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Medication Use in the Community: Comparison between Urban and Rural Home Pharmacies

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Abstract:

Objective: This study aimed to examine the contents of home pharmacies and medication use, as well as storage and disposal habits in urban and rural households in Serbia.

Material and Methods: This prospective research was conducted within 70 households in Novi Sad (urban setting) and Laćarak (rural setting) from October 1, 2015 to January 15, 2016. The data were collected using a standardized questionnaire, as well as by direct examination of drugs stored in households.

Results: The most common groups of drugs stored were cardiovascular drugs, drugs for the nervous system, anti-rheumatic products and antimicrobials. A high percentage of drugs for the alimentary tract were found stored in Laćarak, while drugs for the respiratory tract were discovered in Novi Sad. Prescription only medications (POMs) made up 69.7% of all medications in Laćarak and 60.6% in Novi Sad. POMs were purchased independently in high amounts (13.2% in Laćarak and 9.1% in Novi Sad). Presence of expired medications was higher in Laćarak (12.0%) than Novi Sad (5.8%). Over two-thirds of the households stored medications properly; however, only 10.0% of respondents reported the proper disposal of unused medications.

Conclusion: The structures of home pharmacies in Novi Sad and Laćarak differ, which implies different healthcare needs. The practice of self-medicating was noted both in Novi Sad and Laćarak. While Laćarak residents rely more on the advice of friends and family, Novi Sad residents buy medicine mostly without any consultation. Medications in both environments are stored properly in the majority of households, but mostly disposed of improperly together with household waste.

Keywords: consumer safety; expiration date; self-medication; storage and disposal

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Introduction

Use of medicine is influenced by socioeconomic and cultural factors, education and availability. Based on the medicines found in households, as well as the knowledge and attitudes of family members, it is possible to examine how much people rely on self-medication, the drugs which are most often used without consultation, to what extent they adhere to the prescribed dosage regimens, and whether they are familiar with the conditions for proper storage and disposal of drugs.[1] The reaction to the presence of certain clinical symptoms is determined by different circumstances, but a significant number of people will not seek medical help until the symptoms significantly worsen or become an obstacle to everyday activities.[2,3] Over-the-counter medicines (OTC), as well as prescription-only medicines (POMs), can be found in households. A large selection of OTC drugs provides the possibility of free choice in self-medication. Drug advertising should be objective, and mustn't lead to wrong conclusions, or warrant that drug safety and efficacy is ensured by its natural origin.[4] In practice, everywhere in the world, such regulations, as well as many other ethical principles, are violated in a sophisticated way.[5] In countries in transition, such as Serbia, the inaccessibility of the healthcare system, due to large crowds in health centers, lack of time due to the fast paced modern lifestyle, as well as the high prices of treatment in private practice, causes a lot of people to choose self-medication.[6] Although self-medication as a treatment method reduces pressure on the healthcare system, and can be useful if patients have an adequate level of knowledge and if they use only OTC medicines,[1] it still contains the risk of improper treatment and more frequent adverse effects, which then burden healthcare services with additional costs.[7] In particular, it is necessary to restrict self-medication in certain populations, such as pregnant women, breastfeeding mothers, children, and people older than 65 years due to age-related metabolic and excretion function involvement.[8] Besides OTC drugs, it appears that POMs are often used by people on their own initiative, if pharmacies and employees do not adhere to the regulations.[9,10] Although drug storage in households is a common practice, it can pose a health risk, especially if medicines are not stored in accordance with the manufacturer's instructions. Pharmacy staff members usually offer only instructions concerning the drug delivery process, while information about proper storage of medicines in households is usually omitted.[11] Not every place in a home is suitable for drug storage. Storing drugs in the kitchen or bathroom can lead to their exposure to moisture and high temperatures, which can shorten the expiry date. It is important to note that some drugs are photodegradable, and thus light exposure may result in potency loss, altered efficacy, and adverse biological effects.[1] Further, storing drugs in reachable places carries the risk of intoxication, especially in families with young children.[12-14] Drug compliance depends on many factors, and the most common reasons for non-compliance are forgetting, adverse effects, changes to the dose or regimen by the physician, health improvement, and lack of insight into treatment benefits.[15] In households, we can find expired stored medicines and leftover medicines. It is also necessary to point out the importance of proper drug disposal, because drugs thrown in the trash together with domestic waste or in the sewerage system pollute our environment. Drugs reach landfills, rivers and the water supply, which results in antimicrobial's resistance, use of expensive reserve antibiotics, and the exposure of the population to mutagens and allergens.[16] Drug manufacturers and vendors are obliged to organize drug destruction; however, this policy has not yet been fully implemented in practice.[17]

