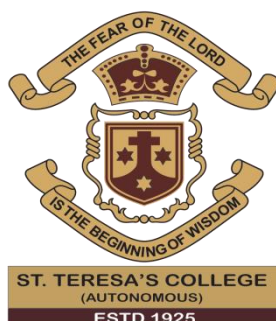


TACKLING THE RISE OF PLASTIC POLLUTION DURING COVID TIMES

Dissertation submitted to

ST.TERESA'S COLEGE

(AUTONOMOUS)



AFFILIATED TO

MAHATMA GANDHI UNIVERSITY

In partial fulfillment of the requirement for the

AWARD OF THE DEGREE OF MASTER OF SCIENCE IN

HOME SCIENCE (BRANCH B)

RESOURCE MANAGEMENT AND INTERIOR DESIGNING

BY

MARY TREESA XAVIER

REGISTER NO: AM20HRM007

DEPARTMENT OF HOME SCIENCE AND CENTRE FOR RESEARCH

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'Certified as bonafide research work'

**SIGNATURE OF THE HEAD OF
THE DEPARTMENT**

SIGNATURE OF THE GUIDE

DECLARATION

I hereby declare that the thesis entitled '**Tackling the Rise of Plastic Pollution during Covid Times**' is a bonafide record of research work done by me during the course of study(2021-22), under the supervision and guidance of Dr. Susan Cherian, Associate Professor, Department of Home Science and Centre for Research, St. Teresa's College, Ernakulam.

MARY TREESA XAVIER



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CERTIFICATE

This is to certify that the thesis entitled '**Tackling the Rise of Plastic Pollution during Covid Times**' is an authentic record of the original research work carried out by **Ms. MARY TREESA XAVIER** with Reg No. **AM20HRM007** under my supervision and guidance during the academic year 2021-22.

Ernakulam
10 -06 -2022

Dr. SUSAN CHERIAN

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CONTENTS

Sl.No	Topic	Pg.No
1	Introduction	1
2	Review of Literature	7
3	Methodology	17
4	Result and Discussion	21
5	Summary and conclusion	45
6	Bibliography	52
7	Appendix	57

Sl.No	List of Figures	Pg.No
3.1	Area of study	18
3.2	Research Design	20
4.1	Distribution of samples according to age	22
4.2	Awareness of Impact of Plastic Pollution	23
4.3	Opinions of Covid towards Plastic Pollution	24
4.4	Disposal methods of Plastic	25
4.5	Reusing Plastics	26
4.6	Plastic Pollution	27
4.7	Awareness of Government Programme Schemes used by Government to Reduce Plastic	29
4.8	Pollution	29
4.9	Methods Implemented to Reduce Plastics	30
4.10	Alternatives of Plastic Carry Bags	32
4.11	Types of masks used when going out	33
4.12	Methods of disposal of Plastic Masks	34
4.13	Pie chart on reusing Plastic Bottles	35
4.14	Pie chart on upcycling PPE Scraps	36
4.15	PPE Bed rolls	37
4.16	Graph on recycling of plastic materials	38
4.17	Segregation of waste materials	39
4.18	Ways of Reduce Plastic Pollution	39
4.19	Usage of PPE Kits	40
4.20	Methods to dispose of PPE kits	41
4.21	Usage of Gloves	42
4.22	Disposal of gloves	43

Sl.No	Appendix	Pg No
1.	Questionnaire	

ABSTRACT

Plastic waste pollution cause harm to the mankind and environment and has become a global concern. Recent COVID-19 pandemic has led to a significant increase in demand of single use plastic, intensifying the pressure on the already occurring problem. It has been seen that more than 8 million tonne of pandemic associated plastic waste have been generated globally. The aims of this study includes in finding out the use of plastic and disposal practice in present pandemic situation, to check the awareness of homemakers regarding plastic pollution and its hazards, to review on the plastic waste management practices that is commonly done in household level and to find out other eco-friendly alternatives that are used by the respondents. The methodology used in the study is a baseline survey among 100 samples residing in Ernakulam district. The sample were selected using convenience sampling technique. The result of the study shows that the respondents were aware of the hazards of plastic pollution though many of them not practicing segregation or proper disposal of plastic wastes. The study echoes the fact that education at micro level can bring significant changes in the awareness of individuals, bringing certain changes and attitudes towards plastic waste management. . Curbing the use of plastic is the need of the hour, because plastic pollution has a massive impact on our environment. The study concludes awareness on plastic pollution can help to protect our Mother Earth, make peace and take care of life in the present moment and in the future.

Chapter 1

INTRODUCTION

The spread of Covid 19 pandemic has geared up the use of plastics in our state, thereby creating complexities of plastic waste management. Improved hyper-hygienic lifestyle and the fear of transmission of the diseases conveniently shifted our behavioral patterns like the use of masks, gloves and PPE kit (Personal Protective Equipment), increased demand plastic packaged foods and groceries and the use of disposable utensils etc. Plastics have again become a severe threat to natural ecosystems and human health as there is an increase in the number of plastic debris. Hence there is a need of reviewing this condition based on present situation of plastic pollution and its potential implications on environment and human health.

The term plastic is a word that means “pliable and easily shaped”. It recently became a name used in the category of polymers. Polymers are long chain molecules that is abound in nature. It is seen that over a last century mankind has been learning more about synthetic polymers. The first synthetic polymer was invented in 1869 by John Wesley Hyatt, which inspired the American firm to use them as a substitute of ivory, which was obtained by slaughtering elephants. This discovery was revolutionary and mankind started to manufacture them without

limits. The creation of the new materials helped free mankind from social and economic constraints imposed by the scarcity of natural resources. Inexpensive celluloid made material wealth more widespread and obtainable.

World War II necessitated great expansion of plastic industry in US, as the industry might prove the success of the military force. According to the author Susan Freinkel “product after product, market after market, plastics challenged traditional markets and won, taking place of steel in cars, paper and glass in packaging, and wood in furniture”. The endless possibilities of gave some observers utopian vision of materials wealth as it was an inexpensive, sanitary and safe substance that can be easily made by any man. The unblemished optimism about plastics didn’t last long. After the wars the perception of plastics changed to a negative, criticism arose as when plastic debris were first observed in 1960’s, around the time of 1970-80’s anxiety about plastic waste reached to a peak since plastics did last forever in our environment. However in 1980s plastic industries led a drive encouraging municipalities to reuse plastic materials as a part of waste management materials.

Plastic pollution is the accumulation of plastics and its materials on both land and water bodies which adversely affects the entire ecosystem. Plastics which act as a pollutant are divided according to

their sizes such as micro-, meso-, macro debris. As we know plastics are inexpensive, durable, and can be molded easily, hence it is highly chosen by manufacturers when compared to other materials. The origin of plastic pollution begins in the middle of ocean basins, which is thousands of kilometers from the land into the central gyres. The first scientific report was given by Carpenter and Smith in 1972 who published a journal containing the presence of plastic debris in Sargasso Sea. Some undergraduates in 1986 aboard a tall ship started counting pieces of small debris which was taken across the North Atlantic Ocean, which made its way to the long-term data set on plastic debris (Law et al., 2010). In the year 1996 Captain Charles Moore discovered the “Great Pacific Garbage Patch” on the account of large accumulation of plastic debris in the middle of North Subtropical gyre (Moore et al., 2001). In 2004, Richard Thompson coined the term “micro plastics” to the ubiquitous small plastic particles (<5mm in size) found in the sediments of surface water (Thompson et al., 2004), he and his team researched highly on the emerging contaminant, which ultimately led to the exponential rate of increase in the scientific evidence regarding the contamination and the effects of plastic debris in the ocean. Studies conducted by oceanographic shows us that tons of debris is ending up in ocean each year. It is estimated that around 5.25 trillion of individual plastic particle weighing around 244,000 metric tons are floating over the surface of the water. Another study which was conducted in 2021 shows that around forty four per cent of the plastic wastes seen on the

downstream, shoreline is made up of plastic bags, bottles and items related to takeout meals. Plastic pollution affects the life of marine animals. Sunlight in combination with sea water embrittles the plastics which helps the plastic to break down to smaller micro plastics which make it available for small aquatic marine animals such as zoo planktons and tiny fishes. Plastics that are less than 5mm (0.2inch) is seen in the organs of the aquatic fishes which when consumed by mankind in large quantities is harmful for human health. There is some terrestrial aspect of pollution. Drainage and sewer system gets clogged by plastic bags which in long runs lead to flooding in land the animals that feed in waste dumps for instance the sacred cow of India suffer from intestinal blockages from plastic packaging. The mass of plastics is not greater than other components of waste, But it takes up a disproportionately large volume. As the waste dumps expands largely in residential areas, the scavenging poor found living amongst the plastic residuals. In addition to this scenario wind transported micro plastics have been found to be deposited high atop mountains and on arctic benches.

Covid – 19 is an infectious disease caused by Sars-CoV-2 has led the world to increase the use of single use plastics which intensifies the pressure on already out of control problem with plastics. People infected with this virus experiences moderate respiratory illness and can recover without special medical treatment. However, some

individuals gets seriously ill requires special medical attention. Older people and those underlying medical conditions such as cardiovascular diseases, diabetes, chronic respiratory disease, or cancer are likely to be the victims of this particular virus. The best way to prevent the transmission of this virus is by staying away at a distance of one meter from other individuals, wearing properly fitted masks, washing hands by using alcohol fitted rubs and by getting vaccinated under the following guidance of the respective authorities. Covid pandemic across the globe has led to increase in the use of single use plastics that have intensified the pressure on already persisting problem of plastic waste management. As Covid 19 positive cases are increasing in Ernakulam Dist., use of one-time plastic in the form of mask, gloves and PPE kit are increasing. Hence it is essential to curb the menace of plastic pollution by creating awareness in the community.

Statement of the Problem

Plastic consumption in India has been on the rise for the last few decades and has especially penetrated every sphere of urban life. Plastic is today so much a part of our lives. We come across plastic at every phase of life, be it packaging or agriculture, health care or high technology. The rich and the poor, the young and the old, the urban and the rural, all depend on plastics for a variety of their uses. Single-use plastic items have caused a lot of damage to the environment and

there is an urgent need to collectively curb its usage, monitor its disposal, and, if possible, avoid using it altogether.

Personal hygiene and Covid19 safety measures adopted by people in the present pandemic situation were highly influenced the rise in plastic pollution. The consumption and use of plastics in the form of masks, gloves and PPE kit significantly contributed to plastic pollution. Now it is crucial to shift towards sustainable and environment friendly alternatives. Bio-based plastics and zero- waste management play a significant role in this. The present study is an attempt to popularize bio-based plastic and other alternatives to promote sustainable living.

Objectives of the Study

The objectives of the study are:-

- To find out the use of plastic and disposal practice in present pandemic situation
- To check the awareness of homemakers regarding plastic pollution hazards
- To study the plastic waste management practices at household level
- To find out the eco-friendly alternatives to plastic used by the respondents

REVIEW OF LITERATURE

Use of plastic has increased nearly 33 percent during the years of the pandemic, recent researches says. The literature pertaining to the study on *Tackling the rise of plastic pollution during Covid times*' is discussed under following heading:

- 2.1. Impact of plastic pollution during Covid -19 on environment
- 2.2. Impact of plastic pollution during Covid-19 on animals
- 2.3. Impact of plastic pollution during Covid-19 on mankind
- 2.4. Techniques that could help resolving plastic pollution

2.1. Impact of plastic pollution during Covid -19 on environment

Public health now being of utmost priority, along with close monitoring of economic and social impacts, the implications of COVID-19 in the environment remains largely undervalued. Unmanaged plastics waste is particularly concerning due to its implications to natural ecosystems and public health and safety. Nonetheless, environmental health problems have received less and less attention from governmental agencies, the scientific community

and general public. This can be perceived by the withdrawal of several national and state-wide agreements on the use and consumption of plastics (Patrício Silva et al., 2021a)

Cities facing high COVID-19 incidence rates are struggling to manage the dramatic increase in medical waste production by healthcare facilities. For instance, the King Abdulla University Hospital in Jordan produced tenfold higher medical waste (650 kg per day, when considering an occupation of 95 COVID-19 patients) than the average generation rate during the regular operational day of the hospital. A drastic increase in medical waste was also reported in other parts of the world, such as in Catalonia, Spain, and in China, with an increment of 350% and 370%, respectively.

