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Differences in ADHD medication usage patterns in children and adolescents from different cultural backgrounds in the Netherlands

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Abstract

Purpose Differences in incidence and prevalence of ADHD medication use between ethnic groups have been reported. Goal of this study was to determine whether there are also differences in usage patterns of ADHD medication among native Dutch children and adolescents and those with a Moroccan, Turkish and Surinam cultural background in the Netherlands between 1999 and 2010.

Methods In a cohort of ADHD patients <19 years ($N = 817$) incident use and discontinuation of ADHD medication were measured for ethnicity and adjusted for age, gender and socio-economic status.

Results A significant higher proportion of ADHD-diagnosed patients from Moroccan (32 %) and Turkish (42 %) cultural background never used ADHD medication compared to Dutch natives (21 %). One-fifth of native Dutch and Turkish patients already used ADHD medication before the ADHD diagnosis date. Discontinuation of ADHD medication within 5 years was significantly higher in Moroccan [HR 2.4 (95 % CI 1.8–3.1)] and Turkish [HR 1.7 (95 % CI 1.1–2.6)] patients. A sensitivity analysis with a zip code-matched comparison between Dutch natives and non-natives showed similar results, suggesting this effect is probably not explained by socio-economic status (SES).

Conclusion Differences are found in prescribing and use of ADHD medication between patients with a different cultural background. Native Dutch and Turkish patients start more frequently with ADHD medication before the ADHD diagnose date, which can be an indication of differences in either referral patterns and/or access to care. A higher percentage of patients with a Moroccan and Turkish cultural background never start using ADHD medication at all and discontinuation rate is higher compared to Dutch natives and Surinamese.

Keywords ADHD medication · Usage patterns · Dutch · Moroccan · Turkish

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Introduction

Attention deficit hyperactivity disorder (ADHD) is a highly prevalent neurobiological disorder characterised by developmentally inappropriate problems with attention, concentration, impulsivity and hyperactivity causing impairment in daily life and its presentation is influenced by psychosocial, environmental, genetic and biological factors [1–3]. The prevalence of ADHD among preschoolers is estimated at 0.5–6.5 %, among children and adolescents worldwide at 5 %, among adults at 1–4.7 % and among elderly adults at 2.8 % [4–11].

Studies in several countries, including the Netherlands, have shown a strong increase during the last two decades in prevalence and incidence of ADHD medication use among

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pre-schoolers and schoolchildren (especially among boys of 6–12 years old), and adults [12–29].

Between groups with a different cultural background differences have been found with respect to health care consumption, costs, use or dosage of psychotropics or medication for attention deficit hyperactivity disorder in children and adolescents. For example, the costs for psychotropic medication for African-American children, coming into contact with US Child Welfare Agencies, were almost 400 dollar lower than in a white child [30]. The percentage of African-American, Latin-American, non-Hispanic black or Asian children and adolescents getting a prescription for initial ADHD medication is lower than in Caucasian Americans [23, 31–40]. Differences in prescription rate or cost do not seem to be associated with differences in effectiveness of ADHD medication, since there is evidence that ADHD medication is as effective in Caucasian as in Afro American of Latin-American children or adolescents [41, 42]. Also, the persistence of ADHD symptoms from child to adolescence seems to be equal in patients with different ethnic backgrounds [43]. No literature is available about differences in children and adolescents from different ethnic backgrounds with ADHD or using ADHD medication within other European countries.

The Netherlands are a multi-cultural society, with clear differences between different ethnic groups in income, work, education and consumption of health care [44]. In the 1960s and 1970s from the twentieth century, two large groups of immigrants of Turkish and Moroccan cultural background came to live in European countries such as the Netherlands. Surinam was a Dutch colony until 1975 and the immigration of Surinamese to the Netherlands strongly increased during the period of decolonization. Among the immigrants, there is a higher prevalence of risk factors for mental disorders such as low income, low socio-economic status and bad housing [45]. However, Dutch studies show that the prevalence of psychological problems or psychiatric disorders among youth of different ethnic origin is equally divided [46, 47], but children, especially from Turkish or Moroccan cultural background, seem to be underrepresented in mental health care institutes [48, 49].

