (22.5%) reported having received such training, while 55 (77.5%) responded they had not. In this regard, 66 (93%) medical residents considered that education on cannabinoids should be part of medical training. Similarly, 17 residents (23.9%) reported not having received education on the endocannabinoid system, and 66 (93%) agreed that physicians should receive professional training on it. Additionally, 55 residents (77.5%) expressed that knowledge of the endocannabinoid system is important during their professional practice (Figure 1).

Regarding the self-perceived level of knowledge about the endocannabinoid system, as well as the compounds and receptors involved, 17 and 18 participants (23.9% and 25.4%) informed having no prior knowledge on the subject; besides between 38 and 39 medical residents (53.5 and 54.9%) considered having basic knowledge, while 10 to 13 medical residents (14.1% and 18.3%) reported having intermediate knowledge. Likewise, between 3 and 5 participants (4.2% and 7.0%) reported having advanced knowledge on the topic. Finally, participants were asked: Do you consider yourself prepared to prescribe or advise a patient on the medical use of cannabinoids? In this regard, 59 medical residents (83.1%) expressed a lack of confidence, indicating they felt unprepared for the task, while only 4 (5.6%) participants considered themselves prepared to prescribe or advise on cannabinoid-based medicine (Figure 2).

Regarding the medical use of cannabinoids, 66 medical residents (93%) indicated that cannabinoids do have any medical use. Additionally, 54 residents (76.1%) stated that cannabinoids can achieve therapeutic efficacy as long as

Figure 1. Opinions of medical residents regarding professional training received on the medical use of cannabinoids



The values at the top of each bar represent the percentage of medical residents who selected that response

they are used responsibly; however, 17 medical residents (23.9%) reported lacking knowledge on the subject. Regarding the perception about adverse and therapeutic effects of cannabinoid-derived medications, 43 participants (60.6%) declared that they were unaware of a clear relationship between both effects.

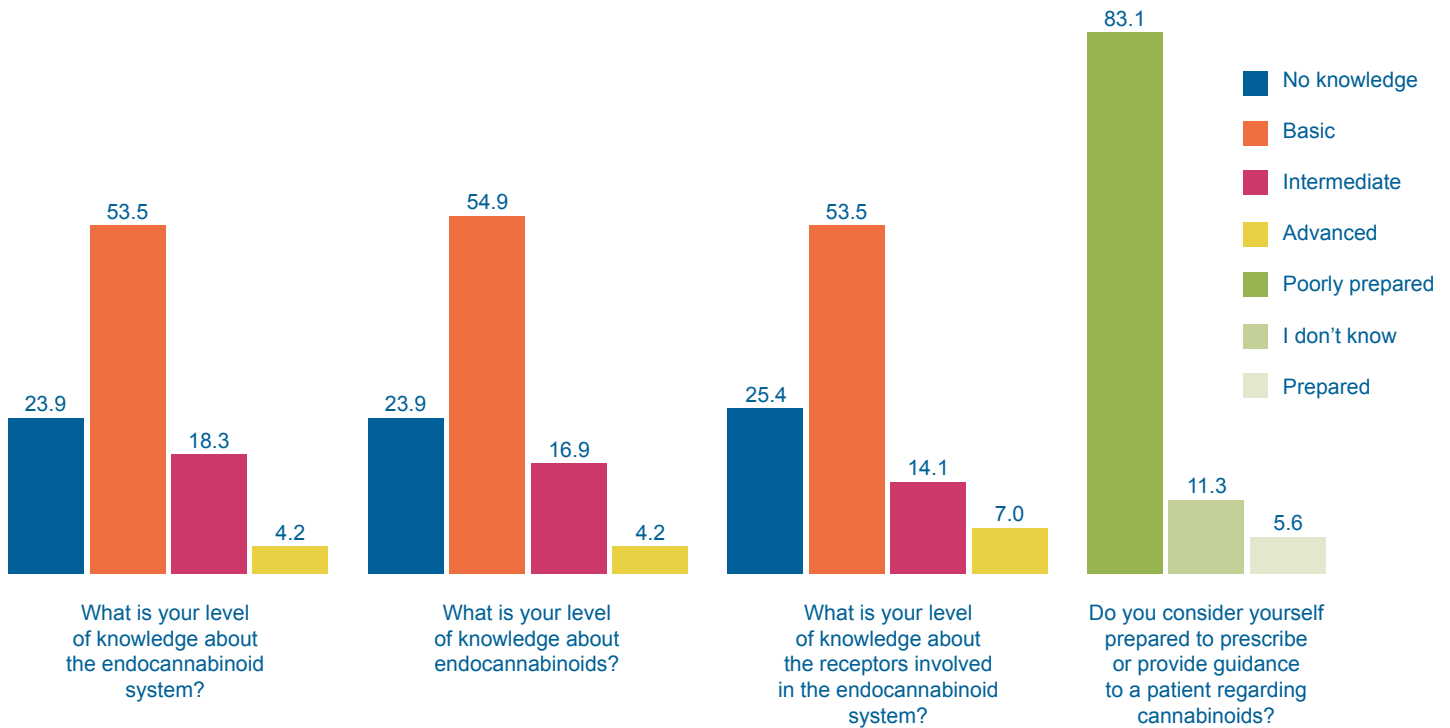
On the other hand, 13 participants (18.3%) considered that potential adverse effects could outweigh therapeutic benefits, while 15 residents (21.1%) disagreed with this statement, pondering that therapeutic effects may be predominant. Likewise, 34 medical residents (47.9%) reported being unable to identify differences between a cannabis preparation and a cannabinoid-derived medication (Figure 3).

