Review Article

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TOXICOLOGICAL AND MEDICOLEGAL ASPECTS OF VIJAYA (*CANNABIS SATIVA* LINN.): A SYSTEMATIC REVIEW

Shilpa *
Lecturer, Shree Lakshmi Narayan Ayurvedic College, Amritsar, Punjab, India

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***Corresponding author**
E-mail: shilpapuriayu@gmail.com

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ABSTRACT

Vijaya is botanically *Cannabis sativa* Linn. belonging to the family cannabinaceae. It is commonly known as bhanga, cannabis, Indian hemp and marijuana. The Ayurvedic text Ras Tarangini has included Vijaya among eleven Upavisas, a group of drugs which are not so lethal but produce toxic symptoms on consumption or administration. Schedule-E (1) of Drugs & Cosmetics Act, 1940 has included *Cannabis sativa* in the list of poisonous plants under the Ayurvedic system of medicine. The Narcotic Drugs & Psychotropic Substances Act, 1985 includes cannabis among narcotic drugs and natural drugs of abuse. Also the main active chemical component of cannabis i.e. tetrahydrocannabinol has been included among the list of psychotropic substances in The Narcotic Drugs & Psychotropic Substances Act. Cannabis is reported to be the most commonly abused illicit substance globally. Thus it is necessary to obtain information on the toxicological and medicolegal aspects of *Cannabis sativa*. The present article reviews the properties, toxic constituents, mode of action, toxic signs and symptoms, and management of Vijaya poisoning as per Ayurvedic and contemporary point of view. Also a review of its medicolegal aspects is presented. This presentation aims to provide the information which will help in treating and counsel the patients of cannabis poisoning.

Key words: Vijaya, *Cannabis sativa*, Cannabis poisoning, medicolegal aspects

INTRODUCTION

The term cannabis is commonly used to indicate various psychoactive formulations of the cannabis plant. The species *Cannabis sativa*, *Cannabis indica* and *Cannabis ruderalis* are preferably called as cannabis[1]. In India the cannabis drugs are obtained from the flowers, leaves (and the resin collected from them), fruits, young twigs and stem bark of the plant *Cannabis sativa Linn.* It belongs to the family cannabinaceae.[2] Cannabis sativa is an annual, dioecious, flowering herb. Staminate (male) plants are usually taller but less robust than pistillate (female) plants. Stems are erect and can vary from 0.2-6m. However, most of the plants reach heights of 1-3m.[3] The plant is practically naturalised in the sub-Himalayan tracts in India and abundantly found in the waste lands from Punjab, eastwards to Bengal and extending Southwards.[4] It is a deliriant cerebral type of poison which causes delirium (a state of disturbed consciousness with imaginary talks, delusion, hallucination etc.).[5]

VARIOUS FORMS OF CANNABIS USED IN INDIA

Bhang- Bhang is prepared from the fresh matured leaves and flowering shoots of both female and male plants. These may be wild or cultivated.[2] It contains the active principle in a concentration of 15% and is the least potent.[6] It is taken as a drink or chewed.

Ganja- Ganja consists of the dried flowering tops of the female plant, which are specially cultivated. So that there is a large amount of resinous exudate. Fresh ganja is of rusty green colour and has a characteristic odour.[2] It contains the active principle in a concentration of about 25%.[6]

Charas- Charas is also known as Hashish. It is the resinous exudate from the leaves and flowering tops of the plant. It is of greenish colour that turns to brownish- grey when kept for sometime.[2] It is the most potent of all cannabis preparations, containing the active principle in a concentration of about 25-40%.[6]

Ganja and charas are commonly smoked. They may be mixed with tobacco and smoked as a joint or may be smoked in a clay pipe called chillum or in the ordinary hookah with or without tobacco. These may also be cooked in foods and eaten.

TOXIC PART OF VIJAYA (CANNABIS SATIVA LINN.)

Acharya Sushruta has included Vijaya among Mulaja Vishas (root poisons).[7]
Primary psychoactive component is present in all parts of plant but flowering tops and resin contain the highest concentration.

PROPERTIES OF CANNABIS SATIVA LINN. AS PER AYURVEDA[4]

Ras- Tikta (bitter)
Guna- Laghu (light), Tikshna (sharp)
Virya- Usna (hot)
Vipaka- Katu (pungent)
Karma- Vyavayi (spreading without digestion)

MODE OF ACTION AS PER AYURVEDA

According to Ayurveda the above mentioned properties of Vijaya are responsible for its actions in the body. Due to its Vyavayi Guna it is highly permeable and is quickly absorbed in the body. Due to Laghu Guna it enters into all (even minute) body channels and also is Dushchikitsya i.e. difficult to treat. Tikshna Guna enables it to effect the functions of brain and vital parts of the body. Ushna Virya of Vijaya vitiates Pitta (structure governing heat, metabolism and transformation in body and mind) and Rakta (blood) in the body.[8]

