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## Review Article

# Understanding Heroin Addiction – Mechanism, Consequences and Management

Rashtrapal N. Ukey<sup>1\*</sup>, Sandeep V. Binorkar<sup>2</sup><sup>1,\*</sup> Assistant Professor, Dept. of Agadatantra, Govt. Ayurved College, Nanded - 431601(MS) India<sup>2</sup> Assistant Professor and Head, Dept. of Agadatantra, Govt. Ayurved College, Nanded - 431601(MS) India

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### Abstract

The epidemic of substance abuse in young generation has indicated alarming dimensions in India. Changing cultural values, increasing economic stress and dwindling supportive bonds are leading to initiation into substance use. Opium and its pharmaceutical drugs are the most frequently abused substances in India. This paper highlights on the short term and long term effects, mechanism of addiction with complications and its management in such cases. Behavioral therapy including residential and outpatient approaches is also underlined here.

### 1.0 Introduction

June 26 is celebrated as "International Day against Drug Abuse and Illicit Trafficking." It is an implementation undertaken by the world community to sensitize the people specially the youth, to the risk of drugs.<sup>1</sup> In 2011 there were 5.1 million drug-related casualty visits and about one half or 2.5 million visits were attributed to drug abuse and 2.3 million visits recognized to adverse drug reactions.<sup>2</sup> Global prevalence of opioid use in 2010 is estimated at 0.6-0.8 per cent (between 26.4 million and 36 million) of the population aged 15-64, of which nearly half, or between 13 million and 21 million, use heroin.<sup>3</sup>

An estimated 7.5 crore Indians are drug addicts and the number is going up significantly. It is estimated that there are about 6.25 crore alcoholics, 90 lakh Cannabis and 2.5 lakhs opiates and nearly 10 lakh illicit drug users in the country.<sup>4</sup> According to UN report, in India one million heroin addicts are officially registered and about 5 million are unofficially.<sup>5</sup> Millions of drug addicts are existing distrustful lives, between life and death. India is not isolated from this scenario because numbers of drug addicts are increasing day by day.<sup>6</sup>

That started off as casual use among a very small population of high-income group youth in the metro has permeated to all sections of society.<sup>7</sup> This has increased the intensity of the effect, accelerates the process of addiction and complicated the process of recovery.<sup>8</sup> Addiction has led to a negative impact on the society. Apart from affecting the financial stability, addiction increases clashes between every member of the family. With most drug users being in the productive age group of 18-35 years, the loss in terms of human potential is enormous. The damage to the physical, psychological, moral and intellectual growth of the youth is very high. Inhalation of heroin alone has given way to intravenous drug use, that too in combination with other sedatives and painkillers.

\*Corresponding Author  
Rashtrapal N. Ukey,  
Assistant Professor, Dept. of Agadatantra,  
Govt. Ayurved College, Nanded - 431601(MS) India  
Email: [dr.rashtrapal@gmail.com](mailto:dr.rashtrapal@gmail.com)

This paper talks about the immediate effects of heroin, which is characterize by rush of pleasurable feelings. After the initial effects, abusers usually will be drowsy for several hours, and mental function is impaired by heroin's effect on the central nervous system.<sup>9</sup> One of the most dangerous long-term effects of heroin is addiction itself, which is a chronic, relapsing disease characterized by obsessive drug seeking and use, as well as neurochemical and molecular changes in the brain.<sup>9</sup> Also discussed are the medical complications of chronic heroin use, how heroin abuse affects pregnant women, and why heroin users are at special risk for contracting HIV/AIDS and hepatitis B and C.<sup>10</sup> The described treatments for heroin dependence are detoxification, methadone programs, LAAM, buprenorphine and behavioral therapies.

