

Impact of Medical Cannabis Legalisation: A Thematic Review

Impak Mensahkan/Legalisasi Ganja Perubatan: Tinjauan Tematik

EKMIL KRISNAWATI ERLIN JONI*, SHAHRUL MIZAN ISMAIL & ROHAIDA NORDIN

ABSTRACT

The usage and values of cannabis, or cannabis for medicinal purposes, have been historically recognised since ancient times. Evidence from clinical research demonstrated the therapeutic advantages of cannabis in an extensively wide area of medicinal aspects. Resultantly, many nations have decided to legalise the medicinal use of cannabis. Despite the international recognition of medical cannabis, Malaysia maintains the status quo of cannabis prohibition as a highly addictive drug with no medicinal value. The Malaysian government argues that the harmful effects of medical cannabis legalisation outweigh the benefits. No review paper has discussed the current research patterns on the impact of medical cannabis legalisation, while thematic review studies on this issue are limited. Therefore, this article synthesised literature from 2017 to 2021 to identify research patterns and recent academic discussions on the impact of medical cannabis legalisation. A keyword search and screening process utilising Scopus and Web of Science (WoS) databases inclusion criteria yielded 718 peer-reviewed academic journal articles. Nonetheless, only 72 articles were selected for final evaluation following the exclusion and inclusion process. The thematic review of the 72 publications identified 19 preliminary codes on the impact of medical cannabis legalisation. The ATLAS.ti 9 software was utilised to conduct the theme analysis review of the selected articles. The quantitative results presented the research patterns of the impact of medical cannabis legalisation. Additionally, the qualitative analysis generated five main themes developed in the literature on the impact of medical cannabis legalisation, namely (1) impact on health, (2) impact on policy, (3) impact on society, (4) impact on health system, and (5) impact on criminal activities. The findings will benefit future studies on implementing medical cannabis law (MCL) in Malaysia. Unfortunately, this study is limited to Scopus and WoS databases, and the impact of recreational cannabis legalisation is not included. The findings may benefit future research on medical cannabis legalisation and the suitable regulatory framework of medical cannabis policy for Malaysia.

Keywords: Medical cannabis; impact; effect; legalisation; thematic review; ATLAS.ti 9

ABSTRAK

Penggunaan dan nilai ganja atau ganja bagi tujuan perubatan telah diiktiraf dalam sejarah sejak zaman dahulu. Kajian klinikal membuktikan kelebihan dan manfaat ganja yang luas dalam pelbagai aspek perubatan. Oleh itu, banyak negara telah meluluskan penggunaan ganja dalam perubatan. Walaupun ganja perubatan telah diiktiraf di peringkat antarabangsa, Malaysia masih mengekalkan status larangan sebagai ubat dan ganja dianggap sebagai dadah yang menyebabkan ketagihan serta tidak mempunyai nilai perubatan. Kerajaan Malaysia berhujah bahawa kesan bahaya mensahkan ganja perubatan melebihi manfaatnya. Walaupun begitu, berdasarkan pemerhatian masih ada kekurangan kajian yang meninjau secara tematik mengenai impak mensahkan/legalisasi ganja perubatan. Oleh itu, tujuan tinjauan tematik ini menggunakan ATLAS.ti 9 adalah untuk mensintesis literatur daripada tahun 2017 to 2021 untuk mengenal pasti perbincangan akademik terkini tentang kesan menghalalkan/mensahkan ganja perubatan. Pencarian kata kunci, diikuti oleh saringan menggunakan kriteria kemasukan dari pangkalan data Scopus dan Web of Science (Wos), mengenal pasti 718 artikel jurnal. Namun, setelah proses penyaringan, hanya 72 artikel yang digunakan sebagai artikel terakhir yang akan dikaji. Kajian tematik terhadap 72 artikel ini mengenal pasti 19 kod awal yang membincangkan kesan meluluskan/legalisasi ganja perubatan. Penerbitan tersebut dikelompokkan kepada lima tema : (1) impak kepada kesihatan, (2) impact kepada polisi, (3) impak kepada masyarakat, (4) impak kepada sistem kesihatan, dan (5) impak kepada aktiviti jenayah. Hasil kajian ini akan memberi manfaat kepada kajian akan datang mengenai pelaksanaan undang-undang ganja perubatan (MCL) di Malaysia. Walau bagaimanapun, kajian ini terhad kepada pangkalan data Scopus dan WoS. Tambahan pula, kesan pengesahan ganja rekreasi tidak termasuk dalam kajian ini. Penemuan ini mungkin memberi manfaat kepada penyelidikan masa depan mengenai legalisasi ganja perubatan dan rangka kerja kawal selia yang sesuai bagi dasar ganja perubatan untuk Malaysia.

Kata kunci: Ganja Perubatan; impak, kesan; legalisasi/mensahkan; tinjauan tematik; ATLAS.ti 9

INTRODUCTION

Medical cannabis is identified as leaves and flowers derived from the plant family Cannabaceae (Fitzcharles et al. 2019). Medical cannabis refers to goods containing natural phytocannabinoids or synthetic cannabinoids approved by regulatory bodies for medical purposes (Van Rensburg et al. 2020) possession and use of cannabis by adults. Cannabis contains varying amounts of the cannabinoids delta-9-tetrahydrocannabinol (THC) and utilised to treat or reduce symptoms of various ailments (Parolaro 2021). The plant contains a highly variable mixture of approximately 400 or more chemical constituents (De Aquino et al. 2018). Malaysia has ratified United Nations (UN) drug conventions and banned cannabis as cannabis use can be extremely harmful to users and causes adverse health effects (Hall 2009).

Malaysia has held a zero-tolerance policy towards cannabis and other drugs. The drug menace was declared the primary threat to national security (Kamarudin 2007). Therefore, severe punishment is imposed on the illegal use of cannabis, including a death sentence for trafficking or life imprisonment and whipping if an individual is found in possession of cannabis. Opponents of the medical cannabis policy in Malaysia are concerned about the potential negative effects of cannabis use, including addiction, impaired cognition, and mental health issues (Selan 2018; Abida Haq & Umi Kalsom 2020), as well as the lack of high-quality clinical trials examining the advantages and disadvantages of using cannabis for medicinal purposes (Mohamad Haniki et al. 2022). Notwithstanding, the supporters of cannabis policy contended that cannabis benefits the lives of numerous patients suffering from various conditions (Rolles & Murkin 2014). They also argued that the negative consequences of cannabis use had been exaggerated while the medicinal benefits have been understated (Hall 2020). As cannabis is classified as a dangerous substance under the Malaysian Dangerous Act 1952 (DDA), obtaining cannabis goods for clinical research or conducting studies on the pharmacological and behavioural effects of cannabis application is difficult.

Debates over the topic in Malaysia were stirred in 2018 following the cases of Muhammad Luqman v Public Prosecutor (2021) 7 CLJ 524 and Pendakwaraya v Amiruddin Nadarajan Abdullah (High Court of Klang Malaysia, 20 February 2019). The cases forced the government to change the

law and adopt a decriminalisation policy towards medicinal cannabis use. The Pakatan Harapan [Alliance of Hope (PH)] government supported the movement (Sivanandam 2018; Tan 2018). Unfortunately, the PH government collapsed due to a political crisis several months later (Ahmad 2020; New Straits Times 2020). The Perikatan Nasional government [The National Alliance (PN)] took charge, but the new government did not favour the medical cannabis policy (Harun 2021).

