Prescribed Medication Availability and Deliberate Self-Poisoning: A Longitudinal Study

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ABSTRACT

Objective: The availability of prescribed medication to patients who engage in deliberate self-poisoning (DSP) is not known, and it is not clear whether patients choose drugs prescribed to them for self-poisoning. The objectives of this study were to investigate (1) prescribed medication availability in DSP patients compared to the general population, (2) whether patients use their prescribed medication in their DSP episodes, (3) differences between patients who ingest prescribed medication and those who do not, and (4) the time between the last collection of prescribed medication used for DSP and the DSP episodes.

Method: The design was longitudinal. We included 171 patients admitted for DSP to 3 hospitals in Eastern Norway between January 2006 and March 2007. Data on patients' prescriptions prior to admission were retrieved from the Norwegian Prescription Database (22.5 months of observation time). The primary outcome measure was type and amount of drugs ingested in the DSP episode.

Results: DSP patients had a much greater prescribed medication load compared to the general population, with a mean of 30 prescriptions collected in the year prior to DSP. In total, 77.2% of patients ingested drugs that they had collected, whereas 25% of patients used drugs collected the week prior to admission. The tendency to ingest collected drugs increased with age (OR = 1.1, 95% CI = 1.01 to 1.11, $P = .01$). Patients who collected sedatives were more likely to use these for self-poisoning than patients who collected antidepressants.

Conclusions: The much greater medication load of DSP patients is particularly important given their tendency to ingest their prescribed medication in self-poisoning episodes. The study indicates that timing of collection of medication prior to an episode is less important than general medication load. More attention should be directed to the total medication load for individuals at risk of self-harm.

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A key strategy in preventing suicidal behavior is to limit the availability of means for fatal and nonfatal episodes of deliberate self-harm (DSH).[1] This strategy particularly applies to deliberate self-poisoning (DSP). Because approximately 90% of DSH episodes that present in hospitals involve deliberate self-poisoning (DSP),[2] research has focused on the effect of limiting access to medication on rates of nonfatal and fatal DSP, for instance by reducing pack sizes for analgesics.[3–12]

A basic assumption in studies inferring causality from changes in prescribing and patterns of drug consumption in both fatal and nonfatal episodes of DSP is that patients choose to use medication prescribed for them in their DSP acts.[13] However, research on the access that patients have to prescribed medication is scarce. This scarcity is surprising, given that DSP patients are at risk of repeat episodes of DSP[14] and suicide.[15–17] Studies using standardized interviews suggest that over 90% of DSP patients have evidence of psychiatric disorder at the time of presentation.[18,19] Moreover, the significantly elevated risk for premature death from causes other than suicide among patients who deliberately poison themselves, with excess mortality found for most somatic conditions,[20,21] indicates a high prevalence of physical illnesses in this patient group, as confirmed in a large-scale study of DSH patients from 11 European countries.[22] Together, these findings indicate an increased likelihood that individuals at risk of DSP are prescribed medication in larger quantities and more frequently than the general population.

To our knowledge, only 1 study has investigated whether DSP patients use medication prescribed for them in their DSP episodes. However, this study was limited to patients who ingested prescribed medication in their DSP episodes, and only psychotropic medication and analgesics were included. From a preventive point of view, it would be useful to focus on DSP patients who have access to prescribed medication, and to investigate prospectively what differentiates patients who use these for DSP from patients who do not use their prescribed medication in their DSP episodes.

The aims of the present study were to investigate (1) prescribed medication availability in DSP patients compared to the general population, (2) whether patients use their prescribed medication in their DSP episodes, (3) differences between patients who ingest prescribed medication and those who do not in their DSP episodes, and (4) the time between the last collection of prescribed medication used for DSP and the DSP episodes.

METHOD

Design

Medication load and the extent to which patients ingest medication collected prior to DSP in their DSP episodes were investigated in a longitudinal design comprising questionnaire as well as registry data.

Data Collection

The patients were aged 18 years or older who had engaged in DSP and had presented to 3 major hospitals in Eastern Norway (Ulleval University Hospital, Oslo; Innlandet Hospital Trust, Gjoevik; and Vestre Viken Hospital Trust, Baerum) between January 2006 and March 2007. These are

all somatic hospitals treating most cases of DSP. Patients treated without admission or referred directly from outpatient units (ie, general practitioner or psychiatric outpatient clinics) to psychiatric wards were not included in the study. *Deliberate self-poisoning* was defined as the intentional self-administration of more than the prescribed or recommended dose of any medication in the context of evidence that the act was intended to harm the patient, although not necessarily to result in death.[3] Patients who were intellectually or developmentally disabled, psychotic, or non–Norwegian speaking were excluded, as were patients admitted for accidental medication overdoses. The medical staff at the hospitals recruited the DSP cases to participate in the study. Each patient completed a questionnaire, with the majority completing them within the day following hospital presentation. Trained health personnel assisted the patients in completing the questionnaire.

