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ORIGINAL RESEARCH ARTICLE

Nationwide study on antipsychotic polypharmacy among forensic psychiatric patients

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ABSTRACT

This nationwide retrospective cross-sectional study examines the prevalence of antipsychotic polypharmacy (APP) and demographic, forensic, and clinical factors associated with its practice among Greenlandic forensic psychiatric patients. We collected data from electronic patient files, court documents, and forensic psychiatric assessments. We defined APP as two or more concurrent prescriptions of antipsychotic medication. The study population of 74 patients had a mean age of 41.4 years, and 61 were men. All included patients had either schizophrenia or another ICD-10 F2-diagnosis. We used unpaired t-tests and Chi^2 or Fisher's exact test. The prevalence of APP was 35% ($n = 26$), and there was a significant association between APP and a prescription of clozapine (Chi^2, $p = 0.010$), olanzapine (Fisher's test, $p = 0.003$), and aripiprazole (Fisher's test, $p = 0.013$). Furthermore, we found a significant association between APP and prescription of a first-generation antipsychotic (FGA) (Chi^2, $p = 0.011$). Despite recommendations in guidelines, the use of APP is common practice. The majority of forensic psychiatric patients suffer from severe psychiatric disorders, often with other comorbidities, including substance use disorder. The severity and complexity in mental health render forensic psychiatric patients at high risk of APP treatment. Further knowledge on APP use is crucial to secure and further improve the psychopharmacological treatment for this group of patients.

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Introduction

Schizophrenia is a severe psychiatric disorder with a heterogeneous symptom profile and is often challenging to treat [1]. Approximately 30% of patients with schizophrenia has an inadequate response to 2 different antipsychotics given at optimised doses [2]. Most guidelines recommend that treatment-resistant patients initiate clozapine before considering antipsychotic polypharmacy (APP) regime. Furthermore, the standard approach for treating schizophrenia should be antipsychotic monotherapy (APM) [3–5].

During the last decade, several studies have studied the use of antipsychotic polypharmacy as a treatment option for patients with schizophrenia, with conflicting results. Tiihonen et al. (2019) found that in a population of patients with schizophrenia, those receiving a combination of clozapine and aripiprazole had the lowest risk of rehospitalisation [6]. A recent meta-analysis, investigating APP and schizophrenia, found indication for superior efficiency of some clozapine augmentation strategies, compared to monotherapy [7]. However, APP is also associated with severe adverse effects, such as an increased risk of developing metabolic syndrome, extrapyramidal side effects, and increased mortality [5,8–10].

Although most guidelines suggest APP treatment as a last resort, it is common clinical practice. Alberti et al (2022) found a generally higher consumption of antipsychotics among Greenlandic schizophrenic patients, compared to the Danish equivalent, and an APP prevalence of 35% [11]. Sneider et al. (2015) found an APP prevalence of 25% in a Danish population of patients with schizophrenia [12]. In a systemic review and meta-regression study, Gallego et al. (2012) found a pooled median APP rate of 20% across all included regions, with the highest rates in Asia (32%) and Europe (23%) [13]. APP might be prescribed to increase or speed-up

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efficacy, target different symptoms, reduce side effects, or decrease the dose of the original prescribed antipsychotic [14,15]. Male gender, age, schizophrenia diagnosis, more frequent previous hospital admissions, longer duration of previous admissions, inpatient status, high-dose antipsychotic prescription, clozapine treatment, and treatment with long-acting injections (LAI) have been associated with APP [12,16–23].

Forensic psychiatric patients are characterised by having a high prevalence of psychotic disorders, primarily schizophrenia [24,25], but there are few studies describing APP among forensic psychiatric populations [25,26]. Furthermore, a recent systematic review on pharmacological treatment in forensic psychiatry concluded that there was a lack of evidence in the effectiveness of pharmacological treatment of forensic psychiatric patients [27]. Consequently, further understanding and knowledge concerning the prescription pattern are needed to guide future psychopharmacological treatment of forensic psychiatric patients.

