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ACCESS TO INFORMATION AND ENVIRONMENTAL AWARENESS AMONG THE POPULATION OF THE TIJUCA NEIGHBORHOOD, RIO DE JANEIRO: INFLUENCE ON ACTIONS RELATED TO REVERSE LOGISTICS

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Abstract: The aim of this study was to evaluate, interviews with residents of the Tijuca neighborhood, located in the city of Rio de Janeiro, Brazil, the level of access to information on reverse logistics, the environmental awareness of those interviewed, and their relationship with the proper disposal of reverse logistics waste. Data was collected through interviews, based on a random approach to residents of the neighborhood, men and women over the age of 18, literate, belonging to all economic classes. A total of 326 interviews were carried out between September and December 2019, using a questionnaire consisting of 23 questions, using two approaches: face-to-face interviews and an online application. The questions aimed to identify the perceptions of population of the Tijuca neighborhood about the reverse logistics waste contained in the National Solid Waste Policy, with the exception of pesticides, since it is an urban area. The work focused on the analysis of 8 questions related to access to information on reverse logistics and selective collection programs and points, as well as the interviewees' behavior and environmental awareness. Seven questions were also analyzed regarding the destination given by the interviewees to reverse logistics waste. The results indicated little concern about the waste generated by the interviewees, especially in their homes. There was also little access to information, with 23.6% of residents not knowing where waste generated in their homes was disposed of and never being concerned about this issue, and 47.2% saying they did not know about the destination of household solid waste, despite showing interest. In addition, 74% of those interviewed said they were unaware of any selective collection program in their neighborhood. It can also be seen that 60.1% of residents unaware of collection points in the neighborhood. Only 7.7% were aware of the issue, with the majority showing potential traces of awareness. Finally, when analyzing the results relating to the disposal of waste related to reverse logistics, it was found that, regardless of the type of waste, there was a lack of action on the issue. It was found that there is a direct relationship between the lack information and environmental awareness and the lack of actions aimed at reverse logistics on the part of residents. Encouraging environmental education programs is essential, with widespread and intense publicity about how and where to dispose of waste correctly. Awareness-raising campaigns should be carried out to highlight the problems caused by improper waste disposal, pointing out that mixing waste with recyclable waste reduces the possibility of reusing aggregates due to contamination.
Keywords: Environmental awareness, Environmental education, Reverse logistics.

INTRODUCTION

Urban solid waste is an environmental concern due to the various environmental problems it causes, such as soil, air and water contamination. The problems related to solid waste are linked to the increase in its generation, the variety of discarded materials and the difficulty in finding areas for its disposal (LEME, 2009). Most of the solid urban waste collected in Brazil is sent to landfills, with an increase of 10 million tons in a decade, from 33 million tons a year to 43 million tons. On the other hand, the amount of waste disposed of in unsuitable facilities (dumps and controlled landfills) has also grown, from 25 million tons to just over 29 million tons per year (ABRELPE, 2020).

The National Solid Waste Policy (Política Nacional de Resíduos Sólidos - PNRS), instituted by Law No. 12.305/2010, establishes the principles, objectives, instruments and guidelines for the integrated management of solid waste, and is an important instrument for tackling the main environmental, social and economic problems arising from the inade-

quate management of solid waste. It also establishes reverse logistics as one of the instruments for implementing shared responsibility for the life cycle of products, enabling a set of actions aimed at collecting and returning the remaining products and solid waste to the business sector, for reuse in its cycle or in other production cycles or other environmentally appropriate final destination.

The products and respective waste covered by PNRS are: pesticides, their waste and packaging; batteries; tires; lubricating oils, their waste and packaging; fluorescent, sodium and mercury vapor and mixed light bulbs; electrical and electronic products and their components. In addition, medicines and packaging in general were also identified as priorities. Considering the issue of solid waste and the importance of reverse logistics actions, it can be said that any initiatives aimed at conserving and preserving the environment cannot be considered without taking into account the behavior and actions of human beings (OLIVEIRA, 2006).

OBJECTIVES

The aim of this study is to assess, through interviews with residents of the Tijuca neighborhood, located in the city of Rio de Janeiro, Brazil, the level of access to information on reverse logistics, the environmental awareness of those interviewed, and their relationship with the proper disposal of reverse logistics waste.

