AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS AMONG COLLEGE STUDENTS IN TIRUNELVELI DISTRICT

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Archers & Elevators Publishing House

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Website: www.aeph.in

First Edition 2020

ISBN:

Price:Rs

PRINTED IN INDIA

A& E printers, Bangalore-90.

ACKNOWLEDGEMENT

First and foremost, we glorify The Lord Almighty for the wisdom he bestowed upon us, the strength, peace of mind, and good health to finish this project.

We are highly indebted to our ICM Congregation for the golden opportunity to do this meaningful project on the topic “Awareness on Detrimental Effects of Single-Use Plastics among College Students in Tirunelveli District”.

We would like to express our sincere gratitude to Rev.Sr.A.Magdelene Therese, Secretary, St.Ignatius College of Education, for her incessant encouragement and for providing the necessary support to complete this project.

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ABBREVIATIONS

ANOVA	: Analysis of Variance.
BPA	: Bisphenol A
DDT	: Dichlorodiphenyltrichloroethane
DESPA	: Detrimental Effects of Single-use Plastics Awareness
DEHP	: Diethyl hexyl phthalate
Fig.No	: Figure Number
HDPE	: High-Density Polyethylene
LDPE	: Low-Density Polyethylene
PETE	: Polyethylene Terephthalate
PCC	: Polyvinyl chloride
PP	: Polypropylene
PS	: Polystyrene or Styrofoam
SD	: Standard Deviation
SUP	: Single Use Plastics

CHAPTER-I

INTRODUCTION AND CONCEPTUAL FRAMEWORK

DEFINITION-ENVIRONMENT

The word Environment is derived from the French word "Environ" which means "surrounding". Our surrounding includes biotic factors like human beings, Plants, animals, microbes, etc and abiotic factors such as light, air, water, soil, etc. Environment is a complex of many variables, which surrounds man as well as the living organisms. Environment includes water, air and land and the interrelation ships which exist among and between water, air and land and human beings and other living creatures such as plants, animals and microorganisms (Kalavathy, 2004).She suggested that environment consists of an inseparable whole system constituted by physical, chemical, biological, social and cultural elements, which are interlinked individually and collectively in myriad ways. The natural environment consist of four interlinking systems namely, the atmosphere, the hydrosphere, the lithosphere and the biosphere. These four systems are in constant change and such changes are affected by human activities and vice versa (Kumarasamy et al., 2004).

CATEGORIES OF ENVIRONMENT

Natural Environment

Natural environment is not man-made and has resulted from the evolutionary process. In a natural environment the environmental system operates through a self regulating mechanism called 'homeostatic' mechanism. In this mechanism, if any change is brought about in the natural environment by any one component (air,water,soil,forest,etc.), it is counter-balanced by changes in some other component in order to maintain stability.(Dasmohapatra,G.2009).

Man-made Environment

Man, the most advanced among all the animals, can modify the environment to a great extent with the help of various technologies. Man-made environment include buildings, transport vehicles, power plants and space labs.

COMPONENTS OF ENVIRONMENT

Our environment has been classified into four major components: 1.Hydrosphere, 2.Lithosphere, 3.Atmosphere, 4.Biosphere.

Hydrosphere

Hydrosphere includes all water bodies such as lakes, ponds, rivers, streams and ocean etc. Hydrosphere functions in a cyclic nature, which is termed as hydrological cycle or water cycle.

Lithosphere

Lithosphere means the mantle of rocks constituting the earth's crust. The earth is a cold spherical solid planet of the solar system, which spins in its axis and revolves around the sun at a certain constant distance. Lithosphere mainly, contains soil, earth rocks, mountain etc. Lithosphere is divided into three layers-crusts, mantle and core.

Atmosphere

The cover of the air, that envelope the earth is known as the atmosphere. Atmosphere is a thin layer which contains gases like oxygen, carbon dioxide etc. and which protects the solid earth and human beings from the harmful radiations of the sun. There are five concentric layers within the atmosphere, which can be differentiated on the basis of temperature and each layer has its own characteristics. These

include the troposphere, the stratosphere, the mesosphere, the thermosphere and the exosphere (Kalavathy, 2004).

Biosphere

It is otherwise known as the life layer, it refers to all organisms on the earth's surface and their interaction with water and air. It consists of plants, animals and micro-organisms, ranging from the tiniest microscopic organism to the largest whales in the sea. Biology is concerned with how millions of species of animals, plants and other organisms grow, feed, move, reproduce and evolve over long periods of time in different environments. Its subject matter is useful to other sciences and professions that deal with life, such as agriculture, forestry and medicine. The richness of biosphere depends upon a number of factors like rainfall, temperature, geographical reference etc. Apart from the physical environmental factors, the man made environment includes human groups, the material infrastructures built by man, the production relationships and institutional systems that he has devised. The social environment shows the way in which human societies have organized themselves and how they function in order to satisfy their needs (Kumarasamy et al., 2004).

ENVIRONMENTAL POLLUTION

Environment pollution is the addition of contamination into the natural environment that causes detrimental effects to nature, nature resources and mankind. Any unnatural and negative changes in all the dimensions like chemical, physical and biological characteristics of any component of the ecosystem i.e air, water or soil which can cause harmful effects on various forms of life and property is called environmental pollution. Any substance which causes harmful effects or uneasiness in the organisms, then that particular substance may be called as the pollutant. The materials that cause pollution are of two types:

Persistent pollutants: Those pollutants which remain consistent in the environment for a long period of time without any change in its original form are called persistent pollutants. For example pesticides, nuclear wastes, and plastics etc.

Non-persistent pollutants: These pollutants are the opposite of persistent pollutant and break down in the simple form. If this process of breaking down is done by living organisms, then such pollutants are referred to as biodegradable pollutants. From another perspective, pollutants can be classified as follows:

Primary Pollutants: Primary pollutants are those which remain in the form in which they were added to the environment for ex. DDT, Plastic

Secondary Pollutants: Secondary pollutants are formed due to interaction of primary pollutants amongst themselves viz. PAN by the interaction of NO_2 & Hydrocarbons.

According to their existence in nature:

Quantitative Pollutants: These substances are already present in the atmosphere but they become pollutant when their concentration level reaches to a particular level which is above a threshold limit.

Qualitative Pollutants: These are man-made pollutants eg. Fungicides, herbicides etc.

1.4.1 POLLUTION

Pollution is the introduction of contaminants into the environment that cause harm or discomfort to humans or other living organisms, or that damage the environment, which can come in the form of chemical substances, or energy such as noise, heat or light. Pollutants can be naturally occurring substances or energies, but are considered contaminants when in excess of natural levels. Environmental pollution

takes place when the environment cannot process and neutralize harmful by-products of human activities (poisonous gas emissions) in due course without any structural or functional damage to its system.

Pollution occurs, on the one hand, because the natural environment does not know how to decompose the unnaturally generated elements (i.e., anthropogenic pollutants), and, on the other, there is a lack of knowledge on the part of humans on how to decompose these pollutants artificially. It may last many years during which the nature will attempt to decompose the pollutants; in one of the worst cases – that of radioactive pollutants – it may take as long as thousands of years for the decomposition of such pollutants to be completed. Human activities directly or indirectly affect the environment adversely. A stone crusher adds a lot of suspended particulate matter and noise into the atmosphere. Automobiles emit from their tail pipes oxides of nitrogen, sulphur dioxide, carbon dioxide, carbon monoxide and a complex mixture of unburnt hydrocarbons and black soot which pollute the atmosphere. Domestic sewage and run off from agricultural fields, laden with pesticides and fertilizers, pollute water bodies. Effluents from tanneries contain many harmful chemicals and emit foul smell. These are only a few examples which show how human activities pollute the environment.

Causes of Environmental Pollution

Following are the few cause of Environmental pollution

Industries

Industrial pollution takes on many faces. It contaminates several sources of drinking water, releases unwanted toxins into the air and reduces the quality of soil all over the world. Industries have been polluting our environment, especially since the beginning of the industrial revolution, as mentioned above, notably due to the increasing use of fossil fuels. In the 19th century and for a significant part of the 20th century, coal has been used to make machines work faster, replacing human force. Industrial pollution continues to cause significant damage to the earth and all of its inhabitants due to chemical wastes, pesticides, radioactive materials etc. It affects wildlife and ecosystems and disrupts natural habitats. Animals are becoming extinct, and habitats are being destroyed. The transportation of petrol through pipelines; if there is a leak in the pipeline; the soil will automatically be polluted. At the same time, if the tanker transporting petrol from its production plant to the place where it will be consumed leaks or sinks, the water will get contaminated.

Transportation

Ever since men abandoned animal power to travel, pollution of the environment has become higher and higher. Its levels have only been increasing until now. Similarly to industries, pollution caused by transport can mainly be attributed to fossil fuels. Indeed, humans came across a long way from horse carriages to cars, trains (which, before electricity, used to be propelled by coal), and airplanes. As traffic is increasing every day, pollution follows that evolution.

Agricultural Activities

Agriculture is mainly responsible for the contamination of water and soil. This is caused by the increased use of pesticides, as well as by the intensive character of its production. Almost all pesticides are made from chemical substances and are meant to keep diseases and threatening animals away from the crops. However, by keeping these forms of life away, the harm is almost always made to the surrounding environment as well. Furthermore, as agriculture gets more and more intensive to feed the increasing world population, more environments and ecosystems are destroyed to make space for the crops.

Trading Activities

Trading activities include the production and exchange of goods and services. As regards goods, pollution can be caused by packaging (which often involves the use of plastic, which is made from fossil fuels) or transport, mainly.

1.4.2.5 Residences

Residential areas provide their fair share of pollution as well. First, to be able to build homes, the natural environment has to be destroyed in one way or another. Wildlife and plants are driven away and replaced by human constructions. As it requires the work of industries, construction itself is also a source of contamination of the environment.

EFFECTS OF ENVIRONMENTAL POLLUTION

The main cause of environmental pollution are

Effects on Humans

The effects of environmental pollution on humans are mainly physical, but can also turn into neuro-affections in the long term. The best-known troubles to us are respiratory, in the form of allergies, asthma, irritation of the eyes and nasal passages, or other forms of respiratory infections. Notably, these well-spread affections can be observed when air pollution is high in cities, when the weather gets hot, for instance.

On top of that, environmental pollution has been proven to be a major factor in the development of cancer. This can happen, for example, when we eat reminiscences of pollutants used in the production of processed foods or pesticides from the crops. Other rarer diseases include hepatitis, typhoid affections, diarrhea, and hormonal disruptions.

Effects on Animals

Environmental pollution mainly affects animals by causing harm to their living environment, making it toxic for them to live in. Acid rains can change the composition of rivers and seas, making them toxic for fishes; an essential quantity of ozone in the lower parts of the atmosphere can cause lung problems to all animals. Nitrogen and phosphates in water will cause the overgrowth of toxic algae, preventing other forms of life to follow their normal course. Eventually, soil pollution will cause harm and, sometimes, even the destruction of microorganisms, which can have the dramatic effect of killing the first layers of the primary food chain.

Effects on Plants

As for animals, plants, and especially trees, can be destroyed by acid rains (and this will also have a negative impact on animals as well, as their natural environment will be modified), ozone in the lower atmosphere block the plant respiration, and harmful pollutants can be absorbed from the water or soil.

Effects on the Ecosystem

Environmental pollution, almost exclusively created by human activities, has a negative effect on the ecosystem, destroying crucial layers of it and causing an even more negative effect on the upper layers.

PLASTICS

Plastics is the term commonly used to describe a wide range of synthetic or semi-synthetic materials that are used in a huge and growing range of applications. We use plastic products to help make our lives cleaner, easier, safer and more enjoyable.

We find plastics in the clothes we wear, the houses we live in, and the cars we travel in. The toys we play with, the screens we watch, the IT tools we use and medical equipment we benefit from all contain plastics. The term "plastic" is derived from the Greek word "plastikos", meaning fit for moulding. This refers to the material's malleability, or plasticity during manufacture, which allows it to be cast, pressed, or extruded into a variety of shapes - such as films, fibres, plates, tubes, bottles, and boxes. Plastics are synthetic materials that are made from synthetic resins or organic polymers. Examples of these polymers include nylon, PVC, and polyethylene. Plastics are categorized into two groups, those that go through a chemical change process in their constituents when subjected to heat (thermosetting polymers) and those that do not (thermoplastics). Examples of thermoplastics include polypropylene and polyethylene. They are the most common types of plastics because they are usually produced in large quantities but at very low costs. Most disposable items are packaged in these. Supermarkets and a lot of other retail stores also use them to package goods bought. Plastics are mainly composed of petrochemicals that when burnt or melted, cause environmental pollution. Plastic pollutants can also be classified in terms of size. This creates three categories of pollutants namely micro, meso, and macro debris.

1.6.1Age of Plastics

Since the 1950s, the production of plastic has outpaced that of almost every other material. Much of the plastic we produce is designed to be thrown away after being used only once. As a result, plastic packaging accounts for about half of the plastic waste in the world. Most of this waste is generated in Asia, while America, Japan and the European Union are the world's largest producers of plastic packaging waste per capita. Our ability to cope with plastic waste is already overwhelmed. Only nine per cent of the nine billion tonnes of plastic the world has ever produced has been recycled. Most ends up in landfills, dumps or in the environment. If current consumption patterns and waste management practices continue, then by 2050 there will be around 12 billion tonnes of plastic litter in landfills and the environment. By this time, if the growth in plastic production continues at its current rate, then the plastics industry may account for 20 per cent of the world's total oil consumption. Most plastics do not biodegrade. Instead, they slowly break down into smaller fragments known as micro plastics. Studies suggest that plastic bags and containers made of expanded polystyrene foam (commonly referred to as "Styrofoam") can take up to thousands of years to decompose, contaminating soil and water.

1.6.2. Types of Plastics

(i) Polyethylene Terephthalate (PETE or PET)

Polyethylene Terephthalate was first introduced by J. Rex Whinfield and James T. Dickson in 1940, this plastic is one of the most commonly used on the planet.

(ii)High-Density Polyethylene (HDPE)

In 1953, Karl Ziegler and Erhard Holzkamp used catalysts and low pressure to create high- density polyethylene. It was first used for pipes in storm sewers, drains, and culverts. HDPE is the most commonly recycled plastic because it will not break under exposure to extreme heat or cold. According to the EPA, 12% of all HDPE products created are recycled in a year. This is a very small dent in the planet's carbon footprint.

(iii) Polyvinyl Chloride (PVC) PVC is one of the oldest synthetic materials in industrial production. PVC is one of the least recycled materials; generally less than 1% of PVC plastic is recycled each year. It has been called the "poison plastic" because it contains numerous toxins and is harmful to our health and the

environment.

(iv) Low-Density Polyethylene (LDPE) LDPE was the first polyethylene material. It has less mass than HDPE, which is why it's considered a separate material for recycling. Packaging and containers made from LDPE make up about 56% of all plastic waste, 75% of which comes from residential households.

(v) Polypropylene (PP) J. Paul Hogan and Robert L. Banks of Phillips Petroleum Company discovered polypropylene in 1951

Polystyrene or Styrofoam (PS) In 1839, German apothecary Eduard Simon accidentally came across polystyrene while preparing medication. He isolated a substance from natural resin. It took German chemist Hermann Staudinger to research this polymer and expand on its uses. Since polystyrene is lightweight and easy to form into plastic materials, it also breaks effortlessly, making it more harmful to the environment. Beaches all over the world are littered with pieces of polystyrene, endangering the health of marine animals.

(vi) Miscellaneous Plastics The remaining plastics include: polycarbonate, polylactide, acrylic, acrylonitrile butadiene, styrene, fiberglass, and nylon. Many BPA products fall into this category, which means it's best to avoid them, especially for food products. It is not very easy to break down these plastics once they are created, unless they are exposed to high temperatures. This means they are nearly impossible to recycle.

1.7Common Causes of Plastic Pollution

There are many reasons why plastic pollution takes place. The biggest contributing factor has to be human activities because they are the ones that manufacture plastics and then introduce them into the environment. Some of the common causes of this type of pollution include:

1. **Plastic bags from shopping:** When we buy items from the retail store, chances are that they'll be packaged in plastic bags. Most of them are thermoplastics that are produced in large quantities. Many people shop regularly and that means that the amount of plastic bags introduced into the environment also increase at a faster pace. Since most of the plastics are also low cost and thin, they can only be used a couple of times before they tear. These shopping bags are major pollution of the environment and it's common to see them thrown around.

2. **Plastic Toys:** Most toys are usually made of plastic. This is usually taken as a safety measure because kids can easily injure themselves with metallic toys. As we all know, these young fell as are not very responsible people and the toys are usually damaged almost immediately after they've been purchased. A kid can go through many toys in a month unless the parent just decides to let him or her play with the broken one. There are also companies that sell products such as cereals and include free toys as part of marketing. Parents then feel obliged to buy them because they come with gifts for the kids. When all these are summed up, we have ecosystems full of plastic toys and with no proper place or method to dispose of them.

3. **Pet Bottles:** Pet bottles are also common plastic pollutants. These bottles are normally used for feeding or administering medication. The damaged bottles are then disposed of and they end up polluting the environment in one way or the other. Apart from the feeding bottles, there are also feeding plates or troughs made of plastic.

4. **Failure to recycle:** Failure to recycle or reuse plastic materials is another major cause of plastic pollution. The failure to recycle is one of the main reasons why plastic pollution is such a major concern the world over because it seems that the more the world population increases, the bigger the problem becomes.

5. **Using Plastic Disposables:** People who host parties and use plastic disposable cups, plates, forks and knives are the main culprits here. As much as they make work easier because they eliminate the need to wash utensils after the party, it's also detrimental to the environment. These plastic disposables are usually thrown away after the party and end up causing plastic pollution in several ways.

6. **Plastic Fishing Nets:** Commercial fishing is a very important economic activity. This is because fish is a source of white meat with numerous health benefits. Individuals, companies, and even nations engage in commercial fishing because it is an important source of income and revenue. The only problem is that in large scale fishing especially in trolling operations, the nets are usually made of plastic materials. They remain submerged for long periods and leak toxins into the ocean waters. They can also break apart and stay in the water causing more pollution in the process.

Poor Disposal of Plastic Waste: Plastics do not degrade easily because of the type of materials that they are made of. We can use lots of materials made of plastic but when we properly dispose of them, pollution is reduced. Poor plastic waste disposal is, therefore, a major cause of pollution. Many people are very careless with the way they dispose of their plastic wastes and that has presented a big challenge as far as having a clean planet is concerned.

EFFECTS OF PLASTIC POLLUTION

Plastic pollution has so many negative effects on human, plant, and marine life as well as other living organisms. Here are some of them:

1. **Affects Human life and Health:** Plastics are mainly made from petrochemicals. It, therefore, goes without saying that they are not good for human health and can cause problems in different ways. When plastics degrade in water sources, they release toxins that can cause poising or cancerous diseases. Several health practitioners have cautioned against using plastics, especially when handling hot consumables. Plastic pollution can cause diseases that are very costly to treat and difficult to manage. Children can also ingest plastic materials that have been carelessly disposed of and this can result in choking or even death. Plastic bottles can sometimes trap water and provide ideal breeding places for germs and mosquitoes. This can result in several health problems for people that live near such places.

2. **Degrades Quality of Land and Affects Agriculture:** Plastic papers strewn all over the place are an eyesore. They make the surrounding appear untidy and unpleasant. When they break down, they release chemicals into the ground that make land unproductive and unconducive for plant growth. They can also make the area unsuitable for habitation by microorganisms. Plastic pollution, therefore, affects agriculture by degrading the quality of soil and, in turn, affects the balance that is required for an ecosystem to thrive.

3. **Poses Threat to Animal Health:** Cattle are very notorious when it comes to eating plastic bags. Since these materials are not digestible by the stomach, they can cause stomach upsets and poisoning due to the chemicals released from the components of plastic. This is what happens when we fail to dispose of plastics properly and scatter them all over the place. Unlike humans, animals can eat anything, the issue of whether it's edible or not notwithstanding.

4. **Disrupts Marine life:** Aquatic life is also not spared when it comes to the effects of plastic pollution. Commercial fishing where plastic nets are used introduce toxins into the ocean and pollute the water. This is harmful to the marine life. Organisms that live in water can also ingest plastic materials and die because of the toxins contained in them. This would cause the loss of biodiversity and upset the

ecosystem due to the interdependence of the different inhabitants.

