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Full Length Research Paper

People perceptions about usage of polythene and its impact on environment at Ruwanwella DS division in Sri Lanka

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The study was conducted in Ruwanwella during November to January 2022. Polythene poses serious impacts on the environment. The aim of this survey was to assess people's perceptions about the usage of polythene and its impact on the environment. Data was collected from 30 housewives and 30 A/L students using two semi-structured questionnaires and interviews with a doctor. The main reason for using polythene bags among both groups were the lack of alternatives. Burning Polythene was the common method used by both groups (93%,63%). They recognized that polythene leads to issues like blocked drainage systems, air pollution, deterioration of scenic beauty, water pollution, and the breeding of mosquitoes due to the presence of polythene waste. Furthermore, 97% of housewives agreed that polythene waste contributes to the sickness of animals and soil infertility. Regarding the concern about causing floods due to polythene blockage, 50% of housewives agreed, 37% disagreed, and 13% were not concerned. On the other hand, the majority of A/L students (80%) were not concerned about the environmental impact of polythene bags causing floods. The study revealed that both groups lack knowledge and awareness about the flood risk posed by polythene waste. This study also indicated that the trend of using polythene bags is increasing, despite respondents' awareness of the harmful effects of plastic products. To mitigate impacts of polythene waste, it is suggested to banning of polythene bags, encourage the use of organic materials to wrap lunch, and promote alternatives to polythene bags.

Key words: Polythene, perception, environment, effect, infertility.

INTRODUCTION

"There are few things certain in life: death, change, and waste. Polythene is one type of waste. It is a These components are not naturally biodegradable, and decomposition is slow (KGCHB, 2022). In Sri Lanka, polythene is commonly and extensively used for carrying various products from shops, markets, and industries, as well as for packaging goods. Almost all traders prefer to sell and supply their products in polythene packaging, especially polythene bags, which are encouraged among consumers. These bags are typically made from high-density polyethylene (HDPE) and are intended single-use. However, after use, consumers often dispose of them improperly, leaving them in trash cans or littering for them in open places throughout Ruwanwella city. Unfortunately, Ruwanwella lacks a proper waste management system, and an effective sewerage system

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is largely absent. Consequently, many people do not take the proper disposal of polythene seriously, leading to its irresponsible disposal into the environment. Ignorant citizens, as well as unaware retailers and consumers, discard used polythene bags and other polythene products in open spaces, along roads, water bodies, places of worship, bus stands, bus stops, and playgrounds within the urban area. This improper disposal can result in discarded polythene spreading throughout the environment, carried away by wind, or consumed by animals, creating an environmental burden on both the environment and society." The use of polythene bags is not a recent development (Minhaz-Uddin et al., 2018). Plastic bags were introduced in the 1970s (Williamson, 2003) and quickly gained popularity in the late 20th century (Sugii, 2008) among retailers and consumers. It is estimated that approximately 500 billion plastic bags are used worldwide each year (KA, 2007). In Sri Lanka, the consumption of polythene bags and lunch sheets is alarmingly high, with around 5 million lunch sheets and 20 million polythene bags used daily (KGCHB, 2022).

This widespread usage of polythene bags poses a serious problem for developing countries like Sri Lanka, which is already vulnerable to the impacts of climate change. Improper disposal of polythene bags and related products in open spaces and inadequate dumping sites significantly harm the environment and human health. Since polythene is non-biodegradable, it becomes essential to establish a proper method for managing its disposal.

The increasing dumping of polythene-related bags and products into landfills worldwide, especially single-use items, has immeasurable effects on nature. It is projected that by 2050, there could be more plastic than fish in the sea (Ellis et al., 2005). Animals, such as dogs and cows, have been adversely affected by this issue (KGCHB, 2022). Furthermore, the blockage of drainage systems is a common problem in urban areas due to the threat of polythene waste. In the municipality of Ruwanwella, the city area often experiences flooding after even slight rain, posing significant flood risks.