METHODOLOGY

The study was carried out in the Tijuca neighborhood, located in the North Zone of Rio de Janeiro. Data was collected through interviews, based on a random approach to residents of the neighborhood, men and women over the age of 18, literate, belonging to all economic classes. 326 interviews were conducted between September and December 2019. The questionnaire was based on two approaches: a face-to-face interview and *an online* application.

In order to administer the questionnaire in person, regions of the Tijuca neighborhood were mapped out in 30 points, taking into account streets with a high flow of people and the preservation of physical safety for the interviewer. Ten interviews were conducted at each point. For the *online* questionnaire, social networks created for the neighborhood (*facebook, instagram*) were used to publicize the survey, and a total of 26 residents were included in this approach.

Twenty-three questions were designed to identify the perceptions of the population of the Tijuca neighborhood on environmental issues related to the PNRS, with a focus on reverse logistics waste, with the exception of pesticides, due to the fact that this is an urban area. The first part of the questionnaire contained sociodemographic questions (gender, age, level of education, family income, occupation/profession), while the second focused on questions about the population's habits and behaviors related to the generation and final disposal of the waste generated. This study focused on the analysis of 8 of these questions, focused on aspects related to access to information on reverse logistics and selective collection programs and points, as well as aspects that address behaviors related to the environmental awareness of the interviewees (questions 1 to 8 - Table 1). We also analyzed the questions that dealt with the destination given by the interviewees to reverse logistics waste (questions 9 to 15 - Table 1).

To assess the level of environmental awareness based on the consumption habits and attitudes of the interviewees, the answers to seven questions were categorized in a sequence of increasing intensity, based on the Lickert scale, as proposed by Bertoline and Possamai (2005). The index was calculated based on the sum of the values obtained from the answers and then divided by the number of questions answered (7 in this study). Next, the degree

1. How often do you worry about the amount of waste generated in your home?
( ) every time ( ) sometimes ( ) very few times ( ) never
2. Do you separate waste that can be recycled in your home?
( ) every time ( ) sometimes ( ) very few times ( ) never
3. Before you throw something away in your home, do you think about how you could reuse it?
( ) every time ( ) sometimes ( ) very few times ( ) never
4. Do you take care not to throw garbage in the street?
( ) every time ( ) sometimes ( ) very few times ( ) never
5. Do you know where your household waste goes?
( ) Yes, and I think it's important to be aware of this issue ( ) Yes, but I'm not very concerned about it
( ) No, but I'm interested in knowing ( ) No, and I've never been concerned about it
6. Do you know of any selective collection programs in your neighborhood?
( ) Yes, and I think it's important to be aware of this issue ( ) Yes, but I'm not very concerned about it ( ) No, but I'm interested in knowing ( ) No, and I've never been concerned about it
7. Are you aware of any collection points in your neighborhood : (you can select more one option)
( ) Batteries ( ) Fluorescent, sodium and mercury vapor mixed light bulbs ( ) Tires
( ) Lubricating oils, their waste and packaging ( ) Products sold in plastic, metal or glass packaging ( ) Electrical and electronic products and their components ( ) Medicines ( ) I don't know
8. Do you know what reverse logistics is?
( ) Yes, and I think it's important to be aware of this issue ( ) Yes, but I'm not very concerned about it
( ) No, but I'm interested in knowing ( ) No, and I've never been concerned about it
9. Where do you dispose of them? Batteries
( ) ordinary waste ( ) collection points ( ) retail units ( ) waste pickers' associations ( ) vacant lots ( ) other
10. Where do you dispose of them? Tires
( ) ordinary garbage ( ) collection points ( ) resale units (commerce) ( ) waste pickers' association ( ) vacant lots ( ) other
11. Where do you dispose of it? Lubricating oils, their waste and packaging
( ) ordinary waste ( ) collection points ( ) retail units ( ) waste pickers' association ( ) vacant lots ( ) other
12. Where do you dispose of them? Fluorescent, sodium and mercury vapor and mixed light bulbs
( ) ordinary garbage ( ) collection points ( ) retail units ( ) association of waste pickers ( ) vacant lots ( ) other
13. Where do you dispose of them? Electrical and electronic products and their components
( ) ordinary garbage ( ) collection points ( ) retail units ( ) waste pickers' association ( ) vacant lots ( ) other
14. Where do you dispose of them? Products sold in plastic, metal or glass packaging
( ) ordinary waste ( ) collection points ( ) retail units ( ) waste pickers' associations ( ) vacant lots ( ) other
15. Where do you dispose of it? Medicines
( ) ordinary garbage ( ) toilets/sinks ( ) collection points ( ) retail units ( ) waste pickers' associations ( ) vacant lots ( ) others

Chart 1 - Questions related to access to information and interviewees' behavior in relation to reverse logistics.

