Introduction

Medicines are increasingly consumed both in developed and developing countries[1]. In the last 20 years, expenditures on pharmaceuticals have grown faster than the gross national product in all European countries[2], with both price levels and consumption pattern determining the total expenditure in a particular country. Identifying the characteristics of high drug users is an important step towards limiting the cost of drugs[3]. Understanding which drugs are being used, by whom, when and how they are used, has obvious consequences for individuals and populations health and for an efficient health resources utilization[4-8]. Population-based analysis can be used to study the extend to which characteristics such as age, sex, socioeconomic status and region of residence[9], are associated with different patterns of drug use. It can also help to understand whether pharmaceutical use is responsible to differential health needs across populations[4;6;10;11]. This is highlighted by the fact that drug use and illness not always follow the same pattern. Other factors that not just the basic needs are influencing drug consumption. They can be inherent to the countries scientific knowledge, sociodemographic state and culture or inherent to individual's believes and expectations[4;7;12]

Drug utilisation data can be assessed by several means both having advantages and disadvantages[4;5;11;13-17]. Studies based on physician's prescriptions or drug sales, healthcare databases and health surveys, are the most frequently reported. Besides, not only disease prevalence may be different among countries, but also the pattern and the frequency of drug use are not standardized, which is a problem when cross-national comparisons are to be made. Frequency of drug use can be reported has lifetime, last-year and last-month frequency, lifetime and last-month frequency or one of the three, but also on the number of times a drug was used or the number of days it was used on. Besides, medicines can also be classified as prescription or non prescription drugs, which as also as to be taken into account when inferences on usage is to be made[3;12;18].

Several studies have been done in order to define predictors of drug use. Sociodemographic factors as age, gender, education level and socioeconomic position, as well as self-perception of health, number of diseases or disease associated symptoms, are the most frequently factors that have been published, with some of them being more consensual then the others.

Material and Methods

Data on the prevalence of drug use were obtained as part of an ongoing cross-sectional health and nutrition survey of adults living in Porto, Portugal, during 2001-2004. Random digit dialling was used for recruitment using households as the sampling frame. In each house, a single person older then 18 years old was random selected to take part in the study. A participation rate of 70% was achieved. The mini-mental state examination (MMSE) was applied for individuals over 64 years to evaluate their cognitive impairment. Recruitment and interview methods have been published elsewhere[19;20]. Trained interviewers collected data for 1,289 participants, using structured questionnaires. Data included information on demographic, social and medical characteristics. Education was recorded as completed years of schooling and divided in three broad categories: less then 5, 5-12 and more then 13 years. Socio-economic status was classified according to the registrar-general's (RG's)[21] occupational classification into five groups: I- Professional occupations, II- Intermediate occupations, III_N- Nonmanual skilled occupations and III_M- Manual skilled occupations, IV- Partly skilled occupations and V- Unskilled occupations. Two more groups were created with VI- Retired and Handicap and VII- Housewives and Unemployed. Socio-economic status was further simplified in three more board categories: Employed, Retired and Handicap, and Housewives and Unemployed.

Subjects who scored less then 24 in the MMSE were classified as inadequate to provide reliable information, leading to the exclusion of 49 individuals, remaining for the analysis 1,240 (762 women and 478 men) participants. Drug exposures were assessed by the question "Over the last 12 months have you been taken any medicine in a chronic continuous way?". All drugs were recorded by trade name and classified according to the Anatomical Therapeutic Chemical (ATC) classification system[22]. In the impossibility to classify into one of the main groups, Z99 code was established. Diagnosed diseases by a physician were assessed by the question: "*Have your physician ever diagnosed …?*". Diseases were grouped according to the 10th International Classification of Diseases (ICD-10). Statistical analysis was performed using the statistical software packages SPSS (version 12.0). The routines used were frequency distribution and bivariate associations by cross-tabulation using chi-squared (χ^2) test for categorical variables. Binary logistic regression with forward stepwise elimination of variables was used to examine covariate effects of each factor on drug use and to calculate odds ratio (OR) and the corresponding confidence interval (95%CI). Covariates with a univariate $p<0.1$ in the respective univariate analysis were entered in the model. Statistical significance was assumed when $p<0.05$.

