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DISPOSAL OF EXPIRED OR UNUSED MEDICINES IN FEDERAL DISTRICT – BRAZIL: AN ANALYSIS OF REVERSE LOGISTICS[1]

DESCARTE DE MEDICAMENTOS EXPIRADOS OU NÃO UTILIZADOS NO DISTRITO FEDERAL – BRASIL: UMA ANÁLISE DA LOGÍSTICA REVERSA

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ABSTRACT
This study aims to analyze part of the Reverse Logistics chain of expired or unused medicines in the Federal District (FD) - Brazil, namely, the disposal by users and receipt by pharmacies and drugstores. As for the method, this is applied research, and primary and secondary data were collected. The application of the questionnaire resulted in 158 responses from residents of the Federal District and 65 companies were interviewed. The result with the residents shows that most of the population disposes of their medicines incorrectly; they never received information about the correct disposal of medicines; but residents who tried to deliver the medicines to pharmacies had no difficulty. The result of the research with drugstores shows that most of them receive expired or disused drugs; that dispensing containers are not available to customers, but that there are containers for primary storage within the pharmacies themselves. Thus, it is concluded that the main problem is in the first link of the chain that is, in consumers who do not dispose of waste correctly, since the next link in the chain, pharmacies, and drugstores, are not showing resistance when receiving the medicines, that is, they comply with their legal responsibility.

Keywords: Reverse logistics, Reverse logistics of medicines, Expired medicines, Unused medicines.

RESUMO
Este estudo tem como objetivo analisar parte da cadeia de Logística Reversa de medicamentos vencidos ou em desuso no Distrito Federal (DF) - Brasil, a saber, o descarte pelos usuários e o recebimento pelas farmácias e drogarias. Quanto ao método, trata-se de uma pesquisa aplicada, e foram coletados dados primários e secundários. A aplicação do questionário resultou em 158 respostas de moradores do Distrito Federal e foram entrevistadas 65 empresas. O resultado com os moradores mostra que grande parte da população descarta seus medicamentos de forma incorreta; nunca receberam informações sobre o descarte correto de medicamentos; mas os moradores que tentaram entregar os medicamentos nas farmácias não tiveram dificuldade. O resultado da pesquisa com drogarias mostra que a maioria delas recebe medicamentos vencidos ou em desuso; que os recipientes dispensadores não estão à disposição dos clientes, mas que existem recipientes para armazenamento primário nas próprias farmácias. Assim, conclui-se que o principal problema está no primeiro elo da cadeia ou seja, nos consumidores que não descartam os resíduos corretamente, já que o elo seguinte da cadeia, farmácias e drogarias, não estão

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demonstrando resistência ao receber o lixo. medicamentos, ou seja, cumprem sua responsabilidade legal.

Palavras-Chave: Logística reversa, Logística reversa de medicamentos, Medicamentos vencidos, Medicamentos não utilizados.

1. INTRODUCTION

The consumption of medicines has increased due to technological advances and social development, which, despite being beneficial to society, raises concerns about the impact of these wastes (BUENO, 2016). In addition, self-medication is a common practice among Brazilians more than 10 thousand tons of waste in this category are generated per year by the Brazilian population, making Brazil the seventh country with the highest consumption of medicines in the world (SILVA *et al.*, 2014).

Pharmaceutical residues fall into Group B according to the resolution of the National Council for the Environment (CONAMA) Nº 358 of 2005, because they have corrosive characteristics, and because their incorrect disposal poses risks to the environment such as soil contamination, groundwater, animals, vegetation, and man (CONSELHO NACIONAL DO MEIO AMBIENTE – CONAMA, 2005). In this way, with a large amount of manufacture and consumption of medicines, Policies, Laws, and Decrees of Reverse Logistics (RL) of expired or unused medicines were implemented so that the impact of this waste was reduced (DOS SANTOS; FRIZON, 2019).

The Federal Government determines at the national level, through the National Policy and Solid Waste (NPSW) (Lei Nº 12.305BRASIL, 2010) that the life cycle of products must be a shared responsibility, that is, from manufacturers to consumers and holders of public services for urban cleaning and solid waste management, to minimize the volume of solid waste and rejects generated, as well as to reduce the impacts caused to human health and environmental quality resulting from the life cycle of products (Lei Nº 12.305, de 2 de agosto de 2010.BRASIL, 2010). In short, all actors must play their part in the reverse logistics chain.

Reverse Logistics can be defined as the process of planning, implementing, and controlling reverse flows of raw materials, packaging, final manufacturing, and distribution products (LEITE, 2009). In the case of drugs, it is concerned with residues after their expiration date, discontinuity of use, or proper disposal of these elements (DE BRITO; DEKKER, 2004).

Despite the significant impact that the incorrect disposal of solid waste from medicines can cause to the environment and society, only in the year 2020 will the RL of expired or disused home medicines, for human use, industrialized and manipulated, and their packaging after disposal by consumers was sanctioned by Decree No. 10,388 (BRASIL, 2020).

