



Original article

Hospital admission profile related to poisoning by, adverse effect of and underdosing of psychotropic drugs in England and Wales: An ecological study

Tamara Al-Daghastani^{a,*}, Abdallah Y. Naser^b^a Department of Medical Allied Sciences, Al-Balqa Applied University, Al-Salt, Jordan^b Department of Applied Pharmaceutical Sciences and Clinical Pharmacy, Faculty of Pharmacy, Isra University, Amman, Jordan

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ABSTRACT

Background: Drug poisoning is considered as one of the main principal reasons for acute care hospitals admissions, and it places a significant burden on emergency medical services resources. The aim of this study is to examine the trend of hospital admission due to poisoning by psychotropic drugs and prescriptions of psychotropic medications in England and Wales in the past 21 years.

Method: Hospital admission data from the Hospital Episode Statistics database in England and the Patient Episode Database in Wales were used in this ecological study. For the period from April 1999 to March 2020, hospital admissions data relating to poisoning by, classified by adverse effects of, and underdosing of psychiatric medications were extracted. Data on CNS drug prescriptions was collected for the time period 2004–2020.

Results: During the study period, hospital admission rate increased by 19.9% [from 39.94 (95% CI 39.40–40.48) in 1999 to 47.90 (95% CI 47.34–48.45) in 2020 per 100,000 persons, trend test, $p < 0.05$]. The most common reason of poisoning by psychotropic drugs that lead to hospital admissions was unspecified poisoning by antidepressants (accidental (unintentional), intentional self-harm, assault, as adverse effect, and under-dosing), which accounted for 48.9% of the total number of admissions. CNS medications prescription rates increased by 56.4% [from 247629.78 (95% CI 247593.18–247666.39) in 2004 to 387372.48 (95% CI 387333.41–387411.55) in 2020 prescriptions per 100,000 persons, trend test, $p < 0.001$]. The most commonly prescribed CNS medications prescriptions were analgesics, antidepressant, antiepileptic, and hypnotics and anxiolytics, which accounted for: 35.0%, 28.7%, 10.0%, and 9.5%, respectively. During the study

period between 2004 and 2020, the overall medications prescribing rate showed to be very strongly and positively correlating the hospital admissions rate with the overall poisoning by psychotropic drugs ($r = 0.799$; $p \leq 0.001$).

Conclusion: Over the last two decades, there has been a parallel increase in the hospitalization rate for psychotropic drug poisoning and the prescription rate for CNS medications. Future research should focus on identifying high-risk populations who are more prone to psychotropic drug poisoning.

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1. Introduction

The drug therapy and pharmacy domain has witnessed many improvements over the past decades, which have led to an

expansion in medicine used around the world and a notable patient care advancement. However, the growth of drug use is increasing the drug-related problem (DRP) (Alzahrani et al., 2017, Ayalew et al., 2019).

DRP is defined as a condition or event that includes a patient's drug therapy that potentially, or really, intervenes in the performance of the best result (Roxburgh and Degenhardt 2008, Cipolle et al., 2012, Richardson et al., 2014). Eight types of DRP endorsed by the American Society of Health-System Pharmacists; drug non-compliance, drug without indication, indicators without drugs, drug errors, adverse drug reactions, drug interactions, failure to receive medication, and drug poisoning (H-S. 1993, H-S.

* Corresponding author.

E-mail address: t.aldaghastani@bau.edu.jo (T. Al-Daghastani).

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1996, Ayalew et al., 2019). Over the past few decades, DRPs hospital admissions were significantly increased (Nivya et al., 2015). DRPs incidence ranged during hospital admissions from 15.1% to 16.9%, and approximately 5.3% of worldwide hospital admissions were due to DRPs (De Vries et al., 2008, Kongkaew et al., 2008, Miguél et al., 2012).

Drug poisoning and overdose were the major DRPs (Bakhaidar et al., 2015). Several factors affect drug poisoning and overdose, like the amount, nature, and route administration of the drug, and socio-psychological burdens, lifestyle, and age (Albert et al., 2015, Bakhaidar et al., 2015, Chala et al., 2015). Many studies have observed that the plurality of poisoning cases among children was accidental, while were intended among adults (Oguche et al., 2007, Moazzam et al., 2009, Bakhaidar et al., 2015). The most prevalent concerned drugs were antidepressants, antipsychotics, and painkillers (Mittal et al., 2013).

Antipsychotics, mood stimulants and stabilizers, hypnotics, antidepressants, and anxiolytics drug categories are used to treat diverse mental health conditions and are described as psychotropic agents (Zohar et al., 2015). Psychotropic agents are an increasing reason for death and poisoning. In specific, the main reason for increased hospital admissions were benzodiazepines (Coben et al., 2010, Armstrong et al., 2012).

The principal reason for acute care hospital admissions is drugs poisoning, and it places a significant burden on emergency medical services resources. Besides, more than 15% of all intensive care unit's admissions are due to drug poisoning (McGrath 1989, Schwake et al., 2009, Okumura et al., 2012). In England, there were 7027 drug-related mental and behavioural disorders hospitalizations in 2019/2020, 21% higher than drug-related mental and behavioural disorders hospitalizations in 2009/2010 (National Health Services 2021). Furthermore, there were 16,994 hospitalizations due to poisoning by drug misuse in England during 2019/2020 (National Health Services 2021).

It is necessary to recognize the current trend of psychotropic agents related hospital admission to evaluate the extent of this health problem and present health care providers with evidence to promote approaches for preventing and lessening such health problem. Accordingly, this research aimed to study the trend of hospital admissions due to poisoning by psychotropic drugs and prescriptions of psychotropic medications in England and Wales in the past 21 years.

2. Methods

2.1. Study sources and the population

This was an ecological study using publicly available data extracted from the Hospital Episode Statistics (HES) database in England (Health and Social Care Information Centre (HSCIC) 2021) and the Patient Episode Database for Wales (PEDW) for the period between April 1999 and April 2020 (NHS Wales Informatics Service 2021). They've previously been utilized to look into the trends of various health outcomes and the associated hospital admissions (Naser et al., 2018, Alanazi et al., 2021, Hemmo et al., 2021, Naser et al., 2021a, Naser et al., 2021b, Al-shehri et al., 2022, Alrawashdeh et al., 2022, Sweiss et al., 2022a, Sweiss et al., 2022b). The HES and PEDW databases contain hospital admission data for patients with poisoning by psychotropic drugs, not elsewhere classified from all age groups which are subdivided into four categories; below 15 years, 15–59 years, 60–74 years, and 75 years and above. We identified poisoning by psychotropic drugs, not elsewhere classified-related hospital admissions using the Tenth Revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10) 5th Edition (used

by National Health Service (NHS) to classify diseases and other health conditions) (National Health Services 2022). All diagnostic codes for poisoning by psychotropic drugs, not elsewhere classified (T43) were used to identify all hospital admission related to different types of poisoning by psychotropic drugs, not elsewhere classified in England and Wales. HES and PEDW databases record all hospital admissions, Outpatients, and Accident and Emergency (A&E) activities performed at all National Health Service (NHS) trusts and any independent sector funded by NHS trusts. Data for hospital admissions in England and Wales are available from the years 1999/2000 onwards. Available data include patient demographics, clinical diagnoses, procedures, and duration of stay. HES and PEDW data are checked regularly to ensure their validity and accuracy (Health and Social Care Information Centre (HSCIC) 2021, NHS Wales Informatics Service 2022). To calculate the yearly hospital admission rate for poisoning by psychotropic drugs, we collected mid-year population data for the period between 1999 and 2020 from the Office for National Statistics (ONS) (Office for National Statistics (ONS) 2022).