Malaysian policymakers remained hesitant to legalise medical cannabis use in Malaysia, although the UN Commission on Narcotics Drugs (CND) dropped cannabis and cannabis resin from the most dangerous list category (JR 2020; The Star 2020). Several policymakers opined that the decision of CND to reclassify cannabis from Schedule IV (most dangerous) to Schedule I (least dangerous) would impact the country's narcotics laws and Malaysian society (Selan 2018). The Malaysian government argued that the harmful effects of medical cannabis legalisation outweigh its benefits (Harun 2021). The calls have increased for the government to consider legalising medical cannabis as the debate continues (Chin 2021; Yusof & Arfa Yunus 2021), which has resulted in the establishment of the bipartisan caucus to study medical cannabis use (Teh Athira 2021). In response to the calls, the former Health Ministry Khary Jamaluddin stated that Malaysia would authorise the import and use of cannabis for therapeutic purposes if the medicine conforms with official laws and policy (Veena Babulal 2021). He further stated that the Health Ministry aims to register cannabidiol (CBD) products by 2023 (Anonymous 2022). Following the political change to the unity government after the latest general election in 2022, the new Prime Minister, Datuk Seri Anwar Ibrahim, recently stated that thorough research and discussions are necessary regarding the approval of medical cannabis use in Malaysia. This includes considerations related to controlling the use of the substance (Anonymous 2023).

Despite these arguments, a lack of thematic review studies exists on the impact of medical cannabis legalisation. Limited research discussed the issue of medical cannabis in Malaysia. Previous investigations focused on the role of Malaysian non-government organisations (NGOs) in promoting medical cannabis (Mohd Zain et al. 2016) and the benefit of medical cannabis to cancer patients (Desa et al. 2017), chronic pain management (Maharajan et al. 2020), enhance the neurogenesis in the brain

(Suliman et al. 2018) and analyse risks, benefits and regulations of medical cannabis (Mohamad Haniki et al. 2022). Other research focus on medical usage of cannabis documented by Muslims scholars (Ekmil et al. 2023), the viewpoint of Islamic law on growing hemp in Malaysia (Mahaiyadin et. al 2022) and a review of medical marijuana from the perspectives of medicine, legal regulations, and Islamic law (Nordin et al. 2022). Nevertheless, none of these studies focused on the impact of medical cannabis law (MCL), especially in the Malaysian context. Although much literature is available on the effects of MCL internationally, the research is restricted to specific ailments, clinical trials, policies, and regions. A lack of thematic review studies discussed by previous researchers in this area has been identified. Therefore, this study reviewed the impacts of medical cannabis legalisation addressed in the Scopus and Web of Science (WoS) publications from 2017 to 2021 using ATLAS.ti 9 to answer the research question below:

1. What is the impact of medical cannabis legalisation patterns related to the articles, geographical dissemination, and themes developed in the literature from 2017 to 2021?
2. What are the impacts of the medical cannabis legalisation discussed in the literature from 2017 to 2021?

MATERIALS AND METHODS

This research employed a thematic analysis process in the literature review using the ATLAS.ti 9 software. This method was invented by Zairul (2020; 2021). According to Clarke and Braun (2013), the thematic analysis identifies patterns and generates themes through extensive subject reading. The subsequent step determined the themes related to the impact of medical cannabis legalisation and constructs categories to ascertain the publication pattern in the selected databases. The research aimed to examine and evaluate the result to recommend future research in the medical cannabis field. Numerous selection criteria were used to narrow the literature field:

1. Published between 2017 to 2021.
2. Have at least one of the following keyword(s): medical cannabis, or medical marijuana, or medical marihuana.
3. Contain the keyword (s) legalisation or legalization.
4. Includes keywords(s): Impact(s) or effect(s).

Controlling the types of publications is necessary to help clarify the present debates over the implications of medicinal cannabis legalisation.

TABLE 1. Search strings from Scopus and WoS

Source	Keywords	Results
SCOPUS	Initial search string	70
	(TITLE-ABS-KEY ("medical cannabis") OR TITLE-ABS-KEY ("medical marihuana") OR TITLE-ABS-KEY ("medical marijuana") AND TITLE-ABS-KEY (legali*ation) AND TITLE-ABS-KEY (impact*) AND TITLE-ABS-KEY (effect*))	
	A keyword search followed by a filter using inclusion criteria from SCOPUS databases	33
WoS	(TITLE-ABS-KEY ("medical cannabis") OR TITLE-ABS-KEY ("medical marijuana") OR TITLE-ABS-KEY ("medical marihuana") AND TITLE-ABS-KEY (legali*ation) AND TITLE-ABS-KEY (impact*) AND TITLE-ABS-KEY (effect*)) AND PUBYEAR > 2016 AND PUBYEAR < 2022 AND (LIMIT-TO (PUBSTAGE , "final") OR LIMIT-TO (PUBSTAGE , "aip")) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English"))	
	Initial search string	648
	medical cannabis OR medical marijuana Or medical marihuana (All Fields) and Legali*ation (All Fields) and Impact* OR Effect* (All Fields)	
	A keyword search followed by a filter using inclusion criteria from WOS databases	187
	medical cannabis OR medical marijuana Or medical marihuana (All Fields) and Legali*ation (All Fields) and Impact* OR Effect* (All Fields) and Open Access and 2021 or 2020 or 2019 or 2018 or 2017 (Publication Years) and Articles (Document Types) and English (Languages)	

The authors conducted a literature search using a specific search string in the Scopus and WoS databases to identify the current academic insight state regarding the impact of medical cannabis legalisation. The authors used the search string title-abs-key for the Scopus database and all fields searched in the WoS database by following the method undertaken by Abd Rahman et al. (2022). With reference to other authors such as Zairul (2020), Zairul (2021), and Othman et al. (2022), using the same search string (for example, title search) as methodology is unnecessary for each database in the thematic review. Most authors use similar keywords for each database when searching the literature. The initial search resulted in 70 publications from Scopus and 648 publications from WoS using a specific search string (refer to Table 1).

In selecting the literature, several inclusion criteria were included, as stated below:

1. This study limited the article selection to include only peer-reviewed journal articles published in Scopus and WoS. Other types of publications such as reports, conference proceedings, thesis, chapters in books, books, and review articles were excluded as they contradict the study's objective.
2. The authors selected articles published in the English language only and published in the recent five years (2017-2021 inclusively).
3. The authors selected open access type articles and excluded other articles inaccessible to the authors as the articles must be read for the purpose of this review.
4. The selected article must clearly disclose and discuss the impact of medical cannabis legalisation.

Upon using the inclusion and exclusion criteria from Scopus and WoS databases, 33 articles were selected from Scopus and 187 articles from WoS (refer to Table 1). Subsequently, the authors read and scanned all the abstracts. After a thorough reading, 144 publications were eliminated. The reasons for exclusion are as follows:

1. Preliminary conclusions and anecdotes or narratives in the article did not address the medical cannabis legalisation. Therefore, non-medical cannabis articles were excluded from this study.
2. The article was considered irrelevant if the content discussed or evaluated the impact of recreational cannabis legalisation. For example, the irrelevant content includes the impact of state-level legalisation for recreational use, the effect of recreational cannabis policy on opioid overdose and opioid mortality, the impact of recreational cannabis legalisation and youth, adolescent, college students, and public-school students, public health implication of legalising the sale of cannabis for recreational use, and impact to health and hospitalisation as a result of liberalising of cannabis use.
3. The authors also eliminated incomplete or unavailable full articles and overlapping or duplicate articles.

Resultantly, the final articles to be examined were reduced to 72 (Figure 1).

