ARTICLE
https://doi.org/10.3395/2317-269X.00802

Drug disposal for municipalities in the Jequitinhonha Valley, Minas Gerais, Brazil

Descarte de medicamentos em municípios do Vale do Jequitinhonha, Minas Gerais, Brasil

Maria Jesus Barreto Cruz*

Alex Braga Azevedo

Helle Lilliane da Cruz

Emerson Cotta Bodevan

Lorena Ulhôa Araujo

Delba Fonseca Santos

Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM), Diamantina, MG, Brasil

* **E-mail:** maria_enfermagem@yahoo.com.br

Received: Jun 19, 2016
Approved: Jan 16, 2017

ABSTRACT

The objective of this work was to investigate the way families of children and adolescents from 20 municipalities of Vale do Jequitinhonha, Minas Gerais, Brazil, dispose medications. A cross-sectional study was carried out, using a population-based household survey, with a proportional stratified random sample by municipality of 555 residents. When asked about access to the health service, 98.2% and 94.0% of respondents lived less than five kilometers from the Basic Health Unit and the basic pharmacy, respectively. In relation to the last medical appointment in a one-year period, 39.3% had had one month before the interview date, being the main reason affections of the respiratory system. Regarding the destination of leftover medications after the end of treatment, 46.7% stored at home for later use. Regarding overdue drugs, 88.5% discarded in the environment and 88.8% said they had never received information on the correct way to dispose medications. It is noted that the population discards the drugs incorrectly and in inappropriate places, and that they have not received the formal orientation regarding the disposal, demanding actions to promote the rational use of medicines and the impacts caused on the environment.

KEYWORDS: Dispose of Medicines; Expired Medicines; Public Health; Sanitary Surveillance

RESUMO

O objetivo deste trabalho foi investigar as formas de descarte de medicamentos por famílias de crianças e adolescentes de 20 municípios do Vale do Jequitinhonha, Minas Gerais, Brasil. Foi realizado um estudo transversal, tipo inquérito populacional domiciliar, com amostra aleatória estratificada proporcional por município de 555 moradores. Quando questionados sobre o acesso ao serviço de saúde, 98,2% e 94,0% residiam a menos de cinco quilômetros da Unidade Básica de Saúde e da farmácia básica, respectivamente. Em relação à última consulta médica realizada no período de um ano, 39,3% haviam realizado em até um mês da data da entrevista e o principal motivo foram afecções do sistema respiratório. Sobre o destino das sobras de medicamentos após o término do tratamento, 46,7% armazenaram em casa para uma posterior utilização. Em relação aos medicamentos vencidos, 88,5% descartavam no ambiente e 88,8% disseram nunca ter recebido informações quanto à forma correta de descarte dos medicamentos. Nota-se que a população descarta os medicamentos de forma incorreta e em locais inadequados, e que não receberam a orientação formal em relação ao descarte, demandando a realização de ações para a promoção do uso racional dos medicamentos e os impactos causados no meio ambiente.

PALAVRAS-CHAVE: Descarte de Medicamentos; Medicamentos Vencidos; Saúde Pública;Vigilância Sanitária

INTRODUCTION

The development of the pharmaceutical industry and the increased access to medicines contribute to the increase in their consumption and accumulation in households worldwide[1]. Therefore, the various types of unused drugs, the amounts stored in households, and disposal practices, as well as the factors that may explain waste, are the subject of many studies[2]. Drug disposal in household garbage or sewage may have public health implications, since pharmaceutical compounds can pollute water reservoirs and aquifers, causing damage to ecological systems[3,4]. Data from the World Health Organization (WHO) show that various drug residues or metabolites are present in drinking water sources[5]. Several developing countries, including Brazil, have drug products in their water systems due to the lack of standardization of final drug disposal[6]. In Brazil, it is estimated that about 20% of the purchased medicines are disposed of in the sewage system or in domestic garbage[7]and may represent an environmental problem.

In this context, there are initiativesboth in the world[1,5,8,9] and in Brazil[10,11,12] for the implementation of drug collection and disposal management systems. The Ministries of Health and Environment, bodies responsible for the regulation of the disposal of medicines in Brazil,determine guidelines and standards for the stakeholders of waste-producing activities to take responsibility for proper disposal[13,14].