Source: Authors of the work.

of environmental awareness was assigned as follows: values equal to or greater than 3.5 indicate the degree of "Awareness"; values equal to or greater than 3.5 indicate the degree of "Awareness"; values equal to or greater than 3.5 indicate the degree of "Awareness". Values equal to or greater than 2.5 and less than 3.5 being associated with the degree "Potential traces of awareness"; values equal to or greater than 1.5 and less than 2.5 being associated with the degree "Few traces of awareness"; and values less than 1.5 indicating an interviewee "Not aware of the problem" (Bertoline & Possamai, 2005).

RESULTS

Analyzing the answers to questions 1 to 4, the results indicate very little concern about the waste generated by the interviewees, especially in their homes. With regard to the question about concern about the amount of waste generated in the home, the results indicated that the group interviewed was not very concerned about the impact of waste generation on the environment, since 44.7% of those interviewed were only rarely or never concerned about the waste generated in their homes (Figure 1).

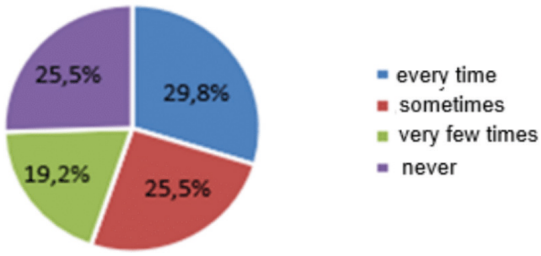

Figure 1. Concern about the amount of waste generated in the homes of Tijuca residents, based on interviews conducted (N=326 interviewees).

Source: Authors of the work.

In a recent survey carried out in the Morro Azul community, also located in the municipality of Rio de Janeiro, a similar percentage of only 31% of respondents answered "every time" regarding their concern about the amount of waste generated in their home (CALAZANS, 2019). Furthermore, approximately half of the interviewees were little or never concerned about the separation and recycling of the waste produced (Figure 2), once again corroborating the work of Calazans (2020), in which 37% of the interviewees were little or not concerned about the separation and eventual recycling of the waste produced (CALAZANS, 2019).

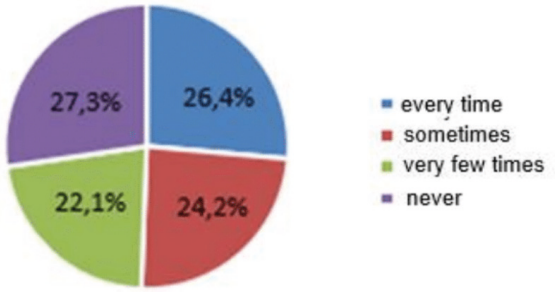

Figure 2. Knowledge about the destination of waste generated in the homes Tijuca residents, based on interviews conducted (N=326 interviewees).

Source: Authors of the work.

When asked about the possibility of reusing the waste generated, once again almost half of the interviewees had no or very little interest in the matter (Figure 3).

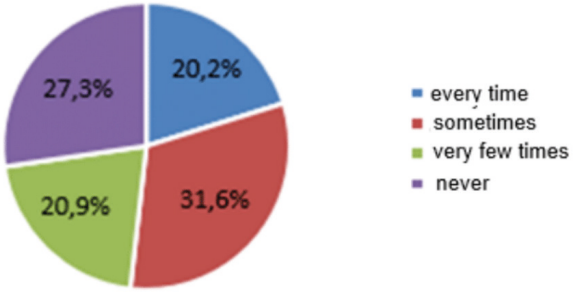

Figure 3: Knowledge about the reuse of waste generated in the homes Tijuca residents, based on interviews conducted (N=326 interviewees).

Source: Authors of the work.

In the survey carried out in the community of Morro Azul (RJ), 54% of respondents said that they at least sometimes thought about how to reuse discarded waste (CALAZANS, 2019). These results corroborate Leme's (2009) view that few people ask about the possibility of reusing the materials contained in waste and that few people are concerned about the durability of the materials found in waste.

