



# Comorbidity of Mental Disorder in Patients with Chronic Disease: A Comparative Study of Heroin Dependence Patients and Diabetes Mellitus Patients

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## Abstract

**Background:** Chronic patients are at greater risk for a psychiatric problem than the normal population; yet, the increased rate of mental disorder among one chronic patient compared to another chronic patient is uncertain. We aimed to assess the rate of mental disorder among people with heroin dependence and diabetes mellitus in comparison with the healthy population.

**Methods:** This cross-sectional study was carried out in Kuala Lumpur, Malaysia in 2017-2020. The study consisted of 648 participants including heroin dependence patients, diabetes mellitus patients, and healthy population. The GHQ-28 and SCL-90-R scales were used to assess mental disorder among the study populations.

**Results:** The current study revealed the rate of mental disorder among heroin dependence patients, diabetes mellitus patients, and healthy population respectively at 52.1%, 49.5%, and 23.2% using SCL-90-R and GHQ-28. The rate of mental disorder in both heroin dependent (OR 95%= 3.59: 2.37-5.44) and diabetic groups (OR 95%=3.25: 2.14-4.92) were significantly more than the healthy population; however, the odds ratio of mental disorder was not significantly different between heroin dependent and diabetic groups. Furthermore, the results revealed an acceptable agreement between SCL-90-R and GHQ-28 to detect mental disorders (Kappa=0.60;  $P<0.001$ ).

**Conclusion:** People with diabetes mellitus and heroin dependence have significantly poorer mental health than healthy people in Malaysia have. Furthermore, the equivalent rate of mental disorder among such patients suggests that heroin dependence patients are not more distressed than diabetes mellitus patients are. However, further comparative studies are needed to prove these findings.

**Keywords:** Mental disorder; Heroin dependence; Diabetes Mellitus

## Introduction

According to a report of WHO (2016), mental disorder is an important risk factor for development of chronic diseases. Heroin dependence and diabetes mellitus have accounted for two major

chronic diseases affecting people in the Low and Middle-Income Countries (LAMIC) (1).

Heroin dependence as a chronic brain disorder is a complicated health problem and creates many



social, economic, and medical problems for the society (1). Heroin dependence patients with mental disorder encounter with more physical problems and severe psychopathological symptoms (2), poor effects of treatment and less compliance to treatment (3), suicide/suicidal ideation (4).

Diabetes mellitus is a serious chronic disease affecting people throughout the world especially in LAMICs (1). Diabetes mellitus patients with mental disorder more likely encounter with poor glycemic control (5), poor treatment adherence (6), increased sexual dysfunction (7), and severe psychopathological symptoms (8).

Many of psychiatry studies among heroin dependence patients and diabetes mellitus patients have based their conclusions on either treatment groups or institutionalized subjects in the lack of proper control group; therefore, no final conclusions could be drawn from such studies. One common finding is that people suffering from chronic diseases are more prone to experience the symptom related to a mental disorder (5, 8-15); yet the increased rate of mental disorder among one chronic patient in compared to another chronic patient is questionable.

The current study assesses the rate of mental disorder in two prevalent chronic diseases driven by different pathology, i.e. heroin dependence and diabetes mellitus in compared to the healthy population; besides, explores the agreement between Symptom Checklist-90-R (SCL-90-R) and General Health Questionnaire-28 (GHQ-28) for determining mental disorders. To our knowledge, no study has compared the rate of mental disorder among different chronic patients using a two-scale method in Malaysia.

## Materials and Methods

### Sample

The current study was a comparative cross-sectional study carried out in Kuala Lumpur, Malaysia in 2017-2020. The study samples consisted people aged between 18-70 years including:

1. People who met the threshold for the diagnosis of diabetes mellitus according to the WHO definition: i.e. fasting plasma glucose level  $>126$  mg/dl (7.0 mmol/l) or a casual plasma glucose  $>200$  mg/dl (11.1 mmol/l).
2. People met the criteria for heroin addiction based on the DSM-IV and receiving Methadone Maintenance Therapy.
3. People free of any chronic disease selected from the normal population attended the study clinics or accompanied the patients.

The study took place at the UM Hospital, Hospital Kuala Lumpur, and Polyclinic Insaf Murni in Kuala Lumpur. According to the results of sample size calculations, 750 subjects were randomly invited to the study. The response rate in this study was 86% as 648 participants agreed to complete the research questionnaires.

### Ethical approval

The ethical approval was obtained from the Medical Ethics Committee of University of Malaya Medical Center (UMMC). The ethical conditions of participation including voluntary participation, privacy, anonymity and confidentiality explained to the respondents. Based on the written informed consent, they would be free to withdraw from the study at any point. All subjects in this study declared their agreement.

