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Impact of the Irregular Disposal of Masks and the Perception of the Community of the Federal Institute of Sergipe, Campus Aracaju/SE

Impacto del Descarte Irregular de Máscaras y la Percepción de la Comunidad del Instituto Federal de Sergipe, Campus Aracaju/SE

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Abstract: In early 2020, the first case of COVID-19 was detected in Brazil. The pandemic continued to advance, which led to the adoption of the use of masks in commercial establishments, parks, workplaces, public transport, as a protective measure. This situation generated another concern, the impact generated by irregular disposal. In view of the above this study aims to perform a survey of the impacts caused by the irregular disposal of masks and verify the perception of the academic community (students, teachers and administrative technicians) of the Federal Institute of Education, Science and Technology of Sergipe, Aracaju Campus. A questionnaire was elaborated to be applied to the academic community where we sought to identify the perception of the interviewees about the use of masks, and the impact that their irregular disposal can cause. These data were tabulated, and graphs were generated. The results show that: masks are efficient in combating the proliferation of COVID-19 and irregular disposal has numerous impacts. It is concluded that most interviewees do not properly sanitize the masks, are aware of the impacts generated by incorrect disposal, but do not perform the correct disposal.
Keywords: E*nvironmental impact, Hhealth, Covid.*

Resumen: A principios de 2020 se detectó el primer caso de COVID-19 en Brasil. La pandemia continuó avanzando, lo que llevó a la adopción del uso de máscaras en establecimientos comerciales, parques, lugares de trabajo, transporte público, como medida de protección. Esta situación generó otra preocupación, el impacto generado por la eliminación irregular. Teniendo en cuenta lo anterior, este estudio tiene como objetivo llevar a cabo una encuesta de los impactos causados por la eliminación irregular de máscaras y comprobar cuál es la percepción de la comunidad académica (estudiantes, profesores y personal administrativo) del Instituto Federal de Educación, Ciencia y Tecnología de Sergipe, Campus de Aracaju. Se elaboró un cuestionario para ser aplicado a la comunidad académica que buscaba identificar la percepción de los encuestados sobre el uso de máscaras, y el impacto que puede causar su descarte irregular. Estos datos fueron tabulados y se generaron gráficos. Los resultados muestran que: las máscaras son eficientes en el combate a la proliferación del COVID-19 y el descarte irregular trae innumerables impactos. Conclui-se que, a maioria dos entrevistados não higienizam corretamente as máscaras, têm consciência dos impactos gerados pelo descarte incorreto, mas não realizan o descarte correto.
Palabras clave: *Impacto ambiental; Salud; Covid.*

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INTRODUCTION

In Brazil, the first case of COVID-19 was detected on February 26, 2020: a 61-year-old white man who had returned to the city of São Paulo from Italy (BUENO, SOUTO and MATTA, 2021). On March 12, of the same year, the first death was confirmed, of a 57-year-old woman who was admitted to a municipal hospital in São Paulo. And on March 18, 2020, after several other deaths, the House of Representatives approved a legislative decree recognizing the state of public calamity (VERDÉLIO, 2020; BRASIL, 2020a apud BUENO, SOUTO e MATTA, 2021).

As the pandemic was in advance, the use of masks in commercial establishments, parks, workplaces, public transportation, among others, started to be discussed as an additional protection measure (LING et al, 2020 apud ORTELAN et al, 2021). As Veiga (2020) reports, this situation meant that suddenly the entire population was - or at least should have been - using facial protection on a daily basis. This situation has generated another concern, the impact generated by irregular disposal. Given the above, this study aims to conduct a survey of the impacts caused by the irregular disposal of masks and verify the perception of the academic community (students, teachers and administrative staff) of the Federal Institute of Education, Science and Technology of Sergipe, Aracaju/SE Campus.

THEORETICAL FOUNDATION

The term pandemic is used to designate an epidemiological trend, indicating that many outbreaks are occurring simultaneously everywhere, with distinct intensities, qualities and forms of injury and related to socioeconomic, cultural, environmental, collective or even individual conditions (MATTA et al, 2021). As reported by these same authors, the challenges posed by the pandemic are not only sanitary, but also socioeconomic, political, cultural, ethical, scientific, which are aggravated by structural inequalities.