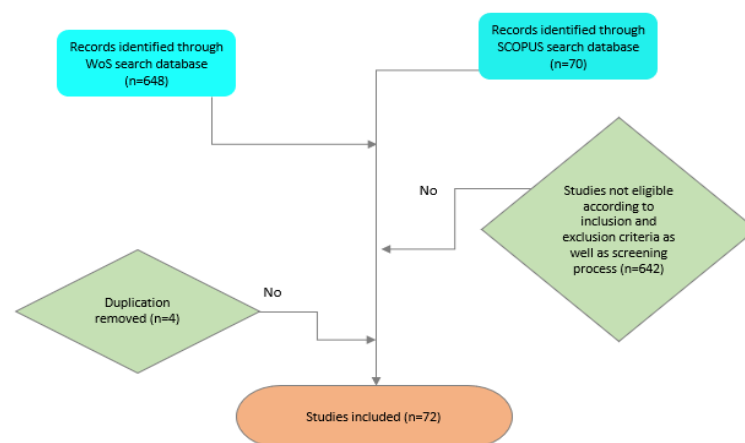


FIGURE 1. Inclusion and exclusion criteria in the thematic review

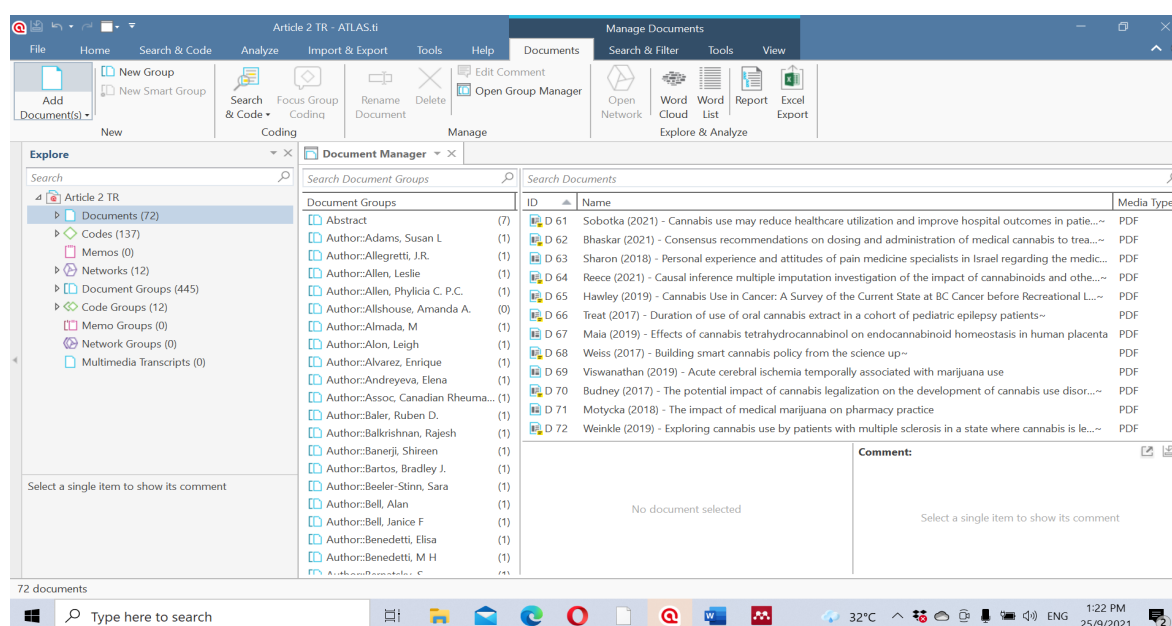


FIGURE 2. The code group established from the Mendeley metadata and process in ATLAS.ti 9

Subsequently, all the publications were uploaded as primary documents to ATLAS.ti 9. From the metadata established in Mendeley, each paper was automatically clustered into the following code groups: (a) issue number, (b) authors, (c) volume, (d) publication company, (e) periodical, and (f) year of publication. Thus, the publications could be analysed according to the published year and discussion pattern associated with each year. The total articles finalised into the final documents in the ATLAS.ti 9 were 72 documents (refer to Figure 2). The categorisation of articles with ATLAS.ti 9 facilitated the sorting of articles in an organised, practical, and systematic way. A total of 19 codes were generated during the initial round of coding. The codes were grouped into several themes to answer the following research question: “What are the impacts of medical cannabis legalisation

discussed in the literature from 2017 to 2021?” The coding contributed to the final five primary themes to answer the research questions.

RESULTS AND DISCUSSIONS

The findings were classified into two categories: quantitative and qualitative findings. The quantitative findings addressed the first research question, while the qualitative findings answered the second research question.

1. Quantitative finding

The research patterns on the impact of medical cannabis legalisation were examined related to articles by journal, the year of publication, geographical dissemination, and themes developed in the literature from 2017 to 2021.

TABLE 2. Publications identified by journal and year

Journals	Year				
	2017	2018	2019	2020	2021
ACR Open Rheumatology				1	
Addiction	1				1
Addictive Behaviors			2		
Advances in Pharmacology and Pharmacy		2			
American Journal on Addictions				1	
Annals of Hepatology					1
Annual Review of Clinical Psychology	1				
Archives of Suicide Research				1	
Archives of Toxicology			1		
BMC Complementary Medicine and Therapies				1	
BMC Pharmacology and Toxicology					1
BMC Research Notes					1
Brain Sciences					1
British Journal of Pharmacology			1		
Cannabis and Cannabinoid Research					1
Clinical Therapeutics		1			
Cureus			2		1
Current Oncology			1		
Current Topics in Behavioral Neurosciences	1				
Dialogues in Clinical Neuroscience				1	
Drug and Alcohol Dependence	2	2			
Economic Analysis and Policy					1
Epilepsia	1				
Expert Review of Pharmacoeconomics & Outcomes Research		1			
Forum for Health Economics and Policy			1		
Frontiers in Public Health			1		1
Harm Reduction Journal					1
Inflammatory Bowel Diseases		1			
International Journal of Drug Policy	1			1	1
International Journal of Environmental Research and Public Health					1
International Journal of Mental Health and Addiction		1			
JAMA Network Open			1	1	1
Journal of Adolescent Health		1			
Journal of Cannabis Research					1
Journal of Clinical Medicine				1	
Journal of Drug Issues	1				
Journal of General Internal Medicine			1		
Journal of Health Politics, Policy and Law				1	
Journal of Medical Toxicology	1				
Journal of Pain Research		1			
Journal of Pediatric Gastroenterology & Nutrition	1				
Journal of Rheumatology			1		

TABLE 3. The themes discussed in the literature

References	Impact on criminal activities	Impact on health	Impact on health system	Impact on policy	Impact on society
Alon et al. (2021)	-	-	/	-	/
Andreyeva & Ukert (2019)	-	/	/	-	-
Bartos et al. (2020)	/	/	-	-	-
Benedetti et al. (2021)	-	-	-	/	/
Benedetti et al. (2021a)	-	-	-	/	/
Bhaskar et al. (2021)	-	/	-	-	-
Botsford et al. (2020)	-	/	-	-	-
Bradford & Bradford (2018)	-	/	/	-	-
Brown et al. (2020)	-	/	-	-	/
Bruce et al. (2018)	-	/	-	-	-
Brunette et al. (2018)	-	/	-	-	-
Budney & Borodovsky (2017)	-	/	-	-	-
Cahill et al. (2021)	-	/	-	-	-
Calonge (2018)	-	-	-	/	/
Cambren et al. (2017)	-	-	-	/	-
Cerda et al. (2018)	-	-	-	-	/
Cofield et al.(2017b)	-	/	-	-	-
D'Amico et al. (2018)	-	-	-	-	/
De Aquino et al. (2018)	-	/	/	-	-
Ding et al. (2020)	-	/	-	-	-
Fitzcharles et al. (2019)	-	/	-	-	-
Fitzcharles et al. (2020)	-	/	-	-	-
Goodwin et al. (2021)	-	-	-	-	/
Hall (2020)	-	/	-	/	-
Hawley & Gobbo (2019)	-	/	-	-	-
Hoffenberg et al. (2017)	-	/	-	-	-
Hunt & Miles (2017)	-	-	-	/	/
Johnson et al. (2017)	-	-	-	-	/
Johnson et al. (2018)	-	-	-	-	/
Joundi et al. (2021)	-	/	-	-	-
Kaufman et al. (2021)	-	/	-	-	-
Klieger et al. (2017)	-	-	/	/	-
Ladegard et al. (2020)	-	-	-	-	-
Maia et al. (2019)	-	/	-	-	/
Malinowska et al.(2019)	-	/	-	-	-
Mascal et al. (2019)	-	/	-	-	-
Matthay et al. (2021)	/	-	-	-	/
McGuckin et al. (2020)	-	/	-	-	-
Merker et al. (2018)	-	/	-	-	-
Motycka et al. (2018)	-	-	/	-	-
Mueller et al. (2021)	-	/	-	-	/
Orenstein & Glantz (2020)	-	-	-	/	-