Despite the high percentage of 77% of respondents' answers indicating concern about not throwing waste in the street, the result of 23% (12.6% sometimes, 4.6% very few times and 5.8% never) of respondents who may eventually throw it in the street (Figure 4) is worrying, understanding that this educational principle he environment is basic for any citizen.

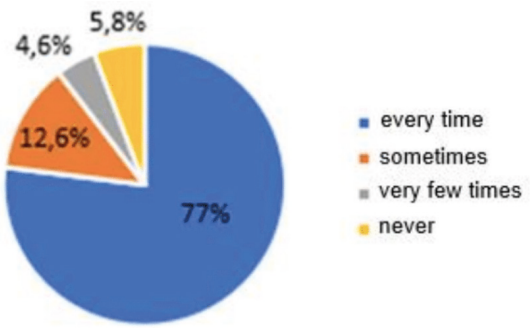

Figure 4 - Level of concern about not throwing waste in the street by Tijuca residents, based on interviews (N=326 interviewees).

Source: Authors of the work.

There are similarities in the results obtained in the community of Morro Azul (RJ), where 46% of respondents said they were concerned about not throwing waste in the street, 32% were eventually concerned, 19% were not very concerned and 3% were never concerned (CALAZANS, 2019).

It should be noted that Rio de Janeiro City Hall, through the Municipal Cleaning Company - COMLURB, the Municipal Guard and the Military Police, through the Zero Waste Program, fines anyone caught throwing waste on the street. The initiative aims to make Urban Cleaning Law No. 3.273/2001 effective, as well as raising awareness among the population of the importance of not disposing of waste in the streets, beaches, squares and other public areas, improving the quality of cleaning in the city of Rio de Janeiro.

Moving on to the analysis of questions 5 to 8, which involve residents' knowledge of actions related to reverse logistics, there was little access information: 23.6% of those interviewed did not know where the waste generated in their homes was disposed of and had never been concerned about this issue and 47.2% said they did not know about the destination of household solid waste, despite showing interest. In addition, 74% of those interviewed said they were not aware of any selective collection program in the Tijuca district; 16.5% said they were aware of some selective collection program in the Tijuca district, and 9.5% were not concerned about the issue. It can also be seen that a high percentage of interviewees (60.1%) had no knowledge of collection points in the Tijuca neighborhood (Figure 5). The lack of knowledge about selective collection programs and collection points favors the irregular disposal of waste that could be properly recycled or waste that has an impact on the environment.

Moving on to the analysis of knowledge about reverse logistics, only 19% of respondents knew about the concept (only 13.5% were concerned about the issue). In relation to the 81% of respondents who were unaware of the subject, more than half showed an interest in learning about it; 29.8%, in addition to being unaware, were not even concerned about the issue.

Finally, when analyzing the results regarding the disposal of waste related to reverse logistics (questions 9 to 15), we see that, regardless of the type of waste, there is a lack of action on the issue. The majority of res-

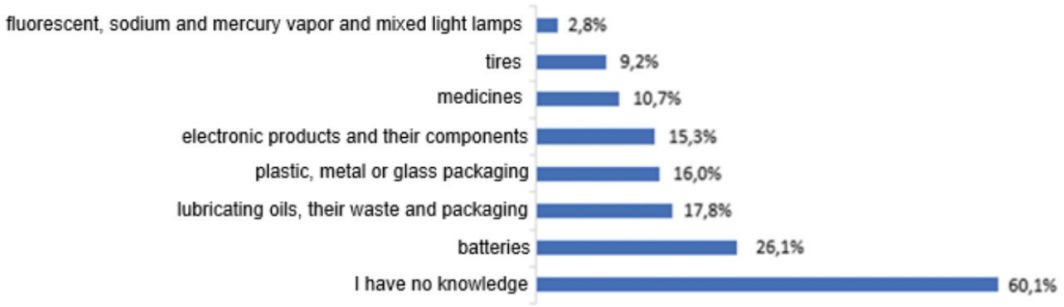

Figure 5: Knowledge of selective collection points in the Tijuca neighborhood, Rio de Janeiro.
Source: Authors of the work.