On the other hand, in the scope of the Federal District, since 2013, with Law Nº 5,092 of 2013, pharmacies are obliged to receive from the consumer medicines with an expired expiration date or in disuse. These must return the medicines to their respective manufacturers so that they can dispose of them properly, as provided for in the National Policy on Solid Waste (DISTRITO FEDERAL, 2013).

It is important to emphasize that, for the reverse logistics chain of medicines to work, it is necessary that all actors - supplier, industry, and consumer - play their role within it (ZAJAC *et al.*, 2016), as non-compliance can have negative consequences to the environment and society (BILA; DEZOTTI, 2003; PINTO *et al.*, 2014; ZAPPAROLI I.D., CAMARA M.R.G., BECK, 2011)

However, the study by Ramos et al. (RAMOS, 2017) in the Federal District, revealed that in 2017 around 73.7% of the population declared having household inventory and 75.2% stated having the habit of checking expiration dates. Regarding the proper form of disposal, 80.7% stated that they had never received information about this procedure and 45% had never thought about this matter, whether they were disposing of it inappropriately or not (RAMOS, 2017). As for the practice of improper disposal, 87% of the interviewees stated that they had disposed of their medicines incorrectly, with 71.3% of the interviewees stating that they had disposed of them in a trash can for common waste, 8.7% in a sink and 7% in a toilet (RAMOS, 2017).

Results such as those presented by Ramos et al. (RAMOS, 2017) shows the relevance of research corresponding to the reverse logistics chain of medicines because when the product is disposed of incorrectly, it becomes impracticable to reuse or correctly conduct this waste, since each material has its specific form of disposal, which has consequences for the environment and human beings, in addition, when companies do not accept disposal, despite being

mandatory, the correct destination of products and preservation of the environment is unfeasible (RAMOS, 2017).

Therefore, it is necessary to research the knowledge and practice of the population concerning waste disposal, to avoid inappropriate disposal, as well as verify whether companies and industries are fulfilling their role in the chain, especially the drug chain, which according to Silva (2014), the practice of reverse logistics in expired or disused domestic medicines is a recent topic and little known by society, given the scarcity of disclosure on this subject. Given the above, the objective of this article is to analyze part of the Reverse Logistics chain of expired or unused medicines in the Federal District, namely, disposal by users and receipt by pharmacies and drugstores.

2. LITERATURE REVIEW

2.1. Reverse Logistics and Medicine Disposal

Reverse logistics is understood as the logistics area responsible for planning, operating, and controlling the flow of materials after consumption and sale. and sustainable (LEITE, 2009). It emerged as a way to reduce damage to the environment and make all actors in the chain responsible for the correct destination of the consumed product, from manufacturing to the final consumer. In this sense, the commercial, business, social, and environmental objectives of companies must be considered in a synchronized way (COHEN; SMITH; MITCHELL, 2008).

The stages of reverse logistics are similar to those of direct logistics, however, the flow is reversed, that is, the practice of reverse logistics makes it possible to reuse inputs or, if reuse is not feasible, the product will have a correct final destination without impact. to the environment (LAMBERT; RIOPEL; ABDUL-KADER, 2011; SRIVASTAVA, 2008; ZHANG; HUANG; HE, 2011). Reverse logistics must be part of the life cycle of products that are used or consumed daily. In addition, expired, damaged, or unusable products must be returned to their point of origin for correct disposal or reuse (LACERDA, 2002). For Lacerda (LACERDA, 2002) the reverse flow has three stages: disposal, collection and recycling, reuse, or correct final destination. The disposal stage, as it is the first, is

fundamental for the reverse logistics chain (LACERDA, 2002). Thus, if there is no awareness of the proper disposal of medicines, it becomes impractical to reduce risks to the environment and humans. Improper disposal can affect waste pickers and recyclable material collection workers, as when searching the garbage, they can become contaminated by consuming medicines that were disposed of incorrectly (PINTO *et al.*, 2014).

Figure 1 depicts the flowchart of expired or consumed medications, and the first activity is carried out by the consumer, who becomes the first link in the chain, in whose responsibility is limited to storing the medication and discarding it at the pharmacy or point of sale. nearest collection point. In the next step, which refers to the industry, in this context, the pharmacy has the responsibility of collecting the medicine, storing it, and then returning it to the supplier, the latter will give the final destination appropriate to the product.

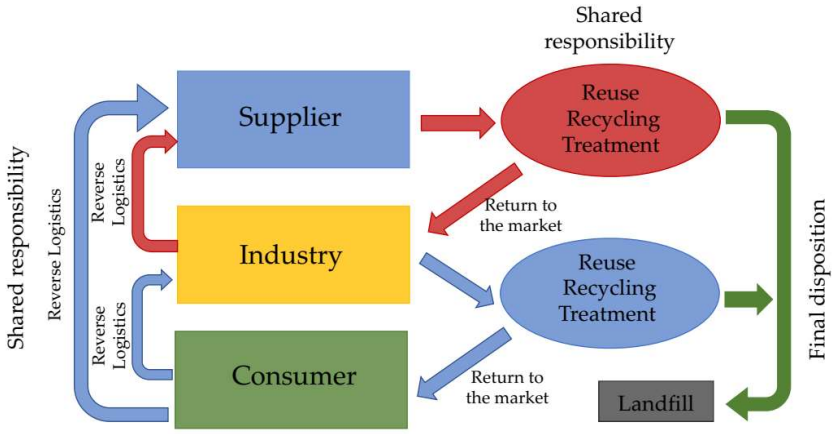

Figure 1 - Reverse logistics of medicine
Data Source: (PATELLA, 2011)