Thus, our study aims to determine the APP prevalence among the Greenlandic forensic psychiatric population treated with antipsychotics, and examine demographic, clinical, forensic, or pharmacological/medical characteristics associated with APP prescribing.

Method

Design

Data in this retrospective cross-sectional study is part of a previous study of forensic psychiatric patients in Greenland. Data was collected on February 29th, 2020 [28].

Health care in Greenland

Greenland has a population of 57.000 people, with around a third of the population living in the capital of Nuuk and two-thirds living in smaller towns or settlements. Greenlandic healthcare is universal, with equal access for all Greenlandic citizens. Medical services are all free of charge at the point of delivery, including prescribed medication [29–31]. Greenland's primary health care system is divided into five regions, organising smaller district hospitals and local healthcare clinics, with Queen Ingrids Hospital in Nuuk functioning as a national hospital for more specialised treatment [30,32].

A significant challenge in The Greenland Healthcare system is a shortage of healthcare professionals, recruitment problems, and a frequent change of staff [30,31]. To secure consistency and quality in prescription practice, a list of recommended pharmaceuticals has been issued [29].

The Greenlandic Criminal Code was passed in 1954 [33], with the latest revision in 2017 [34]. The Criminal Code does not include a traditional Penal Code [35]. Instead, it lists the possible measures and states that the offender's personal circumstances must be considered. The intention of the Criminal Code is to emphasise the resocialization of the offender [36,37]. The first closed institution in Greenland opened in 2019. Prior to 2019, dangerous offenders were transferred to Denmark to serve their sentence in a Danish prison [37].

Mentally ill and mentally healthy offenders are tried identically, as the Greenlandic Criminal Code does not operate with the concept unfit to stand trial. According to Greenlandic procedural law § 436, a forensic psychiatric assessment (FPA) must be performed when the mental status of the accused is found to be of significance to the decision of the case. Furthermore, the disadvantages or costs associated with the investigation must not be disproportionate to the nature and gravity of the case. The FPA is usually performed by a psychiatrist, a psychologist, and a translator through examinations of the electronic patient file, court documents, and interviews with the accused. The court uses this assessment as a recommendation in the choice of special measures, as the question of guilt and the sanction is decided by the court.

Criminal codes § 156 and 157

The Criminal Code § 156 states that" if the offender at the time of the offence was insane or in a similar condition, or was mentally retarded, measures under this chapter may be imposed when necessary to prevent the perpetrator from committing further offences. The same applies if the offender after the time of the offence, but before sentencing, has been mentally retarded, or has entered a not merely transient state of insanity" [34]. The term legal "insanity" is equivalent to the medical term "psychosis".

According to the Criminal Code § 157; "If it is found expedient to prevent further offences, the court may decide that the convicted person must be placed in a psychiatric hospital or other institution in Greenland or in Denmark".

Those suffering from cognitive impairment (in the criminal code; mental retardation) will be sentenced to care by municipality institutions.

Treatment in forensic psychiatry

The majority of Greenlandic forensic psychiatric patients are treated as outpatients [28]. The Department of Psychiatry in Nuuk has twelve beds. Nine of these beds

are in an open ward and three are in a low secure, general psychiatric closed section [38]. Forensic psychiatric patients may be admitted to both the closed and open ward in Greenland, depending on their treatment and security need. More severely ill forensic psychiatric patients in need of treatment in a further specialised secure setting are routinely transferred to Denmark to a medium secure forensic psychiatric department in accordance with an agreement between the former home rule and the Central Denmark Region [28,39,40]. There are no concrete criteria that has to be fulfilled for a transfer. The collaboration is based on an individual assessment of a patient's treatment needs for safety and security, and potential transfers are discussed between both parties.