For the accessible period of April 2004–March 2020, statistics on psychotropic medicine prescriptions in England and Wales were taken from the Prescription Cost Analysis database (National Health Service 2022).

2.2. Ethical approval

De-identified data on hospital admissions, mortality, and population is available to the public. As a result, it was classified as an exempt category.

2.3. Statistical analysis

Hospital admission rates with 95% confidence intervals (CIs) were calculated using the finished consultant episodes of poisoning by psychotropic drugs-related admission divided by the mid-year population. Similar procedure was followed to calculate CNS medication prescription rates. The trends in hospital admissions and medication prescriptions were assessed using a Poisson model. Correlation between hospital admissions rate and medication prescriptions rate was estimated using Pearson Correlation Coefficient. All analyses were conducted using SPSS version 27 (IBM Corp, Armonk, NY, USA).

3. Results

The total annual number for poisoning by psychotropic drugs hospital admissions for various reasons increased by 37.4% from 20,825 in 1999 to 28,605 in 2020, reflecting an increase in hospital admission rate of 19.9% [from 39.94 (95% CI 39.40–40.48) in 1999 to 47.90 (95% CI 47.34–48.45) in 2020 per 100,000 persons, trend test, $p < 0.05$].

The most common reasons of poisoning by psychotropic drugs that lead to hospital admissions were unspecified poisoning by antidepressants (accidental (unintentional), intentional self-harm, assault, as adverse effect, and under-dosing), poisoning by tricyclic and tetracyclic antidepressants, unspecified poisoning by antipsychotics and neuroleptics (accidental (unintentional), intentional self-harm, assault, as adverse effect, and under-dosing), and poisoning by psychostimulants with abuse potential which accounted for 48.9%, 20.9%, 13.4%, and 8.3%, respectively (Fig. 1).

During the past 21 years, poisoning by psychotropic drugs lead to an increase in hospital admissions rate for poisoning by other psychotropic drugs, not elsewhere classified, poisoning by other and unspecified antipsychotics and neuroleptics, and poisoning

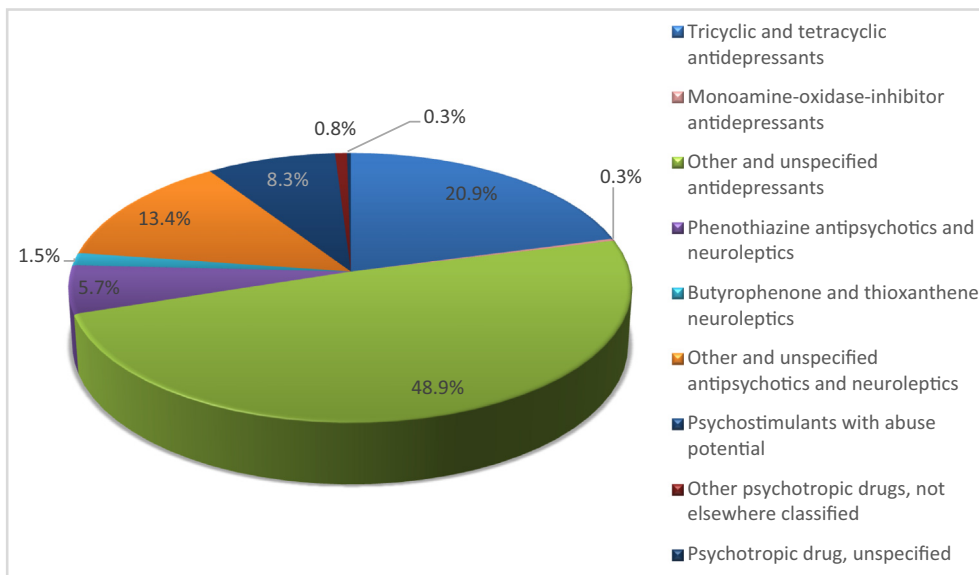


Fig. 1. Percentage of poisoning by psychotropic drugs hospital admission from total number of admissions.

by other and unspecified antidepressants with 7.37-fold, 3.23-fold, and 1.23-fold. On the other hand, hospital admissions resulted from poisoning by psychotropic drugs, unspecified poisoning by tricyclic, tetracyclic antidepressants and by phenothiazine, antipsychotics and neuroleptics, monoamine-oxidase-inhibitor antidepressants, butyrophenone and thioxanthene neuroleptics, and poisoning by psychostimulants with abuse potential were decreased by 74.4%, 58.2%, 55.9%, 44.0%, 132 35.6%, and 0.5%, respectively (Fig. 2).

Concerning age group diversity for poisoning by psychotropic drugs hospital admission, the age group 15–59 years accounted for 90.4% of the total number of hospital admissions, followed by the age group 60–74 years with 4.1%, the age group below 15 years

with 3.7%, and then the age group 75 years and above with 1.8%. Rates of hospital admission among patients aged below 15 years decreased by 15.8% [from 11.53 (95 %CI 10.86–12.19) in 1999 to 9.70 (95 %CI 9.11–10.29) in 2020 per 100,000 persons]. Rates of hospital admission among patients aged 15–59 years increased by 22.3% [from 59.67 (95 %CI 58.81–60.52) in 1999 to 72.97 (95 %CI 72.06–73.87) in 2020 per 100,000 persons]. Rates of hospital admission among patients aged 60–74 years increased by 80.2% [from 8.91 (95 %CI 8.21–9.61) in 1999 to 16.06 (95 %CI 15.24–16.87) in 2020 per 100,000 persons]. Rates of hospital admission among patients aged 75 years and above increased by 48.0% [from 8.07 (95 %CI 7.18–8.96) in 1999 to 11.95 (95 %CI 11.01–12.89) in 2020 per 100,000 persons] (Fig. 3).

