

Cannabis: Social Concerns, Research And It's Current Scenario

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ABSTRACT: Cannabis is commonly regarded as an innocuous drug and the prevalence of lifetime and regular use as increased in most developed countries. However, accumulative evidence highlights the risks of dependence and other adverse effects, particularly among people with pre-existing, psychiatric disorders. The legality of cannabis for medical and recreational use varies by country, in terms of its possession, distribution, and cultivation, and (in regards to medical) how it can be consumed and what medical conditions it can be used for.

Our purpose is to complete a systematic review to provide evidence for a medical cannabinoid prescribing guideline. We focused on the conditions for which medical cannabinoids have the best evidence base and the highest likelihood of having medical uses and its advantages. Our another vital objective is to complete distinct systematic reviews on legalization of Cannabis and economic benefits of legalizing cannabis. On completion, we hoped to have clear guidance for people, as well as to provide adequate information to promote shared, informed decision making.

Keywords: Tetrahydrocannabinol (THC), cannabidiol, abuse, public health, legalization, economy

I. CANNABIS: INTRODUCTION

Cannabis is a complex plant, also called marijuana, hash, weed, ganja and have several other names. Cannabis a psychoactive drug that contains more than 60 psychoactive component such as tetrahydrocannabinol(THC), cannabidiol (CBD) which have opposing effects are primarily used for medical and recreational purposes. Mainly cannabis is taken or used as by smoking, within food, vaporizing or as an extract. It is also believed that smoking marijuana is less harmful than smoking cigarettes among teenagers which is a very serious concern. It is believed that cannabis is the most widely cultivated and trafficked and abused illicit

drug. It is estimated that about 147 million people, 2.5 of the world population consume cannabis (annual prevalence) compared with other drugs such as cocaine and opiate(1).cannabis is a depressant drug that slow down the activity of the central nervous system and the messages going between the brain and the body and sometimes it may also produce hallucinogenic effect.

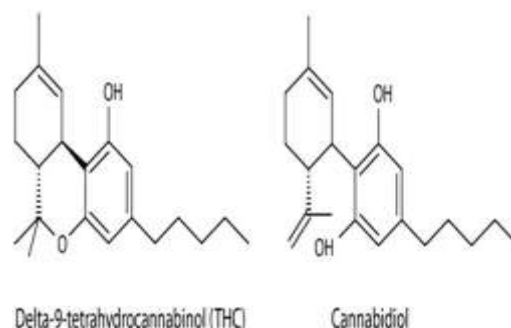


Figure 1: Chemical structures of delta-9tetrahydrocannabinol and cannabidiol.

II. CANNABIS: HISTORY

The history of cannabis is very vast and confusing, still there are no confirm evidences that from which place and which period this plant actually came. Even burned seeds of cannabis have been found in the tombs dating back to 3000 B.C(2). so we can't say how old this plant is. It is believed that cannabis was originally evolved in Central Asia before people introduced the plant to other continents such as Africa, Europe and Americas. If we see the history of cannabis mainly it was used for medicinal purposes but still it was found that people were using its psychoactive component to get high(3).

In different religion

Cannabis (also called bhang in India) has a long history of spiritual use in India. It is believed that Hindu god lord Shiva (referred to as the lord of bhang) rested under a cannabis plant and ate its leaves following its family argument. Also the

Vedas, which is a collection of ancient scriptures, which refers cannabis as an herb to release people from anxiety.

In Muslim, The Quran (their holy book) does not directly forbid cannabis. There is a mixed controversy among the Muslim scholars as some say it is similar to Khamr (alcoholic drink) and therefore believed it to be haram (forbidden), where as in Shia Islam is considered as halal (permissible). But now some modern Islamic leaders state that cannabis can be used for medical purposes but not in recreational form.

In Buddhism it is said that Gautam Buddha subsisted on one hemp seed a day for six years to aid in his path to achieve enlightenment. Also many Buddhist practitioners has also seen consuming cannabis to facilitate meditation.

Similarly in other religions cannabis has been mentioned either directly or indirectly.

Early historical use of Cannabis

Early uses of marijuana were largely medicinal, and was used to treat like malaria, nausea, depression and even to suppress sexual desires(4). Also there are many evidences which show that in some cultures used the psychoactive component of marijuana (THC) for rituals or religious ceremonies.

In china, the Chinese Emperor Shen Nung (father of Chinese medicine) mentioned in one his document that cannabis useful in treating gout, malaria and rheumatism.

In India, ancient doctors prescribed marijuana for pain relief but also advised that consumption of too much can lead to some serious issues. They also created a drink called bhang, a mixture of milk and other ingredients, and used it as an anesthetic and anti-phlegmatic (calm).

In Egypt, many Egyptian text document like the Egyptian medical papyrus of herbal knowledge mentions the use of cannabis as a medicine that includes uterine cramps, constipation and even sore toenails(5).

Some Roman medical texts listed cannabis as a cure for earache and the way to suppress sexual desires. They also boiled the roots of the plant and used them as a treatment for gout, arthritis and generalized pain.

Modern history of Marijuana

In the beginning of 19th century, cannabis extract were used in Britain and the US to relieve pain and nausea (Grinspoon and Bakalar, 1993; Mechoulam, 1986; Nahas, 1984).

The medical use of cannabis declined as drugs were developed in the early 20th century that could be given in doses orally or by injection instead of cannabis extract that varied in quality

and content (Kalant, 2001; Pisanti and Bifulco, 2017).

The inclusion of cannabis in the Single Convention on Narcotic Drugs in 1961 as a drug with no medical(6).

Uses of Cannabis:

Medical uses

Cannabis has a long history for its use and preparation for medical use directly or indirectly. However, by the beginning of twentieth century, medical use of cannabis had largely declined, and its consumption for medical purposes was very limited when in 1961 cannabis was included in the United Nations Single Convention on narcotic Drugs and classified that cannabis had no medical uses(7). But in the past twenty years, it was seen that the patient who was taking cannabis medically was found recovering from variety of conditions, including chronic pain, cancer pain, sleep disturbances, depression, anxiety disorders and neurological disorders, the symptoms of which are reportedly improved by using cannabis (NASEM, 2017).

One of the important issue in the provision of cannabis preparations for medical use is how they will be consumed. The fastest and traditional mode of consumption for recreational users, is to roll the herbal cannabis resin into a cigarette (sometimes mixed with tobacco) and smoke it. As the smoke is absorbed through the lungs into the bloodstream, the effects of THC on the brain are felt in less than a minute, but the harm associated with smoking with tobacco are well known. Although it appears from some limited evidence that smoking cannabis may be somewhat less harmful, but it may still damage the lungs.

Cannabis use in different diseases

Multiple Sclerosis (MS) - In this a cannabis extract is used under the tongue seems to improve symptoms such as muscle spasms, the need to urinate have been seen in some people with multiple sclerosis(8) .

Nerve pain – Many research shows evidences that smoking cannabis can moderately reduce nerve pain caused by HIV and other conditions. The pain relief lasts for about two hours(9).