Results

Of the 1,240 subjects interviewed, 809 (65.2%) reported taking any medicine in a chronic continuous way in the last 12-months. Table 1 presents the prevalence of medicines use according to social-demographic characteristics. The prevalence was higher in females (71.3%), in subjects older than 66 years (93.1%) and in those with less than 4 years of complete education (less than primary school). Drug use was more frequent in those who were retired or handicap (90.1%) and who have reported suffering from more than one disease, with a prevalence of drug use of 100% for those reporting five diseases. Low educational level was associated with high drug use but when adjusted by logistic regression lost its significance. Table 2 shows that after logistic regression was done the only excluded variable was educational level that lost its significance in the analysis. All other variables retained a higher significant association with drug use. When comparing to employed status, retired or handicap have almost 4 times more probability (OR=3.68, p=0.0001) than employed, while in housewives and unemployed the probability is almost 50% higher (OR=1,47, p=0.03). Considering the number of reported diseases, for each additional disease, an increases in 84% the probability of using medicines (OR=1.84, p=0.001) is observed.

According to ATC classification system, group C (33.5%), group A (33%) and group N (25.9%), were the most frequently reported groups. Psycholeptics drugs were the most frequently subgroup mentioned (18.8%), with those with less education (56.1%), the retired or handicapped (73.2%) and the elders (68.3%) being the higher drug users. No significant difference was found between sexes (61% *vs* 39%, p=0.49). The distribution of reported drugs is presented on Table 3. Drugs acting on the rennin-angiotensin system and lipid lowering drugs accounted for more than 10% of the consumed drugs. Women were the most frequently consumers for both A (69.9% *vs* 30.1%, p<0.0001) and N drug groups (74.8% *vs* 25.2%, p<0.0001), but no significantly difference were found between sexes for cardiovascular system drugs (63.4% *vs* 36.6%, p=0.324).

Nearly thirty percent (28.8%) of the participants reported having no chronic disease and 31.9% reported having at least one chronic disease. Figure 1 shows the frequency of each reported disease group. Almost forty percent of study participants reported having any circulatory system or Endocrine, nutrition and metabolic disorders with hypertension and dyslipidemia accounting for 26% and 33.3% of the cases. Although women have reported more frequently having one of those diseases, no statistically significant difference between sexes was found. Depression was mentioned in 11.5% of study participants (Table 4), with females (84.6% *vs* 15.4%, p<0.0001) and those in the middle age group (67% *vs* 9.8% in younger than 34 and 23.1% in older than 66 years, p<0.001), reporting depression more often. No significant difference was found regarding socio-economic status.

Figure 2 shows the relationship between the prevalence of drug use and the prevalence of self-reported diseases. For neoplasm and for circulatory and nutrition, endocrine or metabolic diseases no major differences seems to exist between reported disease and drug use, while for musculoskeletal, respiratory and mental disorders the difference is clear. Twenty-four percent (24.3%) of study participants reported having any disease of the musculoskeletal or connective tissue but only 8.2% were in treatment; 23.1% reported having a respiratory disease whereas 4% are under treatment. For those using drugs for the nervous system (25.9%), only 11.5% reported having any mental disorder. These results suggest that we might have a gap between self-reported disease and respective treatment.

Discussion

In order to promote rational drug use is important not only to know patterns of drug use on the population but also to characterise drug users. In this regard, this study contributes to a better understanding of medicines use in Portuguese urban populations.

In the former study we found a prevalence of drug use of 65.2%. This number is similar to the one found in previous studies of chronic drug use[23-25]. Prevalence of drug use seems to be lower when studies evaluate only prescription[26] or non-prescription medicines[27;28], which was not our intention.