Dramatic increase in medical waste is overloading the capacity of each country or municipality, to manage/treat it adequately. Due to the persistence and high contagiousness of SARS-CoV-2 virus, many countries are classifying all hospital waste as infectious, which require to be incinerated under high temperatures, allowing sterilisation, followed by landfilling of residual ash. While some countries or municipalities will manage alternatives to treat medical waste properly, others (with less economic and waste management resources) might be forced to apply inappropriate management strategies, which will likely entail adverse effects to the environment, human health and safety, while raising the potential for a second wave of epidemic.

During the COVID-19 pandemic, there was an increased global demand for disposable single-use plastic (SUP). Increased use and consumption of SUPs occurred in the form of items like take-away packaging from restaurants and the reversal or postponement of policies targeted to reduce SUPs within countries like the UK and US (Patrício Silva et al., 2020). There was also widespread use of personal protective equipment (PPE) (Prata et al., 2020). As PPE are designed to protect the user against infection, items like disposable face masks and gloves were widely consumed by the general public to prevent infection by SARS-CoV2 virus. It was conservatively estimated that during the COVID-19 pandemic 129 billion face masks and 65 billion gloves were being consumed per month, globally (Prata et al., 2020). Given the mass consumption of these items around the world, leakage from proper and improper waste management streams was inevitable from” (Ammendolia and Walker, 2022) both accidental leakage and intentional indiscriminate littering.

Face masks are playing an essential role in preventing the spread of COVID-19. Face masks such as N95, and surgical masks, contain a considerable portion of non-recyclable plastic material. Marine plastic pollution is likely to increase due to the rapid use and improper dispensing of face masks, but until now, no extensive quantitative estimation exists for coastal regions. Linking behaviour dataset on face mask usage and solid waste management dataset, this study estimates

annual face mask utilization and plastic pollution from mismanaged face masks in coastal regions of 46 countries. It is estimated that approximately 0.15 million tons to 0.39 million tons of plastic debris could end up in global oceans within a year. With lower waste management facilities, the number of plastic debris entering the ocean will rise. Significant investments are required from global communities in improving the waste management facilities for better disposal of masks and solid waste. China is the major producer of global face masks. Face mask production in China increased to 116 million per day in February 2020, 12 times higher than usual (Adyel, 2020). The global face mask market's value rose from 0.79 billion USD in 2019 to approximately 166 billion USD in 2020 (Phelps and Cooke, 2020). However, what proved to be an effective approach to slow down the transmission rate has now transformed into a severe environmental threat. Almost every country is prioritizing protecting public health over environmental health, which has badly affected policies regarding decrease usage of single-use plastics (Silva et al., 2020).

Single-use face masks contain a significant portion of a polymer material such as polyurethane, polycarbonate, polypropylene, polystyrene, polyacrylonitrile, polyethylene, or polyester (Fadare and Okoffo, 2020). With the rise in both consumption and production of face masks, the management of these used masks has become a global concern. The waste management system in developed and developing

countries is not properly designed to handle solid waste and current pandemic waste (Aragaw, 2020). Although local and international authorities have framed many policies for the safe disposal of COVID wastes, their mass implementation has become challenging and daunting for authorities (Van Fan et al., 2021). As a result, inadequately managed masks thrown into the environment find their way into solid waste and act as a possible medium of transmission (Kampf et al., 2020; Klemeš et al., 2020).

Drastic increase in medical wastes, including disposable masks, medical protection suits and sanitizer bottles would intensify the burden in the disposal of hazardous materials that are potential threats to the ecosystem (UN, 2020). Apart from the natural environment, the social environment and self-identity can also be affected during this sudden pandemic (Huang and Zhao, 2020; Sher, 2020).

2.2. Impact of plastic pollution during Covid-19 on animals

Inadequate management of only 1% of face masks may contribute to waste of 30,000–40,000 kg per day (World Wildlife Fund, 2020). Apart from this, these face masks, under environmental conditions, break down into smaller sizes (less than 5 mm) particles and contribute to microplastic pollution (Zambrano-Monserrate et al., 2020). These particles enter both fresh water and coastal environments and pose a severe threat to the aquatic environment and lives (Gall and

Thompson, 2015). Being small in size, these particles are easily accessible to marine organisms and enter into the food chain. Micro plastic is already found in shellfish and other fish species (Smith et al., 2018).

Plastic can have enormous impacts on animals, some direct, others indirectly. An entanglement, for example, can be acute, resulting in immediate death by suffocation or drowning, or chronic, meaning it may exhaust the animal, restrict feeding to the point of starvation or result in strangulations, wounds, infections or cause amputations (Butterworth et al., 2012). Face masks littering the environment could also be an emerging new source of microplastics (Fadare & Okoffo, 2020).

A young gull (*Larus* sp.) was found walking with a face mask tangled around its legs in Chelmsford, Essex, UK (RSPCA Essex South, 2020). It had struggled with the mask for two weeks and its limbs and joints were swollen, but it recovered in the South Essex Wildlife Hospital. A juvenile peregrine falcon (*Falco peregrinus*) on the Yorkshire coast, UK, with its talons entangled in a face mask, eventually managed to free itself (BBC, 2020a). Cygnets from a mute swan (*Cygnus olor*) from Lake Bracciano, near Rome, Italy, were observed with face masks around their beak (wwitaly, 2020), and a mallard (*Anas platyrhynchos*) with a mask hanging around its neck, seen in Casentino, Italy, was referred to by local media as “The duck

unable to take off the mask” (ArezzoNotizie, 2020). A recent find of a dead gull in Rotterdam, The Netherlands, which was hit by a car, also had a face mask entangled around its legs. Although this entanglement may not have been the cause of death, it may have weakened the bird as a chronic entanglement, prior to the car-collision (Kompanje, 2021). The bird, together with its face mask, has been preserved in the Natural History Museum of Rotterdam (NMR 9989-172803).

COVID-19 litter is also ingested by animals, as the find of a Magellanic penguin (*Spheniscus magellanicus*) in Brazil illustrates (Penza, 2020). The stomach of this animal, found on Juquehy Beach in São Sebastião, north of São Paulo, revealed an ingested face mask. Multiple long-tailed macaques (*Macaca fascicularis*) were seen chewing on a face mask in Genting Sempah, Malaysia (Getty Images, 2020). Young gulls (Laridae sp.) have also been observed fighting over a face mask on Weymouth beach, UK, as they were hunting for food, and one flying away with it in its beak (Klein, 2020). Young gulls carrying a face mask were also observed at the port of Dover, and at the coast of Weston-Super-Mare in the UK (Reuters, 2020; Simmons, 2020).

2.3. Impact of plastic pollution during Covid-19 on mankind

Consumption of micro plastics poses severe detrimental effects on human health, such as chromosome alteration, obesity, cancer, and

infertility, to name a few (Sharma and Chatterjee, 2017). The presence of face masks is already found in many oceans, beaches and freshwater systems (Ardusso et al., 2021; De-la-Torre et al., 2021).

Although COVID-19 is a contagious respiratory disease that spreads through droplets from the nose or mouth via coughing or sneezing, this type of approach could be even more toxic to people, since disinfectants such as bleach and glutaraldehyde have been reported as leading to higher risks for the development of progressive lung diseases (Svanes et al. 2018; Dumas et al. 2019) and do not necessary improve virus containment.

Older adults and people with previous underlying medical conditions like lung or heart disease or diabetes seem to be at higher risk for developing more serious complications from this disease (Onder et al. 2020; Zhou et al. 2020).

Modern lifestyle may negatively affect our health. As a result, many people may be in the disadvantageous position to face the pandemic with an already impaired immune system due to their exposure to environmental health hazards. Starting from the intrauterine life period, humans are in a constant exposure—willingly or not—to various endocrine-disrupting chemicals, mutagens, carcinogens, hazardous radiation, and psychological stress factors that interact with their immune system. Moreover, food and water security

issues, climate change, as well as water, soil, and air pollution are only a few environmental factors with known detrimental effects on human and animal health (Maipas et al., 2021).

Mental health is an emerging problem that should be more centralized and conquered, as unemployment, social isolation and social turbulence would aggregate psychological states during this tough period.(Wang & Xue, 2021)

2.4. Techniques for resolving plastic pollution

Researchers in Chile have created a bag that behaves like normal plastic but has certain beneficial features. Roberto Astete and Christian Olivares Created a formula using limestone instead of oil by products, which resulted in the changes in structure of plastics from indestructible to a soluble form. It became one of the alternatives of plastic. Chile, Rwanda and Jamaica took action against plastic pollution by using ‘Solubags’ which dissolves when stirring in normal drinking water.

In 2012 Ashwanth Hedge a Mangalore citizen paved was to reduce plastic alternatives by making that is eco-friendly affordable, degradable and consumable. ‘Envigreen’ is a plant based plastic product that is created by using 12 ingredients potato, tapioca, corn, natural starch, vegetable oil, banana, and flower oil. The raw material is first turned to a liquid and undergoes a six- step procedure till the

creation of the end product. It usually decomposes within a time frame of 180 days, highly water soluble and when boiled can be consumed.

In 2014 Kevin Kumala in Indonesia created an edible plastic bag by using Cassava roots that are grown in Indonesia. Cassava is vegetable root that is one of the staple foods seen in Africa, Latin America and Asia. The company ‘Avani Eco’ created the plastic bag looks and feels like plastic that is completely degradable and compostable. It doesn’t create a problem for aquatic or life forms even if consumed as these plastics have a plant based origin.

Shayya literally means bed in Sanskrit. India is the world’s second-largest PPE manufacturer, with more than 1,000 manufacturers producing 4.5 million pieces a day, according to The Guardian. Mattresses were in short supply when the Indian state of Kerala ordered the opening of 50-bed COVID care centres. The Shayya bedrolls were an ideal solution, being both cheaper and easier to disinfect than regular mattresses used in treatment centres (Menon, 2021).

Chapter 3

METHODOLOGY

Plastics have become a severe trans boundary threat to natural ecosystems and human health. The scenario is likely to be aggravated by the excessive use and consumption of single-use plastics (including personal protective equipment such as masks and gloves) due to COVID-19 pandemic. The study on *'Tackling the rise of plastic pollution during Covid times'* aims to get a deeper understanding on the consequence of using single use plastics and certain alternatives used to prevent further destruction of the environment. Research method used for this study is one in the form of online survey.

Online methods for data collection are used in a variety of situations including research among the managerial community as well as the academic community. Online surveying is widespread for surveying among individual consumers (e.g., Zviran, et.al 2006), business-to-business customers (Grant,et.al, 2005), and industrial markets (McNaughton, 1999).

The survey comprises of the following steps:

3.1.1 Selection of Area

3.1.2 Selection of Sample

3.1.3 Selection of Tool

3.1.4 Collection, Consolidation and Analysis of the Data

3.1.1. STUDY AREA

The area taken into consideration for this study is both urban and rural areas of Ernakulam, Kerala. Due to the pandemic scenario huge consideration is given to the urban population as they consist of assorted, multi- cultural and materialistic community. It has been seen that urban area use higher levels of plastics.



FIG.3.1 AREA OF THE STUDY

3.1.2 SELECTION OF SAMPLE: SAMPLE SIZE AND SAMPLING TECHNIQUE

Sample size of the respective study consisted of 100 individuals. Sampling technique adopted for the study is convenience sampling. Convenience Sampling is a type of non-probability sampling in which individuals are sampled simply because they are ‘Convenient’ sources of data for the researchers (Lavrakas, 2008). It differs from purposive sampling as judgment is not used to create a representative sample.

3.1.3 SELECTION OF TOOL

Selection of the tool is the main core of any study. A well-structured questionnaire has been put into use to collect the required data that is crucial for the study. Questionnaire is basically a tool, that comprises of a set of standard questions based on the topic of the study and to collect information, demographics, and opinions and so on. The basics of a structured questionnaire include a set of questions that gives us general information, information’s regarding the awareness about plastic pollutions, initiatives taken and techniques on tackling could help reduce the plastic pollution to leave a safe and sustainable environment for the younger generations. Questionnaire that was created for the study can be viewed in Appendix 1.

3.1.4 COLLECTION, CONSOLIDATION AND ANALYSIS OF THE DATA

The questionnaire was provided online in goggle form. The data received was consolidated and tabulated with certain softwares and keenly speculated with proper statistical tools. The statistical tools that were considered are percentiles and graphs.