There are many other diseases where cannabis has been used aggressively, however there are insufficient evidence available that can confirm if it's really helping it. Some of them are- Nausea and vomiting caused by cancer drug treatment- Early research shows that using a mouth spray containing cannabis helps prevent delayed nausea and vomiting in people treated with cancer drugs.

This delayed nausea and vomiting starts at least 24 hours after receiving cancer drugs.

A group of eye disorders that can lead to vision loss (glaucoma) - cannabis seems to reduce pressure inside the eye in people with glaucoma. But this effect lasts for only 3-4 hours(10). It may also decrease the blood flow to the nerve that sends information from the eye to the brain, but it may also decrease blood flow to the nerve that sends information from the eye to the brain. This may damage our vision, so it is unclear if cannabis improves sight in people with glaucoma(11).

Migraine – some early research suggest that smoking cannabis might make migraine headaches less painful. But chances are there people might develop tolerance to cannabis, making it less effective over time(12)

Rheumatoid arthritis – Research suggests that using a mouth spray containing cannabis extract might decrease morning pain and improve sleep in people with RA. But it doesn't seem to improve joint stiffness in the morning or overall pain severity(13).

Fibromyalgia – It is a condition characterized by chronic pain, fatigue, difficulty sleeping, and sleeping problems. In 2018 a review from NAP conclude that there's a moderate amount of evidence that cannabis-related products that can help to improve sleep in people with fibromyalgia for short term(13).

There are several cannabinoid-containing medical products have been authorised by government for marketing, but their sells are very limited. Some of them are:

Sativex: contains equal quantities of THC and CBD from two cannabis extracts. The product is sprayed inside the cheek or under the tongue, is authorized for the treatment of muscle spasticity resulting from multiple sclerosis. (Iversen, 2007; Russo and Guy, 2006)

Epidiolex: A plant- derived CBD oral solution indicated for the treatment of seizures associated with Lennox-Gastaut syndrome or Dravet syndrome in patients 2 years of age or older(14)

Cesamet and canemes: These are oral capsules containing a synthetic cannabinoid similar to THC(15). The main

Cannabis use in Ayurveda

Marijuana has a long history of use in Ayurveda. It's ayurvedic uses is mentioned in many ancient books of Ayurveda like the Sushruta Samhita, Chakra Samhita and Shargandhara Samhita. The Ayurvedic tradition recognizes marijuana (known as Vijaya in Sanskrit) as a medical herb. However, it is strongly recommended to use in small doses, and always in combination with other more sattvic (pure) herbs to balance the nervous system effects produce by cannabis. Today the use of marijuana in mainstream Ayurvedic practice is virtually non-existent.

Some recent uses cannabis in Ayurveda includes-

1. Ayurveda is all about balancing the Doshas (three vital biological energies i.e. the Vatta dosha, the pitta dosha, and the Kapha dosha)
2. Oils are essential in Ayurveda
3. Cannabis is used in Ayurvedic Massage
4. Cannabis is integral to traditional medicine

Other than this cannabis containing Ayurvedic medicines are available which are used to treat various types of diseases, and each of them involves a different form of preparation and administration to enhance the effect. Some of the diseases include are:

Hypertension: The so called Bhang (a cannabis based beverage) is used to treat people suffering from high blood pressure but only on occasional basis. However, with the use Ayurveda this drink can be prepared even for long –term treatments(17,18).

Cannabis as a diuretic: cannabis juice extracted from the plant is used to reduce bladder inflammation and also for the removal of kidney stones.

Cannabis as a healing substance: the powder obtained from the dry cannabis leaves is applied on open wounds to speed up the healing process.

Sexual dysfunction: Combination of cannabis with other aphrodisiac herbs (substances that increases sexual desire) and certain foodstuffs are used to treat people mostly men who are suffering from some sexual dysfunction problems(19,20).

Skin infection: leaves of cannabis are used to treat skin infections and ailments such as rash, irritation as well as to provide relief from itchy and painful skin.

Other uses of cannabis

Cannabis is very versatile as it has so many uses. Its uses can be traced back to thousands

of years before Christ. Marijuana can be used in different ways not simply smoking it as a cigarette. Until about 100 years ago almost all the world's bibles, maps, books and clothes were made out of cannabis.

Some products made from cannabis are: Textile: until 19th century approximately 90 percent of sales such as nets, ropes, flags was made from cannabis. The original hard wearing Levi's jeans were made from cannabis. In 1938 a Popular Mechanics, a USA magazine, stated that hemp was the "standard fiber of the world"(21,22).

Clothes made from hemp was more durable yet softer than those made from cotton.

Biomass: we can produce biomass from cannabis plant usually by gasification. Currently the world production of biomass has been estimated at 146 billion tons a year. The advantage of using cannabis as a biomass is that the fuel does not produce any harmful waste products and there is no pollution(22).

When we talk about marijuana then we cannot simply ignore its most common use of it i.e. smoking and its other form. Marijuana is smoked almost every corner of this earth, and people are using it aggressively. Some common forms of smoking cannabis include:

Cigarette smoking: The most common method of using marijuana is to roll it into cigarette (or joint) using rolling papers and then smoking it. Sometime people smoke marijuana in blubbers, which are mini-bongs about the size of a pipe, and is the oldest method of smoking marijuana. Vaping: This is a new method of consuming marijuana other than normal techniques. In this the active ingredients are inhaled as a vapor which is more harmful than traditional method. Some people claim that they get better high when they vape. However, in the US Food and Drug Administration enacted a rule to require cigarette companies to cease manufacturing and selling vaping products by the end of January 2020(23,24)

Marijuana tinctures: liquid extracted from cannabis are mixed with a solution of water or alcohol. A few drops of this solution is placed under the tongue and is quickly absorbed into the bloodstream. Mostly it is used for medical purposes, but sometimes because of its intense effect, it is often abused(25)

Effects of Cannabis

The use of marijuana is legal in some states for medical reasons, and in even some areas, recreational use is legal as well. No matter how we use marijuana, this drug can produce immediate and long term effects. The effects of marijuana on

the body are often immediate. Long-term effects may depend on how we take it like through smoking, as an ingredient on food, brewed tea or oils. When we inhale marijuana smoke into our lungs, the drug is quickly released into our bloodstream and makes its way to our brain and other organs. It takes a little longer to feel if we eat or drink marijuana(26).

Some common short term effects are:-

- Altered senses
- Changes in mood
- Impaired body movement
- Difficult with thinking and problem solving
- Impaired memory
- Very strange behaviour, seeing, hearing or smelling things that aren't there, not being able to tell imagination from reality (psychosis)(27)
- Up to seven times more likely to contract sexually transmitted infections than nonusers (for females)(28)
- Increased heart rate (risk of heart attack)
- Problems with coordination (impairing safe driving or playing sports)
- Hallucinations

Where-as long term effects include

- Decline in IQ (up to 8 points if prolonged use started in adolescent age)(29)
- Poor school performance and higher chance of dropping out
- Impaired thinking and ability to learn and perform complex tasks(29)
- Lower life satisfaction
- Addiction (about 9% of adults and 17% of people who started smoking as teens)
- Potential development of opiate abuse
- Relationship problems, intimate partner violence
- Antisocial behaviour including stealing money or lying

It has also been seen that marijuana affects our brain development. When people begin using marijuana as teenagers, the drug may affect our thinking, memory and learning functions and how the brain builds connections between the areas necessary for these functions(30).

