



## The Comparison of Socio-Demographic and Clinical Variables of Inmates Using Gabapentin For Medicinal Purposes and Those Abusing The Drug

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### Summary

**Objective:** To compare the socio-demographic and clinical data of inmates using gabapentin for medicinal purposes and those abusing the drug.

**Methods:** The study included inmates of the Konya E-Type Prison who used gabapentin between June 2012 and December 2014 and were admitted to the prison polyclinic. The participants were divided into two groups; those using gabapentin due to existing symptoms without any labeled indication (Group 1), and those using the medication due to disorders with labeled indications (Group 2). Both groups were investigated in terms of drug addiction, drug abuse, and gabapentin abuse according to the Diagnostic and Statistical Manual-Text Revision (DSM IV-TR).

**Results:** Nearly all inmates (n=21) using gabapentin with off-label indications (Group 1) reported using it due to muscle pain, neuropathic pain, sleep disorder, signs of anxiety, sweating, trembling, and nausea-vomiting, whereas those using gabapentin with labeled indications (Group 2) reported using it because of their diseases, such as diabetic neuropathy and epilepsy. Alcohol/substance abuse was found higher among the first-degree relatives of those using gabapentin with off-label indications (P < 0.001). The rates of substance dependence (n=10) and substance abuse (n=13) were significantly higher in Group 1 than in Group 2 (P < 0.001).

**Conclusion:** The inmates who were diagnosed as having drug addiction and substance abuse according to the DSM-IV-TR used gabapentin after entering prison to prevent opioid withdrawal symptoms.

**Key words:** Gabapentin, inmates, substance abuse, substance addiction

### Gabapentini Kötüye Kullanan ile Tedavi Amaçlı Kullanan Mahkumlar Arasındaki Sosyo Demografik ve Klinik Değişkenlerin Karşılaştırılması

#### Özet

**Amaç:** Gabapentini tedavi amaçlı-endikasyonlu kullanan mahkumlar ile kötüye kullanan mahkumlar arasındaki sosyodemoğrafik ve klinik verileri karşılaştırmak.

**Metod:** Bu çalışmaya Haziran 2012-Aralık 2014 yılları arasında Konya E Tipi Cezaevinde kalan, cezaevi polikliniğine başvuran ve ağrı polikliniğimize sevk edilen gabapentin kullananlar mahkumlar dahil edildi. Gabapentini mevcut şikayetlerinden dolayı endikasyonsuz kullananlar (Grup 1), hastalığa bağlı olarak endikasyonlu kullananlar (Grup 2) DSM IV-TR`ye göre madde bağımlılığı, madde kötüye kullanımı ve gabapentin kötüye kullanımı yönünden araştırıldı.

**Bulgular:** Endikasyonsuz gabapentin kullanan mahkumların (Grup 1) tamamına yakını (n:21) gabapentini kas ağrıları, nöropatik ağrı, uyku bozukluğu, anksiyete belirtileri, terleme, titreme ve bulantı-kusma için kullandığını belirtirken, endikasyonlu olarak gabapentini kullanan mahkumlar (Grup 2) daha çok mevcut hastalıklarının belirtilerini baskılamak için (diyabetik nöropati, ve epilepsi) kullandıkları tespit edilmiştir. Endikasyonsuz kullanan grubun birinci derece yakınlarında alkol/madde kullanımının daha yüksek olduğu belirlenmiştir (P<0.001). Grup 1 için madde bağımlılığı (n=10) ve madde kötüye kullanımı (n=13) anlamlı olarak Grup 2'den yüksek bulunmuştur (P<0.001).

**Sonuç:** DSM IV-TR`ye göre madde bağımlılığı ve madde kötüye kullanımı tanısı alan mahkumların cezaevine girdikten sonra özellikle opioid çekilme belirtilerini engellemek için gabapentin kullandıkları ve gabapentin kötüye kullanımı tanımına uydukları görülmüştür.