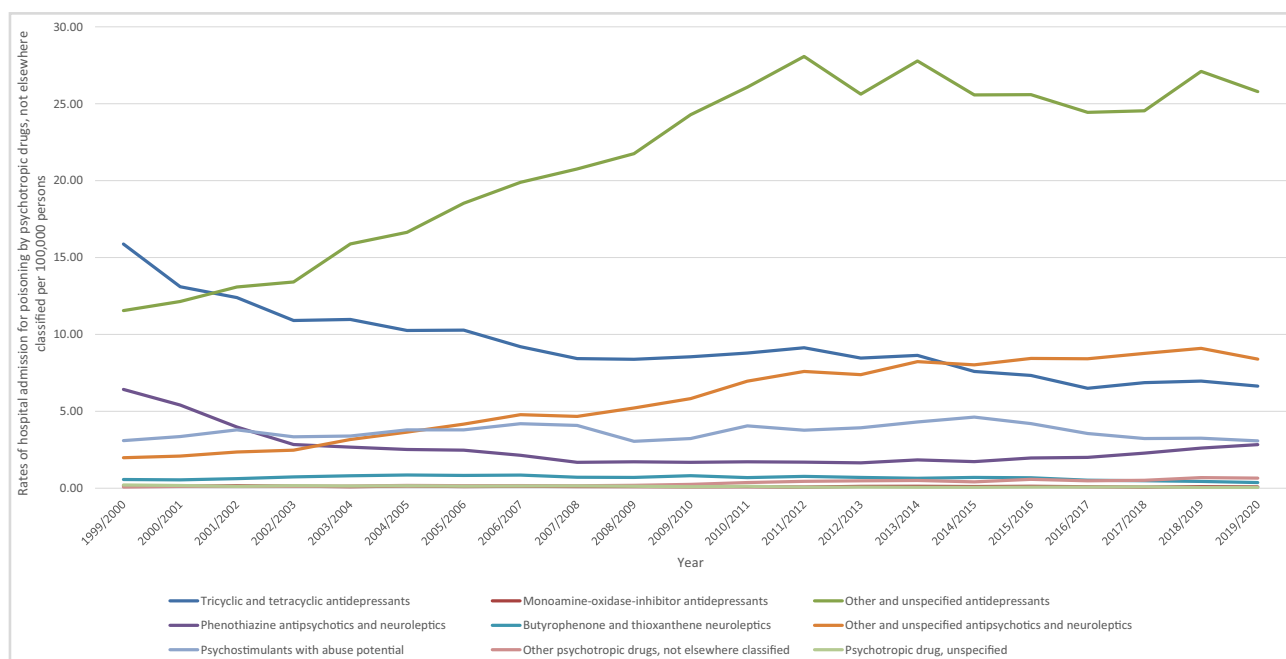


Fig. 2. Rates of hospital admission for poisoning by psychotropic drugs in England and Wales stratified by type between 1999 and 2020.

A total of 515,774 hospital admission episodes caused by poisoning by psychotropic drugs were recorded in England and Wales during the study period. Females contributed to 59.1% of the total number of hospital admission accounting for 304,925 hospital admission episodes by a mean of 14,520 per year. Females hospital admission rate increased by 33.0% [from 43.87 (95% CI 43.07–44.66) in 1999 to 58.33 (95% CI 57.46–59.19) in 2020 per 100,000 persons]. Males hospital admission rate increased by 3.8% [from 35.81 (95% CI 35.08–36.55) in 1999 to 37.19 (95% CI 36.49–37.88) in 2020 per 100,000 persons] (Fig. 4).

3.1. Admission rates by gender resulted from poisoning by psychotropic drugs

The majority of hospital admission rates caused by poisoning by psychotropic drugs were higher among females compared to males this include the following: poisoning by tricyclic and tetracyclic antidepressants, poisoning by monoamine-oxidase-inhibitor antidepressants, poisoning by other and unspecified antidepressants, poisoning by phenothiazine antipsychotics and neuroleptics, poisoning by butyrophenone and thioxanthene neuroleptics, poisoning by other and unspecified antipsychotics and neuroleptics, and poisoning by psychotropic drug, unspecified (Fig. 5).

On the other hand, hospital admission rates resulted from poisoning by psychotropic drugs such as psychostimulants with abuse potential, and poisoning by other psychotropic drugs were higher among males compared to females (Fig. 5).

3.2. Admission rates by age group resulted from poisoning by psychotropic drugs

All of the poisoning by psychotropic drugs related hospital admissions were more common among the age group 15–59 years as follows: hospital admissions due to poisoning by tricyclic and tetracyclic antidepressants, poisoning by monoamine-oxidase-inhibitor antidepressants, poisoning by phenothiazine antipsychotics and neuroleptics, and poisoning by other psychotropic drugs were more common among the age group: 15–59 years, 60–74 years, 75 years and above, and below 15 years, respectively.

Hospital admissions due to poisoning by other and unspecified antidepressants were more common among the age group: 15–59 years, 60–74 years, below 15 years, and 75 years and above, respectively. Hospital admissions due to poisoning by butyrophenone and thioxanthene neuroleptics, and poisoning by other and unspecified antipsychotics and neuroleptics were more common among the age group: 15–59 years, 75 years and above, 60–74 years, and below 15 years, respectively. Hospital admissions due to poisoning by psychostimulants with abuse potential, and poisoning by psychotropic drug were more common among the age group: 15–59 years, below 15 years, 60–74 years, and 75 years and above, respectively (Fig. 6).

3.3. Central nervous system medication prescriptions

The absolute number of Central Nervous System (CNS) medications prescriptions dispensed annually in England and Wales increased by 74.9% [from 132,274,419 in 2004 to 231,337,777 in 2020]. CNS medications prescription rates increased by 56.4% [from 247629.78 (95% CI 247593.18–247666.39) in 2004 to 387372.48 (95% CI 387333.41–387411.55) in 2020 prescriptions per 100,000 persons, trend test, $p < 0.001$].

The most commonly prescribed CNS medications prescriptions were analgesics, antidepressant drugs, antiepileptic drugs, and hypnotics and anxiolytics, which accounted for: 35.0%, 28.7%, 10.0%, and 9.5%, respectively (Fig. 7).

During the past 21 years, a tremendous increase in the rate of CNS medications prescriptions was noticed in drugs used for the treatment of dementia, CNS stimulants and drugs used for ADHD, antiepileptic drugs, and antidepressant drugs with 6.51-fold, 2.39-fold, 1.94-fold, and 1.32-fold. Besides, the rate of CNS medications prescriptions for drugs used in psychoses and related disorders, drugs used in parkinsonism and related disorders, analgesics, and drugs used in nausea and vertigo was increased by 68.6%, 61.7%, 19.0%, and 1.3%, respectively. But the rate of CNS medications prescriptions for drugs used in the treatment of obesity, hypnotics and anxiolytics, and drugs used in substance dependence was decreased by 56.2%, 24.2%, and 15.0%, respectively (Table 1, Fig. 8).

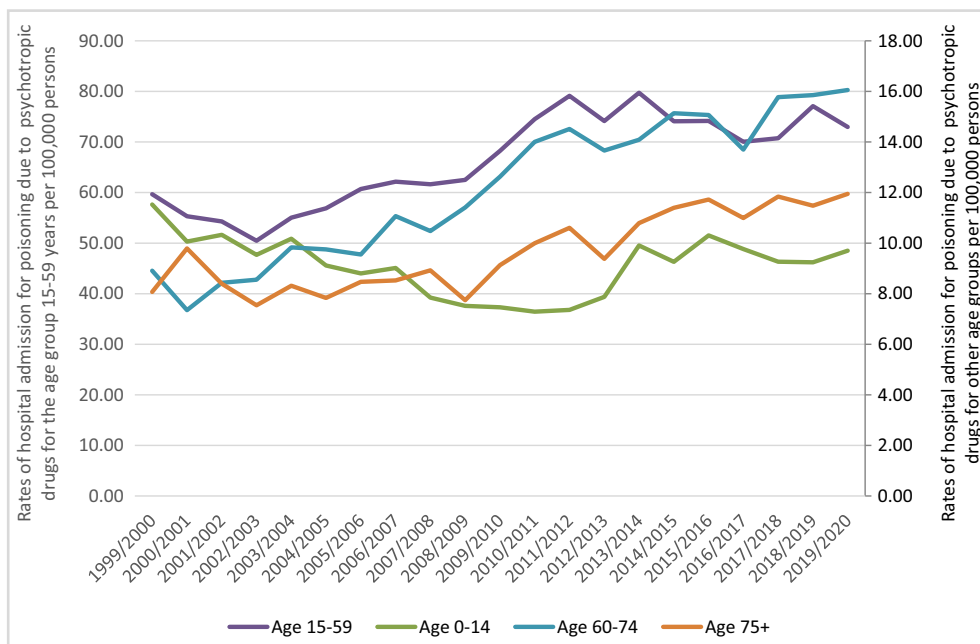


Fig. 3. Rates of hospital admission for poisoning by psychotropic drugs in England and Wales stratified by age group.