Nuijen et al. [49] concluded that, after consulting a mental health care institute, youngsters with a "non-native Dutch" cultural background seem to have a higher dropout range of psychological or psychopharmacological treatment. Feelings of shame, fear for stigma, ignorance of recognising mental problems by parents, lack of emotional problem identification, teachers of referrers and prejudices to mental disorders or treatment, negative experiences with professional agencies, financial situation and language or cultural discrepancies could play a role in the underrepresentation of children and adolescents with an other cultural background than a Dutch background [47, 48, 50, 51]. A recent American study, however, showed that there were almost no differences in referral between different ethnic groups, although former studies showed differences in referral rates and treatment [52].

Wittkampf [53] showed that the prevalence of ADHD medication prescriptions in Turkish and Moroccan Dutch immigrant populations (0 to 60+ years) was lower compared to that of the native Dutch population. One might, therefore, raise the question whether these differences in medication use reflect different intervention choices that might be due to cultural background.

To our knowledge, so far little is known about differences in use and usage pattern of ADHD medication like continuation or discontinuation among subjects of different cultural background in international as well as in national, Dutch, research. Lipkin et al. [54] found that a higher dosage of stimulants was prescribed in Medicaid non-African-American and in privately insured African-American children compared to Caucasian subjects. A higher percentage of Caucasian subjects continued use of stimulants from 1995–1996 to 2003–2004 than of Hispanics or African Americans [23]. Both studies suggest that differences in prescription and usage pattern might exist between cultural or ethnic groups.

The subject of the present study is to analyse differences in starting and discontinuation of ADHD medication between native Dutch youth and those with a Moroccan, Turkish or Surinam cultural background with ADHD in the Netherlands adding information to the literature whether there might be differences found in these patterns.

Methods

Setting

The psychiatric casus register (PCR) collects data of approximately 117,000 patients on age, gender, psychiatric diagnosis, type of psychiatric care, date of psychiatric diagnosis and start or ending of psychiatric treatment of patients of different psychiatric institutions in the province of Utrecht, the Netherlands. These data were linked to data obtained from the Achmea Health Database. Achmea is a large health insurance company in the middle of the Netherlands. The Achmea database contains demographic details, complete medication history and hospital admission information of 1.5 million insured patients. In the Netherlands, each individual is required to have a health insurance.

Study population

For this study, all patients who had a diagnosis of ADHD at Altrecht between January 1999 and December 2010 and

were younger than 19 years at the time of diagnosis were identified from the Psychiatric Casus Register. Altrecht is a large institute for mental health care, a conglomeration of psychiatric hospitals and outpatient clinics that serves about 800,000 inhabitants in the central region of the Netherlands.

These patients were subsequently linked with patients from the Achmea Health Database on date of birth, sex and zip code. Patients who could not be linked uniquely because they appeared twice in the database or had no information about ethnic cultural background were excluded. Furthermore, patients were only eligible for inclusion if they had at least 6 months of history in the composed database before the ADHD diagnosis and could be followed for at least 6 months afterwards.

The Achmea Health Database registers the foreign nationality of first generation Moroccan and Turkish immigrants. Second- or third-generation immigrants were identified by use of a special designed computer programme recognising surnames and matching it with their cultural background. Ethnic cultural background was classified as "native Dutch" (Dutch, Western and other non-Western nationalities), "Moroccan", "Turkish" or "Surinam" [45].

ADHD medication use

For each patient, all prescriptions for ADHD medication: immediate release methylphenidate (IR-MPH like Ritalin® or Medikinet®) or extended release methylphenidate (ER-MPH like Concerta®, Medikinet CR® and Equasym XL®), dexamphetamine (Dexedrin®), atomoxetine (ATX, Strattera®), nortriptyline (Nortrilen®) or clonidine (Dixarit®) were identified from the Achmea Health Database. Concerta® was introduced in the Netherlands in 2003, atomoxetine in 2005 and Medikinet CR® and Equasym XL® in 2007.