5. **Air Pollution:** Burning plastics causes air pollution. That's because this action introduces pollutants into the atmosphere through smoke and debris. When inhaled, the smoke from burning plastics can cause breathing complications. The pollutants can also affect the ozone layer and contribute to global warming. Since plastics are mainly composed of petrochemicals, burning them can also cause acid rain as the chemicals released ascend into the higher atmosphere.

Blocks the drainage system: Plastics can cause blockage and prevent the flow of waste material. When this happens, the air can be polluted due to the bad smell of decomposing materials. It would also cause a host of bacterial diseases. Unblocking a drainage system is not that easy. You will have to part with some money when the problem hits home just to get the system working properly again. It's much worse when it's on a larger scale because that would require the relevant authorities to come up with a proper plan to find a solution. This could take time. Blocked drainage systems are also very risky during the rainy season. They inhibit the easy flow and drainage of rain water. This can cause flooding, especially in urban centers.

6. **Loss of Tourism:** Tourists are mainly people who just want to have a good time and gain new experiences. Nobody wants to travel to a foreign place just to interact with dirty environments and probably contract infections and diseases. Plastics around seashores make the beaches unsightly and unattractive to tourists. This can lead to a fall in the number of them that visit a place and subsequently loss of income for the locals. Dirty tourists' places basically kill tourism.

Single use plastics

The most common single-use plastics found in the environment are, in order of magnitude, cigarette butts, plastic drinking bottles plastic bottle caps, food wrappers, plastic grocery bags, plastic lids, straws and stirrers, other types of plastic bags, and foam take-away containers. These are the waste products of a throwaway culture that treats plastic as a disposable material rather than a valuable resource to be harnessed.

Plastic waste causes a plethora of problems when it leaks into the environment. Plastic bags can block waterways and exacerbate natural disasters. By clogging sewers and providing breeding grounds for mosquitoes and pests, plastic bags can increase the transmission of vector- borne diseases like malaria. High concentrations of plastic materials, particularly plastic bags, have been found blocking the airways and stomachs of hundreds of species. Plastic bags are often ingested by turtles and dolphins who mistake them for food. There is evidence that the toxic chemicals added during the manufacture of plastic transfer to animal tissue, eventually entering the human food chain. Styrofoam products, which contain carcinogenic chemicals like styrene and benzene, are highly toxic if ingested, damaging the nervous systems, lungs and reproductive organs. The toxins in Styrofoam containers can leach into food and drinks. In poor countries, plastic waste is often burned for heat or cooking, exposing people to toxic emissions. Disposing of plastic waste by burning it in open-air pits releases harmful gases like furan and dioxin. Single-use plastic bags are used to carry goods and usually provided to customers at the point of sale. The most common shopping bags are made of a type of plastic called polyethylene – or polythene – a tough, light, flexible, synthetic resin obtained by polymerizing ethylene.

Foamed plastics

Foamed plastics is common but often erroneously referred to by the brand name "Styrofoam",25 is the material most widely used to produce food containers as it is rigid, lightweight, and has good insulation properties. There are two main types of foamed plastics: foamed polystyrenes and foamed polyurethanes. Foamed

polystyrenes can be further categorized – based on the production method – into expanded polystyrenes (EPS) and extruded polystyrenes (XPS)." Single-use plastic bags and Styrofoam products are widely used because they are strong, cheap and hygienic ways to transport goods. Plastic groceries bags consume less energy and water to produce and generate less solid waste than paper bags, taking up less space in landfills. Due to their light weight and balloon-shaped design, plastic bags are easily blown in the air, eventually ending up on land and in the ocean

Biodiversity loss and food chain contamination due to single use plastic

Plastics in the environment pose significant hazards to wildlife both on land and in the ocean. High concentrations of plastic materials, particularly plastic bags, have been found blocking the breathing passages and stomachs of hundreds of different species. Plastic bags in the ocean resemble jellyfish and are often ingested by turtles and dolphins who mistake them for food. There is emerging evidence that the toxic chemicals added during the manufacturing process transfer from the ingested plastic into the animals' tissues, eventually entering the food chain for humans as well. When plastic breaks down into micro plastic particles, it becomes even more difficult to detect and remove from the open oceans.

Health and Social Impacts

Styrofoam items contain toxic chemicals such as styrene and benzene. Both are considered carcinogenic and can lead to additional health complications, including adverse effects on the nervous, respiratory and reproductive systems, and possibly on the kidneys and liver. Toxins in Styrofoam containers can transfer to food and drinks, and this risk seems to be accentuated when people reheat the food while still in the container. In low-income regions, domestic waste - including plastics - is often burnt for heating and/or cooking purposes, exposing largely women and children to prolonged toxic emissions. Illegal disposal practices of plastics often take the form of open burning, accentuating the release of toxic gases that include furans and dioxins.

Harmful Nature

Disposable plastics used in packaging foodstuff meant for human consumption contain harmful compounds. Improper disposal of these packaging products leads to these harmful compounds finding their way to water bodies, where they dissolve over a long time due to their non- biodegradable nature. Littered plastics are also harmful to animals because they occasionally eat them and die. Additionally, plastics fabrication involves the use of potentially dangerous chemicals, which are added as stabilizers or colorants. Most of these chemicals have not undergone an ecological risk appraisal, and their impact on human well-being and the environment is presently vague. One example is phthalates, which are used in the manufacture of PVC.

Environmental Degradation

Plastics are generally non-biodegradable; hence, they may take centuries to decay. This is due to the intermolecular bonds that constitute plastics, whose structure ensures that the plastics neither corrode nor decompose. Plastics disposed of indecently get washed away to water reservoirs. They clog waterways and float on reservoirs, polluting and making them unsightly.

Low Melting Point

Plastics generally have a low melting point, so they can't be used where heat levels are high. This also means they cannot be used as protective barrier for furnaces. Some plastic products are highly flammable -- polystyrene, acrylics, polyethylene and nylons commonly used in packaging, home and office appliances. This makes them a fire hazard.

Durability

Plastics generally have a short useful life compared to metals. This short life cycle results in pile-ups of unwanted garbage in the office, home or waste yards. Although some of the plastics are recycled, most remain uncollected in dump sites and pollute the environment. Additionally, polythene bags are easily carried by wind, something that makes them almost impossible to collect for recycling.

Harmful Effects of Single use Plastics

- Using plastic bags in packaging of hot bread and meals makes these bags flexible and able to interact with high of plastic bags with high heat resulting in release of the carcinogenic dioxin

- The light weight and high consumption of plastic bags and their ability to persist for long periods of time in the environment without decomposing made them one of the main factors of pollution in the open spaces, public squares, main roads inside and outside cities, sea beaches and water.

- The easy evaporation and wide use of plastic bags make it difficult to collect and dispose them. They also distort the general appearance of the places.

- When plastic bags stick to trees and plants they obstruct the natural light from reaching parts of the plant causing impairment to the process of photosynthesis.

- Plastic bags cause diseases and even death to the cattle that come across and eat them during pasture.

- Burying of plastic bags in soil makes an insulating layer that keeps rainwater in the upper part of the soil and prevents water and other fertilizers from reaching its lower part.

- Plastic bags create a fertile environment for the growth of infectious bacteria

- Accumulation of plastic bags in water blocks the irrigation canals and drainage.

- Burning of plastic bags causes the emission of chlorine dioxide, carbon dioxide, dioxin, other gaseous compounds, acids and many harmful toxic compounds.

- Plastic bags pose danger to the environment and marine organisms when they exist and pile up in the coastal areas.

- Using plastic containers to save food especially pickles, acid and fatty food causes plastic to decompose, and toxic carcinogens to access the body

STATEMENT OF THE PROBLEM

Having acknowledged the harmful effects of single use plastics in the environment through literatures, awareness videos motivated the investigators to conduct this study on the ***"AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS AMONG COLLEGE STUDENTS IN TIRUUNELVELI DISTRICT".***

SIGNIFICANCE OF THE STUDY

Single-use plastics are responsible for many major problems that our environment is facing today. Materials like plastic bags, straws, coffee stirrers, soda and water bottles and most food packaging are made by single-use plastics. Plastic bags are made from crude oil, natural gas and other petrochemical derivatives. Plastic bags can take around 1,000 years to degrade – they are not biodegradable and can only degrade because of the UV rays of the sun. Although plastic will not biodegrade (decompose into natural substance like soil,) it will degrade (break down) into tiny particles after many years. In the process of breaking down, it releases toxic

chemicals (additives that were used to shape and harden the plastic) which make their way into our food and water supply. Plastic pollution is the introduction of plastic products into the environment which then upset the existing ecosystems in different ways. These pollutants cause environmental degradation and also affect different living organisms and their habitats negatively. When plastic products accumulate in the environment, they begin to cause problems for wildlife, humans, and other living organisms. They create conditions that are not favorable for healthy living and proper growth. This is what is essentially referred to as plastic pollution. These toxic chemicals are being found in our bloodstream and disrupt the Endocrine system which can cause cancer, infertility, birth defects, impaired immunity and many other ailments. Burning of plastics cause emissions of toxic gases and release a toxic carcinogen called dioxin. The dioxin affects the function of the reproductive and immune system. It is also associated with skin and respiratory problems resulting from exposure to and inhalation of toxic fumes, especially hydrocarbons and residues released during the process. Direct toxicity from plastics comes from lead, cadmium and mercury. These toxins have also been found in many fish in the ocean, which is dangerous for humans. Diethyl hexyl phthalate (DEHP) contained in some plastics, is a toxic carcinogen. Plastics are directly linked to cancers, birth defects, immune system problems, and childhood developmental issues. BPA present in plastics resulted in mammary cancer and chronic inflammation of the prostate. Plastic leaching toxins enters into food and drink and entering our food chain through micro plastics and Nano plastics. It is necessary for adolescents to know about the harmful effects of using Single-use plastics so that they can reduce the frequent use of using single use plastics. Lack of research in this field motivated us to undertake this research. Our aim is to enlighten the students about the dangerousness of using Single-use plastics in human health.

DEFINITION OF THE OPERATIONAL TERMS

The operational definitions express the researcher's perception of the variables and dimensions of the concept under study.

Awareness

Awareness raising is a process that seeks to inform and educate people about a topic or issue with the intention of influencing their attitudes, behaviours and beliefs towards the achievement of a defined purpose or goal. It is a relative concept which mainly focus on an internal state, such as a visceral feeling, or on external events by way of sensory perception.

Detrimental effects

Detrimental means tending to cause harm to an individual. According to the investigators detrimental is the damaging effects of single- use plastics in the environment and living organisms. Many plastics are suspected of being detrimental to health because of the chemicals and additives they contain.

College students

College students are the students who finished their higher secondary examination in Tirunelveli District. According to the investigators, college students are those who joined the college after the completion of their higher secondary examinations and who joined in the 3 year arts or science course in Tirunelveli district.

GENERAL OBJECTIVE

1. To find out the level of Awareness on detrimental effects of Single-use plastics of College students

SPECIFIC OBJECTIVES

1. To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to background variables such as gender, locality of home environment , type of family, group of study, locality of college, nature of college, type of college, social media usage, participating in community service, fathers' education, mothers education, father's occupation and mother's occupation.

2. To find out the significant difference if any between college students in their awareness on detrimental effects of single-use plastics with reference to the background variables such as gender, locality of home environment, type of family, group of study, locality of college, nature of college, social media usage, participation in community service, fathers' education, and mothers education.

3. To find out the significant difference if any among college students in their awareness on detrimental effects of single-use plastics with reference to the background variables such as type of the college, father's occupation and mother's occupation.

1.13.3. NULL HYPOTHESES

1. There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to their gender.

2. There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to locality of home environment.

3. There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to type of family.

4. There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to their group of study.

5. There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to locality of college.

6. There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to their nature of college.

7. There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to social media usage.

8. There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to participation in community service.

9. There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to fathers' education.

10. There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to mothers' education.

11. There is no significant difference among college students in their awareness on detrimental effects of single-use plastics with respect to their type of college.

12. There is no significant difference among college students in their awareness on detrimental effects of single-use plastics with respect to their father's occupation

13. There is no significant difference among college students in their awareness on detrimental effects of single-use plastics with respect to their mother's occupation.

LIMITATIONS

Limitations are those conditions beyond the control of the researches that may place restrictions on the conclusions of the study & their application to other situations. As far as the study is concerned the investigators finds certain limitations. They are

i. The investigators have limited to test 5% level of significance.

ii. The investigators expect the sampling error.

iii. The truthfulness of the responses by the respondents.

iv. Respondent's mood, whim, interest, while answering.

DELIMITATIONS

"Delimitations are the boundaries of the study". Owing to the constraint of time the investigators have fixed certain boundaries for his study: they are

1. The investigators have taken samples only from Tirunelveli district.

2. The investigators have confined his study only to students studying in college.

3. The investigators have selected only 300 students as samples for this research.

4. Among the innumerable environmental problems, only the awareness on the detrimental effects of single-use plastics is focused attention in the present study.

5. The investigators have confined the following alone as the background variable for the study.

- Gender
- Locality of home environment
- Type of family
- Group of study
- Locality of college
- Nature of college
- Social media usage
- Participation in community service
- Fathers' education
- Mothers education
- Type of college
- Father's occupation
- Mother's occupation

CHAPTER-II

REVIEW OF RELATED STUDIES

2.1. INTRODUCTION

In research methodology, the term literature review refers to the knowledge of a particular area of investigation of any discipline that includes theoretical, practical, and research studies. The term 'Review' means to organize the knowledge of the specific area of research to develop and edifice of knowledge to show that one's study would be an addition to this field.

A Literature review acts as an extensive critical study in the proposed field. It empowers the investigator to familiarize themselves with the accumulated facts or methodological approaches in his selected field of study. They are secondary sources, and their ultimate aim is to provide a theoretical grounding and empirical studies of the area. It also provides hope for cohesive and integrated approaches to our problems and resolution and solution through research. It depicts a reasonable estimate of the researcher's scholarliness and ability to distinguish from relevant and irrelevant. It helps establish the current status of the proposed study and act as an indication of how the research will advance knowledge in its area. The ultimate task of reviewing the literature is highly creative and tedious because the researcher has to synthesize the field's available expertise in a unique way to provide the rationale for one's study.

In the words of John W. Best review of literature is "a brief summary of previous research and the writing of recognized experts" evidence that the research is familiar with what is already known and what is still unknown and untested". Thus, the review of related studies is an essential part of any investigation. The survey of the related studies is a crucial aspect of the planning of the study. In the words of Turney and Robb (1971) "the identification of a problem, the development of a research design and determination of the size and scope of the care and intensity with which a researcher has examined the literature related to the intended research.

MEANING OF LITERATURE REVIEW

The statement of the research problem and the literature review are mutually supportive. The statement of the research problem clearly defines the subject area to be treated. The literature review demonstrates that the research problem has reviewed prior attention and shows further research to resolve the problem. James B Fisher states, "To be effective, a literature review must be clear, coherent and persuasive analysis of the current state of the literature". It may be classified as:

i. Related literature

ii. Related studies

Related Literature

Related literature these are the sources that are extracted from the materials that are usually printed and found in books, encyclopedias, professional journals, magazines, novels, poetry, newspapers, and other publications, etc. that contain facts, theories, laws, and other documented observations. This should be in chronological order from recent to past when presented. It is unscientific.

Related Studies

The related studies refer to the review of studies, Inquiries, or investigations that have some bearing or similarity to the research problem. It embraces theses, dissertation, and research studied substantially characterized by the presence of the following part: research problems, hypotheses, objectives, related literature,

methodology, findings, conclusions and recommendations, and bibliography. They are usually unpublished materials such as manuscripts, theses, and dissertations. This is also arranged in chronological order from recent to past. It is scientific.

The Classification of Related Studies

The related studies are segregated as:

i. Local studies or Indian studies.

ii. Foreign or International studies.

CHARACTERISTICS OF RELATED STUDIES

A logical flow of ideas characterizes a well-structured literature review, current and relevant references with a consistent, appropriate referencing style, and an unbiased and comprehensive view of the previous research topic. Other characteristics are:

i. The survey materials must be as recent as possible.

ii. Materials reviewed must be objective and unbiased.

iii. Materials surveyed must be relevant to the study.

iv. Surveyed materials must have been based upon genuinely original and true facts or data to make them valid and reliable.

v. Materials must be not be few but not too many.

IMPORTANCE OF REVIEW OF RELATED STUDIES

i. It locates comparative data and findings useful in the interpretation and discussion of results. The conclusions drawn in related studies may be significantly compared and may be used as a subject for the findings of the study.

ii. It avoids duplication and encourages needed replication.

iii. It provides theories, ideas, explanations or hypotheses which may prove useful in the formulation of a new problem.

iv. It provides with a clear and precise picture of the problem to be solved.

v. It sensitizes the investigator to new possible areas for research.

vi. It suggests method, procedure, sources of data and statistical techniques appropriate to the solution of the problem.

vii. It provides sources for hypotheses. The researcher can formulate research hypothesis on basis of available studies.

viii. It helps in developing experts and general scholarship of the investigator in the area investigated.

ix. It contributes towards the accurate knowledge of the evidence or literature in one's area of activity is a good avenue towards making oneself.

Detrimental effects single-use plastics

Indian Studies Related to Detrimental Effects Single-Use Plastics

Shaira,H., Ismail,I.M., Ahmed,N., Zeena,N.,Arooj,P.,Shreya,P., Reiham Shafir,R., Nazeer,R (2020) conducted a study on Assessment of Knowledge, Attitude and Practice Regarding Single-Use Plastics among the Residents of a Rural Area in a Coastal District of Karnataka - A Descriptive Study. Their study shows that the

attitude towards the single-use- plastic was satisfactory since 80% of them believed that single-use-plastic should be banned. More than 60% were willing to replace the plastic bag with an alternative. The practice was found to be low since 82.4% were using plastic bags on a regularly basis.

Anupama Deepak, Vishnu Priya,V.,and R. Gayathri (2019) conducted a study on "Awareness of plastic hazards among dental students". This study aims to create and assess the awareness of plastic hazards among dental students. Materials and Methods: A prospective, cross-sectional questionnaire-based survey study was carried out at Saveetha Dental College on plastic hazards awareness. A well-structured questionnaire was prepared, distributed, and collected when the undergraduate student filled it. The questionnaire mainly evaluated the undergraduate's essential awareness of plastic hazards, its effects, and management of the hazard. The result was then statistically analyzed and processed. Results: Most of the participants in the settings had an awareness of plastic bag usage hazards. People commonly use plastics due to their easy availability and ease of handling goods. Females were found to use plastics more often than males in shopping, carrying goods, etc. The results were graphically represented and then analyzed. Conclusion: Plastic pollution can lead to various health problems such as lung diseases, skin diseases, reproductive issues, and growth and maturation problems. Therefore, reducing the use of plastic and increasing biodegradable and jute bags can reduce plastic pollution. However, there is a need to spread awareness of using alternative strategies.

Manoj,M.(2019) conducted a study on "The Impact of awareness about environmental hazards caused by plastic pollution, on the attitude towards the governmental ban on single-use plastic products among adults in the Indian City Chennai and its suburbs". Single-use plastic products are cheap, readily available everywhere, and easy to use, making them very popular among all society's strata. But nearly all of it is discarded within 24 hours of its use irresponsibly, resulting in these products becoming the biggest threat to the environment and biodiversity. Creating awareness about plastic pollution hazards does not seem to curtail the use of single-use plastic products or the way it discarded. Many governing bodies have resorted to banning the production, sale, and use of plastic products hazardous to the environment. This study aimed at understanding the relationship between awareness about plastic pollution and attitude towards the governmental ban on single-use plastic products among the adult residents of Chennai and its suburbs. 172 adults, 77 males, and 95 females, selected through the random sampling method, took part in the study. The data was collected using a questionnaire developed for the purpose and analyzed using the data analysis component of MS office 2013. The results showed that there is a significant relationship between the level of awareness about plastic pollution and the nature of attitude people towards stringent actions of the government to safeguard the environment.