### Measurements

The instruments applied in this study were the Bahasa Melayu Symptom Checklist-90-Revised (SCL-90-R) and General Health Questionnaire-28 (GHQ-28). They are sensitive, time efficient, and well-validated instruments for assessing common mental disorders.

### The Symptom Checklist-90- Revised

The SCL-90-R developed by Derogatis (1977) is a self-report instrument containing 90 items and designed to measure nine current psychiatric symptoms including: Somatization, Obsessive-Compul-

sive Disorder, Interpersonal Sensitivity, Depression, Anxiety, Hostility, Phobic Anxiety, Paranoid Ideation, and Psychoticism. In addition, the SCL-90-R provides three indexes including Global Severity Index (GSI), Positive Symptom Index (PST), and Positive Symptom Distress Index (PSDI). The SCL-90-R has been validated in several countries including Malaysia (16-20).

### ***The General Health Questionnaire-28***

The GHQ-28 developed by Goldberg (1978) has 28 items. This scale helps to measure four groups of psychiatric morbidity containing somatization, anxiety, social dysfunction, and depression. Each item has four response categories such as "better than usual"; 'same as usual'; 'worse than usual'; or 'much worse than usual. The GHQ-28 is a reliable instrument that is validated in prior studies including Malaysia (18, 21, 22).

### ***Cut-off points***

The cut-off points considered for the GHQ-28 was 24 recommended by Goldberg (1978). The cut-off value for the SCL-90-R was 104 calculated according to the pattern utilized in the original version (23); that is, adding one standard deviation to the total score of GSI.

### ***Statistical analysis***

The data was analyzed using SPSS version 21 (Chicago, IL, USA). Descriptive statistics such as mean and standard deviation, as well as, inferential statistics such as ANOVA, chi-square, correlation coefficient, Kruskal-Wallis, binary and multinomial logistic was applied to make judgments of the probability that an observed difference between groups is a dependable one or one that might have happened by chance. To compute the confidence interval, the Wilson formula was utilized. The level of significance was 0.05.

## **Results**

The study populations including Malay, Chinese, and Indian fully completed the Bahasa Melayu-

GHQ-28 and SCL-90-R scales. The majority of the subjects were Malay (Malay 79.2%) and Muslim (79.3%). The mean age of heroin dependence patients, diabetes mellitus patients, and the normal population were  $40.2 \pm 10.0$ ,  $41.8 \pm 10.8$ , and  $39.5 \pm 11.4$ , respectively.

### ***Scale Statistics***

To measure the consistency of related questions in the questionnaire, the subscales of both research questionnaires were subjected to Composite Reliability (CR) analysis. The consistency of both SCL-90-R and GHQ-28 were highly acceptable, in which the consistency of the SCL-90-R and GHQ-28 subscales ranged from 0.955 to 0.904 and 0.915 to 0.859, respectively (Table 1).

### ***The Prevalence of Mental Disorder***

Table 2 shows the prevalence and confidence interval of mental disorders based on the GHQ-28 & SCL-90-R among the study populations. According to the results of the GHQ-28, heroin dependents had the highest frequency of mental disorder (41.60%, CI 95%: 35 – 48.1) followed by diabetes mellitus patients (34.4%, CI 95%: 28.1 – 46.7) and normal group (20.90%, CI 95%: 15.4 – 26.3). The results of the Chi-Square analysis ( $\chi^2 = 21.61$ ,  $P < 0.001$ ) and Welch test (Welch = 21.507,  $P < 0.01$ ) revealed a significant difference between the groups; however, there was not statistical difference between heroin dependence and diabetic subjects for mental disorder rate.

Based on the SCL-90-R, diabetic respondent had the highest frequency of mental disorder (43.10%, CI 95%: 35.5 – 48.5) followed by heroin dependences (42.0%, CI 95%: 36.5 – 49.7) and healthy group (14.70%, CI 95%: 9.9 – 19.5). Besides, the results of the Chi-Square analysis revealed a significant difference among these groups for mental disorder rate ( $\chi^2 = 49.68$ ,  $P < 0.001$ ). Likewise, Welch test indicated a significant difference between the groups for both GSI and PST.