TOXIC CONSTITUENTS OF CANNABIS SATIVA LINN. AS PER CONTEMPORARY VIEW

The principal psychoactive component of *Cannabis sativa* is delta-9- tetrahydrocannabinol (THC).[4]

MODE OF ACTION AS PER CONTEMPORARY VIEW

THC produces its toxic effects by acting on endocannabinoid system. There are two types of cannabinoid receptors on which THC acts: type 1 (CB_1) and type 2 (CB_2) cannabinoid receptors. CB_1 receptors play a key role in the psychoactive effects of cannabis. CB_1 receptors are mainly involved in regulating the functions like learning and memory, anxiety, emotion and fear, cognitive function, executive function and control, motivation, motor coordination, appetite, hormone levels and sexual behaviour. Thus all these body functions are impaired in cannabis poisoning.

Cannabis produces its euphoric effects by activating brain's dopamine reward pathway, which consists of both CB_1 and CB_2 receptors. These receptors increase dopamine release when activated by THC. Dopamine helps control the functions like cognition, attention, emotionality and motivation.[9]

FATAL DOSE[10]

Preparation	Fatal Dose
Bhang	10 gm/kg body weight, on an average
Ganja	8 gm/kg body weight, on an average
Charas	2 gm/kg body weight, on an average
Delta-9-tetrahydrocannabinol	1000-2000 mg I.V. or 30mg/kg body weight, 90 mg leads to poisoning

FATAL PERIOD

Death is very rare, but it has ensued in 12 hours and may be delayed for several days.[11]

VIKARAS OR TOXIC SIGNS AND SYMPTOMS

As per Ayurveda

The Vikaras produced due to consumption of excessive amount of Vijaya are mentioned in detail in Anandkanda (a text of Ras Shastra), written by Manthana Bhairava. These are as follows:
On excessive consumption of Vijaya the eyes become hyperaemic and tongue, lips, palate become dry, then following stages of Vikaras are developed. There is dryness on the tip of nose, difficulty in respiration and breaths are hot. The eyes are closed and the person covers his/her face. There is burning sensation in feet, hands, eyes and the speech is slurred. Thirst and appetite are increased and there is feeling of drowsiness. The patient forgets what he said a moment before. There is impairment of thinking or loss of perception of time and space. There is debility in hands, interest in physical beauty or the person seeks sexual enjoyment. The person feels like moving in waves again and again. There is visual hallucination, the person frowns and cries excessively. There is hearing of noises in ears, unconsciousness, loss of memory and eructation. The person utters inarticulate sounds, lies down on land. The person does depressed, purposeless and secret talks and does not feel comfortable. There is excessive sweating. This poisoning is painful.[12]

As per contemporary view

The International Classification of Diseases (ICD-10) and the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) have defined cannabis-use-disorders.[13,14] These are:
Cannabis intoxication
Cannabis withdrawal syndrome
Cannabis dependence
Cannabis induced psychotic disorders

Cannabis intoxication

Signs and symptoms of cannabis intoxication given by ICD-10 and DSM-V are the following:

ICD-10 guidelines[13]

Fix.0 Acute intoxication due to use of cannabinoids.
A. The general criteria for acute intoxication must be met.
B. There must be dysfunctional behaviour or perceptual abnormalities including at least one of the following;
1. Euphoria and disinhibition
2. Anxiety or agitation
3. Suspiciousness or paranoid ideations
4. Temporal slowing
5. Impaired judgement
6. Impaired attention
7. Impaired reaction time
8. Visual, auditory and tactile illusions
9. Hallucination with preserved orientation
10. Depersonalization
11. Derealization
12. Interference with personal functioning

C. At least one of the following signs must be present
1. Increased appetite
2. Dry mouth
3. Conjunctival injection
4. Tachycardia

DSM-V guidelines[14]

Cannabis intoxication, a cannabis- related disorder coded as 292.89, is defined by DSM-V, as the following:
Recent use of cannabis
Clinically significant problematic behaviour or psychological changes (i.e. impaired motor coordination, euphoria, anxiety, sensation of slowed time, impaired judgement, social withdrawal) that developed during, or shortly after, cannabis use. At least two of the following signs, developing within 2 hours of cannabis use:
Conjunctival injection
Increased appetite
Dry mouth
Tachycardia

Cannabis withdrawal syndrome[13]

As per ICD-10 this is ill- defined syndrome for which definitive diagnostic criteria cannot be established. It occurs following cessation of prolonged high dose of cannabis. It has been reported variously as lasting from several hours to up to 7 days. Symptoms and signs include anxiety, irritability, tremor of outstretched hands, sweating and muscle aches.