A study conducted in 2012 in Novi Sad[7] noted the differences in home pharmacies between urban and suburban households, raising the need for examining the

differences in medication storage, use, and disposal in different socio-demographic settings. Examination and comparison of the drug inventories between households in urban and rural setting provides information about the similarities and differences of the burden of health disorders in the population of urban and rural environments in Vojvodina. Secondly, knowing that self-medication, especially with POMs, can lead to unfavorable medical consequences, and that this type of treatment in Serbia has been on the rise, it was necessary to examine the adherence to the enforcement of the law restricting the purchase of numerous drugs without medical prescription several years after adoption, in order to make clear where any further action is required. Drug disposal habits in households was also a topic of great interest, considering the unregulated system of disposal in Serbia, and the substantial ecological consequences of improper drug disposal, as well as the data gained through this study which could lead to a possible solution. Therefore, this study was designed to examine the contents and to compare the structures of home pharmacies in urban and rural environments. Additionally, the aim was to investigate the attitudes and habits with regard to self-medication, drug storage, and disposal habits.

Material and Methods

This cross-sectional study was conducted in households from October 1th, 2015 to January 15th 2016. The study includes households in the municipality of Novi Sad, the largest city in Vojvodina, and households from Laćarak, the largest village in Vojvodina. The study was approved by the Ethics Committee of the Faculty of Medicine in Novi Sad (approval number: 01-3385/1). The researchers employed a snowball recruitment method. The study was revealed to different acquaintances in order to recruit the first participating household. Afterwards, the respondents were asked to recommend the next household for possible inclusion in the study through their social contacts. The respondent (family member>18 years of age) was informed of the details of the study through a telephone conversation. All respondents signed an informed consent form before joining the research. During visits, we conducted reviews and analyses of all drugs in the household (trade name, pharmaceutical formulation, expiry date, presence of secondary packaging, presence of summary of product characteristics, number of pills in a package). For every drug item the respondents answered the following questions: indication for what the drug is/was used, method of obtaining the drug (voluntarily purchased in a pharmacy, obtained from friends and family or issued on prescription) and whether the drug was currently being used (current use was defined as used 10 days prior to the interview).

After recording all the drugs in the household, respondents completed the questionnaire. The first part of the questionnaire was related to the socio-demographic characteristics of the household, while the second part referred to storage and disposal habits. After the data had been collected, drugs were classified according to the Anatomical Therapeutic Chemical (ATC) Classification System. The data was processed in Excel 2016 and Statistical Package for the Social Sciences (SPSS) software (SPSS 15.0 for Windows, SPSS Inc., Chicago, IL, USA). Results were presented as a frequency, percentage, mean and standard deviation. The chi-squared test for nominal variables was used to compare the differences between the rural and urban households. All p-values less than 0.05 were considered significant.

Results

In this study, we analyzed a total of 70 households, 35 in the municipality of Novi Sad and 35 in Laćarak. Total number of drug items present in households was 508 drugs (241 in Novi Sad and 267 in Laćarak). There

was no difference in household size between Novi Sad (3.6±1.3 members per household) and Laćarak (3.5±1.6 members per household). The average number of drug items per households was significantly higher in Laćarak (7.6±4.5) than in Novi Sad (6.9±3.6), (p-value=0.04).