In Brazil, the Reverse Logistics of medicines is an eminent need. According to the Federal Council of Pharmacy (CFF, 2016), Brazil ranked sixth in the largest pharmaceutical market in 2016, according to data from the Federal Council of Pharmacy (CFF). In 2013, it was estimated that around 10.3 and 19.8 thousand tons of medicines are discarded annually in Brazil (CFF, 2016). In addition, self-medication is a constant practice in Brazil, the Brazilian population has the habit of having a "pharmacy" in their homes, keeping excess medicines that are usually expired, this practice is aggravated by the distribution of free

samples by pharmacies and the sale of medicines with a greater amount than will be consumed by the individual, in addition to excessive drug advertisements, which are reproduced on television, usually starring artists (RAMOS, 2017).

Drugs have chemical substances that are capable of seriously affecting human health, and may alter the endocrine system, which is related to several factors, such as, for example, a drop in sperm count, breast cancer, and may also cause dysfunction. of the thyroid and it is possible to suffer from changes in the neurological system (CARVALHO *et al.*, 2009).

Among the possible impacts that the substances present in incorrectly discarded medicines can generate, there are some species of fish that, when exposed to the substances and hormones present in contraceptives, can undergo feminization (GHISELLI; JARDIM, 2007).

In the state of Rio Grande do Sul, fifty pharmacies were selected for the research sample and then they were asked if they made any kind of disclosure regarding the correct disposal of medicines, 48% said they did not collect the medicines and that they did not disclose the correct way of disposing of them. disposal, 32% reported that they inform customers only when they ask, 12% have totems in the establishment and 4% through radio advertisements (SILVA *et al.*, 2014). In addition, still, according to Silva (SILVA *et al.*, 2014), part of the state's population is not aware of the practice of reverse logistics, despite the existence of regulations, as a result, the waste is disposed of in common garbage or the sewer.

2.2. Main Rules of Reverse Logistics of Medicines

Since 2013, all pharmacies and drugstores in the Federal District are obliged to receive medicines from their consumers, a fact determined by Law No. 5092 of May 4, 2013 (DISTRITO FEDERAL, 2013), of the Federal District. This Law enacts the obligation of pharmacies and drugstores in the Federal District to receive any expired or unused medicine for correct disposal, therefore, it becomes the responsibility of the productive chain of the pharmaceutical industry, to the correct destination of the medicines delivered by the consumer (DISTRITO FEDERAL, 2013).

In 2020, Decree No. 10.388, of June 5, 2020 (BRASIL, 2020), was created, which regulates § 1 of the caput of art. 33 of Law No. 12,305, of August 2, 2010 (Lei Nº 12.305, BRASIL, 2010), and establishes: “the reverse logistics system for expired or disused home medicines, for human use, industrialized and manipulated, and their packaging after disposal by consumers”.

This Decree determines the responsibility of all agents in the production chain, from the consumer to the industries. The correct packaging of medicines is defined, consumers must pack them in bags or containers so that leakage does not occur. The next stage is primary storage carried out by pharmacies, drugstores, and collection points, while secondary storage is carried out by distributors until the external collection stage of the containers containing the medicines discarded by consumers occurs. In the external collection activity, household drug residues are transported to the proper treatment and final disposal site. As of this Decree, consumers now have greater legal responsibility for the duty to dispose of unused or expired medications (BRASIL, 2020).

As provided for in the National Solid Waste Policy (Lei Nº 12.305, BRASIL, 2010) RL is applied in pharmacies and drugstores within the Federal District, to return expired medication to the manufacturer so that it can be disposed of correctly (DISTRITO FEDERAL, 2013). In this way, the responsibility for storing, packaging, and sending the waste back to its point of origin is established by one of the actors in the chain, the pharmacy (DISTRITO FEDERAL, 2013). In addition, the FD State Department of Health, through notes, suggests that health units also receive domestic medicines from the population, so that they have the correct destination, despite the responsibility of pharmacies (RAMOS, 2017). Thus, the population of the FD can deliver unused or expired medicines to pharmacies and drugstores in the FD, which are responsible for sending them to the manufacturer, since the population does not know what to do with the waste (AGUIAR, 2017).

For Ramos et al. (RAMOS, 2017) the importance of information on the reverse flow and final destination of medicines is clear, with population awareness being a fundamental means to avoid inappropriate disposal and, consequently, risks to society (RAMOS, 2017).

