Relationship Between Benzodiazepine Prescription, Aggressive Behavior, and Behavioral Disinhibition: A Case-control Study in a Swiss Prison

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Research

Abstract

Background.

Benzodiazepines are commonly prescribed in prisons amidst the controversies surrounding their potential role in causing behavioral disinhibition and aggressive behavior and their association with use and trafficking of illicit and addictive substances. The present study aimed to 1) ascertain the relationship between benzodiazepine prescription (including their dosage and duration of use) and aggressive behavior and behavioral disinhibition in prison, and 2) investigate whether there was an association between benzodiazepine prescription, (including their dosage and duration of use) and using and trafficking illicit and addictive substances during imprisonment.

Methods.

Data were extracted from the electronic database of an "open" Swiss prison (n = 1,379) over a five-year period (2010–2015). Measures included benzodiazepine prescription (yes/no), duration of benzodiazepine use and mean dosage, and punishable behaviors (physical and verbal aggression, disinhibited but not directly aggressive behaviors, property damage or theft, substance-related offenses, and rule transgression). Propensity score matching was used to assess the relationship between benzodiazepine prescription and punishable behaviors. Logistic regressions were used to test the relationship of benzodiazepine duration and dosage with punishable behaviors.

Results.

Benzodiazepine prescription (yes/no) was not significantly associated with punishable behaviors. Detained persons taking benzodiazepines were not more likely to commit offenses involving illicit or addictive substance use or trafficking, even when taking these medications in higher dosage and over a longer period of time.

Conclusions.

Our findings suggest that access to benzodiazepines in the prison setting should be subject to the same regulations as in the community and that prescribing benzodiazepines to detained persons is just as safe as prescribing these medications to those who are not detained.

Introduction

Benzodiazepines (BZD) are one of the most widely prescribed drugs in WEIRD (Western, Educated, Industrialized, Rich, and Democratic) countries [1–4]. They are mainly prescribed to treat sleep disorders, anxiety disorders, epilepsy, and withdrawal from certain substances. Their use has been widely debated.

On one hand, BZD act quickly, are very useful in acute settings, and are generally effective. On the other, they have been associated with various adverse effects, including sedation, psychomotor and cognitive impairment, falls and fractures in the elderly, and dependence [5, 6]. In addition, individuals with substance use disorders frequently abuse BZD, which is harmful, especially when various illicit drugs and opioids are combined with BZD [7]. In view of these problems, most treatment guidelines do not recommend BZD as first-line treatment for anxiety and related disorders and suggest that they should only be used short-term [8–10]. In contrast, several experts have recently pointed out that such recommendations are based on little empirical evidence and that these guidelines do not adequately reflect the risk-benefit ratio when using BZD [3, 4, 11–14].

If use of BZD is controversial in the general population, the situation is even more complex in prisons, where they are commonly prescribed [15, 16]. First, substance use disorders are more common among detained persons than in the general population [17], and smuggling and trafficking of drugs are frequent in prisons around the world [18]. Considering the likelihood of BZD abuse in the context of substance use disorders, it has been suggested that BZD should be entirely avoided or minimally prescribed in prisons [15, 19–21]. However, this is problematic, because prisoners would be deprived of a valid therapeutic option [2, 22].

Another crucial issue associated with prescribing BZD in prisons pertains to an increased risk of behavioral disinhibition, resulting in aggressive behavior [1, 23]. There is a dearth of research on this topic [24], and some studies suggest that the link between BZD use and heightened aggression may only apply to short-acting BZD [25]. Furthermore, violent crime was associated with unusually high doses of BZD [26], whereas there was no increase in impulsive behavior with therapeutic doses of BZD [27]. In a recent study, Albrecht et al [28]. concluded that high BZD doses were not sufficient to increase the risk of violence. These disparate findings make it difficult to understand the role of BZD as a treatment option in the prison setting.

In view of the aforementioned issues and controversies, the present study, conducted in a sample of Swiss detained persons, had two main aims: 1) to ascertain the relationship between BZD prescription and aggressive behavior and behavioral disinhibition in prison; we also aimed to assess the potential effects of the dosage of BZD and duration of their use on aggression and behavioral inhibition during imprisonment; and 2) to investigate whether BZD prescription was associated with using and trafficking illicit and addictive substances.