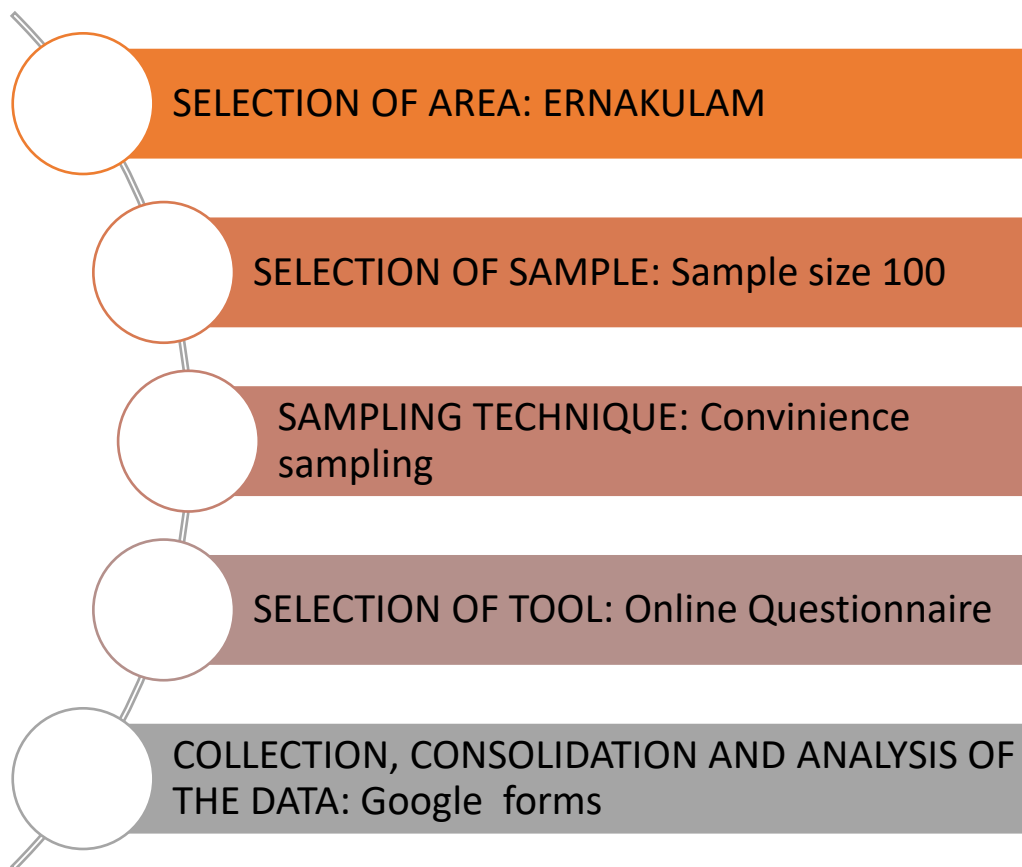


FIG.3.2 RESEARCH DESIGN

Chapter 4

RESULTS AND DISCUSSION

In today's lifestyle plastic plays an important role in an individual's life one way or another. Plastic pollution before COVID-19 pandemic was already scaling in terrestrial, aquatic, and atmospheric environments. An estimated 4.8-12.7 million metric tons (Mt) of mismanaged plastic waste generated on land entered the marine environment in 2010 alone [49], with much of this (1.2 - 2.4 million Mt) delivered by rivers. According to the study by Eriksen et al. Reported that over five trillion plastic debris was estimated floating in the world's oceans. Plastics have an excellent strength to weight ratio, and they are durable and inexpensive, making them the material of choice for most disposable medical tools, equipment, and packaging.

The study on '*Tackling the rise of plastic pollution during Covid times*' was conducted to identify the use and disposal of single use plastics during Covid times and to find out the awareness of homemakers regarding plastic pollution hazards. The study also aims in improving plastic waste management practices at household levels and to inculcate eco-friendly alternatives. The study samples do

consists of 101 homemakers. The research method used to select the samples was convenient sampling method. The tools used for research is in the form of a online questionnaire. The data collected were consolidated, analyzed and presented as follows:-

4.1 Age of Respondents

Age of the respondents is one of the most important characteristics to speculate views on the facing problem. The rise in the numerical of the age gives us idea of how mature that individual is. The respondents are classified as follows:

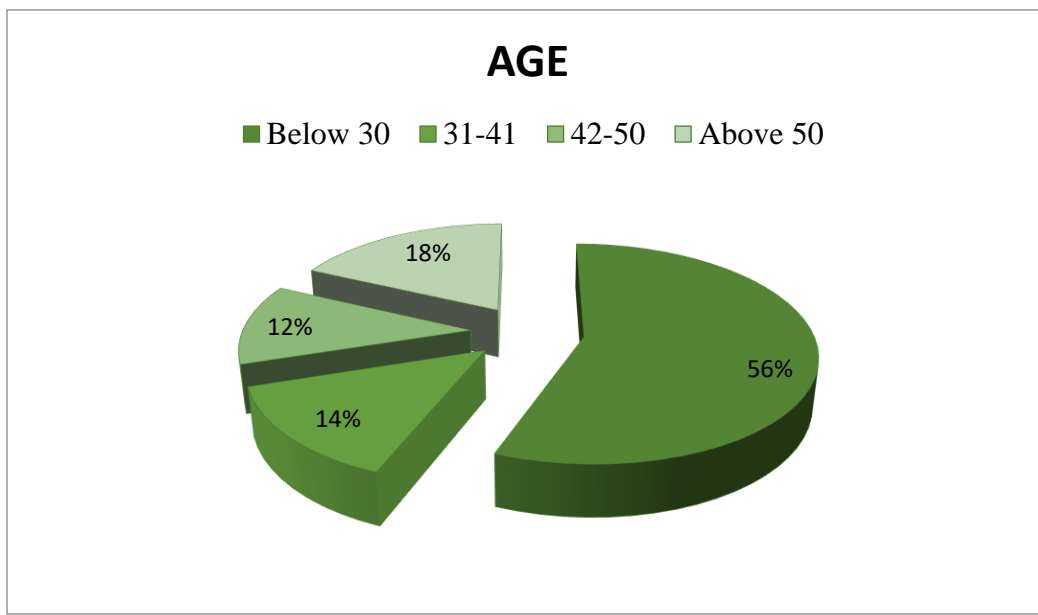


Figure 4.1 Distribution of Samples according to Age

From the above pie chart it is evident that fifty six percent of the respondents aged below thirty years take up more than half of the chart. This age group consists mostly of homemakers who are young.

The second highest ranking in the pie chart is of age group that is above fifty and highly include of the respondents above the age of fifty. Third position seen in the chart is of individuals who are in between the age of thirty one to forty one. The least number of respondents is seen between the age group of forty two to fifty.

4.2 Awareness of Plastic Pollution

Plastic pollution is seen as a serious threat to the environment, animals and to mankind as well. Plastic takes up to One Hundred years to degrade which is quite longer when compared to normal human's life, even degraded it stays as micro plastics which is present and is harmful for the environment. To know the rate of awareness of plastic pollution the given chart is represented.

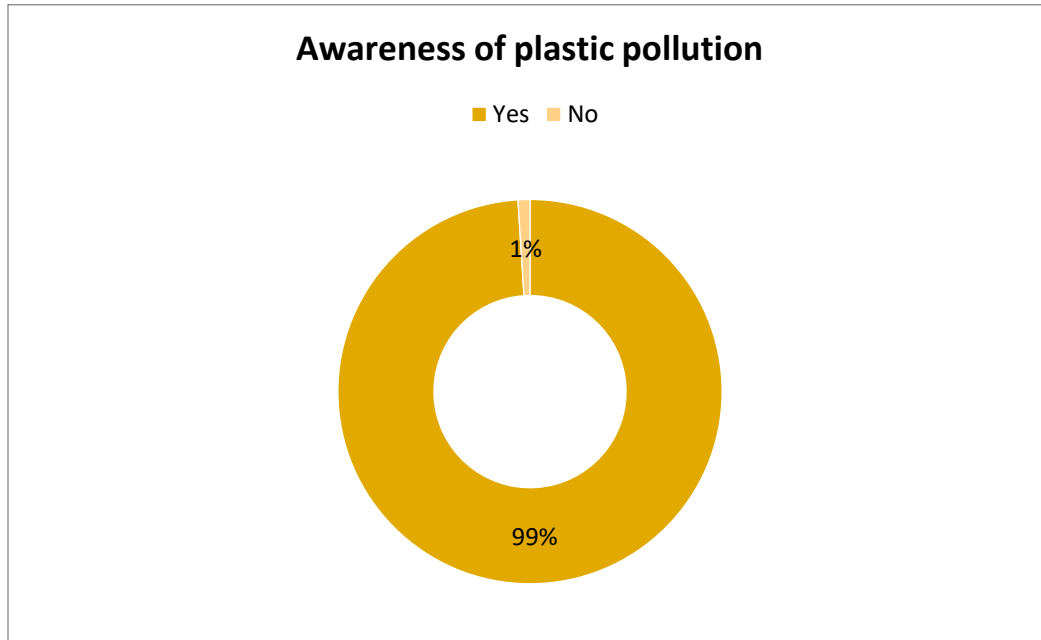


Figure 4.2 Awareness of Impact of Plastic Pollution

From the above chart it has been seen that majority of the respondents is aware of plastic pollution and its harmful effects. To specifically understand around ninety nine per cent of the individuals are aware about plastic pollution and only one percent is unaware about plastic and its toxic effects.

4.3 Opinions towards Covid and plastic pollution

Opinions of the respondents matter in the study of plastic pollution. An opinion gives us an idea of how much an individual is updated to the present and gives us a good knowledge in help studies to know about the difference and come up with a good solution

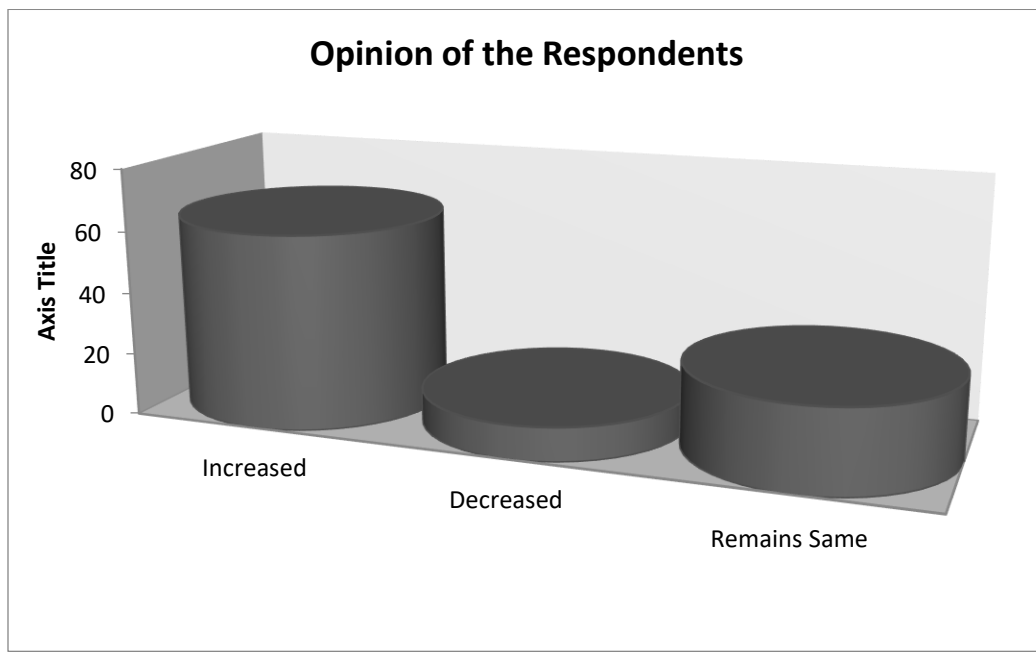


Fig 4.3 Opinion of the respondents towards Covid and plastic pollution

From the graph it is visible that the majority of the respondents responded to the increased plastic pollution, specifically speaking sixty two per cent of the population said that there is an increase in the plastic pollution. While twenty six per cent of individuals responded as plastic pollution remaining the same. The minority responded it is decreased, specifically speaking ten per cent. From the above study it can be derived that there is rise in plastics with the rise of the pandemic