For example, a study from New Zealand conducted in part by researchers at Duke University showed who started smoking marijuana heavily in their teens and had an ongoing marijuana use disorder lost an average of 8 IQ points between ages 13 and 38. The lost mental abilities didn't fully return in those who quit marijuana as

adults.(31). There are several other effects that can occur when we consume marijuana and some are dangerous. They may include:

Mental effects:

Long-term marijuana use has been linked to mental illness in some people, such as:

- Temporary hallucinations
- Temporary paranoia
- Worsening symptoms in patients with symptoms in patients with schizophrenia-a severe mental disorder with symptoms such as hallucinations, paranoia, and disorganized thinking(32)

Effects on Brain:

The active ingredient in marijuana is delta-9 tetrahydrocannabinol or THC, act on cannabinoid receptors on nerve cells and influences the activity of those cells. In our brain there are some areas where we have many cannabinoid receptors and other areas have very few or none at all(33). The cannabinoid receptors found in our brain mainly influence pleasure, memory, concentration, sensory and time perception and coordination movement.

Physical Effects:

Breathing problems. Smoking marijuana irritates the lungs, and people who smoke marijuana frequently can have same breathing problems as those who smoke tobacco(34). These problems include daily cough and phlegm, more frequent lung illness, and a higher risk of lung infections.

Intense nausea and vomiting- Regular, and long term marijuana can lead to some people to develop Cannabinoid Hyperemesis Syndrome. This causes the user to experience regular cycles of severe nausea, vomiting and dehydration(35).

Effects on the heart:

Marijuana can cause the heart to beat faster and blood pressure to rise, which can be dangerous for people with heart disease. The risk of heart attack is several times higher in the first hour after smoking marijuana that it would be normally, research suggests. Several other studies have found a link between marijuana use and atrial fibrillation, the most common heart rhythm disorder(36).

Effects on Bones:

Heavy users of marijuana have a low body weight and a reduced body mass index (BMI), which would contribute to loss of bone density. Heavy users are defined as those who have smoked

more 5,000 times during their lifetime. People who smoke large amounts of marijuana on a regular basis have reduced bone density, which can increase the risk of bone fractures(37).

Effects on Lungs

Marijuana smokers consumes a lot less cannabis than cigarette smokers consume tobacco, but the harmful effects of smoking marijuana should not be ignored. It is well known that marijuana contains a similar amount of carcinogens hydrocarbons as tobacco smoke and because marijuana smokers typically inhale deeper and hold the smoke in their lungs longer than tobacco smokers, their lungs are exposed to those carcinogenic properties longer, when smoking (38).

Effects on Digestive System

Smoking marijuana can cause some stinging or burning in our mouth or throat while we're inhaling. But when it is taken orally it can cause some digestive issues. For example, oral THC can cause nausea and vomiting because of the way it is processed in our liver. It may also damages the liver. An increase in our appetite is common when taking any form of marijuana, leading to what many call "the munchies"(41). This is considered a benefit for people being treated with chemotherapy for cancer. Other people who are looking to lose weight, this effect could be considered a disadvantage.

Effects on Central Nervous System

The effects of marijuana extend throughout the central nervous system (CNS). Marijuana is thought to ease pain and inflammation and help control spasms and seizures. Still, there are some long-term negative effects on the CNS to consider(42). THC triggers our brain to release large amount of dopamine, a naturally occurring "feel good" chemical. It is what gives you a pleasant high, it may heighten our sensory perception and our perception of time.

Effects on Immune System

Smoking marijuana can suppress the body's immune system, which explains why smokers are more susceptible than non-smokers to certain cancers and infection(43). This effect is due to chemicals present in the drug that fire up the body's production of immune system cells called myeloid-derived suppressor cells. For example in a research performed at University of South Carolina University mentioned that, they injected one group of mice with THC and compared them with a group not injected with the compound. Later it was found that the mice injected with THC had more immune

suppressing cells than the mice who didn't receive THC.

The researchers found that marijuana triggered the production of a massive number of myeloid derived suppressor cells- leading to immune suppression and cancer growth- by activating cells that respond to the cannabinoids found in marijuana, researchers said.

Effects on exposure during pregnancy

Several studies have found that children born to mothers who used marijuana during pregnancy exhibit some problems with neurological development(39). Prenatal marijuana exposure can cause:

- Altered responses to visual stimuli
- Increased tremulousness
- Problems with sustained attention and memory
- Poor problem-solving skills

Although many questions still remain to be answered before the most informed choices can be made between prohibiting and regulating supply, there are many things that cannot be known unless some jurisdiction tries a regulatory policy.

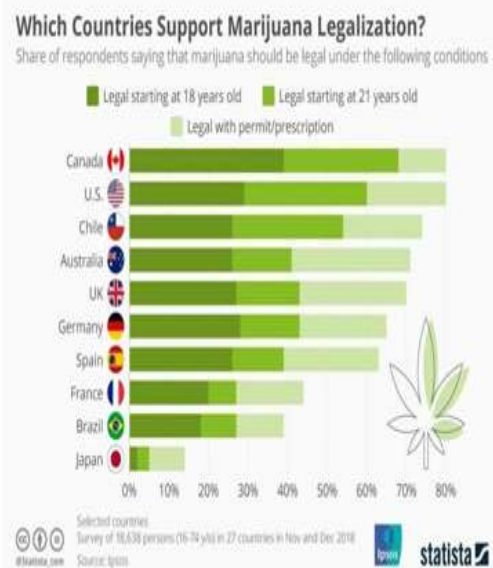
The scientific evidence published to date indicates that marijuana has a broad range of psychological and biological effects, some of which, at least certain conditions are harmful to human health(40). But unfortunately, the available information is not sufficient to tell us how serious the risk may be.

Legalization of cannabis

The legalization of cannabis and its recreational use varies by country, in terms of its control, distribution, and cultivation, and (in regards to medical) how it can be consumed and under what conditions it can be used for. These policies in most of the country are regulated by the United Nations Single Convention on Narcotic Drugs (SCND) that was approved in 1961, along with the Convention on Psychotropic Substances and the 1988 Convention against Illicit Traffic Narcotic Drugs and Psychotropic Substances. The use of cannabis for recreational purposes is prohibited in most countries, however many countries have adopted a policy to legalize to make it a non-criminal offense for its use under certain conditions(44). Whereas in other places such as in Asia or in the gulf countries where keeping a small amount of cannabis is a bid punishable offence and can put you behind the bars for several years.