Maria Saroja,M., and Michael Jeya Priya,E.(2019) conducted a study on "Awareness on the side effects of using single-use plastics among higher secondary students Tirunelveli district". The study's main objective was to find out the awareness of the side effect of single-use plastics among higher secondary students in Tirunelveli district. Survey method was adopted in this study. The sample consists of 500 higher secondary students in Tirunelveli. Maria Saroja developed side Effects of Single-Use Plastic Awareness Scale, M and Michael Jeya Priya, E (2019) has used for collecting data. Percentage analysis 't'- test and x2 were used for analyzing the data. The present study revealed a significant difference among higher secondary students in their awareness of the side effects of using single-use plastics.

Srnivasan,N.,Swarnapriya,V.,Felix,A.J.W., and Pravin.(2019) conducted a study on "Assessment of knowledge and practice on plastics among the professional course students of Annamalai university,Tamilnadu". Plastics waste is a major cause of

environmental pollution that becomes carcinogenic to humans, congenital disabilities, impaired immunity, endocrine disruption, development, and reproductive effect. The study was carried out to determine the level of knowledge and practice of first-year professional course students regarding plastic. Cross-sectional study, all the students of first-year MBBS, Dentistry, Physiotherapy students studying at Annamalai University, Annamalainagar, were included. A total of 563 students of professional course students were included in the study—their knowledge in terms of general aspects such as ill effects, reuse, and practice. The result found that 46% of the students having a good experience and only 27.6% were found to have a good way. Though the students have good knowledge of plastic's ill effects, their practice in terms of disposal was less. Researchers found that there were significant variations were observed among the college students of a different course.

Vigneshwaran.,A and Arunkumar,B.,(2019) conducted a study on "Knowledge Attitude and Practice on Plastic Usage Among the Residents of Tiruchirappalli Municipal Corporation, Tamil Nadu - A Descriptive Study". The researchers had chosen the Convenient Sampling Method i.e. Non-Probability Sampling Method. Researcher took 60 respondents among 9,16,674 (Census India - 2011) people through this method in Tiruchirappalli Corporation, Tamil Nadu, India. Results indicated that in the plastic usage, the people are satisfactory in the dimension of Knowledge and Practice but only useful in Attitude but not satisfactory. Attitude of the people should be changed towards plastic usage. Also, fewer questions are only used in dimension Practice in the data collection process.

Ningrum,Z.B and Herdiansyah,H.,(2018) conducted a study on "Environmental awareness and behavior of college students regarding the environment in urban area". Their research aimed to analyze college students' environmental awareness, report their environmental behavior, and explore the correlation of some factors towards environmental awareness and action in a sample of 150 college students in one university in Jakarta. Previous studies have shown that demographic characteristics influence environmental awareness and behavior. The method applied was quantitative methods. For this purpose, a research instrument in the form of a questionnaire was designed and tested on college students. Data were processed by Spearman test with the help of SPSS. The results show that the level of environmental awareness and behaviors is 'good' among the respondents irrespective of gender difference. However, there lies a difference between genders at the practice level. This research concludes that college students have good environmental awareness and behavior. The college students show them by turning off computers when they are not being used to save energy, reducing single-use-plastic use, using an alternative for plastic such as paper/cloth bag, and participating in environmental programs.

Angelin Priya., Manju Toppo., Daneshwar Singh., Nisha Singh., and Soumitra Sethia. (2016) conducted a study on "A study to assess the impact of an education intervention on the knowledge regarding hazards of plastic food containers in school children." The study aims to assess the knowledge regarding the safe use of plastics and assess educational intervention's impact—the study design-community based educational intervention study. The study participants are 300 school students from standard 7-9 and 11 of Bhopal's private schools. The result revealed that the knowledge of the respondents increased after the educational intervention.

Nitin Joseph., Aswin Kumar.,and Raghavendra Babu Yellapur Prahalad.(2016) conducted a study on "Usage of Plastic Bags and Health Hazards: A Study to Assess Awareness Level and Perception Legislation among a Small Population of Mangalore City". Plastic bag users are at risk of several health hazards. There is a paucity of data about awareness of health hazards among the general population in India. This study was done to determine the status of awareness of the health hazards

associated with plastic bags usage among people and their perception towards the legislation prohibiting the use of plastic bags—a cross-sectional study conducted in Mangalore city in August 2013. Data was collected from the people by interviewing any adult member (aged above 18 years) in each selected household using an interview schedule. Most of the participants in the settings had an awareness of the hazards of plastic bag usage. The result revealed a need to spread awareness of using alternative strategies and effective implementation of legislation to minimize the usage of plastics in the community.

Pavani, P., and Raja Rajeswari, T.(2014) conducted a study on "Impact of Plastics on Environmental Pollution". Thousands of plastic factories produce tons of plastic goods popularly used by the people because of their ease, cheapness, and convenience. Due to their non-biodegradable nature, they cause a hazardous negative impact on the environment. Disposal of plastic waste, which is a significant cause of environmental pollution, becomes carcinogenic to humans, congenital disabilities, impaired immunity, endocrine disruption, development, and reproductive effect. In addition to dumping plastic material into marine, many species are known to be harmed or killed, which could jeopardize their survival, especially since other forms of anthropogenic activities already endanger many. Marine animals are mostly affected through entanglement in and ingestion of plastic litter. Less conspicuous conditions, such as plastic pellets and scrubbers, are also hazardous. A mechanism of controlling the generation of waste at the source, alternative disposal methods, establishing additional drop-off-areas (landfills) and incineration mechanisms, and plastic recycling facilities also recommended.

Priya.K.(2014) conducted a study on "A study on the level of environmental awareness among college students in Coimbatore District". The growing concern with environmental issues and their impact on general awareness is one of the most noticeable phenomena of the last two decades. Increase in economic activities in developing countries result in more energy and consumption demand, which generally leads to environmental degradation. The main objective of the study is to study the environmental awareness level among college students. In the present study, a random sampling technique was used to select the sample. The sample consists of total of 50 respondents. The present study explores that (i) gender does not influence the environmental awareness of college students (ii)the students from urban areas have environmental awareness than rural (iii)Students from science courses have environmental awareness. (iv)The locality of students has a significant influence on the environment.

M.Sivamoorthy,M., Nalini,R., and Satheesh Kumar,C.(2013) conducted a study on "Environmental Awareness and Practices among College Students". The environmental awareness and practices related to various factors like causes of pollution, conservation of soil, forest, air, etc., energy conservation, conservation of human health, conservation of wildlife and animal husbandry. The study's main objective is to assess the environmental practices among college students regarding the usage of plastic and its disposal, alternative for plastic, toilet usage, its use in the cultivation of saplings, rainwater harvesting, and their participation in environment-related programs. Two hundred ten college students participated in the study. The study reveals that the level of awareness is high among the respondents irrespective of gender difference. Still, there is a difference between genders at the practice level, i.e., males practicing more than females. This study also proposes some recommendations to safeguard the environment in India.

Unnikrishnan (2012) conducted a study on "A Study on Customer Awareness of Green Marketing and Green Brand Effectiveness" has examined the factors such as customer awareness of green brands, customer perception regarding Price, availability, greenness, and effectiveness. Attitudes are changing toward the environment to encourage innovation for conservation.

International Studies Related to Detrimental Effects Single Use Plastics

Timo Herberz,T., Barlow,Y.C., & Finkbeiner,M.(2020) conducted study a study on Sustainability Assessment of a Single-Use Plastics Ban. In their study concludes that single- use items are harmful to the environment regardless of their material. Therefore, banning or imposing a premium price on single-use items in general and single-use plastic items is a more effective method of reducing consumption and pollution. The plastics ban only leads to a small reduction of global plastic marine pollution and provides only a partial solution to the problem it intends to solve.

Cheuk-Fai Chow., Wing-Mui Winnie So., Tsz-Yan Cheung.,and Siu-Kit Dennis Yeung.(2017) conducted a study on "Plastic Waste Problem and Education for Plastic Waste Management". The purpose of the study is to examine the effectiveness of three teaching strategies (direct teaching, hands-on teaching, and stimulation game-based teaching) on change in knowledge, attitude, and behavior in students toward plastic waste management. Quantitative data were collected from 61 pupils from several local primary schools of Hong kong aged from 8-12 from grades 4 to 6 and participated in the education project. The study reveals that the three methods facilitate more significant changes in pupil's attitudes and behaviors regarding plastic waste management.

Mohammad Bakri Alaa Hammami, Eman Qasem Mohammed, Anas Mohammad Hashem, Mina Amer Al-Khafaji, Fatima Alqahtani, Shaikha Alzaabi., and Nihar Dash.(2017) conducted a study on "Survey on awareness and attitudes of secondary school students regarding plastic pollution: implications for environmental education and public health in Sharjah city, UAE". Their study aims to assess knowledge and attitude about plastic pollution among secondary school students in Sharjah city, United Arab Emirates. A cross- sectional study was conducted among 400 students in 6 different secondary schools in Sharjah city. Self-administered questionnaires were distributed through the probability stratified random sampling method. The result revealed that the students' mean knowledge score was 53%, with females ($P < 0.01$), grades 11 and 12 ($P = 0.024$), and students whose mothers were educated ($P = 0.014$) being more knowledgeable and inclined towards pro-environmental behavior.

Neo Sau Meia., Choong Weng Waia., and Rahmalan Ahamadb.(2015) conducted a study on "Environmental Awareness and Behaviour Index for Malaysia".National Environmental Performance Index (EPI) is evaluated every two years to examine Malaysia's environmental performance concerning different indicators such as climate change and water quality. Considering the causes of environmental degradation are mainly due to anthropogenic activities, this study aims to explore the need to indicate the social-psychological factors among Malaysians in qualifying the level of public environmental awareness and behaviour. A nationwide study has been conducted to examine environmental awareness and behaviour from 13 States and three Federal Territories. A national survey was conducted to determine the level of environmental awareness and behaviour among Malaysians. All 13 States, including Perlis, Perak, Kedah, Pulau Pinang, Pahang, Kelantan, Terengganu, Selangor, Negeri Sembilan, Melaka, Johor, Sabah, Sarawak, and three Federal Territories, including Putrajaya, Kuala Lumpur, and Labuan, were covered. The result demonstrated the current level of environmental awareness and behaviour among Malaysians, according to the four categories; water pollution, air pollution, waste management, and climate change.

Mudiarasan Kuppusamy., and Behrooz Gharleghi.(2015) conducted a study on the "No Plastic Bag Day" Concept and Its Role in Malaysian's Environmental Behaviour Development". The purpose of this study is to investigate the Malaysian values, awareness's, and attitudes toward "No Plastic Bag Day" concept. It also investigates how this event revolutionized the consumers' behaviour every saturday. This research is derived from the quantitative research approach and will analyse

220 questionnaires distributed in the Klang Valley area over a period of 2 months. In this research, the PLS modelling approach will analyse the relationship between Eco literacy, Perceived Behaviours, Consumer's Attitude, and Subjective Norms with Environmental Behaviour Development. A total of 250 questionnaires were distributed in targeted areas via using a non-random sampling technique. Fifty questionnaires are distributed on each hypermarket during the selected day with the aim of unbiased or overpopulation selected in the certain hypermarket. The target population for this research is limited to Malaysian and non-Malaysian in the Klang Valley area. The empirical analysis using PLS unveiled that Ecoliteracy, Perceived Behaviours, and Subjective Norms have a significant relationship with Malaysia's environmental behaviour development.

Javier López-Murcia Martín.(2015). "Social perceptions of single-use plastic consumption of the Balinese population". Bali's island has suffered from an increasing amount of single-use plastics being littered into the environment during the past few years. This research aims to determine the social perceptions of plastic bags and bottles, mainly through consumption habits, the degree of awareness of environmental impacts, and the willingness to reduce their consumption. The methodology is based on a survey approach and literature review contrasting the characteristics of plastic bottles and bags, their associated impacts, the relationship between consumer behavior and attitudes, and the current worldwide alternatives to reduce their consumption, including the usage of reusable bottles and bags, a Container Deposit Scheme (CDS), a ban on plastic bags and taxation. Results indicate that Balinese people already undertake a more environmentally friendly choice regarding bottles, the plastic bag usage is moderate, reuse rates are high. The environmental impact awareness is relatively high, and the willingness to reduce consumption is elevated. In conclusion, the consumption habits of the Balinese population suggest that single-use plastics are perceived rather negatively. However, a set of recommendations is provided for a continued improvement, considering the intermediate acceptance of a CDS to manage plastic bottles and a contradictory preference for a ban on plastic bags and voluntary actions to reduce plastic bags.

Riyad Moharam., and Maher Ali Al.Maqtari.(2014) conducted a study on "The Impact of Plastic Bags on the Environment: A Field Survey of the City of Sana'a and the Surrounding Areas, Yemen". Thousands of plastic factories are producing tons of plastic bags, which are very popularly used by the people for shopping purposes because of its ease, cheapness and convenience of use but their very hazardous negative impact is never highlighted or, at the very least, openly discussed in a more serious tone. The situation is worsened in Yemen as an economically disadvantaged country. Many countries have banned plastic bags due to public concern over the profound negative impact on the environment and agriculture, especially in agricultural countries, such as Yemen, Bangladesh, India, Pakistan, South Africa, etc. In this research paper, they surveyed Sana'a's city's field and recorded where those plastic bags accumulated. The number of factories producing plastic bags and discuss the causes and effects and reviewed a range of solutions for a clean environment for us and our future generations. The isolated microbial strains were identified based on their cultural morphological and biochemical study.

Yong Chang Jang., Jongmyoung Lee., Sunwook Hong., Jong Su Lee Won Joon Shim., and Young Kyoung Song.(2014) conducted a study on "Sources of Plastic Marine Debris on Beaches of Korea: More from the Ocean than the Land". Reduction of marine debris requires knowledge of its sources. The plastic marine debris was found on six beaches of Korea. Samples more extensive than 25 mm were collected from 10 quadrats of 5 × 5 m for each beach in spring 2013. The total 752 items (12,255 g) of debris comprised fiber and fabric (415 items, 6,909 g), hard plastic (120 items, 4,316 g), styrofoam (93 items, 306 g), film (83 items, 464 g), foamed plastic other than styrofoam (21 items, 56 g), and other polymers (20 items, 204 g). With the probable

sources allocated to each of 55 debris types, the source of 56% of all the collected debris appeared to be ocean-based, and 44% was land-based. Priorities of policy measures to reduce marine debris should differ from region to region as the primary debris sources may vary.

CRITICAL REVIEW OF RELATED STUDIES

Knowledge moves forward through a process of integration post research and thinking. To know the past and build the research design based on the past, the investigators have reviewed a plentiful of research on Awareness on detrimental effects of single –use plastics. This helped investigators develop insights about the nature of the undertaken research problem and determine whether any study has been undertaken in the researcher's field of study. The investigators have reviewed about 13 Indian and 8 International studies pertaining to the main variables and have generated a clear picture and up-to-date information about the variables. In general, out of 13 Indian studies, 11 were on effects on single-use plastics and related topics. Among the 8 International studies, 7 were on single-use plastics, and others are related topics.

Among them, most of the studies have been done through the survey method. The samples were taken from students of schools at all levels and mostly on college students. Different sampling techniques have adopted, like stratified sampling and purposive sampling, but most of the studies used random sampling techniques for selecting their sample. Questionnaires were used as a tool for most of the studies, and other tools used were interviews, observation, etc.

Further, the present study differs from the studies discussed above in terms of population, area, tool, and sample. Therefore the investigators have decided to undertake this topic for the research, which focuses on the awareness on the detrimental effects of single-use plastics among college students in Tirunelveli district.

CHAPTER-III

RESEARCH METHODOLOGY

INTRODUCTION

Research is considered to be a prominent key that is essential for opening new doors in any branch of knowledge. Research inculcates scientific and inductive thinking and it promotes the development of logical habits of thinking and organization. It brings vividness, completeness and comprehensiveness to many complex problems through a careful investigation or inquiry. Research methodology involves the systematic procedures by which the researcher starts from the initial identification of the problem to its final conclusions. Methodology of research outlines the entire research plan. It describes what must be done, what data will be needed, what specific data gathering tools will be used and how the sources of data will be selected. It is very much essential in systematic research.

Research methods address problems in both research design and data analysis. The success of any research depends largely on the suitability of the method, tools and techniques used for the collection of data. Thus, this chapter describes the research design i.e, the research method or strategy, sample design, choice of research tools and choice of statistical techniques used for the present study.

MEANING OF RESEARCH

Research is systematic attempt to obtain answers to meaningful questions about a phenomena or events. Paul and Leedy define Research as the mean to solve problems in our attempt to push back the frontiers of human ignorance. Redman and Mory define research as a "systematized effort to gain new knowledge". According to Kerlinger, "Scientific research is systematic, controlled, empirical and critical investigation of hypothetical prepositions about the presumed relations among natural phenomena".

Research is an intellectual activity that establishes new knowledge and discovers new truths about certain events or events. It has the intension of verifying the existing knowledge to enable the researcher to understand, predict or control the events of the world.

Objective of Research

Research intends to fulfill the following objectives:

i. To provide answer to the question through the application of scientific procedures.

ii. To discover the hidden truths and facts to formulate theories, principles etc.,

iii. To get familiarized and gain new insight with a phenomena.

iv. To bring out the real nature, character of individual, situation or a group.

v. To test a hypothesis of a causal relationship between variables.

vi. To determine the frequency with which something occurs or which it is associated with something else.

Importance of Research

The significance of research can be rightly understood in the words of Francis Bacon "Research is a power of suspending judgment with patience, of meditating with pleasures, of asserting with caution, of correcting with readiness and arranging thought with scrupulous plan". It helps in the development and establishment of sound theories. It also helps in the modification of behaviour according to the

challenges of time and consequences. Thus research is structured inquiry that utilizes acceptable scientific methodology to solve problems and create new generally applicable knowledge.

Characteristics of Research

The specific characteristics of research may clarify its spirit:

i. It is an intensive and diligent investigation towards solution of a selected problem.

ii. Research emphasizes the development of generalization, theories, and facts.

iii. It is reliable, verifiable and exhaustive.

iv. It based on observable experience or empirical evidences.

v. It demands insight and imagination.

vi. It is essentially inter disciplinary in approach.

vii. It evolves out of the thirst and urge for doing things newly or to answer unsolved problems.

viii. It should be carefully recorded and reported.

ix. It is deductive, logical and objective.

x. It is replicable and transmittable.

Methods of Research

Research is an intensive and diligent investigation towards solution of a selected problem. The types of research methods are:

Descriptive Method

In the words of Best and Khan (2005) "Descriptive research describes and interprets what is. It is concerned with conditions or relationships that exist, opinions that are held, processes that are going on, effects that are evident, or trends that are developing. It is primarily concerned with the present, although it often considers past events and influences as they relate to current conditions". It provides a method of investigation to study, describe and interpret what exists at present.

Experimental Research

Experimentation provides a method of hypothesis testing. According to John.W.Best. "Experimental research is the description and analysis of what will be or what will occur, under carefully controlled condition". The logical association between manipulated factors and observed effects are established by controlling or removing other influential factors.

Historical Research

Historical research has been defined as the systematic and objective location, evaluation and synthesis of evidence in order to establish facts and draw conclusions about past event (Borg, 1963). It involves exploring the meaning and relationship of events, and as its resource it uses primary historical data in the form of historical artifacts, records and writings. It attempts to find out what happened in the past and to reveal reasons for why and how things happened.

RESEARCH DESIGN

Research design is a mapping strategy. It is essentially a statement of the object of the inquiry and the strategies for collecting the evidences, analyzing the

evidences and reporting the findings. Thus it includes the following components:

i. Research strategy or Research method.

ii. Choice of research tool.

iii. Sampling design.

iv. Choice of statistical techniques.

The research design of the present study has been sketched out in this chapter.

METHOD ADOPTED IN THE PRESENT STUDY

In psychology, much of the natural scientific type of researches has been conducted using the descriptive techniques that are used to interpret the results recorded of the behaviour under investigation. In the present study the research problem, "Awareness on the Detrimental Effects of Single-use plastics among College Students in Tirunelveli District". The goal of this study is to evaluate the awareness about the harmful effects of Single-use plastics among the younger generation.

It is a multifaceted phenomenon, thus keeping in mind the study's purpose and population. The investigators have adopted a descriptive method with the survey as a technique for the present study.

