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RESEARCH ARTICLE

HEROIN PURITY AND COMPOSITION: AN ANALYSIS OF STREET LEVEL SAMPLES IN BIHAR

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ABSTRACT

Background: This study was a qualitative analysis of street heroin in Bihar. The aim of the study is to examine the purity and composition of street grades samples of heroin sized from arrests of street level users and dealers in Bihar. Analysis of composition of illict drug can support in comparative analysis in linking two or more sample together. It can also provide information about their distribution route. ***Materials and Methods:*** Eleven suspected samples of heroin were selected seized from street- level users/ dealers in Bihar and referred to Forensic Science Laboratory, Bihar, Patna. Physical characteristics of the samples were analyzed for their colour and appearance. Marquis Test and Frohde Test were performed for presence of diacetyl morphine. Gas-Chromatography/Mass Spectrometry screening was conducted to identify the adulterants and conformation of heroin. The chemical formulation (Chloride or Base) was confirmed using precipitation tests with Silver Nitrate and Barium Chloride solutions. Molish's Test and Benedict's Test were done for identification of sugar diluents. ***Result:*** Eight out of eleven samples looked like fine powder, the rest were more granular. Preliminary colour tests were performed for diacetyl morphine. Positive result indicates all of the eleven samples contained diacetyl morphine. Purity was assessed by means of Gas-Chromatography/Mass Spectrometry. Different manufacturing impurities and adulterants were also found. Anion test for chemical formulation was performed indicates Basic and Hydrochloride nature of heroin. Carbohydrate test also shown positive. ***Conclusion:*** These profiles latter can be used in comparison of illegal heroin specimens in different areas and also allow us to determine the geographical place where heroin was made.

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INTRODUCTION

The epidemic of substance abuse in young generation has assumed alarming dimensions in India. Changing cultural values, increasing economic stress and dwindling supportive bonds are leading to initiation into substance use. According to a UN report, One million heroin addicts are registered in India, and unofficially there are as many as five million (1). Illicitly prepared heroin are sold/ used in addiction in Bihar also (2). At each stage from importation, through wholesalers, to low level dealers heroin was cut (adulterated) to dilute the amount available and realize bigger profits (3). There has been speculation that heroin may contain various toxic additives (4,5) .Unknown poisons have also been implicated in a fatal neurologic condition following heroin smoking(6).Analysis of composition of illict drug can support in comparative analysis in linking two or more sample together (7). It can also provide information about their distribution route (8). The aim of the study is to examine the purity and composition of street grades samples of heroin sized in Bihar i.e from arrests of street level users and dealers in Bihar.

MATERIALS AND METHODS

Eleven suspected samples of heroin were selected seized from street- level users/ dealers in Bihar and referred to Forensic Science Laboratory, Bihar, Patna .All samples were examined in Forensic Science Laboratory, Bihar, Patna for their purity and composition. Physical characteristics of the samples were analyzed for their colour and appearance (Table-1).

Presumptive colour test were performed for presence of diacetyl morphine (Marquis Test and Frohde Test) (9).Gas-Chromatography/Mass Spectrometry screening was conducted on all samples in order to identify the adulterants and conformation of heroin(9). The chemical formulation (Chloride or Base) was confirmed using precipitation tests with Silver Nitrate and Barium Chloride solutions.(9). Carbohydrates tests (Molish's Test and Benedict's Test)were done for identification of sugar diluents(10,11).

RESULTS

In this present study eleven (11) heroin samples were analyzed as in Table 1. Describes physical characteristic of the samples. Eight out of eleven samples looked like fine powder, the rest were more granular. Most commonly found colours were Beige (seven samples), Dark Beige (one sample),Light Beige (two samples) and white(one sample).Preliminary colour tests were performed for diacetyl morphine. Positive result indicates all of the eleven samples contained heroin. as in Table 2.Purity was assessed by means of Gas-Chromatography/Mass Spectrometry as in Table -3.