Among the relevant measures adopted in Brazil for the implementation of proper drug disposal, we highlight Anvisa's efforts through RDC n. 306/2004[10], which regulates the management of healthcare waste, and Resolution n. 358/2005[11], of the Ministry of the Environment, which addresses the treatment and final disposal of healthcare waste. Both legislations require the Health Services Waste Management Plan[10]. Additionally, Anvisa's RDC n. 44/2009[12]provides for Good Pharmaceutical Practices for sanitary control of the operation, dispensing and marketing of products and the provision of pharmaceutical services in pharmacies and drugstores. However, these laws do not impose the compulsory collection of medicines by pharmacies and drugstores. Subsequently, the National Policy on Solid Waste was instituted by Law n. 12.305/2010[15] and regulated by Decree n. 7.404/2010[16]. Since 2011, the Brazilian National Congress has been discussing Bill n. 595/2011[17], which aims to compel pharmacies, drugstores and health centers to receiveexpired or unused medicines from the population.

In this setting, several state and municipal initiatives were taken as a solution for the final drug disposal. Rio Grande de Sul, in the cities of Passo Fundo[18] and Porto Alegre[19], Amazonas[20], Paraíba[21], Mato Grosso, in Cuiabá[22], and Acre[23] have shown some progress in the requirementthat pharmacies receive and pack medicines and their packaging, as well as see to it that they go to the appropriate destination[24]. From the point of view of education and information to citizens, Anvisa provided a communication channel with information on drug disposal[25].

Therefore, the present study intends to investigate how drugsare disposed of and the level of awareness about proper destination by families of children and teenagers living in urban areas of the Jequitinhonha Valley, innorthernMinas Gerais, through a population-based epidemiological study.

METHOD

This is a cross-sectional study, of the household population survey type, done from April 10 to July 20, 2013, conducted through interviews with families from 20 municipalities of the Jequitinhonha Valley, Minas Gerais, who had a stock of medicines in households where children under the age of14 years were on medication.

Considering a 50% prevalence of drug stock in the population (lack of knowledge of the actual prevalence in Jequitinhonha Valley/p = 0.50), the sample was calculated based on the urban areas of each town, totaling 672 home interviews (acceptable error 5% and 95% confidence level for an infinite sample). For this estimate, we used census numbers from the Brazilian Institute of Geography and Statistics (IBGE)[26], which showed an approximate total of 88,936 individuals under 14 years of age in 20 municipalities (Alvorada de Minas, Aricanduva, Capelinha, Carbonita, Congonhas do Norte, Couto de Magalhães de Minas, Datas, Diamantina, Felício dos Santos, Gouveia, Itamarandiba, Leme do Prado, Minas Novas, Presidente Kubitschek, Santo Antônio do Itambé, São Gonçalo do Rio Preto, Senator Modestino Gonçalves, Serro, Turmalina and Veredinha) of the Alto Jequitinhonha Intermunicipal Health Consortium, Diamantina, Minas Gerais, geographically distributed as shown in the Figure.

The households were selected by hierarchical sampling. First they were proportionally stratified by municipalities, then we randomly selected census tracts within each municipality. Finally we randomly obtained households within each census tract, using the 137 census tracts defined by the IBGE as reference units[26].

Inclusion criteria were families with children under 14 years of age, vulnerable age group for intoxication[28], mandatory interview with legal guardians, stockpiling of medicines and drug use by children. The study excluded families whose legal guardians were not present at the time of the interview or refused to grant it, whose home address was a commercial establishment and those where there were no residents under 14 years of age.

The variables we analyzed were distance from home to the Basic Health Unit (BHU) (≤ 5 km or 5–10 km), distance from home to the basic pharmacy (≤ 5 km or 5–10 km), last medical appointment (< 1 month, 1–3 months, 3–12 months,> 12 months), last year drug use (yes or no), destination of unused drugs after treatment ends (save for reuse, discard in the environment, no drug left, delivery to BHU or the Community Health Agent (CHA), give to neighbors, friends or family), the way to dispose of expired medicines (disposal in the environment, delivery to BHU or CHA, burning, other) and whether the respondent received any guidance on disposal (yes or no). The drugs used by the children were then

classified into groups and subgroups according to the latest version of the WHO Anatomical Therapeutic Chemical Classification (ATC)[29]. The distance from the health service was established according to Law et al.[30,31].