Table 1 shows the main groups of drugs (1st levels) according to ATC classification. The most commonly used drugs in Novi Sad belonged to the nervous system, followed by the Musculo-skeletal system, cardiovascular system, antiinfectives for systemic use, and the respiratory system drug group.

Table 2 shows the most common subgroups of drugs (2nd levels) within the most frequently present groups of drugs in the households. Within the nervous system drug group, the most common drugs were analgesics (N02). Analgesics were more common in Novi Sad (19.1%) in comparison to Laćarak (7.1%). Psycholeptics (N05) and psychoanaleptics (N06) were more common in Laćarak. The most common subgroup of cardiovascular system drugs in both places was agents acting on the rennin-angiotensin system (C09), while the most common drugs in the musculo-skeletal system drug group in both environments were antiinflammatory and antirheumatic products (M01). Within the alimentary tract and metabolism drug group, the most common drugs in Laćarak were drugs for functional gastrointestinal disorders (A03), antidiarrheals, and intestinal antiinflammatory/antiinfective agents (A07), while the most common drugs in Novi Sad within the same drug group were drugs for acid related disorders (A02) and drugs used in diabetes (A10). A majority of the drugs within the antiinfectives for systemic use drug group were antibacterials for systemic use (J01) in both settings.

Table 3 shows drugs in households according to the mode of issuance. There were more POMs in Laćarak (69.7%) compared to Novi Sad (60.6%), (p-value<0.01).

Table 1 Structure of home pharmacies (Anatomical Therapeutic Chemical classification–1st levels)

Anatomical Therapeutic Chemical classification	Place of residence					
	Laćarak		Novi Sad		Total	
	Number*	%	Number*	%	Number*	%
Alimentary tract and metabolism	39	14.6	28	11.6	67	13.2
Blood and blood forming organs	13	4.9	4	1.7	17	3.4
Cardiovascular system	64	24.0	29	12.0	93	18.3
Dermatologicals	11	4.1	14	5.8	25	4.9
Antiinfectives for systemic use	25	9.4	29	12.0	54	10.6
Musculo-skeletal system	45	16.9	40	16.6	85	16.7
Nervous system	39	14.6	55	22.8	94	18.5
Respiratory system	18	6.7	22	9.1	40	7.9
Various	13	4.9	20	8.3	33	6.5
Total	**267**	**100.0**	**241**	**100.0**	**508**	**100.0**

*number of drug items

Table 2 Five most common groups of drugs in households (Anatomical Therapeutic Chemical Classification –2nd levels)

Anatomical Therapeutic Chemical classification	Place of residence			
	Laćarak		Novi Sad	
	Number*	%	Number*	%
N–Nervous system	39	14.6	55	22.8
N02–Analgesics	19	7.1	46	19.1
N03–Antiepileptics	1	0.4	1	0.4
N04–Anti–Parkinson drugs	3	1.1	0	0.0
N05–Psycholeptics	11	4.1	6	2.5
N06–Psychoanaleptics	5	1.9	1	0.4
N07–Other nervous system drugs	0	0.0	1	0.4
C–Cardiovaskular system	64	24.0	29	12.0
C01–Cardiac therapy	0	0.0	1	0.4
C02–Antihypertensives	1	0.4	1	0.4
C03–Diuretics	7	2.6	2	0.8
C04–Peripheral vasodilators	2	0.8	0	0.0
C05–Vasoprotectives	4	1.5	8	3.3
C07–Beta blocking agents	12	4.5	7	2.9
C08–Calcium channel blockers	12	4.5	0	0.0
C09–Agents acting on the rennin–angiotensin system	24	9.0	9	3.7
C10–Lipid modifying agents	2	0.8	1	0.4
M–Musculo–skeletal system	45	16.9	40	16.6
M01–Antiinflammatory and antirreumatic products	41	15.4	36	14.9
M02–Topical products for joints and muscular pain	4	1.5	4	1.7
A–Alimentary tract and metabolism	39	14.6	28	11.6
A01–Stomatological preparations	5	1.9	4	1.7
A02–Drugs for acid related disorders	4	1.5	10	4.2
A03–Drugs for functional gastrointestinal disorders	6	2.3	2	0.8
A06–Drugs for constipation	2	0.8	0	0.0
A07–Antidiarrheals, intestinal antiinflammatory/antiinfectiveagents	12	4.5	3	1.2
A10–Drugs used in diabetes	5	1.9	8	3.3
A11–Vitamins	5	1.9	1	0.4
J–Antiinfectives for systemic use	25	9.4	29	12.0
J01–Antibacterials for systemic use	23	8.6	28	11.3
J02–Antimycotics for systemic use	1	0.4	0	0.0
J04–Antimycobacterials	1	0.4	1	0.4
Other	55	20.6	60	24.9
Total	**267**	**100.0**	**241**	**100.0**

