

Utilization of Injectable Drugs for Communicable and Non-communicable Diseases in Primary Healthcare: A Retrospective Study in Turkey

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ABSTRACT

Objective: Primary care, which is often the first level of contact for patients with various communicable diseases (CDs) and non-communicable diseases (NCDs), might exhibit patterns of injectable drug utilization different from hospitals. We aimed to examine injection prescribing to adults with CD or NCD in primary care.

Methods: In this retrospective study, single-diagnosis injectable drug-containing prescription data from Family Medicine Information System comprising 32 provinces of Turkey were analysed. The prescriptions were grouped by diagnosis as "CD" (n=3848) and "NCD" (n=9338). Injectable drug utilization patterns in these groups were analysed by demographics, diagnoses, and drug subgroups.

Results: Out of 13186 prescriptions, 70.8% were issued for NCDs. NCD prescriptions were mostly generated for women and elderly ($p < 0.05$ for both). About 63.3% (n=2948) of injectable drugs in CD prescriptions were antibiotics and 12.6% were analgesics. Cefazolin (15.2%) was the most commonly prescribed antibiotic for acute pharyngitis and acute sinusitis, and benzathine benzylpenicillin (12.8%) was the top-choice for acute tonsillitis and rheumatic fever. In NCD prescriptions, 34.0% (n=4214) of injectable agents were analgesics and 16.9% were muscle relaxants. The most frequently encountered drug in NCD prescriptions was thiocholchicoside (16.3%), which was the top-choice in all seven common musculoskeletal diagnoses.

Conclusion: Muscle relaxants and analgesics were the most commonly prescribed injectable drugs for NCDs, musculoskeletal diseases in particular. Antibiotics were frequently encountered in CD prescriptions, mostly as broad-spectrum for lower respiratory tract infections (RTIs) and narrow-spectrum for upper RTIs. These findings may elucidate the issues to especially focus on regarding excessive use of injections.

Keywords: injectables, antibiotics, analgesics, primary care, thiocholchicoside.

INTRODUCTION

Parenteral route of drug administration provides precise dosing and produces better bioavailability and faster effect. Besides, it also has remarkable disadvantages such as higher cost, requirement of experienced staff and essential equipment, and increased risk of adverse outcomes such as injection site reactions including infections.¹ Thus, parenteral drugs should be preferred in cases where the need and the superiority of the parenteral route over the enteral is clearly demonstrated.² According to the World Health Organization (WHO), overuse of injections when oral formulations would be more appropriate is a common ex-

ample of irrational drug use. In this respect, WHO included the percentage of prescriptions with an injectable drug as one of the prescribing indicators to measure the degree of irrational drug use.³ A previous study in Turkey reported that approximately 10% of the prescriptions collected from different levels of healthcare institutions contained an injectable preparation, which was similar to the median of Middle East and North African countries, and lower than that of European and Central Asian countries.^{4,5} Injectable drugs can be preferred for the treatment of both communicable diseases (CDs) and noncommunicable diseases (NCDs), which can affect a large number of people in the world. The estimated worldwide prevalence and incidence of CDs, ma-

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Table 1. Comparison of prescriptions containing communicable and noncommunicable disease diagnosis by patient gender, age, season and SEDI category.

		Total (n=13186) (n) (%)	CD (n=3848) (n) (%)	NCD (n=9338) (n) (%)	p-value
Gender	Male	5205 (39.5)	1591 (41.3)	3614 (38.7)	0.005
	Female	7981(60.5)	2257 (58.7)	5724 (61.3)	
Age	18–44*	4862 (36.9)	1841 (47.8)	3021 (32.4)	<0.001*
	45–64	4849 (36.8)	1147 (29.9)	3702 (39.6)	
	≥65	3475 (26.3)	860 (22.3)	2615 (28.0)	
Season	Winter	3314 (25.1)	1049 (27.3)	2265 (24.3)	<0.001
	Spring	3241 (24.6)	897 (23.3)	2344 (25.1)	
	Summer	3482 (26.4)	773 (20.1)	2709 (29.0)	
	Autumn	3149 (23.9)	1129 (29.3)	2020 (21.6)	
SEDI	Above average	5363 (40.7)	1650 (42.9)	3713 (39.8)	0.001
	Below average	7823 (59.3)	2198 (57.1)	5625 (60.2)	

* The difference between the groups was due to 18-44 age group.