**Anahtar Kelimeler:** Gabapentin, madde kötüye kullanımı, madde bağımlılığı, mahkumlar

## INTRODUCTION

The abuse of drugs that affect the central nervous system is an important social problem that the Food and Drug Administration of the United States (FDA) is trying to prevent (1). Although psychotropic drugs are commonly abused, other drugs can also be misused or overused. Studies on the abuse of gabapentin have recently started to appear in the literature (2-5). Gabapentin is a new-generation antiepileptic drug (6). It is a structural analog of gamma-amino butyric acid (GABA), which is an important neurotransmitter of the central nervous system (CNS) (7). In 1993, the FDA approved gabapentin for the treatment of partial epileptic seizures in patients aged over 12 years (1-3,4). Later studies indicated that besides its antiepileptic effect, gabapentin was also effective in other illnesses such as psychiatric disorders, movement disorders, and neuropathic pain (6,8-11). The studies on the use of gabapentin for indications other than epilepsy constitute approximately 40% of all studies on the use of gabapentin (6). Gabapentin is also used in addiction treatments. Certain studies have suggested

the potential effect of gabapentin in the treatment of opioid withdrawal syndromes, and withdrawal syndromes of cocaine (12-15).

Individuals with a history of substance abuse are particularly inclined to abuse drugs that affect the central nervous system (16). A study reported the assessment of the non-medical use of prescription drugs as 13% for pleasure, 39% for self-treatment, and 48% mixed sub-group. Substance abuse was detected in approximately half of the mixed sub-groups (17). Therefore, it is important to identify individuals who might be inclined to abuse prescription drugs.

Gabapentin is being increasingly abused, especially by patients with a history substance abuse and by inmates in prisons (4). These observations and the very few studies on the existence of gabapentin addiction or gabapentin abuse put physicians on the fence regarding the prescription of gabapentin in inmate groups. This dilemma bears the risk of resuming abuse on one side and not using a potentially useful treatment alternative on the other.

The present study was conducted among inmates of the Konya E-Type Prison who used gabapentin. The study was planned to compare the socio-demographic and clinical data of inmates who used gabapentin for therapeutic purposes with labeled indications and inmates who abused gabapentin.

## MATERIAL AND METHODS

The present study was conducted among inmates housed in the Konya E-Type Prison (separately in men, women, and children wards) between June 2012 and December 2014. Gabapentin-using inmates who presented to the prison clinic with several symptoms were consulted if necessary, and gabapentin-using inmates who were referred to the pain clinic were included in this study. Research ethics committee approvals were obtained for the study from the Faculty of Medicine, Necmettin Erbakan University (Ref. no:7775) and the Ministry of Justice (Ref. no: 4838). Face-to-face interviews were conducted with inmates who used gabapentin, and their files were assessed. The inmates who used gabapentin with no labeled indications (off-label) and with labeled indications were identified through polyclinic interviews. Inmates who used gabapentin due to their existing symptoms without indications were classified as Group 1, and those using gabapentin due to an illness with indications (diabetes mellitus n=8, epilepsy n=2, lumbar disk hernia n=4, and varicose vein n=2) were classified as Group 2. The groups were then asked about the period of gabapentin use, the amount of gabapentin taken daily, other drugs used together with gabapentin, and their reasons for gabapentin use. Addiction and substance abuse were investigated according to the DSM-IV-TR, regarding psychiatry. Gabapentin abuse was assessed by the same psychiatrist. We investigated whether the patient's relatives used gabapentin. When considered necessary, the groups consulted physicians

of related specialties (neurology, internal medicine, and neurosurgery).

The socio-demographic data of the groups were compared including marital status (married, divorced or separated, single), graduation (primary, high school, university), who they lived with (spouse and children, parents, alone, other relatives or friends) before being jailed, alcohol/substance use by first-degree relatives (no alcohol or substance use, only alcohol use, only substance use, multiple substance use), the reasons for gabapentin use (muscle pain, neuropathic pain, anxiety, shivering, sweating, and nausea/vomiting, sound sleep) substance addiction and substance abuse, and gabapentin abuse according to the DSM IV-TR.

## STATISTICS

The data were analyzed using Statistical Package for the Social Sciences (SPSS) 21.0 software. Descriptive statistics were presented as mean  $\pm$  standard deviation (SD), median (25%-75% values), frequency and percentage. The Mann-Whitney U test was used to compare continuous variables. The Chi-square test was used to compare categorical variables. A P value less than .05 was considered statistically significant. Afterwards, the descriptive measures table was presented for the numerical variables. Furthermore, phi or Cramer's V correlation coefficients were calculated to illustrate the strength of the Chi-square analyses.