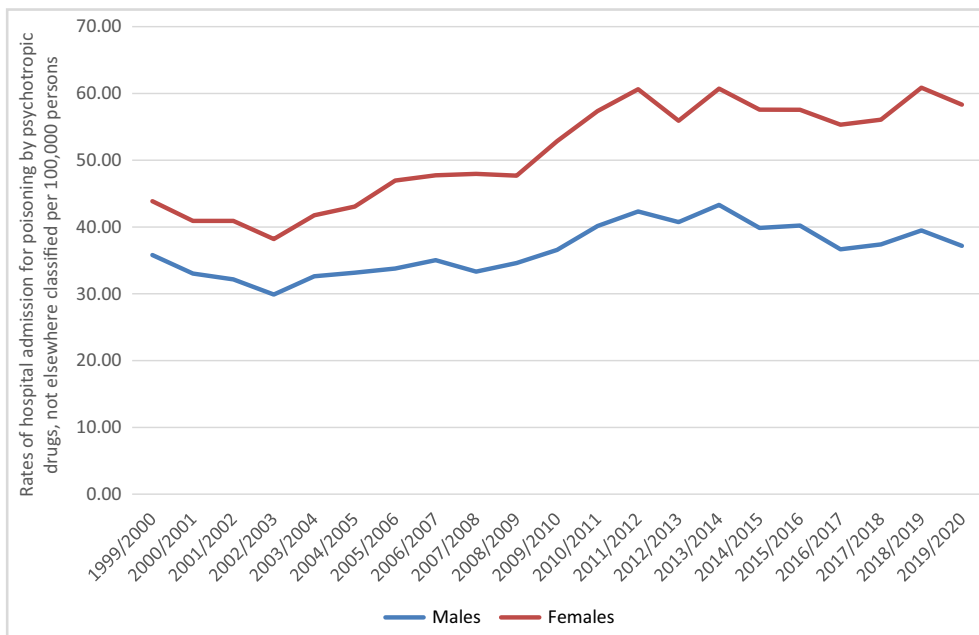


Fig. 4. Rates of hospital admission for poisoning by psychotropic drugs in England and Wales stratified by gender.

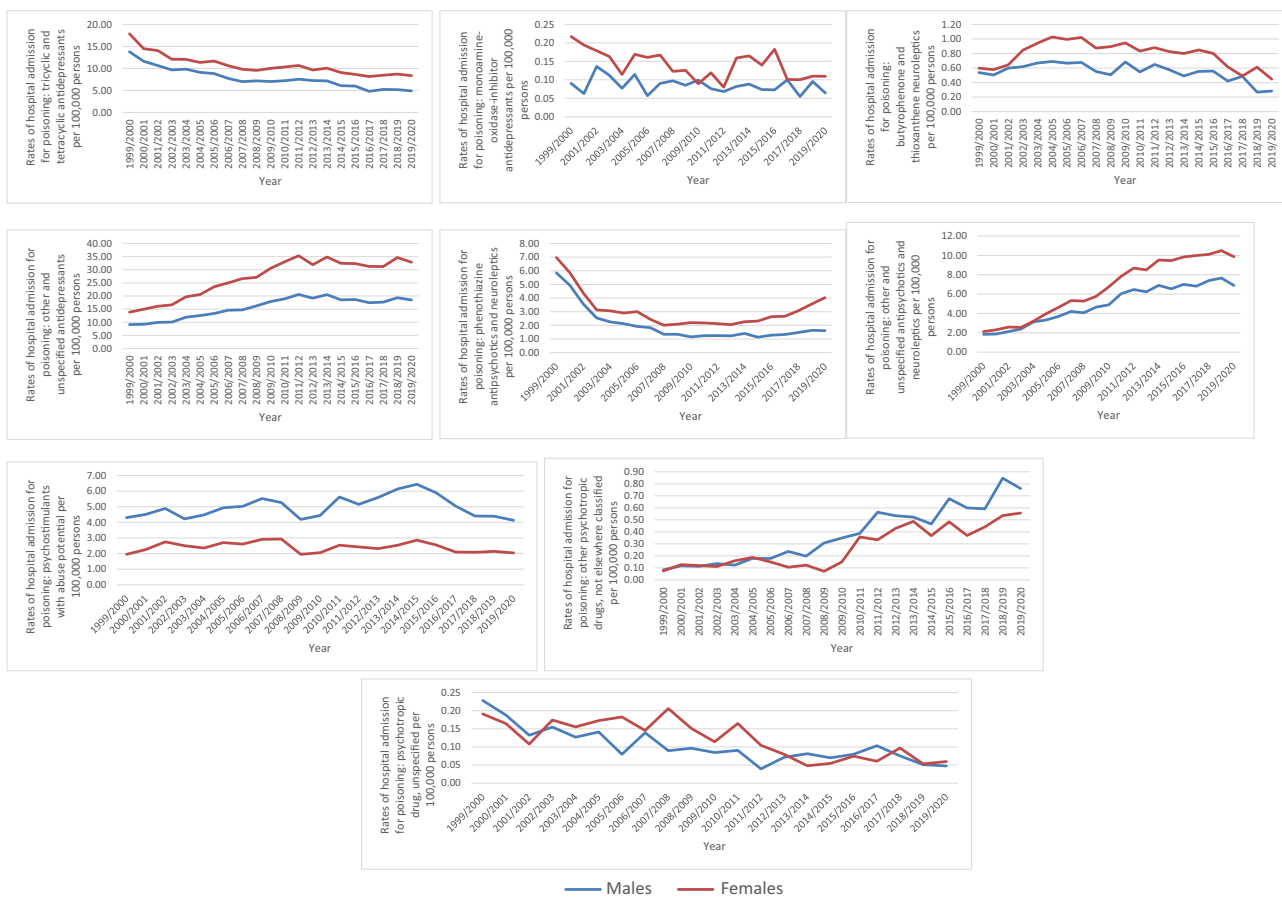


Fig. 5. Hospital admission rates for poisoning by psychotropic drugs in England and Wales stratified by gender.