3. MATERIALS AND METHODS

Through applied research, whose methodological framework is characterized as descriptive-exploratory, primary and secondary data were collected using a mixed approach (quanti-quali). Primary data were obtained using two research instruments: a questionnaire and a semi-structured interview, while secondary information was collected through a literature review. The application of the questionnaire resulted in 158 responses from residents of the Federal District and 65 companies (pharmacies and drugstores) were interviewed.

As for the procedures, the research was divided into two stages: Research with residents of the FD; and Research with Pharmacies in the Federal District. The first stage of the research verified the citizens' knowledge about the correct disposal of medicines and investigated whether people correctly dispose of medicines in the FD. While the second stage of the research investigated the collection of expired or unused medicines by pharmacies in the Federal District. The stipulated number of drugstores was based on the 33 Administrative Regions (ARs) existing in the FD, with two pharmacies being selected per AR, totaling 66 pharmacies and drugstores. The selection of drugstores was made from searches on Google, with the term: "Pharmacies and AR". Pharmacies were selected in order of appearance and contacted by telephone. A total of 65 pharmacies were surveyed, and only one drugstore in the SIA Region could not be contacted because they did not answer the phone. Data collection was carried out from December 2021 to February 2022 and lasted, on average, five minutes (5').

Finally, the quantitative data were analyzed using descriptive statistics and, in a complementary way, the qualitative information was submitted to discourse analysis which, according to Bardin (BARDIN, 1977) belongs to the field of content analysis having the word as its object (BARDIN; RETO; PINHEIRO, 2009).

4. ANALYSIS RESULTS

This section is divided as follows: 4.1 Analysis of data collected through the questionnaire answered by residents of the FD; and 4.2 Analysis of information obtained through interviews carried out in pharmacies and drugstores.

4.1. Survey With Residents of The Fd

The primary agent of Reverse Logistics for expired or disused medications is consumers since they are responsible for giving the first correct destination to this waste. In this way, what will be analyzed below is whether the residents of the FD correctly dispose of the waste generated by them and whether they have this knowledge.

These two questions were asked since even if the individual knows the correct form, he may not perform it. With the National Policy on Social Waste (NPSW) in 2010 and Decree No. 10,388, the responsibility of consumers regarding the reverse logistics system for expired or unused medicines is required and regulated.

So that incorrect disposal does not occur, the consumer must be aware and carry out all the steps - separate, pack and dispose of correctly - that he is responsible for, in this way, the environment will be preserved, as the impact generated by the consumption of medicine will be reduced (ZAJAC *et al.*, 2016).

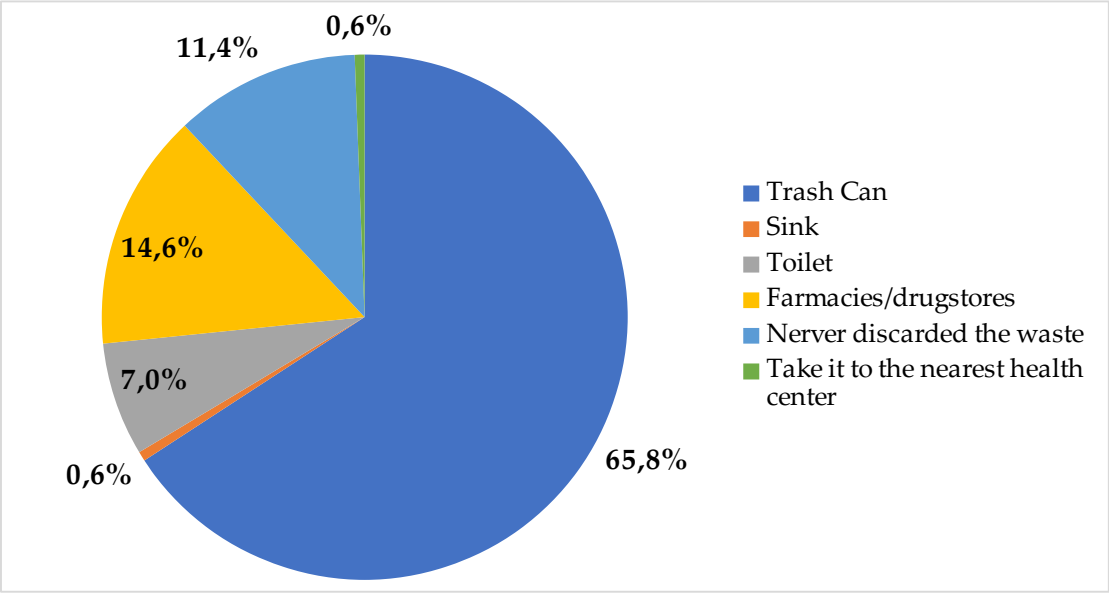

Figure 2 - The main way of discarding expired or unused medicines
Source: Research data.

As can be seen in Figure 2, most respondents (74.4%) stated that they dispose of medications incorrectly, with 67.1% in the trash can sink and toilet (sewage), receiving, respectively, 6.7 % and 0.6%. The result obtained converges with the statement by Melo and Rodrigues (MELO *et al.*, 2009) on the importance of reverse logistics for the disposal of medicines since most people dispose of medicines in the trash or public sewage system. Silva (2014) pointed out that even though there are laws and regulations in Brazil, the final destination of drug waste is usually common waste or sewage.

