



Factors Influencing Vulnerability Towards Heroin Addiction in a Pakistani Cohort

Shagufta Jabeen¹, Muhammad Saqlain Raja¹, Sadia Saeed¹, Muhammad Mobeen Zafar¹, Rizwana Abdul Ghani¹, Abid Mahmood¹, Muhammad Fiaz², Pakeeza Arzoo Shiaq¹, Shahid Mahmood Baig³, S.M. Saqlan Naqvi¹ and Ghazala Kaukab Raja^{1*}

¹Department of Biochemistry, PMAS Arid Agriculture University, Rawalpindi, Pakistan

²Department of Medicine, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, Pakistan

³National Institute for Biotechnology and Genetic Engineering, Faisalabad, Pakistan

ABSTRACT

Addiction to opioids including other illicit drugs is a chronic, relapsing multifactorial disorder of brain and, if left untreated, major medical, social, and economic problems arise. Drug addiction is among major health issues faced by the World including Pakistan with an alarming annual increase in heroin addicts. The study was designed to identify the socio-demographic risk factors contributing to increasing susceptibility to heroin addiction in Pakistani populations. In this epidemiological study subjects were interviewed through a comprehensive questionnaire consisting of open and closed-ended questions. Data regarding key factors such as age and ethnicity, communal domain, education level, employment status and demographic factors (drug route, drug dose) have bearing upon heroin addiction was collected. Descriptive and inferential statistics were used for data analysis. Early age of addiction onset, low literacy rate, peer pressure, occupation type, and stress are among risk factors increasing susceptibility towards heroin addiction in our studied cohort. Drug abuse initiated at an early age seems to trigger transition to heroin addiction under the influence of environmental risk factors.

Article Information

Received 10 August 2016

Revised 31 August 2016

Accepted 17 September 2016

Available online 02 November 2016

Authors' Contributions

GKR, SMSN and SMB were involved in study design, data analyses and interpretation. SJ collected data and drafted the manuscript. MS analyzed the data. SS helped in manuscript writing. All other authors participated in data analysis and interpretation.

Key words

Drug, Stress, Peer pressure, Multifactorial

INTRODUCTION

Drugs categorized as stimulants, sedatives, hallucinogens and opioids are being abused throughout the world including Pakistan. According to Koob and LeMoal (1997) dysregulation of the brain reward mechanism is induced by repeated drug abuse with subsequent allostasis, the ability to achieve stability through change. Opioids, the highly addictive narcotics are clinically important analgesics and used for pain management whereas their abuse often results in development of tolerance, dependence, and overdose (Fischer *et al.*, 2006a, 2006b). Mu-opioids receptors in central nervous system are the target sites to award the effects of opioids that particularly refers to natural, semi-synthetic, and synthetic chemicals (Fornasari, 2012). Opioids addiction, a complex relapsing brain disorder is characterized by compulsory drug seeking, drug abuse, tolerance and physical dependence in spite of harmful consequences (Krantz and Mehler, 2004). Different internal and external environmental factors including an addict's mindset, social influences like home environment, peer pressure and response to stress and stressors may also contribute to opiate addiction vulnerability (Kreek *et al.*, 2012). Multiple external/environmental factors with varying degree of contribution at individual level results in increased risk of opioid dependence development (Weinberg, 2001). Regarding risk factors an early antisocial behavior, anxiety, depression, socioeconomic status, academic failure, hyperactivity physical/sexual abuse and history of substance dependence in family

are considered as the major contributing risks (Kilpatrick *et al.*, 2000; Ronel and Levy-Cahana, 2011; Zapata *et al.*, 1998). Moreover 1st drug attempt at an early age, poor academic performance and psychiatric history are likely to increase the frequency of substance use (Tsuang *et al.*, 1999). In the context of Pakistan opioids are commonly abused but heroin is one of the major drugs of addiction in young boys and men, poses massive personal and public health costs. Inter-individual variability regarding vulnerability to addiction has been reported. Being a complex disease it can be influenced by a multitude of highly entangled factors; behavioral, environmental, developmental including gender and ethnicity, and genetics. However the vulnerability towards addiction increases with an increase in the number of predisposing risk factors clustering in an individual while protective factors reduce the risk of addiction development (NIDA, 2014). Though the magnitude and severity of problem varies, Pakistanis are extensively exposed to illegal opium, heroin trafficking and abuse (Malik and Sarfaraz, 2011). Based on the data presented in United Nations Office on Drugs and Crime, there are 6.7 million (aged 15-64 years) total drug abusers while 0.8 million regular heroin users in Pakistan with an annual consumption of 44 tons of heroin (UNODC, 2013). A report by Anti-Narcotics Force of Pakistan (2006-2007) has focused on different factors responsible for increasing prevalence of drug abuse in Pakistan. Some of the key factors include ease of access of drug at very low prices, illiteracy/low education level, peer pressure, social and family stress, *etc.* (Aslam, 2015; Aslam *et al.*, 2011). Like many common disorders with multifactorial etiology, external factors play an important role in development of heroin addiction. Therefore, present study was designed to investigate the factors associated with heroin addiction vulnerability in Pakistani populations.

