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## The Impact of Marijuana Policies on Youth

Dr. Pratibha Verma<sup>1</sup>

Department of Management, Galgotias University, Yamuna Expressway Greater Noida, Uttar Pradesh, India<sup>1</sup>

pratibha.verma@Galgotiasuniversity.edu.in<sup>1</sup>

**ABSTRACT:** This technical report updates the technical report of the 2004 American Academy of Pediatrics on marijuana legalization. Current drug use epidemiology, as well as meanings and biology of marijuana substances, side effects of marijuana use, and effects of use on the development of the adolescent brain, are discussed. Issues related directly to medical marijuana are also discussed. In the United States, four separate policies are debated concerning the legalization of marijuana: legalization of marijuana for medicinal purposes only, decriminalization of the recreational use of marijuana, legalization of the recreational use of marijuana, and criminal prosecution of the recreational (and medical) use of marijuana. These methods are compared and the current data available is provided to assist in the formulation of public policy. The impact of criminal penalties for the use and possession of marijuana on young people are also discussed, as are the effects or possible effects of the other 3 policy approaches on the use of marijuana by adolescents. The corresponding policy declaration contains guidelines.

**KEYWORD:** Cannabidiol (CBD), Tetrahydrocannabinol (THC), Thought Disorders, Mood, Anxiety, Psychoactive.

### I. INTRODUCTION

The biologically active molecules that bind to receptors in the human body are cannabinoids. Endocannabinoids, including anandamide and 2-arachidonoylglycerol, which bind to receptors known as CB1 and CB2, are developed by humans. These human endocannabinoid receptors can bind to both naturally occurring and synthetic cannabinoid molecules and have biological activity [1]. Cannabinoid biology is currently poorly known. Areas of therapeutic potential for these molecules have been established in science, including analgesia in chronic neuropathic pain, enhancement of appetite in debilitating diseases and spasticity in multiple sclerosis. Adverse effects ranging from benign (eg, tachycardia and palpitations) to extreme can also occur, however (eg, mood, anxiety, and thought disorders). There are 2 prescription cannabinoid products that are licensed by the US Food and Drug Administration [2]. Regulated studies indicate that pharmaceutical preparations incorporating cannabinoids with varying CB1 and CB2 receptor affinities tend to be capable of producing therapeutic effects while protecting against adverse reactions.

Marijuana refers to the dried leaves and flowers of a cannabis plant containing a large number of cannabinoids which are biologically active. There are several cannabis species and subspecies. In order to extract cannabinoids, plant leaves are smoked, vaporized, or fried, which can then be consumed because of their pleasurable psychoactive effects. Marijuana cannabinoids can also produce medicinal benefits that have contributed to the use of marijuana as a medicine. Marijuana, however, is a complex blend of cannabinoids (more than 200 have been identified) and other molecules, and this mixture's risk-benefit ratio has not been well established. Selective breeding of marijuana plants has resulted in higher plant cannabinoid concentrations over the past few decades, resulting in a more potent psychotropic effect and a potential increased risk of adverse effects. Physicians are unable to prescribe any substance that involves smoking to release the desired effects, since smoke contains tar and other dangerous chemicals. Alternative cannabis administration approaches have been produced without combustion[3].

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Tetrahydrocannabinol (THC) is the marijuana plant's main psychoactive cannabinoid. Depending on the species and subspecies of marijuana used in breeding the plant, the amount of THC in a given plant varies widely[4].

For psychoactive effects, a low-THC strain of *Cannabis sativa*, hemp, is not used. Hemp is used instead to manufacture a range of consumer goods, including paper, textiles, apparel, health food, and biofuel. Hemp products which are commercially available (e.g. hemp milk) are devoid of cannabinoids. In a range of countries, including Spain, China, Japan, Korea, France, and Ireland, hemp is legally grown[5].