When the World Health Organization (WHO) declared, on January 30, 2020, that the outbreak of the disease caused by the new coronavirus (COVID-19) was a Public Health Emergency of International Importance, and then on March 11 of the same year a pandemic, there were no vaccines until then; being the great challenge of the countries at that time the flattening of the contamination curve (LIMA, 2020).

The high transmission of the new coronavirus added to the lack of vaccine, intensified the debate about effective protective measures, which indicated as recommendations to prevent the spread of the disease the wide social distance and hand washing, for symptomatic patients or who tested their respective contacts the isolation; and finally, the need for the extended use of masks in public (Rede Vida, 2020).

The types of masks most used by professionals are, according to Fust et al (2021): surgical masks and N95 masks (PFF2 or equivalent). These same authors describe these masks as follows: a) surgical

masks are made of non-woven material, have at least one internal and one external layer and a filtering element; and b) the N95 or PFF2 is made of polypropylene and must be sealed and well adjusted, and have a minimum filtering efficiency of 95% of airborne particles.

The use of masks for professional use, such as surgical masks and respirators, by the general population could lead to a shortage of these materials for professionals on the front line of the fight against COVID-19, so the use of home-made masks is recommended, even if they are not classified as personal protective equipment (SOUSA et al, 2021). As reported by Cogo, Silva and Godoy (2020) **for people who were not health professionals** it was recommended by the Ministry of Health that the masks could be homemade of fabrics, being indicated care when handling, time of use of up to 02 hours, and correct disinfection procedure. The use of masks is an option for home symptomatic patients, caregivers, people living in houses with many residents, long-stay institutions, and places with crowds (TAMINATO et al, 2020).

As Bueno and Smythe (2020) report, for the making of the homemade masks, 100% cotton fabric or non-elastic tricoline fabric is recommended, and a T-shirt mesh with at least 90% cotton in its composition is an option. The masks made with these materials are washable and reusable. Another option is to make masks with non-woven fabric (TNT), with a recommended weight between 20-40 g/m², at least double layer, preferably using triple layer. The masks made with this material are disposable and single-use (BUENO, SMYTHE, 2020).

The use of masks, regardless of the type, is essential to avoid contamination, but after a certain time - shorter in the case of disposable masks and longer in the case of reusable ones - they need to be discarded, due to the time limit of their use, they generate an impact, especially if their disposal is performed incorrectly (BASSI, et al, 2021).

According to Franco et al (2020) the World Health Organization (WHO) indicates some protocols that must be followed in order to use the masks correctly, such as: wash your hands with soap and water or alcohol gel before using the mask; when placed, they should cover the mouth and nose leaving no space between the face and the accessory; avoid putting your hands in the mask during use; and finally, exchange it for a new one, removing it from behind and throwing it in a closed trash can.

Masks when disposed of incorrectly can cause Covid-19 contamination - as the garbage becomes contaminated - creating risks for people and potentially creating irreparable damage to the environment. It is a big challenge how long it will take for nature to decompose the incorrectly discarded residues, and such action can cause damage to the environment. Therefore, it is necessary to give importance to environmental awareness issues and sustainable consumerism (FALUME; RAMÍREZ-SÁNCHEZ, 2022).

Within this approach the fabric masks can be considered more sustainable, because they are used several times before being discarded.

METHODOLOGY

Study Area

This study was carried out at the Instituto Federal de Sergipe, Campus Aracaju (Figure 1) located at Engenheiro Gentil Tavares Avenue, 1166, Getúlio Vargas district, Aracaju. In the 2021 school year, the IFS had a total of 4,544 students enrolled in the various levels; as well as 203 teachers and 137 administrative technicians, totaling a universe of 4,884 people.

FIGURE 01: Federal Institute of Sergipe, Aracaju/SE Campus.

SOURCE: https://www.google.com.br/maps.