* Corresponding author: ghazala@uaar.edu.pk

0030-9923/2016/0004-1161 \$ 8.00/0

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MATERIALS AND METHODS

We conducted the study to explore the external environmental/socioeconomic aspects of heroin addicts in Pakistan. The study is approved by the Ethics Committee of Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan for the Use of Human Subjects. Data was collected using a comprehensive questionnaire and a written informed consent was obtained from all study subjects. To investigate the environmental factors we included a random sample of 540 male heroin addicts admitted in different drug rehabilitation centers/hospitals. Among socio-demographic/external characteristics of studied population; age (onset of drug addiction), literacy level, daily drug dose, ethnicity, communal domain and stress in case group were computed. The subjects were divided into three age groups; <20 years, 21-40 years and >40 years. The daily drug dose was grouped into <250 mg, 250-1000 mg and >1000 mg/day and ethnicity was recorded under three major ethnic groups; Punjabis, Pakhtoons and "Others" (include miscellaneous ethnic groups). The external/environmental risk factors were also categorized as communal domain, stress and "others". Though all cases included in study were heroin addicts, the frequencies of different drugs being used in different age groups before transition to heroin addiction was also investigated.

Table I.- Descriptive statistics of study population.

		Frequency (%)		
		<20	21-40	>40
Onset age for	Heroin use	39.61	57.49	2.90
	Tobacco smoking	84.91	14.79	0.30
	Marijuana use	80.50	19.20	0.31
	Alcohol drinking	75.81	24.19	0.00
Daily drug dose	<250 mg	12.4		
	250-1000 mg	23		
	>1000mg	64.5		
Ethnicity	Punjabi	64		
	Pakhtoon	27.05		
	Others	8.95		
Risk factors (External / Environmental)	Communal domain	73.95		
	Stress	18.14		
	Others	7.91		

Statistical analysis

Descriptive and inferential statistics were used to draw the conclusions. Onset of addiction in different age groups, daily drug dose, prevalence of addicts in different ethnic groups and risk factors were estimated using frequency estimation. Association of addiction with age, ethnicity, and literacy level and employment type was computed using

multinomial logistic regression and odds ratio (OR) was calculated. Significance level for all analysis was ≤ 0.05 . SPSS v.21 software was used for analysis.

RESULTS

As presented in Table I, the frequency of addictive drugs abuse is higher in <20 years age group as compared to the 21-40 and also >40 years. Among total study subjects 64% were Punjabis, 27.05% Pakhtoons, and 8.95% were from "Other" ethnic groups. The frequency of the onset of drug abuse in <20 years group is as follows; tobacco smoking (84.91%), marijuana use (80.50%), alcohol drinking (75.81%) and heroin (39.61%). In case of 21-40 and >40 years age groups, the drug abuse frequency for all other drugs was low as compared to <20 years age group except for heroin. However among heroin addicts, the highest frequency (57.49%) was found in 21-40 years old subjects (Table I). As for literacy levels the details of study population are as follows: Primary 33%, Middle 24.9%, Secondary 19.6%, Higher Secondary 10.7%, Graduation 5.2%, and Postgraduate 4.2%, respectively (Table II).

Table II.- Distribution of study subjects based on literacy level, drug route, and daily drug intake.