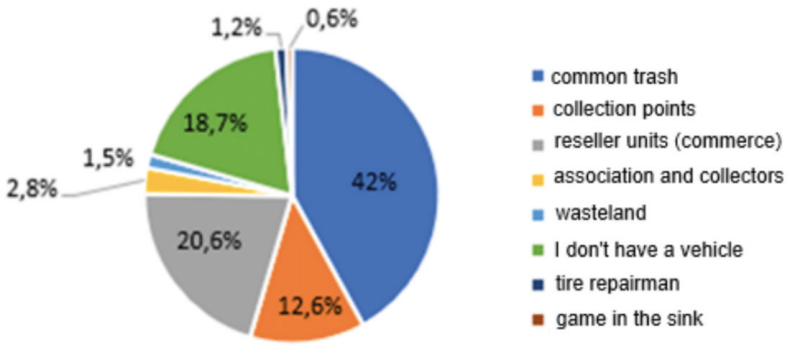

Figure 8. Information from residents of the Tijuca neighborhood about where they dispose of lubricating oils, their waste and packaging, based on interviews conducted (N=326 interviewees).
Source: Authors of the work.

pondents improperly dispose of batteries in ordinary garbage and on vacant lots, amounting to 60.5%. As for disposal at waste pickers' associations, which are also inappropriate places, there was no response. Only 39.5% of respondents (11.3% at retail units and 28.2% at collection points) dispose of batteries properly (Figure 6).

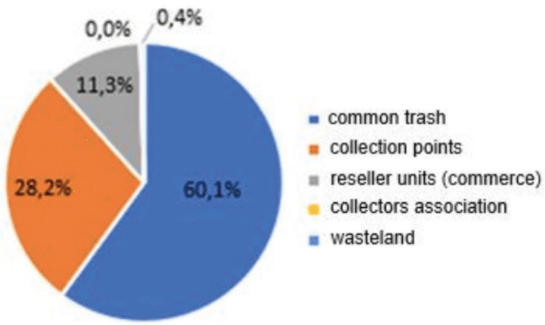

Figure 6: Information residents of the Tijuca neighborhood about where they dispose of batteries, based on interviews (N=326 interviewees).
Source: Authors of the work.

The results obtained confirm studies on the improper disposal of batteries in the municipality of Frederico Westphalen (RS), where 82% of those interviewed said they would dispose of batteries in common waste (KEMERICH, 2012). In another study (FILHO, 2018) on the disposal of batteries, 95% of respondents said they would dispose of the waste correctly if they knew of collection points for this waste, a fact that also occurs in Tijuca (Figure 5), which shows the low percentage of 26.1% of respondents who said they knew of a collection point for batteries.

With regard to tires, eliminating people who didn't own vehicles, i.e. considering only 65.6% of the population interviewed, 25.5% of these people disposed of them in regular garbage, while 3.4% disposed of them in vacant lots (Figure 7). As for proper disposal, among those who owned vehicles, 27.6% said they disposed of them at dealerships and 5.2% at

collection points. It can be understood that the answers "waste pickers' association" (1.8% of vehicle owners) and "tire repairer" (2.1% of owners) also refer to collection points.

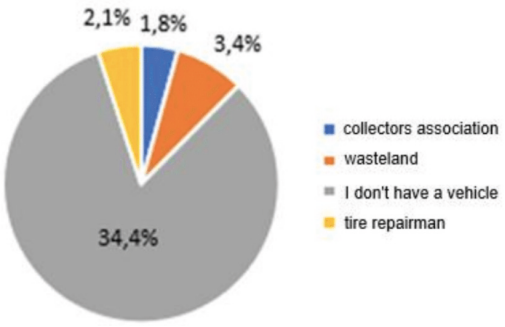

Figure 7. Tijuca neighborhood residents' information on where they dispose of tires, based on interviews conducted (N=326 interviewees).
Source: Authors of the work.

In Brazil, it is estimated that 100 million old tires are scattered in landfills, vacant lots, rivers and lakes, and every year, tens of millions of new tires are manufactured in the country (ANIP, 2017). It should be noted that only 9.2% of respondents were aware of a tire collection point in Tijuca (Figure 5).

Figure 8 shows the behavior of residents in relation to the disposal of lubricating oils, their waste and packaging. Once again, when analyzing the 81.3% of respondents who owned vehicles, 20.6% of them stated that they disposed of the oil correctly at retail outlets and 12.6% at collection points. It can be understood that the answers "waste pickers' association" (2.8% of owners) and "tire repairer" (1.2%) refer to collection points. Inadequate disposal in ordinary garbage was the response of 42% of vehicle owners, of which 1.5% said they disposed of it in vacant lots and 0.6% said "I throw it in the sink".