Initially a questionnaire was prepared to be applied to the academic community of the IFS - Campus Aracaju (students, teachers and administrative staff). A link, with access to the form, was made available via e-mail and on the wall of the classes in the Google Classroom. The sample size was not stipulated, considering that the number of responses depended on the adherence of the community to the questionnaire. From the universe of 4884 people, 159 answered the questionnaire, which results in a confidence level of 80% with a margin of error of 5%, considered satisfactory for this work. The

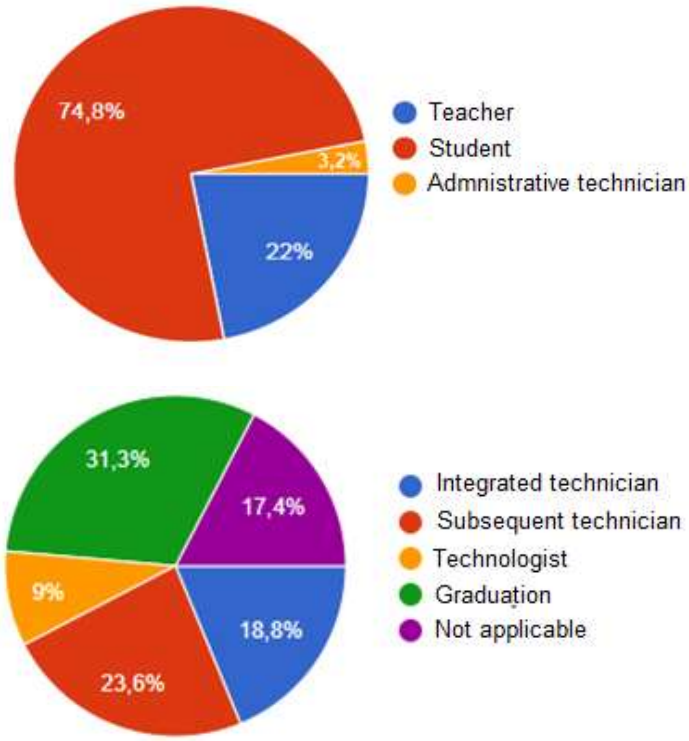
questionnaire is composed of 11 multiple-choice questions, ranging from information about the respondent to the type of mask, how it is used, how it is disposed of, etc. These are presented in Figures 2 to 13. No scale was used to analyze the perception of use and the impacts of incorrect disposal, only the percentage values obtained in each question.

RESULTS AND DISCUSSIONS

Characterization of the interviewees

A total of 159 responses were obtained, distributed as indicated in Figure 2, below:

FIGURE 02: Respondents' category (above) and students' mode (below).



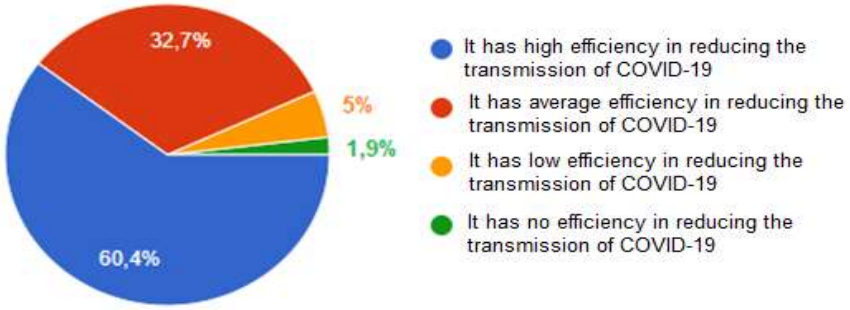
SOURCE: Survey data (2022).

Of the participants, the largest percentage was of students (74.8%), followed by teachers (22%) and administrative technicians (3.2%), a fact justified by the higher number of this category. In the student category, the predominance was of undergraduate students, followed by students in the subsequent and integrated technical courses, and finally, of the technologists. This result shows a greater interest of undergraduate students in participating in the survey, considering that the number of students enrolled in technical courses is the largest.

Relationship between mask use and transmission reduction

Respondents were asked their opinion regarding the effectiveness of masks as a barrier to reduce transmission of COVID-19. The results are presented in Figure 3.

FIGURE 03: Interviewees' opinions about the masks' efficiency.



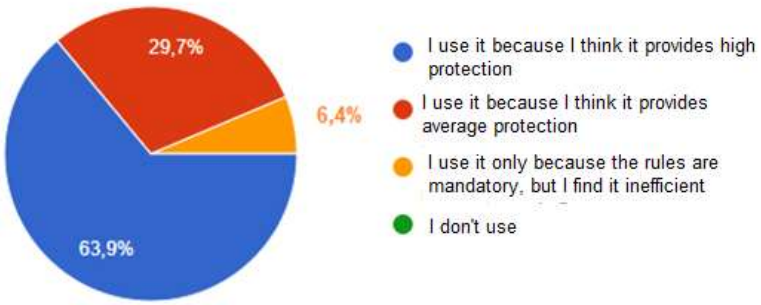
SOURCE: Survey data (2022).