4.4 Methods Used for the Disposal of Plastic

Proper disposal and waste management of plastic is an important factor, however mismanagement in the disposals lead to plastic pollution. Exposure to long term UV rays of light releases certain chemicals that are harmful for all the living forms living in both land an water. Certain disposal methods are explained below:

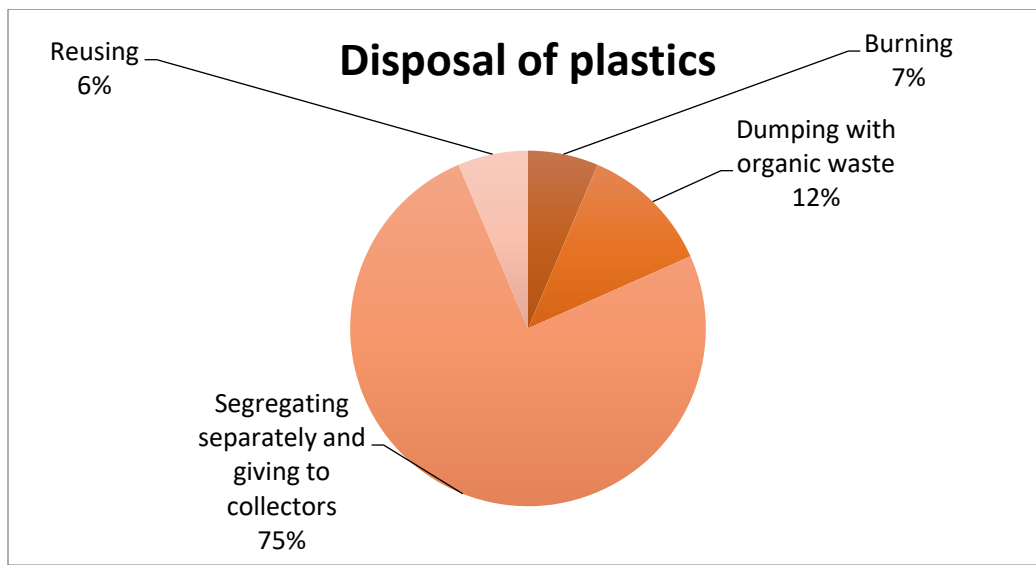


Fig 4.4 Disposal methods of Plastics

From the above graph it has been revealed that majority of the respondents chose segregating separately and giving to collectors as the means of disposing plastics, specifically speaking seventy five per cent of the individuals responded. While twelve per cent of the individuals responded that they discard plastics by dumping along with organic waste materials latter disposal methods are either by reusing or by burning it.

4.5 Reusing Plastics

Recycling plastic waste material reduces the stress and strain on finite resources of earth such as clay, wood, sand, water and so on. Reusing plastics effectively reduces the footprint of plastics on the dumpsites across the globe. Some of the products of plastics have been given to see if any of the respondents reuses they are explained as follows:

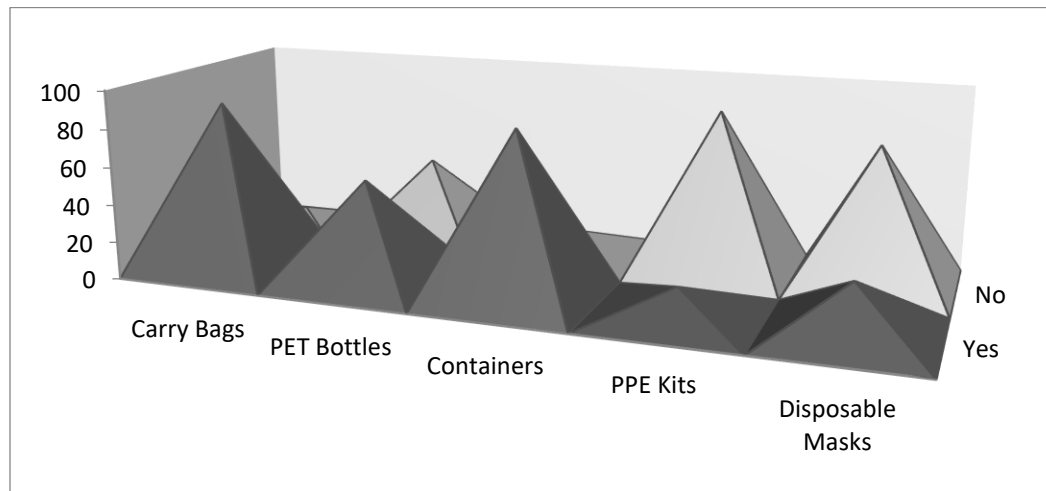


Fig 4.5 Reusing plastics

The studies show us that around eighty-nine per cent of the respondents use carry and the latter twelve of the respondents dispose plastics. In case of PET bottles fifty four percent reuse those bottles while forty seven per cent do not use and disposes it. When viewing on containers and PPE kits and disposable masks it is seen that around eighty seven of the respondents reuse containers and the rest fourteen percent disposes it, PPE kits around fifteen per cent reuse while eighty six percent disposes of it lastly in case of Disposable mask only few respondents i.e. around fifteen percent reuse the mask again the latter seventy four percent disposes it.

4.6 Presence of Plastic Pollution in Ernakulam

Plastic pollution is higher in Ernakulum state as high level of population lives in urban as well as rural areas of the state. The graph provided below will provide an insight on the level of plastics present on place where the respondent lives is studied below:

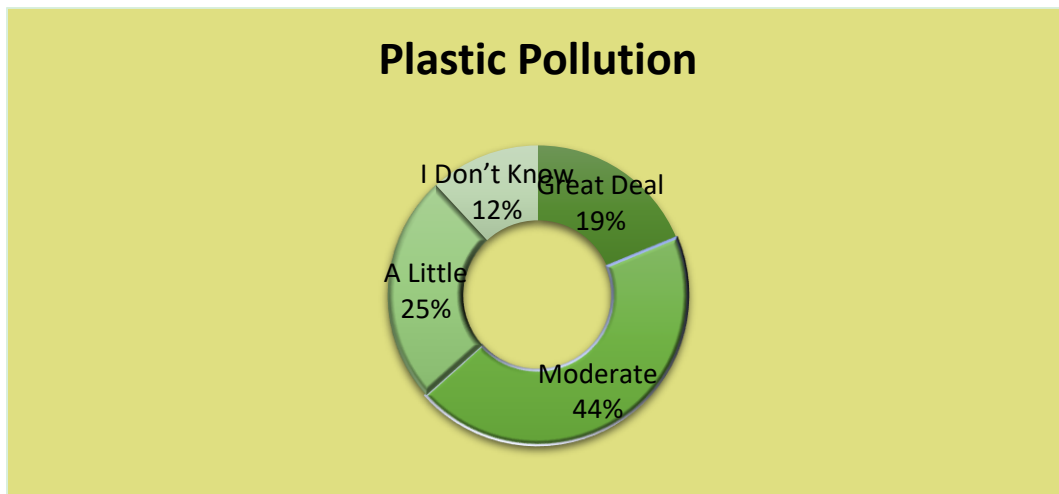


Fig 4.6 Plastic Pollution

The studies indicate that around forty-four per cent of the plastic pollution is low on the majority of respondent's places they live in. Twenty five per cent respondents shows us that only a little amount of plastic pollution is present in the areas they live in, while nineteen percent shows us that a great deal of plastic is present in the areas they live and the latter twelve per cent re not aware about the level of plastic pollution in the areas they live in.

4.7. Awareness of Government Programmes

Governments do create many awareness Programmes for the betterment of the society. Some of the ways in which government promotes such programmes is through campaigns, implementing schemes and so on, these days government targets the younger and the upcoming generation so that a change can be created. From the graph it can be studied that the majority of the respondents are indeed aware of the governments programmes, specifically speaking around fifty nine point four per cent of the individuals re ware of the programmes the rest forty point six per cent of the individuals are not aware of the programmes laid out by the government.

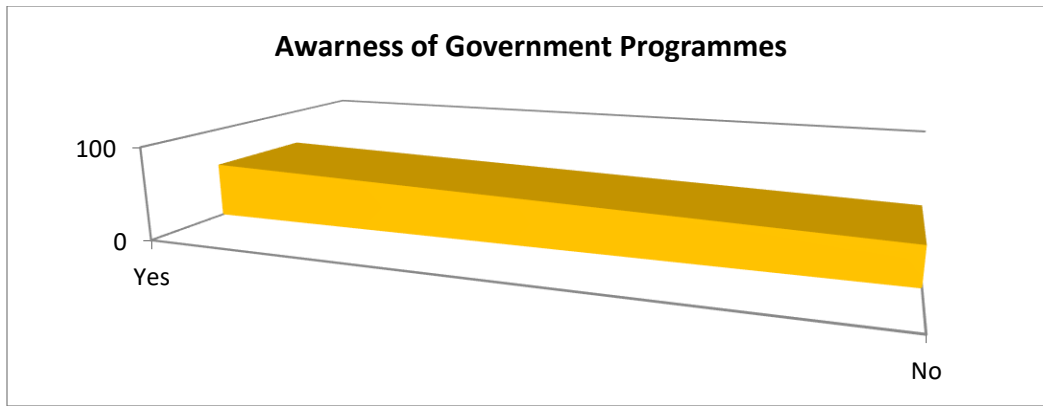


Fig 4.7 Awareness of government programmes

4.8 Schemes Used by the Government to Reduce Plastic Pollution

Schemes are used or much to say are given by the government as it helps in reducing the consumption of plastics and at the same time saves energy and consumption of other finite resources. The study provided below gives us an idea on how much schemes put forth by government help in reducing plastics, they are as follows:

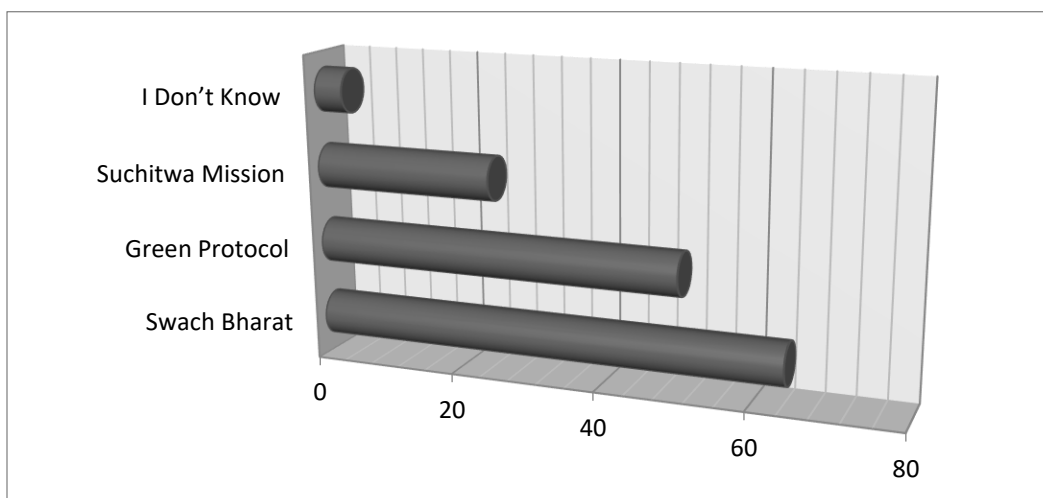


Fig 4.8 Schemes used by the government to reduce plastic pollution

The study reveals that sixty four point four per cent individuals are aware of the scheme Swachh Bharat. Fifty point five per cent individuals are aware of Green Protocol scheme. Twenty four per cent of the individuals are aware of Suchtwa mission. Four per cent of the individual are not aware of any schemes set by the government.