Study population

All Greenlandic citizens are identifiable through a unique personal identification number. The nationwide Electronic Patient File (EPF) contains data on all admissions and outpatient treatments of inhabitants in Greenland. The EPF contains data from 2007 and onwards [28].

The study population was identified from a joint registry between the Greenland Prison and Probation Service, and the Psychiatric Area, Queen Ingrid´s Hospital. Furthermore, forensic Greenlandic patients admitted to the forensic medium secure ward in Denmark were identified. Of the total population ($n = 109$), ten patients were excluded as they had a custodial sentence or supervisory judgement, had no current sentence, or were sentenced to treatment in Denmark. Six were excluded as they were either sentenced to municipal care due to intellectual disability, or admitted to the high-security unit in Denmark, or permanently residing outside of Greenland [28].

As our purpose was to investigate the use of APM and APP, we excluded 10 patients who did not receive any antipsychotic treatment and further excluded 2 patients due to missing values regarding prescribed medication. To ensure comparability with other studies, we further excluded seven patients who did not have a diagnosis of schizophrenia or another F2 diagnosis (Figure 1). Our study thus comprises a nearly complete sample of the Greenlandic population of forensic psychiatric patients sentenced to psychiatric treatment in a Greenlandic court, having an F2 diagnosis in accordance with the International Classification of Diseases, 10th revision (ICD-10) and receiving antipsychotic treatment.

Data collection

We collected data from the national electronic patient file (EPF), forensic psychiatric assessments (FPA's), and legal documents concerning Greenlandic forensic patients.

We defined antipsychotic polypharmacy as two or more concurrent antipsychotics in line with previous studies [7,25,26]. Data on prescribed medication was coded based on the ATC index and dosage. Antipsychotic agents classified as first-generation antipsychotics (FGAs) included zuclopenthixol, haloperidol, and perphenazine. Second-generation antipsychotics (SGAs) included clozapine, olanzapine, quetiapine, risperidone, aripiprazole, and paliperidone [41,42]. We also collected data concerning: co-prescriptions of antidepressants, mood stabilisers, anxiolytics, and medication for substance abuse. Pro Re Nata (PRN) prescriptions were not collected.

Descriptive variables were divided into demographic (gender, age, marital status, educational level, and patient location at the time of study), clinical (primary diagnosis, previous psychiatric hospitalisations, and intellectual disability), forensic (index offence, prior convictions, and previous incarceration) and medical variables (form of administration, generation of prescribed drug, high-dose treatment and prescription of clozapine). High-dose was calculated using the prescribed daily dose (PDD) and the defined daily dose (DDD) and defined as a PDD:DDD ratio greater than 1.5, consistent with previous studies. The Defined Daily Dose is the assumed average maintenance dose per day for a drug used for its main indication in adults. By comparing the PDD and DDD for all prescribed antipsychotics for a patient, it is possibly to make an estimate of high dose prescription [43,44].

Statistical analysis

Statistical analysis was performed using Stata/MP version 17.0. Association between categorical variables and the use of APP was tested with Pearson's Chi^2 and Fisher's exact test where appropriate ($n < 5$). Statistical significance was set at $p < 0.05$. We did not impute missing values.

Ethical approval

The data was originally collected for a study comparing Greenlandic forensic psychiatric patients, with forensic patients in Nunavut, Canada. The permission for collection of data was obtained from the Health Management (Nanoq-ID 13,089,266/12729056), the management for the Psychiatric Area, Queen Ingrid's Hospital and the Danish Agency for Patient Safety (Case No. 3–3013–3253/1). Ethical approval for the research project and study design was given by the Research Ethics Committee of Greenland (Case