Materials And Methods

Study design and participants

This retrospective, cross-sectional study was based on the data on 1,206 persons detained in Realta prison, Kanton Grisons, Switzerland. This is an "open" prison (capacity of 120) for sentenced males who work outside the prison and have up to 36 hours of leave per week. Data for the 2010–2015 period were

extracted from the electronic prison database on 1,379 measures (some detained persons were incarcerated multiple times). Approval for conducting the study was received from the Cantonal Research Ethics Committee of Bern (no. 2016 – 01539).

Variables

1. *1. Socio-demographics.* These include age and region of origin.
2. *2. Incarceration and offense variables*. We recorded the length of incarceration (based on the dates of admission and discharge) and offenses leading to imprisonment: violence-related offenses (assaults, sexual crime, other kinds of violence); property-related offenses (theft, robbery, other property offenses); substance-related offenses (violation of drug laws); and other offenses (arson, justice obstruction, manslaughter, trafficking, violation of weapon laws).
3. *3. BZD prescription.* We recorded whether or not detained persons were prescribed BZD during imprisonment. For those who received BZD, duration (in days) of use and dosage (mean dosage expressed as mg/day and converted into diazepam mg equivalents) of BZD were collected. The list of BZD and diazepam mg equivalent conversion guidelines are provided in Supplementary Table 1.
4. *4. Other prescribed medications.* We recorded whether detained persons were prescribed other psychotropic medications (i.e., antidepressants, antipsychotics, methylphenidate, mood stabilizers, or opioid agonists [including heroin used for therapeutic purposes]) and medications for any somatic (non-psychiatric) condition.
5. *5. Punishable behaviors*. Data on the type and frequency of detained persons' punishable behaviors were collected. These were classified into five categories: 1) physical and verbal aggression (assaults and threats made against others), 2) disinhibited, but not directly aggressive behaviors (e.g., slamming doors, swearing), 3) property damage or theft, 4) substance-related offenses (alcohol or illicit drug use or trafficking), and 5) rule transgression (e.g., smoking when not allowed, returning from leave late). We made a binary qualification (presence/absence) for each category.

Statistical analyses

We first computed descriptive statistics for all variables. Then, we tested whether punishable behaviors were associated with BZD prescription.

In the first set of analyses, we used a propensity score matching to minimize the effect of confounding factors and make it possible to compare individuals who received BZD with those who did not receive them. This method is used to estimate the effect of a treatment when relying on observational data and to address the fact that assignment to a treatment is not random. The propensity score matching aims to mimic randomization by matching the treated and untreated groups on a set of predetermined covariables. The propensity score was estimated using a probit regression predicting BZD prescription and including the following factors: age, region of origin (Switzerland/not Switzerland), length of incarceration, type of offense, use of any other psychotropic medication, and use of any medication for somatic diseases. The balancing properties of the propensity score were satisfied. We then matched

groups (BZD/no BZD) using nearest neighbor matching (fill Mahalanobis), allowing multiple neighbors in case of identical propensity scores. The average treatment effect on the treated (ATT) was computed for each punishable behavior used as outcome (sanctions related to physical and verbal aggression, disinhibited, but not directly aggressive behaviors, property damage or theft, substance-related offenses, and rule transgression). Crude and matched associations (before/after propensity score matching) are reported.

In the second set of analyses, we focused on detained persons who received BZD. We computed five logistic regressions, using as predictors mean dosage and duration of BZD prescription and the same outcomes as the first set of analyses. For all these models, we controlled for age, region of origin, length of incarceration, type of offenses, use of any other psychotropic medication, and use of any medication for somatic diseases.

For the propensity score analysis, we computed sensitivity analyses using other methods to match groups (covariate adjustment, inverse probability weighting, and stratification). For the second set of analyses, we performed sensitivity analyses by using the maximum BZD dosage instead of the mean dosage. We also conducted logistic regressions using mean dosage and duration of BZD use coded as zero for detained persons without BZD prescription. Finally, we controlled for the effect of short- versus long-acting BZD. In all cases, the findings were similar to those reported in the Results section.