## RESULTS

A total of 39 inmates who were housed at the Konya E-Type Prison were included in the study. The Konya E-Type Prison had a total of 1236 inmates comprising 1179 males and 57 females. The 23 inmates in Group 1 and 16 inmates in Group 2 were all men.

The socio-demographic and clinical data obtained from the inmates who used gabapentin are presented in Tables 1 and 2 respectively.

The mean age was  $35.4 \pm 8.8$  years in Group 1 and  $36.8 \pm 10.7$  years in Group 2 ( $P = 0.271$ ).

The period of gabapentin use was  $5.1 \pm 3.7$  years for Group 1 and  $5.6 \pm 3$  years for Group 2 ( $P = 0.414$ ).

The daily dose of gabapentin used by inmates was  $1382.6 \pm 405.2$  mg in Group 1 and  $1306.2 \pm 325.5$  mg in Group 2 ( $P = 0.650$ ).

The reasons for gabapentin use in Group 1 / Group 2 included muscle pain ( $n=23$  (100.0%) /  $n=8$  (50.0%)), neuropathic pain ( $n=23$  100.0% /  $n=8$  50.0%), anxiety ( $n=22$  95.7% /  $n=2$  12.5%), shivering ( $n=21$  91.3% /  $0$  0.0%), sweating ( $n=21$  88.0% /  $0$  0.0%), and nausea/vomiting ( $n=21$  91.3% /  $n=4$  25.0%), respectively. These findings were statistically significant ( $P < 0.001$ ).

The sound sleep values were 38 (90.4%) for Group 1 and 15 (93.7%) for Group 2 ( $P = 0.778$ ).

The results for marital status (married, divorced or separated, single) were 8 (34.8%), 4 (17.4%), and 11 (47.8%) for Group 1, and 10 (62.5%), 1 (6.2%), and 5 (31.2%) for Group 2, respectively ( $P = 0.211$ ).

The education levels of the groups in terms of graduation (primary, high school,

university) were 11 (47.8%), 11 (47.8%) and 1 (4.3%) for Group 1, and 8 (50.0%), 7 (43.7%) and 1 (6.2%) for Group 2 respectively ( $P = 0.947$ ).

The people with whom the inmates lived before being jailed are reported in Table 1 ( $P = 0.229$ ).

Alcohol/substance use by first-degree relatives (no alcohol or substance use, only alcohol use, only substance use, multiple substance use) were 5 (21.7%), 8 (34.8%), 1 (4.3%), and 9 (39.1%) for Group 1, and 14 (87.5%), 2 (12.5%), 0 (0.0%), and 0 (0.0%) for Group 2, respectively. These findings were statistically significant ( $P = 0.001$ ).

According to the DSM IV-TR, substance addiction was 10 (43.5%) in Group 1, and 13 (56.5%) in Group 2. Substance abuse was 0 (0.0%) for Group 2. The difference between the groups was statistically significant ( $P < 0.001$ ).

When both groups were compared for gabapentin abuse, the values were 23 (100.0%) for Group 1 and 0 (0.0%) for Group 2. The difference between the groups was statistically significant ( $P < 0.001$ ).

**Table 1.** The socio-demographic data obtained from the inmates who used gabapentin.

	Group 1*	Group 2†	P
	n=23	n=16	
	(%)	(%)	
Age (years) median (25-75% values)	32.0 (19–52)	36.0 (20–54)	0.271
Marital status			
Married	8 (34.8)	10 (62.5)	0.211
Divorced or separated	4 (17.4)	1 (6.2)	
Single	11 (47.8)	5 (31.2)	
People with whom the inmates lived before going to prison			
Spouse and children	8 (34.8)	9 (56.2)	0.229
Spouse and children	6 (26.0)	5 (31.2)	
Parents	5 (21.7)	2 (12.5)	
Alone	4 (17.4)	0 (0.0)	
Other relatives or friends			
Graduation			
Primary (15 years)	11 (47.8)	8 (50.0)	0.947
Secondary-high school (611 years)	11 (47.8)	7 (43.7)	
University	1 (4.3)	1 (6.2)	
Alcohol/substance use by first-degree relatives			
No alcohol or substance use	5 (21.7)	14 (87.5)	0.001
No alcohol or substance use	8 (34.8)	2 (12.5)	
Only alcohol use	1 (4,3)	0 (0.0)	
Only substance use	9 (39.1)	0 (0.0)	
Multiple substance use			
According to the DSM IV-TR			
Substance addiction	10 (43.5)	0 (0.0)	< 0.001
Substance abuse	13 (56.5)	0 (0.0)	

\*Inmates who used gabapentin with no labeled indications (off-label).