Additionally, blocked sewerage systems lead to foul smells and create favorable breeding grounds for disease-carrying mosquitoes and other vectors, potentially spreading diseases like encephalitis, dengue fever, and malaria (Ellis et al., 2005).

Polythene bags can hinder water percolation and proper soil aeration when they enter agricultural fields. This can have detrimental effects on agriculture, such as reducing soil fertility, nitrogen fixation, nutrient retention, and disrupting the balance of flora and fauna in the soil. These negative impacts significantly decrease soil fertility and, consequently, agricultural productivity (Minhaz-Uddin et al., 2018). Bisphenol A (BPA), a compound found in polyethylene, has been linked to various health issues, including sexual dysfunction diabetes, obesity, heart disease, and cancer. In Sri Lanka, respiratory problems like asthma and cough have become common due to the release of solvents from, burning polythene waste (KGCHB, 2022).

Moreover, the incineration of polythene contributes to air pollution, releasing toxic gases like methane, which can lead to acid rain. Incineration of Polythene waste in open fields is a major source of air pollution (Pandirajan et al., 2020). This incineration also releases pollutants such as PM10, PM25, ozone, SO_2, NO_2, and CO into the air, further exacerbating air quality issues. Even recycling polythene products can result in the release of these pollutants, posing environmental risks (KGCHB, 2022). The use and improper disposal of polythene bags and related products have significant and wide-ranging consequences, impacting both agricultural productivity and public health due to the release of harmful substances and pollutants.

The use of polythene bags and various other polythene-related products, such as toffee wrappers, chocolate wrappers, ice packets, and yogurt cups, is a common problem that leads to the deterioration of the scenic beauty of the environment. (Obebe et al., 2020). Accumulation of these items in various places can negatively impact the aesthetic value of attractive tourist destinations. Both Sri Lanka and Ruwanwella DS division face this severe problem.

Furthermore, the flora and fauna communities are at great risk due to discarded polythene bags and related products. Animals like sea turtles, sea birds, and coral reefs are particularly affected when they come into contact with or consume polythene bags. The plastic clogs their intestines, leading to slow starvation and, in some cases, death (Minhaz-Uddin et al., 2018). Each year, our water bodies become a repository for more polythene waste, primarily due to open dumping and improper waste management. During rainfall, polythene waste is washed down drains and ends up in waterways like lakes, ponds, and channels, further contributing to the environmental problem.

This research aims to investigate people's perceptions about the usage of polythene and its impact on the environment in the Ruwanwella DS division of Sri Lanka.

MATERIALS AND METHODS

The methodology for this study includes site selection, observation, and data collection through a questionnaire survey and interviews in both formal and non-formal ways. Secondary data was collected from different sources such as journal articles, reports, published books, newspapers, and websites. Individual people were personally visited by the researcher for data collection. To collect the data, semi-structured questionnaires were created in the native language Sinhala and then translated into English. During the field visit, conversations were held with all respondents to explain the aims of the study. For some respondents who were interested but unable to write answers to the questionnaires themselves, the researcher provided assistance, and their responses were written