*number of drug items

Data on the method of drug purchase did not match the data on the drug issuance mode. Out of a total number of drugs, 13.1% in Laćarak and 9.1% in Novi Sad were POMs purchased without prescription or obtained from friends or family. More respondents from Novi Sad acquired POMs independently compared to respondents from Laćarak, while more respondents from Laćarak obtained POMs from friends and family compared to respondents from Novi Sad (Table 4).

In both settings drugs were usually stored in one place in the household. Mostly drugs were found in living rooms and bedrooms, although in a high percentage of households in Laćarak (28.6%), as well as households in Novi Sad (22.9%), drugs were also found stored in the kitchen. In 2.9% of the households of Laćarak and 11.4% of the households of Novi Sad, drugs were stored in the bathroom. Drug items were kept in hard to access places for children in just 20% of households in Laćarak but in more than 66.6% of households in Novi Sad, which was a significant difference (p-value<0.01). We found more drugs which were not in current use in households in Novi Sad (54.8%), in comparison to Laćarak (40.8%), (p-value= 0.034). Expired drugs made up 12% of all the drugs in Laćarak and 5.8% of all the drugs in Novi Sad (p-value< 0.01). Unused drugs were usually disposed of with home waste (Laćarak – 71.4%, Novi Sad – 74.3%), while a small percentage of unused drugs were handed over to a pharmacy (Table 5).

Table 3 Drugs in households according to the mode of issuance

Variable	Place of residence						Chi-squared p-value
	Laćarak		Novi Sad		Total		
	Number*	%	Number*	%	Number*	%	
Mode of drug issuance							<0.01
Over-the-counter	81	30.3	95	39.4	176	34.6	
Prescription-only-medication	186	69.7	146	60.6	332	65.4	
Total	**267**	**100.0**	**241**	**100.0**	**508**	**100.0**	

*number of drug items

Table 4 Drugs in households according to the obtaining manner

Variable	Place of residence						Chi-squared p-value
	Laćarak		Novi Sad		Total		
	Number*	%	Number*	%	Number*	%	
Purchase method							0.96
Acquired with prescription	151	56.6	124	51.5	275	54.1	
Obtained from friends or family	27	10.1	14	5.8	41	8.1	
Purchased without prescription	89	33.3	103	42.7	192	37.8	
Total	**267**	**100.0**	**241**	**100.0**	**508**	**100.0**	