Data were collected by four interviewers trained in a pilot study to validate the collection, using a structured questionnaire with open- and closed-ended questions. In households with more than one child, only one questionnaire was conducted. The individual was selected by draw, using a table of random numbers. Interviewers were instructed to request the presentation of the medical prescription and home-stored medicines taken by the children.

For data analysis we used Epi Info version 7.0 software (CDC/WHO, Atlanta, GA, USA) and Microsoft Office Excel 2007, and the data were presented in figures and tables, considering relative and absolute values.

The project was approved by the Research Ethics Committee of the Federal University of Jequitinhonha and Mucuri Valleys (UFVJM) (Opinion n. 044/11). The participating population was informed of the purpose of the study and signed the Informed Consent Form (ICF).

RESULTS

The study included 555 individuals, of which 117 (17.4%) were losses. The vast majority of respondents reported living less than five kilometers (km) away from a BHU (98.2%) and 94.4% from a basic pharmacy. Regarding the last medical appointment, 39.3% reported having had their last appointment within one month before the data of the interview and 90.8% reported having taken some medication overthe last year (Table 1).

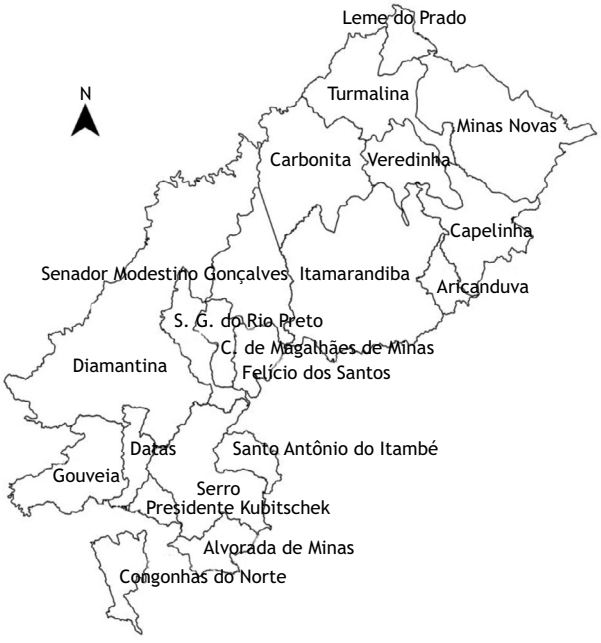

Figure. Map of the location of the study municipalities[27].

In total, parents or legal guardians reported 1,231 medications, 77.5% of which were prescribed and 22.5% were self-medication. The most cited drugs were those used for respiratory system disorders, followed by those of the central nervous system, especially painkillers and systemic antiinfectives. Among the painkillers, paracetamol stood out with 208 citations (Table 2).

Regarding the destination of unused drugs after the end of the treatment, 46.7% stored them at home for later use; 26.3% of respondents said they discard them in the environment; 16.7% said there were no drugs left; 9.2% returned them to some health facility; and 1.1% reported giving to neighbors, friends or family. When it comes to expired drugs, 88.5% of the respondents said they discard them in the environment; 5.9% returned them to some health facility; 2.2% burned them; 3.4% reported some other situation and 88.8% said they had never received information about proper disposal (Table 3).

DISCUSSION

The study has shown that most families lived relatively close to a BHU and basic pharmacy; that the children had seen a doctor in the last three months and taken medicines at some point over the last 12 months. It also found risky behaviors for the environment with regard to the treatment given to unused drugs and disposal of expired drugs.

With regard to the distance between homes and the BHU or basic pharmacy, Unglert[32] and Penchansky and Thomas[33] state that geographical proximity is an important component of access to healthcare services and therefore it is necessary to facilitate access within the geographical limits of each social territory, integrating services and practices. In this context, according

Table 1. Distribution of characteristics of respondents according to the distance traveled between their household and the BHU and the basic pharmacy, last medical appointment and use of medicines. Municipalities of Jequitinhonha Valley (MG), Brazil, 2013.

Characteristics	N	%
Distance from household to BHU (km)		
≤ 5	545	98.2
5-10	10	1.8
Distance from household to basic pharmacy (km)		
≤ 5	522	94
5-10	33	6
Last medical appointment (month)		
> 1	218	39.3
1-3	165	29.7
3-12	117	21.1
> 12	55	9.9
Took medicine (last year)		
Yes	504	90.8
No	51	9.2

BHU: Basic Health Unit.