Variables	Frequency (%)
Literacy level	
Primary	33
Middle	24.9
Secondary	19.6
Higher Secondary	10.7
Graduation	5.2
Postgraduate	4.2
Drug route	
Smoking	60
Sniffing	14
Injections	23
Sniffing plus injections	5
Daily drug intake (Number of times)	
Once/day	10.7
Twice/day	22.8
Thrice/day	66.1
>Thrice/day	41.1

Data related to the route of drug administration indicates smoking 60%, sniffing 14%, injections 23%, sniffing plus injections 5% (Table II). As for the frequency of daily drug use, 41.1% were using >3 times/day, 66.1% were using thrice in a day, 22.8% were on a twice use/day whereas 10.7% were on a single time use/day. As for the contribution of external/environmental risk factors, stress contributed 18.4% towards drug addiction and 7.9 % in case

of category “others”. It is worth mentioning that category “others” is a combination of multiple factors including; urge, company, poverty, unawareness, anger, drug trafficking, home environment, and curiosity for experiencing drugs while stress is also a part of it (Table I). The analyses of demographic variables with drug addiction showed high prevalence of drug users among individuals having occupations like field workers (laborers), shopkeepers and drivers. Analysis also indicated strong association among addiction and occupations: field workers/laborers (OR= 2.07 CI = 1.24-3.44, $p=0.005$), shopkeepers (OR= 1.93 CI=1.06-3.54, $p=0.003$) and drivers (OR= 1.44 CI=1.77-2.66, $p=0.04$) (Table III).

Table III.- Association of study variables with heroin addiction.

Study variables	Heroin addiction OR (95% CI)	p-value
Age in years (21-40 years as reference group)		
<20	1.23 (0.58-2.66)	0.58
>41	1.10 (0.6-1.8)	0.69
Ethnicity (Punjabi as reference group)		
Pakhtoon	1.03 (0.53-1.99)	0.94
Other Ethnicity	1.26 (0.62-2.57)	0.52
Occupation (Office employee as reference group)		
Field worker (laborer)	2.07 (1.24-3.44)	0.005
Shopkeeper	1.93 (1.06-3.54)	0.003
Driver	1.44 (1.77-2.66)	0.04

Significance levels $p\text{-value} \leq 0.05$.

DISCUSSION

Opioids addiction is interplay of extrinsic and intrinsic factors an individual is exposed to and may contribute towards addictive risk phenotypes/behaviors. In current study the contribution of key socio/demographic factors towards heroin addiction vulnerability was explored. This study found supporting evidence for a critical role of traits like age, communal domain, low literacy level, employment status and stress as predisposing risk factors of heroin addiction in Pakistani cohort. In addition invasive heroin administration route contributed towards higher risk of health threatening blood borne disease/infections. Besides a trend towards overdose is another key factor related to heroin addiction. Among demographic risk factors of heroin addiction, individuals starting addictive drugs at an early age especially adolescence is considered amongst heightened risk for substance use disorder (Schepis *et al.*, 2008). Though ethnic background of an individual has not been generally considered among demographic factors predisposing to drug addiction, our results tend to indicate higher proportion of Punjabi ethnicity in our study cohort. Although study subjects were sampled randomly but a higher frequency of Punjabi group may be due to the reason

that samples were collected from regions heavily populated with Punjabis. As for age, overall our results emphasize that younger subjects (<20 years) are highly prone to drugs of abuse as compared to the older age groups. A high prevalence of marijuana, alcohol and tobacco encountered among adolescents clearly highlights this age group is highly susceptible to early onset of substance abuse. Our results also support previous findings that individuals starting drug use in young age are also at increased risk of substance dependence (Adriani *et al.*, 2003; Swartzwelder *et al.*, 1998). However, the onset of heroin abuse was higher in adult population (21-40 years age) group as compared to the <20 years. The age specific varying trends of heroin addiction could be attributed to multiple factors including the type of drugs (tobacco, marijuana, alcohol, opium) an individual first attempted before transition to opioids. Another important factor is easy access to addictive drugs other than heroin and their availability. Furthermore, the high price of heroin might be resulting in its use at later ages rather than adolescence and variation in daily drug dose. It is evident from literature that heroin overdose is one of the major reasons of deaths among addicts (Darke and Duffou, 2016; Darke and Hall, 2003; Rudd *et al.*, 2016). About 65% of heroin addicts use average daily drug dose between 150-250 mg (Rehab-International, 2016). A smaller fraction of our addicted population (12.4%) was at <250 mg daily drug dose, 23% were within the range of 250mg-1000mg while majority of the subjects (64.5%) were at multiple daily doses >1000mg. The continued use of high drug doses several times a day leads to the development of drug tolerance leading to drug overdose (Kosten and George, 2002). A large proportion of our study subjects addicted to higher heroin doses is an alarming situation as they could be at high risk of drug overdose. It is indicated by literature that heroin users have a high risk of death, especially death due to overdose (Buster *et al.*, 2002). However our results do emphasize that potential interventions are needed to reduce the rate of heroin overdose and related morbidity. Moreover, the route of drug administration has been reported to play role in drug over-dose like drugs taken via injections pose higher risk which reduces substantially when smoked (Darke *et al.*, 2000). Though, it is important to emphasize that death can, and does, result from smoking, snorting, and swallowing heroin (Gossop *et al.*, 1996; Neaigus *et al.*, 2001; Swift *et al.*, 1999). In our study cohort different figures regarding routes of heroin administration exist; Smoking 60.2%, Injection 22.6%, Sniffing 13.6%, while 4.8% were using the combined routes of injection and sniffing. According to a report on Drug Use in Pakistan (2013) 0.4% of heroin addicts in Pakistan use injections for drug administration (UNODC, 2013). Data from current study cohort reports 22.6% of the total study subjects administering heroin through injections. Moreover, addicts tend to share needles while injecting drugs. These health threatening practices are becoming a leading cause of communicable diseases/infections especially HIV-AIDS, Hepatitis, and Tuberculosis are highly prevalent among drug users. Though majority of the subjects were un-aware