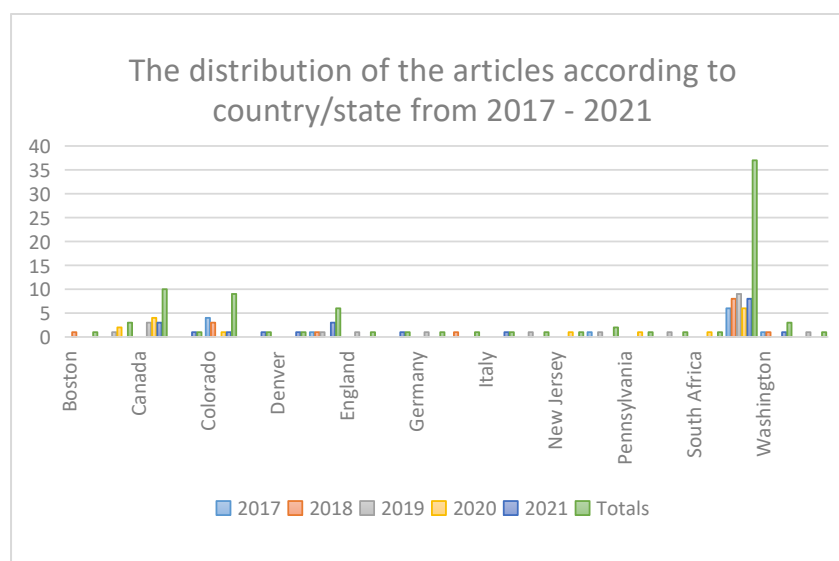


FIGURE 4. Articles classified according to publication year, country, and state of origin

In Figure 4, most of the knowledge on the impact of MCL originates from studies in high-income nations, such as Germany, the United States (US), Portugal, Canada, England, Germany, Israel, and Italy. Some publications originated from other regions, such as North America, South Africa, and Europe. The impact of MCL has been significantly discussed from 2017 until now by developed countries, such as the US. Unfortunately, Figure 3 proves that no study discussed MCL in Malaysia and its neighbouring countries, such as Thailand, Singapore, or other Asian nations. Thus, a gap in the literature on medical cannabis in Malaysia and Asian countries is evident. The existing gap in the literature is observable in Thailand (the first country to legalise medical cannabis in Asia) context, as Thailand adopted MCL less than three years ago (beginning February 2019). The literature from Thailand may be published in the Thai language, and this review is restricted to English only.

The highest numbers of studies were from the US states, including California, Connecticut, Massachusetts, New Jersey, Pennsylvania,

Washington, and West Virginia. In addition, the impact of MCL is also reported in the city of Denver, Chicago, and Boston. Most publications emerged from developed nations, possibly because these nations were among the pioneers in adopting MCL. There is a dire need to conduct studies on MCL in the Malaysian and Asian contexts to identify the health benefits to patients requiring medical cannabis to alleviate pains or treat symptoms.

In summary, this section answers the first research question and provides an overview of the impact of MCL research and its patterns. The quantitative findings present the current patterns in publications concerning the impact of MCL research.

2. Qualitative findings

From the thematic review, the literature was grouped into five different categories: impact on health, impact on society, impact on the health system, impact on policy, and impact on criminal activities.

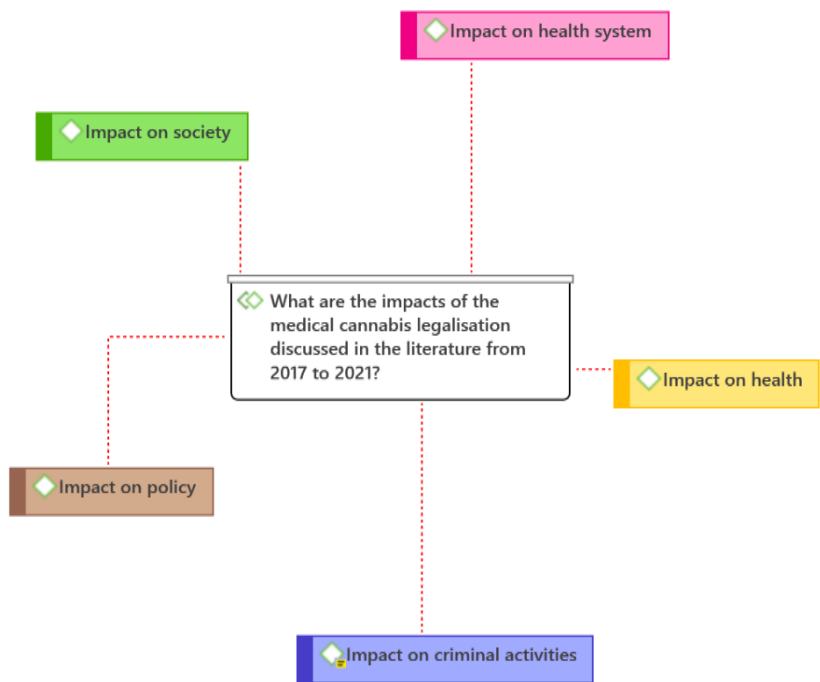


FIGURE 5. Five selected themes to answer the research question

THEME 1: IMPACT ON HEALTH

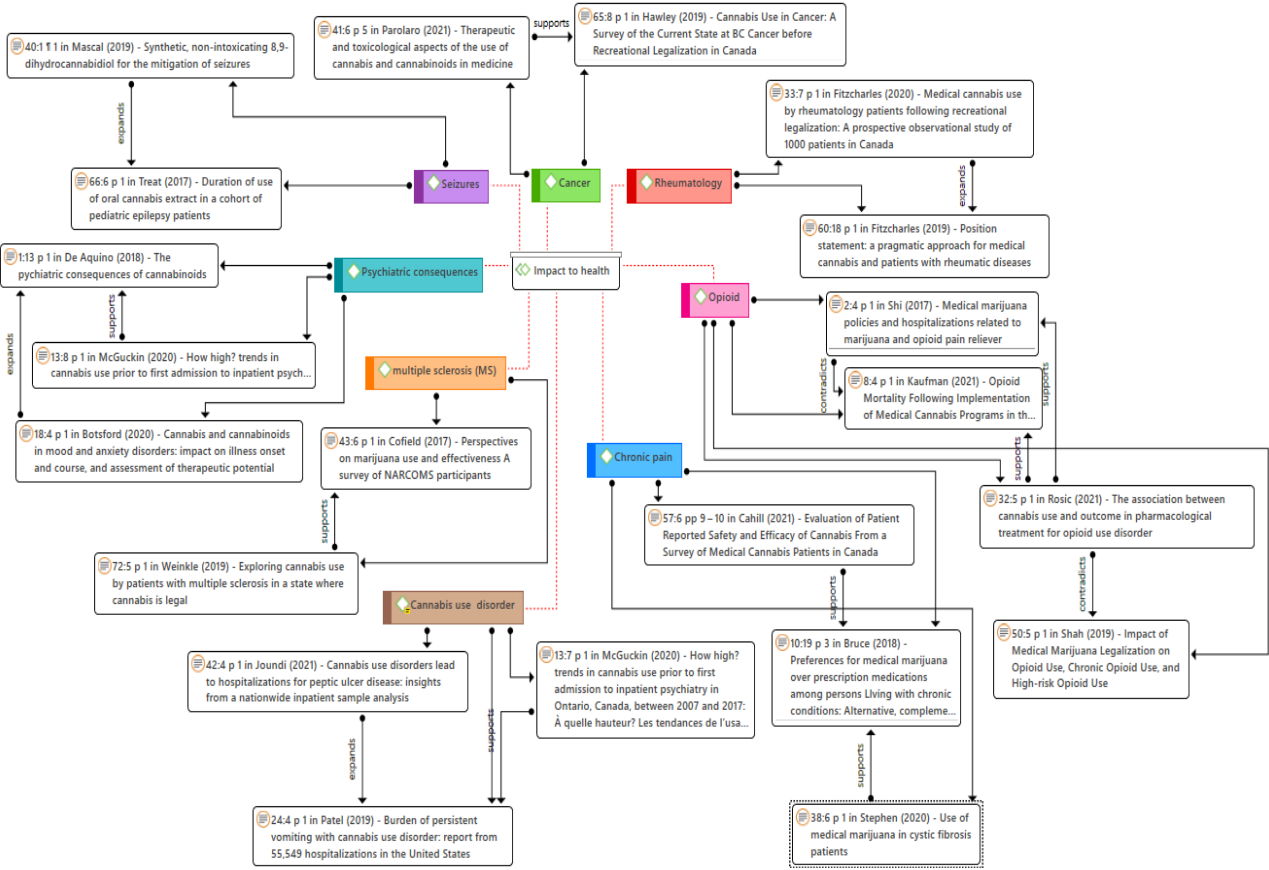


FIGURE 6. The tabulation of authors' discussion on the impact of medical cannabis legalisation on the health