CD: Communicable diseases, NCD: Noncommunicable diseases, SEDI: Socio-economic development index.

ternal, neonatal and nutritional diseases in 2017 were reported as 4.8 billion and 27.2 billion, respectively, and these were 7 billion and 10.8 billion for NCDs, respectively.⁶ NCDs and their effects are more prominent in developed and developing countries.^{6,7} Primary health care centres are often the first level of contact for patients with various CDs and NCDs, and they provide the care needed for the diagnosis and treatment of these diseases.⁸ The prescribing practices for injectable drugs can also be different in primary health care centres than those in hospitals due to various factors including the inadequate physical infrastructure of primary health care centres (i.e. the absence of emergency and inpatient services) and patients' reasons of visits (i.e. mostly uncomplicated cases).⁹ Hence, studies investigating the prescribing practices of injectable medicines for CDs and NCDs in primary care might identify problems for the treatment of these diseases and guide for implementation of appropriate interventions. Besides, the results of these studies might provide important clues about the frequency, severity, and treatment burden of these diseases. In this study, we aimed to examine injectable drug prescribing to adults with CD or NCD in primary care.

METHODS

In this retrospective cross-sectional study, data of injectable drug-containing prescriptions issued throughout the year of 2010 from Family Medicine Information System (FMIS) were used. Per national legislation of Turkey, ethical approval was not required for this retrospective study using anonymized data. FMIS was an electronic prescription database designed for monitoring and evaluation of prescriptions issued by the family physicians and providing feedback to the prescribers.¹⁰ Out of 33 provinces of Turkey selected as pilot regions to collect data for FMIS, 32 provinces with available primary care prescription data for

the whole year of 2010 were included in this study. The dataset included 38400 prescriptions, for which 100 injectable drug-containing prescriptions issued in each month of the year were selected by simple random sampling for each province. Among the prescriptions generated for ≥18 years (n=32953), those with single diagnosis (n=15574) were selected. These prescriptions were classified by diagnosis based on the Global Burden of Disease Study 2017, which assessed the disease and injury-related burden.⁶ In that study, the conditions related to disease burden were classified as "communicable, maternal, neonatal and nutritional diseases", "NCD" and "injuries" according to International Classification of Diagnosis-10 (ICD-10) codes.⁶ After that, we excluded prescriptions with a diagnosis of any maternal, neonatal or nutritional disease, or injury. Accordingly, the remaining 13186 prescriptions were included in the study, 3848 of which were in "CD group" and 9338 were in "NCD group".

The prescriptions in both groups were compared by age and gender of the patients, injectable drugs included, month of issue, and the socio-economic development index (SEDI-2011) category of the provinces they issued in. SEDI-2011 is an index in which the socioeconomic development status of 81 provinces in Turkey are evaluated using 61 different indicators under eight domains as demography, employment, education, health, competitive and innovative capacity, finance, accessibility, and quality of life.¹¹ Before evaluation, we categorized the provinces as "above average" and "below average" according to the SEDI values. Moreover, the most common ten diagnoses in CD and NCD groups, and the top five injectable drugs prescribed for each of those were examined. The drugs were analysed according to the fifth level of Anatomical Therapeutic Chemical (ATC) classification.¹²

Table 2. Distribution of the most frequently encountered ten diagnoses in prescriptions issued for communicable and noncommunicable diseases.

CD prescriptions		NCD prescriptions	
Diagnosis (ICD-10)	n (%)	Diagnosis (ICD-10)	n (%)
Acute tonsillitis (J03)	1133 (29.4)	Diabetes mellitus (E10-E14)	1355 (14.5)
Acute bronchitis (J20)	823 (21.4)	Other arthrosis (M19)	1271 (13.6)
Acute pharyngitis (J02)	463 (12.0)	Dorsalgia (M54)	676 (7.3)
Viral immunization (Z25)	445 (11.6)	Other arthritis (M13)	577 (6.2)
Acute sinusitis (J01)	188 (4.9)	Pain, not elsewhere classified (R52)	517 (5.5)
Unspecified upper RTI (J06)	178 (4.7)	Gonarthrosis (M17)	246 (2.6)
Unspecified lower RTI (J22)	109 (2.8)	Schizophrenia (F20)	192 (2.1)
Infectious diarrhea and gastroenteritis (A09)	103 (2.7)	Biomechanical lesions, not elsewhere classified (M99)	180 (1.9)
Acute bronchiolitis (J21)	67 (1.7)	Cystitis (N30)	177 (1.9)
Rheumatic fever without mention of heart involvement (I00)	64 (1.7)	Other soft tissue disorders, not elsewhere classified (M79)	176 (1.9)
Others	275 (7.1)	Others	3971 (42.5)
Total	3848 (100.0)	Total	9338 (100.0)

CD: Communicable diseases, NCD: Noncommunicable diseases, ICD-10: International Classification of Diseases-10, RTI: Respiratory tract infection.