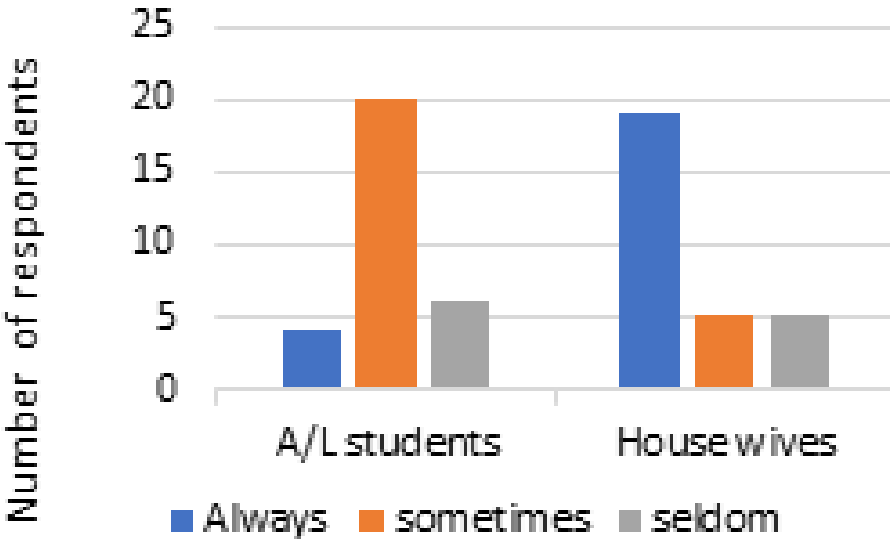

Figure 1. Comparing of usage of polythene between housewives and A/L students.

down by the researcher. The study was conducted in the Ruwanwella area, which is situated in the Kegalle district on the bank of the Gurugoda Oya. Preliminary information about the study area was attained through a preliminary investigation. Throughout the survey period, the aim and scope of the study were carefully maintained.

Sixty interview schedules were prepared for the survey: 30 interview schedules for housewives in Athalawa village and 30 for A/L students in a private class in the area. Before finalizing the schedule, it was pre-tested to assess its suitability to respondents, and necessary corrections and modifications were made accordingly. The study was conducted from November 2022 to March 2023. On-site sampling commenced in November 2022, and primary data collection was completed by the end of December 2022. After each interview, it was thoroughly checked to ensure that the information had been accurately recorded. Once the data was collected, it was analyzed, estimated, and converted into percentages, tables, and figures.

Analysis of data

The information obtained from all the respondents was coded, compiled, and tabulated after completing the field survey. The responses to the questionnaire were transferred to an Excel sheet to facilitate tabulation for statistical analysis. The collected data for this study were analyzed using basic statistics, such as number and percentage distribution. The relationship between two variables was also investigated using the schedule. Additionally, several graphs were utilized to provide a clear focus on the situation.

RESULTS AND DISCUSSION

The study found that among 30 housewives, 66% always use polythene bags, 17% use them sometimes, and 17% use them seldom in the study area. Among the A/L students, 13% always use polythene bags, 67% use them sometimes, and 20% use them seldom, while 3% of the respondents reported using other alternatives after one-time use.

According to Figure 1, it is evident that housewives use polythene bags more frequently than A/L students. An equal percentage of housewives use polythene bags seldom and sometimes. However, this chart does not illustrate the percentage of housewives and A/L students who never use polythene bags, as all respondents consume polythene bags to some extent.

Number of polythene bags used per week

Figure 2 indicates that A/L students use polythene bags more frequently than housewives in the class range between 1 and 10. It shows that both groups mostly use polythene bags within the range of 1 to 10 bags. On the other hand, there is a noticeable decrease in the usage of polythene bags in the class ranges of 21-30, 31-40, and 41-50, which suggests a lower usage of polythene bags in those ranges for both housewives and A/L students.

Your preference to use polythene

Based on Figure 3 It was found that among the A/L students, 37% like to use polythene bags, while 63% dislike using them. Conversely, among housewives, 13% like to use polythene bags, while 87% dislike using them.

Dispersion of polythene bags after use by respondents

In the survey area, the disposal of polythene waste was considered the most significant environmental concern.