Given the results obtained, 74.4% of respondents incorrectly dispose of expired or unused medication, even if they know the correct way to dispose of it. This can damage the soil, lakes, and rivers and contaminate garbage collectors who have direct contact with the waste discarded in the dump (BILA; DEZOTTI, 2003; PINTO *et al.*, 2014; ZAPPAROLI I.D., CAMARA M.R.G., BECK, 2011). According to Ghiselli (GHISELLI; JARDIM, 2007), with the excess of medicines, such as contraceptives, discarded incorrectly, through the toilet or sink, fish species suffered feminization when they encountered the substances and hormones contained in this medicine. However, 14.6% responded that they discarded it in pharmacies and drugstores and 0.6% took it to the nearest health center, and 11.5% stated that they never discarded the waste.

Even if most respondents dispose of it incorrectly, it does not mean that they do not know the correct way, as 66.1% state that drugstore pharmacies are among the correct forms of disposal (Figure 3).

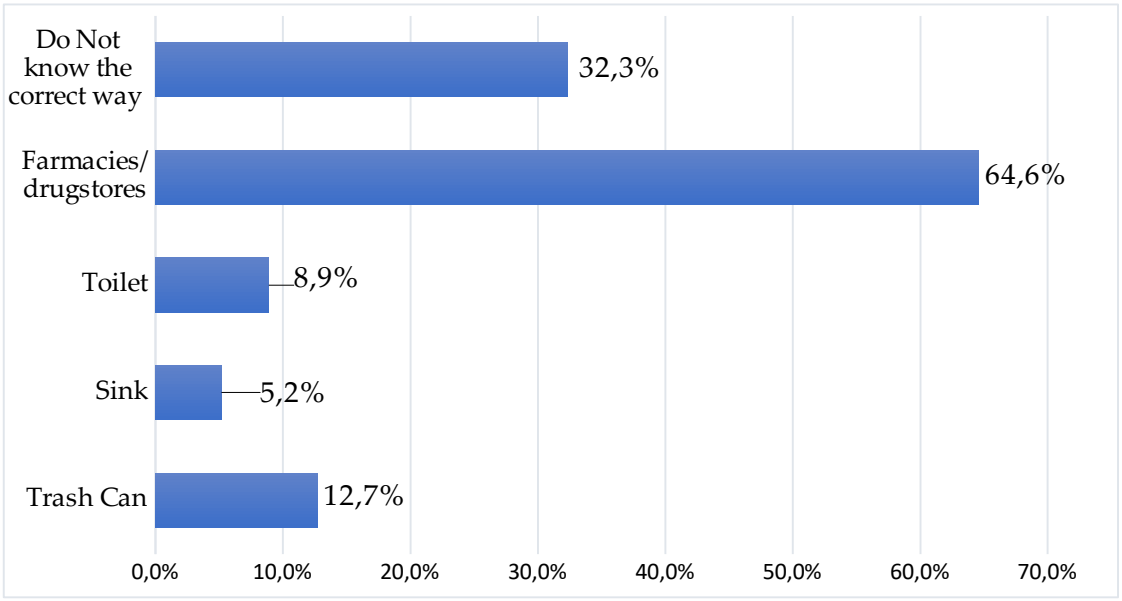

Figure 3 - Correct way(s) to dispose of expired or unused medications
Source: Research data.

The trash can for common waste, the sink and the toilet are stated as the correct way to dispose of medicines by 13.9%, 4.8%, and 8.5% respectively. These data show that, despite most affirming the correct way of disposal, there is a part that still thinks it is correct to dispose of medicines by other means.

Another point that should be highlighted is that, according to Figure 3, 32.30% of people claim not to know the correct way to dispose of it. That is, this demonstrates the lack of disclosure on the subject and that waste is not currently being well managed by the population, which generates a negative impact on the environment and corroborates the research developed by Silva (SILVA *et al.*, 2014).

As for the attempt to dispose of medicines in pharmacies and drugstores, 79.7% never tried to discard medicine in pharmacies or drugstores. On the other hand, of the 16.5% who tried to discard it, they were successful, while 3.8% tried but failed (Figure 4).