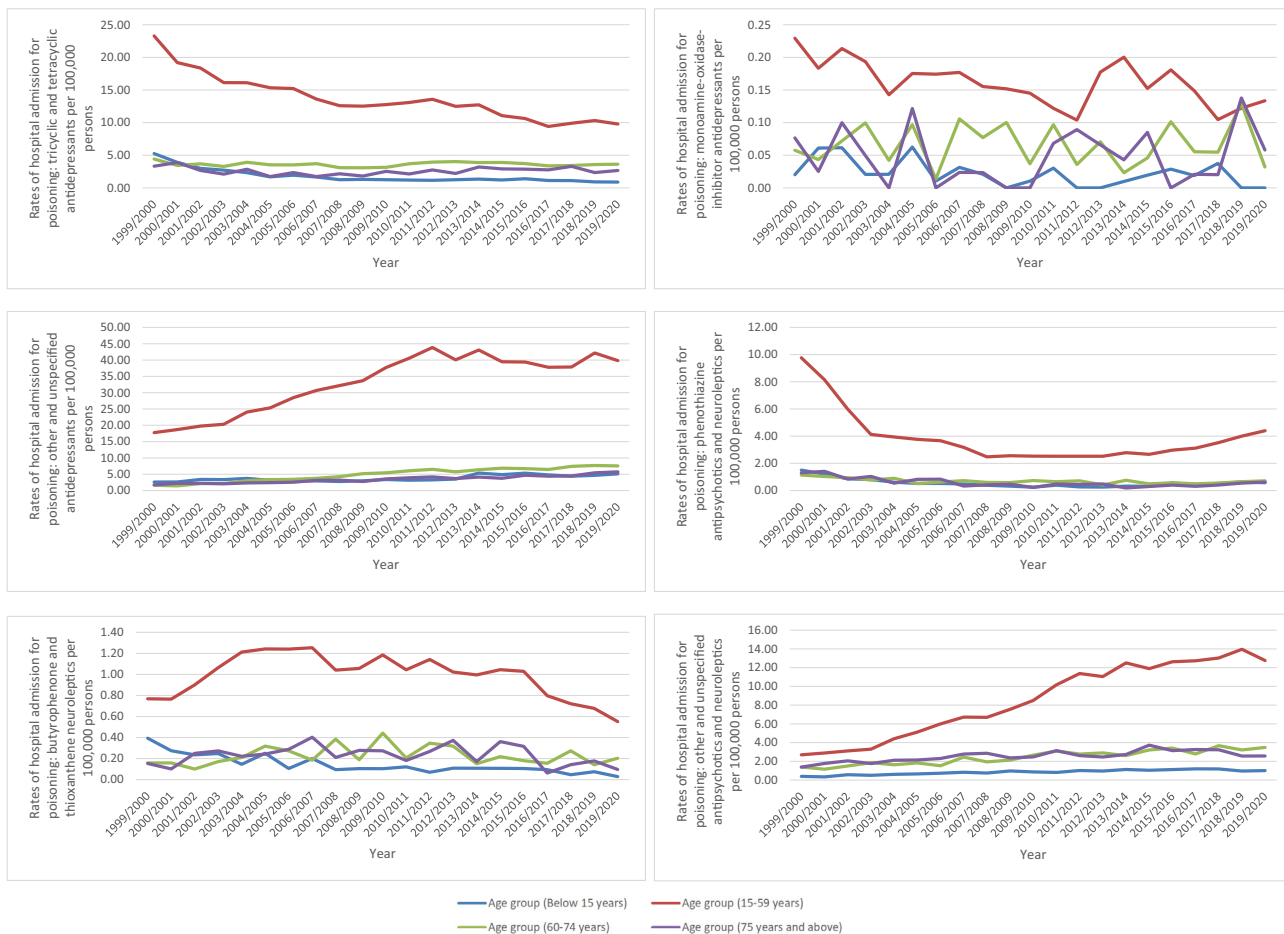


Fig. 6. Hospital admission rates for poisoning by psychotropic drugs in England and Wales stratified by age group.

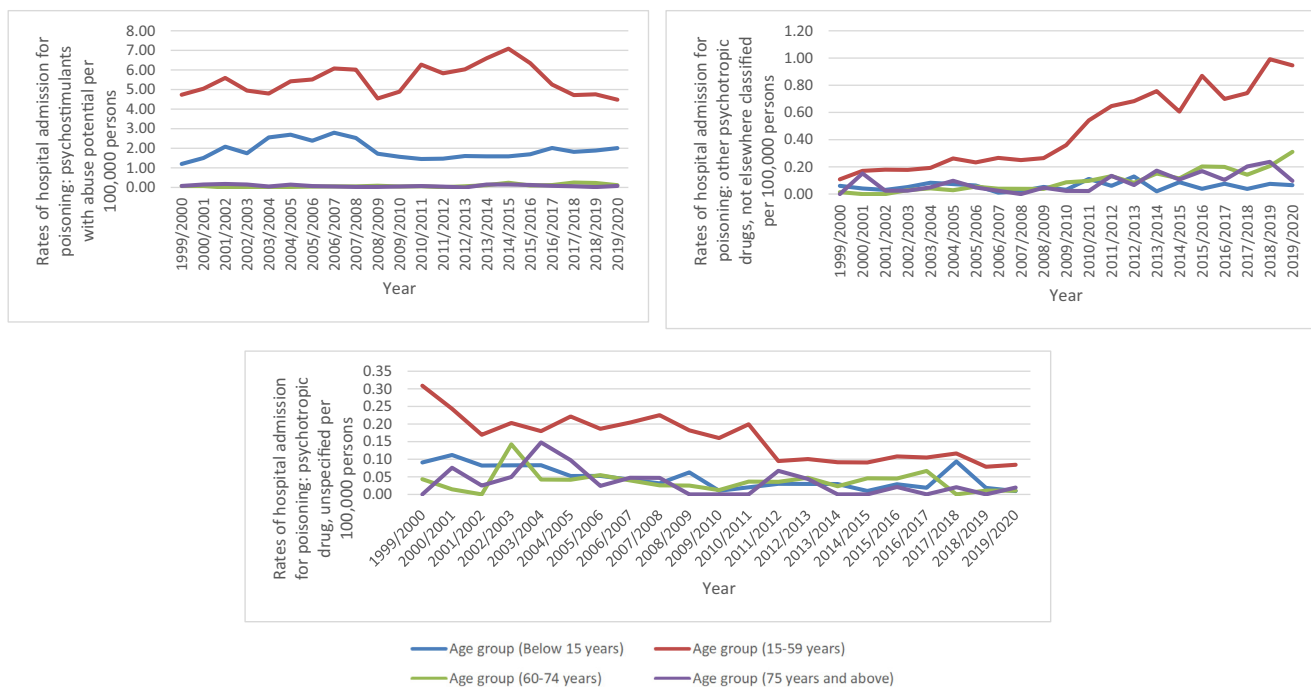


Fig. 6 (continued)

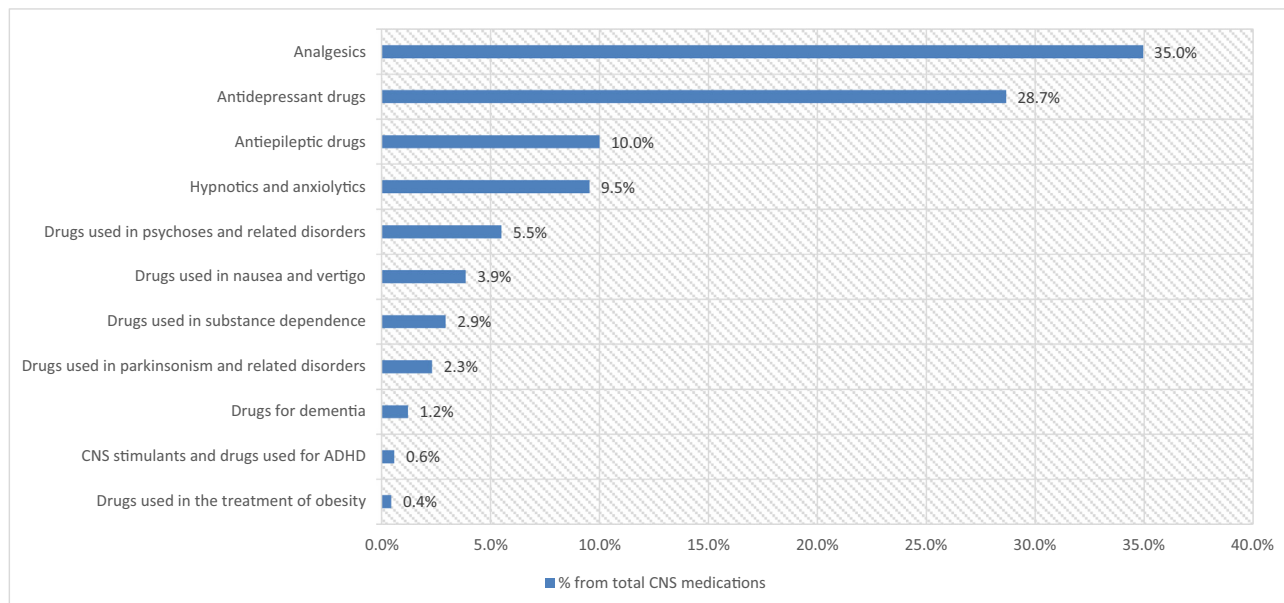


Fig. 7. Percentage of each medication prescription from the total number of CNS medication prescriptions.