Table 2. Distribution of medicines used by children in the last year according to ATC classification groups and subgroups. Municipalities of Jequitinhonha Valley (MG), Brazil, 2013.

Therapeutic groups	ATC code	N	%
Respiratory system	R	393	32.0
Dexchlorpheniramine	R06	115	29.3
Ambroxol	R05	47	11.9
Others	-	231	58.8
Central nervous system	N	379	30.8
Paracetamol	N02	208	54.9
Dipyrone	N02	150	39.6
Others	-	21	5.5
Antiinfectives for systemic use	J	215	17.5
Amoxicillin	J01	150	69.8
Sufamethoxazole + trimethoprim	J01	16	7.5
Others	-	49	22.7
Musculoskeletal system	M	91	7.4
Ibuprofen	M01	49	53.8
Nimesulide	M01	17	18.7
Others	-	25	27.5
GI tract and metabolism	A	77	6.2
Metoclopramide	A03	26	33.8
Dimethicone	A03	24	31.1
Others	-	27	35.1
Blood and blood forming organs	B	20	1.6
Ferrous sulphate	B03	14	70.0
Others	-	6	30.0
Antiparasitics, insecticides and repellents	P	24	1.9
Albendazole	P02	10	41.7
Mebendazole	P02	4	16.6
Others	-	10	41.7
Dermatological	D01/D06/D07	22	1.8
Dexametazone	D07	5	22.7
Neomycin	D06	5	22.7
Others	-	12	54.6
Don't know/Don't remember		10	0.8
Total		1231	100.0

ATC: Anatomical therapeutic chemical.

Table 3. Behavior of respondents according to the destination given to unused and expired drugs, and awareness of the correct way to dispose of drugs. Municipalities of Jequitinhonha Valley (MG), Brazil, 2013.

Variable	N	%
Destination of unused drugs		
Storage to use again	259	46.7
Disposal in the environment	146	26.3
No leftover	93	16.7
Delivery to BHU or CHA	51	9.2
Give to neighbors, friends or family	6	1.1
Destination of expired drugs		
Disposal in the environment	491	88.5
Delivery to BHU or CHA	33	5.9
Burning	12	2.2
Other	19	3.4
Received information about disposal		
No	493	88.8
Yes	62	11.2

BHU: Basic Health Unit; CHA: Community Health Agent.

to Law et al.[30,31], geographical accessibility to pharmacies has an impact on primary drug care and may favor the receipt and packaging of medicines for proper final disposal. With state and municipal regulatory frameworks for drug disposal[24], health and environmental managers in the Jequitinhonha Valley will be able to guide their intervention plans.

From the point of view of the drug disposal done by the population, it was observed that BHU are rarely used, a result that differs from that found by Iob et al.[34] in a survey conducted in the state of Rio Grande do Sul, which found that 22.2% of the population returns unused drugs to BHU.

In the study, it was found that the destination of medicines that are unused and/or are expired is the disposal in the environment. Regarding the disposal of expired drugs, the result was superior to that reported by Bueno et al.[35], in Ijuí-RS, and Gasparini et al.[36], in Catanduva-SP, which reported 72.8% and61.35%, respectively. In a systematic review by Kusturica et al.[37], it has been observed that in many countries the population disposes of medicines in the environment. Moreover, there is lack of correct information and clear instructions, and people are unaware of the association between environmental harmand disposal methods.

The magnitude of this problem can be found in several studies. Unglert[32] states that more than 200 pharmaceutical products have been identified in freshwater systems worldwide, and that antibiotics, painkillers, cardiovascular, dyslipidemic and antidepressant drugs were the most common. The presence of antibiotics in water is associated with the development of antimicrobial resistance[38,39,40,41,42]. The consequences to human health of chronic exposure to these subtherapeutic levels in water are unknown, however, there is evidence of toxic effects on aquatic fauna[43]. A similar situation is found in several Brazilian studies. In Três Lagos, Rio de Janeiro, anti-inflammatories were detected in a stream and near the sewage treatment plant[44]. In the state of São Paulo, in the municipality of São Carlos, Campanha et al.[45] found paracetamol, atenolol, and steroid hormones in river waters.