Statistical Analysis

Data were analysed using IBM SPSS Statistics 22.0 (IBM Corp., Armonk, NY, USA) software. Results were expressed as numbers, percentages, or mean ± standard deviation values. Frequency analysis was used for statistical evaluation. Categorical variables were compared by chi-square and Student t-test were used for comparison of continuous variables. P-value under 0.05 was inferred as statistically significant.

Main Points:

- Seven out of 10 prescriptions were issued for NCDs, which were mostly generated for women and older patients.
- Near two-thirds (63.3%) of injectable drugs in CD prescriptions were antibiotics and 34.0% of injectable agents were analgesics in NCD prescriptions.
- Antibiotics were frequently encountered in CD prescriptions, being mostly as broad-spectrum for lower respiratory tract infections (RTIs) and narrow-spectrum for upper RTIs.
- The most frequently prescribed injectable drug in NCD prescriptions was thicolchicoside (16.3%), which was the top-choice in all seven common musculoskeletal diagnoses.
- This study may provide guidance in determining the road-map of any intervention to limit unnecessary use of injectable agents.

RESULTS

A total of 13186 single-diagnosis prescriptions included in the study comprised 34.3% of all injectable drug prescriptions in the FMIS-derived database. Among these, 29.2% were issued for CDs, while 70.8% were for NCDs. Women made up 60.5% for whom the prescriptions were generated, and this was significantly higher in NCD group (61.3% vs. 58.7% in CD, p<0.05). The mean age of recipients was lower in CD prescriptions (47.2±18.3) compared to that in NCD prescriptions (52.9±16.9), (p<0.05). Patients aged 18-44 years comprised a higher proportion in CD group (47.8%) when compared to NCD group (32.4%), (p<0.001). Prescriptions were mostly written in provinces that were "below average" (59.3%) in terms of SEDI category. NCD prescriptions were more common in those provinces (60.2%) compared to CD prescriptions (57.1%), (p=0.001), (Table 1). The highest number of prescriptions were issued in August (8.9%), whereas the months with the fewest prescriptions issued were May, October, and November (7.9%). Prescribing was most common in October (11.1%) and January (9.5%) in CD group and in August (9.9%) and June (9.6%) in NCD group (Figure 1).

The most common diagnoses in prescriptions were acute tonsillitis (29.4%), acute bronchitis (21.4%), and acute pharyngitis (12.0%) in CD group, while these were diabetes (14.5%), other arthroses (13.6%), and dorsalgia (7.3%) in NCD group (Table 2). In CD group, 63.3% (n=2948) of injectable drugs were antibiotics and 12.6% were analgesics. Nine of the 20 most commonly encountered injectable drugs in CD prescriptions

Table 3. Distribution of the most frequently prescribed drugs for the top ten diagnoses in prescriptions with a diagnosis of communicable disease.