*number of drug items

Table 5 Storage and disposal of drugs in households

Variable	Place of residence						Chi-squared p-value
	Laćarak		Novi Sad		Total		
	Number	%	Number	%	Number	%	
Drug storage	N**		N**		N**		<0.01
In one place in household	18	51.4	23	65.7	41	58.6	
In more places	17	48.6	12	34.3	18	41.5	
Total	35	100.0	35	100.0	70	100.0	
Drug storing room	N**		N**		N**		0.06
Living room	10	28.6	12	34.3	22	31.5	
Kitchen	10	28.6	8	22.9	18	25.8	
Bathroom	1	2.9	4	11.4	5	7.2	
Pantry	1	2.9	4	11.4	5	7.2	
Bedroom	13	37.1	7	20.0	20	28.6	
Total	35	100.0	35	100.0	70	100.0	
Drug used for	N*		N*		N*		<0.001
Acute disease	30	11.3	45	18.7	75	14.8	
Chronic disease	128	47.9	64	26.6	192	37.8	
Not in current use	109	40.8	132	54.8	241	47.4	
Total	267	100.0	241	100.0	508	100.0	
Expired medication	N*		N*		N*		0.015
Expired	32	12.0	14	5.8	46	9.1	
Not expired	235	88.0	227	94.2	462	90.9	
Total	267	100.0	241	100.0	508	100.0	
Accessibility to children	N**		N**		N**		0.01
Easily accessible	8	80.0	4	33.3	12	54.6	
Hardly accessible	2	20.0	8	66.6	10	45.4	
Total	10	100.0	12	100.0	22	100.0	
Drug disposal	N**		N**		N**		0.305
Together with home waste	25	71.4	26	74.3	51	54.3	
Hand over to pharmacy	4	11.4	3	8.6	7	10.0	
Burn	3	8.6	2	5.7	5	7.2	
Pass on to friends/family	2	5.7	0	0.0	2	2.8	
Other	1	2.9	4	11.4	5	6.6	
Total	35	100.0	35	100.0	70	100.0	

N*=number of drug items, N**=number of households

Data for accessibility to children included only households with children<12 years of age

Discussion

During the analysis of the drugs in households in Novi Sad and Laćarak, we examined similarities and differences in amount and structure of drugs in urban and suburban households. Also, we gained insight into different aspects of drug usage, such as self-medication practice, storage, and disposal of unused medicines. Our research has shown that there were certain differences in the drugs stored in the households of Novi Sad and Laćarak. A higher percentage of drugs acting on the respiratory system were found in Novi Sad. This could be explained by poorer air quality in an urban environment. We found more drugs acting on the cardiovascular system and alimentary tract and metabolism (primarily drugs for functional gastrointestinal disorders and antidiarrheals) in Laćarak, compared to Novi Sad, which can be related to traditional eating habits in the southern part of Srem (where Laćarak is located), which abounds with meat products and alcoholic beverages; and, it is an average elderly population living in the countryside. More drugs for acid-related disorders were found in Novi Sad. This can be explained by its contemporary urban lifestyle and consequent psychological stress.

Results of our study show a higher percentage of OTC drugs in the households of Novi Sad (39.4%) compared to Laćarak (30.3%), which can be explained by a younger population in the urban environment, which mainly uses modern communication means and information sources. Almost identical results in Novi Sad were obtained by Paut Kusturica and colleagues (41.0%): OTC drugs were the majority of drugs found in the households of Novi Sad).[6] Despite the efforts made to improve the control of POM dispensing and use in Serbia through the enforcement of laws restricting the purchase of many drugs, especially antibiotics, without medical prescriptions (November 2011), this still remains a serious issue.[4] The Medicines and Medical Devices Agency of Serbia performs the classification of medicinal products, regulates the regime of their dispensing, and publishes a list of around 300 drugs that are available OTC. However, there is a discrepancy between legislation and everyday practice. Out of all the drugs in households of Laćarak, 13.1% were POMs purchased independently without a prescription. POMs purchased without a prescription in Novi Sad made up 9.1% of the total number of found drugs. A study from 2012, conducted in Novi Sad showed that 21% of total drugs found were POMs obtained without prescription[6], which is a favorable time trend, bearing in mind that the existing legislation and stricter controls didn't start until November 2011, and time was required for the implementation of these regulations. Differences in obtaining POMs between the urban and rural environment could be explained by more frequent controls in pharmacies in the urban environments, and closer social contacts and trust among the inhabitants of the rural environments. In addition, our results showed that a higher number of Laćarak residents purchased medications, advised by friends and family members or received unused medicines through social contacts, compared to Novi Sad. A study conducted in Belgium in 2008 by Bello and colleagues in households in both urban and rural settings, but disregarding comparison, showed that 21.0% of all drug packages found were POMs purchased without prescription.[18]