Many countries have legalized recreational cannabis that includes South Africa, Canada, Georgia, and Uruguay also eleven states and the

District of Columbia in the United States and the Australian Capital Territory in Australia. However, their legality policies varies in their countries and sub national jurisdictions when it comes to commercial sale. Other countries where cannabis is legal have more restrictive laws that only allow the use of certain cannabis derived pharmaceutical drugs, such as Sativex, Marinol or Epidiolex. In the United States, 33 states and the District of Columbia have legalized the medical use of cannabis, but at the federal level its use remains prohibited for any purpose.



Legal status of cannabis in the United States

It is important to recognize that in the United States medical and recreational marijuana laws do not change the fact that using marijuana continues to be an offense under Federal law. Medical marijuana in the US is controlled by the state level, but as per the federal law, cannabis is a schedule I drug, and is illegal as noted in the controlled Substances Act, but the federal government, under former Obama administration, had stated they would not actively prosecute patients and caretakers complying with state medical marijuana laws. However, use of medical marijuana outside of the state laws for illegal use or trafficking would not be tolerated by the state or federal government.

Political leaders, the US government officials, health care providers and medical organizations have different views regarding its benefits and risks of medical marijuana. Many states where marijuana is legal for medical purposes are in favor that further research should be pursued, while opponents list concerns about health risks and believe that it is a gateway that can lead to

more dangerous drug abuse, among other issues. But keeping all risks side, California became the first state to legalize recreational use of marijuana in January 2018(45).

In order to qualify for legal medical marijuana, patients must have a diagnosed condition that is on their states list of qualifying medical marijuana conditions, and should receive a recommendation from their doctor. The patient can then obtain a medical marijuana card, or qualification, to purchase medical marijuana and associated products from dispensaries(46).

Cannabis legalization bill proposed in Israel

On 21st June 2020, in Israel a bill regarding cannabis use was approved by the Ministerial Committee for Legalization, making a big hurdle on the way to become a law. Under this bill it will be legal to keep up to 50 grams of marijuana and people can consume up to 15 grams of marijuana above the age of 21(47,48,49).

If this proposed bill becomes a law then selling and purchasing marijuana for personal use will be legal for those above 21 and authorized shops will be allowed to sell other cannabis products. But growing marijuana at home will still be illegal. The bill also outlined medical cannabis reform.

Cannabis legalization possibility in India

The possibility of making cannabis legal in India is hard to say. Although, cannabis is extensively used and trade illegally throughout the country. In 2019, a study conducted by the All India Institutes of Medical Sciences (AIIMS) said that about 7.2 million Indians had consumed cannabis in India last year. A report from United Nation Office on Drugs and Crime (UNODC) said that retail price of cannabis in India is much cheaper around US\$ 0.10 per gram, which is lowest of any country. However it is interesting to know that weed is illegal in the country by the National Drugs and Psychotropic Substances Act, but they have permitted the use of seeds and leaves allowing the state to regulate it.

In 2019, Uttarakhand became the first state in the country to allow commercial cultivation of the hemp crop, even the state government granted a license to the Indian Industrial Hemp Association (IIHA), for growing the crop 1,000 hectares, on a trial basis.

In Madhya Pradesh state, the Law Minister P.C. Sharma said that the state government is planning to legalize the cultivation of cannabis in the state for medical and industrial use. However, since then there is no further development has taken place.

Similarly, the Chief Minister of Manipur state Mr. N. Biren Singh revealed that the government is serious for legalizing the marijuana to help boost the state's revenue. He also said that start-ups could be involved in the legalization process, which show a very high potential to be part of this industry.

Going through all these statements there is a big chance that someday we can expect medical marijuana may get legalized in India.

Consequences for Legalization of Cannabis

The main problem in legalizing marijuana will increase the risk of abuse in people of age 21 or older. Marijuana use is illegal under federal law, in 2011 it was estimated that there are 18 million people were active users of marijuana. Since June 2014, 23 US states had legalized the use of marijuana for medical purposes believing that the drug may be useful as an analgesic for chronic pain, an antiemetic, and antispasmodic(50,51,52)

A study conducted by National Survey on Drug Use and Health (NSDUH), regarding if marijuana legalization changed whether people's health. The research was mainly focused on the four states of the US that are Colorado, Washington, Oregon and Alaska and divided the people among adolescents (12 to 17), young adults (18 to 25), and older adults (26 and older)(53). From the study it was found that marijuana use, frequent use and cannabis use disorder more among older adults in legalization states compared to the non-legalization states(54,55,56). The increase in use went from 5.65% to 7.1%, the frequent use went from 2.13% to 2.62% and the cannabis use disorder went from 0.9% to 1.23%.

The researchers also found that there was a relative increase in cannabis use disorder among adolescents in legalization states compared to the non-legalization states(57) but the results were so small that the researchers suggested caution. Lastly there was no relative increase among the young adults in legalization states. They took several steps to validate their results and they conclude that if the legalization makes occasional use easier, probably that's not a big concern(58). But, if its leads to more use and addiction that could cause real problems for individuals and society at large.

Economical Importance of Cannabis

By far we know that cannabis is the most illicit drug in the world and is banned in most of the countries except some country like Canada, the Netherland and in some states of the US(59,60,61) We are all familiar with its negative effects, illegal

trade, recreational and medicinal use, is it really that bad, we cannot say exactly. If we look back the history of cannabis it was used everywhere either medically or for recreational use, but later in 21st century it got banned, even in many research it was found that cannabis is less dangerous compared to alcohols, tobacco and other drugs(62,63). Today many countries have uplifted the ban from cannabis not fully and it was observed that not only they are helping in treating people but it has boosted the country's economy as well. For example, Canada which is the largest legal market of cannabis in the world right now is estimated to be worth of \$5 billion, another example is in the US in 2019, Colorado State collected more than \$302 million in form of taxes and fees on medical and recreational marijuana and sales in the US were \$12.2 billion, in 2019. In 2019 legal cannabis sales worldwide reached \$14.9 billion which was \$10.2 billion in 2018. In 2024, the worldwide sales are expected to reach \$42.7 billion. So by seeing all these figures we can say that cannabis is really playing a major role in boosting the economy(64,65,66).

Economical benefits of legalizing cannabis

Today, everyone knows the medical importance of marijuana and in many countries people are supporting to legalize it. It is not about whether cannabis will be legalized but which country goes next(67,68). There are many benefits of legalizing marijuana(69,70,71) But, it would be challenging for the governments to control marijuana intake and its abuse. Some major benefits of cannabis include are:

1. Impact on Tax Revenue – with the legalization of marijuana, in the United States, state governments have found a new source of tax revenue i.e. the marijuana industry and subsequent marijuana businesses. A report released by New Frontier Data released showing the US government would collect up to \$131.8 billion between 2017 and 2025 if marijuana were legalized. These billions will come from different types of taxes such as sales tax, business tax, revenue and payroll tax deductions. In California State they generated 411.3 million in excise tax which include \$98.9 million cultivation tax, and \$335.1 million in sales tax(72,73).

We accept it or not but tax generated from the cannabis industry can be used to fund some important aspects of society such as in health, education and the environment(74,75,76).