Rank	Diagnosis (total number of drugs on prescriptions)	1st drug (n) (%)	2nd drug (n) (%)	3rd drug (n) (%)	4th drug (n) (%)	5th drug (n) (%)
1	Acute tonsillitis (n=1387)	Benzathine penicillin (422) (30.4)	Cefazolin (229) (16.5)	Procaine penicillin (204) (14.7)	Metamizole (136) (9.8)	Ceftriaxone (136) (9.8)
2	Acute bronchitis (n=1008)	Ceftriaxone (458) (45.4)	Cefuroxime (154) (15.2)	Metamizole (91) (9.0)	Methylprednisolone (65) (6.4)	Ampicillin and beta lactamase inhibitor (54) (5.4)
3	Acute pharyngitis (n=575)	Cefazolin (126) (21.9)	Metamizole (86) (14.9)	Benzathine penicillin (85) (14.8)	Cefuroxime (53) (9.2)	Ceftriaxone (38) (6.6)
4	Viral immunization (n=455)	Influenza vaccine* (442) (97.1)	Pneumococcal vaccine ^δ (12) (2.6)	Diclofenac (1) (0.2)	-	-
5	Acute sinusitis (n=231)	Cefazolin (43) (18.6)	Metamizole (36) (15.5)	Cefuroxime (32) (13.8)	Ceftriaxone (28) (12.1)	Lincomycin (26) (11.2)
6	Unspecified upper RTI (n=227)	Metamizole (39) (17.1)	Cefazolin (36) (15.8)	Benzathine penicillin (20) (8.8)	Ceftriaxone (20) (8.8)	Lincomycin (15) (6.6)
7	Unspecified lower RTI (n=121)	Ceftriaxone (33) (27.2)	Cefuroxime (28) (23.1)	Cefazolin (24) (19.8)	Methylprednisolone (6) (5.0)	Metamizole (6) (5.0)
8	Infectious diarrhea and gastroenteritis (n=172)	Sodium chloride (31) (18.0)	Metoclopramide (16) (9.3)	Electrolyte combinations (15) (8.7)	Metronidazole (13) (7.7)	Vitamin B complex (11) (6.4)
9	Acute bronchiolitis (n=73)	Ceftriaxone (21) (28.8)	Cefuroxime (14) (19.2)	Cefazolin (12) (16.4)	Methylprednisolone (9) (12.3)	Betamethasone (2) (2.7)
10	Rheumatic fever without mention of heart involvement (n=70)	Benzathine penicillin (48) (68.6)	Betamethasone (7) (10.0)	Meloxicam (3) (4.3)	Dexamethasone (2) (2.9)	Tenoxicam (2) (2.9)

* Inactivated purified antigen, ^δ Purified polysaccharide antigens.

RTI: Respiratory tract infection.

Color coding is used for visualization of the table. Green: Corticosteroids; Grey: Vaccines; Light Yellow: Electrolyte solutions and vitamins; Navy Blue: Analgesics; Orange: Antiinfectives; Red: Antivomiting agent; White: Blank.

were antibiotics, followed by analgesics, vaccines (flu and pneumococcal vaccines), and corticosteroids (Figure 2a). Thirty-four percent (n=4214) of the injectable drugs were analgesics and 16.9% were muscle relaxants in NCD group. Thirteen percent of NCD prescriptions included both analgesics and muscle relaxants, while only 1.8% included muscle relaxant as thiocolchicoside, without any concomitant analgesic. Of the 20 most commonly prescribed injectable drugs in NCD group, six were analgesics, five were insulins, and three were corticosteroids. Thiocolchicoside (16.3%) was the most frequently encountered injectable drug in NCD prescriptions (Figure 2b).

Antibiotics were the most commonly encountered injectable drugs for eight of the top ten diagnoses in the CD group. Ceftriaxone was the most frequently prescribed injectable drug for the diagnosis of acute bronchitis, acute bronchiolitis, and unspecified acute lower respiratory tract infections (RTIs). Benzathine

benzylpenicillin was the top choice for acute tonsillitis and rheumatic fever without cardiac involvement, and cefazolin for acute pharyngitis and acute sinusitis (Table 3).

Thiocolchicoside was the most commonly prescribed injectable drug for seven of the ten most common diagnoses in NCD group. These prescriptions mainly included analgesics, with diclofenac being the most commonly preferred one, second to thiocolchicoside. All top five injections prescribed for diabetes treatment were insulin preparations (Table 4).

DISCUSSION

At least sixteen billion injections are administered worldwide every year. Ninety percent of those are given for therapeutic purposes, and in many cases, injections are reported to be overused despite available oral alternatives.² In this study, we examined the utilization of injectable drugs included in prescriptions with

Table 4. Distribution of the most frequently prescribed drugs for the top ten diagnoses in prescriptions with a diagnosis of noncommunicable disease.