Although difference between the strength of the association among studies exists, the prevalence of drug use is usually higher for women and the elderly[23;23-25;27;27-31] and for those in low socioeconomic levels[8;18;24;25]. Age has frequently been reported as the most basic predictor of drug use, and for both genders[3;24;25], older ages have been associated with higher prevalence of drug use. The exception is for self-medication in which this trend seems to be inverted[32;33]. Pharmaceuticals seems to be more prevalent among females[8;12], specially during the reproductive years[30]. Not only women seems to be more concerned about health then man[34], but also several programs are directed to woman's health, specially in the reproductive age (gynaecological procedures – breast cancer screening, papa smear, etc), which unless in part, may account for the highest drug consumption seen in this group[1;24;25;34]. However, adjustment for chronic diseases substantially reduces the gender differences in medication usage and overall utilization of health services[34].

Low educational level that was a significant predictor of drug use in the univariate analysis, after regression analysis lost its significance, which is in agreement with several studies[18;23-25;29]. In other studies[26;28;29;29;30], educational level have been shown to be inversely proportional to drug use[26;30], sometimes significantly only in men[30]. However, in these studies adjustment for self-perceived health was done, which has not been our case.

For those who were employed, self-reported drug use (51.9%) was lower than in those who were unemployed (65.5%) or retired (90.1%), which is in accordance with other studies[23;26]. However, for non-prescription medicines, the inverse seems to occur. Individuals with low income use more prescription medicines than salaried employees that seems to use more non-prescription drugs[18;25;27;32;33;35]. Besides, most of these studies asked for drugs used in the two weeks before the study started, which may reflect mostly the consumption of drugs used for acute conditions.

As expected[8;30], chronic diseases increased (OR=1.86, $p<0.001$) the probability of drug use. However, as have already been described[26], discrepancy between reported diseases and current medication use was observed. This was especially true for musculoskeletal and respiratory diseases and for mental disorders. Assessment of chronic diseases by questionnaire, have been described to be good for conditions that have clear diagnostic criteria and are easily

to communicate to the patient, as it happens with cardiovascular diseases and diabetes[13], but its no so good for conditions that do not have so clear diagnostic or which have fluctuating course, as low back pain and arthritis or allergy or hay fever[36]. It may have happened that for those conditions over reporting may have existed. Nevertheless, we might have to consider recall and information bias related to drug exposure, as this assessment was made through self-reported drug use at last 12-months. Under self-reported diagnose was also possible as subjects may underestimate those diseases.

In this study, depression was the only mental disorders reported (11.5%) and nervous system drugs were mentioned by 25.9% of the cases. Indeed, psycholeptic drugs were the most frequent sub-group reported (18.8%), especially among women (31.5% *vs* 16.9%, p<0.0001), which is in agreement with the literature[23;24;26;29-31;37], and among the retired or handicap (73.2%). In fact, on 2004 the International Narcotics Control Board report advised Portugal to analyse the procedures on prescription and utilization of benzodiazepines as it was one of the leading European countries on the consumption of these drugs. From 1999 to 2003[38] there was a decrease of 1.2% on benzodiazepine's utilization with an increase of anxiolytic benzodiazepines (3.8%) and a decrease in hypnotic benzodiazepine's (-21.9%). Although potentially positive, the decrease on benzodiazepine's consumption might have occurred by a shift to other therapeutic classes.

Circulatory system diseases were the most frequent reported diseases (37.5%) with hypertension being present in 26% of the cases. Regarding cardiovascular system drugs, they were reported by 33.5% of study participants, with no significant difference found between genders. Agents acting on the renin-angiotensin system (15.6%) were the most frequently sub-groups reported, followed by diuretics (7.0%) and beta-blocking agents (6.0%). It has already been shown[39] that, compared to other European countries, there is a greater use of agents acting on the rennin-angiotensin system and less use of diuretics and beta-blockers, which have major implications for the health national expenditures on medicines. Also warrant attention is the fact that, besides antinflammatory drugs, cardiovascular drugs is one the groups more frequently associated with drug-drug interactions and visits to emergency departments[40].

This study has provided information about the use of drugs among an urban Portuguese population living in Porto, evaluating the prevalence of drug use and identified main use determinants. In order to have more accuracy of this information, it would have been necessary to have data specifically regarding type, formulation, and timing of exposure of drugs. Also, and considering that chronic exposure is the main parameter of interest, continuous data on drugs intake should be have been used.