Why Survey Technique was selected

i. Survey research is most widely used non-experimental type of educational research.

ii. Descriptive surveys serve as direct source of valuable knowledge concerning human behavior

iii. Survey has the basic connection of "the act of looking over or beyond". Data are ever changing and survey research portrays a brief moment in time to enhance our understanding of the present (Leedy & Ormrod, 2001).

iv. In the words of John.W.Best (1989) "survey method gathers data from a relatively large number of cases at a particular time".

v. For the present study the investigators would like to meet a large number of students with a special attention in Detrimental effects of single use plastics. The information is collected through a highly structured questionnaire and from a large number of respondents represents a specific population

vi. The nature and objectives of the study compelled the investigator to use this normative survey method.

As the survey technique suits the current problem of research "Awareness on the Detrimental Effects of Single-use plastics among College students in Tirunelveli District", the investigators have used this technique for his study.

Survey as Technique

The main hallmark of descriptive research family is the survey technique. The normative survey approach is followed in studying local as well as state, national and international aspects of educational evaluation and generalization and direct towards proper understanding and solution of significant problems. According to John W. Best, "the survey is extensive and cross sectional dealing with a relatively large number of cases of a particular time and yielding statistics that are abstracted from particular cases.

Survey is one of the techniques used in the analysis of fact finding. Survey means viewing and interpreting things rigorously and comprehensively. It is the

most widely used method too. Typically survey gathers data at a particular point in time with the intension of

i. Describing the nature of existing conditions (of what exists),

ii. Identifying standards against which existing conditions can be compared,

iii. Determining the relationships that exist between specific events and how to get there

According to Sukia (1981) "Survey method is a method of collecting and analysis of responding responses as specific population collected through rightly structured questionnaire or even interview". It is not only a way of collecting data but also analyzing results statistically, systematically.

Steps Involved in Survey

The word "survey" indicates the gathering of data. It involves various steps in the process, they are:

i. Planning

A proper plan of action is essential to ensure scientific and objective merits of the study. It ensures defining of the problem and the development of survey design.

ii. Development and application of sampling plan

The required area for study, sampling and sampling procedure has to be defined and formulated. True representative sample should be drawn from population. It should be feasible, practical and economical.

iii. Construction of Research tool

The commonly used survey tools are questionnaire, interview schedule etc., proper selection of the tool or systematic preparation of a new tool should be specified. Depending on nature of problem the tool has to be selected.

iv. Data collection

Data are collected from the proposed population with the specified tool of inquiry.

The comprehensiveness and authenticity of the data has to be ensured.

v. Translation of data

Translation known as coding, the data collected are first translated in to qualified form such as assigning numbers to the responses. It is the initial tabulation system as technical preparation for analysis.

vi. Data Analysis

Basic summary table should be compiled and more of critical analysis should be applied to the data. By using SPSS, the required statistical applications and analysis is done with a view to prove or disprove the hypothesis.

vii. Conclusion and reporting

After collecting and analyzing, the researcher has to accomplish the task of drawing inferences by reporting. This is the final step in the methodology of survey research. Research report is considered as a major component of the research study for the research task remains incomplete till the report has been presented. Major findings and suggestions are given in the conclusion and report is about the research.

Characteristics of Survey

i. It is essentially cross sectional approach.

ii. Its versatility is its greatest strength, which supports in collection of much information like characteristic, attitude, opinion, experience and expectations.

iii. It involves clearly defined problems and definite purpose.

iv. It requires expert and imaginative planning careful analysis and interpretation of the data gathered and skillful reporting of the findings.

v. It does not seek to develop an organized body of the scientific principles. „

vi. It provides information useful to the solution of local problems.

vii. It suggest course of future development.

Advantages of Survey

i. Survey may be qualitative and quantitative.

ii. It gathers data from relatively large number of cases at a particular time.

iii. Survey technique is used to gather the desired information easily and less expensively.

iv. It sensitizes the researcher to unanticipated or unknown problems.

v. Description may be either verbal or expressed in mathematical symbols.

vi. It is concerned with the generalized statistics.

vii. It is extensively useful in all disciplines.

viii. It gives very detailed description of the phenomena.

ix. Within an appropriate sample, survey may aim at representation and provide generalized results.

x. It is relatively easier to administer, and need not require much of field work.

xi. It may be repeated in the future or in different settings to allow comparison to be made.

RESEARCH TOOLS

Tools are administered on the sample subjects for collecting evidences or data. Research tools are of various kinds and employs distinctive ways of describing and qualifying the data. Some of the important research tools are: Questionnaire, Interview, Rating scale. Like the tool in a carpenter's box, each research tool is appropriate in a given situation to follow a particular purpose. In designing any research project careful considerations have to undertake in the selection of measurement tool. This will ensure the selected tool clearly and accurately measures the phenomenon under observation.

i. Firstly, the researcher should determine his / her needs and find out the tests that can be applicable in measuring the variable under observation.

ii. Secondly, the variable is defined and assessed on how narrow or wide it can be.

iii. Thirdly, the researcher should determine whether the variable is measurable or not.

The researchers should select a tool that can fit well with the data to be collected

and allow ease in analysis process (Health links, 2010). Without powerful tool, no data can be collected A good research tool must satisfy validity reliability, objectivity accuracy and predictability. It must be economical by means of time and money too.

Tool used for this study

A properly constructed and administered questionnaire may serve as a most appropriate and useful data gathering device. "A Questionnaire consists of a number of questions printed or typed in a definite order on a form or set of forms" (Kothari,C.R. 1988). It is the popular and highly flexible tool for collecting the data with qualitative information from a relatively large number of respondents. Hence, the "Questionnaire" seems to be apt for the phenomenon of investigation.

In this study of "Awareness on the Detrimental Effects of Single-use plastics among College students in Tirunelveli District", the investigators have developed a well- designed questionnaire consisting of two parts to collect relevant data from the students. They are:

i. Personal data form.

ii. Detrimental Effects of Single-use Plastics Awareness Scale was constructed and validated.

DEVELOPMENT PROCESS OF THE TOOL

The Detrimental Effects of Single-use Plastics Awareness Scale (DESPA) was constructed by the investigators with the objective to measure the awareness level of college students. Systematic procedures were followed in the process of tool construction like:

i. Planning,

ii. Preparing,

iii. Trying out and

iv. Evaluating

1. Planning

The following steps include the activities and task performed in the planning for construction of the tool:

i. The objective of the tool was fixed to measure the level of Awareness

ii. The content area and dimensions was defined.

iii. Decisions over the type and number of items to be included in the scale under each dimension were outline.

iv. A three point scale with scoring key according to nature of items, positive and negative was sketched out.

2. Preparation of items

This step requires understanding and mastery of the subject content and skill for preparing the statements. Hence the items are drawn out from various sources and the items were preliminary item pool is prepared.

i. Sources of items

a. Review of Indian and international studies and literature based on Detrimental Effects of Single-use Plastics Awareness.

b. Ideas, opinions, suggestions, information's regarding awareness on detrimental

effects of single use plastics were gathered from experts, professors, teachers, parents and students.

After a vigilant scrutiny of the available sources 80 statements were framed by the investigator and guide.

ii. Criteria for selection of items

a. It should be in simple and clear statement form, with no sort of ambiguity in its meaning or language.

b. Items should be appropriate to respondent's level.

c. It should be arranged in an order from easy to difficult.

d. Compound and complex sentences should be avoided.

e. An item should express only one opinion and

f. The statement should not lead to multiple interpretations.

iii. Pooling of items

The Detrimental Effects of Single-use Plastics Awareness Scale (DESPA) focused on thoughts, habits and which leads and reflects awareness of college students in their college in behavioural terms are prepared and pooled. Thus there were 52 statements in the DESPA at this stage.

iv. Establishing Validity

According to Lee Chronbach "validity is the extent to which a test measures what it purposes to measure". Prior to the administration of the tool, the investigator to bring forth the expert's judgement, regarding the suitability, adequacy, objectivity and clarity of the pooled items.

a. The newly constructed tool was given to experts, in the field of education for the establishment of "Face Validity", which is a subjective statement that the tool appears to cover the relevant content, and "content validity", which involves the systematic examination of the content to determine whether it covers a representative sample of the domain to be measured.

b. Expert's opinion on the clarity, and suitability in measuring the particular dimension.

c. Arrangements of items in random order and were subjected to expert's scrutiny.

Some items were modified, deleted and rearranged based on their suggestions. Thus the face validity and content validity of the tool was established. Thus, 80 statements were retained in APAS.

3. Trying Out

The main task of try out is to improve and modify the language ambiguity and difficulty. The subjects are selected from the population for which the test is designed. It helps to:

i. To refine the instrument.

ii. To identify the difficult items and to delete the ambiguous or difficult statements.

iii. To estimate reliability index of the tool.

It enables the investigators to select the required number of items for inclusion in the final form of scale Final tool is prepared.

Pilot study

Pilot study is a preliminary try out of the instrument with a small number of individuals. The purpose of pilot study is to refine the instrument including the correlation of deficiencies. A pilot study is not the major data collection of the data.

Before finalizing, the rough draft of the DEPSA consisted of 80 statements. The tool was administered to 100 college students studying in St. Johns College and Sarah Tucker College with prior permission from the head of the institution. The questionnaire was distributed to 100 students to know whether the items included in the questionnaire measure what they have to measure viz. On basis of their responses Scoring was done and Item vs. Item whole correlation was calculated. Ambiguous items were deleted. Only items having high level precision were retained.

Item whole correlation

Karl Pearson's product moment correlation co-efficient was calculated between the item score and the total score to find validity index of the item. In this method "each item score is correlated with the total scale mean score. The items which are significant at 5% level are accepted and selected. The table value at 5% significance level is 0.195. Hence, statements with correlation value above or equal to 0.195 were selected. Items having validity index below 0.195 were deleted from the draft questionnaire, thus 28 items were deleted. So the final tool contained 52 items. Thus, the validity of the tool was established. The validity indices are given in the following.

Table 3.1

ITEM VS WHOLE CORRELATION OF DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS AWARENESS SCALE

ITEM NO.	'γ ' VALUE	REMARKS	ITEM NO.	'γ ' VALUE	REMARKS
***1.**	**0.139**	**Deleted**	***41.**	**0.021**	**Deleted**
***2.**	**0.180**	**Deleted**	42.	0.219	Selected
3.	0.430	Selected	43.	0.260	Selected
4.	0.288	Selected	***44.**	**0.129**	**Deleted**
5.	0.281	Selected	45.	0.285	Selected
6.	0.394	Selected	46.	0.319	Selected
7.	0.329	Selected	***47.**	**0.130**	**Deleted**
***8.**	**0.149**	**Deleted**	***48.**	**0.072**	**Deleted**
***9.**	**0.145**	**Deleted**	***49.**	**0.145**	**Deleted**
10.	0.393	Selected	***50.**	**0.148**	**Deleted**
11.	0.303	Selected	51.	0.334	Selected
12.	0.413	Selected	52.	0.202	Selected
***13.**	**0.075**	**Deleted**	53.	0.261	Selected
14.	0.441	Selected	54.	0.195	Selected
15.	0.371	Selected	55.	0.221	Selected
***16.**	**0.073**	**Deleted**	***56.**	**0.115**	**Deleted**
***17.**	**0.064**	**Deleted**	57.	0.197	Selected
18.	0.239	Selected	***58.**	**0.171**	**Deleted**
19.	0.202	Selected	59.	0.198	Selected
***20.**	**0.142**	**Deleted**	***60.**	**0.016**	**Deleted**
***21.**	**0.099**	**Deleted**	61.	0.308	Selected
22.	0.356	Selected	***62.**	**0.024**	**Deleted**
23.	0.379	Selected	***63.**	**0.061**	**Deleted**
24.	0.276	Selected	***64.**	**0.173**	**Deleted**
25.	0.346	Selected	65	0.382	Selected

26.	0.342	Selected	66.	0.311	Selected
27.	0.297	Selected	67.	0.217	Selected
28.	0.427	Selected	***68.**	**0.045**	**Deleted**
29.	0.386	Selected	***69.**	**0.048**	**Deleted**
30.	0.392	Selected	70.	0.227	Selected
***31.**	**0.125**	**Deleted**	71.	0.274	Selected
32.	0.429	Selected	72.	0.318	Selected
33.	0.198	Selected	73.	0.248	Selected
***34.**	**0.143**	**Deleted**	***74.**	**0.077**	**Deleted**
***35.**	**0.110**	**Deleted**	***75.**	**0.089**	**Deleted**
36.	0.414	Selected	76.	0.195	Deleted
37.	0.205	Selected	77.	0.321	Selected
***38.**	**0.087**	**Deleted**	78.	0.233	Selected
***39.**	**0.034**	**Deleted**	79.	0.197	Selected
40.	0.199	Selected	80.	0.196	Selected

At 5% level of significance, for 98 df the table value of „γ""is 0.195

ESTABLISHING RELIABILITY

Reliability refers to the consistency of scores and stability of test for a certain population. The investigators employed split half method to establish the reliability of the tool. This method of estimating reliability involves both the characteristics of stability and equivalence. In this method result obtained from one half of the scale items being checked against the result from other half of the items. This method is appropriate for testing co-efficient of homogeneity.

The whole tool was split into two halves-odd and even numbered statements. The responses were scored and reliability coefficient of correlation between the two sets of scores was calculated. The reliability index of the tool was estimated by the Spearman Brown formula. The reliability index of DESPA is found to be 0.64.

SPLIT-HALF RELIABILITY VALUE OF THE TOOL

S.No.	**Tool**	**Spilt-half 'γ' value**
1.	Detrimental Effects of Single-use Plastics Awareness (DESPA)	0.64

DESCRIPTION OF THE TOOL

Personal Data form

The personal data form is used to collect general information of the college students. It includes some personal information about the respondents such as gender, nature of college, type of college, group of study, locality of college, place of residence, type of family, locality of residence, father's education, mother's education, father's occupation and mother's occupation.

Detrimental Effects of Single-use Plastics Awareness (DESPA)

The investigator has used a Self-made Questionnaire of Detrimental Effects of Single-use Plastics Awareness Scale developed by the investigators for collecting data for this study. It is intended to measure the level of Awareness on Detrimental Effects of Single-use Plastics of college students. The scale consists of 50 Statements. The statements are of positive and negative in nature.

Nature of items

ITEMS	ITEM NUMBERS	NO. OF ITEMS
Positive	4, 15, 19, 20, 21, 22, 23, 24, 25, 33, 34, 35, 36, 41.	14
Negative	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 26,27, 28, 29, 30, 31, 32, 37, 38, 39, 40, 42, 43, 44, 45,46, 47, 48, 49, 50.	36

SCORING KEY

In the Scoring key, a score is a number assigned to an investigators to provide a quantitative description of respondent's performance on a particular test. Scores are assigned to all the responses. All the statements would be scored for the DESPA in the following manner for the positive and negative questions.

SCORING KEY OF DETRIMENTAL EFFECTS OF SINGLE USE PLASTICS

	CHOICE	
RESPONSE	Positive	Negative
Agree	1	2
Disagree	2	1

AREA OF THE STUDY

The investigators had selected Tirunelveli district for their study.

POPULATION

"Population is defined as a group of individuals that have one or more characteristic is common that are of interest to the researchers".

The researchers has confined the population of the present study only to college students studying in various college of Tirunelveli**.**

SAMPLE AND SAMPLING DESIGN

According to John, a sample, as the name implies, is a smaller representation of a larger whole.

W. Best (2008) "A sample is a small proportion of the population that is selected for observation and analysis. By observing the characteristics of the sample, certain inferences can be made about the characteristics of the population from which it drawn". The investigators have derived the sample for the present study from 300 students studying in college from various colleges in Tirunelveli.

The most basic form of probability sample is the simple Random Sampling technique. With the simple random sample, each unit in the population has an equal probability of inclusion in the sample. Gay (1987) reports: "Random sampling is the best single way to obtain a representative sample. The investigators have used the Simple Random Sampling Technique for this study.

ADMINISTRATION OF THE TOOL

The investigators personally visited the colleges with the permission of the concerned Head of the colleges. The personal data form along with Detrimental Effects of Single-use plastic Awareness Scale was distributed to the students. The students were given enough time to respond to the item of the tools.

COLLEGES SELECTED FOR STUDY

Table 3.2

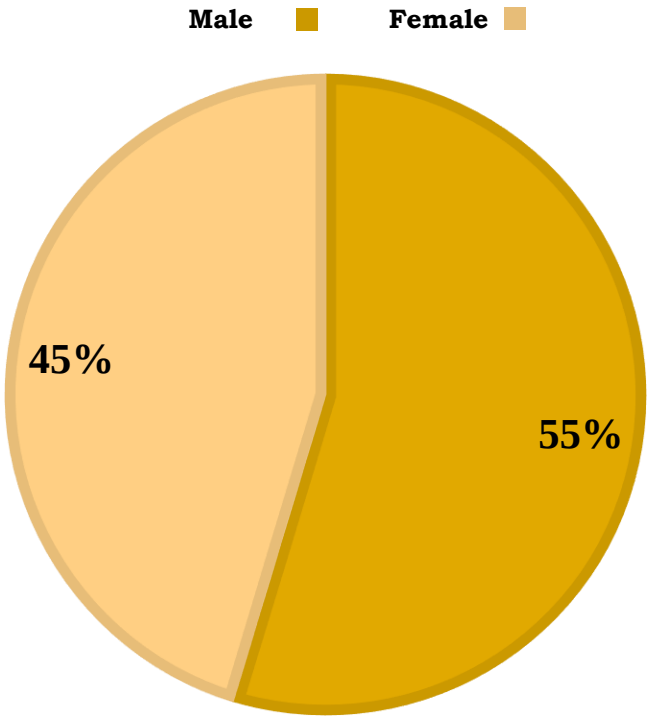
SAMPLE WISE DISTRIBUTION OF THE COLLEGES

S.No.	NAME OF THE SCHOOL	NO. OF SAMPLES
1.	St. Xavier's College, Palayamkottai.	50
2	C.S.I.Jeyaraj Annapackiam College, Nallur	48
3	St. John's College, Palayamkottai.	58
4	Sarah Tucker College, Palayamkottai.	47
5	Sri Sarada College for Women,Tirunelveli	57
6	Rani Anna College , Tirunelveli	40
TOTAL		300

SEX WISE DISTRIBUTION OF THE SAMPLE

Sex	No. of students	Percentage
Male	164	54.7
Female	136	45.3
Total	**300**	**100**

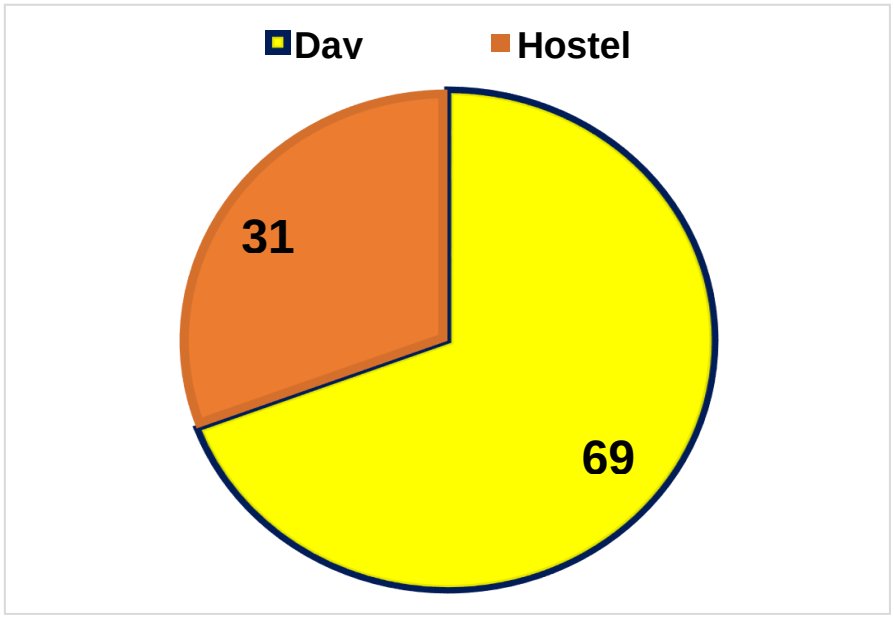
Figure 3.1. Sex wise distribution of the sample