Rank	Diagnosis (total number of drugs on prescriptions)	1st drug (n) (%)	2nd drug (n) (%)	3rd drug (n) (%)	4th drug (n) (%)	5th drug (n) (%)
1	Diabetes mellitus (n=1540)	Insulin aspart + protamine aspart (437) (28.4)	Insulin glargine (311) (20.2)	Insulin lispro (183) (11.9)	Insulin detemir (155) (10.1)	Insulin aspart (140) (9.1)
2	Other arthrosis (n=1768)	Thiocolchicoside (412) (23.3)	Diclofenac (341) (19.3)	Betamethasone (295) (16.7)	Tenoxicam (161) (9.1)	Etofenamate (139) (7.9)
3	Dorsalgia (n=1048)	Thiocolchicoside (329) (31.4)	Diclofenac (259) (24.7)	Etofenamate (89) (8.5)	Dexketoprofen (87) (8.3)	Betamethasone (76) (7.3)
4	Other arthritis (n=793)	Thiocolchicoside (179) (22.6)	Diclofenac (148) (18.7)	Betamethasone (125) (15.8)	Tenoxicam (62) (7.8)	Etofenamate (61) (7.7)
5	Pain, not elsewhere classified (n=733)	Thiocolchicoside (191) (26.1)	Diclofenac (180) (24.6)	Dexketoprofen (70) (9.5)	Etofenamate (61) (8.3)	Betamethasone (52) (7.1)
6	Gonarthritis (n=353)	Thiocolchicoside (75) (21.2)	Betamethasone (67) (19.0)	Diclofenac (50) (14.2)	Tenoxicam (32) (9.1)	Etofenamate (26) (7.4)
7	Schizophrenia (n=199)	Zuclopenthixol (76) (38.2)	Risperidone (69) (34.7)	Fluphenazine (19) (9.5)	Biperiden (17) (8.5)	Flupenthixol (13) (6.5)
8	Biomechanical lesions, not elsewhere classified (n=292)	Thiocolchicoside (111) (38.0)	Diclofenac (101) (34.6)	Dexketoprofen (22) (7.5)	Etofenamate (15) (5.1)	Tenoxicam (13) (4.5)
9	Cystitis (n=209)	Gentamicin (70) (33.5)	Ceftriaxone (31) (14.8)	Diclofenac (20) (9.6)	Cefazolin (13) (6.2)	Metamizole (10) (4.8)
10	Other soft tissue disorders, not elsewhere classified (n=246)	Thiocolchicoside (72) (29.3)	Diclofenac (57) (23.2)	Dexketoprofen (29) (11.8)	Etofenamate (17) (6.9)	Tenoxicam (16) (6.5)

Color coding is used for visualization of the table. Blue: Muscle relaxant; Green: Corticosteroids; Navy Blue: Analgesics;

Orange: Antiinfectives; Pink: Antidiabetics; Yellow: Antipsychotics.

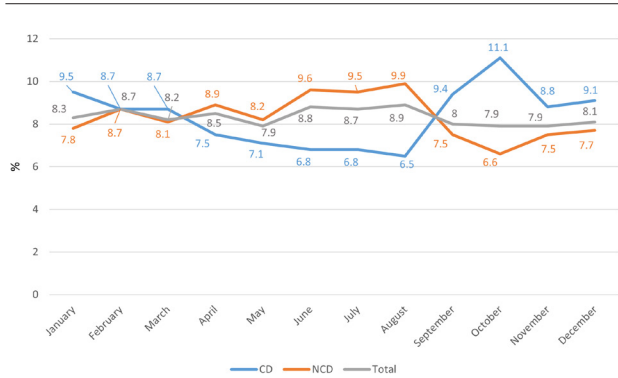
a CD or NCD diagnosis in primary care. Muscle relaxants and analgesics were common in NCD prescriptions due to high number of musculoskeletal diagnoses. Antibiotics were prescribed frequently for CDs, broad-spectrum ones mostly to treat lower RTIs and narrow-spectrum for upper RTIs.

Single-diagnosis prescriptions (n=15574) constituted 40.6% of all prescriptions with an injectable drug (n=38400). This number was lower than previously reported in a study (54.5%) examining prescriptions written in primary care in Turkey between 2013 and 2016, regardless of inclusion of any injectable drug.¹³ This might be partly related to high number of concomitant diseases contributing to injectable drug preference. We also found that approximately three-fifths of the prescriptions (60.5%) were written to women, and this gender difference was slightly more pronounced (61.3%) in NCD group (p<0.05). That might be partly explained by gender differences in the utilization of healthcare services, as women are reported to be more likely to visit primary care in comparison to men.¹⁴

diseases) has declined over the years, with being 46.4% of the disease burden in 1990, 34.0% in 2010 and 28.0% in 2017. On the other hand, the burden of NCD increased from 43.2% in 1990 to 55.4% in 2010 and 62.0% in 2017.^{15,16} This shift was attributed to significant reduction in communicable and preventable diseases due to increased income and improved health and living standards.¹⁶ The same study reported the burden of NCDs in Turkey as 80.9% and CDs along with other preventable diseases as 12.0% in 2010.^{15,16} In our study, 70.8% of injectable drug-containing prescriptions had a diagnosis of NCD and the remainder (29.2%) included CD, which points out proportionally more common utilization of injectable drugs for CDs in primary care. "15-49 years old" reported to have the highest share of NCDs (33.3%) in Turkey in 2010, followed by "50-69 years old" (30.8%).^{15,16} However, NCDs were most common in the "45-64 years old" age group (39.6%) in our study, which might be potentially related to the increased need for injectable drug use in relatively older NCD patients.