4.9 Methods Implemented reduce the use of plastics at household

Certain methods can be used to implement to reduce unwanted consumption of plastics. Implementation is one of the basic steps to put plans into actions in order to achieve goals. Some of the normal methods used can be studied by the following graph:

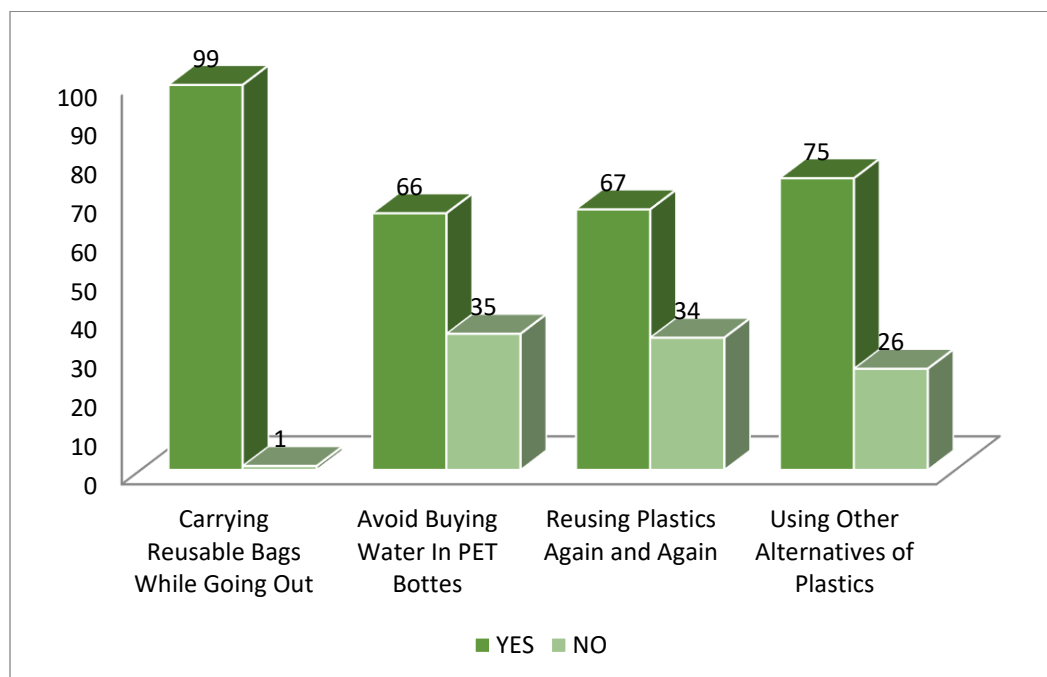


Fig 4.9 Methods implemented to reduce the use of plastics at household

The study reveals that around ninety-nine per cent of the respondents carry reusable bags while going out while one percent of the respondents do not use. Sixty-six per cent of the individual avoid buying water in PET bottles while thirty-five per cent of the individuals buy water in PET bottles. It is seen that sixty-seven per cent of the individuals reuse plastics again and again the rest thirty-four per cent individuals dispose plastics without reusing them. Reusing of plastics can be in the form of art or by any other methods. It is seen that around seventy five per cent of the respondents uses alternatives rather than plastics while twenty six per cent of the respondents use plastics.

4.10 Alternatives of Plastic Carry Bags

It has been a very long time that mankind has been using plastics in the form of carry bags. It is highly used because of its strength, durability and low cost of the materials. However, alternatives are been used them are as follows:

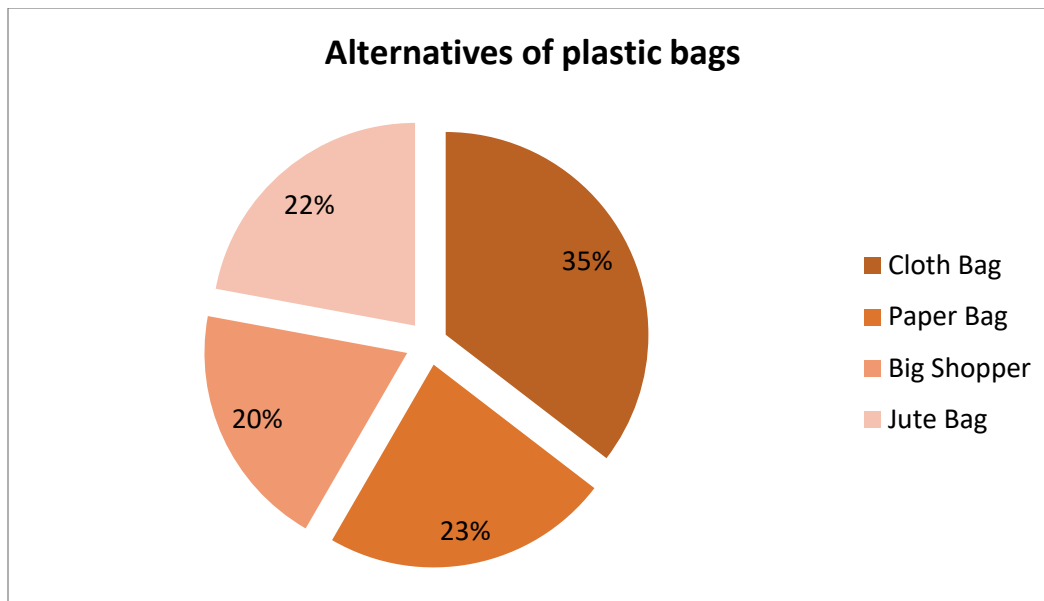
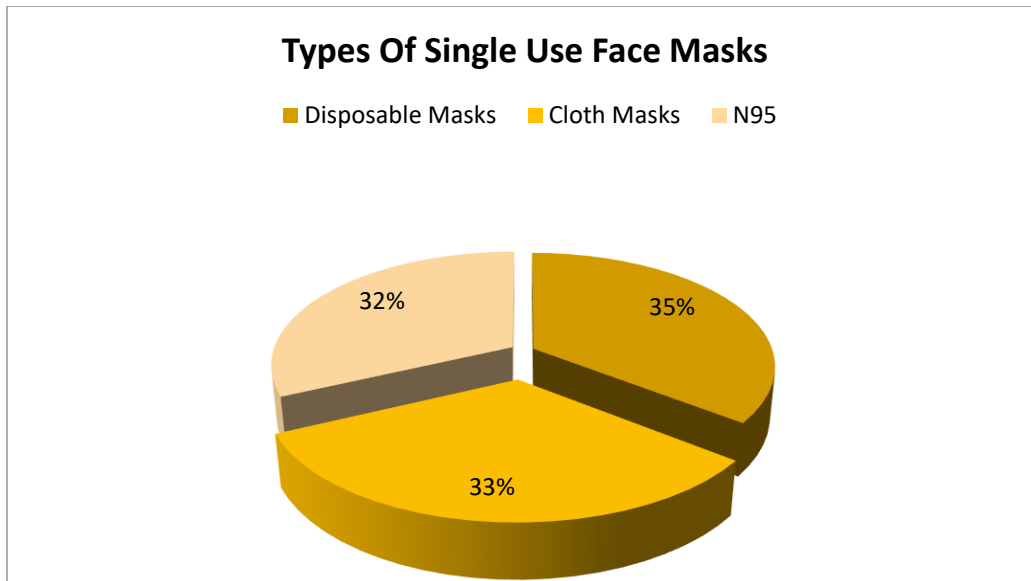


Fig 4.10 Alternatives of Plastic Carry Bags

The study shown above reveals that thirty-five per cent of the respondents uses cloth bags. Twenty-three per cent of the respondents use paper bags as another alternative. Twenty per cent uses big shopper as an alternative. Twenty-two per cent uses jute bags as an alternative. From it can be said that other alternatives are been instead of plastic bags.

4.9 Types of Masks Used by the Respondents

Due to the rise in the Covid-19 scenario according to World Health Organization it is mandatory to wear facemasks. Medical masks were provided to reduce spread of disease as being said a shortage in the market of single use plastics came so people started

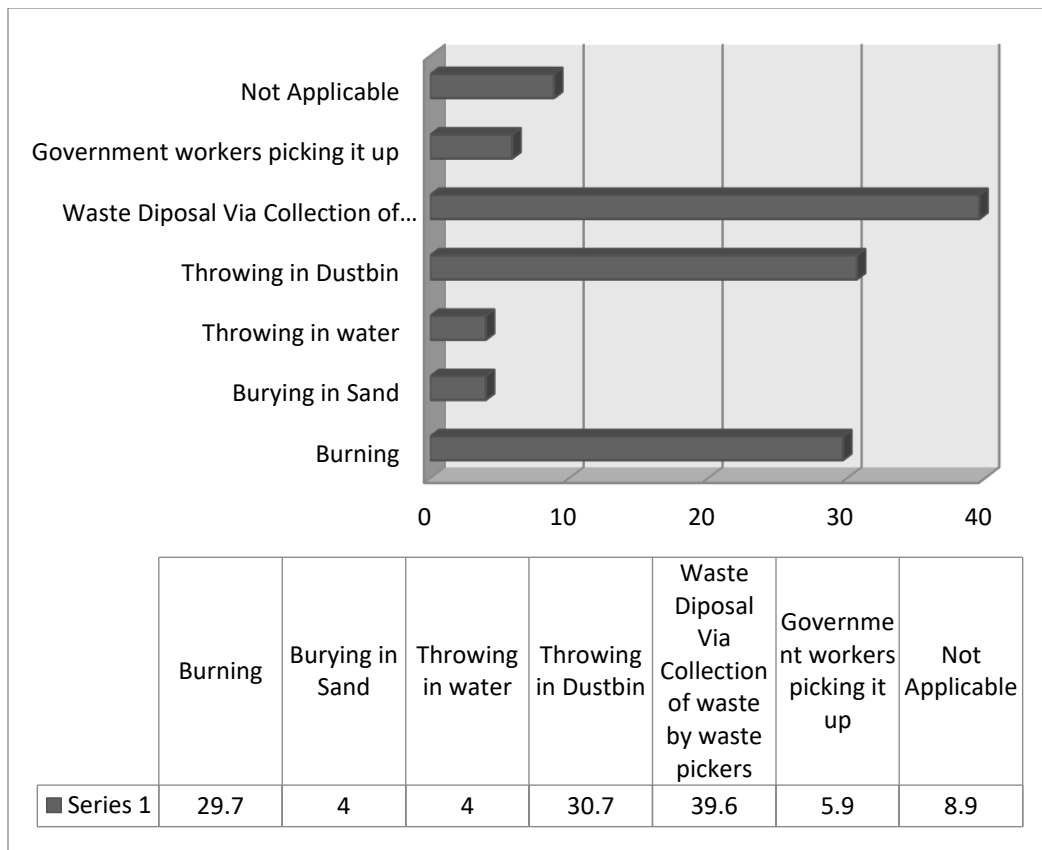


4.11 Types of Single Use Face Masks

From the above studies it is evident that thirty-five per cent of the respondents uses disposable masks, while thirty three per cent uses cloth masks and thirty two per cent of the individual use N95 masks on a daily basis.

4.12 Disposal of Plastic Mask

Masks have been a part of daily lives of every individual since the time of a pandemic. There are many ways in which one can dispose plastic masks. The graph below shows us on how respondent dispose their masks after usage.

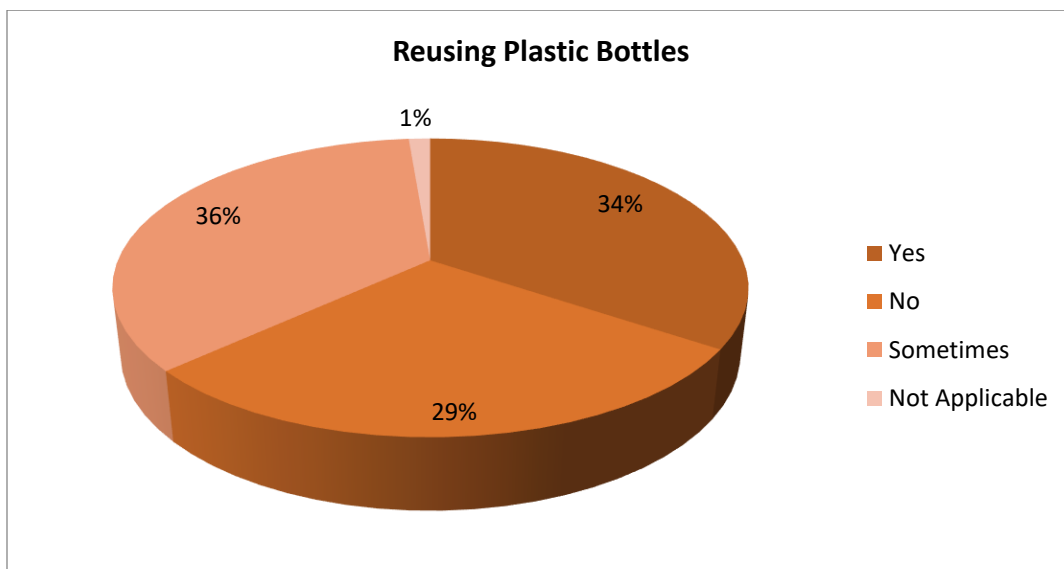


4.12 Methods of Disposal of masks

From the above results it is evident that thirty nine point nine percent of the individuals dispose wastes via collection of wastes by waste pickers. Thirty per cent throw them into the dustbins. Twenty nine per cent disposes via burning and the latter by burying in sand , throwing in water, government workers picking up and its not applicable for a few respondents.