The date of the first dispensing of any ADHD medication marked the start of treatment. Patients were considered to be starters if they were known in the pharmacy for at least 6 months prior to the very first prescription of an ADHD drug. Patients already using ADHD medication during the first 6 months of pharmacy record data collection were considered to be prevalent users. The theoretical duration of use of each prescription was calculated using information about the dispensing date, the number of units dispensed and the prescribed dosage regimen. Discontinuation of ADHD treatment was defined as not having refilled a new prescription for any ADHD drug within 3 months (90 days) after the theoretical end date of the previous prescription.

Assessment of covariates

We assessed the use of psychotropic co-medication at the time of ADHD diagnosis, as well as at 6 and 12 months after this date. Drugs evaluated included typical and atypical antipsychotics, antidepressants [tricyclic other than nortriptyline and serotonin re-uptake inhibitors (SSRIs)], lithium, benzodiazepines, promethazine and anti-epileptic drugs.

Psychiatric diagnosis

Other psychiatric diagnoses of interest, coded according to the Diagnostic and Statistical Manual of Mental Disorders IV and IV-TR, were disruptive behaviour disorder [oppositional defiant disorder (ODD), conduct disorder (CD) and behaviour disorder not otherwise specified], mood disorder (depression, dysthymia, bipolar disorder), autism spectrum disorders [autism, Asperger's syndrome, pervasive developmental disorder not otherwise specified (PDD-NOS)], anxiety disorders (including obsessive compulsive disorder), learning disorder and mental retardation. Diagnoses of these conditions were assessed for all patients in the study population.

Data analyses

Differences between groups from different cultural background with respect to sex, age of ADHD diagnosis, comorbid psychiatric disorders or psychotropic comedication were tested by means of Chi-square tests. Differences were considered significant at $p < 0.05$ (two tailed). Differences between groups from different cultural background with respect to use (never, prevalent, start) of ADHD medication and type of ADHD start medication and prescriber were tested by means of Chi-square tests. Differences were considered significant at $p < 0.05$ (two tailed).

A cumulative frequency curve was made to show the time to ADHD treatment initiation for native Dutch patients and those with a Moroccan, Turkish and Surinam cultural background according to the ADHD diagnosis date.

Among starting users of ADHD medication, we assessed the time to treatment discontinuation. Cox regression analysis was used to calculate hazard ratios and 95 % confidence intervals for the risk of discontinuation for patients with a Moroccan, Turkish and Surinam cultural background compared to Dutch natives. We tested age, gender, provider, zip code, co-medication and individual comorbid disorders as potential confounders and included

them in the multivariate model if they resulted in a >10 % change in the principal outcome.

To investigate social-economic status as a potential confounder, we conducted a sensitivity analysis where we matched Moroccan, Turkish and Surinam patients with ADHD with native Dutch patients by the first numbers of the zip code and did similar analyses. The zip code was used as a proxy for information about mean income per person and grade of urbanisation as defined and registered by Statistics Netherlands [53, 55].

Results

Overall, there were 7045 patients in the Psychiatric Casus Register with any psychiatric diagnosis that could be linked with data from the Achmea database. The study population comprised 817 (11.6 % of total patients) patients that had a diagnosis of ADHD and had least 6 months of history in the composed database before and after the date of ADHD diagnosis.

Table 1 shows that almost three quarters of the study population were native Dutch, followed by patients with a Moroccan (17.5 %), Turkish (6.4 %) and Surinam (2.9 %) cultural background. There are significantly more male (77.5 %) than female (22.5 %) patients with ADHD and especially more Moroccan (84.6 %) and Turkish (92.3 %)

male patients. Overall, almost 60 % of the patients are diagnosed at the age of 6–11 year old with a mean age of 10.1 years (SD 3.5). The mean age at ADHD diagnosis of Dutch natives is 10.1 years (SD 3.5), of Moroccans 9.8 years (SD 3.3), of Turks 11.4 years (SD 3.8) and of Surinam's 10.7 years (SD 3.7).