- Deliberate self-poisoning (DSP) patients have access to large amounts of prescribed medication and tend to ingest prescribed medication in their DSP episodes.
- Current evidence best supports assessing the total medication load for the patients before commencing new treatment and being particularly vigilant for patients with a history of DSP.
- In their assessment, clinicians should include availability of drugs in the household and encourage potentially suicidal patients to get rid of old drugs.

Clinical Points

Measures

Prescription registry data. Data on patients' prescription records were retrieved from the Norwegian Prescription Database (NorPD) for the period between the beginning of 2004 and the date of admission, based on the patients' personal identification numbers. The NorPD is a population database covering all prescriptions collected in Norway at an individual level. The database monitors medication that is dispensed by prescription only. In this study, medication that was available both by prescription and in smaller quantities without prescription (eg, nonopioid analgesics) was defined as over the counter (OTC).

By *medication load*, we refer to the total amount of prescribed medication collected by an individual over a specified period of time. The measurement unit *defined daily dose* (DDD) is defined as the assumed mean maintenance dose per day for a drug used for its main indication in adults (WHO Collaborating Centre for Medication Statistics Methodology, http://www.whocc.no). Drugs were classified according to the Anatomic Therapeutic Chemical (ATC) classification system (http://www.whocc.no).

Medication load in the general population (aged ≥ 20 years) was estimated based on NorPD data on the number of users and turnover by dosage per medication per year in the 3 catchment counties, thereby enabling the estimation of annual DDD per inhabitant per type of medication.

All collected medication was included in the analyses. Psychotropic drugs were divided into the following subgroups: antidepressants (ATC code N06A), neuroleptics (ATC code N05A), sedatives (ATC codes N05B and N05C), antiepileptics (ATC code N03A), opioid analgesics (ATC code N02A), nonopioid analgesics (ATC codes N02B and M01A), and carisoprodol (ATC code M03BA72). One of the main indications for antiepileptics in addition to epilepsy is affective disorder; however, only 2 patients reported suffering from epilepsy. In analyses comparing drugs collected prior to DSP and drugs used for DSP, antidepressants (ATC code N06A), lithium (ATC code N05AN) and antiepileptics (ATC code N03A) were collapsed into 1 category referred to as mood stabilizers. Because of its frequent use in DSP,[23] carisoprodol is considered a category of its own.

Calculations of the number of people who had collected prescribed medication and then went on to use it in their DSP episode were based on equal time periods, ie, the maximum observation time between the start of the registry in January 2004 and the time of admission of the first patient.

Questionnaire data. In the current study, the following information from the patient self-report questionnaires was used: whether premeditation was involved, whether the patient had engaged in previous deliberate self-harm, and whether the patient had epilepsy. Patients also completed the Beck Depression Inventory-Short Form (BDI-SF), a 13-item measure of level of depression.[24]

Hospital data. The outcome measure was drugs ingested in the DSP episode, validated by hospital data, ie, a physician consecutively made a clinical evaluation of the medication involved in each episode based partly on clinical judgment and information from the patient and partly on laboratory findings (ie, blood samples) when necessary. The *main agent* was defined as the substance considered by the physician to be most toxic in the amount taken, whereas other ingested agents were defined as *additional agents*.

For the first aim, data from the NorPD were used; for the second aim, data from the NorPD were used in conjunction with hospital data; for the third aim, questionnaire data were used; and for the fourth aim, questionnaire and NorPD data were used.

Statistical Analyses

We used logistic regression analyses with concordance between medication collected prior to the episodes and medication ingested in the DSP episodes as an independent variable.

Ethics

The study was approved by Norway's East Regional Ethics Committee, the Privacy Ombudsman for Research, and the Data Inspectorate. Written informed consent was obtained from all participating patients.

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RESULTS

The whole sample was included in analyses regarding medication availability. Because hospital data on drugs ingested in the DSP episode were available for patients from 1 hospital, only patients from this hospital were included in analyses regarding concordance between medication used for DSP and prescription records.

