

# FALLS RISK INCREASING DRUGS IN THE ELDERLY: POPULATION BASED STUDY USING KOREAN NATIONAL HEALTH INSURANCE CLAIMS DATABASE

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## BACKGROUND

- The burden of elderly falls on society is a major challenge worldwide and it is expected to rise rapidly with unprecedented rate of aging population which is prominent in East Asian countries. The risk of falls in elderly can be reduced with avoiding fall-risk-increasing drugs(FRIDs).
- Previous literatures had attempted to determine FRIDs but only few literatures were conducted in Asian population. Different genetic variants of CYP enzymes, environmental factors(i.e. lifestyle, housing, healthcare utilizations, etc), and other physical factors(i.e. comorbidities, height, BMIs, etc) of Asian elderly population may yield different list of FRIDs than previous literature conducted in Western population.

## OBJECTIVES

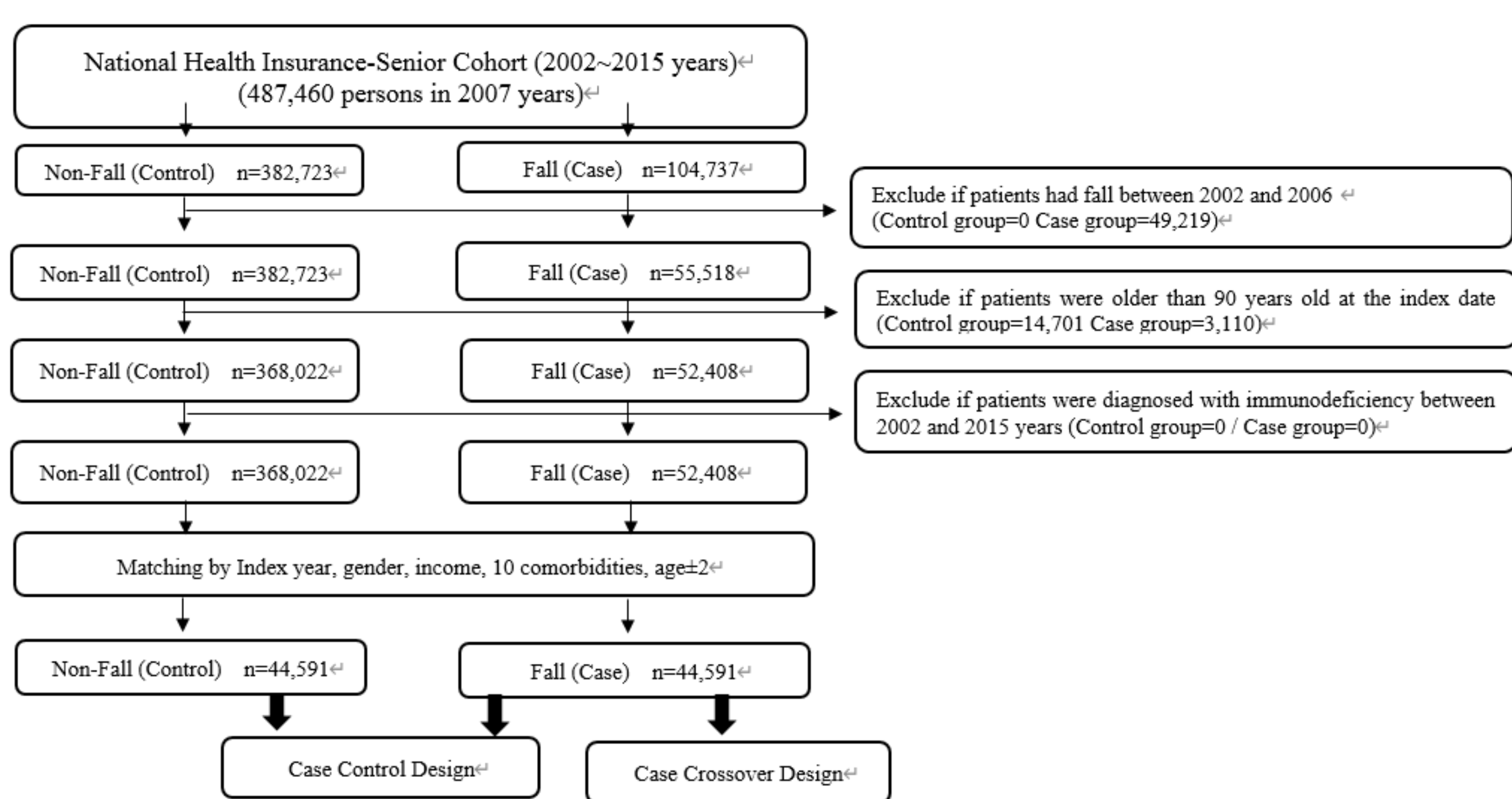
- To assess the association between drug exposure and fall-related injuries and to identify fall risk increasing drugs (FRIDs) in the elderly in South Korea.