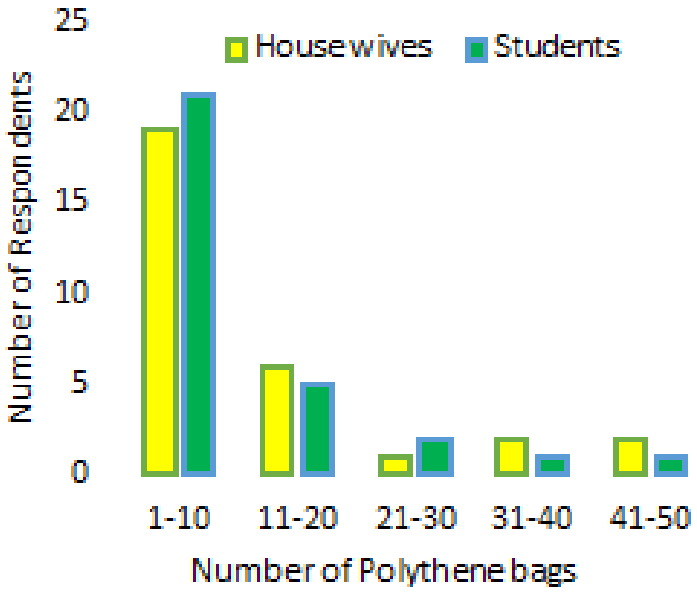

Figure 2. Weekly usage of polythene bags.

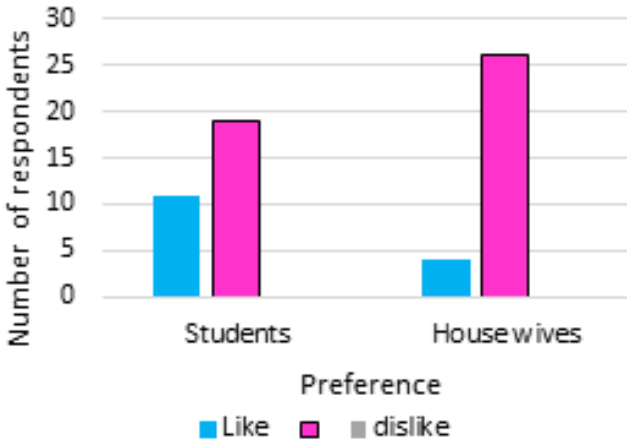

Figure 3. Preference to use polythene bags.

As explained by Figure 4 The primary disposal method after using polythene waste was burning. Among the respondents, housewives were more closely associated with polythene waste disposal. According to the data, they use three main disposal methods for their polythene waste: 93% opt for burning, 3.5% practice open dumping, and another 3.5% bury their polythene waste. Additionally, it was observed that the concept of door-to-door deposition for polythene waste is not familiar to the housewives in the research area.

The findings further indicate that the majority of both groups use the method of burning polythene as a disposal method. However, housewives (93%) tend to use the burning method more frequently than A/L students (63%). It appears that door-to-door deposition is somewhat familiar among A/L students. In the research area, people tend to dump their waste in front of their houses in suitable places. The municipality authority staff (Pradeshiya Sabha, Urban council) then collect the waste into their truck/van on week days and dispose of in an open place or a designated area in the city. While the most common method of solid waste disposal in Sri Lanka is open dumping.

In the specific area of Ruwanwella, burning is the prevalent method. When considering housewives, the data shows that open dumping and burying have an equal number of percentages. For A/L students, the data indicates an equal percentage of burying and door-to-

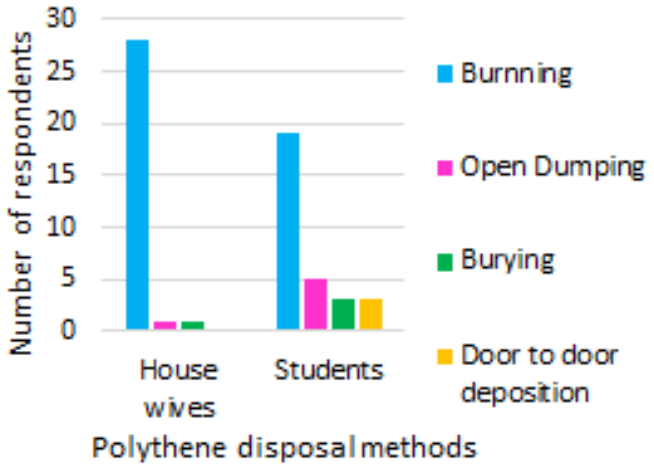

Figure 4. Ways of dispersion of polythene bags after use.

Table 1. Reasons of using polythene bags by housewives and school students.