In the present study, it was observed that 46.7% of respondents kept the unused medication at home for new use, a result similar to that found by Bueno et al.[35] and Iob et al.[34] in studies conducted in Rio Grande do Sul. Given these facts, it is important to note that access to and use of medicines favors the maintenance of a home supply of medicines, which is also increased due to the frequency of use and advertising[46,47]. Thus, it is suggested that other studies be done in the region to investigate the reasons why citizens store medicines at home.

Special attention should be paid to the guidelines of the Anvisa Resolution[10] that states that drug waste generated at home should be packaged, identified and collected by service

professionals or through voluntary action of the population. At this time, it is important to emphasize the opportunity of BHU and pharmaceutical establishments in the Jequitinhonha Valley to implement, through a Reverse Logistics System[12],sharedactions among patients, caregivers, family members, healthcare professionals and legislators.

In the study, it was observed that respondents were unaware of the correct disposal of medicines, a result similar to that found by other studies[34,35,36]. Therefore, it is necessary to promote education initiatives in the Jequitinhonha Valley to empower and qualify citizens on proper drug disposal. Healthcare professionals should also be prepared. A study conducted in the United States has shown that education and prior counseling by the healthcare provider on the proper way to dispose of medication were associated with the return of the citizen to the pharmacy for proper product disposal[48]. Anvisa's microsite can contribute to this process, since it has plenty of information for healthcare professionals and civil society[25].

In several developed countries, pharmacies play a key role in the collection of expired or unused medicines. However, there is no standardization in the programs, legislation, collection methods, and funding involved in this issue[1,49]. Several countries in Europe (Belgium, the United Kingdom, Denmark, Norway, France) have legislation requiring pharmacies to collect the medicine from households[40]. In other countries, pharmacies collect medicines from households on a voluntary basis: Italy, Germany, the Netherlands, Spain, Portugal, Sweden and Switzerland[1]. Since 1971, Sweden has had a drug collection system that has been implemented in asafety perspective and evolved for environmental reasons, with the Swedish population having adequate awareness of disposal methods and return to pharmacy practices[8]. In most US states, the collection of unused or expired drugs is done by the pharmacies, and in Canada, pharmacies voluntarily stand out for the collection of drugs from households[1,9].

In Brazil, similar experiences occur in some states and municipalities, like in Passo Fundo, Porto Alegre, Amazonas, Paraíba, Cuiabá and Acre[24]. These regulations determine that pharmacies and drugstores have a specific container for collection of expired or unused drugs and their packaging, and provide for their proper environmental destination[15,16,17,18,19,20].

Pharmacies and drugstores in Brazil are under environmental and health protection regulations, given that Anvisa determines the participation of these establishments in a program for the collection of medicines discarded by the community[12] and in the control of antimicrobials[50].

It is important to consider some limitations of the study. The household survey is subject to information bias on the part of interviewers and respondents, which are not always controllable, and memory bias, since the recall time for medication use was one year. The period in which data collection was performed, April to July 2013,coincided with the period of cold weather and low air humidity in the region, increasing access to health services.

CONCLUSION

The data found in the present study have shown that the families of the Jequitinhonha Valley dispose of medicines incorrectly. This may be driven by their lack of information and guidance and the absence of health facilities prepared to receive these drugs. Considering that, it is necessary to implement education actions to promote the rational use of medicines and collection systems for safe disposal in public or private health services to prevent the accumulation of medicines in households and the pollution of the environment.