Finally, we addressed the medical opinion regarding the regulation of cannabinoids for medical use. In this regard,

63 participants (88.7%) reported not being familiar with, having read, or having hearing about the Regulation of the General Health Law on Health Control for the Production, Research and Medical Use of Cannabis and its Pharmacological Derivatives. Additionally, they were asked whether they considered that the prescription of cannabinoid-derived medicine could lead to cannabis use disorder. In this regard, 36 medical residents (50.7%) expressed not knowing about the topic, while 24 (33.8%) considered that such prescription could contribute to the development of a related disorder. In contrast, 11 participants (15.5%) disagreed with this statement.

Additionally, medical residents were asked whether they considered that people who support the regulation of medical use of cannabinoids are consumers of other illegal substances.

Figure 2. Self-perceived knowledge level on the endocannabinoid system among the surveyed medical residents



The values at the top of each bar represent the percentage of medical residents who selected that response

In this regard, 31 residents (43.7%) disagreed with this statement, 20 (28.2%) stated not knowing, and the remaining 20 (28.2%) considered that there is a relationship between supporting the regulation of medical use of cannabinoids and the consumption of other illegal substances (Figure 4).

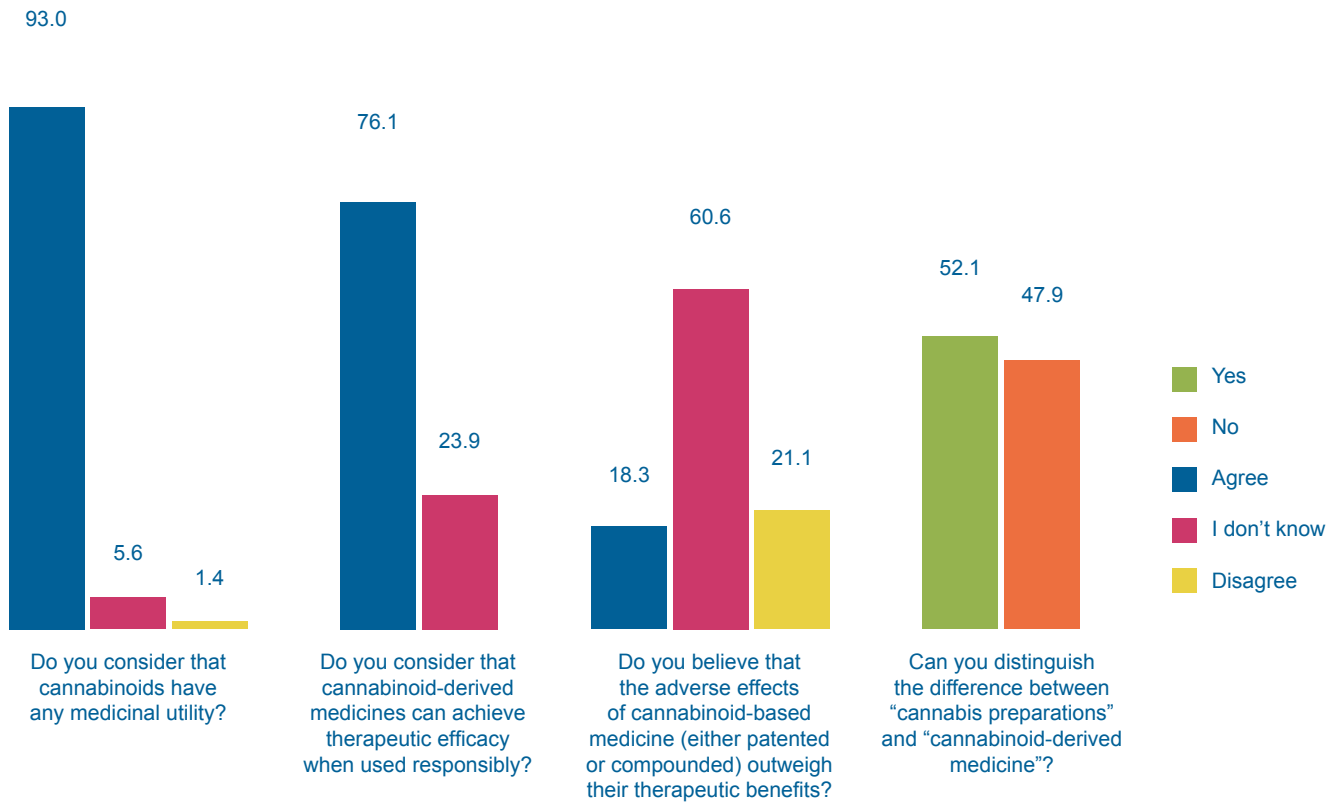
Discussion