The picture is depressing, if the world statistics on the substance abuse scenario is considered. It is the third largest business in the world with a turnover of around \$500 billion, next to petroleum.<sup>11</sup> Drug abuse is a complex phenomenon having variations in social, cultural, biological, geographical, historical and economic phase. In modern families where both parents are working, leading to declined old religious and moral values may rise the number of drug addicts.<sup>12</sup> Drug use, misuse or abuse is also primarily due to the nature of the drug abused, the personality of the individual and the addict's immediate environment. The amplified industrialization, urbanization and migration have led an individual vulnerable to the stresses and strains of modern life.<sup>13</sup> These fast changing social, economical and environmental factors are mainly contributing to the abundance of drug abuse in both forms, traditional and new synthetic substances. The exposure of synthetic drugs through intravenous use leading to HIV/AIDS has added a new catastrophe to the problem.<sup>14,15</sup>

#### 1.1 What is addiction?

Any behavior can be termed as an addiction, if it becomes the primary focus of a person's life, and especially if it results in hazardous effects to one's physical health and well-being. It can be physical, psychological, or both. The term addiction is most commonly associated with a person's compulsive and habitual desire to consume a chemical substance, such as alcohol or other

drugs.<sup>16</sup> Drug addiction is common with the use of habit forming drugs such as Nicotine, Cocaine, Opium (Opiates and Opioids), Marijuana (Cannabis), Steroids and some pain killers. Addiction due to opioids i.e. morphine, codeine and heroine is common in world population.

### 1.2 What is heroin?

Heroin (morphine diacetate or diacetyl morphine) is an opioid analgesic synthesized by C. R. Alder Wright in 1874 by adding two acetyl groups to the morphine molecule, present in opium poppy. In medical field, heroin is known as diamorphine. The name "heroin" is only used when being discussed in illegal form. It is the 3, 6-diacetyl ester of morphine, and functions as a morphine pro drug, which means it is metabolically converted to morphine inside the body as a part of pharmacokinetics. Heroin was originally designed to cure for opium and morphine addiction. It was formally used in medicine to treat severe pain, such as pain in myocardial infarction and in severe injuries.<sup>17,18</sup> Heroin from Asia is typically a powder which can vary in colour from a white to dark brown due to variations in the production processes.<sup>19</sup> Another variety, known as black tar heroin, is often sold in masses weighing about an ounce and has the colour and consistency of roofing tar or coal.<sup>20</sup> Following are other market terms commonly used by drug abusers for Heroin -

Boy, Skunk, He, White, China White, Black Pearl, Black Stuff, Dragon, Dope, Heron, Herone, Big H, Hero, Hera, Mexican Brown, Mexican Mud, Number 3, Number 4, Number 8, Snow Ball, Snow, White Nurse, White Lady, White Horse, White Girl, White Boy, White Stuff, Mud, Scat, Sack,<sup>21</sup> H, Black, Black Tar, Big H, Tar, Horse, Smack, Skag, Junk<sup>22</sup>

### 1.3 Route of administration of heroin

Heroin can be administered in variety of ways:-

- Intravenous (I.V.) - also called as "mainlining"
- Intra muscular (I.M.)-
- Inhalation - Smoked in a water pipe or standard pipe or Mixed in a Marijuana joint or regular cigarette,
- Inhaled - as smoke through a straw- known as "chasing the dragon"
- Snorted - as powder via the nose.<sup>23</sup>
- Subcutaneous (S.C.) - injected under the skin also called as "skin popping"<sup>24</sup>

## 2.0 Mode of Action of Heroin

Heroin unites with opiate receptors ( $\mu$ ,  $\kappa$ , and  $\delta$ ) located in the brain, spinal cord and all over the body. The  $\mu$  receptor is liable for analgesia, euphoria, nervous system depression, respiratory depression, and constipation.  $\kappa$  - Responsible for Spinal analgesia, myosis, psychotomimetic, dysphoria and supra spinal analgesis.  $\delta$  - Responsible for Spinal and supra spinal analgesia. One more receptor, Sigma - responsible for psychotomimetic effects and movement disorders mainly in cases of dextromethorphan and pentazocine.<sup>25</sup>

## 3.0 Effects of Heroin

The effects of heroin can be short-term or long-term. The high or euphoria experienced in the short-term effects can overtake the senses with confusion, unresponsiveness and failure to focus. In the long-term, the health effects can exhaust major organ systems and cause infections that are life threatening. Heroin use is very dangerous as the chances of its overdose are very high and once physical addiction has set in, withdrawal symptoms are a constant threat.