2. Cannabis as a job creator – As the world is suffering from economic crisis in every

sectors, the marijuana industry is getting started when it comes to job creation(77). Any kind of business that deals with cannabis directly will create new employment, even the industries that do not directly deal with cannabis will also grow(78,79). In the United States pot manufactures and distributors both recreational and medicinal sides saw a massive boost in job creation in 2018, with more than 64 thousand new positions that brings more than 200,000 jobs which are directly linked with the industry and some where a total of 300,000 jobs in all related areas combined. In the U.S. economy cannabis industry in total created 2.7 million new jobs in 2018 (according to the Bureau of Labor Statistics(80).

3. Big investment opportunities – As the number increasing of countries and states are moving to legalize the production, purchase and cultivation of cannabis. This legally sanctioned cultivation and consumption of cannabis for adults use and medicinal purposes is becoming common(81).

In 2018, the global medical cannabis market was worth \$13.4 billion, with a projected annual growth rate of 26.4%. The sales of product containing CBD reached \$1.9 billion in 2018, and are expected to rise to \$20 billion by the end of 2024. All these growing number of cannabis companies announcing their entry into national and international stock exchanges. So with the increasing legalization, a growing number of uses and applications, and increasing merger and investment activity, investors have the opportunity to participate in a relatively new growth industry(82,83,84)

4. Reduced law enforcement costs- when talking about the economic benefits of legal marijuana, some of the economic benefits of legalizing marijuana would be spending less money on enforcing marijuana laws. Currently in the US, federal marijuana enforcement agency spends billions of dollars every year. In 2013, a report published by the American Civil Liberties union found that the agency was spending approximately \$3.6 billion per year. If marijuana is legalized on a national level, then these costs would likely to drop considerably(85,86,87).

5. Low medical costs – Legalized marijuana also stands a chance to benefit medical consumers of cannabis-based products. Legalizing marijuana in more and more parts of the country, it is very likely to know that the price

will drop as a result of low taxes. The results may not seem like good news for overall tax revenue or for the marijuana companies who are looking to maximize their profits. But, it will definitely help the individuals who are using marijuana based products for medical treatment will benefit considerably much lower prices for these items(88,89).

Is cannabis important for Indian Economy?

Currently the world is in a state of economic crisis due to Corona virus. The International Monetary Fund (IMF) is calling it the biggest recession since the Great Depression. As a under developed country, India and its poor have been particularly hard hit. The Chief Economic Advisor, K.Subramaniam, said that India will not be able to stimulate the economy to the extent that some larger economies have.(90,91).

Before we come to the point whether cannabis should be legalized or not, we need to look back at the history of cannabis use in India present trends in the cannabis market around the world. Until 185, cannabis was legal in India, but under pressure from the American government, India banned cannabis by passing the Narcotic Drugs and Psychotropic Substances Act (NDPS) (91,92,93). The former President Richard Nixon and his administration demanded that all countries ban cannabis cultivation and usage. It was to this pressure only that India bowed down and banned cannabis(94).

The surprising fact is that the country which forced other nations to ban cannabis including India, several years later America opened up its cannabis industry and today in majority of states cannabis is legal for medical use and even recreational use in some states. It is a billion dollar industry and is expected to become a \$78 billion industry by 2027. It has become a significant source of revenue for the government. Even smaller countries like the Netherlands have increased tourism revenues by encouraging cannabis cafes. Even several African nations are earning good amount of profits from this new trend in legal cannabis(95,96,97).

We believe that the Indian government should uplift the ban of cannabis and legalize it for medical purpose. India has an opportunity to become a leading producer of cannabis for the world. With a population four times larger than the US and can make billion dollars profit like any other countries, that will definitely help India to boost its economy during this pandemic situation. This really can be the miracle crop that could

revolutionize our agriculture, our economy and even our environment.

REFERENCES

- [1]. Thomas KV, Bijlsma L, Castiglioni S, Covaci A, Emke E, Grabic R, et al. Comparing illicit drug use in 19 European cities through sewage analysis. *Sci Total Environ* (2012). doi:10.1016/j.scitotenv.2012.06.069
- [2]. Kolliakou A, Fusar-Poli P, Atakan Z. Cannabis abuse and vulnerability to psychosis: targeting preventive services. *Curr Pharm Des*(2012) 18(4):542–9. doi:10.2174/138161212799316208
- [3]. Teesson M, Slade T, Swift W, Mills K, Memedovic S, Mewton L, et al. Prevalence, correlates and com. *Adolescent Medicine: Pharmacotherapeutics in General, Mental, and Sexual Health*. Berlin: DeGruyter (2012). p. 157–99.
- [4]. Tsumura Y, Aoki R, Tokieda Y, Akutsu M, Kawase Y, Kataoka T, et al. A survey of the potency of Japanese illicit cannabis in the year 2010. *Forensic Sci Int*(2012). doi:10.1016/j.forsciint.2012.04.005
- [5]. Greydanus DE, Patel DR. Substance abuse in adolescents: a complex conundrum for the clinician. *Pediatr Clin North Am*(2003) 59(5):1179–223. doi:10.1016/S0031-3955(03)00079-8
- [6]. Greydanus DE, Patel DR. Substance abuse in adolescents: current concepts. *Dis Mon* (2005) 51(7):392–431. doi:10.1016/j.disamonth.2005.10.002
- [7]. Fischer B, Dawe M, McGuire F, Shuper PA, Capler R, Bilsker D, et al. Feasibility and impact of brief interventions for frequent cannabis users in Canada. *J Subst Abuse Treat* (2012). doi:10.1016/j.jsat.2012.03.006
- [8]. Hibell B, Guttormsson U, Ahlström S, Balakireva O, Bjarnason T, Kokkevi A, et al. ESPAD (The European School Survey Project on Alcohol and Other Drugs) report 2007. Substance Use Among Students in 35 European Countries. Stockholm: Swedish Council Information Alcohol Other Drugs (2009).
- [9]. Eaton DK, Kann L, Kinchen S, Shanklin S, Flint KH, Hawkins J, et al. Youth Risk Behavior Surveillance (YRBS) US 2009. *MMWR Surveill Summ* (2010)
- [10]. Ivanov I, Pearson A, Kaplan K, Newcorn J. Attention deficit hyperactivity disorder and comorbid substance abuse. In: Greydanus DE, Calles JL Jr, Patel DR, Nazeer