Learning disorders were significantly more frequently diagnosed in patients with a Surinam (29.2 %) cultural background and mental retardation in patients with ADHD with a Turkish (21.2 %) and Moroccan (14.0 %) cultural background.

Use of psychotropic co-medication at the time of ADHD diagnosis date and 6 and 12 months afterwards was low: between 0 and 1.8 %. Use of antipsychotics was 2.9 % at 12 months afterwards. No differences are found between native Dutch patients and patients with a Moroccan, Turkish and Surinam cultural background (data not shown).

Table 2 shows that a quarter of the 817 identified patients never used ADHD medication during the study period. This proportion is significantly highest in patients with ADHD and a Moroccan (32.2 %) and Turkish (42.3 %) cultural background. Around 20 % of the native Dutch (22.9 %) and patients from Turkish (19.2 %) cultural background started with ADHD medication before diagnosed with ADHD at the mental health care institute Altrecht (significant difference).

Table 1 Characteristics of 817 patients 0–18 years old diagnosed with ADHD between 1999 and 2010

	Total (N = 817), 100 % (N)	Native Dutch (N = 598), 73.2 % (N)	Moroccan (N = 143), 17.5 % (N)	Turkish (N = 52), 6.4 % (N)	Surinam (N = 24), 2.9 % (N)
Gender*					
Male	77.5 % (633)	74.4 % (445)	84.6 % (121)	92.3 % (48)	79.2 % (19)
Female	22.5 % (184)	25.6 % (153)	15.4 % (22)	7.7 % (4)	20.8 % (5)
Age ADHD diagnosis (years)					
0–5	5.6 % (46)	6.2 % (37)	4.9 % (7)	3.8 % (2)	0.0 % (0)
6–11	62.8 % (513)	63.0 % (377)	67.1 % (96)	50.0 % (26)	58.3 % (14)
12–18	31.6 % (258)	30.8 % (184)	28.0 % (40)	46.2 % (24)	41.7 % (10)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Age first contact (years)	9.58 (3.4)	9.5 (3.4)	9.5 (3.3)	10.4 (3.8)	10.1 (3.4)
Age ADHD diagnosis (years)	10.14 (3.5)	10.1 (3.5)	9.8 (3.3)	11.4 (3.8)	10.7 (3.7)
Comorbid psychiatric disorders					
Disruptive behaviour disorder	32.4 % (265)	32.4 % (194)	32.9 % (47)	32.7 % (17)	29.2 % (7)
Mood disorder*	4.4 % (36)	4.3 % (26)	2.8 % (4)	3.8 % (2)	16.7 % (4)
Autism and related disorders*	8.0 % (65)	9.4 % (56)	2.1 % (3)	9.6 % (5)	4.2 % (1)
Anxiety disorder	31.1 % (254)	32.3 % (193)	26.6 % (38)	36.5 % (19)	16.7 % (4)
Learning disorder*	11.3 % (92)	12.4 % (74)	6.3 % (9)	3.8 % (2)	29.2 % (7)
Mental retardation*	10.3 % (84)	8.5 % (51)	14.0 % (20)	21.2 % (11)	8.3 % (2)

* Significant $p < 0.05$ Chi-square testing

Table 2 Use of ADHD medication in 817 patients 0–18 years old diagnosed with ADHD between 1999 and 2010

	Total ($N = 817$), 100 % (N)	Native Dutch ($N = 598$), 73.2 % (N)	Moroccan ($N = 143$), 17.5 % (N)	Turkish ($N = 52$), 6.4 % (N)	Surinam ($N = 24$), 2.9 % (N)
Never used ADHD medication*	24.7 % (202)	21.2 % (127)	32.2 % (46)	42.3 % (22)	29.2 % (7)
Start ADHD medication use before ADHD diagnosis date*.#	20.6 % (168)	22.9 % (137)	12.6 % (18)	19.2 % (10)	12.5 % (3)
Start ADHD medication use after ADHD diagnosis date#	50.6 % (413)	50.4 % (304)	53.8 % (77)	36.5 % (19)	54.2 % (13)
Prevalent ADHD medication use	4.2 % (34)	5.0 % (30)	1.4 % (2)	1.9 % (1)	4.2 % (1)