Table 1
Percentage change in CNS prescriptions rates from 2004 to 2020.

CNS Medications	Prescriptions rate in 2004 prescriptions per 100,000 persons (95% CI)	Prescriptions rate in 2020 prescriptions per 100,000 persons (95% CI)	% Change From 2004 – 2020
Hypnotics and anxiolytics	35134.49 (35121.69–35147.29)	26643.94 (26632.73–26655.15)	–24.2%
Drugs used in psychoses and related disorders	13346.22 (13337.10–13355.34)	22499.04 (22488.45–22509.63)	68.6%
Antidepressant drugs	58550.40 (58530.49–58570.31)	135797.55 (135770.07–135825.02)	131.9%
CNS stimulants and drugs used for ADHD	909.17 (906.62–911.71)	3081.38 (3076.99–3085.76)	238.9%
Drugs used in the treatment of obesity	1437.84 (1434.64–1441.03)	629.76 (627.76–631.77)	–56.2%
Drugs used in nausea and vertigo	11020.64 (11012.24–11029.04)	11168.24 (11160.25–11176.23)	1.3%
Analgesics	94789.31 (94764.47–94814.16)	112766.92 (112741.55–112792.29)	19.0%
Antiepileptic drugs	17322.66 (17312.51–17332.81)	50997.31 (50984.63–51009.99)	194.4%
Drugs used in parkinsonism and related disorders	5792.06 (5785.79–5798.32)	9362.87 (9355.48–9370.26)	61.7%
Drugs used in substance dependence	8351.08 (8343.66–8358.50)	7099.13 (7092.62–7105.65)	–15.0%
Drugs for dementia	975.91 (973.28–978.55)	7326.33 (7319.72–7332.94)	650.7%

3.3.1. Central nervous system medication prescriptions subtype

• Hypnotics and anxiolytics

The prescriptions rate for barbiturates, hypnotics, and anxiolytics decreased by 93.6%, 31.1%, and 12.5%, respectively (Fig. 9).

• Drugs used in psychoses and related disorders

The prescriptions rate for antipsychotic drugs, and drugs used for mania and hypomania increased by 75.7%, and 43.2%, respectively. Still, the prescriptions rate for antipsychotic depot injections decreased by 29.3% (Fig. 9).

• Antidepressant drugs

The prescriptions rate for other antidepressant drugs, selective serotonin re-uptake inhibitors, and tricyclic and related antidepressant drugs increased by 2.49-fold, 1.54-fold, and 50.1%, respectively. Still, the prescriptions rate for monoamine-oxidase inhibitors decreased by 57.4% (Fig. 9).

• Drugs used in the treatment of obesity

The prescriptions rate for centrally-acting appetite suppressants, and gastro-intestinal anti-obesity drugs decreased by 100.0%, and 38.1%, respectively (Fig. 9).

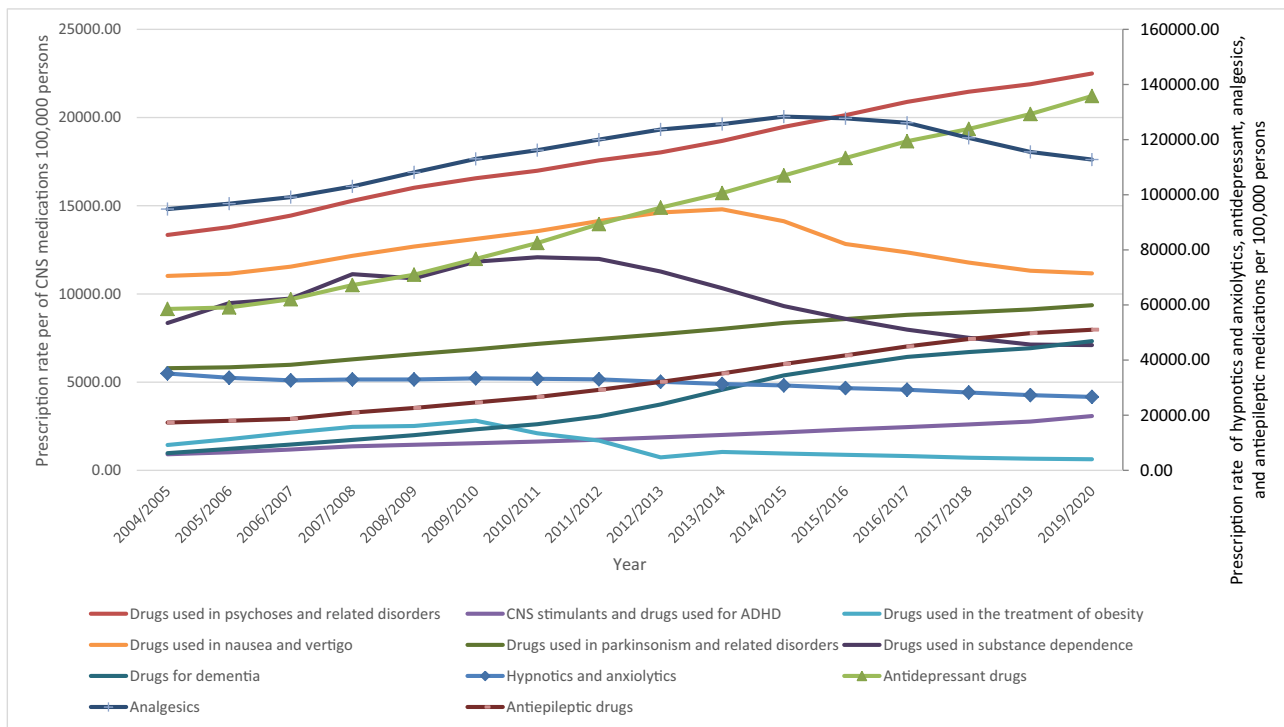


Fig. 8. Prescription rates of CNS medications in England and Wales between 2004 and 2020.