4.13 Reusing Plastic Bottles

Certain plastic bottles are reusable; it highly depends on the time period and the quality of how long it can be used. The study helps in analyzing how many respondents use plastic bottles. From the study it is revealed that thirty six per cent reuses plastic bottles at times while thirty four per cent stated that they reuse plastic bottles. Twenty nine per cent of the respondents do not reuse plastic bottles and dispose them after a single use. One per cent reported as not applicable.



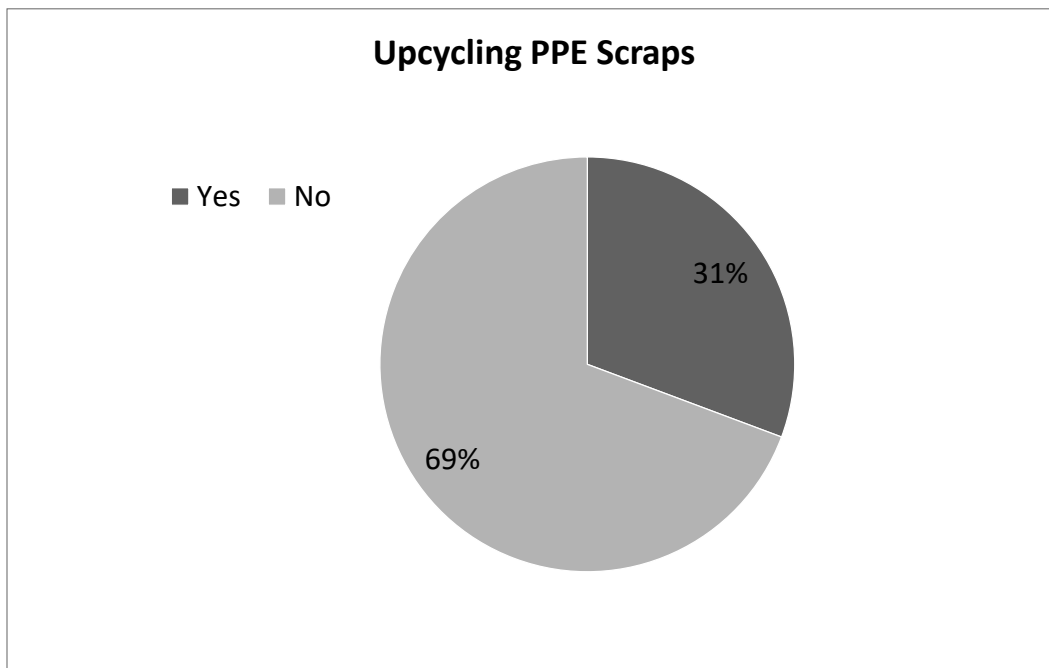
4.13 Reusing Plastic Bottles

The graph presented above sheds a light on how much of the respondents reuse plastic bottles. Around thirty-six per cent of the respondents may reuse plastic bottle sometimes well sometimes they don't while for thirty-four per cent of the individuals reuse plastic bottles and the latter twenty-nine per cent of the individuals do not reuse

plastic bottles. To the minority one per cent the question is not applicable.

4.14. Awareness on up cycling of PPE Scraps

Most of the materials are recyclable and can be changed to different forms. The art of up cycling can be done for PPE Scraps.

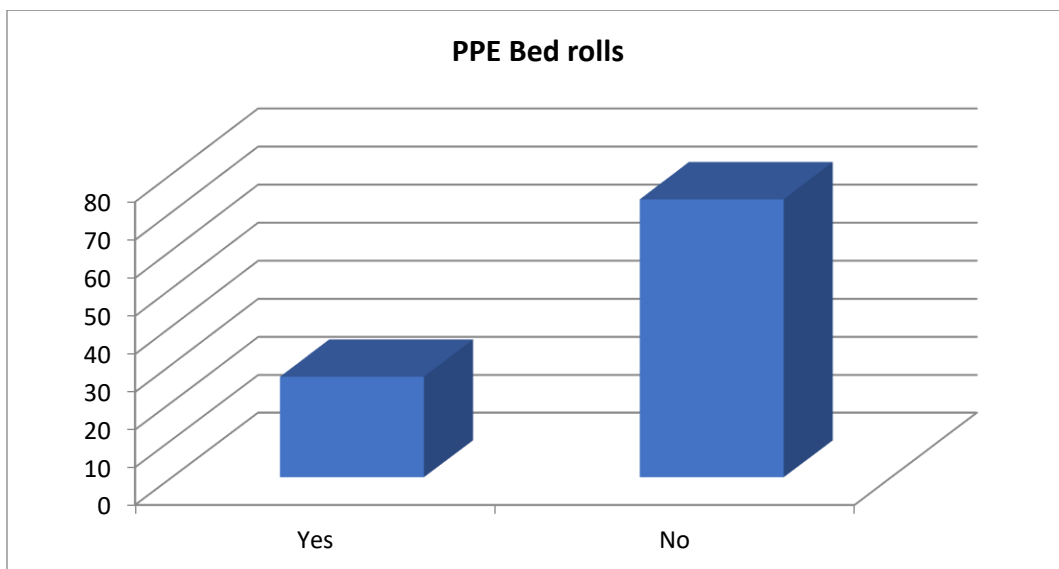


4.14 Awareness on up cycling of PPE Scraps

From the above graph it is evident that around sixty nine per cent of the individuals are aware of up cycling PPE scraps while thirty one per cent of the individual are not aware. It can be a seen a awareness on converting PPE scraps is beneficial.

4.15. PPE Bed Rolls

PPE bed rolls is one of the initiatives taken by Lakshmi Menon from Ernakulam, who is a eco-innovator and the founder of Pure Living, an organization based on sustainable livelihoods. From the graph it is evident that sixty-nine per cent of the respondents are not aware of such innovative ideas that are being good for the society. The rest twenty-six point seven per cent of the individuals are aware of the PPE bed rolls.

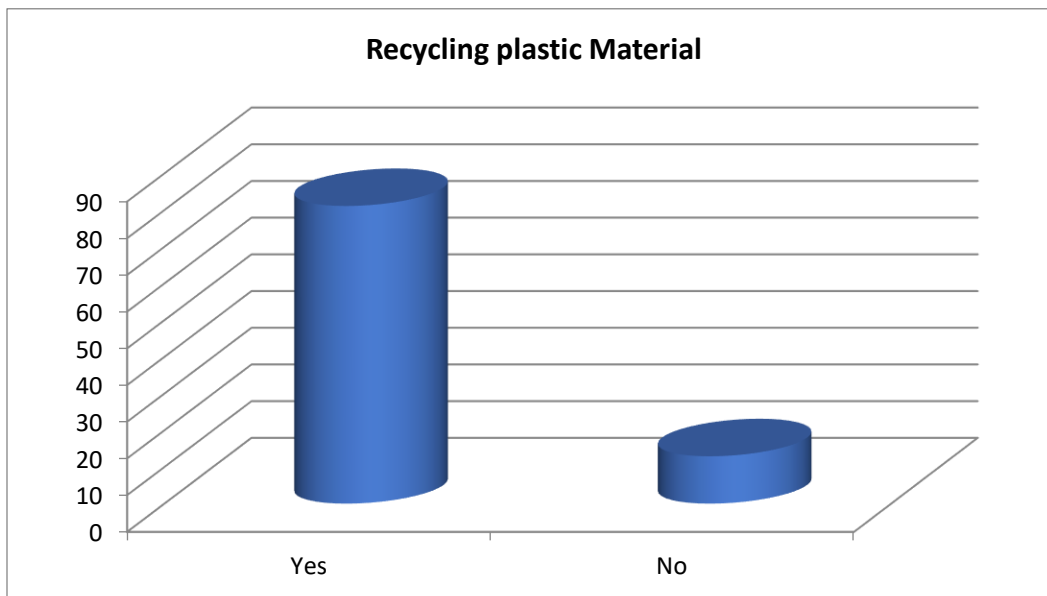


4.15 PPE Bed Rolls

From the graph it is evident that sixty nine per cent of the respondents are not aware of such innovative ideas that are being good for the society. The rest twenty six point seven per cent of the individuals are aware of the PPE bed rolls.

4.16. Awareness on Recycling Plastic Material

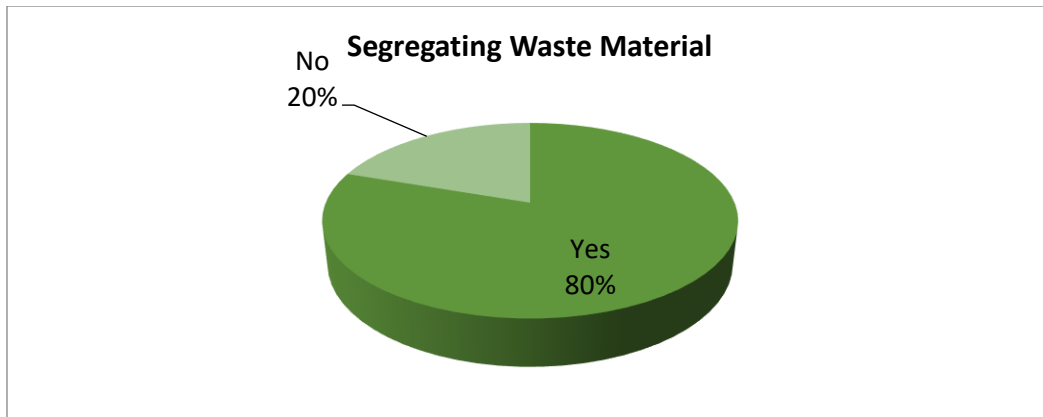
Plastics are highly malleable and can be turned to different form, shape and structure. Around eighty-seven per cent of the respondents do recycle plastic materials and are highly aware of the benefits of recycling plastic materials. From the study it is evident that eighty per cent of the respondents recycle plastic materials, while twenty per cent do not have any awareness about recycling plastic materials.



4.16 Awareness of Recycling Plastic Material

4.17. Segregation of Waste Materials

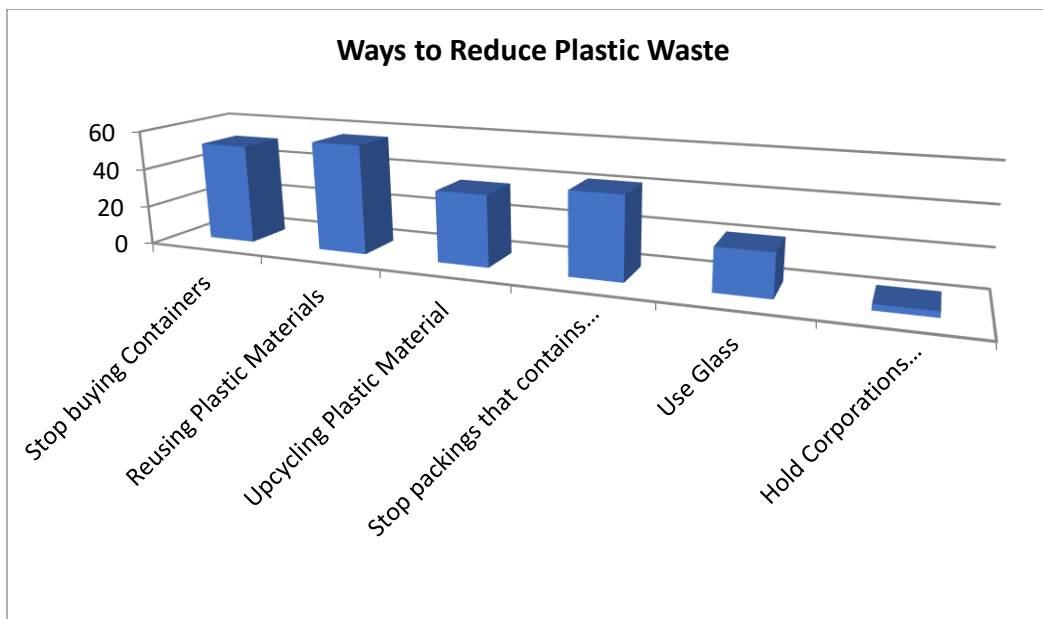
Segregation basically means action or state of setting something apart. Segregating waste materials is one major technique of handling waste materials. It is easier for the Government Corporation and waste pickers to collect waste in a much cleaner way.