## METHODS

### Study population

- The NHIS-senior cohort was used to research association of medication and falls in elderly, which is a nationwide retrospective cohort consist of 558,147 patients selected by simple random sampling from a 5.5 million elderly patients 60 or older in 2002 and followed up until 2015.<sup>1</sup>
- The study population were patients aged ≥65 years who experienced first falls during Jan 1, 2007 to Dec 31, 2015. Patients who had experienced falls between 2002 to 2006 were excluded. Also, patients who were older than 90 years or diagnosed with immunodeficiency were excluded.
- The case of fall-related injuries were defined by the International Classification of Diseases, Tenth Revision(ICD-10) code for accidental falls or fall-related injuries, which include five types of injury: hip fracture, other fractures, head injury, and joint dislocation.<sup>2,3</sup>
- Controls were matched in 1:1 ratio by index year, gender, income level, age, and 10 comorbidities, which are also known to increase risk of falls(i.e., ischemic stroke, osteoporosis, asthma/COPD, arthrosis, cancer, urinary incontinence, diabetes mellitus, hypertension, and dyslipidemia).<sup>4</sup>

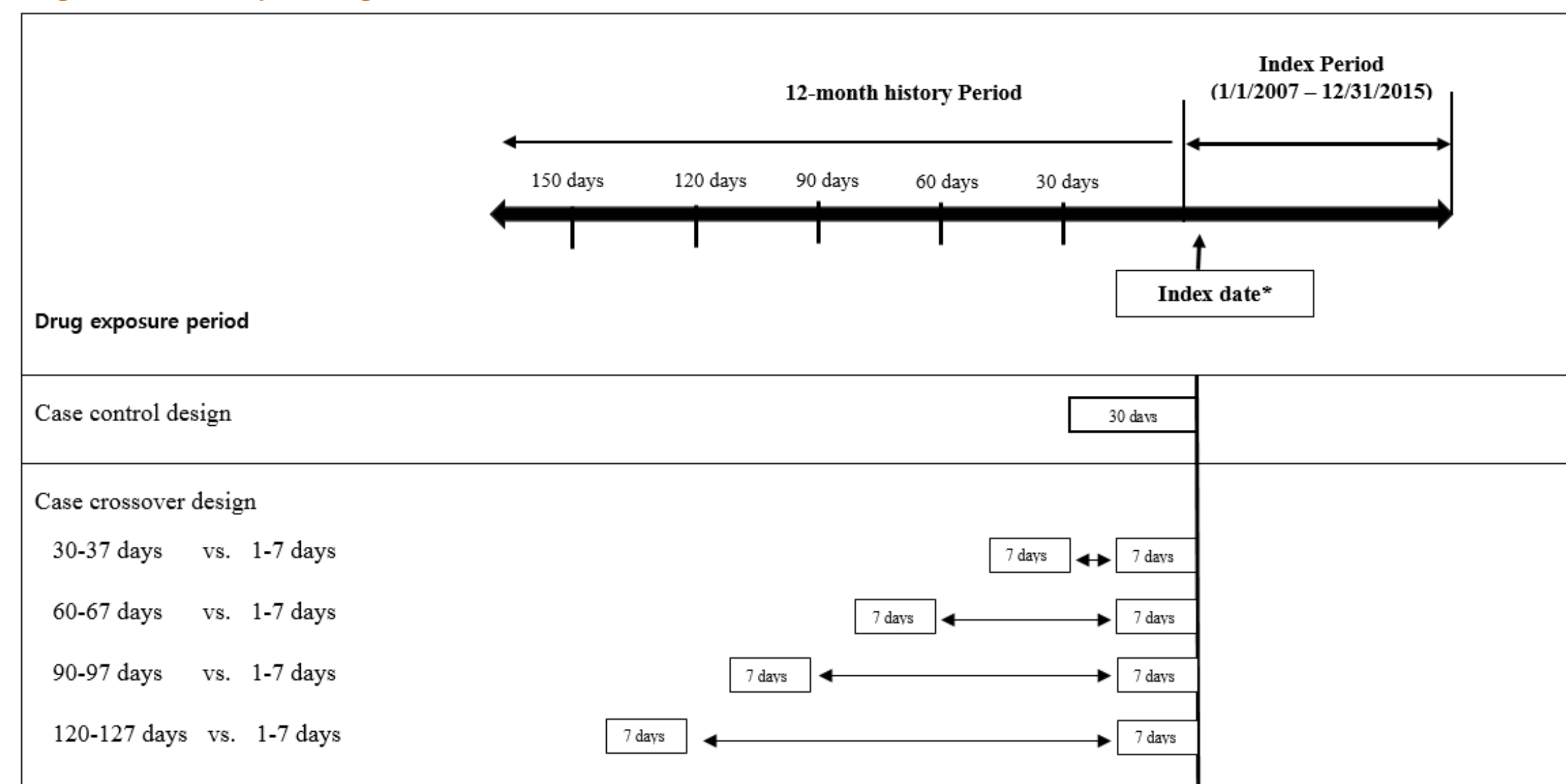
Figure 1. Patient selection scheme



### Data analyses

- All drug categories except for dosage forms for external application in WHO Anatomical Therapeutic Chemical(ATC) system were investigated in this study. The total of 34 drug categories were defined in this study.
- Case-control study was conducted using conditional logistic regression with exposures of prescribed drugs for more than 14 days out of 30 days prior to index date and that of controls.
- Case-crossover study used conditional logistic regression with exposure defined as any prescription exposure during hazard period(7 days prior to index date) and 4 control periods(31-37, 61-67, 91-97, 121-127 days before the index date) within cases.
- All multivariate analyses are adjusted with all other drug categories.