A significant collection of material exists on the health impacts of MCL. The literature demonstrates that the health consequences of cannabis legalisation are complex and varied. The literature discussed the effect of using medical cannabis for various illnesses, such as mood and anxiety disorders (De Aquino et al. 2018; Botsford et al. 2020), mental illness (Brunette et al. 2018; McGuckin et al. 2020), chronic pain (Bruce et al. 2018; Sharon et al. 2018; Bhaskar et al. 2021), self-reported health (Andreyeva & Ukert 2019), cannabis use disorder (Patel et al. 2019; McGuckin et al. 2020; Joundi et al. 2021), opioid-related outcomes (Shi 2017; Shah et al. 2019; Kaufman et al. 2021; Rosic et al. 2021) yet its impacts on severe health consequences such as hospitalizations remain unknown. Meanwhile, the prevalence of opioid pain reliever (OPR, rheumatology (Fitzcharles et al. 2019; 2020), seizures (Treat et al. 2017; Wang 2017; Mascal et al. 2019), inflammatory bowel disease (Hoffenberg et al. 2017; Merker et al. 2018), multiple sclerosis (Cofield et al. 2017; Weinkle et al. 2019), and cystic fibrosis (Stephen et al. 2020).

The impact of medical cannabis and MCL on opioid-related outcomes remains controversial. Ding et al. (2020) contended that the efficacy of medical cannabis and the potential in curtailing the opioid epidemic is limited, with inconsistent evidence on its effectiveness. Shi (2017) established a strong association between MCL and decreased opioid pain reliever-related hospitalisations, reduced prescription opioid usage and high-risk opioid (Shah et al. 2019) and decreased opioid overdoses, mortality, and morbidity relative to those without MCL. Nevertheless, recent data found evidence contrary to previous research where MCL states reflected greater rates of opioid overdose fatality than non-MCL states from 2012 to 2017 (Kaufman et al. 2021). Furthermore, Rosic et al. (2021) found that although regular cannabis use was correlated with a lower risk of opioid use, 50% of daily cannabis users reported experiencing adverse side effects from cannabis compared to infrequent use. The adverse effects include an impact on cognition, motivation, and work and school performance. Overall, 75% of cannabis users claimed that cannabis did not affect their opioid use disorder (OUD) treatment.

Chronic pain patients utilise medical cannabis as an alternative or complementary to other pharmaceuticals for symptom management and strategies for tapering off prescription medications from doctors (Bruce et al. 2018). Additionally, patients claimed that medicinal cannabis has fewer

adverse effects and can mitigate possible risks associated with other drugs (Bruce et al. 2018; Cahill et al. 2021). Similarly, Stephen et al. (2020) reported that pain and stress were the most frequently used medicinal cannabis indications. According to the findings, 28 out of 31 participants found cannabis quite efficient in alleviating their symptoms, whereas 21 respondents considered cannabis extremely vital to their health (Stephen et al. 2020). Cahill et al. (2021) corroborated these findings, stating that medical cannabis improves patients' life quality. The study discovered significant improvements in persistent chronic pain, sleep disturbances, and post-traumatic stress disorder (PTSD) after six weeks of medical cannabis treatment (Cahill et al. 2021).

In addition, certified pain specialists in Israel also view cannabis as a beneficial and reasonably safe treatment for chronic pain in prescribing cannabis based on their clinical expertise (Sharon et al. 2018). Interestingly, the latest study by Bhaskar et al. (2021) used a modified Delphi process that brought together 20 worldwide experts from nine countries. They developed consensus-based recommendations on how to dose and prescribe medical cannabis to patients with chronic pain (Bhaskar et al. 2021). The study significantly impacts treating chronic pain patients as previous studies lack professional guidelines on how to effectively and adequately dose and administer medical cannabis. A gap remains on appropriate dosage and how to manage medical cannabis effectively for patients with other types of illness. More research is required to explore this area.

Medical cannabis has been associated with mild or no adverse effects in treating pain from doctors' perspectives in Israel on the adverse effects of medical cannabis use (Sharon et al. 2018). Only 5% of doctors believed medical cannabis use was significantly harmful (Sharon et al. 2018). Stephen et al. (2020) indicated that only two out of 192 surveys reported mild side effects after medical cannabis use from patients' perspectives. Similarly, a study conducted by Hawley and Gobbo (2019) on the prevalence of cannabis use among cancer patients in Canada indicated a positive impact of the use. Patients with multiple sclerosis reported cannabis use as highly effective with minimal side effects (Weinkle et al. 2019).

In contrast, Patel et al. (2019) found that cannabis use disorder was inversely correlated with a 609% elevated chance of chronic vomiting-related hospitalisation, increased the first admission

to inpatient psychiatry in Canada (McGuckin et al. 2020), and drastically increased hospitalisation for peptic ulcer disease by 18% (Joundi et al. 2021). De Aquino et al. (2018) highlighted the psychiatric effects of medical cannabis, including behavioural, cognitive, and long-term usage effects. Nonetheless, the evidence is insufficient on the benefit of medical cannabis for rheumatic diseases (Fitzcharles et

al. 2019), thus indicating that additional research is required. From the aforementioned finding, additional patient-centred research is required to determine the impact on the patient's health and the specific dose patterns of medical cannabis products related to symptom relief. Collecting longitudinal data on the result of various diseases associated with medical marijuana use is essential.