Approximately three-fifths of the prescriptions evaluated were issued in the provinces "below average" by SEDI category. The high rate of injectable drug prescribing in these provinces with low socioeconomic development indicates that regional differ-

Figure 1. Distribution of prescriptions with a diagnosis of communicable or non-communicable diseases by months. CD: Communicable diseases, NCD: Noncommunicable diseases.



ences should be taken into account when planning of regulatory interventions on promoting rational use of medicines. Several factors that can potentially show local variations such as level of healthcare institution, availability of resources, physician knowledge and attitude, and patient demands such as requesting injectable forms for faster relief might impact the practice of rational prescribing.^{17,18} As for physician and patient-based issues, improved adherence to the guidelines as recommended by WHO might contribute to rational pharmacotherapy, as well as minimizing these regional differences.³

Around half of the injections on NCD prescriptions were analgesics (34.0%) or muscle relaxants (16.9%). Thiocolchicoside was present in one in six NCD prescriptions and also was the most common drug among all prescriptions, which indicates that primary care physicians tend to prescribe high numbers of injectable preparations of this drug. The potential safety issues of various muscle relaxants, including thiocolchicoside, had been questioned. Due to the concerns such as disruption in cell proliferation and increased risk of male infertility, teratogenicity, and cancer development, clinical usage of the drug was restricted in various countries, including Turkey, in recent years.^{19,20} Although these safety precautions emerged after the data collection of the study, the results point out the risk of widespread usage of the drug. A Turkish nationwide drug utilization study from 2013 to 2016 showed that despite the declining trend, thiocolchicoside was generally among the most frequently prescribed drugs, which suggests possible overuse.¹³ Guideline recommendations regarding the use of muscle relaxants for low back pain are conflicting and evidence of clinical benefit are uncertain.²¹ Despite the lack of widespread recommendations, efforts of physicians to achieve faster patient relief or to address their demands might lead to irrational practices such as additional prescribing of a muscle relaxant when in fact unnecessary. Diclofenac was second after thiocolchicoside in almost all musculoskeletal system diagnoses, followed by other NSAIDs such as dextetoprofen and tenoxicam. Also, it was noteworthy that the most preferred injectable analgesic in CD prescriptions was metamizole (9.1%), which was approximately five times higher than diclofenac (1.9%). These results showed that primary care physicians mainly prescribed NSAIDs as injectable analgesics for musculoskele-

Figure 2a. Distribution of the most frequently encountered twenty drugs included in prescriptions for communicable diseases. Antibiotics in Others include streptomycin (0.5%), metronidazole (0.3%), amoxicillin (0.2%), rifamycin (0.2%), ampicillin (0.2%), amikacin (0.1%), thiamphenicol (<0.05%), benzylpenicillin (<0.05%), sulfamethoxazole and trimethoprim (<0.05%), moxifloxacin (<0.05%), amoxicillin and beta-lactamase inhibitor (<0.05%), cefotaxime (<0.05%), ceftazidime (<0.05%), and levofloxacin (<0.05%). Analgesics in Others include tenoxicam (0.3%), etofenamate (0.2%), meloxicam (0.2%), and lornoxicam (0.1%).