REFERENCES

1. Barnett-Itzhaki Z, Berman T, Grotto I, Schwartzberg E. Household medical waste disposal policy in Israel. Isr J Health Policy Res. 2016;5(1):48. https://doi.org/10.1186/s13584-016-0108-1
2. Kusturica MP, Tomas A, Sabo A. Disposal of unused drugs: knowledge and behavior among people around the world. Rev Environ Contam Toxicol. 2017;240:71-104. https://doi.org/10.1007/398_2016_3
3. Gilbert N. Drug-pollution law all washed up. Nature. 2012;491(7425):503-4. https://doi.org/10.1038/491503a
4. Umwelt Bundesamt. Pharmaceuticals in the environment: occurrence, effects, and options for action. Berlin: Umwelt Bundesamt ; 2016[acesso 5 set 2016]. Disponível em: http://www.pharmaceuticals-in-the-environment.org
5. World Health Organization - WHO. Pharmaceuticals in drinking-water. 2012. Geneva: World Health Organizatio; 2012.
6. Bergman A, Heindel JJ, Jobrling S, Kid KA, Zoeller RT, editors. State of the science of endocrine disrupting chemicals: summary for decision-makers. Geneva: World Health Organizatio; 2012.
7. Serafim EOP, Del Vecchio A, Gomes J, Miranda A, Moreno AH, Loffredo LMC et al. Qualidade dos medicamentos contendo dipirona encontrados nas residências de Araraquara e sua relação com a atenção farmacêutica. Rev Bras Ciênc Farm. 2007;43(1):127-35. https://doi.org/10.1590/S1516-93322007000100016
8. Persson M, Sabelström E, Gunnarsson B. Handling of unused prescription drugs: knowledge, behaviour and attitude among Swedish people. Environ Int. 2009;35(5):771-4. http://doi.org/10.1016/j.envint.2008.10.002
9. Law MR, Ma T, Fisher J, Sketris IS. Independent pharmacist prescribing in Canada. Can Pharm J. 2012;145(1):17-23.e1. https://doi.org/10.3821/1913-701X-145.1.17