THEME 2: IMPACT ON HEALTH SYSTEMS

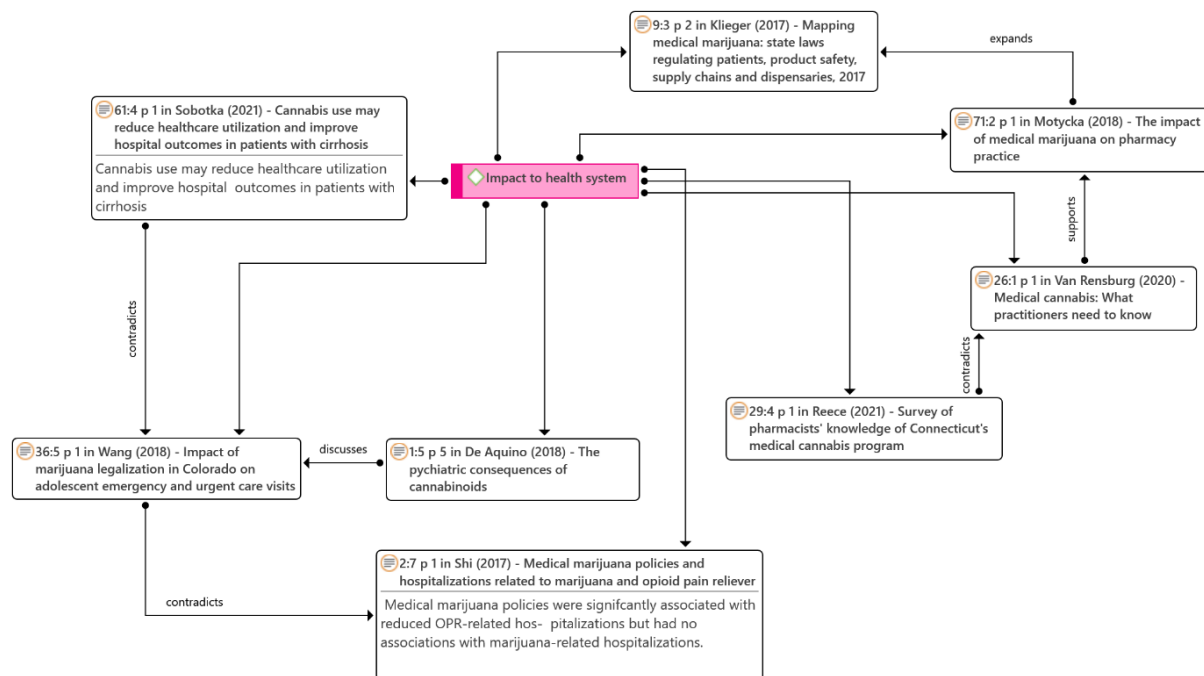


FIGURE 7. Impact on the health system network

Examining the associations between medical cannabis policies and health systems such as hospitals, dispensaries, practitioners, and other health facilities is necessary as the number of countries adopting MCL is on the rise. The policies unintentionally resulted in significant reductions in hospitalisations connected with opioid pain relievers. Sobotka et al. (2021) discovered a downward trend in hospital use and death among cannabis users following the legalisation. According to Sobotka et al. (2021), medicinal cannabis is associated with better patient and hospital outcomes in cirrhotic patients but has conflicting results concerning decreasing hospitalisation for hepatic decompensation. In contrast, Wang et al. (2018) discovered a ten-year increase in teenage cannabis-related emergency department visits in Colorado, particularly in the years after medical and recreational cannabis commercialisation. Shi (2017) discovered no correlation between cannabis-related hospitalisations and medical cannabis policies in the US.

Regarding dispensaries, specific laws are required to monitor the operation of dispensaries, product safety, product source, supply chain, authorised sources, and location of dispensaries (Klieger et al. 2017). In addition, pharmacists (Motyka et al. 2018) and healthcare practitioners (Van Rensburg et al. 2020) must be knowledgeable and well-informed on the adverse effects, drug interactions, addiction potential of cannabis and be capable of providing proper counselling to patients. Unfortunately, a recent study by Reece et al. (2021) discovered that licensed pharmacists in Connecticut lacked comprehensive and correct knowledge of the state's medical cannabis programmes. Strengthening the education and expertise of pharmacists, doctors, and other healthcare professionals regarding their role in prescribing cannabis use, being well informed on adverse effects, and providing advice to patients is crucial as more states legalise medical cannabis. Physicians must present patients with up-to-date evidence regarding the medical effects and potential side effects of cannabinoids.

THEME 3: IMPACT ON POLICY

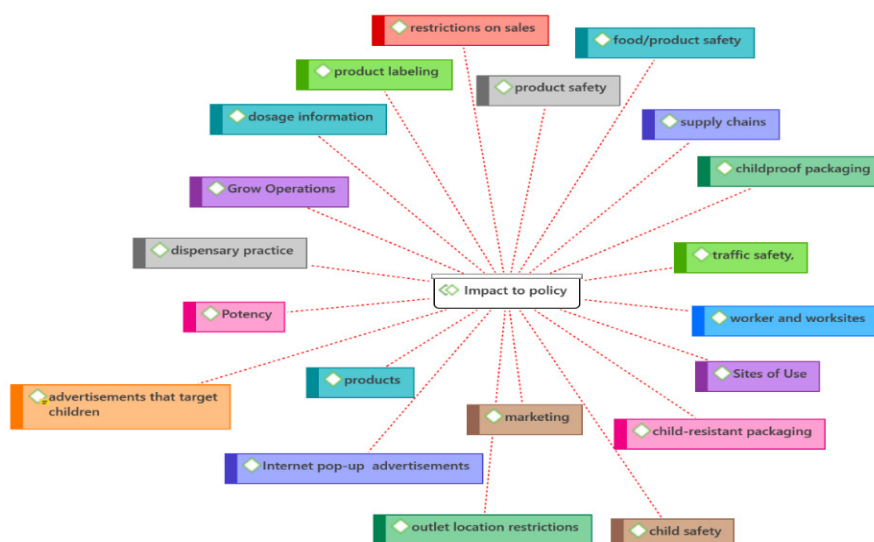


FIGURE 8. Impact on policy network

Numerous policy considerations must be contemplated when developing a regulatory framework for medical cannabis. The path to legalising medical cannabis has an impact on the policy, including licensing regulations, statutes, the establishment of dispensaries, patient registration, product access, outlet location restrictions, child safety, labelling, worksite safety, cannabis product safety, road safety, packaging, work, (Klieger et al. 2017; Calonge 2018) and advertisement policy (Calonge 2018; D'Amico et al. 2018; Silver et al. 2020). Furthermore, Whitehill et al. (2019) but evidence from other US states is limited. Objective: To document the incidence of pediatric cannabis exposure cases reported to the Regional Center for Poison Control and Prevention (RPC stated that the Massachusetts Department of Public Health regulated medical cannabis, imposed stringent criteria for childproof packaging, warning labels, and dosage information and barred edible medical cannabis goods created from mimicking commercially available sweets.

Another issue implies that increasing marketing strategies must be controlled under the legalisation model because advertising can promote dangerous

usage and influence youth to use cannabis (D'Amico et al. 2018) we must begin to look more closely at the longitudinal effects of medical marijuana (MM. For example, Colorado law prohibits pop-up advertisements on the internet and advertisements directed towards children (Pacula & Smart 2017). Adolescents are vulnerable and easily influenced by these marketing strategies. Benedetti et al. (2021) showed that selected cannabis policy changes could potentially affect cannabis availability and usage prevalence among youth.

Specific legislation that increased the penalties was connected with decreased perceived availability and a number of cannabis use measures (Benedetti et al. 2021). Therefore, the best approach to protect patients and the public from the risks associated with MCL is by strengthening the law and regulatory approach. Although evidence indicates that MCL can be beneficial in curing specific ailments, implementing MCL programmes has broader drug policy consequences that must be examined. Various challenges exist, and further comprehensive study is required on the pharmaceutical regulatory model such as dose, uniformity of formulation, administration method, licensing and facilities issues.