4.17 Segregation of waste materials

It is seen that around eighty per cent of the respondents do segregate waste materials before giving it out and the rest twenty per cent of the respondents do not segregate waste materials before giving it to collectors or dumping out in the trashes.

4.18. Effective Ways to Reduce Plastic Pollution

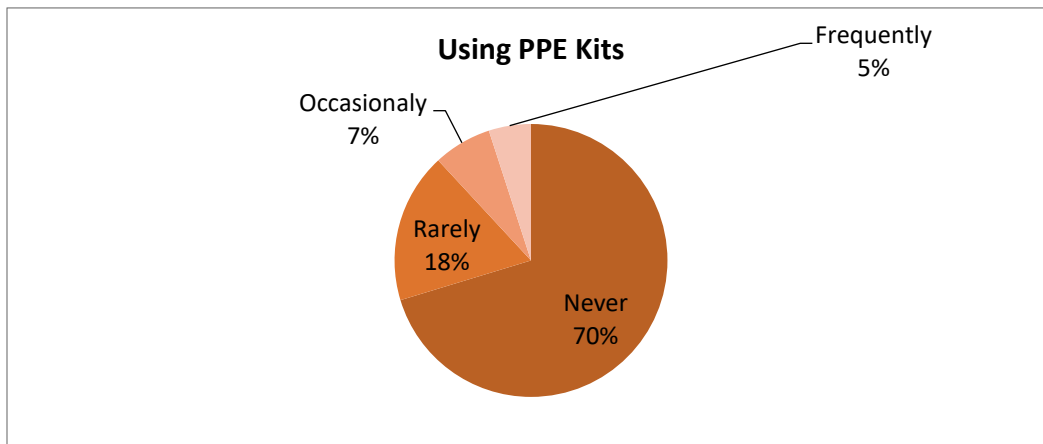


4.18 Ways to reduce Plastic Pollution

From the above graph it can be seen that it can be seen that around fifty six per cent of the respondents reuse plastic materials, fifty two per cent stops buying plastic containers from outside, forty three per cent stops buying the packing's that contains plastic materials, thirty seven percent up cycles the plastic materials they have brought, twenty one per cent of the respondents use glass products to buy materials instead of plastics, the rest three per cent of the respondents holds the corporations accountable for promoting plastics.

4.19. Usage PPE Kits

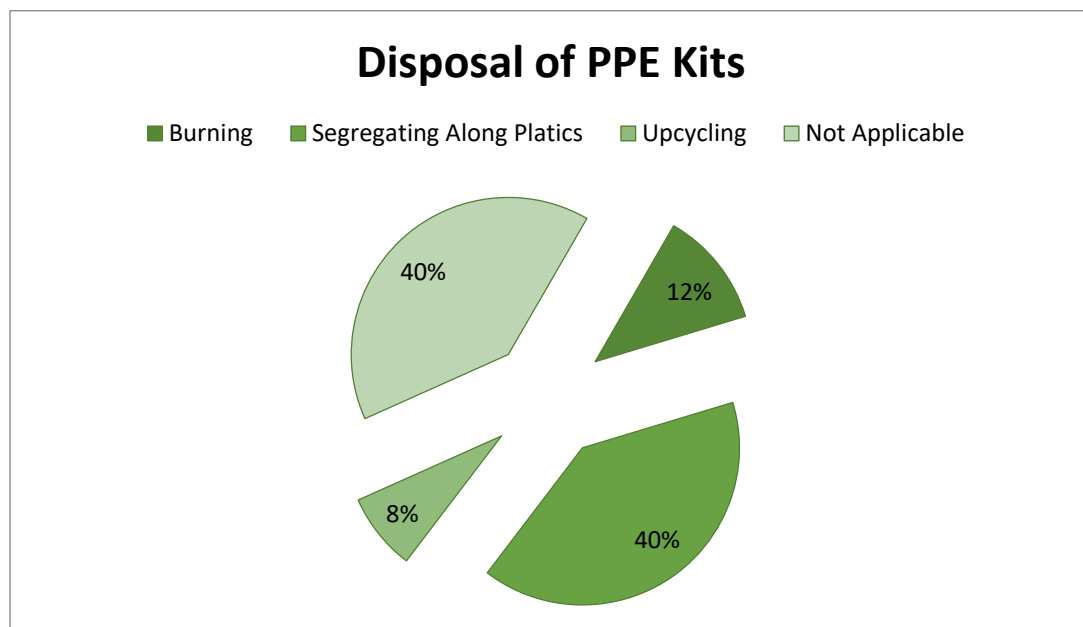
Personal Protective Equipment's (PPEs) are protective gears designed to safeguard the health of workers by minimizing the exposure of biological agents. Due to the sudden increase in the pandemic situations the disposal of PPE kits has increased globally to reduce cross contamination.



4.19 Usage of PPE Kits

From the above study it is seen that seventy per cent of the individuals do not use PPE kits., while eighteen per cent do use PPE kits the latter seven per cent occasionally use the PPE kits and the five per cent frequently use PPE kits.

4.20. Disposal of PPE Kits

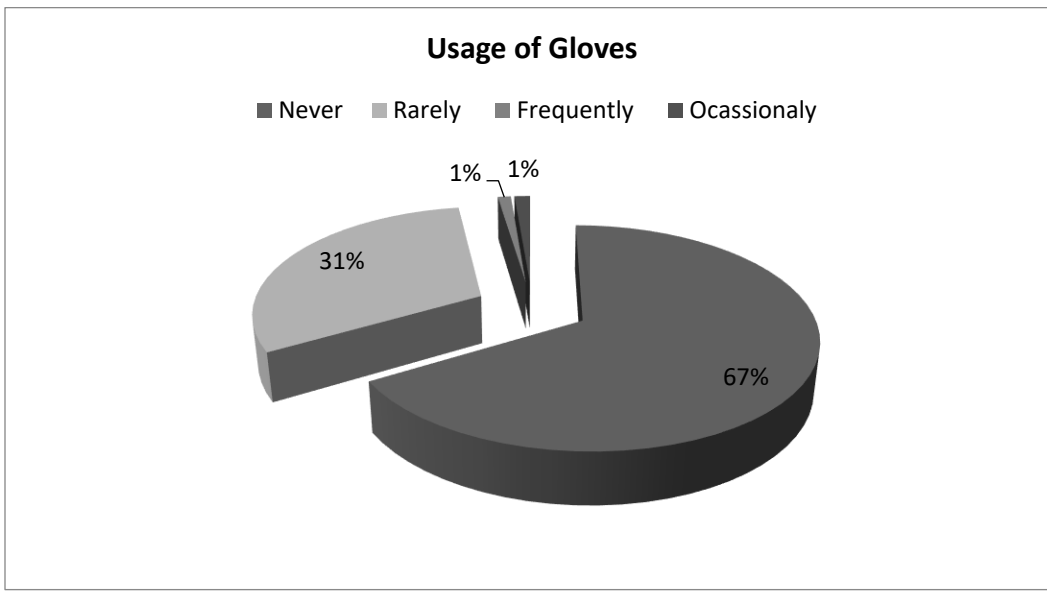


4.20 Disposal of PPE Kits

Around forty per cent of the respondents up cycle PPE Kits. Other forty per cent of the respondents dispose PPE kits before segregating along plastics and rest of the respondents use burning tactics.

4.21. Usage of Gloves

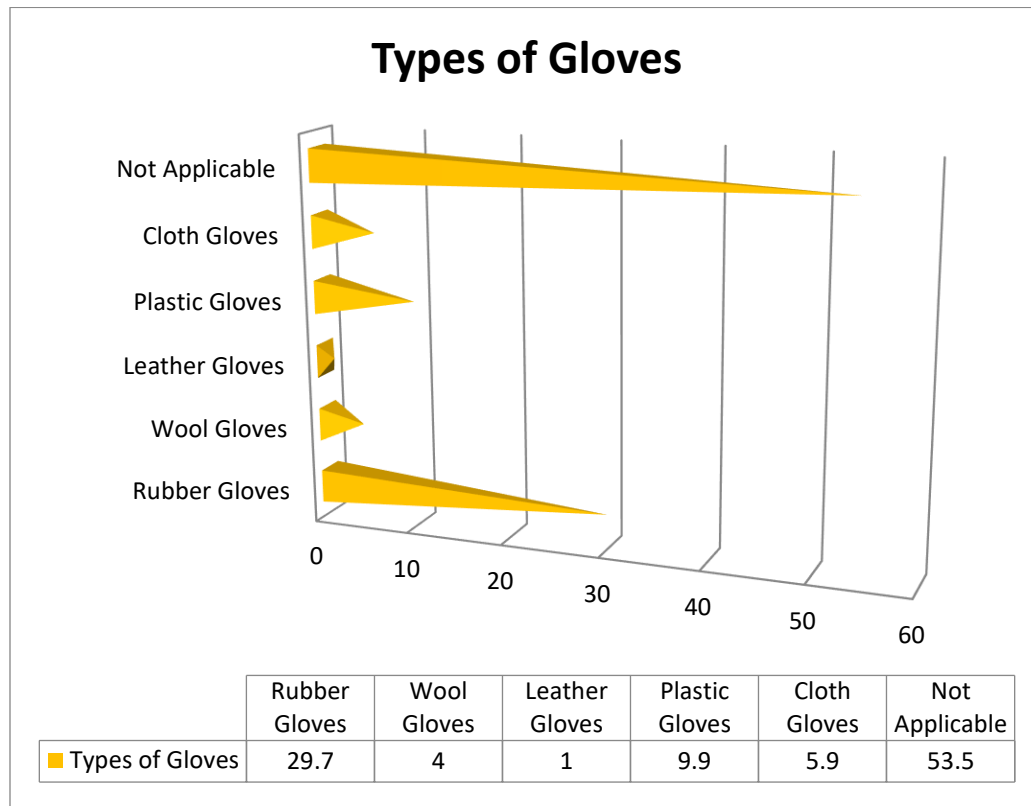
Gloves are one of the important equipment in a PPE kits to avoid unwanted cross contamination in this pandemic period. It helps to keep your hands cleaner and lessen the chance of getting germs that can make one sick.



4.21 Usage of gloves

When the pandemic was at its peak level gloves were highly used to prevent cross contamination. From the above studies it has been incurred that sixty seven per cent of the respondents occasionally use gloves. Thirty one per cent rarely uses gloves, the rest two per cent may or may not use gloves.

4.22. Types of gloves

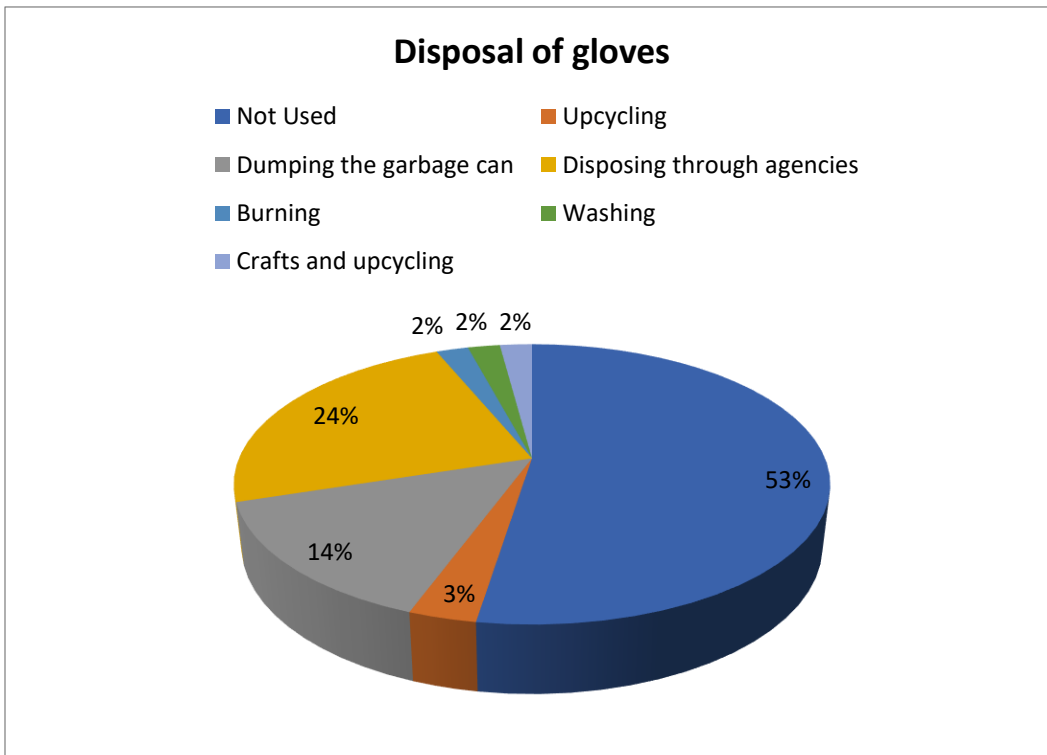


4.22. Types of gloves

From the above studies it is seen that around fifty-three point five per cent of the respondents the question is not applicable. Twenty-nine point seven per cent of the individuals prefer to wear rubber gloves, nine per cent of the individuals use plastic gloves, five per cent use cloth gloves, four percent use wool gloves and the minority one percent uses leather gloves.