- A, Merrick J editors. *Clinical Aspects of Psychopharmacology in Childhood and Adolescence*. New York: Nova Science (2011). p. 33–49.
- [11]. Bonn-Miller MO, Harris AH, Trafton JA. Prevalence of cannabis use disorders diagnoses among veterans in 2002, 2008, and 2009. *Psychol Serv* (2012). doi:10.1037/a0027622
- [12]. Mehrpour O, Karrari P, Afshari R. Recreational use and overdose of ingested processed cannabis (Majoon Birjandi) in the eastern Iran. *Hum Exp Toxicol* (2012). doi:10.1177/0960327112446814
- [13]. Lipperman-Kreda S, Lee JP. Boost your high: cigarette smoking to enhance alcohol and drug effects among Southeast Asian American youth. *J Drug Issues* (2011)41(4):509–22.
- [14]. Greydanus DE, Feucht C, Patel DR. Substance abuse disorders in adolescents: pharmacologic management. In: Greydanus DE, Calles JL Jr, Patel DR, Nazeer A, Merrick J editors. *Clinical aspects of psychopharmacology in childhood and adolescence*. New York: Nova Science (2011). 178 p.
- [15]. Agrawal A, Budney AJ, Lynskey MT. The co-occurring use and misuse of cannabis and tobacco: a review. *Addiction* (2012). doi:10.1111/j.1360-0443.2012.03837.x
- [16]. Simmons MS, Tashkin DP. The relationship of tobacco and marijuana smoking characteristics. *Life Sci* (1995) 56(23-24):2185–91. doi:10.1016/0024-3205(95)00206-L
- [17]. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, DSM-IV-TR*. 4th ed. Washington, DC: American Psychiatric Association (2000).
- [18]. Olthuis JV, Darredeau C, Barrett SP. Substance use initiation: the role of simultaneous polysubstance use. *Drug Alcohol Rev* (2012). doi:10.1111/j.1465-362.2012.00470x
- [19]. Barrett SP, Darredeau C, Pihl RO. Patterns of simultaneous polysubstance use in drug using university students. *Hum Psychopharmacol* (2006) 21(4):255–63. doi:10.
- [20]. Sartor CE, Agrawal A, Lynskey MT, Duncan AE, Grant JD, Nelson EC, et al. Cannabis or alcohol first? Differences by ethnicity and in risk for rapid progression to cannabis-related problems in women. *Psychol Med* (2013) 43(4):813–23. doi:10.1017/S0033291712001493
- [21]. Bowes L, Chollet A, Fombonne E, Galéra C, Melchior M. Lifetime SEP and tobacco and cannabis use. *Eur J Public Health* (2013) 23(2):322–7. doi:10.1093/eurpub/cks06522645240
- [22]. Pesce A, West C, Rosenthal M, West R, Crews B, Mikel C, et al. Marijuana correlates with use of other illicit drugs in a pain patient population. *Pain Physician* (2010)13(3):283–7.
- [23]. O'Brien MS, Compton LA, Liang KY, Anthony JC. Does cannabis onset trigger cocaine onset? A case crossover approach. *Int J Methods Psychiatr Res* (2012) 21(1):66–75. doi:10.1002/mpr.359
- [24]. Malinowska B, Baranowska-Kuczko M, Schlicker E. Triphasic blood pressure responses to cannabinoids: do we understand the mechanism? *Br J Pharmacol* (2012) 165(7):2073–88. doi:10.1111/j.1476-5381.2011.01747.x
- [25]. Fusar-Poli P, Crippa JA, Bhattacharyya S, Borgwardt SJ, Allen P, Martin-Santos R, et al. Distinct effects of Δ^9 tetrahydrocannabinol and cannabidiol on neural activation during emotional processing. *Arch Gen Psychiatry* (2009)66(1):95–105. doi:10.1001/archgenpsychiatry.2008.519
- [26]. Borgwardt SJ, Allen P, Bhattacharyya S, Fusar-Poli P, Crippa JA, Seal ML, et al. Neural basis of Δ^9 -tetrahydrocannabinol and cannabidiol: effects during response inhibition. *Biol Psychiatry* (2008) 64(11):966–73. doi:10.1016/j.biopsych.2008.05.011
- [27]. Bergamaschi MM, Queiroz RH, Zuardi AW, Crippa JA. Safety and side effects of cannabidiol: a Cannabis sativa constituent. *Curr Drug Saf* (2011) 6(4):237–49. doi:10.2174/157488611798280924
- [28]. Solinas M, Yasar S, Goldberg SR. Endocannabinoid system involvement in brain reward processes related to drug abuse. *Pharmacol Res* (2007) 56(5):393–405. doi:10.1016/j.phrs.2007.09.005
- [29]. Grotenhermen F. Cannabinoids. *Curr Drug Targets CNS Neurol Disord* (2005) 4(5):507–30. doi:10.2174/156800705774322111
- [30]. Mechoulam R, Parker LA. The endocannabinoid system and the brain. *Annu Rev Psychol* (2012)64:21–47. doi:10.1146/annurevpsych-113011-143739