Reasons	Housewives	Students
Lack of substitutes	11	11
They are easily available	7	6
They are light in weight	6	8
They are cheap	5	2
Rainy weather	1	3

door deposition for polythene waste.

Reasons of using polythene bags by housewives and school students

The study identified several reasons behind the widespread usage of polythene bags in the study area shown in Table 1. Among housewives, the major reason for the increasing usage of polythene bags was the lack of substitutes (37%). Other reasons included easy availability (23%), lightweight (20%), cheapness (17%), and usage during rainy weather (3%). Among school students, the main reason for the increasing usage of polythene bags was also the lack of substitutes (36%). Other reasons cited were the bags being light in weight (27%), easy availability (20%), usage during rainy weather (10%), and cheapness (7%). In a study conducted by Adane and Muleta (2011), they found that the primary reasons for the extensive usage of polythene bags were their low price (69.13%) and easy availability (66.08%) (Adane and Muleta, 2011). These findings suggest that the lack of suitable alternatives, coupled with factors such as easy availability, low cost, and lightweight, contributes to the widespread usage of polythene bags in the study area. Polythene is inexpensive and durable. These are the reason why the plastic production by people is very high and the demand keeps on increasing day by day. (Okunola et al., 2019).

Polythene bags banned in Sri Lanka

In September 2017, the Sri Lankan Government issued Special Gazette 2034, which banned the use and sale of polythene with a thickness below 20 µ (KGCHB, 2022). However, the government has faced challenges in effectively enforcing the ban, as they have been unable to introduce fines or take actions against those who disobey the law.

In 2021, there was a significant development in reducing plastic waste as the production of shampoo packets was completely stopped in Sri Lanka.

Opinion on environmental impacts of polythene waste by the respondents (housewives and school students)

According to Table 2, the opinions of both housewives and A/L students on the negative effects of polythene

Table 2. Perception impacts of using polythene by housewives and school students.

Effects of polythene	Housewives			Students		
	Agree	Disagree	Not concern	Agree	disagree	Not concern
Animals get sick and die due to polythene	29	1		30	-	-
Polythene causes health problems to human and make them ill	30	-	-	30	-	-
Drainage systems get blocked due to polythene	30	-	-	30	-	-
Polythene causes air pollution/Polythene makes air polluted	30	-	-	30	-	-
Polythene destroys the natural and scenic beauty of the environment	30	-	-	30	-	-
Polythene contaminates the quality of water and it causes water pollution	30	-	-	30	-	-
Polythene makes the soil infertile	29	1		28	1	1
Polythene causes floods	15	11	4	3	3	24
Mosquitoes breed because of polythene	30	-	-	30	-	-

waste on the environment and humans were collected, with options to agree, disagree, or express not being concerned. Among housewives, a significant majority (100%) agreed with various problems associated with polythene waste, including its impact on human health, blocking drainage systems, causing air pollution, deterioration of scenic beauty, water pollution, rendering soil infertile, causing floods, and breeding mosquitoes.

Additionally, 97% of housewives agreed that polythene waste affects animals' health and leads to soil infertility, while 3% disagreed. Regarding causing floods due to polythene blockage, the opinions were divided among housewives, with 50% agreeing, 37% disagreeing, and 13% not being concerned. Among A/L students, the majority (80%) expressed not being concerned about the environmental impact of polythene bags causing floods.

A small minority (3.5%) also expressed not being concerned about soil infertility. However, all A/L students agreed that polythene waste causes the other mentioned issues in the environment and affects human health. According to the Figure 5, The survey results suggest that both groups, housewives, and A/L students, have a lack of knowledge and awareness about the risk of floods due to polythene waste.

This highlights the importance of increasing education and awareness campaigns to inform people about the negative environmental consequences of polythene waste and the need for proper disposal and management.

In 2005, flooding occurred in Mumbai, India, resulting in the loss of over 1000 human lives and at least 1000 animals and livestock.

The flooding was caused by plastic bags clogging the city's storm drains.

Which prevented the monsoon rains from draining away from the city.