†Inmates who used gabapentin with labeled indications.

**Table 2.** The clinical data obtained from the inmates who used gabapentin.

	Group 1* <i>n</i> =23 (%)	Group 2† <i>n</i> =16 (%)	<i>P</i>
The period of gabapentin use (years) median (25-75% values)	4.0 (1–13)	5.5 (1–10)	0.414
The daily dose of gabapentin (mg) median (25-75% values)	1600 (800–2000)	1200 (800–1800)	0.650
According to the DSM IV-TR, gabapentin abuse			
Yes	23 (100.0)	0 (0.0)	< 0.001
None	0 (0.0)	16 (100.0)	
The reasons for gabapentin use			
Muscle pain	23 (100.0)	8 (50.0)	< 0.001
Neuropathic pain	23 (100.0)	8 (50.0)	< 0.001
Sound sleep	21 (91.3)	15 (93.7)	0.778
Anxiety	22 (95.7)	2 (12.5)	< 0.001
Shivering	21 (91.3)	0 (0.0)	< 0.001
Sweating	21 (91.3)	0 (0.0)	< 0.001
Nausea/vomiting	21 (91.3)	4 (25.0)	< 0.001

\*Inmates who used gabapentin with no labeled indications (off-label).

†Inmates who used gabapentin with labeled indications.

## DISCUSSION

The present study found that male inmates in the prison used gabapentin with and without labeled indications. Gabapentin use without labeled indications became widespread among male inmates in the last 6 months of the study. In particular, this issue was determined by an increase in the number of prisoners who persistently tried to obtain gabapentin and other substances. An examination of all female inmates in the prison did not detect substance

addiction, substance abuse or gabapentin use due to any reason.

Certain factors might affect the substance abuse rates of individuals including age, marital status, the people they live with, and their education level (18). In the present study, the influence of these factors was similar in both groups.

Substantial alcohol/substance or multiple substance use was also observed among the first-degree relatives of Group 1. Negative attitudes and behaviors among family members and close relatives, such

as substance abuse and showing tolerance to substance abuse, could be risk factors for substance use. In the present study, the number of inmates with first-degree relatives who used alcohol and substances and who used gabapentin without labeled indications was statistically higher compared with the group that used gabapentin with indications.

In the present study, almost all inmates who used gabapentin with no labeled indications (Group 1) stated that they used it for muscle pain, neuropathic pain, sleep disorders, anxiety symptoms, sweating, shivering and nausea/vomiting, whereas the inmates who used gabapentin with labeled indications (Group 2) said they did so to treat the symptoms of their existing illnesses (diabetic neuropathy, lumbar disk hernia, and epilepsy). Withdrawal symptoms may appear differently among people using different substances. Inmates tend to use gabapentin for withdrawal symptoms that cannot be treated with other drugs in prison. This may be related with the relaxing effect of gabapentin.

Few data are available in the literature regarding gabapentin abuse. The first case of gabapentin abuse was reported in 1997 (3). Another case presentation was made of five inmates who abused gabapentin in Florida in 2004 (4).

Several studies have shown that gabapentin treatment in opioid addicts was reliable and effective and that it could be an alternative treatment because gabapentin caused a decrease in drug addiction and withdrawal symptoms (19-26). In various studies, gabapentin was used for certain withdrawal symptoms such as neuropathic pain, sleep disorder, anxiety symptoms and shivering (20,27-31). Additionally, studies also exist in which gabapentin was used for alcohol, benzodiazepine, and pentazocine detoxification (32-34). Some studies demonstrated the potential effect of gabapentin in the treatment of cocaine and alcohol withdrawal symptoms (12-15). It has been shown that the same mechanism

is effective in cases of neuropathic pain (35) and fibromyalgia (36). All inmates in Group 1 and the majority of inmates in Group 2 (66.7%) stated that they used gabapentin for neuropathic pain.

