

Original Article



The Pattern of Drug Consumption in Community-Dwelling Older People in Tabriz, Iran: Data From Tabriz Older People Health Survey (TOPS)

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Abstract

Background: Multimorbidity in older people leads to an increase in the number of used drugs and leads to more drug interactions. If irrational and unsafe drug consumption is added to this situation, the burden of the problems of the older adults and the society will increase. So, studying the pattern of drug consumption can provide the possibility of designing interventions to improve it. The purpose of this study was to investigate the pattern of drug use among older adults living in Tabriz.

Methods: This cross-sectional study was conducted using the data from a study entitled Tabriz Older People Health Survey (TOPS). The participants were selected from a representative sample of community-dwelling older people aged ≥ 60 years who were living in Tabriz using the probability proportional to size sampling method. All the drugs used by the participants were checked, and their drug interactions and pattern of drug consumption were studied using the World Health Organization (WHO) prescribing guidelines.

Results: The results indicated that on average, 4.6 drugs are consumed per person, 4.8 for women and 4.2 for men. Furthermore, 46% of the participants took five drugs or more which is significantly higher in women (P value=0.007). The most commonly used drug was Losartan, and most of the drugs were classified in the cardiovascular group. Moreover, there were 1128 cases of drug interactions and 213 cases of therapeutic duplication within the drugs used by the participants.

Conclusion: Due to the increase in drug consumption in the older population, it is necessary to pay attention to the compatibility of the drug with the patient's condition and plan for the training of health system employees regarding the proper prescription of medicine for older people.

Keywords: Drug prescription, Elderly, Side effects, Drug interactions, Polypharmacy, Essential drugs

Introduction

The rational prescription of medicine in old age is an important concern of the health system because nearly 80% of older people suffer from at least one chronic disease, and about one-fifth of the diseases in the world are related to disabilities and disorders that occur in the individuals aged 60 years and above.^{1,2}

Nearly one-third of all drug prescriptions are related to the older population, and irrational drug prescription leads to the prolonged treatment process, the emergence of drug resistance (especially resistance to antibiotics), significant drug side effects, and high treatment costs.³⁻⁵ Inappropriate drugs have more side effects rather than

clinical benefits.⁶

About 30% of older people suffer from drug side effects.⁷ The most important form of drug reactions is drug-drug interaction, which includes about 5-26% of all drug side effects.⁸⁻¹⁰ Drug interaction is used when the effects of the drug change in the presence of other drugs, food, drinks, or environmental and chemical factors.¹¹ Drug-drug interaction can be defined as a pharmacodynamics and pharmacokinetics interaction, which ultimately leads to a decrease in effectiveness and an increase in drug toxicity.¹²

Drug-drug interactions can cause unnecessary and preventable hospitalizations, which include 3% of hospitalizations in the general population.^{9,13,14} This figure



is around 20-25% in old age.^{6,15,16} Every year, between 7-9 thousand people die from complications caused by drug reactions in the United States, and they impose at least 40 billion dollars as financial burden on insurance companies,⁸ and according to the American health system, more than one billion dollars in the year is spent on the outcomes of drug-drug interactions.¹⁷⁻¹⁹ In Iran, the prevalence of drug-drug interactions in people living in the community is between 8.5-42%¹⁹⁻²³; however, multimorbidity in older people leads to an increase in the number of used drugs and leads to more drug interactions.²⁴

The centrality of the discussion of irrational prescription is inappropriate drug use, which refers to the use of drugs when there is no need for them. It also means prescribing drugs without careful examination of their effectiveness, safety, affordability, and suitability for the patient.²⁵ An important step to address the issue of prescription and inappropriate drug use is to quantify the occurrence of this phenomenon. Due to the lack of coverage of the referral system and its related problems in Iranian society and accessing drugs without a valid prescription, the management of drug use is somewhat uncontrollable.²⁶ Studying the pattern of drug consumption can provide the possibility of designing interventions to improve the pattern of consumption by increasing the awareness of the quantity and quality of drugs used by the elderly and directing it towards targeted and safe drug consumption. Accordingly, the present study was conducted to investigate the pattern of drug consumption in community-dwelling older people in Tabriz.