Conclusions

The key findings of this study are the following:

- The prevalence of drug use among this urban population was 65.2%
- The prevalence of drug use was 71.3% in females and 55.6% in males
- The main therapeutic groups used were group C (33.5%) and group A (33%) with psycholeptics (18.8%) and agents acting on the rennin-angiotensin system (15.6%) being the most reported sub-groups
- Drug use was directly correlated with older ages, female sex and not being currently employed

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Table 1. Prevalence of drug use by study variables

Co-variables	*% Not drug users*	*% Drug users*
Sex		
Female	28.7% (219/762)	71.3% (543/762)
Male	44.4% (212/478)	55.6% (266/478)
χ^2= 31.57, p<0.0001		
Age (years)		
≤ 34	61.4% (153/249)	38.6% (96/249)
35-65	35.0% (261/746)	65.0% (485/746)
≥ 66	6.9% (17/245)	93.1% (228/245)
χ^2= 161.84, p<0.0001		
Education (years)		
≤4	21.4% (87/407)	78.6% /320/407)
5-12	38.4% (179/466)	61.6% (287/466)
≥13	45.0% (165/367)	55.0% (202/367)
χ^2=51.73, p<0.0001		
Socio-economic status		
Employed	48.1% (311/647)	51.9% (336/647)
Retired or handicap	9.9% (34/344)	90.1% (310/344)
Housewife or unemployed	34.5% (86/249)	65.5% (163/249)
χ^2=144.41, p<0.0001		
Reported diseases (nr)		
0	58.5% (209/357)	41.5% (148/357)
1	38.1% (151/396)	61.9% (245/396)
2	20.6% (53/257)	79.4% (204/257)
3	8.7% (15/172)	91.3% (157/172)
4	6.1% (3/49)	93.9% (46/49)
5	0%	100% (9/9)
χ^2=187.63, p<0.001		

Table 2. Logistic regression analysis of the influence of study variables on the current use of medicines

Independent variables	Simple OR (95% CI)	*p-value*	Adjusted* OR (95% CI)	*p-value*
Sex				
Female	Ref.	-	Ref.	-
Male	0.45 (0.36-.64)	0.0001	0.48 (0.36-0.64)	0.0001
Age (years)				
≤ 34	Ref.	-	Ref.	-
35-65	1.83 (1.28-2.60)	0.001	1.75 (1.25-2.44)	0.001
≥ 66	4.89 (2.41-9.93)	0.0001	4.57 (2.30-9.91)	0.0001
Education (years)				
≤4	Ref.	-		
5-12	1.10 (0.77-1.59)	0.59	-	-
≥13	1.17 (0.79-1.73)	0.42		
Socio-economic status				
Employed	Ref.	-	Ref.	-
Retired or handicap	3.77 (2.32-6.13)	0.0001	3.68 (2.27-5.96)	0.0001
Housewife or unemployed	1.5 (1.06-2.14)	0.023	1.47 (1.04-2.08)	0.030
Reported diseases (nr)	1.86	0.0001	1.84 (1.59-2.14)	0.001

* logistic regression with forward stepwise elimination procedure with an enter criterion of $p<0.05$ and a removal criterion of $p>0.1$

Table 3. Prevalence of reported drug use in study participants

ATC group	*Frequency (%)*
Alimentary tract and Metabolism	*33%*
a02 - antiacids, peptic ulcer and flatulence	5.2%
a10 - drugs used in diabetes	4.9%
a11 - vitamins	12.5%
a12 - mineral supplements	11.8%
Blood and blood forming organs	*9.3%*
b01 - antithrombotic agents	6.1%
b03 - antianemic preparations	3.4%
Cardiovascular system	*33.5%*
c01 - cardiac therapy	6.9%
c03 - diuretics	7.0%
c07 - beta blocking agents	6.0%
c08 - calcium channel blockers	5.6%
c09 - agents acting on the rennin-angiotensin system	15.6%
c10 – lipid modifying agents	11.5%
Genito urinary system and sex hormones	*5.7%*
g03 - sex hormones and modulators of the genital system	2.7%
g04 - urologicals	2.7%
Systemic hormonal preparations, excluding sex hormones and insulins	*3.5%*
h03 - thyroid therapy	2.1%
Antineoplastic and immunomodulating agents	*0.5%*
Musculoskeletal system	*8.2%*
m01 - antinflammatory and antirheumatic products	4.4%
m05 - treatment of bone diseases	2.4%
Nervous system	*25.9%*
n02 - analgesics	3.3%
n05 - psycholeptics	18.8%
n06 – psychoanaleptics	9.5%
Respiratory system	*4%*
r03 - anti-asthmatics	2.9%
r06 – antihistaminics for systemic use	1.0%
Unclassified drugs	*9.8%*