Table 1. Physical Characteristics of Heroin Samples

SlNo.	Colour	Weight(g)	Appearance
1.	Dark Beige	0.4	Granular
2.	Beige	0.4	Fine
3.	Beige	0.5	Fine
4.	Beige	0.4	Fine
5.	Light Beige	0.5	Granular
6.	Light Beige	0.5	Fine
7.	Beige	0.5	Granular
8.	Beige	0.4	Fine
9.	Beige	0.4	Fine
10.	Beige	0.4	Fine
11.	White	0.7	Fine

Table 2. Presumptive Colour test for diacetyl morphine

Sl No.	Marquis Test	Frohde Test
1.	+	+
2.	+	+
3.	+	+
4.	+	+
5.	+	+
6.	+	+
7.	+	+
8.	+	+
9.	+	+
10.	+	+
11.	+	+

Table 3. Qualitative Examination by GC-MS Technique for purity and adultrants

		Alkaloids			Manufacturing impuritis			Adultrants								
Sl No	Diacetylmorphine	Codein	Noscapine	Papaverin	Morphine	Morphinan	Morphine	Caffeine	Paracetamol (Acetaminophen)	Metacetamol	Alprazolam	Griseofulvin	Carbamazepin	Chlorpromazine	Naphthalene	Tetrasiloxane
1.	+	-	-	-	+	+	-	+	-	+	+	-	-	-	-	-
2.	+	+	-	-	-	-	+	+	+	-	+	-	-	-	-	-
3.	+	+	-	-	+	+	+	+	+	+	-	-	-	-	-	-
4.	+	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-
5.	+	+	-	-	+	-	+	+	+	-	+	-	-	-	-	-
6.	+	-	-	-	-	-	-	+	+	-	-	+	-	-	-	-
7.	+	-	-	-	+	+	+	+	+	-	-	-	-	-	-	-
8.	+	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-
9.	+	-	-	-	-	-	+	+	-	-	+	-	-	-	-	-
10.	+	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-
11.	+	-	-	-	-	-	+	+	+	+	+	-	+	+	+	+

All the samples contain diacetyl morphine. Out of eleven samples three samples contain only one alkaloid i.e codein while other alkaloids like noscapine and papaverine were absent in all samples.

Table 4. Test for Anion (Heroin Basic/ Hydrochloride form) & Sugar Diluents

Anion Test		Carbohydrate Test (sugar diluents)	
Sl. No.	Basic/Hydrochloride	Molish'sTest	Benedict's Test
1.	Basic	+	+
2.	Basic	+	+
3.	Basic	+	+
4.	Basic	+	+
5.	Basic	+	+
6.	Basic	+	+
7.	Basic	+	+
8.	Basic	+	+
9.	Basic	+	+
10.	Basic	+	+
11.	Hydrochloride	+	-

Manufacturing impurities like morphine, morphinan and monoacetyl morphine all three together were present in two samples while rest of the samples contain either one or two of them while two of the samples contain non of them. Adulterants like caffeine was found in seven samples. Alprazolam, Metacetamol and paracetamol (acetaminophen) were also present as an adulterants in most of the samples. Two samples contain Griseofalvin while carbamazpine, naphthalene, terasiloxane and chloromazine were found in only one sample.Anion test for chemical formulation indicates that ten samples of Heroin were in Basic form and only one was Heroin Hydrochloride. Table -5. Carbohydrate test showed that all eleven samples of the heroin were diluted with sugars. Ten samples contain reducing sugar while non reducing sugar were detected in only one sample. Table -5. It was also analyzed thatsix samples contain all three diluents Caffeine, paracetamol and sugars.