### ➤ *The Biology of Marijuana:*

There are different marijuana varieties, but *Cannabis sativa* and *Cannabis indica* are the 2 most common species used for "medical marijuana." *Cannabis sativa* usually induces increased alertness and an energetic feeling, psychotropically, whereas *Cannabis indica* is stated to cause more of a sense of relaxation and lethargy in some cases. Both species have been repeatedly hybridized, however, and a typical plant will have differing quantities of both *sativa* and *indica*. Regardless of the species, THC; cannabidiol (CBD), a non-psychoactive cannabinoid; and arachidonoyl ethanolamide (anandamide), an endogenous ligand that is involved in binding THC and CBD to endocannabinoid receptors, are the key recognized active ingredients responsible for the desired therapeutic effects.<sup>8</sup> These and other cannabinoids form a complex combination that binds with varying affinities to CB1 and CB2. These active compounds bind to the endocannabinoid receptors of the body, which are located all over the body. Two main endocannabinoid receptors are present in the immune system: CB1, found in the brain and nervous system, and CB2[6].

### ➤ *The Side Effects of Marijuana Use:*

The rise in heart rate and systolic blood pressure are the most consistent physical side effects. Conjunctival injection, dry mouth, orthostatic hypotension, increased appetite, increased thirst, drowsiness, insomnia, signs of anxiety, panic attacks, loss of short-term memory, hallucinations, and ataxia are additional side effects. There is no known cure for marijuana overdose, but treatment with benzodiazepine can aid in cases with serious symptoms of anxiety or panic attack, and supportive treatment is used for over-sedation. An ischemic stroke has also been documented in young people. No deaths have ever been recorded as solely due to an overdose of marijuana; however, a number of symptoms, including drowsiness, ataxia, nystagmus, hypothermia, and hypotonia, can result in ingestion of marijuana by children. There have seldom been cases of respiratory depression or coma. A number of reports of children with toxic ingestions have occurred since the legalization of medical marijuana in Colorado. In specific serious cases, treatment with activated charcoal to avoid the absorption of marijuana can be beneficial if there is no doubt about the state of consciousness and if treatment is started well within 2 hours of the beginning of ingestion. Children do not have access to medical marijuana, as with any other prescription drug for adults, with the exception of rare situations mentioned later[7].

### ➤ *The Influence of Marijuana Use on Teenage Brain Development:*

New research on adolescent brain growth has found that brain maturation continues into the mid-20s, particularly that of the prefrontal cortex. This maturation involves significant changes that occur through myelination and synaptic pruning in specialization and efficiency. Synaptic pruning or refining involves a decrease in grey matter, mainly in the areas of the prefrontal and temporal cortex and in the subcortical structures by eliminating neural connections. Increased myelination also occurs, which allows white matter fibre tracts to have increased neural connectivity and effectiveness and better integrity. The last areas of the adolescent brain to undergo these neuro-maturational changes are the prefrontal lobes, which, when complete, enable more efficient communication between the higher-order brain areas and the lower-order sensorimotor areas[8].

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Although a number of factors are involved, including genetic predisposition, environment, and mental health disorders, it has been postulated that the developing adolescent brain is particularly at risk for developing substance use disorders. The more likely a substance use disorder, such as dependence or addiction, is to occur, the earlier the adolescent initiates substance use. Now, with new techniques to study the structure and function of the brain, data are emerging to suggest that the use of marijuana may alter the brain that is developing; paralleling what was found in adolescent neurocognitive functioning studies. Studies have shown, for example, that adolescents reporting regular use of marijuana perform more poorly on working memory, visual scanning, cognitive flexibility, and learning tests. In addition, the number of lifetime marijuana usage episodes reported by subjects correlated with lower cognitive functioning overall. Studies evaluating brain structure have recently discovered the effects of marijuana use on the volume of hippocampal, prefrontal cortex, and white matter. In particular, heavy users of marijuana have been found to have a higher volume of grey matter, especially in the left hippocampal region, suggesting interference with synaptic pruning. In addition, heavy use of marijuana was also correlated with poorer verbal and attention performance. Functional MRI studies examining neural activity in abstinent users of marijuana have found activation abnormalities during cognitive tasks that are postulated to correlate with changes in cognition and attention related to marijuana, such as deficits in spatial working memory, verbal encoding, and inhibition. In addition, substance use can alter the developing brain itself in ways that are not yet fully understood but are distinct from the usual development of the brain, and further studies using multimodal approaches to neuroimaging are needed. It is also not clear whether during adolescence there are critical periods when there is increased susceptibility to substances and whether these modifications can be reversed with abstinence or reduced use. The documented effects on cognition and the emerging data that correlate these effects with harmful effects on brain structure and function should, however, serve as cautionary evidence to discourage adolescent recreational use of marijuana[9].