Analyses were performed with Stata 15 (propensity score estimation: *pscore* with no imposition of common support, propensity matching: *psmatch2* with option "ties").

Results

Descriptive statistics are reported in Table 1. The mean age of detained persons was 33.1 ± 10.4 years. About a third (35.4%) came from Africa and another third (31.4%) from Western Europe. The mean duration of incarceration was 125.1 days.

Table 1

Descriptive statistics and bivariate analyses for socio-demographics, incarceration and offense variables, other prescribed medications, and punishable behaviors.

Variables	Whole sample	Yes (n = 293)	No (n = 1,086)
Socio-demographics			
Age[1]	33.1 (10.4)	35.4 (9.8)	32.5 (10.5)
Region of origin[2,3]			
Asia	1.2 (17)	0.7 (2)	1.4 (15)
Eastern Europe/Balkans	11.6 (160)	8.9 (26)	12.3 (134)
Eastern, Central & South Africa	4.1 (57)	1.4 (4)	4.9 (53)
Latin America	1.7 (23)	1.7 (5)	1.7 (18)
Middle East	6.7 (93)	4.8 (14)	7.3 (79)
North Africa	19.2 (265)	21.8 (64)	18.5 (201)
Switzerland	24.4 (337)	37.2 (109)	21.0 (228)
Western Africa	12.0 (166)	3.1 (9)	14.5 (157)
Western Europe	7.0 (96)	6.8 (20)	7.0 (76)
Unknow/unverified	12.0 (165)	13.7 (40)	11.5 (125)
Prison variables			
Length of incarceration (days)[1]	125.1 (177.4)	157.3 (171.6)	116.4 (178.1)
Type of offense[3]			
Violence[2]	13.1 (180)	15.4 (45)	12.4 (135)
Property[2]	38.7 (533)	54.6 (160)	34.4 (373)
Substance[2]	19.4 (267)	25.3 (74)	17.8 (193)

[1] Means and standard deviations.

[2] Percentages and n.

[3] There were 165 missing values for the region of origin (12.0%) and 40 missing values for type of offenses (2.9%).

[4] Reported for participants with BZD prescription (n = 290).

Variables	Whole sample	Yes (n = 293)	No (n = 1,086)
Other[2]	60.0 (827)	51.2 (150)	62.3 (677)
Medical information			
Benzodiazepine			
Prescription[2]	21.3 (293)	-	-
Duration (no. of days)[1,4]	91.5 (7.0)	-	-
Mean daily dosage (mg/Diazepam equivalent)[1,4]	24.0 (25.0)	-	-
Prescription of other psychotropic medications			
Any[2]	25.0 (345)	68.3 (200)	13.4 (145)
Antidepressant[2]	11.8 /163)	34.5 (101)	5.7 (62)
Antipsychotic[2]	15.7 (217)	43.3 (127)	8.3 (90)
Methylphenidate[2]	2.9 (27)	7.2 (21)	0.6 (6)
Mood stabilizers[2]	1.5 (21)	3.8 (11)	0.9 (10)
Opioid antagonist[2]	4.9 (68)	16.0 (47)	1.9 (21)
Other[2]	0.9 (13)	3.1 (9)	0.4 (4)
Any medication for somatic disease[2]	32.4 (447)	56.3 (165)	26.0 (282)
Sanctions			
Physical and verbal aggression[2]	5.9 (81)	8.5 (25)	5.2 (56)
Disinhibited but not directly aggressive behavior[2]	4.7 (65)	7.9 (23)	3.9 (42)
Property damage or theft[2]	2.8 (38)	3.8 (11)	2.5 (27)

[1] Means and standard deviations.

[2] Percentages and n.

[3] There were 165 missing values for the region of origin (12.0%) and 40 missing values for type of offenses (2.9%).

[4] Reported for participants with BZD prescription (n = 290).