The medical use of cannabinoids has gained worldwide relevance in recent decades, driven by growing evidence of their therapeutic efficacy in the management of chronic pain, refractory epilepsy, and certain neurological disorders, including spasticity in multiple sclerosis, motor symptoms in Parkinson's disease, and seizure reduction in resistant epileptic syndromes such as Dravet and Lennox-Gastaut.⁸⁻¹⁴ However, several studies have shown that health professionals have significant

deficiencies in their knowledge about the endocannabinoid system, the pharmacological mechanisms of cannabinoids, and their legal implications.^{6,7} In this context, our study contributes to the existing knowledge by exploring perceptions and the level of medical training regarding the medical use of cannabinoids among medical residents at a university hospital in Mexico.

The results showed a positive attitude toward the medicinal usefulness of cannabinoids but also highlighted lack of confidence in prescribing or advising patients, attributed to the absence of formal education on the subject. This finding coincides with studies conducted among physicians in different countries, in which more than half reported never having prescribed cannabinoid-derived medicine, mainly due to "insufficient knowledge", however, most of them were willing to

Figure 3. Medical residents' opinions on the medical use of cannabinoids



The values at the top of each bar represent the percentage of medical residents who selected that response

explore its use, and only 3.2% reported prior experience in prescribing or recommending.^{6,7,15-19}

These findings reflect a paradox: although there is awareness of its therapeutic value, the educational deficit represents an obstacle to integrating of cannabinoid-derived medicine into clinical practice. This underlines the urgent need to incorporate curricular content on cannabinoid pharmacology.