- [31]. Zanettini C, Panlilio LV, Alicki M, Goldberg SR, Haller J, Yasar S. Effects of endocannabinoid system modulation on cognitive and emotional behavior. *Front Behav Neurosci* (2011) 5:57. doi:10.3389/fnbeh.2011.00057
- [32]. Marco EM, Garcia-Gutiérrez MS, Bermúdez-Silva FJ, Moreira FA, Guimarães F, Manzanares J, et al. Endocannabinoid system and psychiatry: in search of a neurobiological basis for detrimental and potential therapeutic effects. *Front Behav Neurosci* (2011) 55:63. doi:10.3389/fnbeh.2011.00063
- [33]. Fattore L, Spano MS, Deiana S, Melis V, Cossu G, Fadda P, et al. An endocannabinoid mechanism in relapse to drug seeking: a review of animal studies and clinical perspectives. *Brain Res Rev* (2007) 53(1):1–16. doi:10.1016/j.brainresrev.2006.05.003
- [34]. Trezza V, Cuomo VO, Vanderschuren LJ. Cannabis and the developing brain: insights from behavior. *Eur J Pharmacol* (2008) 585(2-3): 441–52. doi:10.1016/j.ejphar.2008.01.058
- [35]. Iversen L. Cannabis and the brain. *Brain* (2003) 126(Pt6):125270. doi:10.1093/brain/awg143
- [36]. Marriott KS, Huffman JW. Recent advances in the development of selective ligands for the cannabinoid CB₂ receptor. *Curr Top Med Chem* (2008) 8 (3): 187–204. doi:10.2174/156802608783498014
- [37]. Guindon J, Hohmann AG. The endocannabinoid system and cancer: therapeutic implication. *Br J Pharmacol* (2011) 163(7):144763. doi:10.1111/j.14765381.2011.01327.x
- [38]. Caballero A, Tseng KY. Association of cannabis use during adolescence, prefrontal CB₁ receptor signaling, and schizophrenia. *Front Pharmacol* (2012) 3:101. doi:10.3389/fphar.2012.00101
- [39]. Gray KM, Carpenter MJ, Baker NL, Desantis SM, Kryway E, Hartwell KJ, et al. A double-blind randomized controlled trial of N-acetylcysteine in cannabis-dependent adolescents. *Am J Psychiatry* (2012). doi:10.1176/appi.ajp.2012.12010055
- [40]. Weinstein AM, Gorelick DA. Pharmacologic treatment of cannabis dependence. *Curr Pharm Des* (2011) 17(14):1351–8. doi:10.2174/138161211796150846
- [41]. Pertwee RG. Cannabis and cannabinoids: pharmacology and rationale for clinical use. *Forsch Komplementarmed* (1999)(Suppl 3):12–5. doi:10.1159/000057150
- [42]. Svrakic DM, Lustman PJ, Mallya A, Lynn TA, Finney R, Svrakic NM. Legalization, decriminalization & medicinal use of cannabis: a scientific and public health perspective. *Mo Med* (2012) 109(2):90–8.
- [43]. Beaulieu P, Rice AS. The pharmacology of cannabinoids derivatives: are there applications to treatment of pain? *Ann Fr Anesth Reanim* (2002) 21(6):493–508. doi:10.1016/S0750-7658(02)00663-9
- [44]. Lee MC, Ploner M, Wiech K, Bingel U, Wanigasekera V, Brooks J, et al. Amygdala activity contributes to the dissociative effect of cannabis on pain perception. *Pain* (2013) 154(1):12434. doi:10.1016/j.pain.2012.09.017
- [45]. Richardson GA, Larkby C, Goldschmidt L, Day NL. Adolescent initiation of drug use effects of prenatal cocaine exposure. *J Am Acad Child Adolesc Psychiatry* (2013) 52(1):37–46. doi:10.1016/j.jaac.2012.10.011
- [46]. Mercolini L, Mandrioli R, Sorella V, Somaini L, Giocondi D, Serpelloni G, et al. Dried blood spots: liquid chromatography-mass spectrometry analysis of delta-9-tetrahydrocannabinol and its main metabolites. *J Chromatogr A* (2013) 1271(1):3340. doi:10.1016/j.chroma.2012.11.030
- [47]. Danovitch I, Gorelick DA. State of the art treatments for cannabis dependence. *Psychiatr Clin North Am* (2012) 35(2):309–26. doi:10.1016/j.psc.2012.03.003
- [48]. Forray A, Sofuoglu M. Future pharmacologic treatments for substance use disorders. *Br J Clin Pharmacol* (2012). doi:10.1111/j.1365-2125.2012.04474.x
- [49]. Greydanus DE, Feucht C, Hawver EK. Substance abuse and adolescence. *Int J Child Health Hum Dev* (2012) 5(2):149–79.
- [50]. Marmorstein NR, Iacono WG, McGue M. Associations between substance use disorders and major depression in parents and late adolescent-emerging adult offspring: an adoption study. *Addiction* (2012). doi:10.1111/j.1360-0443.2012.03934.x
- [51]. Harvey MA, Sellman JD, Porter RJ, Frampton CM. The relationship between non-acute adolescent cannabis use and cognition. *Drug Alcohol Rev* (2007) 26(3):309–19. doi:10.1080/09595230701247772
- [52]. Sundram S. Cannabis and neurodevelopment: implications for psychiatric disorders. *Hum*

- Psychopharmacol(2006)21(4):24554.doi:10.1002/hup.762
- [53]. Schneider M. Puberty as a highly vulnerable developmental period for the consequences of cannabis exposure. *Addict Biol* (2008) 13(2):253–63.doi:10.1111/j.1369-1600.2008.00110.x
- [54]. Dinieri JA, Hurd YL. Rat models of prenatal and adolescent cannabis exposure. *Methods Mol Biol* (2012) 829:231–42. doi:10.1007/978-1-61779-458-2_14
- [55]. Degenhardt L, Coffey C, Romaniuk H, Swift W, Carlin JB, Hall WD, et al. The persistence of the association between adolescent cannabis use and common mental disorders into young adulthood. *Addiction* (2012). doi:10.1111/j.1360-0443.2012.04015.x
- [56]. Urban NB, Slifstein M, Thompson JL, Xu X, Grigis RR, Raheja S, et al. Dopamine release in chronic cannabis users: a [(11)C] raclopride positron emission tomography study. *Biol Psychiatry* (2012). doi:10.1016/j.biopsych.2011.12.018
- [57]. Zalesky A, Solowij N, Yücel M, Lubman DI, Takagi M, Harding IH, et al. Effect of long-term cannabis use on axonal fibre connectivity. *Brain* (2012). doi:10.1093/brain/awt136
- [58]. Leach LS, Butterworth P. The effect of early onset common mental disorders on educational attainment in Australia. *Psychiatry Res* (2012). doi:10.1016/j.psychres.2012.03.040
- [59]. Yücel M, Solowij N, Respondek C, Whittle S, Fornito A, Pantelis C, et al. Regional brain abnormalities associated with long-term heavy cannabis use. *Arch Gen Psychiatry* (2008) 65(6): 694701. doi: 10.1001/archpsyc.65.6.694
- [60]. Abushi H, Akirav I. Short- and long-term cognitive effects of chronic cannabinoids administration in late-adolescence rats. *PLoS ONE* (2012) 7(2):e31731. doi:10.371/journal.pone.0031731
- [61]. Gordon SM, Tulak F, Troncale J. Prevalence and characteristics of adolescent patients with co-occurring ADHD and substance dependence. *J Addict Dis* (2004) 23:3140. doi: 10.1300/J069v23n04_03
- [62]. Dennis M, Godley SH, Diamond G, Tims FM, Babor T, Donaldson J, et al. The Cannabis Youth Treatment (CYT) Study: main findings from two randomized trials. *J Subst Abuse Treat* (2004) 27(3):197–213. doi:10.1016/j.jsat.2003.09.005
- [63]. Han S, Yang BZ, Kranzler HR, Oslin D, Anton R, Farrer LA, et al. Linkage analysis followed by association shown NRG1 associated with cannabis dependence in African Americans. *Biol Psychiatry* (2012). doi:10.1016/j.biopsych.2012.02.038
- [64]. Hürlimann F, Kupferschmid S, Simon AE. Cannabis-induced depersonalization disorder in adolescence. Cannabis-induced depersonalization disorder in adolescents. *Neuropsychobiology* (2012) 65(3):141–6. doi: 10.1159/000334605
- [65]. Horwood LJ, Fergusson DM, Coffey C, Patton GC, Tait R, Smart D, et al. Cannabis and depression: an integrative data analysis of four Australasian cohorts. *Drug Alcohol Depend* (2012). doi:10.1016/j.drugalcdep.2012.06.002
- [66]. Van Dam NT, Bedi G, Earleywine M. Characteristics of clinically anxious versus non-anxious regular, heavy marijuana users. *Addict Behav* (2012). doi:10.1016/j.addbeh.2012.05.01
- [67]. Budney AJ. Should cannabis withdrawal disorder be included in DSM-5? *Psychiatr Times* (2011) 28(2):48–50.
- [68]. Budney AJ, Hughes JR, Moore BA, Vandrey R. Review of the validity and significance of cannabis withdrawal syndrome. *Am J Psychiatry* (2004) 161:1967–77. doi:10.1176/appi.ajp.161.11.1967
- [69]. Budney AJ, Hughes JR. The cannabis withdrawal syndrome. *Curr Opin Psychiatry* (2006) 19:2338. doi:10.1097/01.yco.0000218592.00689.e5 Crowley TJ, MacDonald MJ, Whitmore EA.
- [70]. Cannabis dependence, withdrawal, and reinforcing effects among adolescents with conduct symptoms and substance use disorders. *Drug Alcohol Depend* (1998) 50:27–37. doi:10.1016/S0376-8716(98)00003-9
- [71]. Vandrey RG, Budney AJ, Hughes JR, Liguoria A. A within-subject comparison of withdrawal symptoms during abstinence from cannabis, tobacco, and both substances. *Drug Alcohol Depend* (2008) 92(13):4854. doi:10.1016/j.drugalcdep.2007.06.010
- [72]. Arendt M, Rosenberg R, Fjordback L, Brandholdt J, Foldager L, Sher L, et al. Testing the self-medication hypothesis of depression and aggression in cannabis-dependent subjects. *Psychol Med* (2007) 37(7):935–45. doi:10.1017/S0033291706009688