THEME 4: IMPACT ON SOCIETY

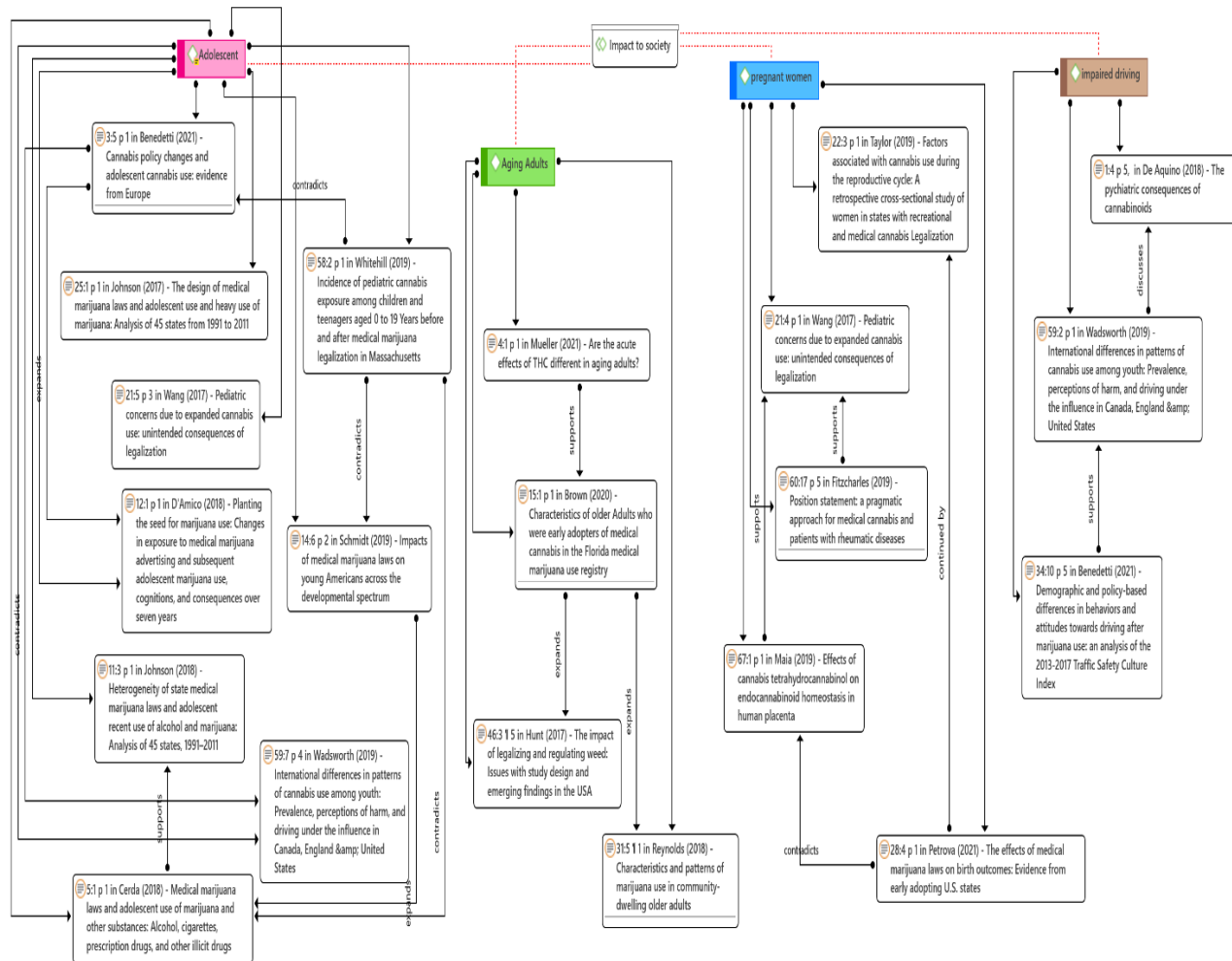


FIGURE 9. Impact on society network

Research on the positive or negative impact of medical cannabis use on society is inconclusive. The impact on the community is divided into a few categories, such as youth, pregnant women, ageing adults, and drivers.

1. Youth

The literature examined the association between MCL and changes in adolescent cannabis use (Cerda et al. 2018; Benedetti et al. 2021), their perception of harm and availability of cannabis (Wadsworth & Hammond 2019; Benedetti et al. 2021), driving attitudes (De Aquino et al. 2018; Wadsworth & Hammond 2019; Benedetti et al. 2021b) and other substances (Cerda et al. 2018). Current research examining the effects of MCL on adolescents showed mixed results. Whitehill et al. (2019) supported the perspective that MCL is associated with higher cannabis exposure rates among young children (aged zero to 19). Nevertheless, the study

was limited to Massachusetts. Literature reviews by Johnson et al. (2017), Cerda et al. (2018) and Schmidt et al. (2019) revealed that most studies support the perspective that MCL does not increase cannabis usage rates among early adolescents. Cerda et al. (2018) presented the effect of MCL on substance use that varied by grade.

Cannabis and other substance use declined among 8th graders following the passage of the MCL. Conversely, the prevalence of substance use among 10th graders remained stagnant after MCL enactment. Similarly, the use of cannabis and other substances remained stable among 12th graders. Nonetheless, non-medical prescription opioid and cigarette use skyrocketed following the implementation of MCL. The study is also consistent with Schmidt et al.'s (2019) conclusion that medical cannabis legislation did not affect cannabis use during early teenage years (12 to 14 years old), late teenage years (15 to 17 years old), or early adults (18 to 25 years old). Schmidt et al. (2019) asserted that

medicinal cannabis legislation enhances the risk of young adults using cannabis. Compared to English adolescents, Canadian and US teenagers displayed a higher prevalence of use, easier access, less perceived danger, and higher driving rates following cannabis use (Wadsworth & Hammond 2019). Nevertheless, Benedetti et al. (2021) indicated that several policy reforms influence the accessibility and persistency of cannabis use, while the restrictive policy decreases the overall prevalence of cannabis use among adolescents.

The literature also revealed that MCL do not increase alcohol use among adolescent (Cerde et al. 2018; Johnson et al. 2018; Veligati et al. 2020) and other substances, such as cigarettes (Veligati et al. 2020), prescription drugs, and other illicit drugs (Cerde et al. 2018). Conversely, Johnson et al. (2018) contended that policies that allow cannabis access are linked with lower rates of adolescent alcohol consumption. The findings indicated mixed outcomes on the impact of MCL on the adolescent. Nevertheless, preventive measures can restrict the prevalence of cannabis use among adolescents. In addition, the review showed that the MCL contributes a positive impact and reduces alcohol use, cigarettes, and other illicit drugs.

The use of cannabis may cause driving impairment (De Aquino et al. 2018). The National Highway Traffic Safety Administration recommended that drivers refrain from driving for at least three hours following cannabis use. Drivers who consume edibles may need to wait longer (Ladegard et al. 2020). Wadsworth and Hammond (2019) revealed that only a small percentage of teenagers in England, the US, and Canada reported driving a car within two hours of cannabis use. This attitude contradicts the recommendations of the National Highway Traffic Safety Administration. In addition, a recent study by Benedetti et al. (2021) concluded that drivers in states that legalised medicinal cannabis reported driving after cannabis use slightly more frequently than drivers from places where medical and recreational cannabis were outlawed, mainly male and younger drivers.

A stringent policy is essential to reduce risk after cannabis use among the youth and people surrounding them because driving under cannabis influence may raise the likelihood of a crash. Therefore, preventative measures targeting adolescents must be established concurrently with states passing MCL to control the prevalence of use and access to cannabis by youth. In addition, the

government should strengthen cannabis advertising laws, similar to regulations for tobacco and alcohol marketing, to avoid the harmful impacts of MCL among adolescents (D'Amico et al. 2018).

2. Pregnant woman and unborn child

Although multiple studies examined the effect of MCL on teenage cannabis use, less is known about the effects of MCL on pregnant women, unborn children, and obstetrical outcomes. Perinatal exposure to MCL has negative repercussions for pregnant women, nursing mothers, a child's cognitive development (Wang 2017), and reproductive health (Maia et al. 2019). The results indicated that Tetrahydrocannabinol (THC) has a detrimental effect on the placental endocannabinoid system (Maia et al. 2019). In contrast, Petrova and Gray (2021) examined the impacts of MCLs on birth outcomes in US states. They discovered no conclusive evidence to confirm the hypothesis that MCL has a deleterious effect on birth weight, birth outcomes, gestation, or Apgar scores.

Similarly, Taylor et al. (2021) discovered no connection with the use of cannabis before, throughout, and after pregnancy among pregnant women living in a medically authorised state. The study concluded that a lack of data exists on the effect of medical cannabis regulations on pregnant women. Additional study is necessary to determine the consequences of MCL implementation on the pregnant woman population, the unborn child, and obstetric outcomes to close the gap in the literature. Current studies may not be generalisable due to changes in cannabis potency and consumption habits.

3. Ageing Adult

Older people reported the greatest rise in cannabis use for medical and complementary health purposes (Bobitt et al. 2019). Therefore, examining the impact of MCL and how medical cannabis use affects ageing adults, and if these impacts differ between adolescents and adults is critical. According to Mueller et al. (2021), older adults aged 50 to 70 years old may be less vulnerable to the cognitive and affective effects of THC compared to younger adults aged 21 to 25 years old. The THC had a more significant deleterious effect in younger adults. Additionally, after taking the THC chemovar, the younger group reported a larger desire for cannabis than older adults.

The result corroborates with Brown et al. (2020) who argued that older adults (< 50 years old) use medical cannabis treatment for chronic pain, musculoskeletal disease and spasms, antidepressants, cardiovascular medicines, and opioids. The finding showed that older adults with follow-up visits improved significantly, as determined by the authorising physicians (Brown et al. 2020). Similarly,

Reynolds et al. (2018) reported that 44% of the ageing adult used medical cannabis products weekly for chronic pain, depression, anxiety, and insomnia. The majority found cannabis to be beneficial for these diseases. Nevertheless, extreme caution should be taken to avoid any impairment among older adults (Fitzcharles et al. 2019).