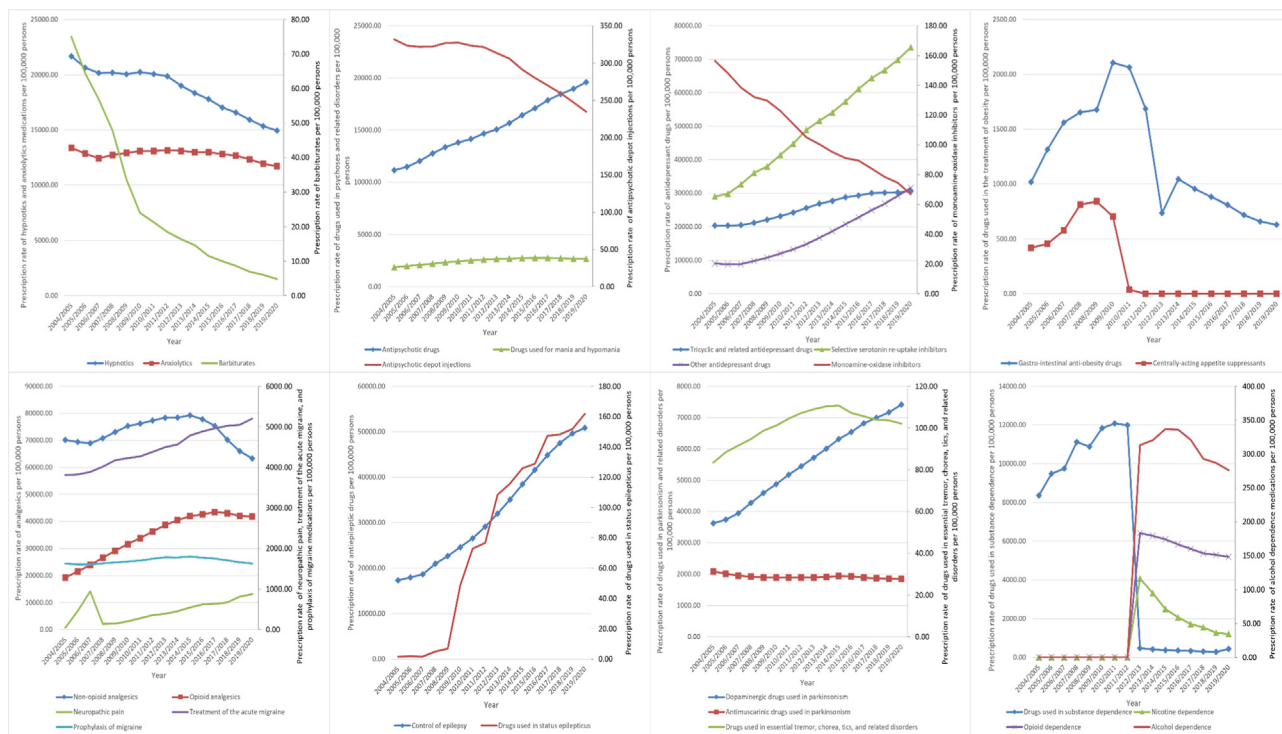


Fig. 9. Prescription rates of CNS medications subtype in England and Wales between 2004 and 2020.

• Analgesics

The prescriptions rate for neuropathic pain, opioid analgesics, and treatment of the acute migraine increased by 17.00-fold, 1.18-fold, and 36.6%, respectively. Still, the prescriptions rate for non-opioid analgesics decreased by 9.7% (Fig. 9).

• Antiepileptic drugs

The prescriptions rate for drugs used in status epilepticus, and control of epilepsy increased by 94.66-fold, and 1.93-fold, respectively (Fig. 9).

• Drugs used in parkinsonism and related disorders

The prescriptions rate for dopaminergic drugs used in parkinsonism, and drugs used in essential tremor, chorea, tics, and related disorders increased by 1.05-fold, and 22.4%, respectively. Still, the prescriptions rate for antimuscarinic drugs used in parkinsonism decreased by 11.7% (Fig. 9).

• Drugs used in substance dependence

The prescriptions rate for drugs used in substance dependence decreased by 94.8%. Moreover, from 2012/2013 to 2019/2020, the prescriptions rate for nicotine dependence, opioid dependence, and alcohol dependence decreased by 70.4%, 19.2%, and 11.9%, respectively (Fig. 9).

3.4. Correlation between admission rate and medications prescription rate

During the study period between 2004 and 2020, the overall medications prescribing rate showed to be very strongly positively correlated with the overall poisoning by psychotropic drugs hospital admissions rate ($r = 0.799$; $p \leq 0.001$), Fig. 10.

4. Discussion

Between 2004 and 2020, the rate of CNS drugs administered in England and Wales increased by 56.4 %, according to our findings. During the previous 16 years, the average annual growth was 3.5%. This rise was linked to a 25.4% increase in the poisoning by psychotropic drugs, not otherwise classified hospital admission rate over the last 16 years (between 2004 and 2020), with a mean increase of 1.6%, and a 19.9% increase between 1999 and 2020, with a mean increase of 0.95%, with a correlation coefficient of 0.799. These increases urge us to monitor CNS medication carefully and closely, because of their importance and their apparent dose effects (Walkup 2009).

During the study period, the hospital admission rate for psychotropic drug poisoning increased by 19.9% [from 39.94 (95 percent CI 39.40–40.48) per 100,000 persons in 1999 to 47.90 (95% CI 47.34–48.45) in 2020, trend test, $p \leq 0.05$]. A 65% increase was seen in a study conducted in the United States between 1999 and 2006 (Coben et al., 2010). Other characteristics such as gender and age (Paulose-Ram et al., 2004, Vargas et al., 2020) may influence the rate of hospital admission due to psychiatric medication poisoning. A rise in psychotropic prescription may play a role in this poisoning increase (Rani et al., 2008, Express Scripts, 2020).

The most common reason for poisoning by psychotropic drugs hospital admissions was unspecified poisoning by antidepressants (accidental (unintentional), intentional self-harm, assault, as an adverse effect, and under-dosing), which accounted for 48.9% and 20.9%, respectively. Overdosing on tetracyclic antidepressants is known to be extremely hazardous (Boehnert and Lovejoy 1985), and a study conducted at a university hospital in the Netherlands found that tetracyclic antidepressant poisoning is the leading cause of hospital and ICU admission among antidepressant poisoning (Bosch et al., 2000). Other causes included unspecified antipsychotic and neuroleptic poisoning (accidental (unintentional), intentional self-harm, assault, as an adverse effect, and under-dosing), as well as poisoning by psychostimulants with abuse potential, which accounted for 13.4% and 8.3%, respectively. The