All 286 eligible DSP patients treated for 378 deliberate self-harm episodes during the study period were identified consecutively. Of the 286 patients, 177 (67.8% female and 32.2% male) consented to the researchers' having access to information about prescriptions collected by them, yielding a 61.9% total response rate for registry data. For 3 patients, matching with registry data was not possible, and 3 patients turned out to be admitted with methods other than DSP, yielding a sample of 171 patients for whom registry data were obtained. Attrition analyses showed no sex differences between participating patients and those who declined to participate ($P = .5$), whereas older age predicted attrition (mean age in sample was 38.6 years, SD = 14.7, versus 43.7 years, SD = 19.4, in nonparticipants, $P = .02$).

Of the 117 initially eligible patients from the hospital for whom information was available on medication used for DSP, 85 patients consented to access to information about prescriptions dispensed to them, yielding a 72.6% response rate for registry data. After excluding 1 patient for whom it was not possible to match with registry data, there were 84 patients for whom registry data were obtained. The mean age of the patients was 37 years (SD = 14.8), which did not differ significantly from the mean age of participants from the 2 other hospitals ($P = .2$). The mean age of the population in the catchment counties was 38.4 years.

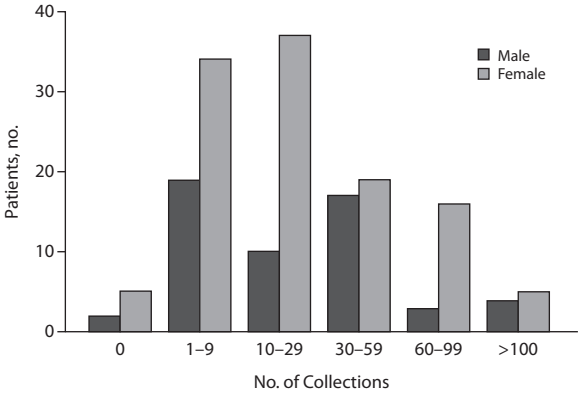
1. Prescribed Medication Availability in DSP Patients Compared to the General Population

The 171 patients overall collected 5,166 prescriptions in the year prior to the DSP episode, yielding a mean of 30.2 prescriptions per patient. Gender did not predict number of prescriptions ($P = .45$), whereas age was moderately correlated with number of prescriptions collected in the year prior to admission ($r = 0.3$, $P < .01$). The frequency of patients in each category of number of drugs is shown in Figure 1.

Of the 5,166 prescriptions collected in the year prior to DSP, 67.7% (3,501) were for psychotropic medication, and the remaining 32.3% (1,665) were for other types of medication. In terms of total DDD, antidepressants were the largest category of psychotropic drugs (36.6% of all psychotropic medication collected), followed by sedatives (32.4%), opioid analgesics (8.6%), neuroleptics (8.2%), antiepileptics (7.6%), nonopioid analgesics (4.5%), and carisoprodol (1.9%).

The nonpsychotropic medication consisted of a wide variety of subgroups of drugs, of which the largest in terms of total DDD was antihistamines (13.9% of all other medication collected in this period, ATC code R06A), statins (8.8%, ATC code C10A), antithrombotic agents (7.1%, ATC code B01A), contraceptives (6.5%, ATC code G03A), adrenergics (5.6%, ATC code R03A), and medication for peptic ulcer and gastroesophageal reflux disease (5.4%, ATC code A02B). Compared with prescription figures in 2005 for the catchment counties, prescription rates in the patient sample were markedly higher than in the general population. The mean DDD per patient was highly elevated across all categories of psychotropic medication compared to corresponding figures for the general population of the catchment counties. As shown in Table 1, this was particularly pronounced for neuroleptics, the mean DDD per patient in the sample being 18.3 times higher than the corresponding figure for the general population, followed by antiepileptics (15.4 times higher) and antidepressants (14.7 times higher). As shown in Table 1, sex-specific analyses showed that this tendency was more pronounced for male than female patients for antidepressants and antiepileptics.