of the diseases they were being exposed to infectious diseases HIV, Hepatitis, Tuberculosis. In addition subjects in our study cohort are also reported to acquire asthma, kidney and skin related problems during heroin addiction development. Among infectious diseases, Hepatitis C was highly prevalent (16%) among our local addicts especially those using needles with the company/fellows through whom they were introduced to drug use. Besides a number of social factors may also contribute either directly or indirectly contribute towards the vulnerability of an individual towards drug addiction.

Among social factors, peer pressure, illiteracy/low education, employment status/occupation and related stresses are been generally found to influence substance abuse. It is worth to mention that our data supports social influence (communal domain) being the leading cause of heroin abuse in our population. A local study has also emphasized peer pressure being the major factor of drugs abuse among youth (Aslam *et al.*, 2011; Mubeen and Sharif, 2007). These findings also highlight strong influence of company at work place or educational institution an individual is exposed to and drug use.

With regards to the role of employment status/occupation, we found significant association of occupation type with drug addiction in our study population. Our results are in accordance with a previous report focused on drug addict youth in Pakistan whom were not attending any school/educational institutes (Mehdi *et al.*, 2014). It was mentioned that social factors especially working environment rich in drug users are contributing significantly towards an increase in the number of drug addicts among non-student youth of Pakistan. Among occupations, driving, hawkers, factory employees and carpenters are highly prone to cigarette smoking/drug use. It is worth to mention that the peer pressure, already exposed to addiction, might have more influence on individuals with immature mental approach and varying psychological pressures. Another general trend commonly observed among addicts in Pakistan is an initial start from tobacco smoking with a gradual switch towards opium, cocaine, heroin including other addicted substances (Nizami *et al.*, 2011; Smart *et al.*, 1982). However stress has been shown to overpower all other social factors. According to data collected from respondents, our analysis revealed that stress is a major external risk factor for an individual indulging in drug abuse in our population. The population and epidemiological studies have confirmed stress as an eminent marker increasing vulnerability towards drug addiction and a major cause for higher relapse rate in individuals previously treated for drug abuse (Sinha, 2008).

CONCLUSIONS

This is the first study from Pakistan exploring association of social and demographic factors increasing vulnerability towards heroin addiction. It provides the evidence that age, communal domain, employment type, low literacy level, stress are significant external contributing

risk factors for heroin addiction in our study cohort. However drug administration routes and trend towards higher drug dose contributed towards increased health risks among addicts. Being complex and multifactorial disorder, heroin addicts require multi-level intervention strategies to address the biological, social and psychological elements of the disorder. In order to effectively prevent and treat heroin addiction cases understanding of the basic mechanisms including comprehensive study of sociodemographic factors contributing for its vulnerability is further required in Pakistani population. Although our findings are somewhat similar to those previously reported in other populations, we attempted to evaluate the factors that may help to design better strategies for the prevention, control, and treatment of illicit heroin use in Pakistani populations. In addition the high risk addiction associated sociodemographic factors identified in presented study could be highlighted to create awareness at individual, family, peer, and government levels.

ACKNOWLEDGEMENTS

We are thankful to Higher Education Commission Pakistan for funds for this study under 5000 Indigenous Scholarship Scheme. We are also thankful to all the drug rehabilitation centers and hospitals enrolled and assessed subjects for this study.

Conflict of interest statement

We declare that we have no conflict of interest.

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