* Significant $p < 0.05$ Chi-square testing

ADHD diagnosis date at mental health care institute

Fig. 1 Time to start ADHD medication treatment in days for native Dutch patients and patients with a Moroccan, Turkish or Surinam cultural background ($N = 581$). $T = 0$ as date of ADHD diagnosis at the mental health care institute
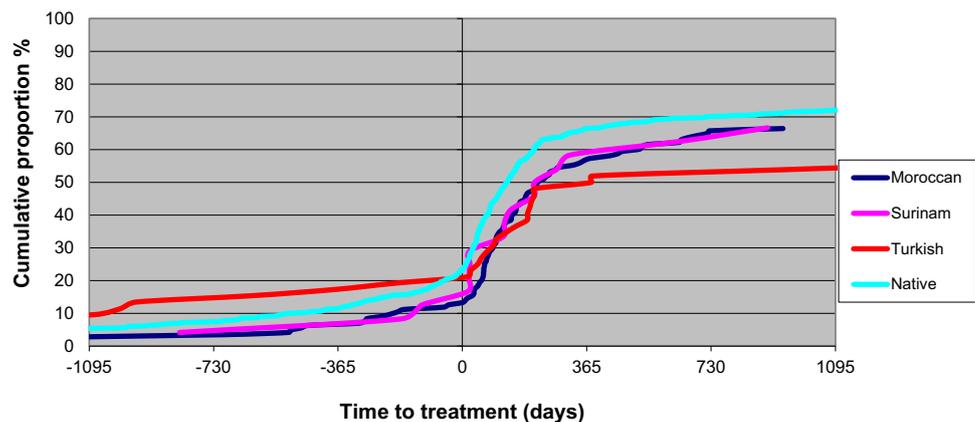

Figure 1 shows the time to ADHD medication treatment start in days for native Dutch patients with ADHD and those from Moroccan, Turkish and Surinam cultural background: around 20 % of native Dutch and Turkish patients start with ADHD medication before the ADHD diagnosis date. A higher proportion of native Dutch patients continues to use ADHD medication (73.3 %) for 3 years after the ADHD diagnosis date.

Table 3 shows that 581 (71.1 %) of the 817 patients with ADHD were starters with ADHD medication having at least 6 months of exposure history available prior to the first prescription of an ADHD drug. Overall, almost three quarters of the patients is male. The percentage of females with a Moroccan, Turkish or Surinam background starting with ADHD medication is lower compared to native Dutch females. One-fifth of the patients starting ADHD medication are getting this prescribed by a general practitioner, almost three quarters by a medical specialist. The rate of paediatrician as first prescriber of start ADHD medication was highest among Dutch natives (16.3 %). Almost all patients start with methylphenidate, mainly immediate release methylphenidate (MPH IR) (around 80 %). When starting with extended release methylphenidate, Dutch natives start with Concerta® (12.2 %) and patients with a Moroccan cultural background with Medikinet CR®

(11.6 %). Almost no patients start with atomoxetine, nortriptyline or clonidine.

Figure 2 illustrates that patients with ADHD from Moroccan and Turkish cultural background are significant more prone to discontinue their incident ADHD medication within 5 years than native Dutch patients of those from Surinam cultural background. From the confounder analysis only age, gender and comorbid mood disorder resulted in a change of >10 % in the hazard ratio for ethnic background. The probability of discontinuation in patients from Moroccan cultural background is 2.4 times higher (95 % CI 1.8–3.1) and from Turkish cultural background 1.7 times higher (95 % CI 1.1–2.6) as compared to native Dutch patients. After matching native Dutch and non-native (Moroccan, Turkish or Surinam together) patients on the first four numbers of their zip code as a proxy for SES, the same significant differences in pattern of discontinuation were found (data not shown).