The results show that the majority, 93.1%, believe that the mask has high or medium efficiency in reducing COVID-19 transmission, and only 6.9% believe that the masks have low or no efficiency. In a study conducted by the Institute of Physics at the University of São Paulo (IF-USP) and the Institute of Energy and Nuclear Research (Ipen), 227 different masks were evaluated - from the PFF2/N95 to those sewn at home - and the results show the importance of the use of this artifact in the epidemiological control of airborne diseases (JOKURA, 2022).

Wearing masks in public places

The respondents were asked whether they used masks in public places, and what the motivation for such action was. The results are presented in Figure 4, below:

FIGURE 04: Wearing masks in public places.



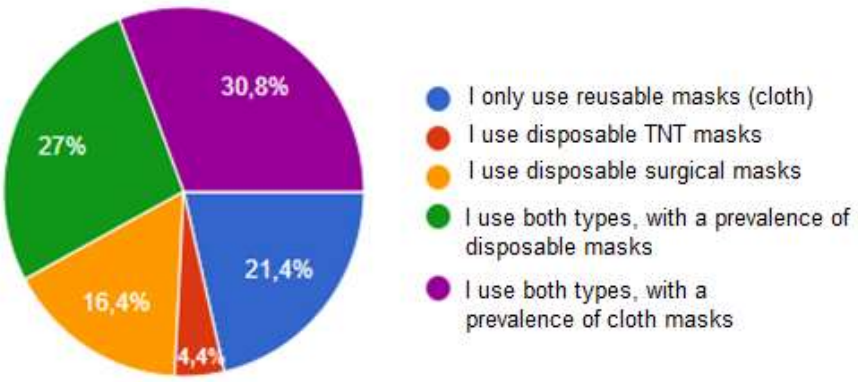
SOURCE: Survey data (2022).

All reported using masks in public places. The vast majority (93.6%) presented as the main reason for using them the belief that there is some protection in these environments, and 6.4% reported using them only because they have to. In this sense, the Technical Note 04/2020 prepared by Rede CoVida - a union between the Center for Integration of Data and Knowledge for Health (Cidacs/Fiocruz Bahia) and the Federal University of Bahia (UFBA) - brings several scientific findings that justify the use of cloth masks by the entire population in environments outside the home (REDE COVIDA, 2020), that is, the widespread use of masks in public places is an efficient strategy to combat the spread of infectious respiratory diseases, including COVID-19.

Types of masks used

About the type or types of masks used, the answers are presented in Figure 5.

FIGURE 05: Types of masks used.



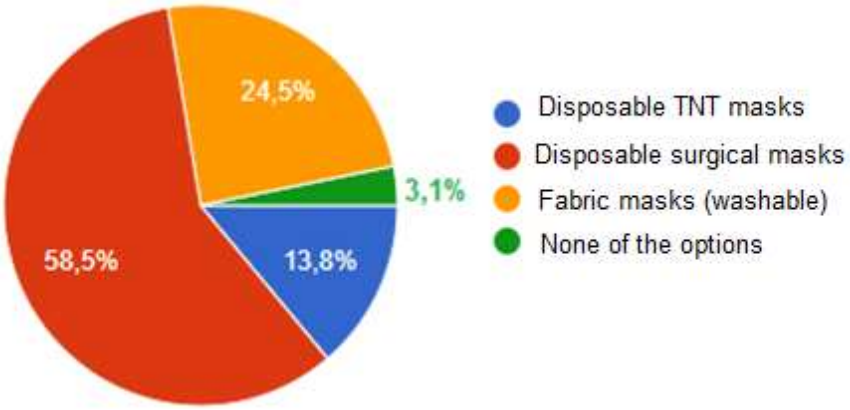
SOURCE: Survey data (2022).

Most reported using all types of masks with a prevalence of cloth masks (30.8%); and this portion, added to those who use only cloth masks (21.4%) show that these masks had a decisive role in trying to stop the spread of COVID-19. The cloth masks have an average retention of particles in the order of 40%, and this value is lower than other types such as PFF2/N95 (98%), surgical masks (89%) and TNT (78%) (JOKURA, 2022). But as reported by Taminato et al (2020) the indication of textile masks is supported in pandemics and emerging infections, especially in low or middle income settings.