Methods

This cross-sectional analysis was embedded within the Tabriz Older People Health Survey (TOPS), which was conducted on a representative sample of community-dwelling older people. The TOPS survey is a cross-sectional study conducted on a representative sample of the aged people in Tabriz through the probability proportional to size method to examine socio-economic variables, health behaviors, and the health profile of the older adults.

Study Setting

The TOPS was conducted in Tabriz, East Azerbaijan province, Iran from July 2019 to January 2020. Tabriz is the most populated city in East Azerbaijan province.²⁷

Study Population

The statistical population included all community-dwelling people aged ≥ 60 years who were living in Tabriz, Iran.

Sample Size and Sampling Method

Details on the sampling methodology have been described elsewhere.²⁸ Briefly, using the probability proportional to size sampling method, 1362 community-based older people were randomly selected from 140 blocks out of

11778 urban blocks in Tabriz.

Data Collection Tools

The data collection was undertaken by trained interviewers using a structured survey to investigate socio-demographic variables. To check the pattern of drug consumption in the participants, all the drugs used by them were entered in the forms designed by the researchers, and then related information and patient medication (name and the number of medications) were collected. The registered drugs were analyzed using the World Health Organization (WHO) prescribing guidelines.²⁹ This index includes the following:

- Average number of drugs per prescription (encounter)
- The percentage of consumed antibiotics in the studied population
- The percentage of consumed drugs from the national list of essential medicine of Iran.

Moreover, other parameters used for the analysis of drugs include the percentage of polypharmacy (≥ 5), classification of drugs, and investigation of drug interactions.

Drug interactions were investigated in people who took at least two drugs at the same time. The drugs were entered into the internet site (<https://www.drugs.com/>), and the results of reports were recorded in four sections: major interactions (highly clinically significant, avoid combinations, the risk of the interaction outweighs the benefit.), moderate interactions (moderately clinically significant, usually avoid combinations, use it only under special circumstances), minor interactions (minimally clinically significant, minimize risk, assess risk and consider an alternative drug, take steps to circumvent the interaction risk, and/or institute a monitoring plan), and therapeutic duplication. Therapeutic duplication is the use of more than one medicine from the same drug category or therapeutic class to treat the same condition. This can be intentional in cases where drugs with similar actions are used together for demonstrated therapeutic benefit. It can also be unintentional in cases where a patient has been treated by more than one doctor or had prescriptions filled at more than one pharmacy, and it can have potentially adverse consequences.

Statistical Analysis

Data were presented as frequencies and percentages, all statistical analyses were conducted using Microsoft Office Excel 2007 and SPSS23, and the level of significance was set at $P < 0.05$.

Results

The average age of the participants was 70.3, and the standard deviation was 7.4. They were in the range of 60 to 96 years old. The demographic characteristics of the studied population are reported in the study profile.²⁸ Out of a total of 1362 elderly people studied, 1099 people were under drug therapy at the time of data collection, and

more than half of them were women (669.61%).

In the studied population, about 5059 drugs were registered, which ranged from 1 to 16 drugs per person, and on average, 4.6 drugs were consumed per person, 4.8 for women and 4.2 for men (P value = 0.55). Furthermore, out of 5059 drugs, 482 drugs were in the category of vitamins and supplements, and about 40% of people used between 1 and 3 drugs. More than half of the participants had 4 to 9 drugs in their treatment plan, and only 6% of the studied population used 10 drugs or more in their treatment process. Additionally, the prevalence of polypharmacy in the study was 46% (Table 1).

The ratio of antibiotics to all drugs was about 1%, and the most used antibiotics were cefixime ($n=10$), azithromycin ($n=7$), metronidazole ($n=7$), and ofloxacin ($n=5$). Out of 4577 drugs (not including vitamins and supplements), nearly 3713 drugs (81%) were from the national list of essential medicine of Iran, and out of the total drugs registered in the study, 45% was related to 10 types of drugs (mostly of them losartan drugs), as depicted in Table 2. Furthermore, as observed in Table 3, most drug categories were related to cardiovascular diseases (43%).