Discussion

Our study shows differences in starting and discontinuation of ADHD medication between native Dutch children and adolescents with ADHD and those with a Moroccan,

Table 3 Start of use of ADHD medication in patients 0–18 years old diagnosed with ADHD between 1999 and 2010

	Total ($N = 581$), 100 % (N)	Native Dutch ($N = 441$), 73.2 % (N)	Moroccan ($N = 95$), 17.5 % (N)	Turkish ($N = 29$), 6.4 % (N)	Surinam ($N = 16$), 2.9 % (N)
Gender*					
Male	78.3 % (455)	76.4 % (337)	81.1 % (77)	96.6 % (28)	81.2 % (13)
Female	21.7 % (126)	23.6 % (104)	18.9 % (18)	3.4 % (1)	18.8 % (3)
First prescribers start ADHD medication					
General practitioner	21.5 % (125)	21.1 % (93)	20.0 % (19)	31.0 % (9)	25.0 % (4)
Medical specialist	73.3 % (426)	75.1 % (331)	69.5 % (66)	62.1 % (18)	68.8 % (11)
Paediatrician	14.3 % (83)	16.3 % (72)	7.4 % (7)	6.9 % (2)	12.5 % (2)
CA psychiatrist	35.5 % (206)	35.4 % (156)	33.7 % (32)	37.9 % (11)	43.8 % (7)
Other/unknown	23.6 % (137)	23.4 % (103)	28.4 % (27)	17.2 % (5)	12.5 % (2)
Other/unknown	5.2 % (30)	3.9 % (17)	10.5 % (10)	6.9 % (2)	6.3 % (1)
First start with					
Methylphenidate IR and ER	98.8 % (574)	98.4 % (434)	100 % (95)	100 % (29)	100 % (16)
MPH IR	79.9 % (464)	80.3 % (354)	75.8 % (72)	89.7 % (26)	75 % (12)
Concerta®	11.5 % (67)	12.2 % (54)	8.4 % (8)	6.9 % (2)	18.8 % (3)
Equasym XL®	1.5 % (9)	1.6 % (7)	2.1 % (2)	0.0 % (0)	0.0 % (0)
Medikinet CR®	4.1 % (24)	2.5 % (11)	11.6 % (11)	3.4 % (1)	6.2 % (1)
Unknown IR or ER	1.7 % (10)	1.8 % (8)	2.1 % (2)	0.0 % (0)	0.0 % (0)
Dexamphetamine	0.3 % (2)	0.5 % (2)	0.0 % (0)	0.0 % (0)	0.0 % (0)
Atomoxetine	0.3 % (2)	0.5 % (2)	0.0 % (0)	0.0 % (0)	0.0 % (0)
Clonidine*	0.5 % (3)	0.7 % (3)	0.0 % (0)	0.0 % (0)	0.0 % (0)
Nortriptyline	0.0 % (0)	0.0 % (0)	0.0 % (0)	0.0 % (0)	0.0 % (0)

CA psychiatrist child and adolescent psychiatrist, *methylphenidate IR* immediate release, *methylphenidate ER* extended release (like Concerta® or Equasym XL® or Medikinet CR®)