Efficiency of the different types of masks

About the type of mask that shows the highest efficiency, the result is presented in Figure 6.

FIGURE 06: Most effective mask in the interviewees' opinion.



SOURCE: Survey data (2022).

For most, the mask that presents greater efficiency is the surgical mask - a fact attested by Jokura (2022) - and in second place the tissue masks, contrary to the study presented by the same author, who indicates that these masks have a lower average retention of particles than the other models. It is noteworthy the fact that 3.1% did not consider any of the types effective.

Hygiene of the cloth masks

When the users of the cloth masks were asked how they perform their hygienization, the answers are presented in Figure 7.

FIGURE 07: How to sanitize the cloth masks.

SOURCE: Survey data (2022).

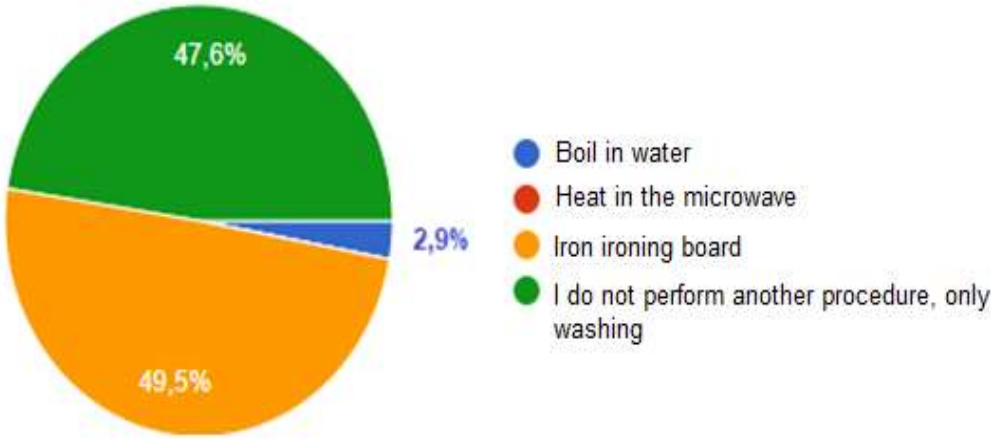
Sanitizing only by scrubbing with soap and water, without soaking, was the most indicated form of sanitization (31.5%). For Cogo, Silva, and Godoy (2020) disinfection consists in placing the mask in a

container with drinking water and sanitary water (2.0 to 2.5%) - diluting 10ml to half a liter of drinking water - after 30 minutes, rinsing in running water and washing with water and soap. For Veiga (2020) it is possible to use a washing machine, as long as it is soaked for at least 30 minutes.

Post-washing procedures

When asked if they perform any additional procedures after washing, the respondents presented the following answers (Figure 8).

FIGURE 08: Post-washing procedures, on cloth masks.



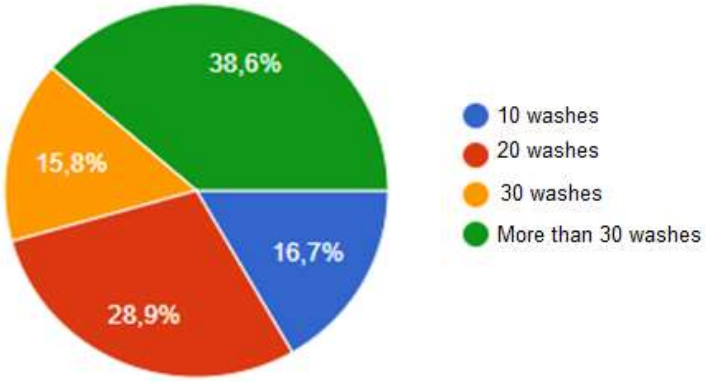
SOURCE: Survey data (2022).

According to Figure 8, most respondents reported that, after washing, they pass the electric iron before using the mask, being this action recommended by ANVISA (2020) apud Cogo, Silva and Godoy (2020). A small portion (2.9%) reported boiling the mask after washing, but according to Bueno and Smythe (2020) boiling is an alternative only in cases where it is not possible to wash with soap; and they also point out that such practice can damage the fabric and decrease the life of the mask. A significant portion (47.6%) reported not performing any procedure after washing, not being this a recommended practice.