Given the answers to the question of irregular disposal of this waste, we can speculate that some interviewees confused lubricating oils, their waste and packaging with used cooking oil, its waste and packaging. The low percentage of 17.8% of respondents who said they were aware of a collection point for lubricating oils, their waste and packaging in Tijuca stands out (Figure 5).

Moving on to the analysis of fluorescent, sodium-mercury vapor and mixed-light bulbs (Figure 9), it can be seen that the vast majority of respondents dispose of them inappropriately (ordinary garbage or wasteland), encompassing a total of 83.7% of respondents.

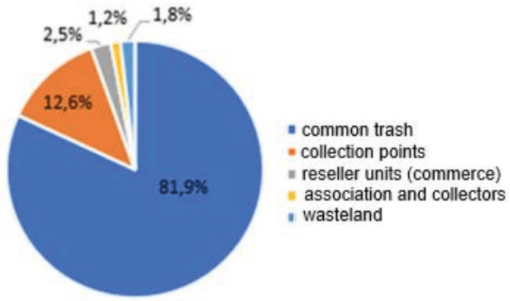

Figure 9. Information from residents of the Tijuca neighborhood about where they dispose of fluorescent, sodium and mercury vapor and mixed light bulbs, based on interviews conducted (N=326 interviewees).
Source: Authors of the work.

In a study on the environmental perception of the disposal of fluorescent lamps in shops in the municipality of Rio Verde (GO) (ARANTES, 2015), 97% of those interviewed disposed of fluorescent lamps in common waste, confirming the results of the present study research. The interview participants also said that they would dispose of this waste correctly if they knew of collection points for it, as they were unaware of any other place where it could be disposed of, because the municipality has no collection points or recycling companies for these bulbs. The remaining 3% said that they store it for later disposal, which ends up being discarded in common waste due to the lack of collection points.

There was a low percentage of 2.8% of respondents who said they were aware of collection points for fluorescent, sodium and mercury vapor and mixed light bulbs in the Tijuca neighborhood (Figure 5).

In this context, the vast majority of respondents (59.2%) inappropriately dispose of electrical and electronic products and their components in the common waste dump and on vacant lots (Figure 10). It can be understood that the answer "waste pickers' association" is also a collection point; in addition, the answer "donation" could be understood not as disposal, but as reuse.

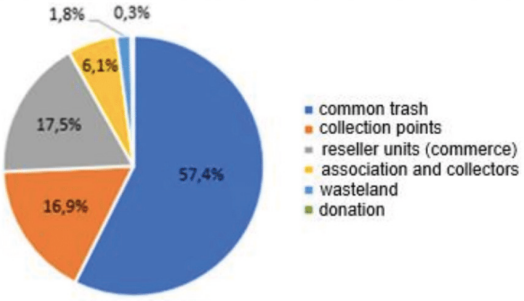

Figure 10. Information from residents of the Tijuca neighborhood about where they dispose of electrical and electronic products and their components, based on interviews conducted (N=326 interviewees).
Source: Authors of the work.

In a study on students' perceptions of electronic waste (ARAÚJO et al., 2015), only 20% of those interviewed knew what electronic waste was and were aware of its risks. Despite this, only 15.3% of respondents were aware of a collection point for electronic products and their components in the Tijuca neighborhood (Figure 5).

On February 12, 2020, Decree No. 10.240 was signed, establishing rules for the implementation of a reverse logistics system for household electronics, i.e. used exclusively by individuals (households or families). The decree obliges companies in the sector to set up systems to collect this type of waste and dispose of it correctly.

The vast majority of respondents said they disposed of plastic, metal or glass packaging in the general waste garbage can, and none of them said they disposed of it in vacant lots (Figure 11). Only 15% of the survey participants act correctly when disposing of this type of waste.