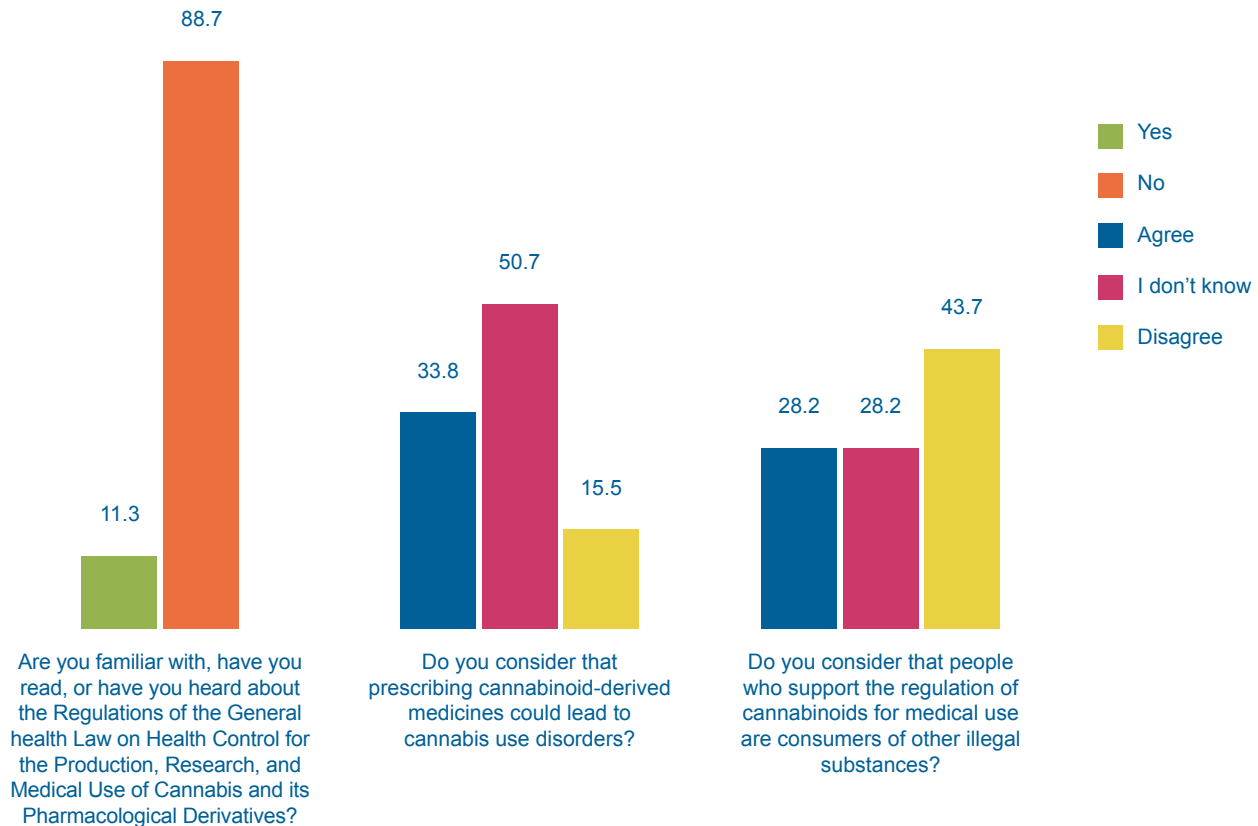
In relation to the endocannabinoid system, the majority of the participating medical residents showed a low general

level of knowledge about the receptors and endogenous compounds. Similarly, one study reported that most of the surveyed physicians (60%) expressed that their knowledge about the endocannabinoid system was minimal or nonexistent.²⁰ Nevertheless, the medical residents in the present study recognized the importance of knowledge for their clinical practice. This result suggests a favorable attitude toward professional training, which coincides with previous reports: although health professionals support the use of cannabinoid-derived

medicine, the need for a more complete, accessible, and up-to-date training on the topic.^{6,7,15,16,18,19,21} This positive attitude represents a key opportunity to develop academic programs that strengthen management of cannabinoid-based therapies.

In the present study, nearly half of the surveyed residents did not know how to distinguish between a cannabis preparation and a cannabis-derived medication. In this context, one study assessed physicians' knowledge regarding the differences between cannabis

Figure 4. Medical residents' opinions on regulation of cannabinoids for medical use



The values at the top of each bar represent the percentage of medical residents who selected that response

products and cannabinoid-derived medications. The numerical results yielded an average score of 2.36, indicating limited understanding of the differences surrounding the range of products with cannabinoids and those commonly used with therapeutic purposes.²² Our findings coincide with these results: a conceptual confusion persists, which can have clinical and regulatory consequences, since cannabis preparations and standardized cannabinoid-derived medications differ in composition, potency, quality control, and regulation.