Variables	Whole sample	Yes (n = 293)	No (n = 1,086)
Substance-related offenses[2]	11.7 (161)	19.1 (56)	9.7 (105)
Rule transgression[2]	23.4 (323)	31.7 (93)	21.2 (230)
[1] Means and standard deviations.			
[2] Percentages and n.			
[3] There were 165 missing values for the region of origin (12.0%) and 40 missing values for type of offenses (2.9%).			
[4] Reported for participants with BZD prescription (n = 290).			

A total of 293 (21.3%) detained persons were prescribed BZD during their incarceration (mean duration of BZD use = 91.5 days, mean dosage = 24.0 mg/day diazepam equivalents).

The most common type of punishable behavior was rule transgression (323 instances or 23.4% of the total sample), followed by substance-related offenses (161; 11.7%), physical and verbal aggression (81; 5.9%), disinhibited, but not directly aggressive behaviors (65; 4.7%), and property damage or theft (38; 2.8%).

In the analyses of the unmatched sample, detained persons with and without BZD prescription were significantly different in terms of the factors included in the propensity score and outcomes (left panel of Table 2). In the matched sample, there was no significant difference on any factor included in the propensity score (right panel of Table 2). Thus, BZD prescription was not significantly associated with any kind of punishable behavior.

Table 2
Associations of factors and outcomes with BZD prescription in a sample with and without propensity score matching

	Sample without propensity score matching			Sample with propensity score matching		
	BZD	No BZD	p	BZD	No BZD	p
	n = 293	n = 1,086		n = 253	n = 150	
Variables included in the propensity score						
Age[1]	35.59	32.47	< .001	35.59	35.59	.643
Region of origin (ref. Switzerland)[2]	0.43	0.24	< .001	0.43	0.46	.532
Length of incarceration (no. of days)[1]	158.30	115.37	< .001	158.30	134.51	.122
Prescription of other psychotropic medications[2]	0.67	0.14	< .001	0.67	0.67	.925
Prescription of medication for somatic disease[2]	0.55	0.25	< .001	0.55	0.54	.789
Offence: violence[2]	0.15	0.13	.231	0.15	0.14	.616
Offence: property[2]	0.53	0.33	< .001	0.53	0.56	.423
Offence: substance[2]	0.25	0.18	.018	0.25	0.22	.464
Offence: other[2]	0.52	0.62	.002	0.52	0.53	.722
Outcomes[2]						
Physical and verbal aggression	0.08	0.05	.084	0.08	0.04	.194
Disinhibited but not directly aggressive behavior	0.17	0.10	.001	0.17	0.13	.390
Property damage or theft	0.08	0.04	.001	0.08	0.07	.576
Substance-related offenses	0.03	0.03	.617	0.03	0.02	.390
Rule transgression	0.30	0.21	.003	0.30	0.24	.239

BZD: benzodiazepine.

[1] Means are reported.

[2] Proportions are reported.

With regards to detained persons who were prescribed BZD, the mean dosage of BZD was not associated with any kind of punishable behavior (Table 3). Duration of BZD prescription was significantly associated only with disinhibited, but not directly aggressive behaviors (p = .011).

Table 3. Association between BZD dosage and duration of use and punishable behaviors (n=290).

DV	BZD mean dosage (IV1)		BZD duration (IV2)	
	coef.	p-value	coef.	p-value
Physical and verbal aggression	0.001	.888	0.001	.847
Disinhibited but not directly aggressive behavior	-0.021	.110	0.010	.011
Property damage or theft	0.010	.399	-0.005	.343
Substance-related offenses	0.003	.611	0.002	.291
Rule transgression	0.008	.171	0.001	.522

BZD: benzodiazepine, DV: dependent variable, IV: independent variable

Logistic models were adjusted for age, region of origin (Switzerland/not Switzerland), length of incarceration, type of offenses, prescription of any other psychotropic medication, and prescription of any medication for somatic diseases.