In preclinical studies, it was assumed that gabapentin, which can alter GABA metabolism without affecting its receptors, could be effective in the treatment of anxiety disorders, which was supported by pioneering studies (29-41). Almost all the inmates in Group 1 (95.7%) and a small number of inmates in Group 2 (4.5%) used gabapentin to decrease anxiety.

In stress and sleep disorders, the adrenergic system is affected by GABA, which is an important inhibitory transmitter in the brain, and the noradrenaline response is increased. This effect maintains regular sleep possibly by decreasing stress (42). Studies also show the effect of gabapentin in the treatment of sleep disorders (27,28). In the present study, inmates who used gabapentin stated that its main purpose was to treat sleep disorders.

In contrast with other studies, the inmates who abused gabapentin in the present study started using the drug by themselves (without any studies or medical indications) at the suggestion of other inmates who also had opioid and alcohol withdrawal. When the reasons for their gabapentin use were inquired, the inmates stated that they were deprived of alcohol and drugs in prison and used gabapentin to decrease the developing withdrawal syndromes.

Gabapentin use among inmates results from the fact that it can be prescribed easily; other addictive drugs are under strict control in prisons, and excessive doses or adverse effects of this drug cause somnolence and dizziness because concurrent opioid use increases the use of gabapentin among inmates (11). When asked whether prisoners experienced gabapentin side effects at normal doses, prisoners reported that it had a calming effect. On the contrary, no adverse effects

were observed. They were also unable to state whether a symptom of withdrawal was related with gabapentin during periods when prisoners did not use it. When evaluating the effectiveness of gabapentin in the addiction category, sedative-drugs such as groups of alcohol and benzodiazepine may be appropriate to assess, but it is thought that the direction of withdrawal symptoms may also be a different mechanism from that group. Further studies and an increase in data on substance abuse will help make clearer assessments.

Inmates who know well about their illnesses and medicine use, but are unable to convince doctors in prison to prescribe gabapentin after stating deceptive symptoms, demand to be referred to other hospitals so that they can ask doctors who have little information about their medical conditions to prescribe gabapentin.

In fact, several adverse effects related to gabapentin overdose have been reported. The most commonly observed adverse effects are dizziness, vertigo, ataxia, nystagmus, and tremor. The most frequent gastrointestinal adverse effects are nausea/vomiting, stomach ache and diarrhea. Other adverse effects are vasodilatation, fatigue, diplopia, amblyopia, leukopenia, weight gain, and peripheral edema (43). None of these adverse effects was detected in inmates who used gabapentin.

The present study had some limitations. It was not possible to detect an overdose of gabapentin because the study could not assess the dose of gabapentin in the blood of inmates who abused the drug. Another limitation was the insufficient number of inmates who used gabapentin with labeled indications.

## CONCLUSION

It was found that inmates who were diagnosed as having substance addiction

and substance abuse according to the DSM IV-TR used gabapentin to prevent opioid withdrawal symptoms after going to prison. Gabapentin should be considered to have the potential to become addictive when used by prisoners with a history narcotic substance abuse. It is recommended that physicians be more cautious about dosing when prescribing this medication, given that overdose of gabapentin is thought to lead to abuse of this drug by recognizing anxiety-reducing and euphoric effects. Further studies are needed on blood-drug levels related to drugs that have the potential for addiction or abuse.

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## Conflict of interest

No conflicts of interest declared.

## Ethics

Each subject signed the acceptance of the study protocol, in which the Ethical Principles for Medical Research Involving Human Subjects (The Helsinki Declaration) were clearly stated.

## Author contributions:

Concept. F.C.,A.A.; Design - F.C., A.A., A.K.; Supervision : A.A.; Resource : D.Y.; Data Collection &/or Processing : F.C.,D.Y.; Analysis &/or Interpretation : F.C., A.K.; Literature Search : F.C., A.A.; Writing - F.C., A.A.; Critical Reviews - F.C.,A.A.

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