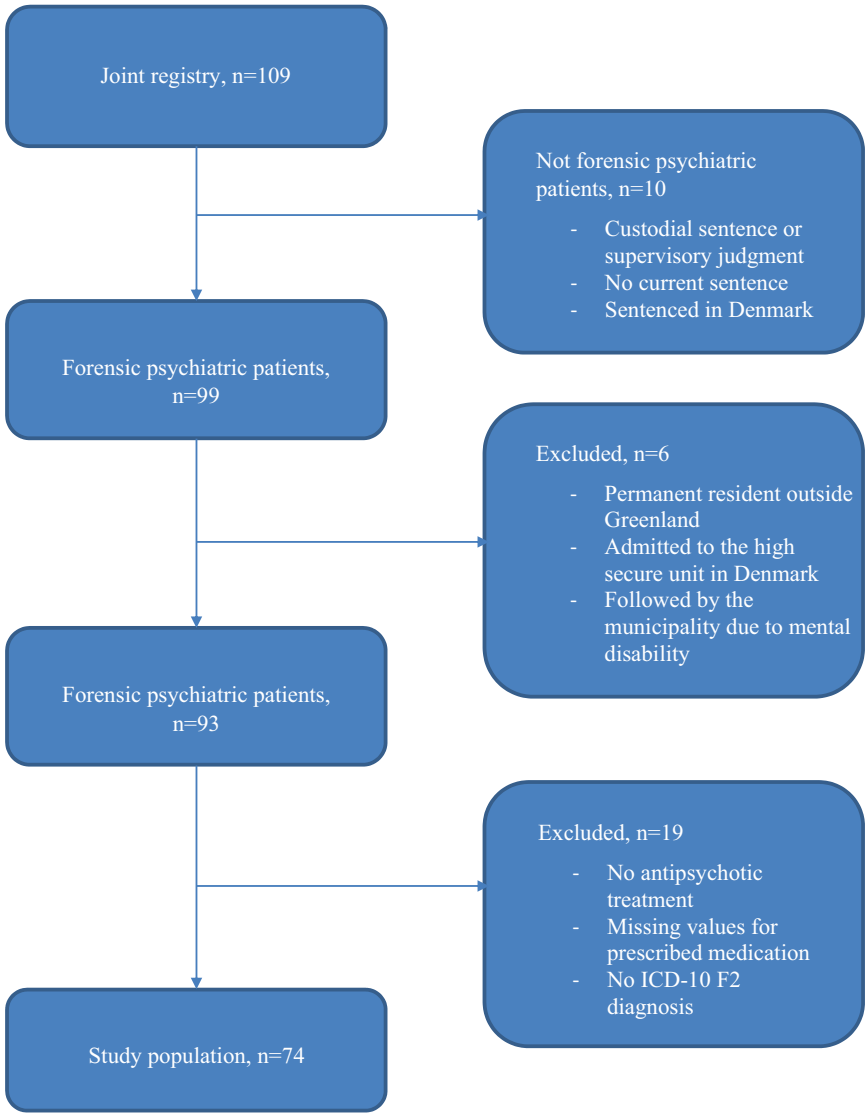

Figure 1. Flowchart for nationwide study on polypharmacy among Greenlandic forensic psychiatric patients diagnosed with schizophrenia or other F2 diagnosis. Cross-sectional study, February 29th 2020.

No. 2019–26450). The study was notified to the Central Region Denmark internal list of research projects (Case number 1-16-02-341-19). We obtained permission to collect data without informed consent for patients in both countries. Small patient groups ($n < 2$) were not included in the study to uphold patient anonymity. Patient data was anonymised before it was included in this study.

Results

Demographic and clinical characteristics

The study population ($n = 74$) had a mean age of 41.4 years (Standard Deviation (SD) 12.8) and 82% ($n = 61$) were men (Table 1). On the 29th of February 2020, 84% ($n = 62$) were outpatients in Greenland and 16% ($n = 12$) were admitted to a psychiatric hospital in Greenland or Denmark. A total of 89% ($n = 66$) were diagnosed with schizophrenia, and 62% ($n = 46$) suffered from a comorbid substance use disorder (alcohol, drugs, or both).