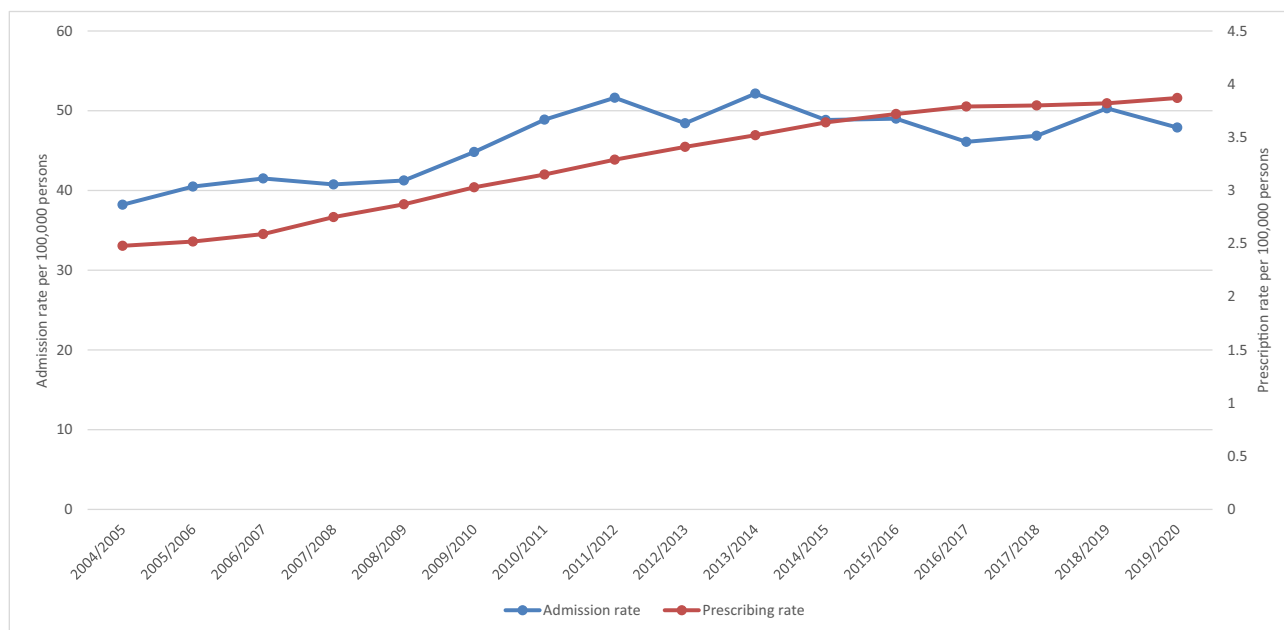


Fig. 10. Correlation between admission rate and medications prescription rate.

most common medication poisoning cause for hospital admission in Malaysia was antipsychotic drug poisoning (Ab Rahman 2002). Indeed, in the United States, mortality from psychostimulant poisoning and abuse increased by a third between 2003 and 2017 (Kariisa et al., 2019), and surely, all of these increases in poisoning and intoxication by various psychotropic medications increase the demand for hospital admission (Suslo et al., 2016). The age range of 15–59 years old accounted for 90.4% of all psychotropic medication poisonings. Children and adolescents are less likely to be poisoned by prescription medications, but they are more likely to be poisoned by over-the-counter medications (Huynh et al., 2018), and the poisoning rate with psychotropic medications among children and adolescents aged 5 to 19 is increasing in Australia (Cairns et al., 2019), with a similar trend in the United Kingdom and the United States (Rani et al., 2008, Express Scripts, 2020). Not only the elderly, but also the age group 15–59 years old, have a much greater percentage of usage of any psychotropic medication (Paulose-Ram et al., 2004), which explains the high rate of psychotropic medication poisoning in this age group.

Females were responsible for 59.1% of all hospital admissions. The hospital admission rate for females grew by 33.0% [from 43.87 (95% CI 43.07–44.66) in 1999 to 58.33 (95% CI 57.46–59.19) in 2020 per 100,000 persons]. Male hospital admission rates grew by 3.8% [from 35.81 (95% CI 35.08–36.55) per 100,000 persons in 1999 to 37.19 (95% CI 36.49–37.88) in 2020]. Females had greater hospital admission rates than males in the majority of cases. Other studies have clearly shown that females are more likely than males to be poisoned by psychotropic drugs (Vargas et al., 2020), which could be due to the higher prevalence of depression and anxiety in women (Altemus et al., 2014) and a higher number of psychotropic drug prescriptions written for females (Simoni-Wastila 1998), as well as other factors such as being a female increasing the risk of attempting suicide and self-poisoning (Tsirigotis et al., 2011).

Prescription rates for CNS drugs grew by 56.4% [from 247629.78 (95% CI 247593.18–247666.39) in 2004 to 387372.48 (95% CI 387333.41–387411.55) in 2020, trend test, $p \leq 0.001$]. In fact, a study found that the United Kingdom had the highest prevalence of psychotropic medication prescription among nine countries (Spain, France, Germany, and the other three south American and three north American) (Wong et al., 2004), with a 68% increase in prescriptions among children and adolescents and this increase can be reasonable due to the increase of prevalence of Central Nervous System disorders and the need of CNS medications in England and United Kingdom in the last 21 years (McCarthy et al., 2012, Meeraus et al., 2013, Donegan et al., 2017, Jack et al., 2020).

Analgesics, antidepressants, antiepileptics, and hypnotics and anxiolytics were the most regularly prescribed CNS medications, accounting for 35.0%, 28.7%, 10.0%, and 9.5%, respectively. While in the United States, psychotropic medication prescriptions account for about 5.5% of all prescriptions, with anxiolytics, sedatives, and hypnotics accounting for 3.2%, antidepressants accounting for 2.3%, and antipsychotics accounting for 0.7% (Paulose-Ram et al., 2004). The discrepancy in percentage is primarily attributable to variances in population sizes between the two groups. Apart from that, a large variety of psychotropic drugs have recently been recommended (Kalverdijk et al., 2017).

Poisoning by other psychotropic drugs not elsewhere classified, poisoning by other and unspecified antipsychotics and neuroleptics, and poisoning by other and unspecified antidepressants all saw a 7.37-fold, 3.23-fold, and 1.23-fold increase in hospital admissions rates, respectively, over the last 21 years. Some psychiatric medicines raise the risk of suicidal ideation, which could lead to self-poisoning and self-harm attempts (Reith and Edmonds 2007). Indeed, there has been a 6.51-fold, 2.39-fold, 1.94-fold, and 1.32-fold increase in the rate of CNS medicine prescriptions

during the last 21 years for drugs used to treat dementia, CNS stimulants and drugs used for ADHD, antiepileptic drugs, and antidepressant drugs. Meanwhile, in the United Kingdom, the number and proportion of people diagnosed with dementia remained stable between 2005 and 2015, but in England, the proportion of people diagnosed with dementia increased from 0.41% to 0.74% during the same period (Donegan et al., 2017), and a study in the UK found a similar increase in ADHD medication use between 2003 and 2008, with a two-fold increase in children and adolescents (McCarthy et al., 2012). On the other hand, the annual incidence of documented epilepsy has dropped by 4% to 9%, which could be attributed to changes in treatment practices (Meeraus et al., 2013). While, with all of these factors in mind, the percentage of antidepressant prescriptions increased in general and nearly doubled for certain age groups between 2005 and 2017 (Jack et al., 2020), with all of these factors in mind, the percentage of antidepressant prescriptions increased in general and nearly doubled for certain age groups. It is necessary to analyze the difference in population census and financial income during the last 21 years, which may be a significant influence in this increase.

To the best of our knowledge, this is the first study in England and Wales to look at trends in hospital admissions owing to psychotropic drug poisoning, adverse effects, and underdosing. Our research offered precise hospital admission rates over a 20-year period, providing a clear picture of the hospitalization profile. There are some drawbacks to this study. First, due to the nature of the data supplied by these databases, we were unable to access data at the patient level to detect other risk variables such as the existence of comorbidities that are related with poisoning by, adverse effects of, and underdosing of psychiatric drugs. Emergency and elective admissions are included in this study's hospital admission data. Therefore, the data should be interpreted with caution, as they may have resulted in an overestimation of the admission rate.

5. Conclusion

Over the last two decades, there has been a parallel increase in the hospitalization rate for psychotropic drug poisoning and the prescription rate for CNS medications. Healthcare practitioners should support rational use of CNS medications as well as early detection and diagnosis in order to improve patient clinical outcomes and reduce therapy duration. Future research should focus on identifying high-risk populations who are more prone to psychotropic drug poisoning.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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