4.23. Disposal of Gloves

An increase in the pandemic scenario has made one to increase in the production and usage of gloves worldwide, the disposal of single use gloves has become a major concern among all the nations. Different methods of disposal of gloves has been explained below.



4.23 Disposal of gloves

From the above pie chart it can be studied that over fifty four per cent of the respondents do not use gloves at all. Twenty four per cent of the individuals dispose gloves through agencies. Fifteen per cent create crafts and up cycles the used gloves. The latter six per cent of the respondents either washes or burns gloves.

Chapter 5

SUMMARY AND CONCLUSION

Plastics are long chain polymers that are easily pliable and can move or adjusted accordingly. John Wesley Hyatt created the polymer as a substitute of ivory. It was considered as one of the greatest invention before world wars. The increase in the production of the plastics and the accumulation of these wastes slowly led to plastic pollution hence harming the environment and mankind in various aspects.

Hundred million tons of plastic are produced all over the world and twenty percent of the solid waste in most developed countries is plastic, in developing countries the condition is more severe, plastic accumulates at the rate of 25 million tons per year. In India it is estimated to be 2 million tons with the use of plastic at 2kg/person/year. The study on '*Tackling the Rise of Plastic Pollution During Covid Times*' explores the recent trends in the use and disposal of plastic and inculcate an awareness among the homemakers on effective measures that can be adopted for disposing plastic. The result obtained for the study is summarized in following points:-

1. The methodology adopted for the study is a baseline survey to explore the current trends in use of plastic and its disposal

practices and awareness of homemakers regarding adverse effects of plastic pollution.

2. The area selected for the study is Ernakulam City. Today in Ernakulam city, plastic waste management is constrained by the lack of public awareness. Disposal of one time use plastic is very much common in this area. Moreover, with the rise of Covid 19 pandemic, it become more common, in the form of mask, gloves, PPE kits and plastic packing materials. Purchase of packed food in one time use plastic is also a common prevailing culture in the district.
3. A sample of hundred households in Ernakulam city were selected using convenience sampling technique.
4. An online questionnaire will be formulated for collecting information regarding awareness on hazards of plastic pollution and practice of use and disposal of plastic among the city dwellers, as the tool for the study.
5. The data gathered will be consolidated, classified, tabulated and analyzed.
6. The study reveals that 56% fifty six percent of the respondents aged below thirty years. The second highest is of age group that is above fifty and finally in between the age of thirty one to forty one includes 32%.
7. The study shows that majority of the respondents are aware of plastic pollution and its harmful effects.

8. Majority of the respondents agrees that there is a steep increase of plastic after the pandemic.
9. The study reveals that majority of the respondents chose segregating plastic waste separately and giving to collectors.
10. The study shows that around eighty-nine per cent of the respondents use plastic carry bags regularly.
11. In case of PET bottles fifty four percent reuse those bottles while forty seven per cent does not.
12. PPE kits and disposable masks - eighty seven percent of the respondents dispose it directly to corporation bin, with out disinfection.
13. The study shows that 44% of the respondents opines that plastic pollution is low in the places where they live in. 25% says moderate amount of plastic pollution is present in the areas they live in, while 19% of the respondents says that there is a great deal of plastic pollution in the areas where they live.
14. The study reveals that majority of the respondents (59%) are aware of the governments programmes.
15. The study reveals that sixty four point four per cent individuals are aware of the scheme Swach Bharat. Fifty point five per cent individuals are aware of Green Protocol scheme. Twenty four per cent of the individuals are aware of Suchtwa mission. 4% of the individual are not aware of any schemes set by the government.

16. The study reveals that around ninety-nine per cent of the respondents carry reusable bags while going out while one percent of the respondents do not use. Sixty-six per cent of the individual avoid buying water in PET bottles while thirty-five per cent of the individuals buy water in PET bottles.
17. Sixty-seven per cent of the individuals reuse plastics again and again the rest thirty-four per cent individuals dispose plastics without reusing them. Reusing of plastics can be in the form of art or by any other methods. It is seen that around seventy-five per cent of the respondents uses alternatives rather than plastics while twenty-six per cent of the respondents use plastics.
18. The study shown above reveals that thirty five per cent of the respondents uses cloth bags. Twenty-three per cent of the respondents use paper bags as another alternative. Twenty per cent uses big shopper as an alternative. Twenty-two per cent uses jute bags as an alternative. From it can be said that other alternatives are been instead of plastic bags.
19. Thirty-five per cent of the respondents uses disposable masks, while thirty three per cent uses cloth masks and thirty two per cent of the individual use N95 masks on a daily basis.
20. The study reveals that thirty-nine percent of the individuals dispose wastes via collection of wastes by waste pickers. Thirty per cent throw them into the dustbins. 29% disposes via burning and the rest by burying in sand and throwing carelessly.

21. The study it is revealed that thirty-six per cent reuses plastic bottles at times while thirty-four per cent stated that they reuse plastic bottles. Twenty-nine per cent of the respondents do not reuse plastic bottles and dispose them after a single use.
22. Thirty-six per cent of the respondents reuse plastic bottle sometimes, thirty-four per cent of the individuals reuse plastic bottles and the rest twenty-nine per cent of the individuals do not reuse plastic bottles.
23. Sixty nine per cent of the individuals are aware of up cycling PPE scraps while thirty one per cent of the individual are not aware.
24. Sixty-nine per cent of the respondents are not aware of such innovative ideas that are being good for the society. The rest twenty-six point seven per cent of the individuals are aware of the PPE bed rolls.
25. The study it is evident that eighty per cent of the respondents recycle plastic materials, while twenty per cent do not have any awareness about recycling plastic materials.
26. Eighty per cent of the respondents do segregate waste materials before giving it out and the rest twenty per cent of the respondents do not segregate waste materials before giving it to collectors or dumping out in the trashes.
27. Fifty six per cent of the respondents reuse plastic materials, fifty two per cent stops buying plastic containers from outside, forty

- three per cent stops buying the packings that contains plastic materials and thirty seven percent up cycles the plastic materials,
28. The study reveals that 70% of the individuals do not use PPE kits., while eighteen per cent do use PPE kits the latter seven per cent occasionally use the PPE kits and the five per cent frequently use PPE kits.
29. Forty per cent of the respondents up cycles PPE Kits Other forty per cent of the respondents dispose PPE kits with out segregating along plastics and rest of the respondents use burning method.
30. When the pandemic was at its peak level gloves were highly used to prevent cross contamination. From the study it has been incurred that sixty-seven per cent of the respondents occasionally use gloves. Thirty-one per cent rarely uses gloves, the rest two per cent may or may not use gloves.
31. Twenty-nine per cent of the individuals prefer to wear rubber gloves, nine per cent of the individuals use plastic gloves, five per cent use cloth gloves, four percent use wool gloves and the minority one percent uses leather gloves.
32. The study reveals that over fifty-four per cent of the respondents do not use gloves at all. Twenty-four per cent of the individuals dispose gloves through agencies. Fifteen per cent create crafts out of it and up cycles the used gloves. The rest six per cent of the respondents either washes or burns gloves.

CONCLUSION

The study echoes the fact that education at the micro level can bring about a significant change in the awareness level of people, thereby leading to change in attitudes and practices of the people regarding plastic waste management. People come to be aware on the adverse impact on throwing a plastic waste into the garbage or corporation bin and how it mars our environment. This awareness alone can help to protect our Mother Earth, make peace and take care of life in the present moment and in the future. If one is aware of this, naturally they will try to dispose fewer plastic waste, an act of peace, a pact with nature, thereby we can restore the beauty of the Earth.

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APPENDIX 1

QUESTIONNAIRE TO ELICIT INFORMATION REGARDING TACKLING THE RISE OF PLASTIC POLLUTION DURING COVID TIMES

Email

Name

1. Age
2. Gender
 - Male
 - Female
 - Prefer not to say

3. Are you aware of the plastic pollution and the impact it has created in the environment?
 - Yes
 - No

4. In your opinion after covid19 plastic pollution
- Increased
 - Decreased
 - Remains the same
5. How do you dispose plastic wastes at home?
- Burning
 - Dumping with organic waste
 - Segregating it separately and giving to collectors
 - Reusing
 - Other
6. Do you reuse plastics?
- | | Yes | No |
|---------------------------------------|-----|----|
| <input type="radio"/> Carry bags | | |
| <input type="radio"/> PET Bottles | | |
| <input type="radio"/> Containers | | |
| <input type="radio"/> PPE kits | | |
| <input type="radio"/> Disposable bags | | |
7. How much plastic pollution is present in the area you live in?
- A Great Deal
 - Moderate amount
 - A Little
 - I don't know

8. Do you think government is taking necessary measures in tackling plastic pollution?
- Yes
 - No
9. Specify the initiatives of Government/NGO's reduce plastic pollution in India.
- Swachh Bharat
 - Green protocol
 - Suchtwa mission
 - Don't Know
 - Others
10. What methods do you implement to reduce the usage of plastics?
- | | Yes | No |
|--|-----|----|
| <input type="radio"/> Carrying reusable bags while going out | | |
| <input type="radio"/> Avoid buying water in PET bottles | | |
| <input type="radio"/> Reusing plastics again and again | | |
| <input type="radio"/> Using other alternatives of plastics | | |

If Yes, specify the alternatives:

.....

.....

11. What are the other options of plastic carry bags you use?

- Cloth bags
- Paper bags
- Jute bags
- Big shopper
- None
- Others.....

12. What type of mask do you use while going out?

- Disposable masks
- Cloth masks
- N95
- Others.....

13. How do you dispose of the used plastic masks?

- Burning
- Burying in sand
- Throwing in water
- Not Applicable
- Waste disposal via collection of waste by waste pickers
- Throwing In dustbins
- Picking waste by government workers

14. Do you reuse plastic bottles after drinking beverages?

- Yes
- No
- Sometimes
- Not Applicable
- Other.....

15. Are you aware of any eco-friendly protocols, Specify

.....

16. Are you aware of any upcycling of PPE scraps?

- Yes
- No

17. Are you aware of new PPE bed rolls made for Covid patients using used PPE kits?

- Yes
- No
- Other.....

18. Are you aware of recycling plastic materials?

- Yes
- No
- Other.....

19. Do you segregate waste materials at home?

- Yes
- No

20. What are the effective ways in which one can reduce plastic pollution?

- Stop buying plastic containers
- Reuse plastic materials
- Upcycling plastic materials
- Stop packing of different materials in plastic containers ,bags, bottles etc which may increase the cost
- Use glass
- Hold major corporations accountable
- Others.....

21. Do you use PPE kits?

- Never
- Rarely
- Occasionally
- Frequently

22. How will you dispose of used PPE kits?

- Burning
- Segregating plastic waste
- Disposing in sand
- Upcycling
- Not Applicable

23. Do you wear gloves while going out?

- Yes
- No

24. What types of gloves do you use?

- Rubber glove
- Wool glove
- Plastic glove
- Leather glove
- Cloth glove
- Other.....

25.How do you dispose used gloves?

- Burning
- Upcycling
- Creating craft items
- Dumping in garbage can
- Disposing through agencies by municipality
- Washing
- Other.....