Cannabis dependence[15]

Cannabis dependence is there if cannabis use is impairing the patient's ability of function either physiologically or psychologically (patient's performance at work, ability to carry out social and family obligations and physical health).

Cannabis-induced psychotic disorders[15]

Psychotic disorders produced by cannabis are: delusions and hallucinations.

DIAGNOSIS OF CANNABIS POISONING

Clinical diagnosis

Balance or motor incoordination can be elicited by a +ve Romberg sign.
Impaired performance may be observed with cognitive functioning tasks, including serial addition / subtraction and object recall.

Laboratory diagnosis
Cannabis metabolites can be detected in saliva, blood, urine, hair and nail. Urine is the preferred sample because of higher concentration and longer detection time of metabolites in it. Immunoassay is adopted as a preliminary method and chromatographic techniques are used as confirmatory drug testing methods. The cut off value for detection of cannabinoids as recommended by the Substance Abuse and Mental Health Services Administration (SAMHSA) is 50ng/ml.

MANAGEMENT

According to Ayurveda
Virechana (therapeutic purgation).
Intake of Amla Rasa (food with sour taste), Sheetal Panak (cooling drink) mixed with Sarkara (sugar) and Madhu (honey), Mudgyush (green gram soup), cow's Ghrita (clarified buttermilk), cow's milk and Mansrasa (meat soup). Chewing of Karpoor (camphor), Ela (cardamom), Lavanga (clove), Kankola (java pepper) and Supari (betel nut) mixed with Tambool (betel leaf).
Anointing the body with paste of Chandana (sandalwood), Usira (vetiver), Karpoora (camphor) and cold water. Wearing garland of fragrant and coolant flowers like Chameli (jasmine), Mallika (winter jasmine), Champa (frangipani), Kamal (lotus) and Utapala (blue water lily). Wearing bangles of soft lotus stalk. Wearing of light, fragrant clothes. Patient should sleep on the bed prepared with Kadali (banana) leaves. Fanning with leaves of Tala (*Borassus flabellifera*) . In the night the patient should wear bangle made of gold and pearls and sit in moon light for two Muhrutas (96 minutes).
All Sheet Upcharas (cold things, food and comforts) should be done.[16]
Shunthi (dry ginger) mixed with cow's curd should be given.[17]

According to contemporary view[18]
Management includes pharmacological as well as psychosocial aspects.

Pharmacological aspects

Cannabis intoxication
Usually mild, self limiting, mostly does not need pharmacological intervention.
Treatment needed in severe distressing anxiety or psychotic symptom induced by intoxication.
Antipsychotic (preferably atypical) for psychosis.
Benzodiazepine in acute anxiety state.
Duration not longer than one day.

Cannabis withdrawal
Benzodiazepines are most commonly prescribed medication.
Dronabinol (cannabis receptor agonist), synthetic THC (20-60 mg/day) for 7-10 days depending on duration of withdrawal symptom.

Cannabis dependence
No medication has been shown broadly effective for this, nor any approved by any regulatory authority.
Buspiron (anxiolytic), up to 60 mg/day for 12 weeks is first choice.
Fluoxetine (anti- depressant), 20-40 mg/day is another alternative.

Psychosocial aspect
It includes counselling of the patient.

POSTMORTEM FINDINGS
Post-mortem findings are not characteristic.[11]

MEDICOLEGAL ASPECTS

Homicidal – Very rare
Suicidal – Rare
Accidental – Common, if at all occurs. Death usually does not occur due to high fatal dose.
Stupefaction – To facilitate robbery
Aphrodisiac – It is so claimed and is supposed to increase the duration of coitus but the action is not certain.
Commonly used to steady nerves to commit crimes, to recall forgotten things, to forget feeling of hunger and to concentrate meditation by "Sadhus" and other and causes mental and moral degradation in chronic users.[19]
Cannabis and driving – Cannabis impairs driving ability and confers a higher risk for motor vehicle accidents, as it affects psychomotor skills and cognitive functions associated with driving.[20]
Run Amok – This is a peculiar homicidal mania, develops in the chronic cannabis addicts, where the addict under its influence gets excited, delirious and develops homicidal tendency – kill person/persons of animosity initially and then others at random with or without any rivalry and at times may commit suicide or submits himself to the law keeping authority.
As to criminal responsibility, it is not considered to be the state of intoxication but to be a disorder of mind, so the person under this situation is not held responsible for his criminal conducts, unless he had taken it purposefully to innerve himself before commission of the offence. But he will not be held liable for his criminal act, if he had taken it unknowingly or at the instigation of others, being ignorant of its effects.[21]

CONCLUSION

Cannabis is one of the most frequently abused drugs in India. Its toxicity and dependence is threatening the quality of human life (especially youth), physically, psychologically as well as socially. Timely diagnosis and effective pharmacological and psychosocial management may save lives. Awareness of its medicolegal aspects is must from social point of view.

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