DISCUSSION

Heroin is still one of the most frequently abused drugs of today. All over the world, law enforcement agencies try to eradicate the illicit production and trafficking of this potent and highly addictive narcotic (12). The purpose of the present investigation was to focuses on heroin impurity profiling and composition of street level heroin in Bihar. Large variations in the quality of these illicit drugs, measured in terms of the concentration of active substance, were observed.The experiments performed during the current study confirm the presence of heroin(diacetyl morphine),alkaloids like codein , manufacturing impurities such as morphine, morphinan, monoacetyl morphine, adultrants like caffeine, acetaminophen, metacetamol, alprazolam, Griseofalvin, carbamazepine, chlorpromazine, naphthalene, tetrasiloxane and sugar diluents as reducing and non reducing sugar. It was also revealed from present analysis that most of the heroin samples were in basic form while only one sample was present as Heroin Hydrochloride. The impurities in the heroin preparation place are partially due to the alkaloid leftovers, such as morphine and partly due to heroin byproducts such as monoacetyl morphine and acetylcodeine (13-16).Acetylcodeine (6-monoacetyle codeine) is an impurity which is formed in the street heroin due to poor baking and is a marker of street heroin (17).The addition of caffeine have been shown to increase volatility and therefore increase bioavailability from the base and salt forms of heroin (e.g., Cooke, 1991; Coomber, 1999a; Eskes and Brown, 1975; Gruhzit, 1958; Huizer, 1987; Huizer et al, 1977; Mo and Way, 1966)(18-24).

Heroin base is quite insoluble in water, but vaporises readily without decomposition, at lower temperatures than heroin HCl (25). Caffeine was probably added to the heroin because of its stimulatory effect. Furthermore, caffeine has synergistic effects with heroin, as it improves the uptake of diacetylmorphine during heroin base smoking (26). Paracetamol (Acetaminophen) has an analgesic effect and is sold as an over-the-counter drug, which is easy to obtain (27). Analgesic effects and bitter taste of paracetamol may disguise poor quality heroin. May be used because it has similar melting point to heroin (28). Additives that increase the bulk, such as sugars (*e.g*. glucose, lactose, sucrose and mannitol) and substances such as caffeine and acetaminophen that embitter heroin and conceal the sweetness of the buffing materials (29). In the present study few samples contain all the three additives caffeine, paracetamol and sugar which were also the most common additives in the UK and Europe during the 1990s. (Coomber, 1997a; de la Fuente et al, 1996; Trimbos Institute, 1998) (30-32). Griseofulvin was often seen in samples of heroin base This is an antifungal drug used in animals and humans to treat ringworm infections of the skin and nails. Why it is added to heroin is not fully understood, but the drug has a bitter taste, which resembles that of heroin (33). The existing data suggest, the heroin sold in Bihar is predominantly heroin base which is pharmacologically suitable for chasing than heroin hydrochloride (salt).Heroin which is injected or snorted is, in fact, heroin hydrochloride (HCl) (or some other salt) (34).

As heroin hydrochloride (HCl) is highly water soluble and has a higher melting point than heroin base, it decomposes to a certain extent upon heating. This reduces the bioavailability of heroin, and renders it less useful for inhalation than heroin base. Heroin base is quite insoluble in water, but vaporises readily without decomposition, at lower temperatures than heroin HCl (Strang et al, 1997a). Smoking heroin is usually the free base, which is appreciably more volatile than the salts (i.e., vaporises more easily)(35). As the finding indicates the presence of heroin is also in hydrochloride form It showed that the trend of injectable heroin is also ouccur among heroin addicts in Bihar. The purity of heroin hydrochloride salt is higher because it readily dissolved and injected, and only rarely contains the alkaloid impurities while heroin base is less pure, with a higher probability of containing codeine(36).One of the sample contain carbamazepine while another one having naphthalene, terasiloxane and chloromazine. This finding shows that variety of adulterants and diluents have changed over time.

CONCLUSION

By combining these data complex characterisations, i.e. impurity profiles, chemical signatures or fingerprints, can be obtained and used for comparative analysis. The latter can be used in comparative analysis of seized heroin samples for tactical (batch-to-batch comparison) and strategic (origin determination) intelligence purposes.

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