### 3.1 Short-term effects of heroin

The short-term effects of heroin are experiences of the high or euphoric rush associated with it and this is the major reason why people prefer opiates.<sup>26</sup> Less than 10 seconds after intravenous injection, opiate users will feel a rush, while an intramuscular injection provides a high in less than 10 minutes. For those who snort or smoke the drug, the euphoria takes up to 15 minutes. Other short-term effects of heroin include dry mouth, warm feeling,

heavy arms and legs, nausea, vomiting, severe itching, Drowsiness and confusion for up to six hours. Slowed heart rate, slowed breathing rate are other signs. When heroin is cupped with poisons or large dose is taken, a short-term effect of the drug can be overdose or death.<sup>27</sup>

### 3.2 The long-term effects of heroin

Long term effect depends upon route of administration. Collapsed veins and pericarditis may occur when someone uses intravenous medium. There are chances of Abscess formation at the site of injection. The vital organs i.e. liver, lungs, kidneys and brain function are widely affected due to its long term use.<sup>28</sup>

Those who are addicted to heroin are more likely to develop co-morbidities because their defenses mechanism is weakened and they are more prone to infections and diseases.

## 4.0 Complication of Heroin Addiction

The complication of long term heroin use by intravenous injection include collapsed veins, bacterial infections of the blood vessels, abscesses (boils), soft tissue infections and disease of liver and kidney. General symptoms include restlessness, muscle and bone ach, muscular spasms, insomnia, diarrhea and vomiting, Chills and goose bumps intense anxiety and other withdrawal symptoms. Lung complications include various types of pneumonia and tuberculosis. It may be the consequence of ill health of the abuser, as well as from heroin's depressing effects on respiration. Street heroin addict may produce immune reactions to contaminants which can cause arthritis or other rheumatologic problems. Sharing injection equipment or fluids can result in the most severe consequences of heroin abuse-infections with hepatitis B and C, HIV, and variety of other blood borne diseases.<sup>29</sup>

If abuser continues using heroin during Pregnancy then symptoms like miscarriage, premature delivery and even stillbirth may occur.<sup>30</sup> There may be greater risk of SIDS (sudden infant death syndrome) in addicted mother.<sup>31</sup> The most significant effect of heroin use is addiction. It develops quickly when intravenous method of administration is used.<sup>32</sup>

## 5.0 Mechanism of Heroin Addiction

Dependence and tolerance are main causes for drug addiction. According to WHO drug dependence is the condition where, there is a compulsion to take the drug on a continuous or periodic basis.<sup>33</sup> As compare to Morphine, Heroine can cross the blood-brain barrier very easily. Heroin is likely to cause bradycardia (by inhibiting the baroreceptor reflex), hypotension (due to decreased peripheral vascular resistance), and respiratory depression (by slowing the brain's response to high CO<sub>2</sub> and low oxygen levels.)<sup>34</sup> Heroin modifies action of dopamine in the brain which causes alteration in the function of brain.<sup>35</sup> Under influence it inhibits release of various neurotransmitters and after withdrawal the neurotransmitters are rapidly produced again. This sudden chemical imbalance in the brain leads to withdrawal.<sup>36</sup> Tolerance is the user's progressive obligation having more quantity of the drug in order to feel the similar effect.<sup>33</sup> This may enhance his or her dose to get pass previous set point, the brain has established and get to the high.

### 5.1 Overdose of heroin

Every year about 1% of all skilled heroin addicts die from an overdose in the United States.<sup>36</sup> Overdoses are more frequent when alcohol and other drugs are blended. The signs and symptoms of heroin overdose includes abnormal mental status, pinpoint pupils, shallow breathing, dry mouth, tongue discoloration and low blood pressure.<sup>37</sup> In a normal person the fatal dose of heroin may range from 200 to 500 mg, but in addicts it may be 1800 mg without any ill effect.<sup>38</sup> There are various reasons for overdose in a skilled addict in spite of his high tolerance.<sup>36</sup>

- (1) He may accidentally procure much more pure form of Heroin than he use to.
- (2) Sometimes the heroin addict may suffer from sudden unexpected toxic effects with similar tolerated dose.
- (3) Blending of heroin with alcohol, sedatives, or other drugs.