Figure 2. Study design



\* Index date is defined as the date of the first fall during index period(1/1/2007 - 12/31/2015)

## RESULTS

Table 1. Baseline characteristics of the study population

	Case (%)	Control (%)	p-value <sup>***</sup>
Total	44,591 (100)	44,591 (100)	
Gender			1.000
Male	12,235 (27.44)	12,235 (27.44)	
Female	32,356 (72.56)	32,356 (72.56)	
Age, means (SD)	76.57 (±5.56)	76.53 (±5.55)	0.295
65-69	4,062 (9.11)	4,062 (9.11)	
70-74	13,731 (30.79)	13,731 (30.79)	
75-79	13,478 (30.23)	13,478 (30.23)	1.000
80-84	8,849 (19.84)	8,849 (19.84)	
85-89	4,471 (10.03)	4,471 (10.03)	
Income level			1.000
1-4 <sup>th</sup>	10,574 (23.71)	10,574 (23.71)	
5-8 <sup>th</sup>	12,719 (28.52)	12,719 (28.52)	
9-10 <sup>th</sup>	16,507 (37.02)	16,507 (37.02)	
Medical-aid	4,791 (10.74)	4,791 (10.74)	
No. of medications, mean(SD) <sup>†</sup>	9.37 (±8.01)	7.87 (±7.22)	<0.001
0	5,319 (11.93)	6,706 (15.04)	
1-5	10,899 (24.44)	12,711 (28.51)	
6-10	12,298 (27.58)	12,597 (28.25)	<0.001
11-15	7,863 (17.63)	7,038 (15.78)	
≥16	8,212 (18.42)	5,539 (12.42)	
No. of comorbidities <sup>**</sup>	2.80(±1.79)	2.80(±1.79)	1.000
Diabetes mellitus	13,806 (30.96)	13,806 (30.96)	1.000
Hypertension	29,252 (65.60)	29,252 (65.60)	1.000

## RESULTS

Dyslipidemia	15,797 (35.43)	15,797 (35.43)	1.000
Ischemic heart disease	5,968 (13.38)	5,968 (13.38)	1.000
Urinary incontinence	4,034 (9.05)	4,034 (9.05)	1.000
Arthrosis	20,870 (46.80)	20,870 (46.80)	1.000
Ischemic stroke	7,925 (17.77)	7,925 (17.77)	1.000
Asthma/COPD	13,418 (30.09)	13,418 (30.09)	1.000
Osteoporosis	12,297 (27.58)	12,297 (27.58)	1.000
Cancer	1,646 (3.69)	1,646 (3.69)	1.000

\*Number of concurrent medications include all medications prescribed within 30 days prior to index date  
\*\* Comorbidities were identified using ICD-10 in history period of one year before the index date  
\*\*\* Two sample univariate test method: fisher's exact test for categorical variables and Wilcoxon rank sum test for continuous variables were used to test significance.