## ➤ *Medical Marijuana :*

As of December 2014, medical marijuana (cannabis) was legal under state law in 23 states and the District of Columbia for adults 21 years of age and older. Cannabis is illegal under federal law and under the federal Controlled Substances Act, it is a schedule I drug (no legitimate medical use). In 1996, the first state to legalize medical marijuana was California. Efforts are under way to legalize the use of medical marijuana in a number of additional states. Specifics of medical marijuana laws vary by state, but all allow adults to use marijuana for medical purposes, usually for certain specified conditions, if recommended by a doctor, although general categories also often include "pain." Minors can obtain medical marijuana in most states that have legalized mediation with the written permission of parents (and, in some cases, other restrictions)[10].

## ➤ *Marijuana Delivery :*

Medical marijuana dispensaries provide marijuana in forms that can be either smoked or ingested to produce the desired medical effects through combustion or vaporization. The rapid onset (minutes) of desired effects results from smoking or vaporizing marijuana, while ingestion results in a more gradual and delayed onset (half hour to several hours). Vaporization is considered less damaging to the lungs because marijuana is slowly heated to its point of vaporization, releasing THC and water vapour instead of being burned to its point of combustion to release THC (as well as tar and other potentially harmful products in smoke). Whether marijuana is vaporized or burned, the dose of THC is the same. It should be noted that any of the harmful products in the smoke are not removed by the use of a water pipe to smoke marijuana.

## ➤ *Teenage Use of Medical Marijuana:*

There are numerous reports on the successful use of medical marijuana by adolescents in the popular media for the treatment of a variety of health conditions, including attention-deficit/hyperactivity disorder, anxiety, depression, and autism, as well as anorexia, chronic pain, and nausea and vomiting after chemotherapy. Data on rates of adolescent use of medical marijuana obtained through licensed dispensaries are not available. There are also no published studies in pediatric or adolescent patient populations on the use of marijuana, with the exception of 1 study evaluating the source of marijuana

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used by adolescents receiving treatment in a treatment facility for substance abuse. "This research found that 74 percent of the adolescents in the treatment facility used diverted "medical marijuana.

## II. CONCLUSION

Marijuana use remains an ongoing concern in pediatric populations, and adolescent use of marijuana has known side effects that are medical, psychological, and cognitive. Marijuana alters brain development in ways that are not fully understood, with detrimental effects on brain structure and function. In addition, marijuana smoke contains tar and other harmful chemicals, so physicians can not recommend it. No research has been published at this time to suggest benefits for children and adolescents from the use of marijuana. In the context of limited but clear evidence showing harm or potential harm from adolescent use of marijuana, formal recommendations for adolescent use of "medical marijuana" are contrary to current evidence. Exceptions may be those relating to emerging anecdotal information relating to the medical potential of cannabinoid medicines, which may be an option for children with life-limiting or seriously debilitating conditions and for whom current therapies are insufficient. Criminal prosecution in the United States for possession of marijuana adversely affects hundreds of thousands of young people each year, especially minority youths. A focus on punishment for young people who use marijuana is not supported by current evidence. Instead, to better help young people who are experimenting with or dependent on marijuana, drug education and treatment programmes should be encouraged. Also, the decriminalization of adult recreational use of marijuana has not led to an increase in recreational marijuana use rates for young people. As long as it is coupled with drug education and treatment programmes, decriminalizing simple possession of marijuana for both minors and young adults may therefore be a reasonable alternative to outright criminal prosecution. The impact on youth use of the outright legalization of adult marijuana recreational use is unknown, and cannot be recommended.

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