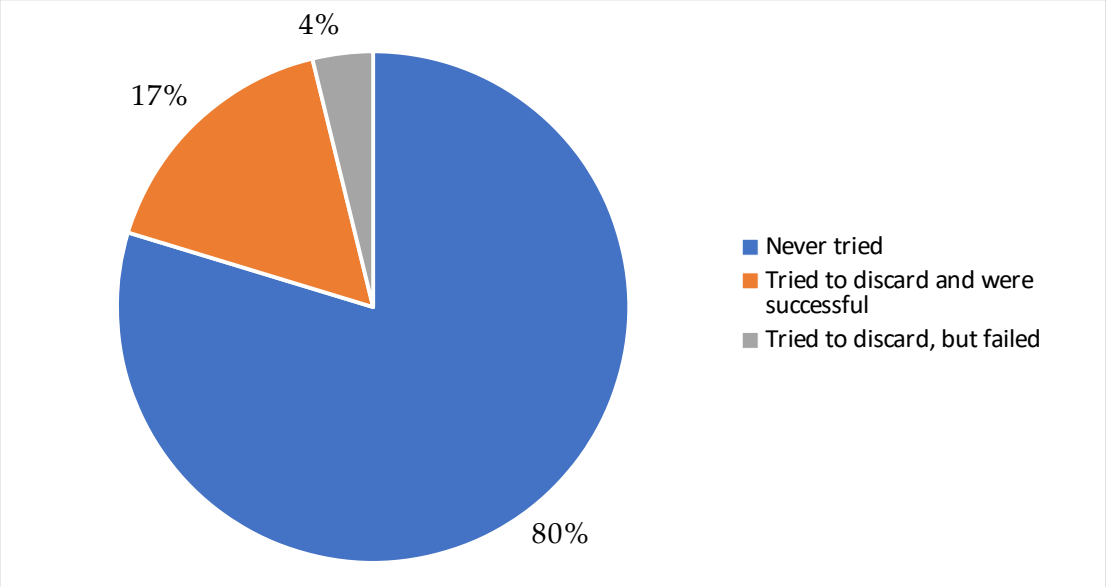

Figure 4 - Attempted disposal of medicines in pharmacies and drugstores

Source: Research data.

Still, regarding the disposal of medications, most respondents (98.8%) indicated that they were not informed about the correct disposal of expired or unused medications at the time of sale and only two respondents claim to have received information about the correct disposal of medicines.

As the consumer is the primary agent in the reverse logistics chain for disposing of expired or unused medications, they must know the correct way to dispose of them. the pharmacy supplies the drug for consumption. These data converge with the research carried out in the Federal District by Ramos and Pimentel (RAMOS, 2017) in which 80.7% declared never having received information about this procedure. Therefore, in the FD scenario, there has not yet been a significant change regarding the dissemination of information on the correct disposal of medicines in these establishments.

In this context, and based on the data collected, what can be concluded is that most of the population of the FD still dispose of their medicines incorrectly, either in the common trash or in the sewer. Another problem is related to the lack of information on the subject since although most respondents consider pharmacies to be one of the correct ways to dispose of them, there is a part that believes that disposing of medicines by other means is correct. Another point that should be highlighted is that 32.30% stated that they did not know the correct way

to dispose of it, that is, this demonstrates the lack of dissemination on the subject and that waste is not currently being well managed by the population, agreeing with the study by Silva (SILVA *et al.*, 2014).

It can be seen in Figure 4 that more than 80% never tried to dispose of them in pharmacies and drugstores, even though most respondents indicated that pharmacies and drugstores are the correct destinations for disposing of medicines. This fact allows us to infer that the lack of incentive and awareness of the population about the consequences to the environment and society is one of the factors why the consumer does not dispose of it in the appropriate place. In addition, another corroborating factor is the lack of disclosure by pharmacies, since, according to data from this survey, most respondents did not receive information on correct disposal by pharmacies or drugstores until the time of the survey.

Therefore, the lack of information and awareness of the population, aggravates and enhances the accumulation of waste, in addition to the excessive distribution of "free samples", medicines with pills above the amount that will be consumed by the patient, interruption or change in treatment (JOÃO, 2011). For Reverse Logistics to be fulfilled and ensure its purpose, which is to cause the least possible damage to the environment, unused medicines need to be properly disposed of, and all agents, from the manufacturer to the collectors, must be committed to campaigns to promote the correct disposal of medicines (SOUZA *et al.*, 2021). Only when the primary agent fulfills its role in the chain will it be possible for other agents to do their part, such as pharmacies and drugstores.

4.2. Research With Pharmacies and Drugstores

With society's awareness, the Government implemented Laws and Decrees for the management of pharmaceutical waste generated by pharmacies, worrying about the environment and the impacts generated by the incorrect direction of medicines (GUARNIERI, 2013). Thus, in 2013, Law 5,092/2013 was sanctioned, in which pharmacies and drugstores in the Federal District are obliged to receive expired or unused medicines for disposal (MCT, 2010) (AGUIAR, 2017).

In this context, to investigate compliance with Law 5092/2013 by pharmacies, it was asked whether pharmacies collected or received medications from consumers. Among 65 pharmacies researched in the FD, 96.9% answered that they receive the medicines from the users, showing that the organizations adhere to the district law. These findings converge with Leite (LEITE, 2009), who stated that responsibility for the waste generated has been transferred from the Government to companies or their industrial chains. Despite being a minority, it is worth mentioning that two pharmacies (3.1%) stated that they did not receive the medication for users, with the justification for non-compliance being the high cost associated with receiving it. Still in this question, Interviewee 34 stated that, if the user tries to discard it at his pharmacy, he advises him to take it to a health center. Thus, although it does not comply with the regulation, it directs the individual user of home medications to the correct form of disposal.