Figure 3. Odd ratios for multivariate analyses for case-control study

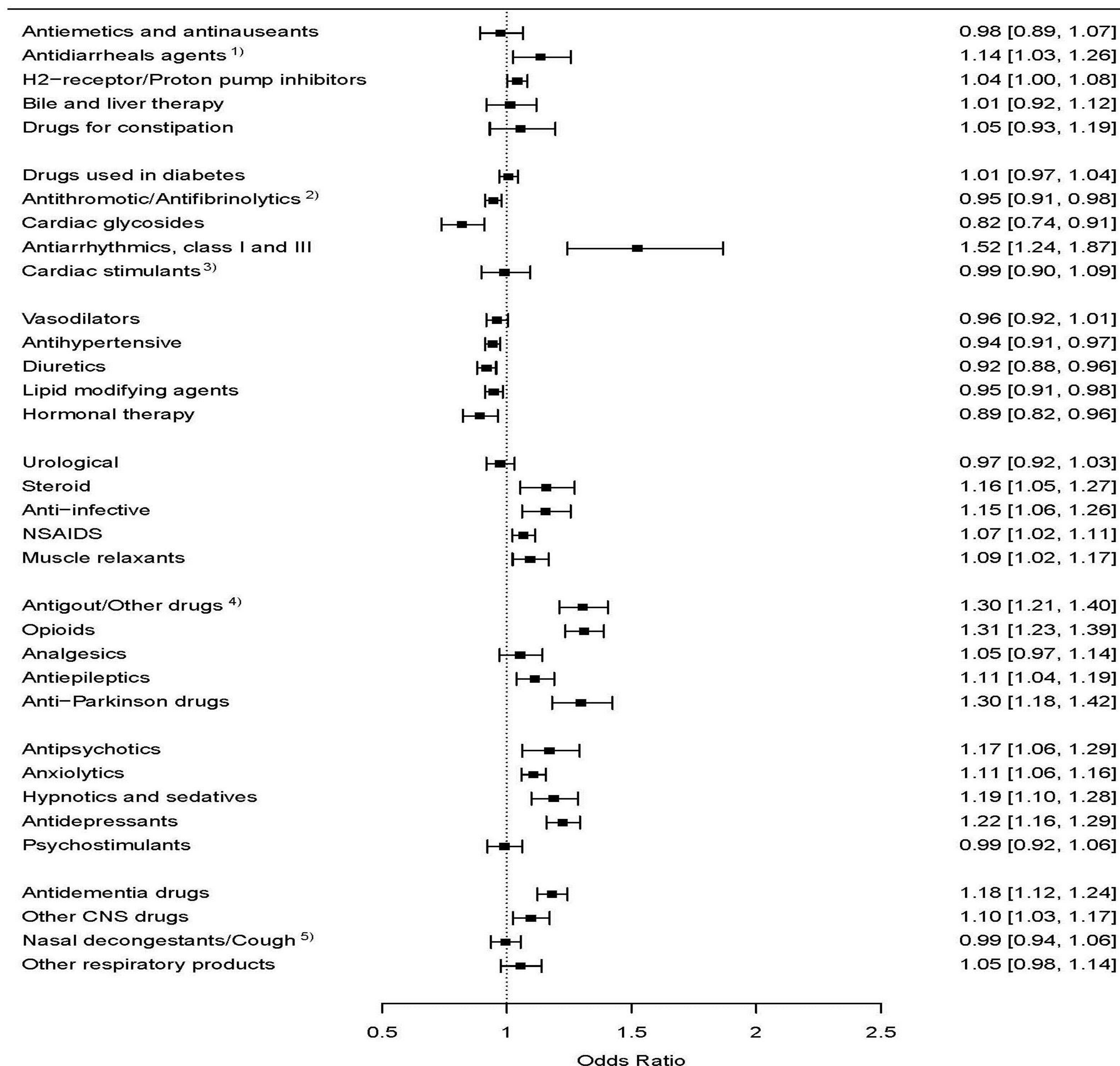
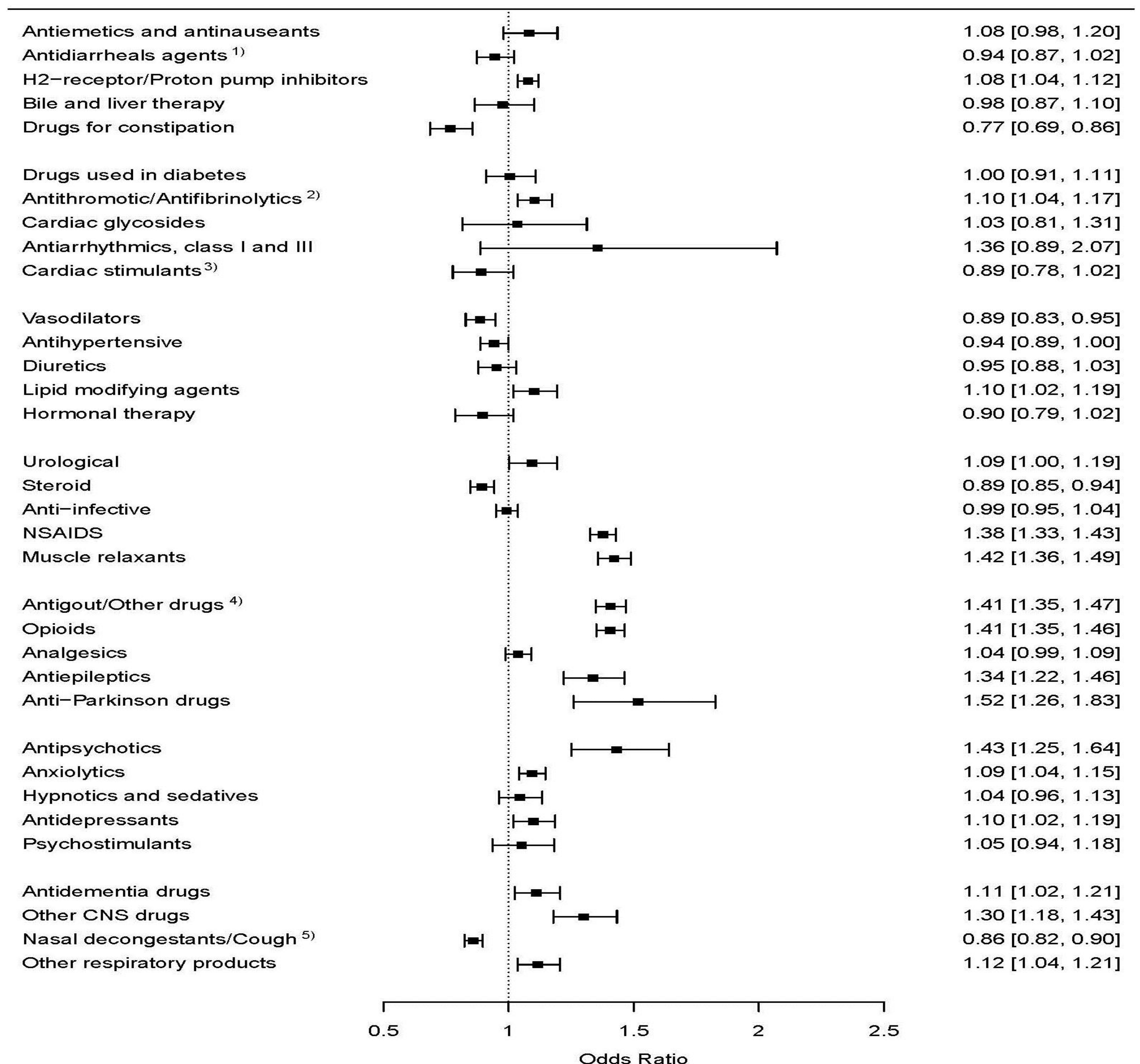


Figure 4. Odd ratios for multivariate analyses for case-crossover study



1) Antidiarrheals, intestinal antiinflammatory/antiinfective agents 2) Antithrombotic agents/antifibrinolytic/antivaricose agents 3) Cardiac stimulants excl. cardiac glycosides/other cardiac preparations 4) Antigout preparations/Other drugs for disorders of the musculo-skeletal system 5) Nasal decongestants for systemic use/Cough and cold preparations/Antihistamines for systemic use

## CONCLUSIONS

- The results of case-control and case-crossover study reported that patients exposed to CNS-related drugs including opioids, antiepileptics, anti-Parkinson drugs, antipsychotics, anxiolytics, antidepressants, antidementia drugs, and other CNS drugs(except for hypnotics/sedatives and psychostimulants) had significant increased risk of falls in elderly.
- H2RA/PPIs, NSAIDs, muscle relaxants, and antigout/other drugs were also significantly associated with increased risk of falls in both analyses.
- The population-based case-control and case-crossover study determined FRIDs in Korean population and it was consistent with previous literature.
- Further studies are necessary to investigate drug categories with inconclusive results. Also, investigating the subcategories of drug categories defined in present study can be helpful.

## REFERENCES

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