Sources of environmental knowledge for housewives and A/L students

Survey findings showed that respondents were aware of environmental problems from different sources like television, radio, books, school and professionals. According to Figure 6, A/L students use television as a source to gain knowledge more than housewives.

According to the table 3, The major sources of awareness of environment problems were television in both interviewed groups (80%, 87%) and the least number of respondents have got knowledge from radio about environmental problems due to polythene waste

Preference to use bags created with other materials

The findings indicate that both housewives and A/L students prefer to use bags made of cloths. Housewives prefer cloth bags than students. Paper bags take the second place according to preference of both groups Figure 7.

CONCLUSION AND RECOMMENDATIONS

The study presents opinions, views, and information regarding the current usage of polythene bags and its environmental impacts

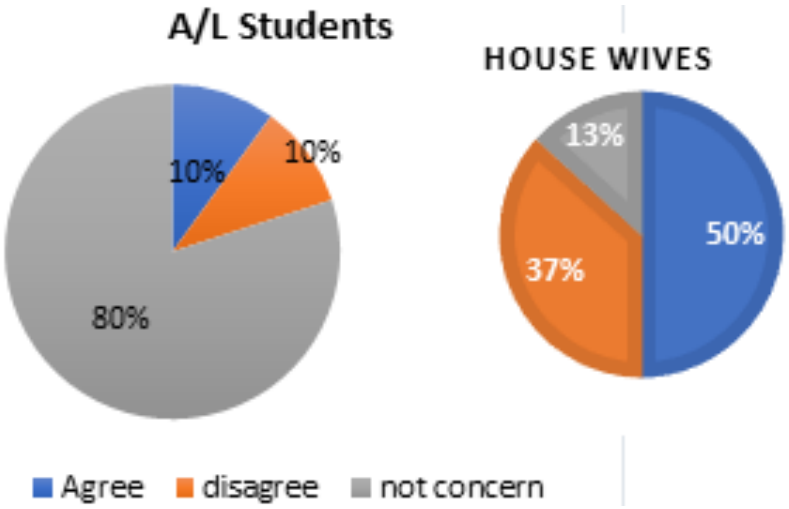

Figure 5. Perception of flood risk.

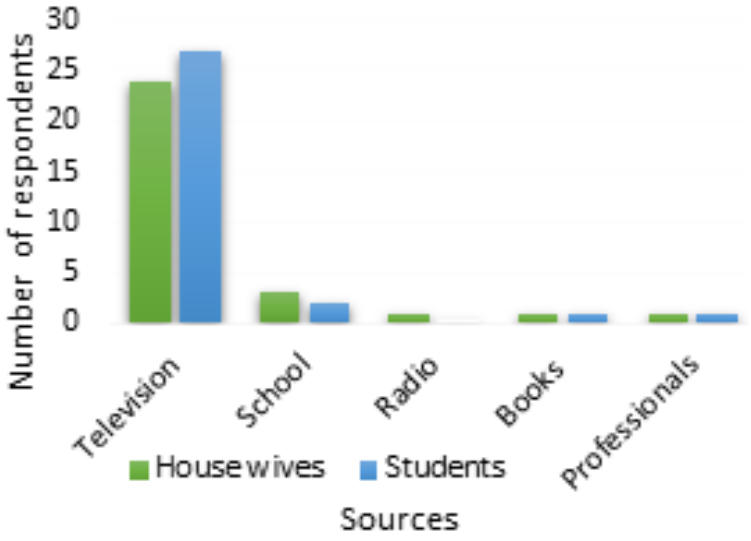

Figure 6. Perception of environmental impacts.

in the Ruwanwella municipality area. The findings indicate that A/L students typically obtain approximately 13 to 14 polythene bags per week, while housewives receive around 12 to 13 bags as consumers. The primary reasons for using polythene bags are the lack of suitable substitutes and the easy availability of polythene-related products. Departmental shops, groceries, fish markets, supermarkets, bookshops, and vegetable markets are common places where polythene bags are obtained. Regarding post-usage activities, reusing polythene bags is considered a safer option for the environment. However, the proper disposal of polythene waste remains a significant concern in the study area. Burning and open dumping are prevalent methods of polythene disposal, while safe polythene dispersion methods are lacking. The study highlights various environmental impacts resulting from polythene waste, including air pollution, water pollution, drainage system blockages, human and animal health issues, soil fertility problems, and scenic beauty deterioration. Awareness of these problems is commonly spread through television and schools in the area.