Number of washes before disposal

Still regarding the fabric masks, it was asked how many washes on average are performed before disposal, and the results are presented in Figure 9.

FIGURE 09: Average number of washes before disposal of the cloth masks.



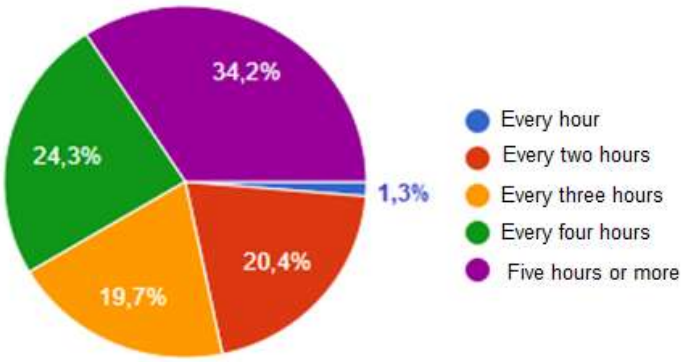
SOURCE: Survey data (2022).

Most respondents reported discarding the mask after more than 30 washes. About the number of washes that a mask can withstand, Veiga (2020) reports that there is no consensus, since its duration will depend on the type of fabric used. The National Agency for Sanitary Surveillance issued an instruction not recommending the use of masks after more than 30 washes (ABREU, 2020).

Frequency of mask exchange

Asked how often they change their cloth masks or discard their disposable masks, the following results were obtained (Figure 10).

FIGURE 10: Frequency of changing or discarding masks.



SOURCE: Survey data (2022).

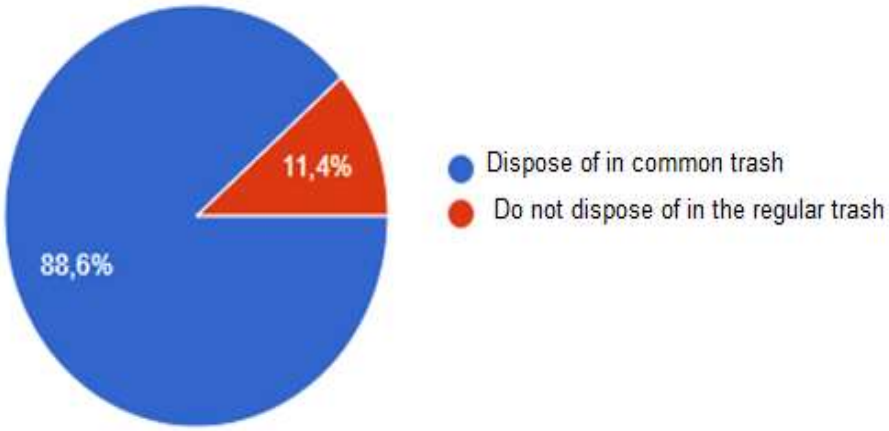
Most reported using the mask for a period equal to or greater than five hours (34.2%) followed by those who change or discard the masks every four hours (24.3%). This situation is worrisome, because according to Cogo, Silva, and Godoy (2020) the Ministry of Health warns that masks tend to become

damp and show dirt when used for longer than 3 hours, and its replacement is recommended after this period to maintain its effectiveness.

Disposal of masks

About the disposal of the masks in the regular garbage, the result shown in Figure 11 was obtained.

FIGURE 11: Disposal of masks in the regular trash.



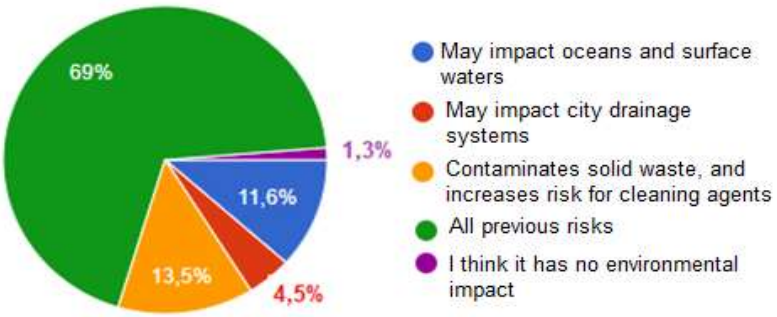
SOURCE: Survey data (2022).