Figure 1. Number of Collections of Prescribed Medication From Pharmacies by Patients With Deliberate Self-Poisoning (n = 171) 1 Year Prior to the Deliberate Self-Poisoning Episode



Whereas DDD per patient of antihistamines, medication for gastroesophageal reflux disease, and adrenergics were elevated compared to DDD per person in the population (3.2, 2.8, and 2.0 times, respectively), this was not the case for other nonpsychotropic medication. Subgroup-specific analyses of antihistamine prescriptions showed that 60.7% of all prescriptions of antihistamines in the sample were accounted for by alimemazine (ie, Vallergan, ATC code R06AD01), for which one of the main indications is sleep disturbance. The mean alimemazine DDDs collected during the year prior to the DSP episode was 26.5 times higher than the corresponding number for this drug in the general population. In comparison, the mean DDD for cetirizine (ie, Zyrtec, ATC code R06AE07), an antihistamine applied predominantly for allergy, was only 2.1 times higher than in the general population. As shown in Table 1, the elevated sample/population ratio of alimemazine was far more pronounced for male than female participants in the sample.

2. Do DSP Patients Use Medication Prescribed for Them in Their DSP Episodes?

The patients ingested a mean of 2.5 different medicines in the DSP episodes. Overall, 92.9% (n = 78) had ingested

Table 1. Medication Load[a] for Patients (n = 171) 1 Year Prior to the Index Deliberate Self-Poisoning Episode Compared to the General Population[b]

	Sample DDD, Mean (SD), Dosage/Person/y		General Population DDD, Mean, Dosage/Person/y		Ratio		
Medication Category	Male (n = 55)	Female (n = 116)	Male (447,166)	Female (474,291)	Male	Female	Total
Psychotropic medication							
Neuroleptics	62.3 (200.0)	73.4 (164.7)	4.0	3.6	15.5	20.2	18.3
Antiepileptics	90.8 (232.7)	52.5 (156.1)	4.2	4.2	21.6	12.4	15.4
Antidepressants	279.4 (403.7)	324.1 (441.4)	15.1	29.0	18.6	11.2	14.7
Nonpsychotropic medication							
Antihistamines	69.0 (212.3)	74.8 (168.9)	28.0	16.2	2.5	4.6	3.2
Alimemazine	33.5 (191.3)	27.2 (87.4)	0.7	1.5	45.9	18.4	26.5
Cetirizine	18.3 (78.6)	12.8 (57.8)	5.1	8.7	3.6	1.5	2.1
Gastroesophageal reflux disease	14.4 (73.1)	35.1 (138.4)	10.4	9.8	1.4	3.6	2.8
Adrenergics	28.5 (96.3)	29.9 (113.0)	16.4	12.8	1.7	2.3	2.0

[a]The total amount of prescribed medication collected by an individual over a specified period of time.
[b]Medication load in the general population (aged ≥ 20 y) was estimated based on data from the Norwegian Prescription Database.
Abbreviation: DDD = defined daily dose.

Figure 2. Frequency With Which Specific Types of Medication Were Ingested by Patients (n = 84) in Their Deliberate Self-Poisoning Episodes by Main and Additional Agents

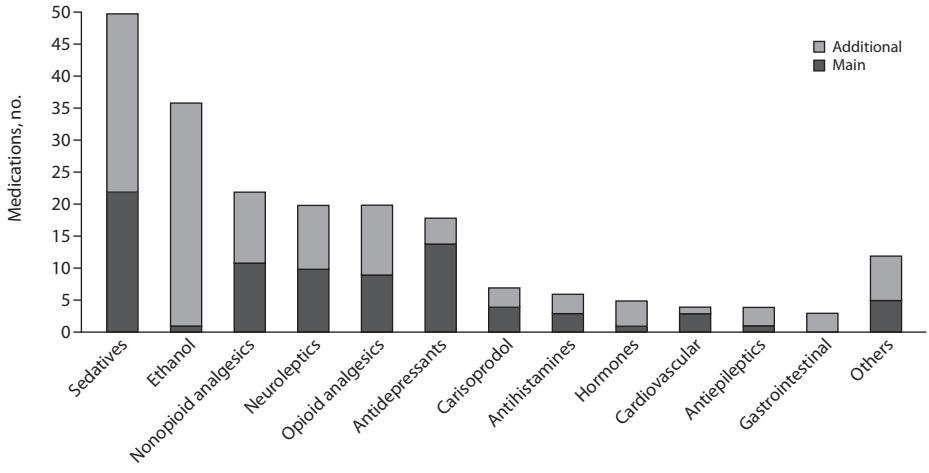


Table 2. Number of Patients Who Ingest Medication Prescribed to Them in Their Deliberate Self-Poisoning Episode, by Medication Category, % (n)