To cope with certain problems, the following recommendations should be followed:

(1) Consumers should carry their own shopping bags when they go shopping.

(2) People should make cloths, paper bags, fiber bags and eco-friendly bags using natural materials like

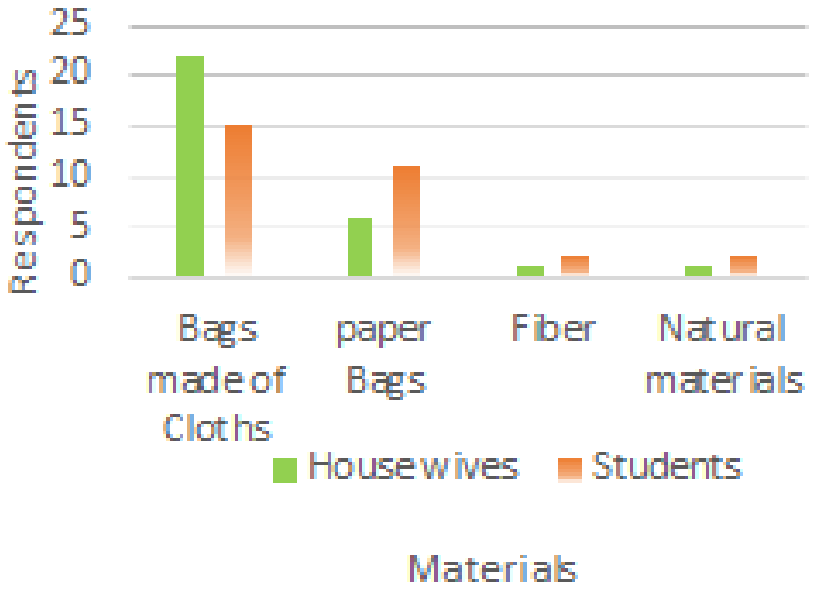

Figure 7. Preference of bags made from other materials.

Table 3. Percentage of perception via source.

Media	Housewives (%)	Students (%)
Television	80	87
School	10	7
Radio	4	0
Books	3	3
Professionals	3	3

basketry and promote them.
(3) We should encourage industries to produce detergents and shampoo in solid form instead of making bottles or sachet packets.
(4) Various campaigns should be organized to increase awareness among consumers, university students, parents and retailers using schools, MOH, University, CEA, NGOs, etc.
(5) Enforce rules and regulations to produce white color products instead of colored ones (examples polyethylene bags and bottles).
(6) People should reduce indiscriminate use and disposal of polythene bags in order to minimize the excessive accumulation in the environment.
(7) Establish garbage bins in every road and advice to separate them properly.
(8) Enforce a tough rule (Fines) against the people who put polythene everywhere.
(9) Promote the concept of zero waste cities by designing and implementing programs that aim to gradually eliminate waste, not through incineration, landfilling, or exporting, but primarily by focusing on waste prevention.
(10) Encourage people to create new innovations from polythene waste, such as fuels, wall art, and clothing.
(11) Educate people about recycling and the 4R concept (Reduce, Reuse, Recycle, and Recover).
(12) Seek the involvement of ecologists to mediate and guide environmental initiatives.
(13) Introduce industries that collect various kinds of waste and recycle them.
(14) Encourage industries to produce bioplastics instead of using polythene materials. Bioplastics can be made from different biodegradable and non-biodegradable materials, including weeds, hemp, plant oil, potato starch, cellulose, and corn starch.
(15) Promote the use of banana leaves and lotus leaves as eco-friendly alternatives to wrap our breakfast and lunch items.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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