In addition, out of a total of 1099 participants who were under medication treatment, 965 people were taking two or more drugs that were evaluated for the possibility of drug interactions. Among these people, 1128 cases of drug interactions were observed, of which 134 cases (12%) were major interactions. Table 4 lists five of the most frequent interactions, of which 668 cases (59%) were moderate interactions, and 326 cases (29%) were minor interactions. Moreover, there can be more than one interaction in the drugs used by the person, or there can be a combination of types of interactions in the used drugs (Table 5). Furthermore, 213 cases (22%) of therapeutics duplication (Range = 1-5) were observed.

Discussion

This study was conducted on 1362 community-dweller elderly in Tabriz, Iran. The results showed that the most abundant drug categories in this population were cardiovascular drugs followed by diabetic drugs. Most of the studies in the field of medicine for the elderly have reported that cardiovascular drugs are the most used drugs in older people.^{30,31} Although in some studies, the frequency of central nervous system drugs has exceeded cardiovascular drugs, which according to their study population, are either people living in nursing homes or hospitalized patients, and their results can be justified.^{32,33}

The findings indicated that about 59% of the participants use four drugs or more, which is about twice the findings of Ragam and colleagues' study, with the difference that their study was conducted on hospitalized people.³⁴ In the present study, the average drug consumption per person was 4.2 drugs, which is much higher than the standard determined by the WHO, which is 1.6 to 1.8 drugs.³⁵ This amount is a little higher than that in a similar study in Tabriz during 2017-2018 (3.9 drugs).³⁶ Furthermore, this

finding is compared to the studies by Hazra et al (3.2 drugs per person) and Wang et al (3.5 drugs per person), which indicates a higher drug consumption per person.^{37,38}

The results also demonstrated that polypharmacy in the studied population is about 46%, which is more than the study by Eteraf Oskouei et al (32.6%).³⁶ Further, polypharmacy was 22% in a study of community dweller elderly in Africa, which is much lower than the result of our study, and it was around 60% in another study in the center of Portugal, which is much higher than that of our study.^{39,40}

According to the WHO recommendation, antibiotic

Table 1. Frequency of Polypharmacy by Gender

Characteristics		Polypharmacy		Total	P Value
		No	Yes		
Gender	Male	255	175	430	0.007
	Female	341	328	669	
Total		596	503	1099	

Note. The P value was calculated based on the chi-square test.

Table 2. The Most Commonly Used Drugs

Drugs	Frequencies	Percent
Losartan	518	10.2
Aspirin	373	7.4
Atorvastatin	307	6.1
Metformin	248	4.9
Amlodipine	247	4.9
Metoprolol	220	4.3
Nitroglycerin	115	2.3
Glyburide	94	1.9
Diclofenac sodium	89	1.8
Propranolol	84	1.7

Table 3. The Frequency of Drug Categories

Pharmaceutical Category	Frequencies
Cardiovascular	2170
Diabetes	485
Supplements and vitamins	482
Central nervous system	457
Blood fat	328
Gastrointestinal	302
Anti-inflammatories	218
Musculoskeletal	121
Respiratory system	111
Glands and hormones	87
Urology	76
Anti-allergic	52
Antibiotics	49
Ophthalmic	29
Dermatological Drugs and Sunscreens	22
Others	70

Table 4. The Most Frequent Major Interactions Observed in the Study

Rank	Drugs	Frequency
1	Losartan- captopril	15
2	Losartan- triamterene	12
3	Warfarin- aspirin	5
4	Nortriptyline- fluoxetine	4
5	Atorvastatin- colchicine	4

Table 5. The Frequency of Drug Interactions in Participants

Drug-Drug Interaction		Gender	
		Male (n)	Female (n)
Major interaction	One interaction within one drug user	31	72
	Two interactions within one drug user	7	17
	Three and more interactions within one drug user	3	4
Moderate interaction	One interaction within one drug user	72	128
	Two interactions within one drug user	49	73
	Three and more interactions within one drug user	104	242
Minor interaction	One interaction within one drug user	81	122
	Two interactions within one drug user	29	44
	Three and more interactions within one drug user	15	36

use in the studied population should not be more than 20-26.8% of all used drugs. In this regard, the percentage of antibiotics used in our study is in an acceptable range (1%). This can have a significant impact on the non-occurrence of drug resistance to antibiotics. On the other hand, the percentage of drugs used from the list of essential medicines in our study was 81%, which is less than the recommendation of the WHO (i.e., 100%).