Patients	Sedatives	Neuroleptics	Carisoprodol	Opiates	Mood Stabilizers
Collected and ingested	59.6 (28)	44.4 (12)	44.4 (4)	40.0 (12)	32.0 (16)
Collected, not ingested	40.4 (19)	55.6 (15)	55.6 (5)	60.0 (18)	68.0 (34)
Total	100 (47)	100 (27)	100 (9)	100.0 (30)	100.0 (50)

prescription-only medication as either the main agent or additional agents, whereas 5.9% (n = 5) had taken OTC medication and 1.2% (n = 1) nonpharmaceutical agents only. As shown in Figure 2, sedatives and ethanol were by far the most frequently ingested drugs, followed by nonopioid analgesics, neuroleptics, opioid analgesics, and antidepressants.

Concordance between collected medications and medications ingested in the index episode was based on equal time periods corresponding to the maximum observation time defined by the start of NorPD January 1, 2004, and admission date of the first included patient, calculated to 682 days (ie, 22.5 months). Of the 84 patients included in this part of the study, 79 had collected prescribed medication during this period. Of these, 74.7% (n = 59) ingested 1 or more of these drugs in the DSP episode, whereas 20.3% (n = 16) ingested prescribed medication that they had not collected themselves, and 5.1% (n = 4) ingested OTC medication. Patients ingesting prescribed medication they had not collected themselves mainly used sedatives and opioid analgesics.

As shown in Table 2, a third of patients collecting antidepressants or mood stabilizers during the year prior to the DSP episode ingested them in the episode, compared to 60%

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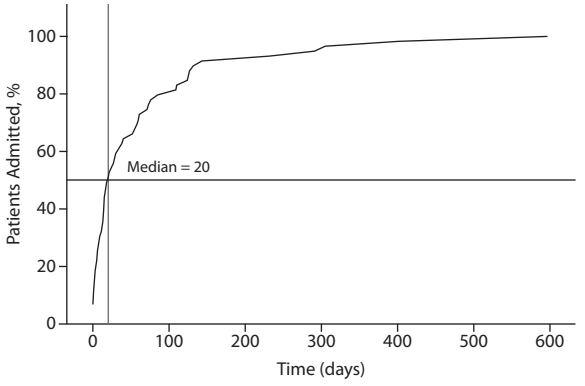
Figure 3. Relationship Between Most Recent Collection of Medication and Cumulative Percentage of Patients (n = 79) Admitted for Deliberate Self-Poisoning



(n = 28 of 47) for sedatives, 44% (n = 12 of 27) for neuroleptics and 40% (n = 12 of 30) for opioid analgesics. Analyses conducted for both shorter (ie, 6 months) and longer (ie, 18 months) time periods prior to DSP showed the same pattern.

3. Are There Differences Between Patients Who Ingest Prescribed Medication in DSP Episodes and Those Who Do Not?

The extent to which medication prescribed for individuals was ingested by them in their DSP episodes significantly increased with age (OR = 1.1, 95% CI, 1.01–1.11; *P* = .01). Because this analysis was based on increase per year of age, this represents a strong effect. This effect remained significant when controlled for sex, previous episode of deliberate self-harm, and premeditation. Neither sex (OR = 0.5, 95% CI, 0.15–1.7; *P* = .29), previous DSH (OR = 1.00, 95% CI, 0.30–3.3; *P* = 1.0), nor premeditation (OR = 1.2, 95% CI, 0.47–3.1; *P* = .8) was predictive in either univariate or multivariate logistic regression analyses.

4. Time Between the Most Recent Collection of Medication Used for DSP and the DSP Episode

One-half (50%) of the patients had collected the last prescription that they later used in the DSP episode within the 3 weeks prior to admission (Figure 3). Patients whose collection of medication used for DSP was temporally close to the DSP episode (≤ 3 weeks) did not differ significantly from patients who collected their medication earlier in terms of age (OR = 1.00, 95% CI, 0.96–1.06; *P* = .86) or sex (OR = 0.85, 95% CI, 0.28–2.6; *P* = .78), albeit depression level at the time of admission did differ significantly (OR = 0.2, 95% CI, 0.05–0.84; *P* = .03).