Prevalence of antipsychotic polypharmacy

The overall prevalence of APP was 35% (26/74) (Table 1). Among inpatients, 50% (6/12) received APP versus 32% (20/62) among outpatients (Chi^2, $p = 0.06$). We did not find any significant association between demographic, clinical, or forensic variables and APP (Table 1).

Table 1. Comparison of Greenlandic forensic patients with an F2 ICD-10 diagnosis in antipsychotic mono versus polypharmacy treatment. Cross- sectional study February 29th 2020.

	Total $N = 74$ n (%)	APM[1] $N = 48$ n (%)	APP[2] $N = 26$ n (%)	p-value
Demographic and clinical characteristics				
Gender				
Male	61 (82)	40 (83)	21 (81)	0.760[b]
Educational level*				
No education after primary school	56 (78)	34 (74)	22 (85)	0.383[b]
Education after primary school	16 (22)	12 (26)	4 (15)	
Admission status				
Outpatient, Greenland	62 (84)	42 (88)	20 (77)	0.247 [b]
In-patient Aarhus University Hospital, Denmark	8 (11)	5 (10)	3 (11)	
In-patient, Dronning Ingrids Hospital, Greenland	4 (5)	1 (2)	3 (11)	
Primary F2 ICD-10 diagnose				
Schizophrenia	66 (89)	43 (90)	23 (89)	1.000 [b]
Other F2 diagnose	8 (11)	5 (10)	3 (11)	
Substance use disorder				
Yes	72 (97)	46 (96)	26 (100)	0.538[b]
No	2 (3)	2 (4)	0 (0)	
Forensic characteristics				
Index offence*				
Non-violent	2 (3)	2 (4)	0 (0)	0.323[b]
Violent	54 (75)	37 (78)	17 (68)	
Sexual offence	16 (22)	8 (17)	8 (32)	
Criminally convicted prior to index offence				
Yes	43 (58)	25 (52)	18 (69)	0.154[a]
No	31 (42)	23 (48)	8 (31)	

*Missing values. 1. Antipsychotic monotherapy defined as only one antipsychotic prescription. 2.Antipsychotic polytherapy defined as two or more antipsychotic prescription. a. Chi^2 test. b.Fisher's exact test.

Pharmacological prescription pattern

In total, 31% ($n = 23$) of the study population received clozapine. Those who received APP had a significantly higher prevalence of a clozapine prescription compared to those receiving monotherapy (50% versus 21%, Chi^2, $p = 0.010$). APP was also significantly associated with a prescription of oral olanzapine and oral aripiprazole (Table 2).

Of the total population, 93% (69/74) received SGAs, and 19% received FGAs. Of the 14 patients prescribed an FGA, 9 were treated with an APP regime. There was a significant association between FGA prescription and APP (Chi^2, $p = 0.011$). No patients received an FGA+FGA combination as APP. In total, 70% (52/72) of patients received LAI. Although not significant, the use of LAI was more prevalent in the patient group receiving APP, than monotherapy (81% vs 65%, Chi^2, $p = 0.146$). Specifically, we found a trend towards a more frequent prescription of Zuclopenthixol as LAI within the group of APP (66,6% vs 33,3%, Fisher's test, $p = 0.059$) (Table 3).

Discussion

The prevalence of APP in the Greenlandic forensic psychiatric population was 35%. There was a tendency for

Table 2. Comparison of prescribed antipsychotic medication among Greenlandic forensic patients with an F2 ICD-10 diagnosis in antipsychotic mono versus polypharmacy treatment. Cross- sectional study February 29th 2020.