* Significant $p < 0.05$ Chi-square testing

Fig. 2 Time in years to discontinue incident ADHD medication after 5 years ($N = 581$)
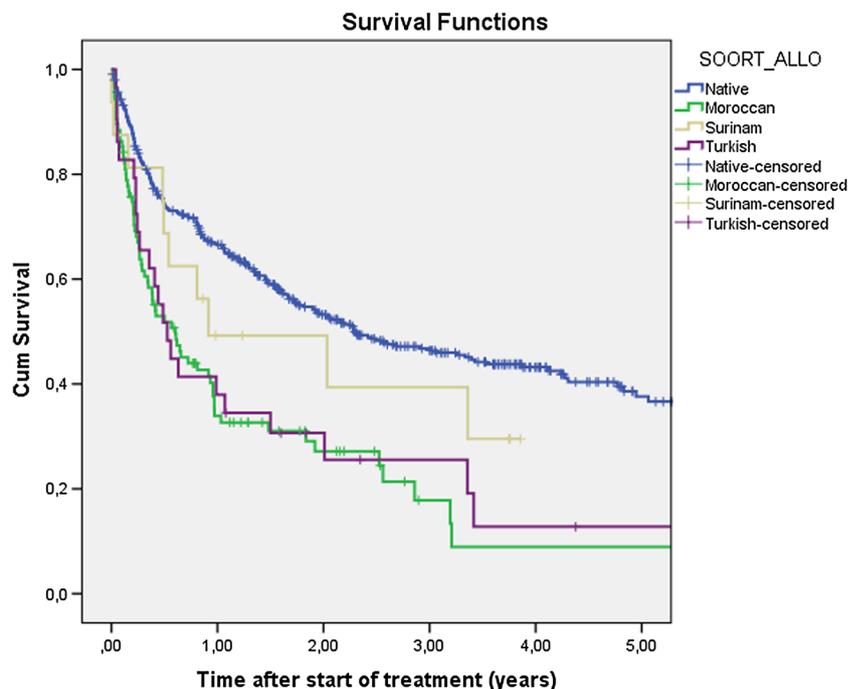
Turkish and Surinam cultural background. A significant higher percentage of patients with a Moroccan (32 %) and Turkish (42 %) cultural background never used ADHD medication during the study period as compared to Dutch natives (21 %). One-fifth of the native Dutch patients and those from Turkish cultural background already used ADHD medication before they were diagnosed at the mental health care institute with ADHD. Discontinuation of ADHD medication within five years is highest in patients with a Moroccan and Turkish cultural background and is not associated with socio-economic status (SES).

Our finding that there is a difference in the percentage of ADHD medication use between ethnic groups is consistent with findings reported in (inter)national literature. In African-American, Latin-American, non-Hispanic black or Asian American children and adolescents, the percentage that was prescribed ADHD medication is lower than in Caucasian Americans and it was shown that the prevalence of ADHD medication prescriptions in Turkish and Moroccan cultural background populations is lower compared to Dutch natives in a Dutch study as well [23, 31–40, 44].

We found that one-fifth of the native Dutch patients and those with a Turkish cultural background started with ADHD medication before the ADHD diagnosis date. It is possible that native Dutch children and adolescents and those with a Turkish cultural background are diagnosed with ADHD elsewhere and that psychopharmacological treatment is already started before they are referred to Altrecht, a mental health care institute. This can be an indication of differences in referral patterns and access to care. In the Netherlands, there are regional differences in the organisation of assessment and treatment of patients with ADHD. In some regions only child and adolescents psychiatrists diagnose and treat patients with ADHD, in other regions, like Utrecht, there are specialised paediatricians beside child- and adolescents psychiatrists, who prescribe medication and work together with first line psychologists, diagnosing ADHD and offering psychosocial treatment. Native Dutch patients and patients with a Turkish cultural background might be diagnosed and treated by them before they were referred to specialised mental health care institute.

Risk of discontinuation of ADHD medication within 5 years significantly differed and was 2.4 times higher in patients with a Moroccan cultural background and 1.7 times higher in those with a Turkish background as compared to Dutch natives. This finding is consistent with findings in the USA from Winterstein et al. [23] who found a higher percentage of Caucasian subjects continuing the use of stimulants compared to Hispanics or African Americans. In our study, discontinuation is not explained by socio-economic status (SES), so we conclude that it might be related to ethnic background. Nuijen et al. [49]

concluded that children and adolescents with a "non-Dutch" cultural background seem to have a higher drop-out range of psychological or psychopharmacological treatment after consulting a mental health care institute. It is suggested that feelings of shame, fear for stigma, prejudices to mental disorders or treatment, negative experiences with professional agencies and language or cultural discrepancies could play a role [47, 48, 50–52, 56].