**Table 1:** The agreement between the GHQ-28 and SCL-90-R using Cohen's kappa

<i>Variable</i>			<i>SCL-90-R</i>		<i>Kappa</i>	<i>P value</i>
			Positive	Negative		
<b>GHQ-28</b>	Healthy	Positive	26(12.3)	18(8.5)	0.629	<0.001
		Negative	5(2.4)	162(76.8)		
	Heroin Dependent	Positive	69(31.5)	22(10)	0.578	<0.001
		Negative	23(10.5)	105(47.9)		
	Diabetic	Positive	61(28)	14(6.4)	0.549	<0.001
		Negative	33(15.1)	110(50.5)		
	Total	Positive	61(28)	14(6.4)	0.598	<0.001
		Negative	33(15.1)	110(50.5)		

*Bold numbers presented similar results in both instruments*

**Table 2:** The comparison rate of mental disorders among heroin dependence patients, diabetes mellitus patients, and healthy people

<i>Mental Disorder</i>	<i>Caseness</i>	<i>Groups</i>			$\chi^2$	<i>P value</i>
		Healthy	Heroin Dependent	Diabetic		
<b>Somatization</b>	Positive	44 (20.9)	100 (45.7)	85 (39)	30.862	<0.001
	Negative	167(79.1)	119 (54.3)	133 (61)		
	<b>OR (95%)</b>	--	3.2(2.08-4.9)	2.43(1.6-3.7)		
<b>Anxiety</b>	Positive	44(20.9)	94(42.9)	90 (41.3)	28.310	<0.001
	Negative	167(79.1)	125 (57.1)	128 (58.7)		
	<b>OR (95%)</b>	--	2.9(1.9-4.4)	1.74(2.7-4.1)		
<b>Depression</b>	Positive	36 (17.1)	104 (47.5)	75 (34.4)	45.097	<0.001
	Negative	175(82.9)	115 (52.5)	143 (65.6)		
	<b>OR (95%)</b>	--	4.4(2.8-6.9)	2.55(1.6-4.0)		
<b>Any symptom</b>	Positive	49 (23.2)	114 (52.1)	108 (49.5)	44.763	<0.001
	Negative	162(76.8)	105 (47.9)	110 (50.5)		
	<b>OR (95%)</b>	--	3.6(2.4-5.4)	3.3(2.1-4.9)		

Due to the non-healthy distribution of PSDI among all groups, Kruskal-Wallis test (a non-parametric method) was applied for comparing PSDI score among three groups. The results revealed that there was a significant difference between these groups ( $\chi^2 = 68.232, P < 0.01$ ). Moreover, the mean comparison using Tamhane-T2 method showed that the mean score of GSI for both heroin dependent and diabetic groups were significantly higher than healthy group while there was no significant difference between heroin dependent and diabetic groups.

In the current study the rate of mental disorder among heroin dependence patients, diabetes mellitus patients, and normal people were determined

using the combination of the scales. Combined indices were calculated based on GHQ-28 and SCL-90-R as positive (with psychiatric disorder) and negative (without psychiatric disorder). If any instrument defined a person as a positive case, then it was categorized as a positive. The rate of mental disorder among the study populations using combined approach presented in table 2. Considering combined index, the prevalence of mental disorders among heroin dependent, diabetic, and healthy groups were respectively 52.1%, and 49.5%, and 23.2%. Moreover, the rates of mental disorder in both heroin dependence patients and diabetes mellitus patients were significantly higher

than the healthy group, and there was not statistical difference between heroin dependent and diabetic subjects. This result was replicated for the three common symptoms of the SCL-90-R and GHQ-28 scales (i.e. depression, anxiety, and somatization).

### ***Correlation of mental disorder and demographic variables in the study populations***

The result of Binary logistic revealed that only the history of injection ( $B= 2.497, P<0.001$ ) and age ( $B= -0.048, P= 0.026$ ) were significantly correlated with mental disorder among heroin dependence patients and diabetes mellitus patients. Those heroin dependence patients with a history of injection more likely faced with a mental disorder than those without such history. The effect of age on diabetic group was negative which indicates young people had a lower chance to meet mental disorder.

## **Discussion**

The present study indicated that approximately half of patients with heroin dependence and diabetes mellitus are suffering from a mental disorder, and there is no significant difference between the rate of mental disorders in the mentioned patients based on the GHQ-28 and SCL-90-R. This study showed that Malaysian heroin dependence patients and diabetes mellitus patients were more prone to experience mental disorder than healthy people were.

The findings of the current study are consistent with the former studies that highlighted the increased rate of mental disorders in patients with heroin dependence (24-29) and diabetes mellitus (5, 30-34).