PLACE OF RESIDENCE WISE DISTRIBUTION OF THE SAMPLE

PLACE OF RESIDENCE	NO. OF STUDENTS	PERCENTAGE
Day Student	208	69.3
Hosteller	92	30.7
Total	300	100

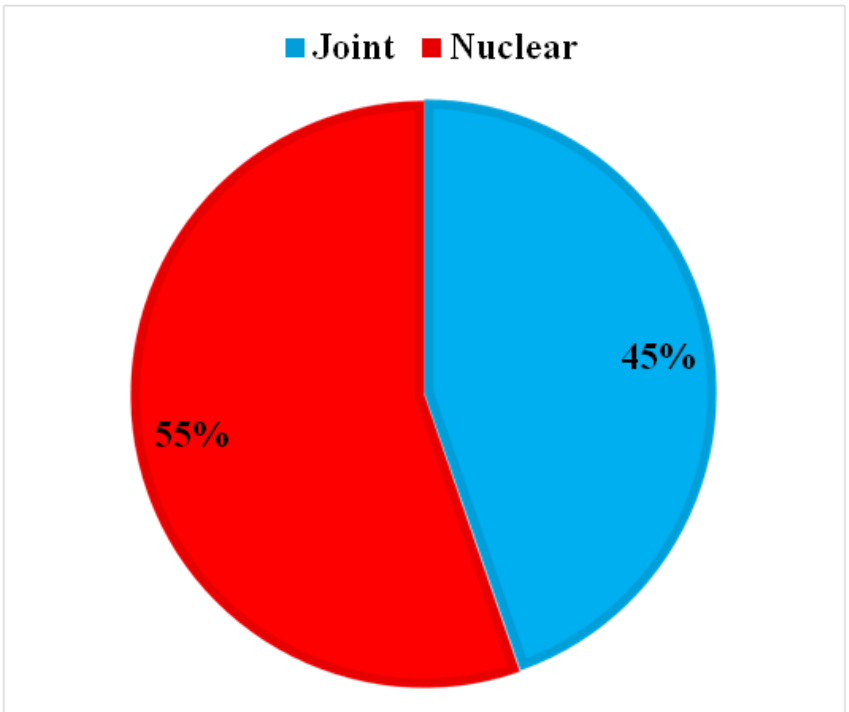
Figure.3.2. Place of residence wise distribution of the sample



TYPE OF FAMILY WISE DISTRIBUTION OF THE SAMPLE

TYPE OF FAMILY	NO.OF STUDENTS	PERCENTAGE
Joint	134	44.67
Nuclear	166	55.33
Total	300	100

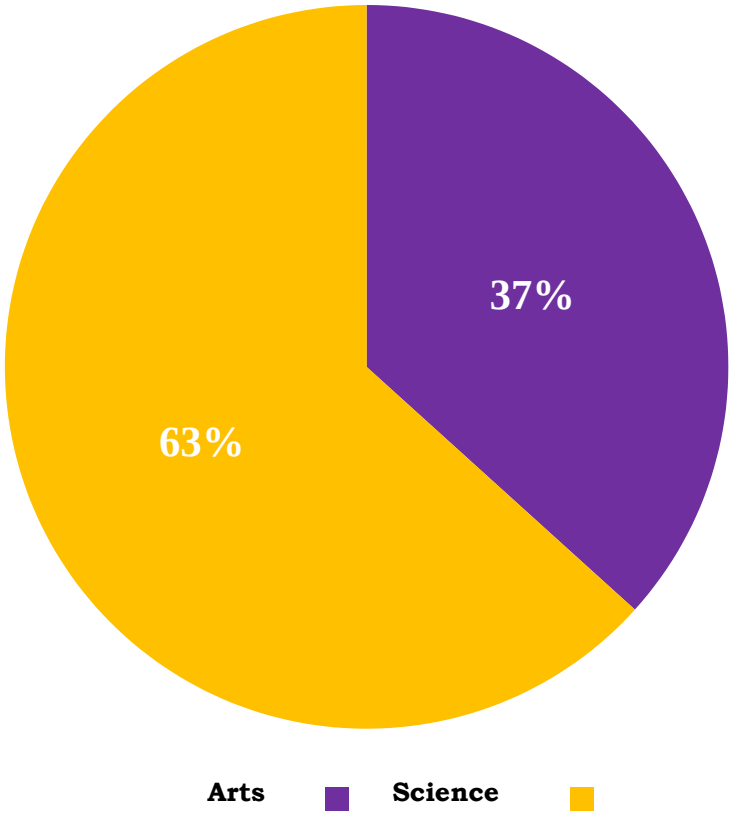
Figure 3.3. Type of family wise distribution of the sample



GROUP OF STUDY WISE DISTRIBUTION OF THE SAMPLE

Group of the study	No. of students	Percentage
Arts	110	36.7
Science	190	63.3
Total	300	100

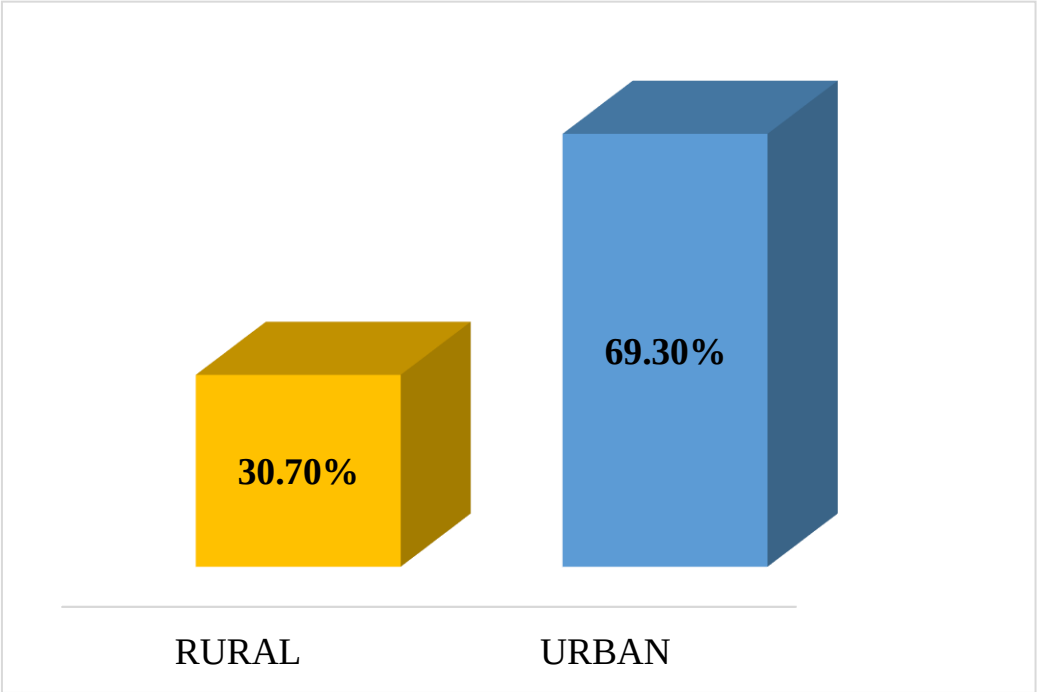
Figure 3.4 Group of study wise distribution of the sample



LOCATION OF THE COLLEGE WISE DISTRIBUTION OF THE SAMPLE

Location of the College	No. of students	Percentage
Rural	92	30.7
Urban	208	69.3
Total	300	100

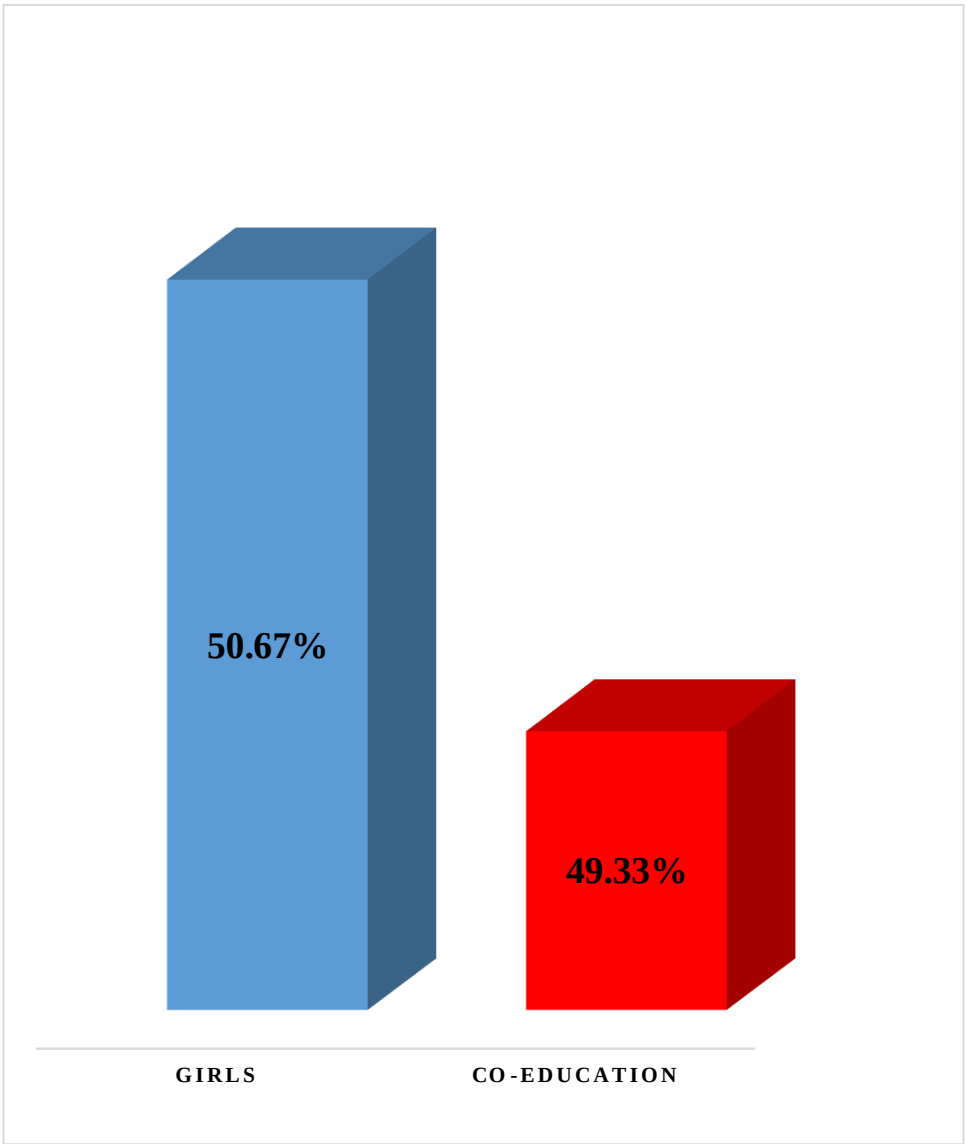
Figure.3.5 Location of the college wise distribution of the sample



NATURE OF COLLEGE WISE DISTRIBUTION OF THE SAMPLE

Nature of college	No. of students	Percentage
Girls	152	50.67
Co-education	148	49.33
Total	300	100

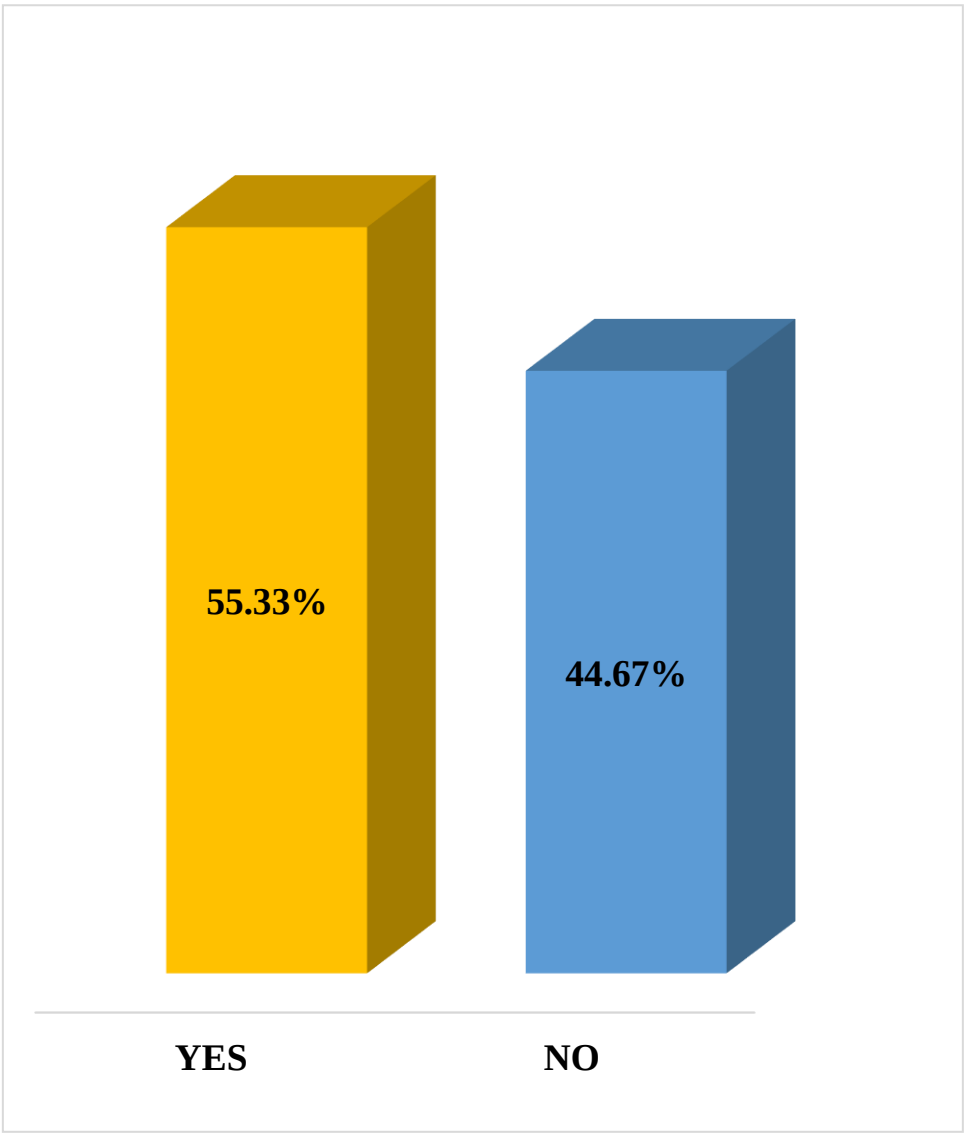
Figure. 3.6. Nature of college wise distribution of the sample.



SOCIAL MEDIA USAGE WISE DISTRIBUTION OF THE SAMPLE

Social Media Usage	No. of students	Percentage
Yes	163	55.33
No	137	44.67
Total	300	100

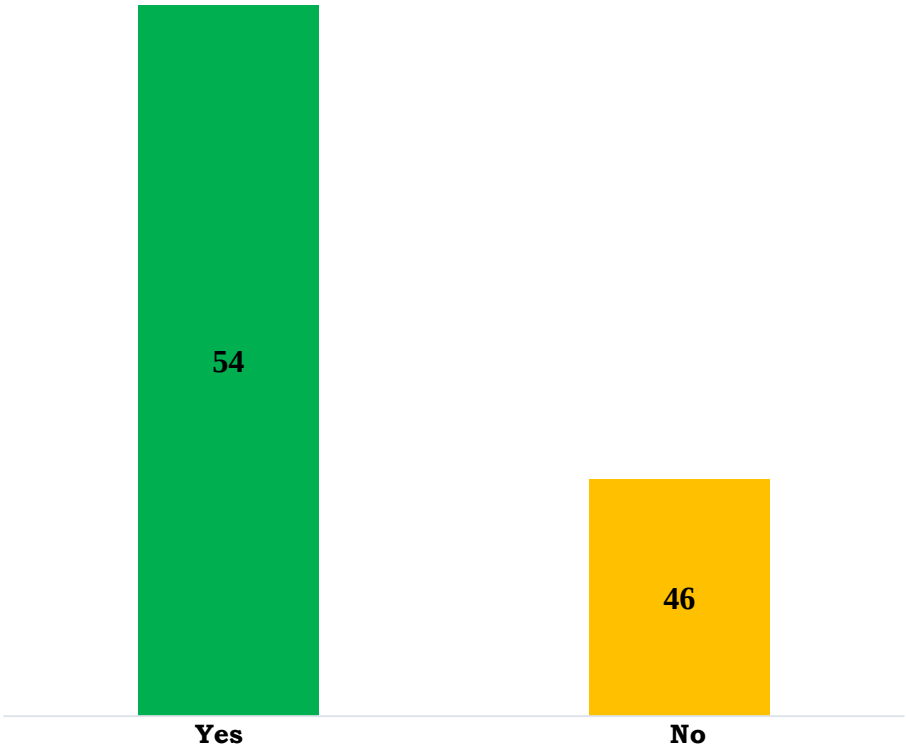
Figure. 3.7 Social media usage wise distribution of the sample



PARTICIPATION IN COMMUNITY SERVICES WISE DISTRIBUTION OF THE SAMPLE

Participation in community services.	No.of Students	Percentage
Yes	162	54
No	138	46
Total	300	100

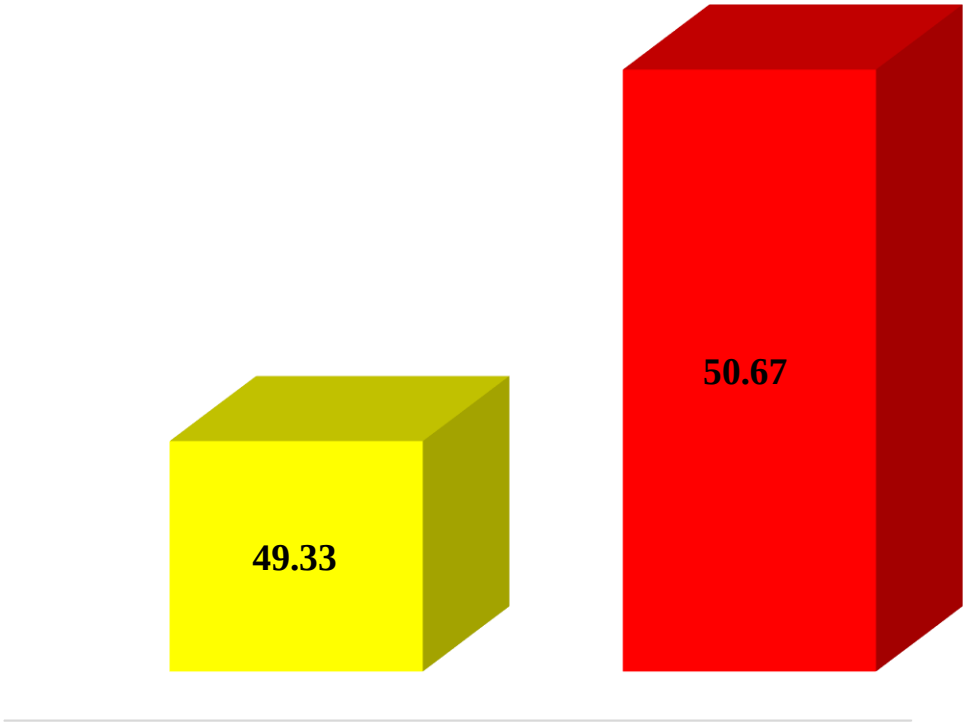
Figure. 3.8 Participation in Community Service wise distribution of the sample



FATHERS' EDUCATION WISE DISTRIBUTION OF THE SAMPLE

Fathers' Education	No. of Students	Percentage
School	152	50.67
Graduate	148	49.33
Total	300	100