Almost two-thirds of the respondents in both environments stored medicines in places that are considered suitable for drug storage, ie, the living room and bedroom. One-third of the respondents in both environments, however, stored drugs in the kitchen and bathroom, exposing them to humidity, temperature changes, chemicals, and food. Two-thirds of respondents stored drugs properly, far less compared with respondents from Belgian households (89.5%).[18] Emphasizing proper drug storage habits and the consequences of improper storage

by pharmacists in pharmacies is of essential importance. In 80.0% of households in Laćarak and 33.3% in Novi Sad, drugs were stored in places easily accessible to children. Our results differ from those obtained in the study from 2010[17], when availability of drugs for children was 20.0% in Novi Sad and 23.0% in households in the rural areas around Novi Sad. Thus, there remains the question of whether habits have significantly changed in this period or this topic requires more data obtained from a larger sample. Results from a study conducted in Croatia in both rural and urban households showed that in 36.0% of households drugs were kept within the reach of children.[19] One of the most serious consequences of preserving drugs in accessible places may be child intoxication. The World Health Organization points out that drug poisoning is most common in the age group 1–4, while the second peak of incidence of drug poisoning (most often on purpose) is in the age group 15–16[20]; therefore, it is of the utmost importance to turn public attention to the possible serious consequences of drug availability in regard to children. Our results showed that the percentage of expired drugs was twice as high in the analyzed rural environment (12.0%) compared to the urban (5.8%). This percentage of expired drugs in the households of Novi Sad was lower compared to the research from 2014 (9.2%)[1], 2008 (12.0%)[7] and 1996 (7.0%).[21] The percentage of expired drugs in both settings in our research was lower when compared with Belgian households where 21.0% of drug packages had passed their expiration date.[18] Our results showed that 88.6% of Laćarak residents and 91.4% of Novi Sad residents disposed of unused drugs improperly, usually together with household waste. As reasons they stated: that was the easiest way to dispose of the drugs, they did not know the proper manner or that the pharmacy staff had refused to take the drugs to be destroyed in a proper manner. Results obtained in a study from 2010[17] showed that 85.0% of residents in urban and 75.0% in rural areas had improper drug disposal habits. Results showed that 11.4% of Laćarak residents and 8.6% of Novi Sad residents handed over unused medicines to the pharmacy. Improperly disposing of unused drugs together with domestic waste, or in the sewage system, endangers our environment. This way, drugs reach lands, water and the living world, leading to bioaccumulation and directly influence the living world, including humans, due to antimicrobials, hormones and cytostatic agents, which leads to antimicrobial resistance, and changes in genotype and phenotype.[22] In accordance with the regulations of the Republic of Serbia, pharmacies are obliged to collect pharmaceutical waste from citizens, but the core of the problem is that the regulations don't define strictly who will take the financial responsibility of disposal, wholesalers or drug manufacturers. Thus, there is no effective system of destroying pharmaceutical waste. Pharmacies do not promote and encourage patients to return unused medicines to pharmacies.[1]

Our study had certain limitations that need to be mentioned. The first limitation is the relatively small sample of investigated households. Secondly, sample selection was based on snowball recruitment, which may have led to selection bias.

Conclusion

The structures of home pharmacies in Novi Sad and Laćarak differ, which implies different healthcare needs. The practice of self-medication was noted both in Novi Sad and Laćarak. While Laćarak residents rely more on the advice of friends and family, Novi Sad residents buy medicines mostly on their own initiative. Medications in both environments are stored properly in the majority of households, but unused medications are mostly disposed of improperly together with household waste. There is a need for education on the proper storage of medication, especially in rural settings, and the development of procedures for proper medication disposal.

Conflict of interest

The authors have no conflict of interest to declare.

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