Although, some researchers reported lower rate than the findings of the present study, other investigations reported a greater prevalence of mental disorder in heroin dependence patients. However, the present study found the rate of mental disorders in patients with heroin dependence patients and diabetes mellitus within the range reported in

the former studies including Malaysian studies; however, diversification of rates would be expected in the psychiatry studies because, the prevalence of mental disorder would be varied depending on the method of study and assessment tools. This study revealed the odds of mental disorders threefold in patients with heroin dependence and diabetes mellitus in compared to the healthy population (Table 2). The present finding reflects the assumptions of those who claimed the link of mental disorder with heroin dependence (28, 29, 35-37) and diabetes mellitus (5, 30-34) in comparison to normal people.

One way to account for the increased rate of mental disorder in patients with heroin dependence and diabetes mellitus would be partly explained by the overlap of symptoms. In the other word, the symptoms induced by drug dependence and diabetes mellitus are seriously considered as confounding factors that can interfere in assessment of psychological disorders. For instance, a number of symptoms frequently experienced by depression and anxiety may appear as a result of hyper/hypoglycemia (38). Likewise, drug-induced changes in neurotransmitter systems in the brain causes emotional changes during drug withdrawal and this is sometimes called the "substance-related artifact hypothesis (39). Accordingly, an increased prevalence of mental disorders in diabetes mellitus patients and heroin dependence patients could be partly attributed to the nature of diabetes mellitus and heroin dependence.

On the other hand, heroin dependence and diabetes mellitus are accounted for two stress-related diseases and this similar rate could be explained by the stress response theory. According to the stress response theory, there is a link between chronic stress, mental illness, and stress-related disease (40), this researcher explained that chronic stress leads to cognitive dysfunctions and emotion dysregulation. This phenomenon can occur with any psychopathological problem or process where brain structure is significantly disrupted; therefore, long-term emotional stress could be an important issue in the development of chronic disease i.e.

heroin dependence and diabetes mellitus. The interesting fact is, the motivations of using drugs and overeating are probably engaged in similar circuits; in fact, chronic stress create a motivation for using drugs or overeating, in turn, increases the risk of drug dependence and diabetes mellitus (41). These conditions imply a vicious circle of chronic stress-mental illness-chronic disease (i.e. heroin dependence and diabetes mellitus) which induces comorbidity of psychological and medical disease. In spite of a relatively similar rate of mental disorder in patients with heroin dependence and diabetes mellitus, the present study found significant differences in the PST and PSDI indicators of the SCL-90-R among these patients. The PSDI scores indicated that the intensity of distress was higher among heroin dependence patients than diabetes mellitus patients, and this could be considered as poor prognosis in heroin dependence patients. This finding is supported by the other finding (28) who found a high level of PSDI among heroin dependence patients. One way to explain the high level of the intensity of distress (PSDI) in heroin dependence patients would be the stigma of drug use. The stigma for forbidden behavior like using heroin may anxiously provide an expectation for interpersonal rejection, and this may increase the risk of distress in such cases. Likewise, heroin dependence patients revealed denying rather than dramatizing symptoms in compared to diabetes mellitus patients, as the low PST score denotes the denial of symptoms. One way to explain could be the fact that denial is a common feature of addiction, and is often considered as a product of cognitive failure due to cerebral dysfunction than an emotion-driven rejection of the truth (41, 42).

According to the result, those heroin dependence patients who experienced drug injection had higher chance to meet mental disorders. This finding is similar to the findings of other research (43) who found significant connection between a history of drug injection and mental disorder among heroin dependence patients receiving treatment. Likewise, the current study found significant relationship between age and mental disorder among diabetes mellitus patients. This finding of higher

prevalence of mental disorder among older diabetes mellitus patients is consistent with the former studies (43, 44).

To sum up, this study concluded that Malaysian males with heroin dependence and diabetes mellitus were significantly more distressed than normal people. Moreover, the equivalent rate of mental disorder among heroin dependence patients and diabetes mellitus patients evokes this assumption that patients with heroin dependence are not more distressed than other chronic patients i.e. diabetes mellitus patients if the ascertainment bias is controlled. However, further comparative studies on mental disorder are needed to support this assumption. Finally, the present study highlighted a significant relationship between the GHQ-28 and SCL-90-R scales in detecting mental disorder among the study population (Table 1). The current finding validates previous studies (18, 21, 45) which highlighted the concurrent validity of the SCL-90-R against the GHQ-28 (45).

## **Conclusion**

The findings of the present study make Malaysian healthcare providers, aware of the noticeable overlap of mental disorder with heroin dependence and diabetes mellitus and implies that mental health status should receive special attention in these patients. To this end, early detection of mental disorders would be a step forward to targeted interventions and treatments in these patients. In addition, integrated medical and psychological interventions should be provided to optimize therapeutic outcomes.

## **Ethical considerations**

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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## Conflict of interest

The authors declare that there is no conflict of interest.

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