	Total $N = 74$ n (%)	APM[1] $N = 48$ n (%)	APP[2] $N = 26$ n (%)	p-value
Form of administration				
Oral only	22 (30)	17 (35)	5 (19)	0.146[a]
LAI[3] ≥1	52 (70)	31 (65)	21 (81)	
Prescribed a first-generation antipsychotic				
Yes	14 (19)	5 (10)	9 (35)	0.011[a]
No	60 (81)	43 (90)	17 (65)	
Prescribed a second-generation antipsychotic (SGA)				
Yes	69 (93)	43 (90)	26 (100)	0.106 [b]
No	5 (7)	5 (10)	0 (0)	
High-dose (PDD:DDD >1.5)				
High	21 (28)	14 (29)	7 (27)	0.838[a]
Low	53 (72)	34 (71)	19 (73)	
Prescribed clozapine				
Yes	23 (31)	10 (21)	13 (50)	0.010
No	51 (69)	38 (79)	13 (50)	

1. Antipsychotic monotherapy defined as only one antipsychotic prescription. 2. Antipsychotic polytherapy defined as two or more antipsychotic prescriptions. 3. Long acting injections.

Table 3. Comparison of antipsychotic prescription pattern among Greenlandic forensic psychiatric patients with an F2 ICD-10 diagnosis in antipsychotic monotherapy versus polypharmacy treatment. Cross- sectional study February 29th 2020.

Type of antipsychotic	Prescriptions (n)	APM (n)	APP (n)	p-value
FGA[1]				
Haloperidol (LAI)	1	0	1	0.351[b]
Perphenazine (LAI)	4	2	2	0.609[b]
Zuclopenthixol	1	0	1	0.351[b]
Zuclopenthixol (LAI)	9	3	6	0.059[b]
SGA[2]				
Clozapine	23	10	13	0.010[a]
Olanzapine	12	3	9	0.003[b]
Olanzapine (LAI)	6	3	3	0.659[b]
Quetiapine	3	1	2	0.281[b]
Risperidone	5	3	2	1.000[b]
Risperidone (LAI)	20	14	6	0.785[b]
Aripiprazole	4	0	4	0.013[b]
Aripiprazole (LAI)	3	3	0	0.548[b]
Paliperidone	1	0	1	0.351[b]
Paliperidone (LAI)	7	6	1	0.410[b]
Other				
Levomepromazine	1	0	1	0.351[b]

1.First generation antipsychotics, 2. Second generation antipsychotics. a. Chi2 test. b Fisher's exact test.

higher APP prevalence among inpatients compared to outpatients (50% versus 32%). There was a significant association between APP and the prescription of either clozapine, oral olanzapine, oral aripiprazole, or FGAs. Also, those receiving APP had higher but non-significant use of LAIs.

Prevalence of antipsychotic polypharmacy

The APP prevalence of 35% in our study contrasts with previous findings. In a Danish study from 2015, comprising 26,000 patients, the prevalence of APP in a general psychiatric population was 25% [12]. In the Gallego et al. study from 2012, the worldwide mean of APP among patients with schizophrenia was 20% [13]. However, Alberdi et al found an APP prevalence of 35% among Greenlandic schizophrenic and non-affective psychotic patients, which correlates well with our results [11].

It needs to be taken into consideration that our population consists of forensic psychiatric patients, of which 94% were sentenced to psychiatric treatment for committing a violent or sexual offence. Previous studies have shown that a history of violence or a forensic history is associated with APP [5,45]. Furthermore, antipsychotics are often used to reduce aggression [26]. Adding to this, it is well-known that forensic psychiatric patients often show treatment resistance and are more challenging to treat due to comorbid substance use disorders, and lack of insight [46,47]. Also, the generally high consumption of antipsychotic drugs in the Greenlandic population, could increase the risk of polypharmacy [11].