- [73]. Calles JL Jr, Nazeer A. Aggressive and violent behavior. In: Greydanus DE, Calles JL Jr, Patel DR, Nazeer A, Merrick J editors. *Clinical Aspects of Psychopharmacology in Childhood and Adolescence*. New York: Nova Science Publishers Inc (2011). 106 p.
- [74]. Schacht JP, Hutchinson KE, Filbey FM. Associations between cannabinoid-receptor-1 (CNR1) variation and hippocampus and amygdala volumes in heavy cannabis users. *Neuropsychopharmacology* (2012). doi:10.1038/npp.2012.92
- [75]. Haney M, Hart CL, Vosburg KD. Marijuana withdrawal in humans: effects of oral THC or divalproex. *Neuropsychopharmacology* (2004) 29:158–70. doi:10.1038/sj.npp.1300310
- [76]. Milin R, Manion I, Dare G, Walker S. Prospective assessment of cannabis withdrawal in adolescents with cannabis dependence: a pilot study. *J Am Acad Child Adolesc Psychiatry* (2008) 47:174–8. doi:10.1097/chi.0b013e31815cdd73
- [77]. Cornelius JR, Chung T, Martin C, Wood DS, Clark DB. Cannabis withdrawal is common among treatment seeking adolescents with cannabis dependence and major depression, and is associated with rapid relapse to dependence. *Addict Behav* (2008) 103:787–99. doi:10.1016/j.addbeh.2008.02.001
- [78]. Gorelick DA, Levin KH, Copersino ML, Heishman SJ, Liu F, Boggs DL, et al. Diagnostic criteria for cannabis withdrawal syndrome. *Drug Alcohol Depend* (2012) 123(1-3):141–7. doi:10.1016/j.drugalcdep.2011.11.007
- [79]. Gardner EL. Addictive potential of cannabinoids: the underlying neurobiology. *Chem Phys Lipids* (2005) 121(1-2):267–90. doi:10.1016/S0009-3084(02)00162-7
- [80]. Cooper ZD, Haney M. Cannabis reinforcement and dependence: role of cannabinoid CB1 receptor. *Addict Biol* (2008) 13(2):188–95. doi:10.1111/j.1369-1600.2007.00095.x
- [81]. Cooper ZD, Haney M. Actions of delta-9-tetrahydrocannabinol in cannabis: relation to use, abuse, dependence. *Int Rev Psychiatry* (2009) 21(2):104–12. doi:10.1080/09540260902782752
- [82]. Gardner EL. Endocannabinoid signaling system and brain reward: emphasis on dopamine. *Pharmacol Biochem Behav* (2005) 81(2):263–84. doi:10.1016/j.pbb.2005.01.032
- [83]. Gardner EL. Addiction and brain reward and anti-reward pathways. *Adv Psychosom Med* (2011) 30:22–60. doi:10.1159/000324065
- [84]. Schneier AB, Cullen J, Ly BT. “Spice” girls: synthetic cannabinoid intoxication. *J Emerg Med* (2011) 40(3):296–9. doi:10.1016/j.jemermed.2010.10.014
- [85]. Ginsburg BC, McMahon LR, Sanchez JJ, Javors MA. Purity of synthetic cannabinoids sold online for recreational use. *J Anal Toxicol* (2012) 36(1):66–8. doi:10.1093/jat/bkr018
- [86]. De Backer B, Maebe Verstraete AG, Charlier C. Evolution of the content of THC and other major cannabinoids in drug-type cannabis cuttings and seedlings during growth of plants. *J Forensic Sci* (2012). doi:10.1111/j.1556-4029.2012.02068
- [87]. Köhnemann S, Nedele J, Schwotzer D, Morzfeld J, Pfeiffer H. The validation of a 15 STR multiplex PCR for Cannabis species. *Int J Legal Med* (2012). doi:10.1007/s00414-012-0706-6
- [88]. Mura P, Sausseureau E, Brunet B, Goulié JP. Workplace testing of drugs of abuse and psychotropic drugs. *Ann Pharm Fr* (2012) 70(3):120–32. doi:10.1016/j.pharma.2012.03.002
- [89]. Salomone A, Gerace E, E’Urso F, Di Corcia D, Vincenti M. Simultaneous analysis of several synthetic cannabinoids, THC, CBD, and CBN, in hair by ultra-high performance liquid chromatography tandem mass spectrometry. Method validation and application to real samples. *J Mass Spectrom* (2012) 47(5):604–12. doi:10.1002/jms.2988
- [90]. Adverse effects of cannabis. *Prescrire In* (2011) 20(112):18–23.
- [91]. Kalant H. Adverse effects of cannabis on health: an update of the literature since 1996. *Prog Neuro psychopharmacol Biol Psychiatry* (2004) 28(5):849–63. doi:10.1016/j.pnpbp.2004.05.027
- [92]. Monshouwer K, Van Dorsselaer S, Verdurmen J, Bogt TT, De Graaf R, Vollegergh W. Cannabis use and mental health in secondary children. Findings from a Dutch survey. *Br J Psychiatry* (2006) 188:148–53. doi:10.1192/bjp.188.2.148
- [93]. Lee MH, Hancox RJ. Effects of smoking cannabis on lung function. *Expert Rev Respir Med* (2011) 5(4):537–46. doi:10.1586/ers.11.40
- [94]. Howden ML, Naughton MT. Pulmonary effects of marijuana inhalation. *Expert Rev Respir Med* (2011) 5(1):87–92. doi:10.1586/ers.10.87
- [95]. Zarfin Y, Yefet E, Abozaid S, Nasser WM, Finkelstein Y. Infant with altered consciousness after cannabis passive

- inhalation. *Child Abuse Negl*(2012)36
(2):813.doi:10.1016/j.chiabu.2011.09.011
- [96]. Molly C, Mory O, Basset T, PaturalH. Acute
cannabis poisoning in a 10-month-old infant.
ArchPediatr(2012).doi:10.1016/j.arcped.201
2.04.018
- [97]. Mallaret M, Dal'Bo-Rohrer D, Demattéis M.
Adverse effects of marijuana. *Rev Prat*
(2005)55(1):41–9.



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