10. Agência Nacional de Vigilância Sanitária – Anvisa. Resolução RDC Nº 306, de 7 de dezembro de 2004. Dispõe sobre o regulamento técnico para o gerenciamento de resíduos de serviços de saúde. Diário Oficial União. 10 dez 2004.
11. Ministério do Meio Ambiente (BR). Conselho Nacional do Meio Ambiente -Conama. Resolução Conama Nº 358, de 29 de abril de 2005. Dispõe sobre o tratamento e a disposição final dos resíduos dos serviços de saúde e dá outras providências. Diário Oficial União. 4 maio 2005;Seção 1:63-5.
12. Agência Nacional de Vigilância Sanitária – Anvisa. Resolução RDC Nº 44, de 17 de agosto de 2009. Dispõe sobre as Boas Práticas Farmacêuticas para o controle sanitário do funcionamento, da dispensação e da comercialização de produtos e da prestação de serviços farmacêuticos em farmácias e drogarias e dá outras providências. Diário Oficial União.18 ago 2009.
13. Falqueto E, Kligerman DC, Assumpção, RF. Como realizar o correto descarte de resíduos de medicamentos? Cien Saude Colet. 2010;15(2 supl 2):3283-93. https://doi.org/10.1590/S1413-81232010000800034
14. Falqueto E, Kligerman DC. Diretrizes para um programa de recolhimento de medicamentos vencidos no Brasil. Cien Saúde Colet. 2013;18(3):883-92. https://doi.org/10.1590/S1413-81232013000800034
15. Brasil. Lei nº 12.305, de 2 de agosto de 2010. Institui a Política Nacional de Resíduos Sólidos; altera a Lei nº 9.605, de 12 de fevereiro de 1998; e dá outras providências. Diário Oficial União. 2 ago 2010.
16. Brasil. Decreto nº 7.404, de 23 de dezembro de 2010. Regulamenta a Lei nº 12.305, de 2 de agosto de 2010, que institui a Política Nacional de Resíduos Sólidos, cria o Comitê Interministerial da Política Nacional de Resíduos Sólidos e o Comitê Orientador para a Implantação dos Sistemas de Logística Reversa, e dá outras providências. Diário Oficial União. 23 dez 2010.
17. Brasil. Câmara dos Deputados. Projeto de Lei 595/2011. Acrescenta o art. 6-A à Lei nº 5.991, de 17 de dezembro de 1973, para dispor sobre o recolhimento e o descarte consciente de medicamentos. 24 fev 2011[acesso 31 out 2016]. Disponível em: http://www.camara.gov.br/proposicoesWeb/fichadetramitacao?idProposicao=493432
18. Prefeitura Municipal de Passo Fundo (RS). Lei Ordinária nº 4.462, de 28 de dezembro de 2007. Dispõe sobre a obrigatoriedade das farmácias manterem urnas para a coleta de medicamentos, insumos farmacêuticos, correlatos, cosméticos deteriorados ou com prazo de validade expirado e dá outras providências. Diário Oficial Município. 3 jan 2008.
19. Prefeitura Municipal de Porto Alegre (RS). Lei Ordinária nº 11.329, de 3 de agosto de 2012. Estabelece procedimentos a serem adotados para o descarte de medicamentos vencidos e de suas embalagens no Município de Porto Alegre. Diário Oficial Porto Alegre. 8 ago 2012.
20. Amazonas. Lei Ordinária nº 3.676, de 12 de dezembro de 2011. Cria o programa estadual de coleta de medicamentos vencidos ou estragados, e fixa outras providências correlatas. 2011[acesso 31 out 2016]. Disponível em: http://leisnaweb.com.br/mostrarato/?ato=5202&host=passofundo.leisnaweb.com.br&search=
21. Paraíba. Lei Estadual nº 9.646, de 29 de dezembro de 2011. Dispõe sobre as normas para a destinação final do descarte de medicamentos vencidos ou impróprios par a uso, no âmbito do Estado da Paraíba e dá outras providências. Diário Oficial Paraíba. 30 dez 2011.
22. Prefeitura Municipal de Cuiabá (MT). Lei nº 5.678, de 9 de agosto de 2013. Prevê a coleta de medicamentos vencidos ou não utilizados em farmácias revendedoras, de manipulação e drogarias. Diário Oficial Eletrônico do Tribunal de Contas MT. 15 ago 2013.
23. Acre. Lei nº 2720, de 25 de julho de 2013. Cria o Programa Estadual de Coleta de Medicamentos Vencidos ou Estragados. Diário Oficial do Estado. 26 jul 2013.
24. Morosini L. Descarte é responsabilidade de quem? Radis. Comunicação e Saúde. 2015;154:27-9.
25. Portal Brasil. Anvisa lança hotsite sobre descarte de medicamentos. 28 jul 2014[acesso 5 set 2014]. Disponível em: http://www.brasil.gov.br/saude/2011/07/anvisa-lanca-hotsite-sobre-descarte-de-medicamentos
26. Instituto Brasileiro de Geografia e Estatística – IBGE. População e Domicílios - Censo 2010 com Divisão Territorial 2001, Minas Gerais. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 2010[acesso 20 jan 2014]. Disponível em: http://downloads.ibge.gov.br/downloads_geociencias.htm
27. Cruz MJB, Dourado LFN, Bodevan EC, Araújo LU, Grael CFF, Santos DF. Uso de plantas medicinais por famílias do Vale do Jequitinhonha, Minas Gerais, Brasil. Infarma: Ciências Farmacêuticas. 2015;27(1):38-48. https://doi.org/10.14450/2318-9312.v27.e1.a2015.pp38-48
28. Fundação Oswaldo Cruz. Instituto de Comunicação e Informação Científica e Tecnológica em Saúde. Sistema Nacional de Informações Tóxico Farmacológicas-SINTOX. Perfil nacional. Rio de Janeiro: Fundação Oswaldo Cruz; 2011[acesso 20 jan 2014]. Disponível em: http://sinitox.icict.fiocruz.br/search/site/medicamentos
29. WHO Collaborating Centre for Drug Statistic Methodology. ATC/DDD Index 2014. Oslo: WHO Collaborating Centre for Drug Statistic Methodology; 2014[acesso 20 jan 2014]. Disponível em: http://www.whocc.no/atc_ddd_index/
30. Law MR, Dijkstra A, Douillard JA, Morgan SG. Geographic accessibility of community pharmacies in Ontario. Healthc Policy. 2011;6(3):36-46.
31. Law MR, Heard D, Fisher J, Douillard J, Muzika G, Sketris IS. The geographic accessibility of pharmacies in Nova Scotia. Can Pharm J. 2013;146(1):39-46. https://doi.org/10.1177/1715163512473062
32. Unglert CVS. O enfoque da acessibilidade no planejamento da localização e dimensão de serviços de saúde. Rev Saúde Pública. 1990;24(6):445-52. https://doi.org/10.1590/S0034-89101990000600002
33. Penchansky R, Thomas JW. The concept of access: definition and relationship to consumer satisfaction. Med Care. 1981;19(2):127-40. https://doi.org/10.1097/00005650-198102000-0000

34. Iob GA, Camillo EGS, Petry RD. Análise da forma de descarte de medicamentos por usuários de uma Unidade de Saúde no município de Porto Alegre/RS. Infarma: Ciências Farmacêuticas. 2013;25(3):118-25. https://doi.org/10.14450/2318-9312.v25.e3.a2013.pp118-125

35. Bueno CS, Weber D, Oliveira KR. Farmácia caseira e descarte de medicamentos no bairro Luiz Fogliatto do município de Ijuí – RS. Rev Ciênc Farm Básica Apl. 2009;30(2):203-10.