The second question asked to the 63 pharmacies that receive medication, sought to verify whether there are any containers exposed to dispose of medications, which could be a way of disclosing correct disposal (Souza, 2021). In this sense, only 29.2% of drugstores answered yes, that they have the container exposed, which shows that this type of advertising is still little explored in pharmacies in the FD. In particular, Interviewee 59 reported that the box comes from the "conscious disposal" program which is among the largest programs in Brazil for collecting expired or unused medicines (BHS, [*s. d.*]).

Most drugstores (70.8%), however, stated that they do not have containers exposed to the consumer, which can be a barrier to correct disposal, due to lack of disclosure (SOUZA *et al.*, 2021). On the other hand, among the alleged reasons for not exposing the containers, there is the issue of safety. According to Interviewee 25, the lack of exposure of the container dispenser to consumers is justified by the impossibility of filtering the objects that are placed in the box. Still, according to Interviewee 25, the sharp object box has already been placed, being unsuitable for this collection point, which caused an incident. Since that episode, the pharmacy has withdrawn exposure to customers to avoid this circumstance. Although pharmacies are responsible for receiving unused or expired medications, they are not among the establishments that are responsible

for collecting sharps, according to Law No. 6,656/2020 (DISTRITO FEDERAL, 2020).

After receiving medicines, the next step in the chain, primary storage is also the responsibility of pharmacies, which is considered as temporary storage of medicines in sealed packages with identification, which prevent leakage until collection and transport to the environmentally friendly final destination. adequate as determined by Decree No. 10,388/2020 (BRASIL, 2020). Thus, the interviewees were asked how the medicines were stored. Among the 65 pharmacies surveyed, most respondents (86.2%) responded that they store them in the pharmacy's warehouse, using bottles provided by the companies responsible for collecting these medications, see Figure 5.

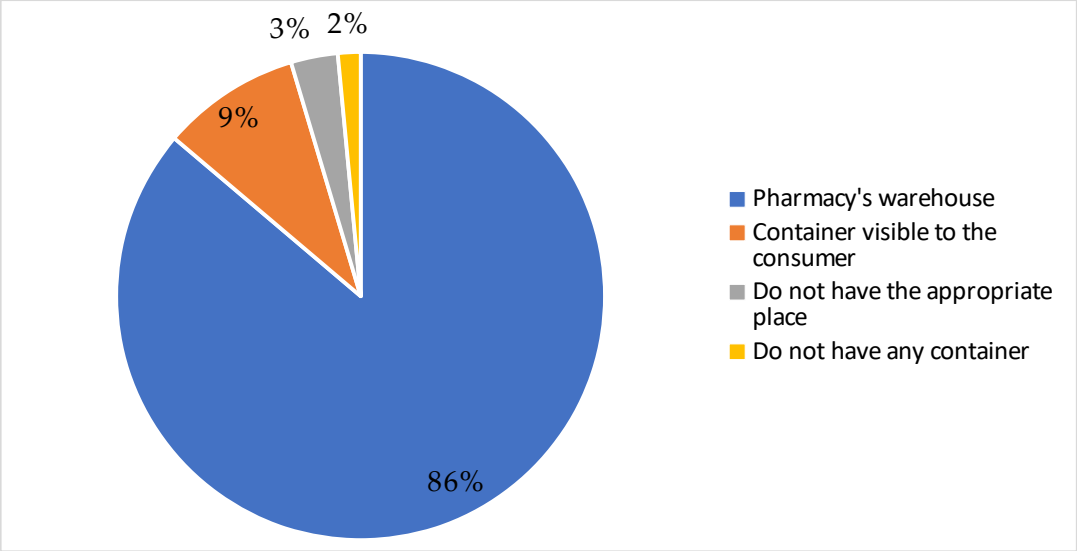

Figure 5 - Storage of medicines in pharmacies and drugstores
Source: Research data.

Pharmacies and drugstores can also be called logistics operators, this term is defined as a "company with operating authorization and special authorization, when applicable, qualified to provide transport or storage services" (BRASIL, 2020). According to Figure 5, while 9.2% of pharmacies reported that the medicines are stored in a container visible to the consumer, and; only two stated that they did not have the appropriate place, Pharmacy 35 revealed to separate them in specific boxes to be collected later, while at Drugstore 36 the medicines are removed from the store's hall and placed in white disposal bags and taken to the garbage location identified as infectious waste. Only Pharmacy 56 does not have primary storage. Because of the result, it is worth mentioning that of

the 65 pharmacies surveyed, 64 have medication storage, only one does not, and of the 65 pharmacies, two claim not to receive the medications, however, one of these has primary storage for its stock.

Finally, the last question was whether the pharmacy disclosed and encouraged the population to participate in the disposal of unused medicines and how (Figure 6). Among the responses obtained, more than 75% of pharmacies claim to disclose, in different ways, the correct way of disposal, although disclosure at the time of sale of the medicine is carried out by only 15.4%. Thus, although only 24.6% claim that they do not disclose the information, the other ways have not had an effect, since residents claim that they do not receive this information.