In recent studies, the prevalence of APP among forensic psychiatric patients ranged from 45% to 55%. Both studies included all diagnostic groups, and while the Canadian study comprised inpatients, the Italian study consisted of patients in residential settings [25,26]. Our APP prevalence of 50% among forensic psychiatric inpatients is rather similar to the two studies. Also, like the Canadian study, we found that APP increased with an increased level of security [26]. The patients transferred to Denmark are typically more complex and severely ill and in need of a more specialised in-patient treatment. Therefore, they might be at a higher risk of polypharmacy due to a more severe psychopathology. This indicates that APP treatment of forensic patients is a dynamic process, where the most intensive and complex treatment such as APP is primarily prescribed for the more severely ill patients. There appears to be an international consensus, with very similar prescription patterns, which might indicate that APP treatment has a broad acceptance among clinicians, and the use of APP is not random, but considered, through experience, as a valid option for treatment-resistant schizophrenia.

Previous studies, investigating both patients from forensic psychiatry and general psychiatry, found several demographic, clinical, and forensic characteristics to be associated with APP [12,13,16–21,26]. Many of these characteristics, such as male gender, in-patient status, and high-dose treatment, are often associated with forensic psychiatric patients. However, none of these characteristics was found to be significantly associated with APP in our study. An important reason for this could be a lack of statistical power.

Clozapine

Our prevalence of clozapine prescribing was consistent with the prevalence found by Farrell et al. (31% vs 35%)

[26]. As clozapine is recommended for treatment-resistant schizophrenia [26], our data indicate that a considerable number of forensic psychiatric patients suffer from treatment resistance. Another explanation could be clozapine's effect on aggressive and unrestrained behaviour [48].

Also, clozapine was significantly associated with APP treatment which is consistent with several previous studies [11,12,26]. This correlates well with most guidelines that recommend that if APP is considered necessary, clozapine should be one of the included antipsychotics [49].

However, 50% of the APP group did not receive clozapine as part of their treatment regime. This might be explained by possible serious side effects and the comprehensive regular bloodwork control required [50–52]. Both of which might decrease compliance and also be difficult to fulfill in remote areas and small settlements.

Long-acting injections

Several papers have shown an association between LAI prescription and APP [13,26,53]. We found a tendency of a higher prevalence of LAI in APP treatments (81%, 21/26) compared to the prevalence of LAI in APM treatments (65%, 31/48). A possible explanation for this could be cross-titration. When starting LAI treatment an oral antipsychotic is often used as lead-in medication in the first weeks before the LAI drug has acceptable plasma levels to avoid psychiatric relapse or adverse effects which may occur in the initiation period [12,54].

We found a high prevalence of LAI prescription (70%) when compared to other studies [21,26]. This could be explained by LAI often being the chosen form of administration for patients with higher psychopathology, compliance issues, and treatment resistance [21,55]. Farrell et al [26] and Armstrong et al [21] both found an LAI prescription prevalence of 49%, however, the two populations consisted of inpatients; one forensic psychiatric patients and one general psychiatric patients respectively. An advantage of LAIs is a better adherence to treatment, compared to oral antipsychotics, which is essential in our population of mainly outpatients [56]. Even though LAI antipsychotics cost more than oral antipsychotics, the use of LAIs has been found associated with fewer rehospitalizations, which benefits both the economy of the health care system and the patients' quality of life [57].

We also found a tendency towards the specific use of Zuclopenthixol as LAI and APP (66,6%, 6/9). Despite small numbers, this combination of a FGA and LAI again suggests the patient group receiving APP has a higher psychopathology as the use of FGA's might also indicate treatment-resistance, as discussed in the next section.

First and second generation antipsychotics

The vast majority of patients in our study received treatment with SGAs either as mono- or polypharmacy, consistent with the official recommendation when treating patients with schizophrenia and other psychotic illnesses in Denmark and Greenland. The national recommendation guide lists specific SGAs in the first and second attempts of treatment [58–60].