Table 4. Prevalence of reported diseases by study participants

Disease group	*Frequency (%)*
Circulatory system	*37,5%*
angina	3.9%
myocardial infraction	2.3%
cardiac arrhythmia	8.5%
hypertension	26%
Endocrine, Nutrition and Metabolic	*36.1%*
diabetes	5.6%
dyslipidemia	33.3%
hypothyroidism	0.3%
hyperthyroidism	0.7%
Neoplasms	*1.7%*
Musculoskeletal system and Connective tissue	*24.3%*
rheumatoid arthritis	1.8%
arthritis (hip and knee)	15.7%
low back pain	11%
osteoporosis	4.7%
cerebrovascular accident	2.2%
Mental and behavioral disorders	*11.5%*
depression	11.5%
Diseases of the respiratory system	*23.1%*
allergy	10.2%
rhinitis	5.0%
asthma	2.7%
bronchitis	10.6%

Figure 1. Prevalence of reported diseases among study participants

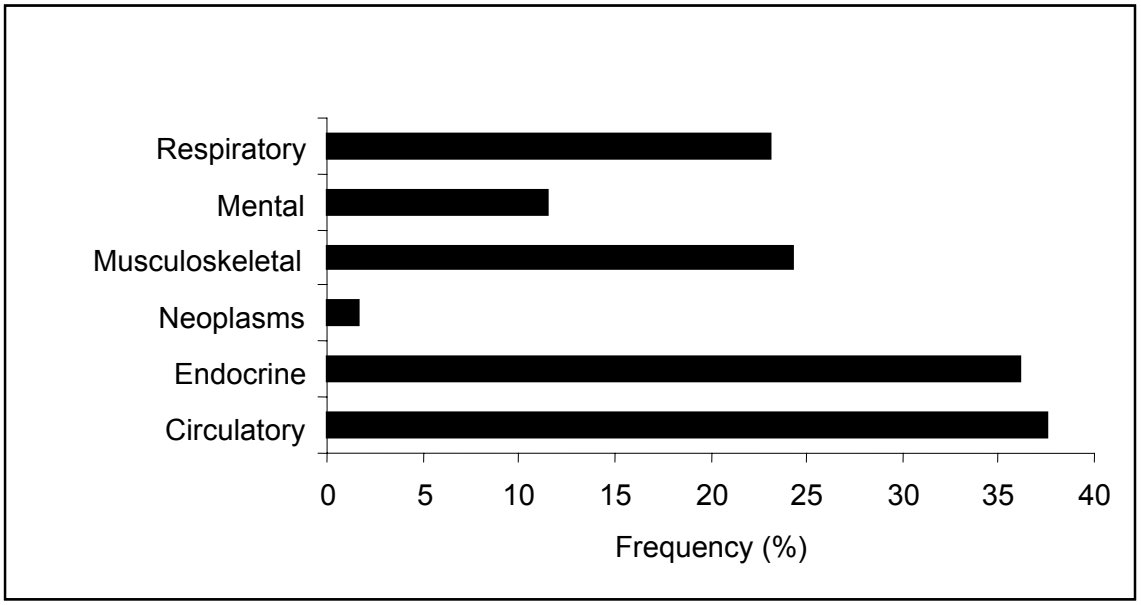

Figure 2. Prevalence of self-reported diseases (black) and drugs (shaded) among study participants