Discussion

The main aim of the present study was to investigate the effects of BZD prescription on aggressive behaviors and behavioral disinhibition in a Swiss prison. When controlling for potentially confounding variables, we did not find any association between BZD prescription and punishable behaviors that would reflect an increase in aggressiveness or behavioral disinhibition. This suggests that control variables might have captured a previous tendency towards aggressive behavior (reflected by the type of offenses) and psychiatric disorders associated with aggressiveness or disinhibited behaviors (reflected by the prescription of other psychotropic medications). This finding is in line with studies showing that therapeutic doses of BZD are not associated with heightened aggressive behavior [27, 28], but it is in contrast to other research that reports an association between use of BZD and aggressive behavior [1, 23]. Importantly, we also found no association between the dosage of BZD and duration of their use and almost all kinds of punishable behaviors.

The only significant result was that use of BZD for longer periods of time might increase the likelihood of engaging in disinhibited, but not directly aggressive behaviors. However, the effect size of this finding was very small: with an increase in the duration of BZD use by one day, detained persons were 1.00 times more likely to exhibit disinhibited, but not directly aggressive behaviors.

The second aim of the study was to investigate whether BZD prescription was associated with using and trafficking illicit or addictive substances during imprisonment. We found that detained persons taking BZD were not more likely to commit offenses involving illicit or addictive substance use or trafficking. This did not change when we examined the dosage and duration of BZD use, which suggests that taking BZD even in higher dosages and over a longer period of time does not seem to lead to substance-related offenses in the prison setting. This finding has important implications because prescribing BZD in prisons is often avoided on the grounds of their presumed greater abuse potential [19, 20]. However, abuse of BZD usually occurs in individuals with a history of substance use disorders; without this history, BZD may be administered safely even in higher dosages and for a relatively long period of time (on average, three months in our sample), with no risk that such use would inevitably lead to other substance abuse [29]. Our findings lend support to this notion in the prison setting.

Our study has also revealed other important findings about the use of BZD in the prison setting. The proportion of detained persons who were prescribed BZD (21.3%) is by no means negligible. Moreover, when compared with detained persons who were not prescribed BZD, those using BZD were also prescribed significantly more often all other classes of psychotropic agents and medications for general medical conditions, which suggests that they had more mental health and general medical problems. A poorer mental and physical health of these detained persons indicates their greater need for adequate healthcare.

Following the principle of the equality of care, prison populations should benefit from effective and evidence-based treatments that are available in the community. In the context of our study, this means that access to BZD in the prison setting should be subject to the same regulations as in the community [2, 22]. The same applies to other psychotropic medications, as well as psychological interventions for mental disorders. It is important to acknowledge that there are very few alternatives to psychotropic medications in the prison system [30] and that treatment of many mental health issues should not only rely on medications such as BZD.

Limitations

This study has a number of limitations. First, it was based on associations and was conducted retrospectively, which precludes us from making inferences about any causal relationship. Second, punishable behaviors recorded by the prison administration were the only indicator of aggressive and disinhibited behavior, and we had no access to any information about punishable behaviors that were concealed or undetected. Future studies should be conducted prospectively and use instruments for assessing irritability, anger, behavioral disinhibition and aggressiveness. Third, our findings are based on a sample of male detained persons in a Swiss setting and it is uncertain to what extent they can be applied to female detained persons in another country. Fourth, there were no data on psychiatric diagnoses and reasons for prescribing BZD, which might have been helpful to better understand and contextualize the risk of aggressive behavior and disinhibition. Finally, prescribing any medication does

not necessarily mean that it will be taken as prescribed, and we have no way of knowing whether detained persons were actually using BZD as prescribed.

Conclusion

Detained persons are a vulnerable population with a high burden of psychiatric and general medical morbidity; they should receive appropriate, timely and evidence-based treatment without institutional barriers to treatment access. Our findings make a significant contribution to the literature in terms of suggesting that prescribing BZD to detained persons is just as safe as prescribing these medications to those who are not detained. More specifically, we did not find support for the notions that BZD increase aggressive or disinhibited behavior in detained persons or that they increase the risk of substance abuse in this population. As with other pharmacological agents, BZD should be used carefully and cautiously in the prison setting, along with evidence-based psychological interventions.

Declarations

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