36. Gasparini JC, Gasparini AR, Frigieri MC. Estudo do descarte de medicamentos e consciência ambiental no município de Catanduva- SP. Ciên Tecnol: FATEC-JB. 2011;2(1):38-51.

37. Kusturica MP, Tomas A, Sabo A. Disposal of unused drugs: knowledge and behavior among people around the world. Rev Environ Contam Toxicol. 2017;240:71-104. https://doi.org/10.1007/398_2016_3

38. Guirguis K. Medications collected for disposal by outreach pharmacists in Australia. Pharm World Sci. 2010;32(1):52-8. https://doi.org/10.1007/s11096-009-9340-x

39. Kusturica MP, Sabo A, Tomic Z, Horvat O, Solak Z. Storage and disposal of unused medications: knowledge, behavior, and attitudes among Serbian people. Int J Clin Pharm. 2012;34(4):604-10. https://doi.org/10.1007/s11096-012-9652-0

40. Al-Shareef F, El-Asrar SA, Al-Bakr L, Al-Amro M, Alqahtani F, Aleanizy F et al. Investigating the disposal of expired and unused medication in Riyadh, Saudi Arabia: a cross-sectional study. Int J Clin Pharm. 2016;38(4):822-8. https://doi.org/10.1007/s11096-016-0287-4

41. Bila DM, Dezotti M. Identificação de fármacos e estrogênios residuais e suas consequências no meio ambiente. In: Universidade Federal do Rio de Janeiro. COPPE. Fronteiras da engenharia química. Rio de Janeiro: Coppe; 2005. p. 141-75.

42. Eickhoff P, Heineck I, Seixas LJ. Gerenciamento e destinação final de medicamentos: uma discussão sobre o problema. Rev Bras Farm. 2009;90(1):64-8.

43. Prescott JD, Estler K. Waste not, want not: drug disposal and the role of the pharmacist. Pharm Times. 2010;76:107-13.

44. Américo JHP, Isique WD, Ortega DJP, Ortiz IAS, Torres NH, Ferreira LFR, et al. Monitoramento do anti-inflamatório piroxicam e do anti-hipertensivo atenolol em um córrego urbano no município de três lagoas, Brasil. Interciencia. 2015;40(10):670-3. https://doi.org/10.1007/s00244-010-9550-1

45. Campanha MB, Awan AT, de Sousa DN, Grosseli GM, Mozeto AA, Fadini PS. A 3-year study on occurrence of emerging contaminants in an urban stream of São Paulo State of Southeast Brazil. Environ Sci Pollut Res Int. 2015;22(10):7936-47. https://doi.org/10.1007/s11356-014-3929-x

46. Nascimento A. Propaganda de medicamentos: como conciliar uso racional e a permanente necessidade de expandir mercado? Trab Educ Saúde. 2007;5(2):189-250. https://doi.org/10.1590/S1981-77462007000200002

47. Nascimento AC, Sayd JD. Ao persistirem os sintomas, o médico deverá ser consultado: isto é regulação? Physis. 2005;15(2):305-28. https://doi.org/10.1590/S0103-73312005000200007

48. Seehusen DA, Edwards J. Patient practices and beliefs concerning disposal of medications. J Am Board Fam Med. 2006;19(6):542-7. https://doi.org/10.3122/jabfm.19.6.542

49. California Product Stewardship Council. International Programs for Pharmaceuticals. 2016[acesso 28 out 2016]. Disponível em: http://calpsc.org/products/pharmaceuticals/internationalepr-programs-for-pharmaceuticals/

50. Agência Nacional de Vigilância Sanitária – Anvisa. Resolução RDC nº 20, de 5 de maio de 2011. Dispõe sobre o controle de medicamentos à base de substâncias classificadas como antimicrobianos, de uso sob prescrição, isoladas ou em associação. Diário Oficial União. 9 maio 2011;Seção1:39-41.

Conflict of Interest

Authors have no potential conflict of interest to declare, related to this study's political or financial peers and institutions.