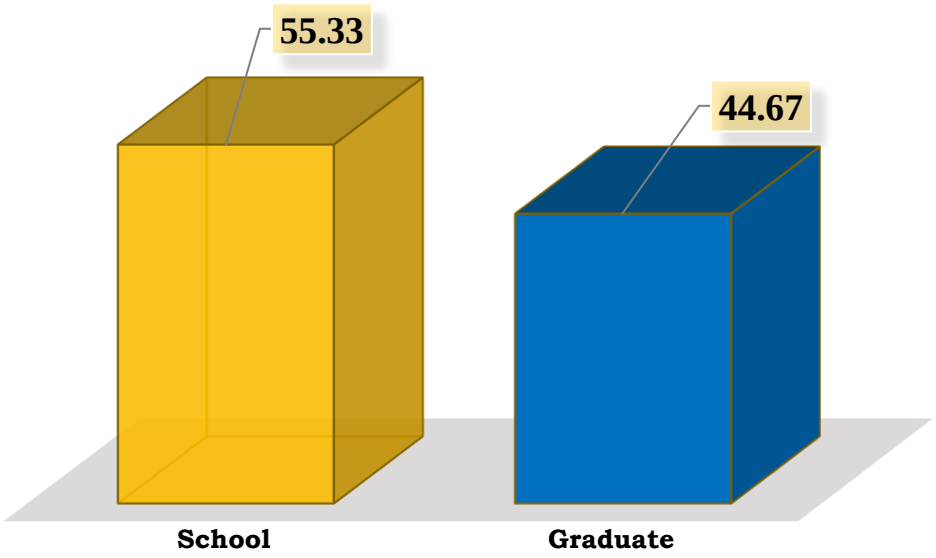
Figure.3.9. Fathers' Education wise distribution of the sample



MOTHERS' EDUCATION WISE DISTRIBUTION OF THE SAMPLE

Mothers' Education	No. of Students	Percentage
School	166	55.33
Graduate	134	44.67
Total	300	100

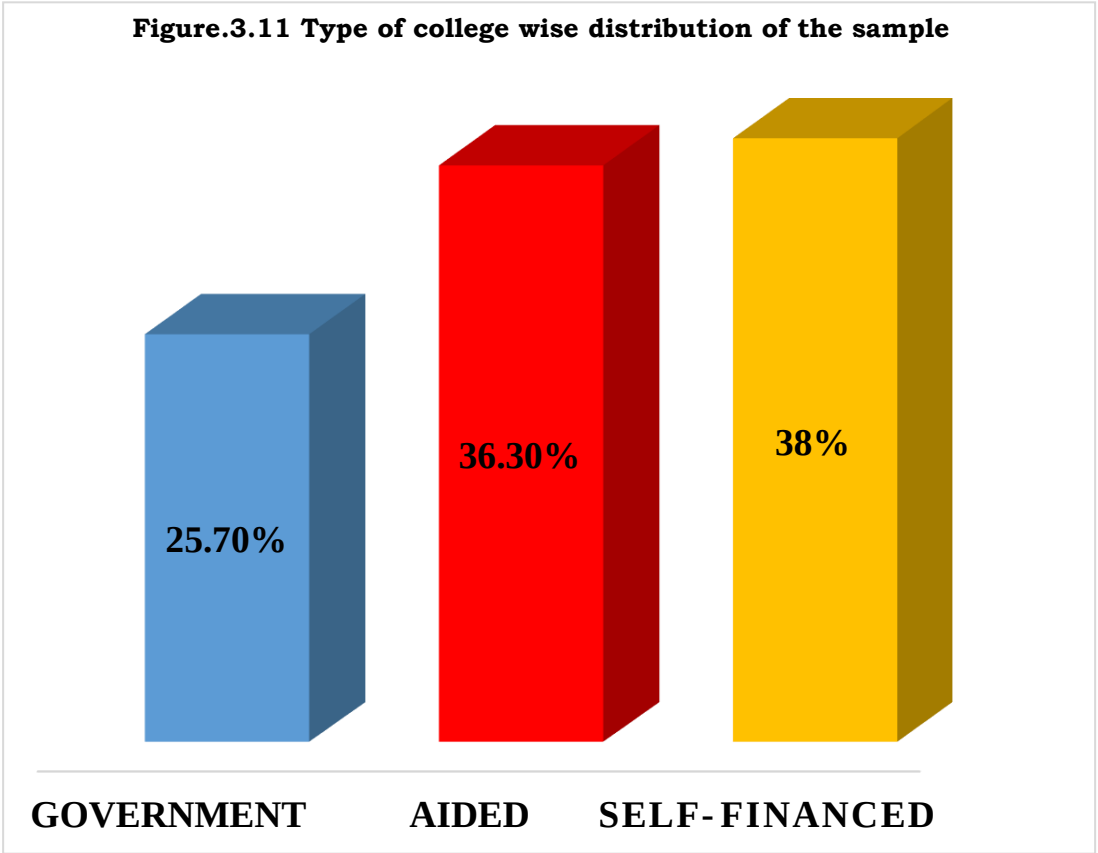
Figure.3.10. Mothers' Education wise distribution of the sample



3.13 TYPE OF COLLEGE WISE DISTRIBUTION OF THE SAMPLE

TYPE OF COLLEGE	NO. OF STUDENTS	PERCENTAGE
Government	77	25.7
Aided	109	36.3
Self-financed	114	38
Total	300	100

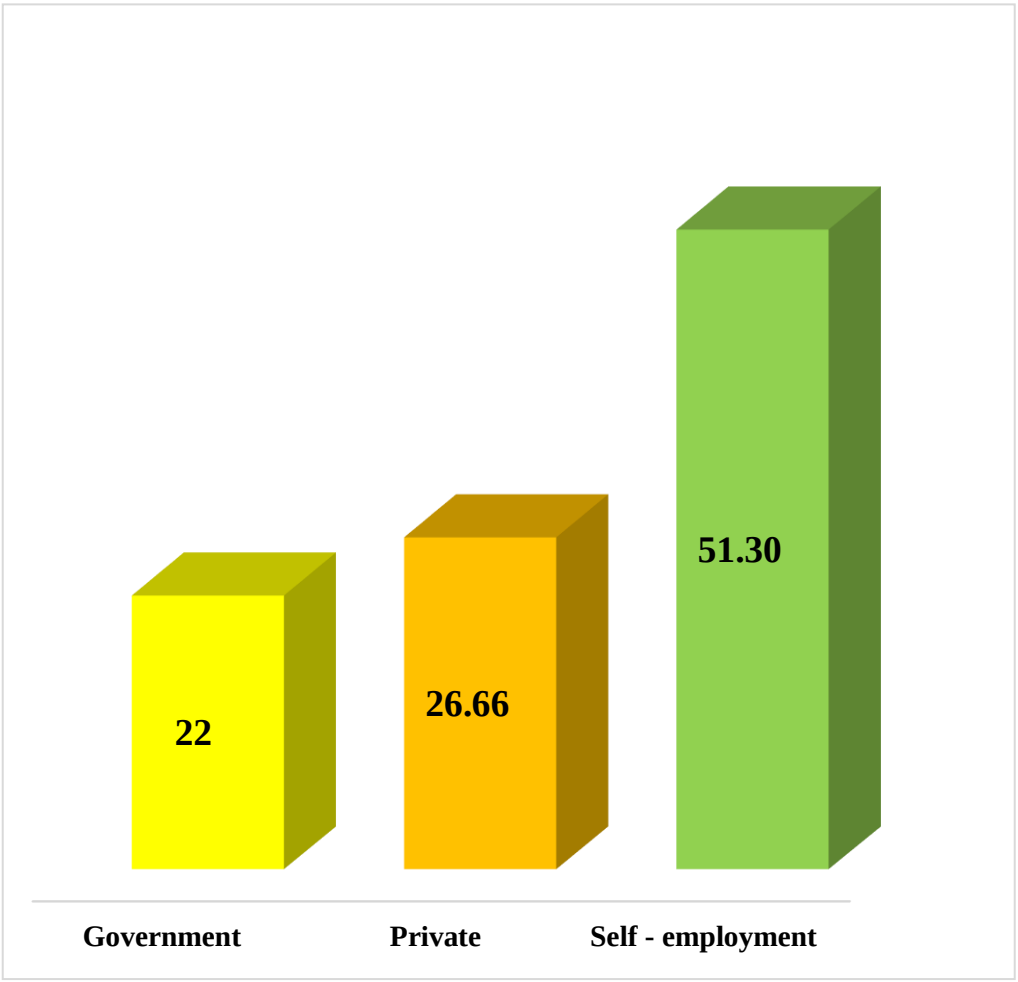
Figure.3.11 Type of college wise distribution of the sample



FATHER'S OCCUPATION WISE DISTRIBUTION OF THE SAMPLE

Fathers occupation	NO. OF STUDENTS	PERCENTAGE
Government	66	22
Private	80	26.66
Self-employment	154	51.3
Total	300	100

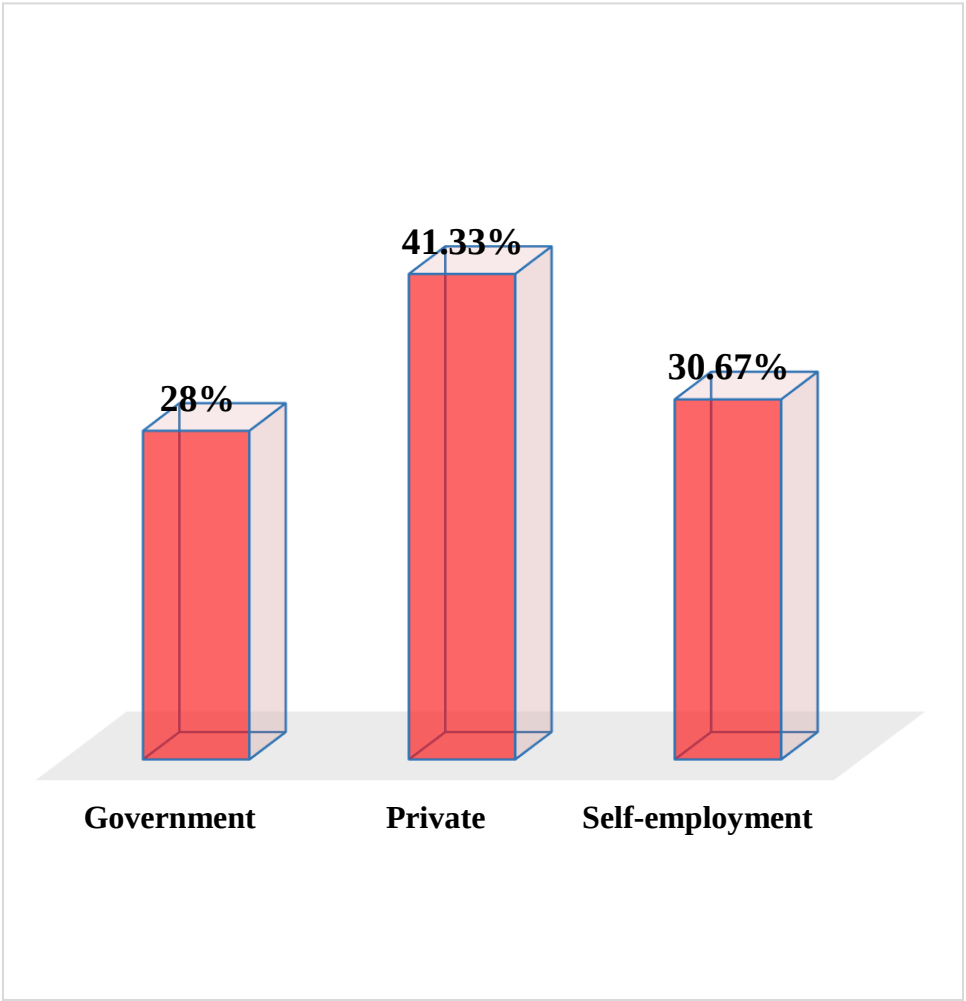
Figure. 3.12. Father's occupation



MOTHER'S OCCUPATION WISE DISTRIBUTION OF THE SAMPLE

Mothers occupation	NO. OF STUDENTS	PERCENTAGE
Government	84	28
Private	124	41.33
Self-employment	92	30.67
Total	300	100

Figure. 3.13 Mother's occupation wise distribution of the sample



STATISTICAL TECHNIQUES USED

"Statistics signifies the method or methods of dealing with numerical facts". According to Croxton &Cowden "It is a science of collecting, summarizing, analyzing and interpreting numerical facts". Since, research often yields such quantitative data; statistics is a basic tool of measurement and research. "The real purpose of statistical methods is to make sense out of facts and figures, to prove the unknown, and to cast light upon the situation". Statistics help in drawing conclusions from facts affected by a multiplicity of causes in any department of enquiry. Thus main purpose of statistical analysis is to draw general conclusion and inferences or making predictions on the basis of particulars facts and evidences.

USES OF STATISTICS IN RESEARCH

The advantages of statistical thinking's and operations in research are:

i. It permits the most exact kind of description.

ii. It forces us to be definite and exact in our procedures and in our thinking

iii. It enables us to summarize our results in a meaningful and convenient form.

iv. It facilitates us to draw general conclusions.

v. It enables us to predict.

vi. It enables us to analyze some of the causal factors underlying complex and otherwise bewildering events.

Research is based on statistics and statistical techniques that are used in data analysis. For analyzing and interpreting the data the investigators have used the following statistical techniques:

1. ARITHMETIC MEAN

Arithmetic average or mean can be easily defined as the sum of all the values of the items in a series divided by the number of items. It is represented by symbol $\overline{X}$. The investigator has used the following formula for calculating mean.

Formula

$$\overline{X} = A + \frac{\Sigma fd}{N} \times C$$

Where

X	=	Arithmetic mean
A	=	Assumed Mean
C	=	Length of the Class Interval
f	=	Frequency
d	=	Deviation of the midpoint of different Class Intervals from assumed mean i.e. (x-A)
N	=	Total frequency

In the present study the investigator has used arithmetic mean for studying Academic Procrastination and Achievement with regard to background variables like Gender, Place of Residence, Type of Family, Group of Study, Location of College, Nature of College, Social Media Usage, Participation in community Services, Father's Education, Mother's Education, Type of College, Father's Occupation and Mother's Occupation.

Uses of Mean

i. It is the more stable, reliable, accurate and widely used measure of central tendency.

ii. In computation equal weightage is given to every item in series.

iii. It provides a good basis for comparison.

iv. It can be used for further analysis and algebraic treatment.

2. STANDARD DEVIATION

Karl Pearson introduced the concept of Standard Deviation in 1893. Standard deviation of a set of scores is defined as the square root of the average of the squares of the deviations from the Arithmetic mean. It is denoted by the Greek letter sigma σ.

Formula

$$\sigma = C \sqrt{\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N}\right)^2}$$

Where

σ = Standard deviation

c = Length of the Class Interval

f = Frequency

N = Total frequency

d = Deviation of the midpoint of different class intervals from assumed mean. i.e. (x-A)

In the present study the investigator has used Standard Deviation for studying Academic Procrastination and Achievement with regard to background variables like Gender, Place of Residence, Type of Family, Group of Study, Location of College, Nature of College, Social Media Usage, Participation in community Services, Father's Education, Mother's Education, Type of College, Father's Occupation and Mother's Occupation.

Uses of Standard Deviation

i. It provides the more reliable measures of variability.

ii. It is used when the distribution is normal.

iii. It is stable and less fluctuating hence, widely used in sampling theory.

iv. It is used in the study of symmetrical frequency distribution.

v. It is used in co-efficient of correlation.

1. t' - TEST

The „t" is the ratio between the observed difference of two means and standard error mean difference. It is to test the significance of the difference between the means of two samples or groups.

Formula

$$t = \frac{M_1 - M_2}{\sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}}$$

Where

M1 = Mean of the first sample

M2 = Mean of the second sample

σ 1 = Standard deviation of the first sample

σ 2 = Standard deviation of the second sample

N_1 = Total number of frequency of the first sample

N_2 = Total number of frequency of the second sample

In this study, the investigator has used the t- test for testing the hypothesis at 5% level of significance. In the present study the investigators have used t test for studying Academic Procrastination and Achievement with regard to background variables like Gender, Place of Residence, Type of Family, Group of Study, Location of College, Nature of College, Social Media Usage, Participation in community Services, Father's Education, and Mother's Education.

Uses of t – test

vi. It is used for process of determining the significant difference between two means of the two groups.

vii. It can be used for large as well as small sample.

3. ANOVA (ANALYSIS OF VARIANCE)

A composite procedure for testing simultaneously the difference between several sample means is known as the Analysis of Variance. It helps us to know whether any of the differences between the means of the given sample are significant. This method is devised by R.A. Fisher in 1923. F – Test is an improvement over„t"- test.

Formula

$$F = \frac{\text{Mean Square Variance between the group}}{\text{Mean Square Variance within the group}}$$

In the present study the investigator has used ANOVA for studying Academic Procrastination and Achievement with regards to background variables like Nature of school and Type of school.

Uses of ANOVA

i. It is used to evaluate more than one main effects and interaction effects of two or more factors in one experimental situation.

ii. It considers both types of effects in term of between or among variance and within variance.

iii. It is used for more than one independent variable effect.

iv. It is used for more than one classification like one way analysis variance, two way analysis variance and three or more ways analysis variance.

CHAPTER IV

ANALYSES AND INTERPRETATION OF DATA

INTRODUCTION

"There's a world of difference between truth and facts. Facts can obscure the truth"-Maya Angelou

Data analysis is one of the important steps in the process of a research. It is a method, which underlies the whole process of research from a selection of a problem and its reduction in size to the point where the data process and the conclusions are reached. After the data are being collected, the researcher turns his focus of attention on his analysis. Analysis of data involves a number of closely related operations that are performed with the purpose of summarizing the collected data and organizing them in such a manner that they will answer to the research questions. "Analysis of data in a general way involves a number of closely related operations, which are performed with the purpose of summarizing the collected data and organizing these in such a manner that they answer the research questions" (Kothari, 1989).

IMPORTANCE OF ANALYSIS

The collected data are clumsy, confusing and complicated. They have to be arranged in an orderly, systematic and organized way before it can serve any worthwhile purpose. The analysis of data involves a number of closely related operations which are performed with the purpose of summarizing the collected data and organizing these in such a manner that they answer the research questions.

FUNCTION OF ANALYSIS OF DATA

i. In order to obtain the significant results.

ii. To convert the raw data in meaningful interpretations.

iii. To evaluate parameters.

iv. To test the null hypothesis.

v. To draw some inference or make generalizations.

AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS

A. PERCENTAGE ANALYSIS Objective-1

To find out the level of awareness on detrimental effects of single-use plastics of college students

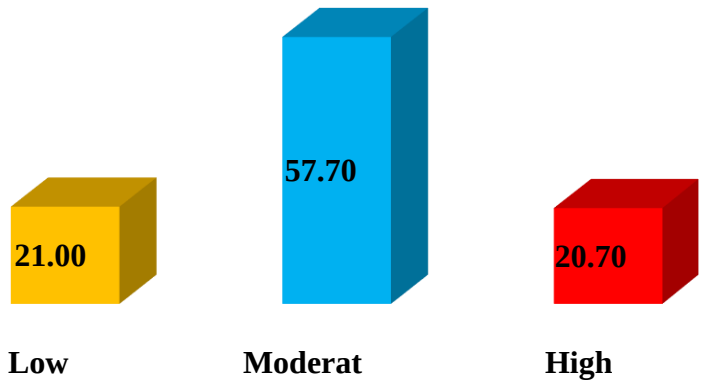
TABLE 4.1

LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS

	Low		**Moderate**		**High**	
	N	**%**	**N**	**%**	**N**	**%**
Overall awareness on detrimental effects of single-use plastics ofcollege students	65	21.7	173	57.7	62	20.7

It is inferred from the above table that 21.7% of college students have low, 57.7% have moderate and 20.7% have high level of awareness on detrimental effects of single-use plastics of college students.

Fig.4.1.
Overall awareness on detrimental effects of single-use



Objective: 02

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to gender.