In 1998 Study conducted in Australia suggests that 50% of regular heroin users would overdose during their life-time, in spite they are "rarely" or "never" worried about possibly overdosing.<sup>39</sup>

## 5.2 Heroin withdrawal

The withdrawal symptoms (the so-called "cold turkey") may begin within 6 to 24 hours of discontinuation of heroin. However, the time period may vary with the amount of the last consumed dose as well as the degree of tolerance.<sup>40</sup> Heroin's withdrawal symptoms are not pleasant and most of these symptoms start within 2 and 3 days after discontinuation and they can continue for a week. The symptoms can be similar to the flu, and include symptoms like Goose bumps on the skin, extreme yawning, loss of appetite, panicked thoughts or behavior, chills, nausea and vomiting, Stomach and muscle cramping, runny nose<sup>41</sup> sweating, malaise, anxiety, depression, extra sensitivity to genitals in females, general feeling of heaviness, diarrhea, watery eyes, insomnia, severe muscle and bone aches and intense craving for the drug.<sup>42</sup>

## 5.3 Treatment of heroin addiction

Effective treatments are now available for addiction but treatment tends to be more effective when heroin abuse is recognized early. The treatments vary depending on the person addicted but methadone, a synthetic opiate that blocks the effects of heroin and eliminates withdrawal symptoms, has a proven record of success for people addicted to heroin. Other pharmaceutical approaches, such as naloxone, LAAM, buprenorphine, and many behavioral therapies also are used for treating heroin addiction.<sup>43</sup>

The use of a totally synthetic opioid, methadone is very effective in case heroin addiction as it stays longer within the body than either morphine or heroin. Methadone closely resembles the basic opiate structure, so it is given orally and thus replaces the things that come with heroin use. Methadone helps to relieve the craving for additional drugs and delays the manifestation of withdrawal symptoms as long as it is in the body.<sup>44</sup>

If the dose of opiate /opioids that was abused is known, then 1 mg of methadone can substitute for 2mg of heroin, 4mg of morphine and 20 mg of pethadine. The total dose can be gradually reduced by 20% per day.<sup>45</sup>

Unconsciousness resulting from heroin overdose can be quickly reversed with other opiate antagonist, naloxone (Narcan). Naloxone blocks morphine or other opioids in a minute or two by occupying the opiate receptors in the brain when given by intravenous injection. A dose of 0.4-0.8 mg (to a maximum of 10 mg) is given every three to five minutes to restore an overdose person.<sup>46</sup>

LAAM (*levo alpha acetyl methadol*) is another opiate blocker that has been used in treatment of addiction with heroin. It persists up to 72 hours in body.<sup>47</sup>

Buprenorphine is a new addition to the range of prescriptions now available for treating addiction to heroin and other opiates. This medication is different from methadone because it offers less risk of addiction. Suboxone (Buprenorphine + naloxone) is a combination drug product formulated to minimize abuse.<sup>48</sup> Other drugs anticipated for reduction in the severity of the withdrawal symptoms can also be prescribed.

Clonidine is of some advantage but its use is limited due to side effects of sedation and hypotension. Lofexidine, a centrally acting alpha-2 adrenergic agonist, was launched in 1992 specifically for symptomatic relief in patients undergoing opiate withdrawal.

Naltrexone is an opioid receptor antagonist applies primarily in the management of alcohol and opioid addiction. Naltrexone blocks the pleasurable effects of heroin and is useful in treating some highly motivated individuals.<sup>49,50</sup>

## 5.4 Behavioral Therapies

There are many efficient behavioral treatments available for heroin addiction. These include residential and outpatient approaches. Now several new behavioral therapies, such as contingency management therapy and cognitive-behavioral interventions have shown particular assurance as treatments for heroin addiction. Contingency management therapy is a voucher-based system, where patients receive "points" based on negative drug tests, which they can exchange for items that persuade healthy living. Cognitive-behavioral interventions are intended to help transform

the patient's thinking, expectancies, behaviors and to increase skills in dealing with various life stressors.