On the other hand, both the European Pain Federation, and the European Monitoring Centre for Drugs and Drug Addiction define the terms “medical cannabis”, “medical marijuana” or “cannabis preparations” exclusively to refer to cannabis plant material, such as flowers, marijuana, hashish, buds, leaves, or full-plant extracts, used for medical purposes. In contrast, products containing plant-derived or synthetic cannabinoid with a defined and standardized THC and CBD content must be classified as “cannabinoid-derived medications” or

“cannabis-based medicine”.^{23,24} In this context, there is a need to disseminate clear terminology for coherent medical and legislative practice.

From our perspective, the stigma observed in 20 medical residents (28.2%), who considered there is a relationship between consumers of illegal substances and people who support the regulation of medicinal cannabis use, could be due to the lack of clear and consensual terminology. This imprecision not only hinders the social acceptance of cannabinoid-derived medicine but

also complicates the development of coherent legislation on its therapeutic use. It is essential to emphasize that, although the therapeutic use of cannabinoids is supported by clinical evidence in certain pathologies, its use must be carried out under medical supervision and within a clearly defined regulatory framework.

Recreational cannabis use, particularly among vulnerable individuals or those with genetic predispositions, has been associated with a higher risk of developing psychiatric disorders such as depression, suicidal ideation, and schizophrenia.^{9,25-28} However, these adverse effects have not been directly linked to therapeutic cannabinoid-derived medications, which have standardized concentrations and well-established administration routes. Clearly defining this difference is essential to avoid confusion between clinical and recreational use, both among health professionals and the general population.

Despite this distinction, social perceptions tend to equate the recreational consumption with medical cannabis use, contributing to stigmatization and misinformation surrounding its therapeutic application.

A study conducted in Monterrey, Nuevo León (Mexico), reported that 23.4% of respondents considered that those who support the regulation of medical cannabis use are also drug consumers. This same study observed that this perception decreased significantly as educational level increased.²⁹ Likewise, research in Sinaloa (Mexico) identified that after receiving scientific

information about the plant, opinions became neutral or positive compared to participants' initial perception, concluding that education reduces stigma and promotes an informed view of cannabis consumption.³⁰ Therefore, education and terminological precision are crucial factors in overcoming the stigma associated with cannabinoid-derived medicine.

Among the strengths of this study is the inclusion of licensed medical residents enrolled in a clinical specialty program at university hospital, which allows identifying the actual needs in specialized medical education. However, important limitations were acknowledged: the sample size and its concentration in a single institution limit the generalization of results to other national or international contexts. Additionally, the use of a self-perception questionnaire could introduce response bias. Another relevant limitation is that none of the surveyed medical residents reported using cannabinoid-derived in their medical practice or belonging to specialties in which its medical use is formally recommended. This situation may influence overall perceptions of therapeutic usefulness, as opinions are not based on direct patients-care experience.

Conclusions

The surveyed medical residents acknowledge the therapeutic usefulness of cannabinoids; however, deficiencies were identified in their knowledge on this topic, as well as on the endocannabinoid system and current regulatory

framework. These results reflect only the perception of licensed medical residents enrolled in a clinical specialty and cannot be generalized to the entire medical population of the region. The results obtained could serve as a basis for future national studies that further explore the knowledge and needs of healthcare professionals regarding cannabinoids medical use, thereby favoring to improved care for patients who require cannabis-derived medications.

Contribution of the authors

GN Q-B: conceptualization, discussion of results, development and writing; IB F-M: conceptualization, development and translation into English; JN M-Z: data analysis and discussion of results; JD M-G: development, writing, survey application, data analysis and discussion of results; M O-V: development, writing, and data analysis; BA A-L: conceptualization, development, and writing.

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Conflicts of Interest

The authors declare no conflicts of interest.

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