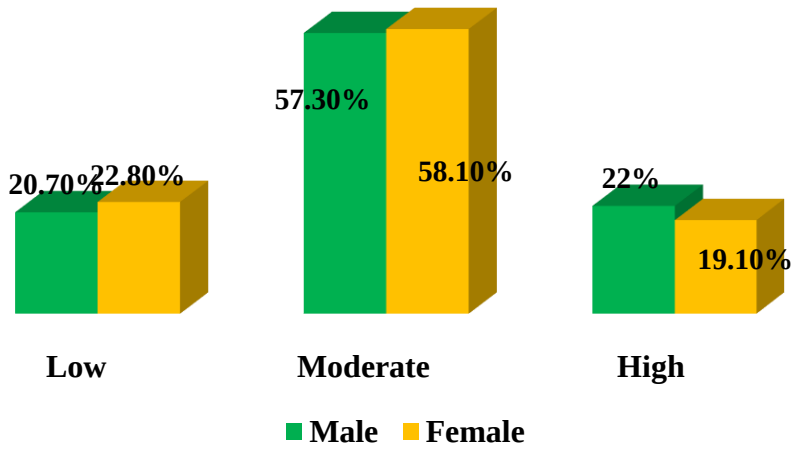
TABLE 4.2

LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO GENDER

		Low		Moderate		High	
Awareness on detrimental effects of single-use plastics	**Gender**	**N**	**%**	**N**	**%**	**N**	**%**
	Male	34	20.7	94	57.3	36	22.0
	Female	31	22.8	79	58.1	26	19.1

It is inferred from the above table that among the male students, 20.7% have low, 57.3% have moderate and 22.0% have high level of awareness on detrimental effects of single-use plastics. Among the female students, 22.8% have low, 58.1% have moderate and 19.1% have high level of awareness on detrimental effects of single-use plastics.

Fig.4.2
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO GENDER



Objective: 03

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to place of residence.

TABLE 4.3

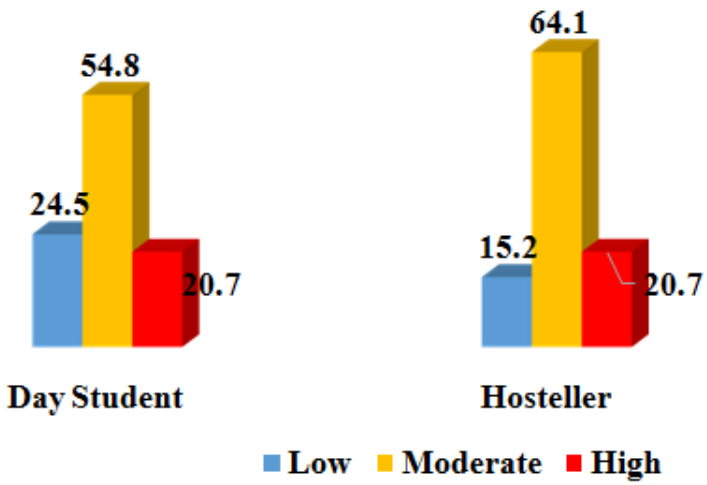
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO PLACE OF RESIDENCE

Awareness on detrimental effects of single-use plastics	**Place of residence**	**Low**		**Moderate**		**High**	
		N	**%**	**N**	**%**	**N**	**%**
	Day Student	51	17	114	38	43	14.33
	Hosteller	14	4.66	59	19.66	19	6.33

It is inferred from the above table that among the day students, 17% have low, 38% have moderate and 14.33% have high level of awareness on detrimental effects of single-use plastics.

Among the hosteller students, 4.66% have low, 19.66% have moderate and 6.33% have high level of awareness on detrimental effects of single-use plastics.

Fig.4.3
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO PLACE OF RESIDENCE



Objective: 04

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to type of family

TABLE 4.4

LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO TYPE OF FAMILY

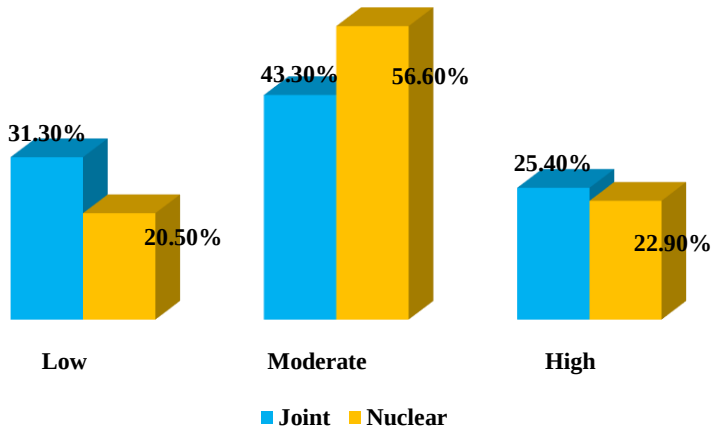
Awareness on detrimental effects of single-use plastics	Type of family	Low		Moderate		High	
		N	%	N	%	N	%
	Joint	42	31.3	58	43.3	34	25.4
	Nuclear	34	20.5	94	56.6	38	22.9

It is inferred from the above table that among the joint family students, 31.3% of them have low, 43.3% of them have moderate and 25.4% of them have high level of awareness on detrimental effects of single-use plastics.

Among the nuclear family students, 20.5% of them have low, 56.6% of them have moderate and 22.9% of them have high level of awareness on detrimental effects of single-use plastics.

Fig.4.4

LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO TYPE OF FAMILY



Objective: 05

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to group of study

TABLE 4.5

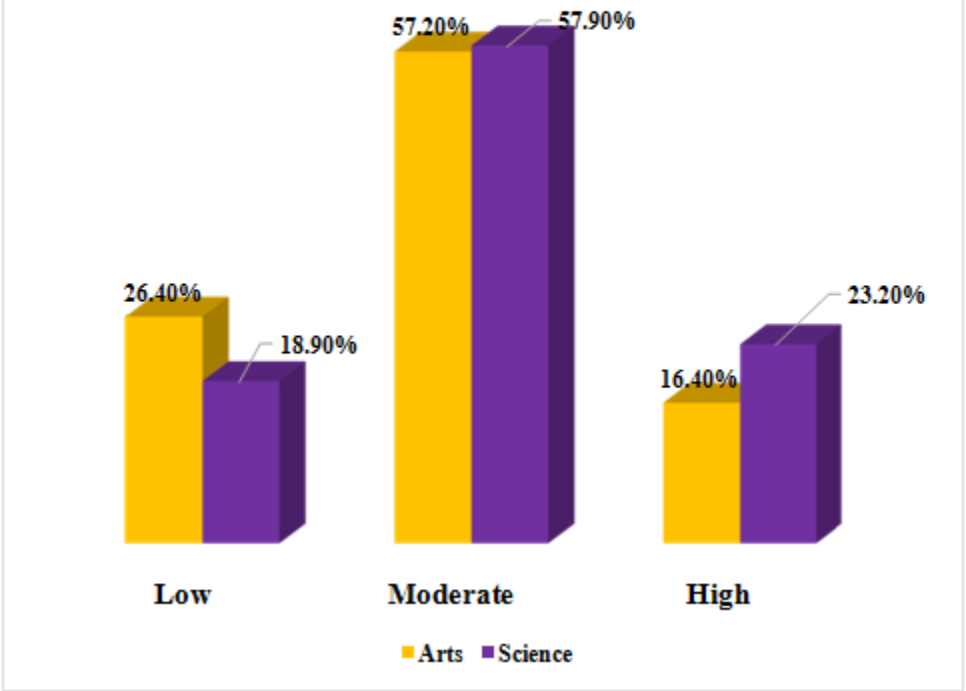
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO GROUP OF STUDY

Awareness on detrimental effects of single-use plastics	Group of study	Low		Moderate		High	
		N	%	N	%	N	%
	Arts	29	26.4	63	57.2	18	16.4
	Science	36	18.9	110	57.9	44	23.2

It is inferred from the above table that among the arts group students, 26.4% have low, 57.2% have moderate and 16.4% have high level of awareness on detrimental effects of single-use plastics

Among the science group students, 18.9% have low, 57.9% have moderate and 23.2% have high level of awareness on detrimental effects of single-use plastics

Fig.4.5
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO GROUP OF STUDY



Objective: 06

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to locality of college.

TABLE 4.6

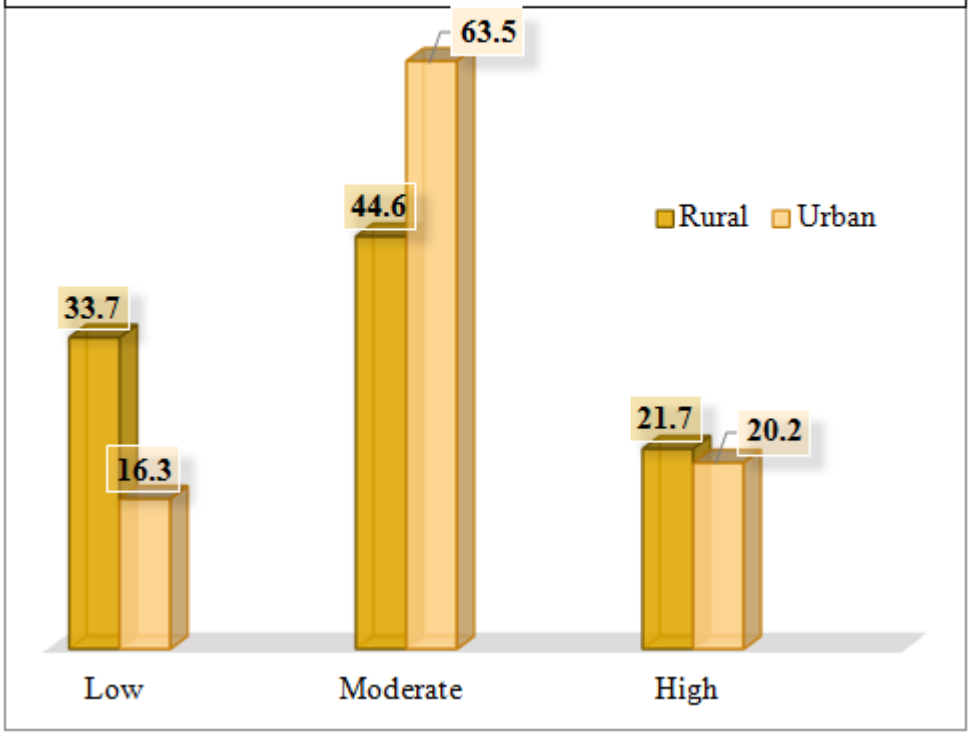
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO LOCALITY OF COLLEGE

Awareness on detrimental effects of single-use plastics	**Locality of School**	**Low**		**Moderate**		**High**	
		N	**%**	**N**	**%**	**N**	**%**
	Rural	31	33.7	41	44.6	20	21.7
	Urban	34	16.3	132	63.5	42	20.2

It is inferred from the above table that among the rural school students, 33.7% have low, 44.6% have moderate and 21.7% have high level of awareness on detrimental effects of single-use plastics.

Among the urban school students, 16.3% have low, 63.5% have moderate and 20.2% have high level of awareness on detrimental effects of single-use plastics.

Fig.4.6
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO LOCALITY OF COLLEGE



Objective: 07

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to nature of college.

TABLE 4.7

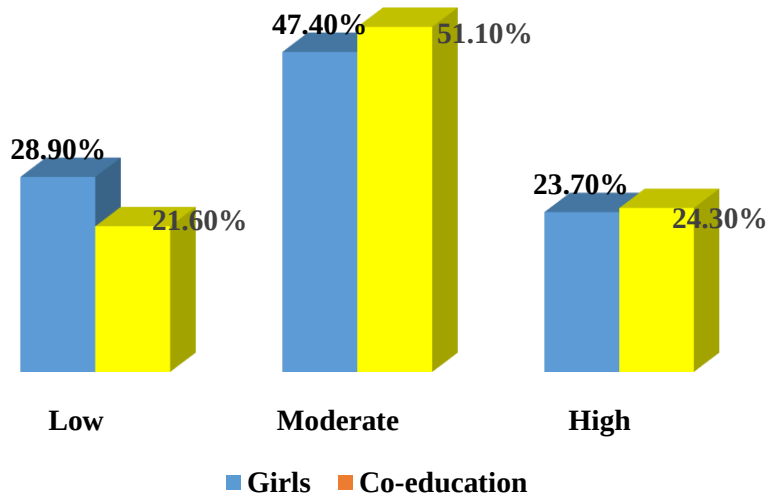
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO NATURE OF COLLEGE

Awareness on detrimental effects of single-use plastics	**Nature of College**	**Low**		**Moderate**		**High**	
		N	**%**	**N**	**%**	**N**	**%**
	Girls	44	28.9	72	47.4	36	23.7
	Co-education	32	21.6	80	51.1	36	24.3

It is inferred from the above table that among the rural students, 28.9% of them have low, 47.4% of them have moderate and 23.7% of them have high level of awareness on detrimental effects of single-use plastics.

Among the urban students, 21.6% of them have low, 51.1% of them have moderate and 24.3% of them have high level of awareness on detrimental effects of single-use plastics.

Fig.4.7
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO NATURE OF COLLEGE



Objective: 08

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to social media usage

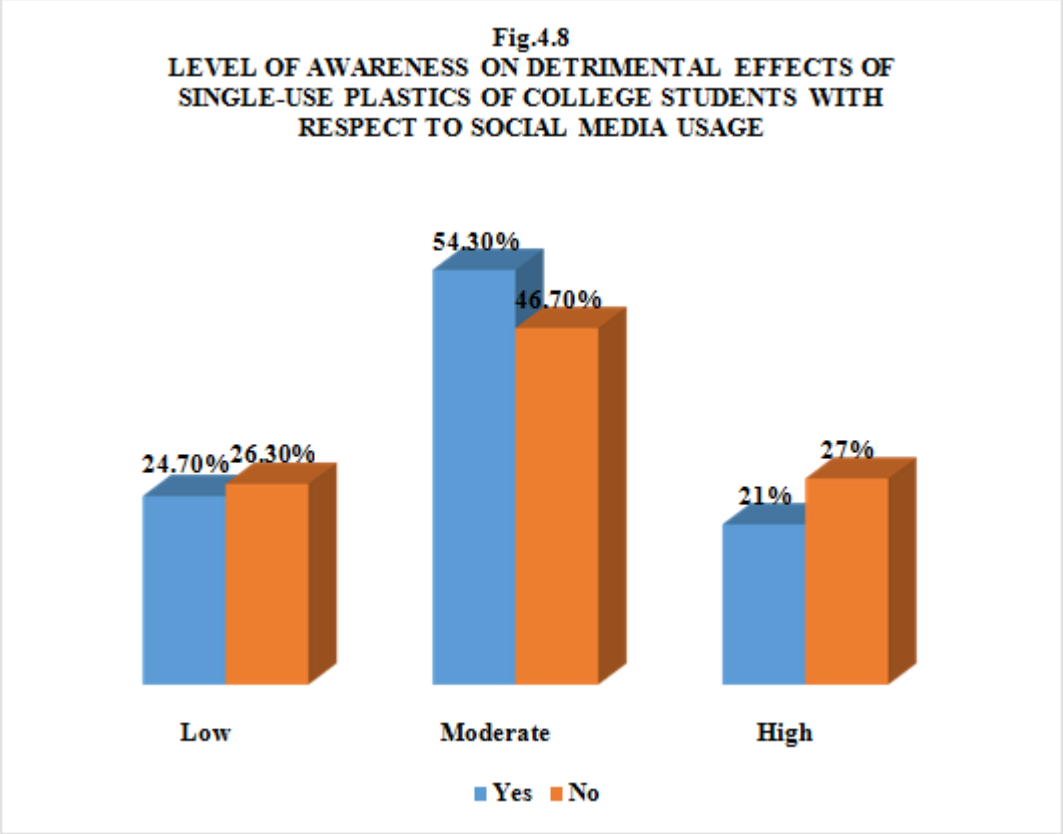
TABLE 4.8

LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO SOCIAL MEDIA USAGE

Awareness on detrimental effects of single-use plastics	**Social media usage**	**Low**		**Moderate**		**High**	
		N	**%**	**N**	**%**	**N**	**%**
	Yes	40	24.7	88	54.3	34	21.0
	No	36	26.3	64	46.7	38	27.0

It is inferred from the above table that among the social media using students, 22.7% have low, 55.2% have moderate and 22.1% have high level of awareness on detrimental effects of single-use plastics.

Among the social media non-using students,20.4% have low, 60.6% have moderate and 19.0% have high level of awareness on detrimental effects of single-use plastics.



Objective: 09

To find out the level of awareness on detrimental effects of single-use plastics with respect to participation in community service.

TABLE 4.9

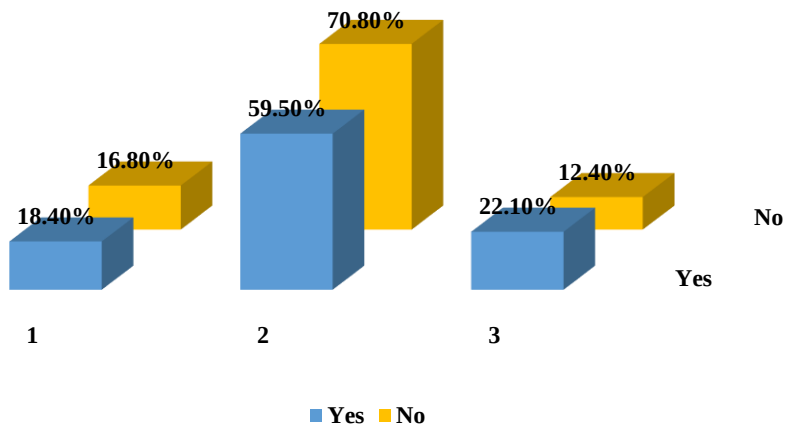
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO PARTICIPATION IN COMMUNITY SERVICE

Awareness on detrimental effects of single-use plastics	**Participation in community service**	**Low**		**Moderate**		**High**	
		N	**%**	**N**	**%**	**N**	**%**
	Yes	30	18.4	97	59.5	35	22.1
	No	23	16.8	97	70.8	18	12.4

It is inferred from the above table that among the students participating in community service, 18.4% have low, 59.5% have moderate and 22.1% have high level of awareness on detrimental effects of single-use plastics.

Among the students not participating in community service ,16.8% have low, 70.8% have moderate and 12.4% have high level of awareness on detrimental effects of single-use plastics.

Fig.4.9
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO PARTICIPATION IN COMMUNITY SERVICE



Objective: 10

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to father's education.

TABLE 4.10

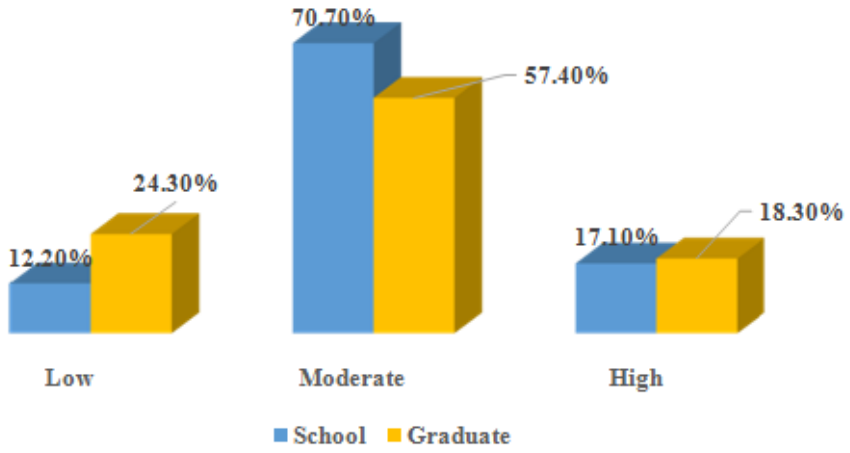
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO FATHERS' EDUCATION

Awareness on detrimental effects of single-use plastics	**Father's Education**	**Low**		**Moderate**		**High**	
		N	**%**	**N**	**%**	**N**	**%**
	School	20	12.2	104	70.7	28	17.1
	Graduate	33	24.3	90	57.4	25	18.3

It is inferred from the above table that students whose father's are school level, 12.2% have low, 70.7% have moderate and 17.1 % have high level of awareness on detrimental effects of single-use plastics.

Among those whose father's are graduate, 24.3 % have low, 57.4% have moderate and 18.3 % have high level of awareness on detrimental effects of single-use plastics.

Fig.4.10
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO FATHERS' EDUCATION



Objective: 11

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to mother's education.