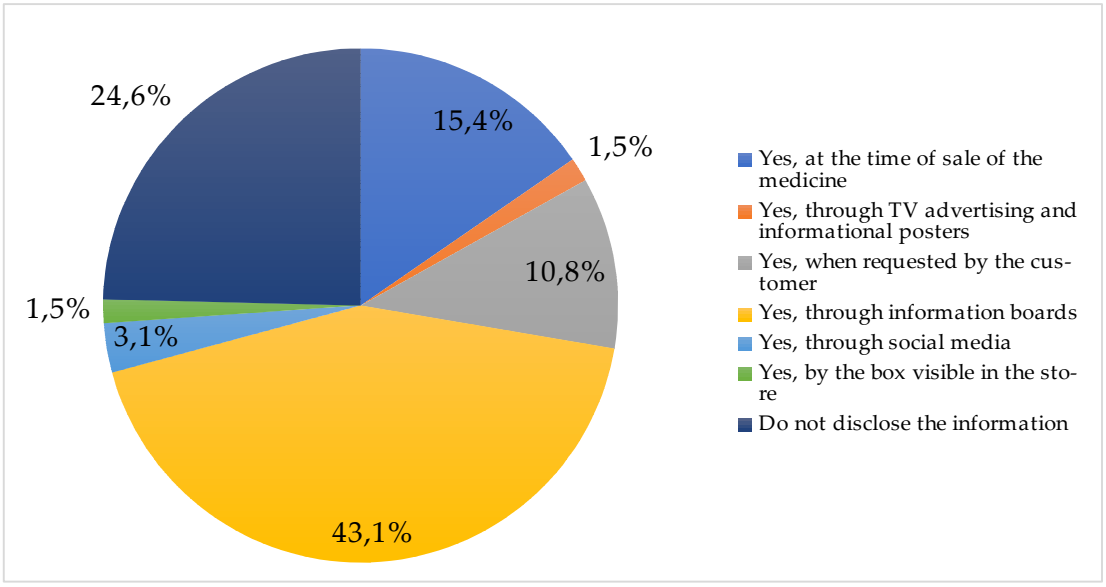

Figure 6 - Disclosure of the correct way to dispose of medicines
Source: Research data.

Given the above, it is important to highlight that the action taken by an organization can impact the environment and people's lives, therefore, the theme of reverse logistics of expired or disused medicines should have more space in television media and social networks. Considering that medication advertisements on television are frequent, and, comparing them with RL campaigns, it can be stated that the correct disposal of medication is almost non-existent (SOUZA *et al.*, 2021). Finally, when verifying the results obtained by the research in pharmacies and drugstores, most receive unused or expired medicines, acting correctly, however, for the medicine to have its correct destination, it is necessary that the

primary actor of the waste, the final consumer, know your role in the chain and play it assertively and effectively.

5. CONCLUSIONS

Part of the reverse logistics system for expired or unused medicines in the Federal District was analyzed through two stages: the disposal of medicines by residents of the FD; and the receipt of this waste by pharmacies and drugstores in the FD. Because of the data obtained, it is observed that in the Federal District, residents still dispose of their medicines incorrectly, either in the common trash or in the sewer. In addition, there is a lack of information on the correct disposal of this waste, since a portion of residents said they did not know how it should be done, while another believes that sewage and common garbage are the correct forms of disposal.

Another point to be highlighted is that, among residents who tried to dispose of medications in pharmacies, few encountered resistance. But, on the other hand, most respondents stated that they never received information about the correct disposal of medicines at the time of purchase. Once again, this shows the lack of awareness campaigns on the topic.

Concerning the next stage of the RL, that is, the receipt of this waste by pharmacies and drugstores in the FD, the data showed that there is little resistance from these establishments to receive expired or unused medicines from consumers. This may be a reflection of District Law 5,092/2013 (DISTRITO FEDERAL, 2013), which requires the receipt of "any expired medication for disposal purposes" since non-compliance with this law can lead to sanctions for these establishments. On the other hand, these establishments are not very concerned with disclosing the correct way to dispose of medicines, which may be among the reasons for this lack of information reported by residents at the time of purchase, the cost of storing and hiring a specialized company to collect and dispose of them. correct for these wastes.

When analyzing part of the reverse logistics system for expired or disused medicines in the Federal District, it is concluded that the main problem is in the first link of the chain, that is, in consumers who do not dispose of waste correctly,

since the link next in the chain, pharmacies, and drugstores, are not showing resistance to receiving the medicines, that is, they comply with their responsibility. It is also important to draw attention to a weak point which is education since there is a clear lack of information for consumers. Given this, it is suggested that education and awareness policies be developed on the importance of the correct disposal of medicines, covering all links in the chain.

Finally, the research was limited to researching the first links in the drug RL chain in the FD. Thus, it is suggested, as future research, the expansion of investigated objects, that is, other links or even the complete medication logistics chain, considering the collection and correct destination of these residues by the logistics operators, to be more reliable demographic metrics of the region. For similar studies, it is recommended to increase the sample size, as among the limitations is also the relatively low number of participants, both pharmacies and drugstores and residents, considering the territorial extension and the expressive population of the Federal District.

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