Further, we found significantly more comorbid mental retardation in patients with ADHD from Moroccan (14 %) and Turkish (21.2 %) cultural background than in native Dutch patients with ADHD and those from Surinam cultural background. Studies have suggested that stimulants are less effective in intellectual disabled children with ADHD, although effect sizes of 0.39–0.52 were found [57]. The mean effect size of stimulants in children with a normal IQ is between 0.6 and 1.8, depending on the rater [58]. It is possible that discontinuation in some patients with ADHD from Moroccan and Turkish cultural background and mental retardation is associated with less effectiveness of stimulants. Probably they might suffer from more of different side effects.

These findings on discontinuation give cause for concern. Many studies have shown that ADHD can have a severe impact on daily life, daily functioning at school or at work, social and emotional development, family stress, health care consumption and expenditure, substance use, abuse and dependence and criminality and there are some indications that ADHD medication might reduce the risk and impact on life [27, 59–72]. Non-native patients with ADHD might be at an additional higher risk for negative outcomes later in life.

Strengths and limitations

In the Netherlands, all inhabitants have mandatory health care insurance. Less than 1 % of the inhabitants in the Netherlands are not insured. Most of them are between 18 and 35 years old and from Antillean or other European countries [73]. So, our hypothesis is that the access to care is equally divided among all native Dutch children and adolescents and those from Moroccan, Turkish, and Surinam origin in our study.

Based on the fact that 27 % of our research population was non-Dutch native, we might conclude that our group was representative for the diversity in cultural background of Utrecht that is known to have 20–21 % inhabitants with a non-Dutch cultural background. We were able to include all patients with an ADHD diagnosis that were registered in the databases with a known ethnic background. This is an advantage over the studies that only include ADHD patients using medication. We expect that our conclusions, therefore, are based on a representative and adequate sample.

A limitation of our study was that we had no information where, when and by whom treatment was started in one-fifth of native Dutch patients with ADHD and those with a Turkish cultural background, who already used ADHD medication before being diagnosed. Further, it must be noted that the number of included native Dutch patients ($N = 598$) and those with a Moroccan ($N = 143$) cultural background is much higher those with a Turkish ($N = 52$) or Surinam ($N = 24$) cultural background. Therefore, the small group size might explain some findings of (not) being different from each other. Another limitation is that there might be some misclassification using surnames for identifying ethnic background. First, marriages of mixed cultural background might occur and might bias the classification in the different groups used in our study. Surinamese marry relative often with partners from native Dutch origin and only one out of eight Turkish' or Moroccan's does not marry with a partner of the same cultural background [74].

Second, when a child carries the surname of the father it will be classified along with his cultural background and vice versa with the surname of the mother. It was not until 1998 that a child automatically got the surname of the father. After 1998, married parents were able to choose whether the child should carry the surname of the father or the mother (less than 5 %).

Conclusion

Differences are found in prescribing and use of ADHD medication among native Dutch patients with ADHD and those with a Moroccan, Turkish and Surinam cultural background. One-fifth of the native Dutch patients and those with a Turkish cultural background already used ADHD medication before being diagnosed at a specialised care clinic, which can be an indication that referral patterns and access to care in those groups differ from those with a Moroccan and Surinam cultural background. It is preferable that access to care is independent of cultural background. Discontinuation of ADHD medication within 5 years is higher in patients with Moroccan and Turkish cultural background compared to Dutch natives and not different in patients with a Surinam cultural background although a small group size might explain this finding of not being different.

Future research should focus on underlying beliefs and prejudices influencing differences in starting use, discontinuation and effect of ADHD medication. Pathways of referral and differences between prescribers from different (mental) health care and other institutes must be analysed, because this might influence compliance. Little is known about long-term outcome of ADHD medication use among groups with a different cultural background; this should be subject for future research. At last, differences in

(presentation of) effects or side effects of ADHD medication in patients of different ethnic backgrounds and whether differences have a genetically, biological or environmental origin should be studied.

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