The vast majority (88.6%) reported discarding the mask in the regular trash; and among these, a portion reported that before discarding it, they put the mask in a plastic bag and identified that it was biological waste. Of the 11.4% who informed they would not dispose of the mask in the regular trash, the options presented were: incinerate the masks or deliver them to hospitals and health clinics to be disposed of as biological waste, which is an appropriate procedure. As Veiga (2020) reports, the masks, whether fabric or disposable, should be considered biological waste, and the most appropriate procedure is to gather the used masks in a resistant container, indicated as "biological waste - masks", and finally, forward them for collection, where they must be separated and undergo a process of industrial incineration.

Impacts of incorrect disposal of the masks.

When asked about the possible impacts caused by the incorrect disposal of the masks, the results shown in Figure 12 were obtained.

FIGURE 12: Impacts caused by the irregular disposal of masks.



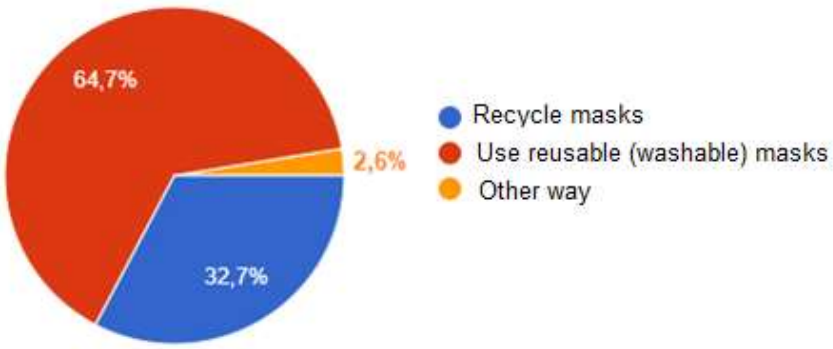
SOURCE: Survey data (2022).

Most (69%) reported believing that the irregular disposal causes impacts on surface water, urban drainage systems and solid waste; and only 1.3% of respondents reported believing that the disposal of masks does not cause any impact. The masks, like any other waste, must be managed correctly, otherwise, as reported by Takayanagui (2005) they pose risks to the environment by the possibility of polluting the soil, groundwater, and air due to their decomposition. As Mathias (2021) reports, it is essential that the population correctly dispose of the masks to avoid contamination of workers such as garbage collectors, who are on the front line of cleaning the cities. Even with gloves and other protective equipment, employees can be exposed to the virus and other bacteria (MARINHO, 2020 apud MATHIAS, 2021).

Reduction in discarded masks

When asked about actions that could reduce the amount of discarded masks, the interviewees presented the following answers (Figure 13).

FIGURE 13: Actions for reducing the number of discarded masks.



SOURCE: Survey data (2022).

Most respondents (64.7%) indicated as a possibility for reducing the number of masks, the use of reusable masks, that is, fabric masks, leaving the surgical masks for use only by health professionals. Veiga (2020) cites as alternatives to delay the disposal, the use as cleaning cloth or even handicrafts in the creation of patchwork quilts, always after cleaning them. Another portion (32.7%) indicated the recycling of masks. One possibility would be recycling, but as Veiga (2020) reports, this alternative is not economically viable. Other ways indicated were the creation of biodegradable masks and greater use of PPF2 masks (which are reusable).

CONCLUSIONS

It is concluded that: a) the masks present a higher or lower efficiency depending on the type of mask - in combating the proliferation of COVID-19, and their use in public places is a correct practice, being this the understanding of most interviewees; b) surgical masks are more efficient, but cloth masks, even being less efficient, played a key role, because they are more accessible to the middle and low income populations; c) most of the interviewees do not perform the correct procedure of soaking the masks in bleach, a fact that could have been the target of a more intense educational campaign in this sense; d) the vast majority of respondents reported being aware that the incorrect disposal of masks generates impacts, however, they dispose of them in a way that is not recommended in the regular trash; indicating, by some, a certain disregard for these impacts; e) even with all the campaigns and disclosure in the media, a small portion of respondents do not believe in the efficiency of masks, using this artifact only by the requirement imposed by law.

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