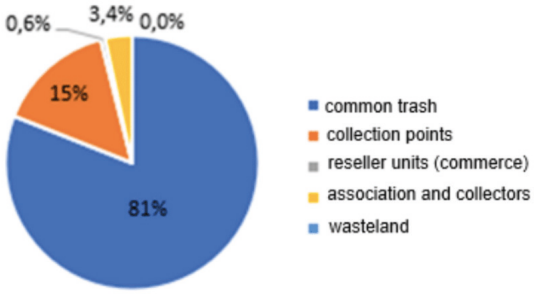

Figure 11. Information from residents of the Tijuca neighborhood about where they dispose of plastic, metal or glass packaging, based on interviews conducted (N=326 interviewees).
Source: Authors of the work.

This same trend was observed in the study carried out by Villar (2008), which found that only 23.9% of respondents separated plastic, metal or glass packaging for proper disposal. Corroborating these results is the low percentage of 16% of respondents who said they knew of a collection point for plastic, metal or glass packaging in the Tijuca neighborhood (Figure 5).

The majority of interviewees (84%) dispose of medicines inappropriately, both in ordinary garbage cans and in toilets/sinks (Figure 12). There were no responses to the question of disposing of medicines on waste ground or sending them to the waste pickers' association, which are also inappropriate places. Only 16% of those interviewed said they disposed of their medicines properly.

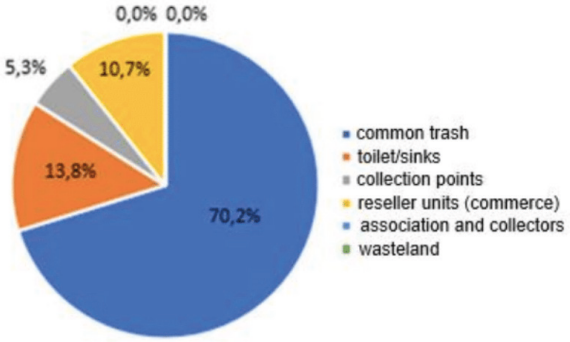

Figure 12. Information residents of the Tijuca neighborhood about where they dispose of medicines, based on interviews conducted (N=326 interviewees).
Source: Authors of the work.

The results obtained corroborate studies on the disposal of medicines, such as one carried out in the Paulínia - SP region (PINTO, 2014), where 91% of all interviewees reported that they disposed of medicines inappropriately (ordinary waste, recyclable points and in running water), and only 4% disposed of medicines properly at health centers, pharmacies or community centers (collection points or retail units). Also in this study, 92% of interviewed said they were unaware of where medicines were collected, showing that they disposed of them improperly due to a lack of information.

According to Gasparini (2010), improper disposal is the result of people's lack of information and publicity about the damage caused by medicines to the environment and the lack of collection points, a fact exemplified by the small percentage of 10.7% of respondents who said they were aware of medicine collection points in the Tijuca neighborhood (Figure 5).

Finally, when analyzing the results regarding the disposal of waste related to reverse logistics (questions 9 to 15), we see that, regardless of the type of waste, there is a great lack of actions related to this issue. By analyzing the results presented, it can be seen that there is a direct relationship between the lack of information and environmental awareness and the lack of actions aimed at reverse logistics on the part of residents.

A low percentage of respondents were aware of the issue (7.7%), but a large proportion of respondents, 44.2%, had "potential traces awareness" (Figure 13). The worrying percentage of 48.1% showed interviewees with "few traces of awareness" (38.6%) and no awareness (9.5%). A study carried out in the Morro Azul Community in the South Zone of Rio de Janeiro obtained a similar result (CALAZANS, 2019).

CONCLUSIONS

Based on the analysis of the information obtained, it is essential that environmental education programs are encouraged, with widespread and intense publicity about how and where to dispose of waste correctly. Awareness campaigns should be carried out, pointing out the problems generated when solid waste is disposed of inappropriately. It is also necessary to publicize the fact that mixing rejects with recyclable waste reduces the possibility of reusing the aggregates because they are contaminated.

It should be noted that the campaigns proposed here are in line with a pragmatic approach to environmental education, with action in certain segments of society, but without drastic interference in the system (LAYRARGUES; LIMA, 2011). It is understood that the pragmatic approach is more feasible in the short and medium term.

Regardless of the suggestion of these actions, it is believed that public institutions should also develop policies to a broader approach to environmental education, the so-called critical approach. In order to implement it, it is necessary to problematize reality, re-evaluate objectives and assess curricula at different levels of schooling, so that we can broadly understand the evolution of the subject over time and stimulate the work of educators, in an unrestricted way, in formal education environments (LOUREIRO, 2007).

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