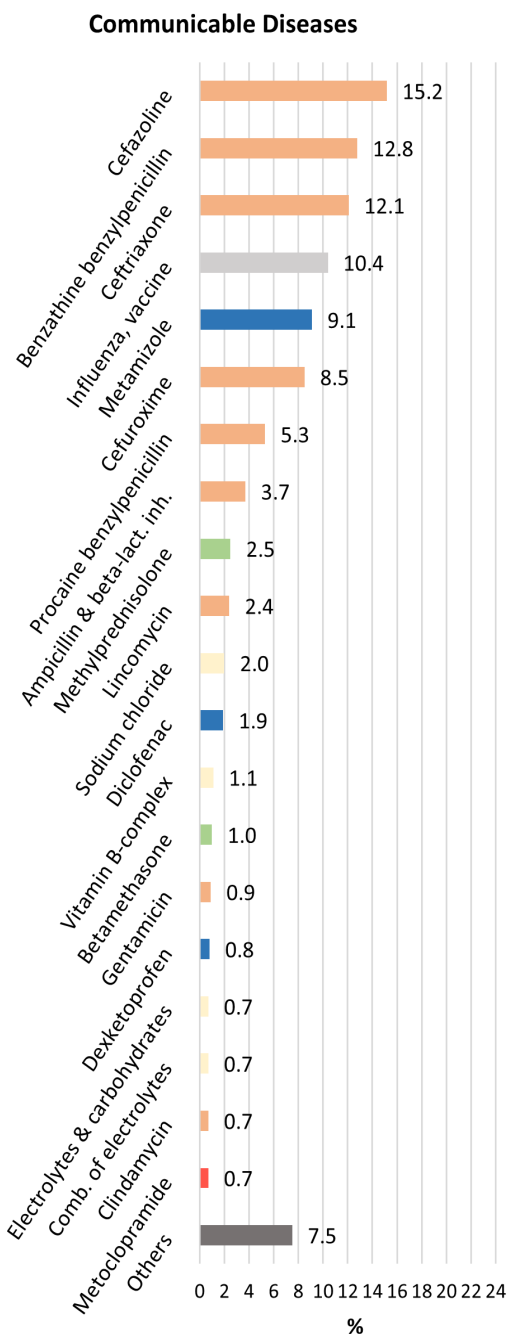
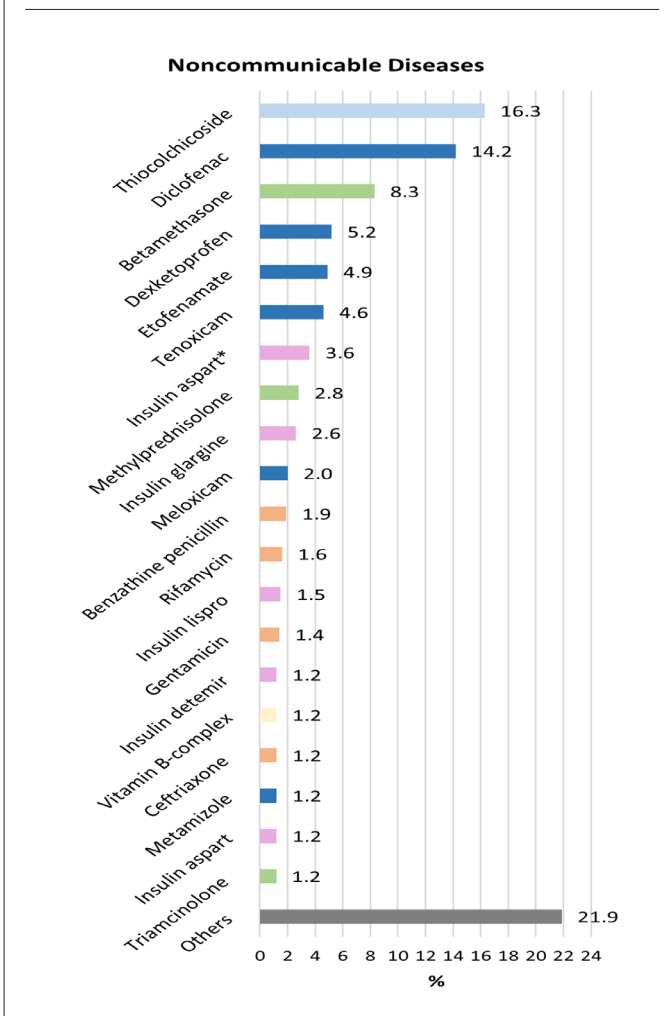


Figure 2b. Distribution of the most frequently encountered twenty drugs included in prescriptions for noncommunicable diseases. *: Insulin aspart and insulin aspart protamine. Analgesics in Others include lornoxicam (1.0%), ketoprofen (0.6%), pethidine (0.1%), tramadol (0.1%), morphine (<0.05%), and piroxicam (<0.05%). Muscle relaxant in Others was fenyramidol (0.6%).



tal system diseases, whereas other analgesic/antipyretics were mainly preferred for infectious diagnoses.

Cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes were reported among the major disorders responsible for 82% of deaths by NCDs.²² In a study examining primary care prescriptions in Turkey between 2013 and 2016, hypertension was reported as the most common diagnosis, followed by myalgia and gastroesophageal reflux among other top ten NCDs.¹³ In our study, the most common diagnosis was diabetes mellitus (14.5%). In 2010, prevalence of diabetes in adults was reported as 13.7%, and 13.6% of the patients with diabetes was using insulin.²³ Especially in the last decade, both insulin and the newer injectable agents such as glucagon-like peptide-1 analogues were reported to effectively provide glycemic control, and those agents were added to the recommendations for type 2 diabetes management in earlier stages.²⁴ In our study, the most com-

monly used injectable drug for diabetes treatment was insulin, however, considering up-to-date recommendations of current treatment guidelines, future studies may provide to what extent the newer injectable components of diabetes treatment have influenced the primary care practice.

In CD prescriptions, the most commonly encountered injectable drugs were antibiotics (63.3%) and analgesics (12.6%). Ceftriaxone was the most frequently prescribed antibiotics in the diagnosis of lower RTIs, whereas benzathine benzylpenicillin and cefazolin were the most frequently prescribed antibiotics in the diagnosis of acute tonsillitis, acute pharyngitis and acute sinusitis. A study from India conducted in 2013 reported that ceftriaxone was the most commonly used injectable antibiotic in tertiary care, followed by cefotaxime and amikacin.²⁵ Contrary to our finding, cefazolin was not among the first fifteen drugs, which might be due to different levels of health care setting and the type of infectious disease. A study from Italy reported that injectable forms prescribed by primary care physicians constituted 15% of antibiotic prescriptions in upper RTIs. Besides, cephalosporins, ceftriaxone in particular, were the most commonly prescribed antibiotics.²⁶ Upper RTIs are one of the common reasons for primary care visits in Turkey.¹³ Considering injectable use of third generation cephalosporins could significantly contribute to the development of antimicrobial resistance, widespread prescribing of narrow-spectrum injectable agents such as cefazolin and benzathine penicillin for upper RTIs might be regarded as relatively rational.²⁷ However, ceftriaxone, a broad-spectrum antibiotic, was the third most commonly prescribed drug in the CD group (12.1%), which might be potentially remarkable in terms of inappropriate antibiotic use.

Between April and November, monthly distribution of prescriptions in CD and NCD groups showed discrete trends. Incidence of the common infectious diseases generally increases in the winter months.²⁸ Accordingly, the use of antibiotics also reported to peak in that season.^{29,30} Our study revealed that injectable drug prescribing for CDs followed a similar trend. On the other hand, the decrease in NCD prescriptions during the autumn season needs further evaluation.

The findings of the study should be interpreted with their limitations. First, although the diagnoses in the prescriptions were assumed to be registered into the electronic system correctly, the physicians who generated the prescriptions might have preferred to register a more relevant diagnosis available in the system, instead of the actual diagnosis. Absence of any method to confirm the diagnosis on the prescription registry might be considered as a limitation. Second, we only analysed the prescriptions with a single diagnosis to assess drug choice for a specific diagnosis. Third, since the identity information of the patients cannot be accessed for ethical reasons, it was technically possible to have more than one prescription data of the same patient in the electronic database. Fourth, the study data covering the year of 2010 might not reflect the most recent changing trends, however, these potential differences might be limited as general clinical practice could be comparably less dynamic and slowly adapting field compared to many specialties of medicine

in terms of therapeutic approach. Lastly, the data reflected the practice in the first years of FMIS. The mass transition to electronic prescribing might have affected prescribing practices in different ways. On the other hand, the results of this study might give an insight for future studies considering the limited number of nationwide studies investigating injectable drug use.

CONCLUSION

This study revealed the details of injectable drug use in primary care in terms of prescribing preferences in CDs and NCDs. Muscle relaxants and analgesics were the most commonly prescribed injectable drugs for NCDs, musculoskeletal system diseases in particular. In prescriptions with CDs, broad-spectrum injectable antibiotics were commonly prescribed for lower RTIs and narrow-spectrum ones for upper RTIs. Thiocolchicoside, whose rationale for use in NCDs is in question, was remarkably the most commonly prescribed drug among all injectable drugs. On the other hand, considering high levels of excessive and inappropriate use of antibiotics in Turkey, preference of relatively narrow-spectrum injectable agents in this study suggests a rational prescribing practice. This study may shed light on the areas needed to be focused when proposing any interventions on limiting injection overprescribing, which is among the main principles of rational use of medicines.

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Ethical statement: The study described in this article was conducted within the framework of the Declaration of Helsinki. Per national legislation of Turkey, ethical approval was not required for this retrospective study using anonymized data.

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