THEME 5: IMPACT ON CRIMINAL ACTIVITIES

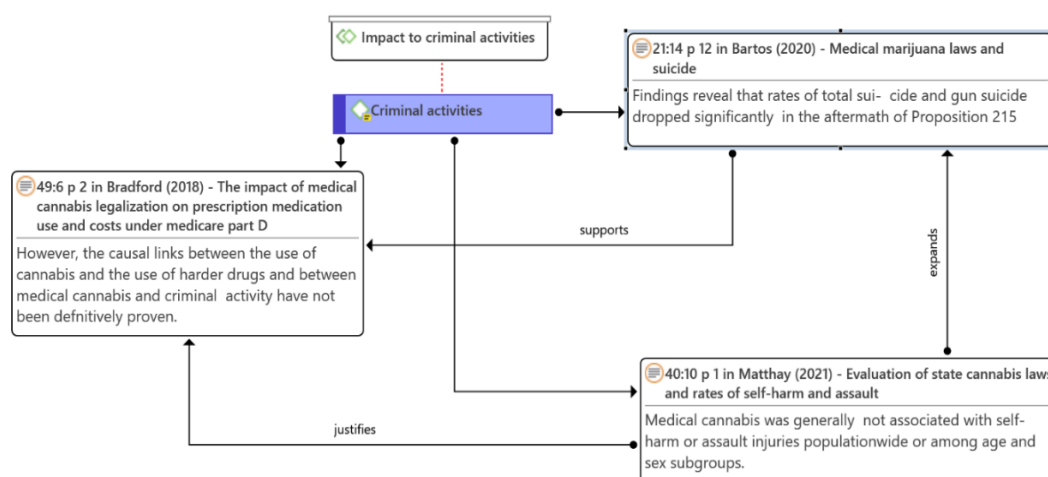


FIGURE 10. Impact on the crime network

One of the significant concerns of MCL is its impact on criminal activities. Bradford and Bradford (2018) argued that no conclusive proven linkage exists between medicinal cannabis and criminal activity. According to Bartos et al. (2020), the rate of total suicide and suicide by gunshot declined significantly following California's medical marijuana legalisation. Nevertheless, the impact on non-gun suicides is considerably less.

Matthey et al. (2021) discovered evidence that medical cannabis was not connected with the rate of self-harm or assault injuries in the general population by age or sex in the District of Columbia and all 50 US states. The research compared self-harm or assault rate injuries before and after cannabis legalisation. Opponents of medical cannabis, such as Niveau et al. (2003), White et al. (2010), and Robert (2014), cited criminal activities and corroborated the above findings by indicating the positive effects of MCL in self-harm, assault, and suicide cases. A detailed study is required on the relationship between the impact of medical cannabis policy and other types of crimes, such as cannabis dependence, the risk for violence, drug trafficking, and property crime, such as theft and burglary and to convince society and reduce the stigma surrounding the implementation of medical cannabis.

CONCLUSION

This thematic review paper highlights current research patterns and various impacts of MCL raised in the literature comprising impacts on health, the health system, society, policies, and criminal activities. Several issues were raised during the implementation of the medical cannabis policy. One of the issues on the impact on health is the necessity to conduct additional patient-centred research to determine the effect on the patient's health. Additional study is required to examine the potential benefits and individual experience with minor ill effects, thus indicating a gap in the literature. Besides, additional research is necessary concerning future legislative orientations in Malaysia to thoroughly understand the adverse side effects of medicinal cannabis use before becoming publicly available for prescription.

Studies to determine the specific dose patterns of medical cannabis products related to symptom relief is still lacking in the literature, particularly in determining the uniformity standard in administering dose for each category of illnesses. Most literature emphasises the health consequences of prevalent cannabis use, frequency, or psychosocial problems caused by cannabis. Nevertheless, the discussion does not comprehensively explore the quantity of

cannabis ingested and the potency of the cannabis being used. The available statistics are typically self-reported, which is inherently imprecise due to the difficulties in measuring and reporting cannabis use and the lack of correct information on the strength or dosage.

The impact of medical cannabis usage on society is concerning. Nevertheless, most literature discussed the impact on youths, the elderly, and motor vehicles crash. Unfortunately, discussions on the unborn child, newborn, pregnant women, and oncology remain lacking. Although cannabis may benefit a subset of patients, rigorous scientific data supporting most claims are relatively limited. Conversely, the impact of medical cannabis on health systems, such as hospitals, dispensaries and healthcare providers, particularly safety and efficacy issues and healthcare providers' ability to balance therapeutic benefit and harms, is still lacking in peer discussion and need further study.

Similarly, further investigation is required on challenges caused by various policy and regulatory strategies that must be considered to ensure success in regulating medical cannabis as a safe and effective medicine, especially in Malaysia. For example, enforcement, policy, dose, uniformity of formulation, method of administration, tax, licensing, cultivation, facilities, distribution, sale and product issues require in-depth investigation. Lastly, more study is also required on the relationship between the impact of medical cannabis policy and other crimes such as drug trafficking, addiction, and the risk for violence. Thus, a gap in the literature in examining the suitable medical legalisation model in the Malaysian context is evident.

Examining the impact of cannabis policy is essential to provide guidelines and lessons for the Malaysian government and policymakers on the impact of the legalisation before taking further steps to legalise medical cannabis in Malaysia. Presently, the debate continues on whether the Malaysian government should legalise medical cannabis. The literature evidently shows that the issue pertaining to medical cannabis is not discussed in Malaysia or neighbouring countries such as Indonesia and Singapore. Thus, a gap is present in developing a suitable MCL model in Malaysia. The time is high for the Malaysian government to set up a body to research the acceptance of Malaysian citizens and the suitability of legalising medical cannabis in Malaysia because multicultural society has different perceptions and stigma towards medical cannabis.

The criminalisation of medical cannabis use has not acted as a deterrent in stopping its use. Desperate patients may be jeopardised and resort to the black market as an alternative to obtain cannabis. Therefore, a regulated market is necessary to ensure the safety of the product and its chemical composition. Thus, the Malaysian government should readdress the medical cannabis policy. The government could invest in further research on the benefits of medical cannabis, the health impact of medical cannabis policy, and educating the key players in healthcare systems by collaborating with experts from other countries by considering the harmful effects of medical cannabis and its therapeutic benefits.

First, educating healthcare providers, the public, and policymakers on the benefits and harmful effects of cannabis is necessary to reduce the stigma surrounding medical cannabis use and correct the misunderstanding prevalent in society. The criminalisation policy creates barriers to performing well-designed research on health outcomes. Malaysia can learn from other countries in implementing MCL. Therefore, rigorous assessment studies and experts' evaluations are necessary to determine the best regulatory mechanisms states have implemented and successfully regulated MCL as a safe and effective medicine to ensure its use is compatible with public health and safety.

The implementation of MCL should be under stringent monitoring, suitable for the Malaysian context, and surveillance programmes for these impacts. Malaysian policymakers must consider a balance between the medicinal advantages of cannabis and the potential public health repercussions and cost. The shortage of expert discussions on medical cannabis in Malaysia has led to disagreement among policymakers in Malaysia on MCL. In conclusion, future studies should explore the suitable regulatory framework for medical cannabis policy in Malaysia, the perceptions of Malaysians towards medical cannabis and the impact of cannabis legalisation in the Malaysian context.

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Eknil Krisnawati Erlen Joni (corresponding author)
Senior Lecturer
Department of Law
Universiti Teknologi MARA (UiTM) Malacca Branch
78000 Alor Gajah Melaka
Email: eknil777@uitm.edu.my

Rohaida Nordin
Associate Professor
Faculty of Law
Universiti Kebangsaan Malaysia (UKM)
43600 Bangi Selangor.
Email: rohaidanordin@ukm.edu.my

Shahrul Mizan Ismail
Associate Professor
Faculty of Law
Universiti Kebangsaan Malaysia (UKM)
43600 Bangi Selangor.
Email: shahrulmizan@ukm.edu.my