Essential medicines are selected based on the prioritization of the health needs of society and should always be available in appropriate forms and dosages, of good quality, and affordable for the health system and individuals. The necessity of choosing a drug from the list of essential medicines is to improve people's access to drugs. Adherence to the list of essential drugs can lead to better drug management and more rational prescribing because these drugs are judiciously selected based on scientific evidence in terms of quality, safety, efficacy, and cost-effectiveness.^{41,42}

In the study in Southeast Asia, the percentage of drugs consumed from the list of essential medicines is 81%, which is similar to our study, but it is more favorable than a study in India (45.7%) and is lower than the study conducted in Ethiopia (99.6%) and Nepal (88%).^{37,43,44}

One of the most important recommendations regarding rational drug prescription for older adults is to avoid prescribing multiple drugs for a specific disease, and monotherapy is recommended to avoid severe drug interactions and unnecessary use of drugs.⁴⁵ In this study, 22% of the studied population faced therapeutic duplication, and an attempt should be made to use as

little medicine as possible. In the current study, 25% of the drugs used by each person were without any kind of interaction, and the prevalence of drug interactions was observed in 75% of the users, which is a significant figure and is much higher compared to other studies.²¹⁻²³ In addition, the results of the current study showed that the highest severity of drug interactions is related to moderate interactions (59%), followed by minor interactions (29%). This finding, compared to the study designed in India, indicates the similarity of minor interactions and the desirability of moderate interactions. However, regarding major interactions, the result of our study is almost 6 times higher than their finding.⁴⁶ The range of major interactions in different studies varies from 3.8% to 18%, and our findings are also in this range.^{47,48}

Moderate and minor interactions can reduce the potential risk of drug interactions by changing the drug dosage and under the supervision of a doctor. However, major interactions face the prohibition of drug use, and it is recommended to replace the drug with other safe drugs or to stop its use to outweigh its side effects.

In the current study, the most major drug interactions were related to interactions between losartan and captopril, losartan and enalapril, losartan and triamterene, losartan and spironolactone, as well as losartan and tizanidine. According to drugs.com site information, the simultaneous use of these drugs causes an excessive decrease in blood pressure and hyperkalemia, leading to kidney failure in the long run. This process also applies to aspirin and warfarin. These two drugs strengthen each other's effect, and their simultaneous use may cause bleeding and prolong blood clotting time. Therefore, it is important to pay attention to drug interactions

Strengths and Limitations of the Study

The high sample size and representative sampling of the community can be regarded as strengths of this study. On the other hand, according to the process of data collection which was done in the presence of interviewers at participants' homes, the consumed medicines were listed, and the prescriptions were not involved in the data-collecting process, so the physician-prescribed and self-prescribed medications (self-medication) were not distinguishable. In addition, researchers were not able to determine the percentage of drug prescriptions with generic names, which is one of the most important components of rational drug prescription.

Conclusion

Due to the increase in drug consumption in the older population, it is necessary to pay attention to the compatibility of the drug with the patient's condition and the recommendations of international organizations to prescribe rational drugs to older adults. Taking into account the status of drug consumption in older people is necessary for health experts and physicians to know about the rational prescription guidelines in order not

to impose additional costs on the health care system and insurance, to prevent drug interactions, and to prevent drug side effects for the consumer. Therefore, effective measures should be taken to improve the elderly's quality of life, including planning for the training of health system employees regarding the proper prescription of medicine for the older population, following up the use of medicine with the appropriate dose, and periodic follow-up of the older adults who take medication routinely.

Ethics statement

This study was reviewed and approved by the Deputy of the Research Ethics Committee at the Tabriz University of Medical Sciences (Ethical ID: TBZMED.REC.1394.1069). Informed consent was also obtained from all participants, and they were assured of the confidentiality of all provided information.

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Conflict of interests declaration

The authors declare that they have no competing interests.

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Data availability statement

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

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Consent for publication

Not applicable.

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