We found a significant association between APP and FGA prescription (Chi2, $p = 0.011$), consistent with previous studies [5,13,21]. The APP patients receiving an FGA only did so in combination with an SGA. A meta-analysis from 2012 found that SGA + FGA was the most common drug combination, which could be attributed to clinicians wanting to combine a more selective D2 receptor blocker with the SGA [61]. FGA´s are direct D2 receptor antagonists, which means that they target positive symptoms like delusions and hallucinations [62] whereas second-generation antipsychotics generally have a lower affinity for the D2 receptors [63]. A lack of improvement in positive symptoms is generally one of the defining features of treatment-resistant schizophrenia [64]. This could indicate that patients receiving FGAs as part of an APP regime are treatment-resistant. These findings all comply with what could be expected regarding the prescription of FGAs.

Olanzapine and aripiprazole

We also found a significant association between receiving APP and olanzapine (Fisher's test, $p = 0.003$) and aripiprazole (Fisher's test, $p = 0.011$). This could be explained by cross-titration as aripiprazole is recommended as the first line of treatment trial and olanzapine is recommended as the second line of treatment [60]. Also, Maudsleys prescription guidelines states that the combination of aripiprazole with other antipsychotics could reduce adverse effects as hyperprolactinaemia and weight increase [65]. It should be noted that the number of patients receiving either olanzapine or aripiprazole is quite small.

Strength and limitations

One of the main strengths is that our study comprises nearly all forensic psychiatric patients diagnosed with a ICD-10 F2 diagnosis in Greenland; thus, risk of selection bias is subsequently low. This study is to our

knowledge the first to describe the APP prescription in an entire national population of forensic psychiatric patients diagnosed with an F2 disorder.

The quality of the data used in this study is also considered to be high. We had access to medical files through the national electronic patient file (EPF) system as well as older, regional versions of the EPF from before the EPF system reached full national coverage in Greenland in 2018. Health care professionals are required by law to document all care in the EPF and the majority of forensic psychiatric patients are treated at the National Hospital in Nuuk by a multidisciplinary team led by a psychiatrist. Furthermore, we obtained data from court documents as well as forensic psychiatric assessments (FPAs). The FPAs are primarily performed by forensic psychiatric experts, psychologists, and social workers ensuring standardised, high-quality data. The reliability study showed a moderate to strong agreement between the two raters, which suggests acceptable inter-rater reliability [28].

However, our study has several limitations. First of all, it is a cross-sectional study, which means that there is a probability that the prevalence of APP may be overestimated due to cross-titration in medication. Secondly, our population is small which affects the statistical power. Finally, we have not included PRN medication, which means that the prevalence of APP most likely is underestimated.

It might be argued that our data cannot be generalised to other forensic populations. However, our population is similar to other forensic psychiatric populations, as they all primarily consist of men who suffer from psychotic disorders and high rates of substance disorder, who did not finish high school, and were convicted of a violent crime.

Clinical implications

Our data indicates that a substantial proportion of forensic psychiatric patients suffers from treatment-resistant schizophrenia, which require a highly intensive and specialised pharmacological treatment as APP is associated with a range of adverse effects. Besides the primary diagnosis, forensic psychiatric patients suffer from several comorbidities, such as substance use disorder and metabolic syndrome, with the latter also being an established adverse effect of antipsychotic treatment [5,8–10,66]. Clinicians need to be aware of and consider the difficulties involved in the treatment of these patients, especially when considering APP.

In forensic psychiatry, the goal of treatment is also to ensure the safety of the patients, staff, and society. This study highlights the complexity of treatment in forensic psychiatry. Sometimes APP may be the superior solution, where several other treatment options have failed. Further investigation into the clinical practice of APP is needed to determine risk factors and possible benefits and disadvantages of APP treatment.

Conclusion

The prevalence of antipsychotic polypharmacy among Greenlandic forensic psychiatric patients suffering from a psychotic disorder was 35%. Our data indicate that a high proportion of forensic psychiatric patients suffer from treatment-resistant schizophrenia in need of complex and intensive pharmacological treatment. Finally, we found a tendency of higher prescription of polypharmacy among admitted patients compared to outpatients, which suggests that polypharmacy may also be related to the need to ensure security and safety for patients, staff and society.

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