DISCUSSION

1. Prescribed Medication Availability in DSP Patients Compared to the General Population

The highly elevated rates of psychotropic medication collection in DSP patients compared to the general population are in keeping with the known high levels of psychiatric morbidity, especially affective disorders, in DSP patients in general.[18,25] Sedatives were also commonly prescribed, but the indications for them are likely to have been diverse and included anxiety and sleep disorders. The connection between prescribing of sedatives and DSP has been debated by other authors, especially in terms of whether prescribing sedatives might increase the risk of deliberate self-harm.[26]

2. Do DSP Patients Use Medication Prescribed for Them in Their DSP Episodes?

The frequent use of prescribed medication for DSP episodes is in line with the findings of Tournier and colleagues[13] and is generally indicative of high loads of somatic and psychiatric morbidity. Interestingly, although ethanol featured as the second largest group of agents ingested in DSP, it was used mostly as an additional agent in the act. This finding is in keeping with the proposition that ethanol increases propensity to self-harm, as has been suggested by other authors.[27]

The majority of individuals who took overdoses of prescription medication ingested medication prescribed for themselves. However, one-fifth took medication prescribed for other people. This finding could indicate that, when faced with a crisis, some people think of a self-harm act impulsively and take whatever is most easily accessible, independent of whether it was prescribed for them or for others. This would be in keeping with both our finding and that of Deisenhammer et al[28] that the time interval between contemplating DSP and ingesting medication is often extremely short.

3. Are There Differences Between Patients Who Ingest Prescribed Medication and Those Who Do Not?

Intriguingly, our findings do not support the notion that patients who ingest medication prescribed for other people or OTC medication are more impulsive in their DSP acts than patients who ingest medication prescribed for themselves. An alternative explanation is that the former group might have acquired prescription medication illegally. This is particularly likely to be the case with benzodiazepines and opioid analgesics, which are readily accessible illegally. It is not clear why patients who collect and then ingest medication prescribed to them some time ago tend to be more depressed than patients who ingest more recently collected medication. This finding might reflect hoarding of medication by more depressed and suicidal patients with the possibility of a future overdose in mind or perhaps poorer compliance and hence greater levels of depression in the former group.

The increasing tendency for patients to use their prescribed medication for DSP is likely to reflect increased access to medication with age as a consequence of increased morbidity, supported by the finding that the total medication load increased with age in this study.

The tendency for patients to be more likely to ingest sedatives than antidepressants available to them through prescription in their DSP episodes has several possible explanations, including that people at risk anticipate different effects of overdose of the 2 groups of drugs and that sedatives might increase the risk of self-harm.[26]

4. Time Between the Most Recent Collection of Prescribed Medications Used for DSP and the DSP Episode

Our data suggest that the time between collection and ingestion is less important than the total prescribed medication load available to these patients. Thus, total medication load seems to be more important when considering DSP risk than single prescriptions.

A main strength of the present study is that it is based on a precise measure of access to prescription-based medication at an individual level. In contrast to other studies, the data have been analyzed longitudinally, thus enabling us to investigate the extent to which accessible prescription medication is used for DSP. Furthermore, medication ingested at the DSP episode was evaluated consecutively by a physician. Finally, rather than using data on prescriptions, we have looked at what types of medication were actually collected and hence available. However, the study has several limitations. First, while it includes patients presenting to 3 hospitals, analyses of concordance between prescription and drugs ingested in DSP are based on patients from 1 hospital. Secondly, analyses of prescriptions taken in overdose do not include OTC medication. Thirdly, due to lack of a control condition, we cannot reach conclusions regarding relative risks of DSP for different types of medication. Fourthly, selection bias might limit the generalizability of the findings. Because only patients who were admitted to hospital for their DSP were included, the findings cannot be generalized to less severe cases of DSP that are not admitted (which are relatively few) or other types of attempted suicide. Moreover, the higher mean age among persons declining to participate might indicate a more chronic sample. However, our data do not suggest this.

CONCLUSIONS

Our data show that DSP patients have a much greater medication load compared to the general population and that the majority of DSP patients then ingest prescribed medication they have collected in their DSP episodes. Our data might challenge the notion that a single prescription bears significance in endangering vulnerable individuals with respect to suicidal acts and suggest that more focus should be directed to the total medication load for high-risk subjects, particularly given the high number of patients taking overdoses of prescribed medication. Measures to prevent DSP could include assessing the range and amount of current drugs available in the household of a patient about to commence antidepressant treatment or other treatments indicative of risk for DSP and, when necessary, encouraging patients to dispose of old unwanted medication.

Drug names: carisoprodol (Soma and others), cetirizine (Zyrtec and others), lithium (Lithobid and others).
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