Both behavioral and pharmacological treatments facilitate to re-establish a degree of standard brain function and behavior, with better employment rates and lower risk of HIV and other diseases and criminal behavior.<sup>51</sup>

## 6.0 The Indian Scenario

The International Narcotics Control Board report 2002 stated that in India, persons addicted to opiates are shifting their drug of choice from opium to heroin. The pharmaceutical products having narcotic drugs are also more and more being abused. The intravenous injections of analgesics like dextropropoxyphene etc are also reported from many states, as it is easily available at 1/10<sup>th</sup> the cost of heroin.<sup>52,53</sup> Since 1954, following the World Health Organization inquiry, nearly 54 countries has decided to discontinue heroin use as a medicine as it is among the most addicted drugs.<sup>54</sup> Still the illicit trafficking is a large practice in third world.

India's opiate use is higher than any other nation, both in terms of number of users and quantity of opiates consumed.<sup>55</sup> The use of narcotics for non-medical purposes was formally banned in 1947 and as both a major opium-cultivating nation and a signatory to various international conventions; India has made major strides in reducing drug use, including opium. But in a diverse and democratic country like India, securitizing any issue is very difficult.<sup>45, 46, 56</sup> It is estimated that, in India, by the time most boys reach the ninth grade, about 50 percent of them have tried at least one of the gateway drugs. However, there is a wide regional variation across states in term of the incidence of the substance abuse, involving larger proportion of teens in West Bengal and Andhra Pradesh.<sup>53</sup>

Increase in incidences of HIV, hepatitis B, C and tuberculosis due to addiction append the reservoir of infection in the community burdening the health care system further. Women in India face greater problems from drug abuse with consequences including domestic violence and infection like HIV, as well as the financial burden. 87% of addicts being treated in a de-addiction center run by the Delhi police acknowledged violence with family members.

Most of the domestic violence is directed against women and occurs in the context of demands for money to buy drugs.<sup>57</sup> At the national level, drug abuse is basically linked with racketeering, conspiracy, corruption, illegal money transfers, terrorism and violence threatening the very stability of governments.<sup>58,59</sup>

In India several measures involving innovative changes in legal and judicial systems have been brought into effect to face the risk of drug trafficking. The introduction of death penalty for drug-related offences has been a major restraint. The Narcotic Drugs and Psychotropic Substances Act, 1985, were enacted with rigorous provisions to control this hazard. The Act envisages a minimum term of 10 years imprisonment extendable to 20 years and fine of Rs. 1 lakhs extendable up to Rs. 2 lakhs for the offenders. The Act has been further amended by making provisions for the forfeiture of properties derived from illicit drugs trafficking.

India has bilateral agreements on drug trafficking with 13 countries.

India also is signatory to the following treaties and conventions:

- 1961 U.N. Convention on Narcotic Drugs
- 1971 U.N. Convention on Psychotropic Substances
- 1988 U.N. Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances
- 2000 Transnational Crime Convention

Comprehensive strategy involving specific programmes to bring about an overall reduction in use of drugs has been evolved by the various government agencies and NGOs and is further supplemented by measures like education, counseling, treatment and rehabilitation programmes. The Indian administration has place into performance a multipronged strategy taking motivational counseling, social-reintegration and building consciousness about the ill results of drug abuse. The Scheme for Prevention of Drunkenness and Means (Drugs) Abuse is being implemented through 350 Non Government Organisations having 387 De-addiction Centers and 52 Counseling Centers full over the nation and having facilities like intervention, renewal helps and carrying knowingsness programs for victims of drug dependence.<sup>59</sup>

## 7.0 Conclusion

Heroin addiction may be a consequence of simple experimentation gone wrong or it may be a way to deal with life stressors or childhood trauma. Once heroin addiction is continued, addict stops growing emotionally and socially. For total deprivation from heroin addiction, it is necessary for addicts to seek proper medical care. Where doctors will treat him for drug addiction and help him to learn social and emotional coping mechanisms that do not involve drugs. The most popular medications used for heroin maintenance treatment are methadone and buprenorphine. Depending upon situation, one or the other may be more appropriate to treat heroin addiction. There is a need for the government enforcement agencies, the non-governmental organizations, and others to collaborate and supplement each other's efforts for a solution to the problem of drug addiction through education and legal actions. India needs motivated people to work for this otherwise epidemic will continue to increase and take lives of many people's including future generations.

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