TABLE 4.11

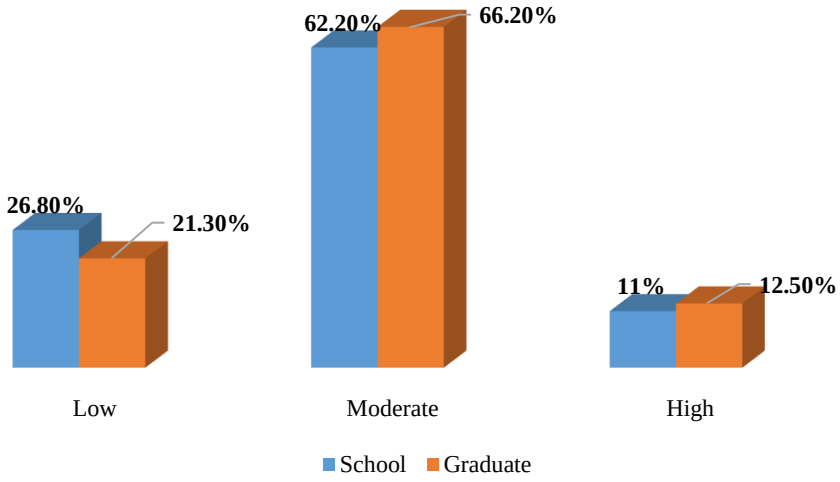
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO MOTHER'S EDUCATION

Awareness on detrimental effects of single-use plastics	**Mother's Education**	**Low**		**Moderate**		**High**	
		N	**%**	**N**	**%**	**N**	**%**
	School	44	26.8	102	62.2	18	11.0
	Graduate	29	21.3	90	66.2	17	12.5

It is inferred from the above table that students whose mothers are educated up to school level,26.8% have low, 62.2% have moderate and 11.0 % have high level of awareness on detrimental effects of single-use plastics.

Among those whose mothers are graduate, 21.3% have low, 66.2% have moderate and 12.5% have high level of awareness on detrimental effects of single-use plastics.

Fig.4.11.
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO MOTHER'S EDUCATION



Objective: 12

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to type of college.

TABLE 4.12

LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO TYPE OF COLLEGE

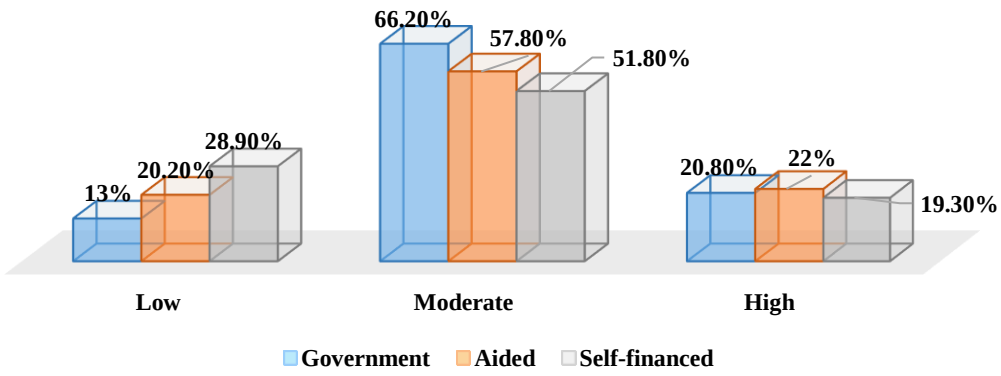
Awareness on detrimental effects of single-use plastics	**Type of college**	**Low**		**Moderate**		**High**	
		N	**%**	**N**	**%**	**N**	**%**
	Government	10	13.0	51	66.2	16	20.8
	Aided	22	20.2	63	57.8	24	22.0
	Self-financed	33	28.9	59	51.8	22	19.3

It is inferred from the above table that among the government college students, 13.0% have low, 66.2% have moderate and 20.8% have high level of awareness on detrimental effects of single-use plastics.

Among the Aided college students, 20.2% have low, 57.8% have moderate and 22.0% have high level of awareness on detrimental effects of single-use plastics.

Among the self-financed college students, 28.9% have low, 51.8% have moderate and 19.3% have high level of awareness on detrimental effects of single-use plastics.

Fig.4.12
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO TYPE OF COLLEGE



Objective: 13

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to father's occupation

TABLE 4.13

LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO FATHER'S OCCUPATION

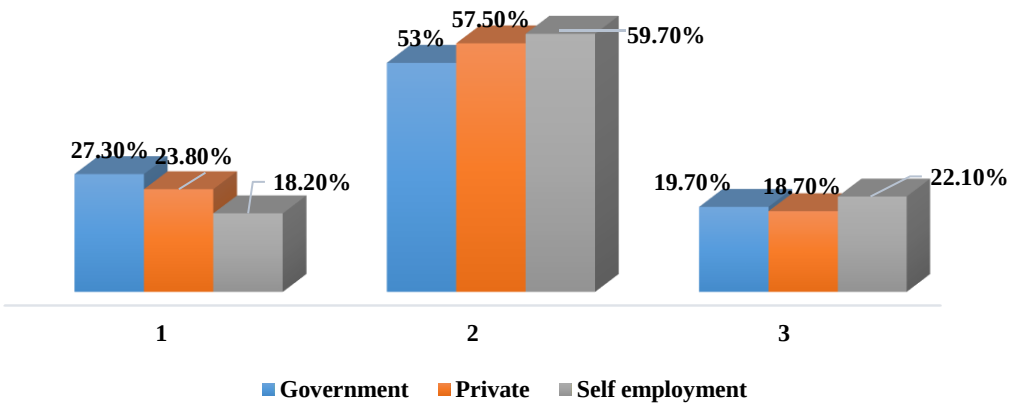
Awareness on detrimental effects of single-use plastics	**Fathers occupation**	**Low**		**Moderate**		**High**	
		N	**%**	**N**	**%**	**N**	**%**
	Government	18	27.3	35	53.0	13	19.7
	Private	19	23.8	46	57.5	15	18.7
	Self employment	28	18.2	92	59.7	34	22.1

It is inferred from the above table that among the government employed fathers, 27.3% of them have low, 53.0% of them have moderate and 19.7% of them have high level of awareness on detrimental effects of single-use plastics.

Among the private occupation fathers, 23.8% of them have low, 57.5% of them have moderate and 18.7% of them have high level of awareness on detrimental effects of single-use plastics.

Among the self-employed fathers education college students, 18.2% of them have low, 59.7% of them have moderate and 22.1% of them have high level of awareness on detrimental effects of single-use plastics.

Fig.4.13
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO FATHER'S OCCUPATION



Objective: 14

To find out the level of awareness on detrimental effects of single-use plastics of college students with respect to Mother's occupation

TABLE 4.14

LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO MOTHER'S OCCUPATION

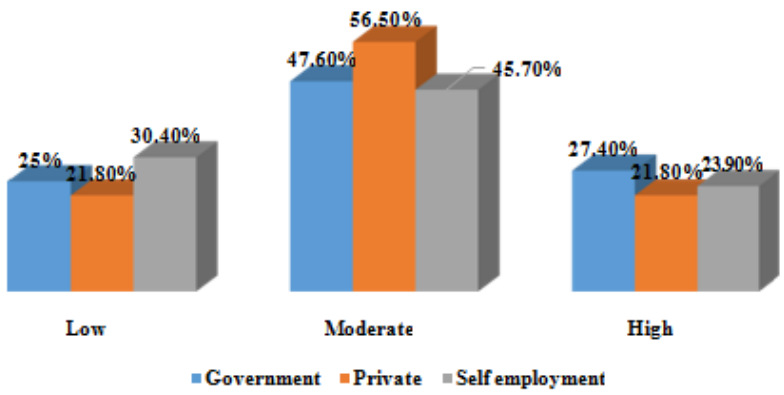
Awareness on detrimental effects of single-use plastics	Mother Occupation	Low		Moderate		High	
		N	%	N	%	N	%
	Government	21	25.0	40	47.6	23	27.4
	Private	27	21.8	70	56.5	27	21.8
	Self-employment	28	30.4	42	45.7	22	23.9

It is inferred from the above table that among the government employed mothers, 25.0% of them have low, 47.6% of them have moderate and 27.4% of them have high level of awareness on detrimental effects of single-use plastics.

Among the private occupation mother, 21.8% of them have low, 56.5% of them have moderate and 21.8% of them have high level of awareness on detrimental effects of single-use plastics.

Among the self employed mothers, 30.4% of them have low, 45.7% of them have moderate and 23.9% of them have high level of awareness on detrimental effects of single-use plastics.

Fig.4.14
LEVEL OF AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS OF COLLEGE STUDENTS WITH RESPECT TO MOTHER'S OCCUPATION



B. HYPOTHESES TESTING

NULL HYPOTHESIS

There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to their gender.

TABLE 4.15

DIFFERENCE BETWEEN MALE AND FEMALE COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS

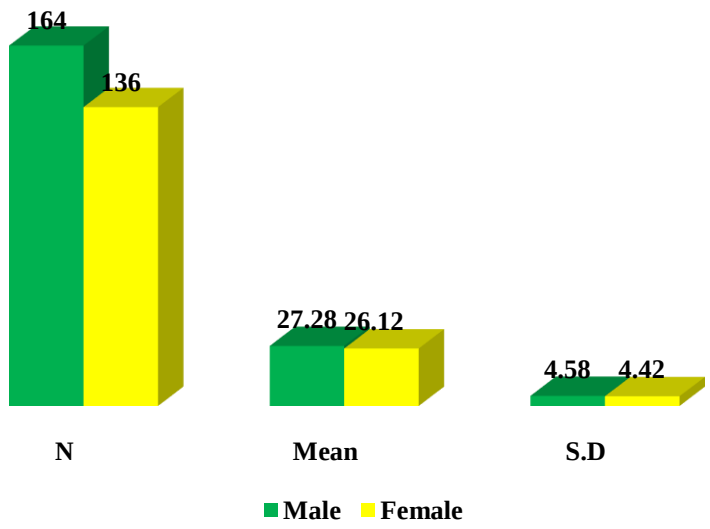
Awareness on detrimental effects of single-use plastics	**Gender**	**N**	**Mean**	**S.D**	**Calculated 't' value**	**Remarks**
	Male	136	26.12	4.42	2.132	S
	Female	164	27.28	4.58		

(At 5% level of significance the table value of „t" is 1.96, S - Significant, NS - Not Significant)

It is inferred from the above table that there is significant difference between Male and Female students in the awareness on detrimental effects of single-use plastics.

Fig.4.15

DIFFERENCE BETWEEN MALE AND FEMALE COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS



NULL HYPOTHESIS

There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to their place of residence.

TABLE 4.16

DIFFERENCE BETWEEN DAY STUDENTS AND HOSTELLER COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS

Awareness on detrimental effects of single-use plastics	Place of Residence.	**N**	**Mean**	**S.D**	**Calculated 't' value**	**Remarks**
	Day Student	208	45.07	4.989	1.04	NS
	Hosteller	92	45.68	3.849		

(At 5% level of significance the table value of „t" is 1.96, S - Significant, NS - Not Significant)

It is inferred from the above table that there is no significant difference between Day student and hosteller in their awareness on detrimental effects of single-use

NULL HYPOTHESIS

There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to type of family.

TABLE 4.17

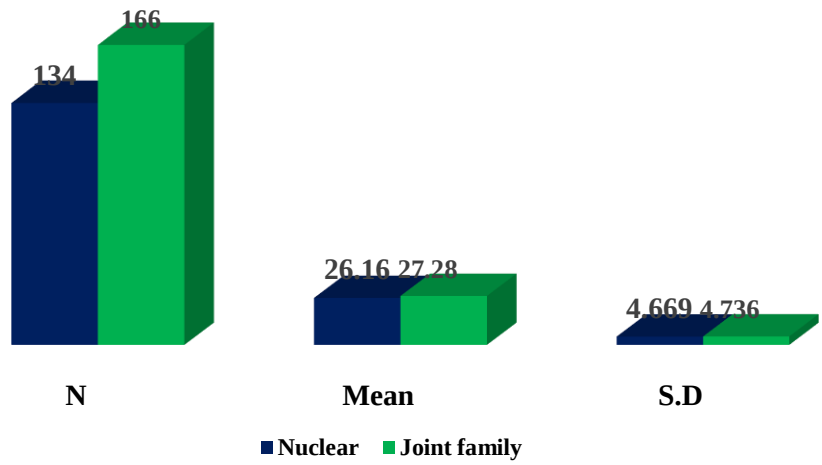
DIFFERENCE BETWEEN NUCLEAR AND JOINT FAMILY COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS

	Type of family	N	Mean	S.D	Calculated 't' value	Remarks
Awareness on detrimental effects of single-use plastics	Nuclear	134	26.16	4.669	2.031	S
	Joint family	166	27.28	4.736		

(At 5% level of significance the table value of „t" is 1.96, S - Significant, NS - Not Significant)

It is inferred from the above table that there is significant difference between nuclear and joint family students in their awareness on detrimental effects of single-use plastics.

Fig.4.16
DIFFERENCE BETWEEN NUCLEAR AND JOINT FAMILY COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS



NULL HYPOTHESIS

There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to their group of study.

TABLE 4.18

DIFFERENCE BETWEEN ARTS AND SCIENCE COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS

	Group of study	N	Mean	S.D	Calculated 't' value	Remarks
Awareness on detrimental effects of single-use plastics	Arts	110	44.91	4.864	0.99	NS
	Science	190	45.46	4.556		

(At 5% level of significance the table value of „t" is 1.96, S - Significant, NS - Not Significant)

It is inferred from the above table that there is no significant difference between Arts and Science group students in their awareness on detrimental effects of single-use

plastics.

NULL HYPOTHESIS

There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to locality of college

TABLE 4.19

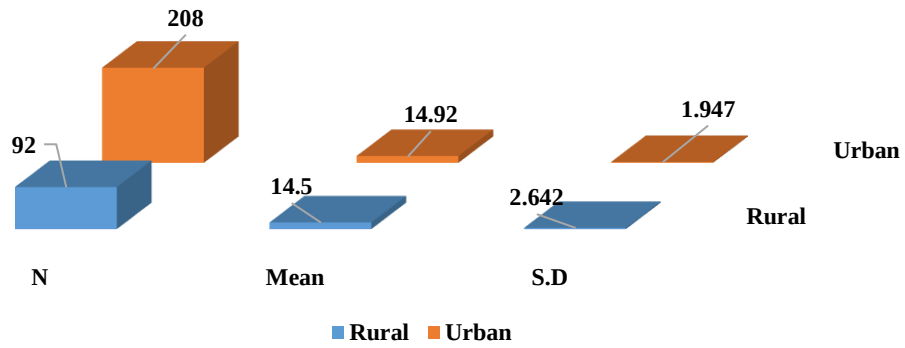
DIFFERENCE BETWEEN RURAL AND URBAN COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS

Awareness on detrimental effects of single-use plastics	**Locality of college**	**N**	**Mean**	**S.D**	**Calculated 't' value**	**Remarks**
	Rural	92	14.50	2.642	1.98	S
	Urban	208	14.92	1.947		

(At 5% level of significance the table value of „t" is 1.96, S - Significant, NS - Not Significant) It is inferred from the above table that there is significant difference between rural and urban students in their awareness on detrimental effects of single-use plastics.

Fig.4.17

DIFFERENCE BETWEEN RURAL AND URBAN COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS



NULL HYPOTHESIS

There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to nature of college.

TABLE 4.20

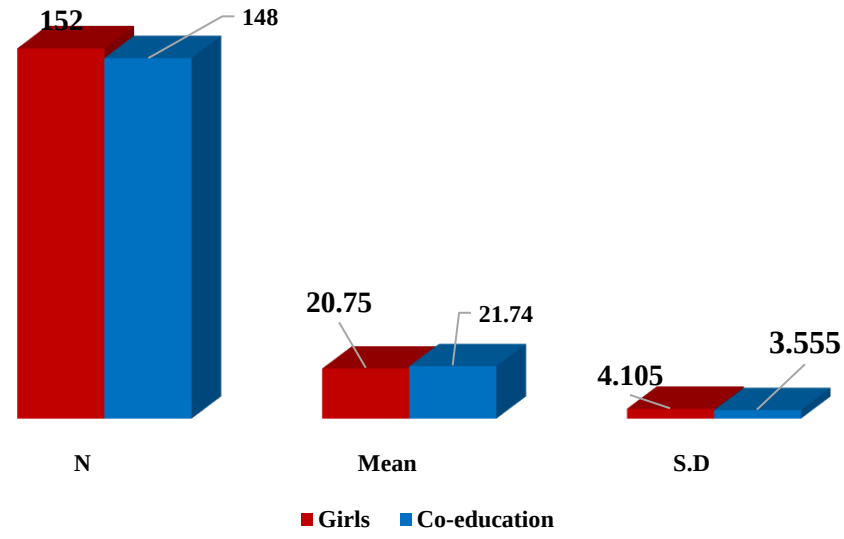
DIFFERENCE BETWEEN GIRLS AND CO-EDUCATION COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS

Awareness on detrimental effects of single-use plastics	**Nature of College**	**N**	**Mean**	**S.D**	**Calculated 't' value**	**Remarks**
	Girls	152	20.75	4.105	2.24 2	S
	Co- education	148	21.74	3.555		

(At 5% level of significance the table value of „t" is 1.96, S - Significant, NS - Not Significant)

It is inferred from the above table that there is significant difference between girls and co-education college students in their awareness on detrimental effects of single-use plastics.

Fig.4.18
DIFFERENCE BETWEEN GIRLS AND CO-EDUCATION COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS



NULL HYPOTHESIS

There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to social media usage.

TABLE 4.21

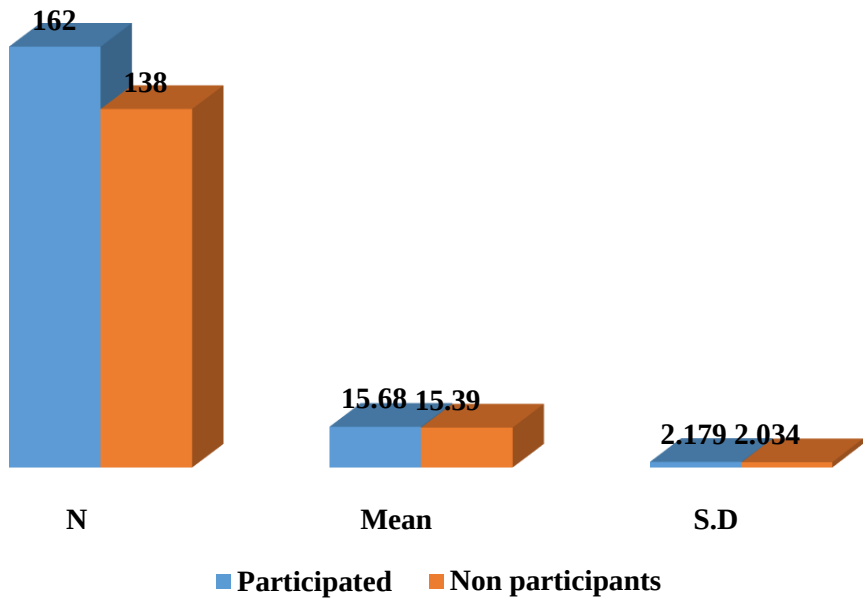
DIFFERENCE BETWEEN SOCIAL MEDIA USERS AND NON SOCIAL MEDIA USING COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS

	Social media usage	**N**	**Mean**	**S.D**	**alculated 't' value**	**Remarks**
Awareness on detrimental effects of single-use plastics	Participated	162	15.68	2.179	2.20	S
	Non participants	138	15.39	2.034		

(At 5% level of significance the table value of „t" is 1.96, S - Significant, NS - Not Significant)

It is inferred from the above table that there is significant difference between participants and non-participants students in their awareness on detrimental effects of single-use

Fig. 4.19
DIFFERENCE BETWEEN SOCIAL MEDIA USERS AND NON SOCIAL MEDIA USING COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS



NULL HYPOTHESIS

There is no significant difference between college students in their awareness on detrimental effects of single-use plastics with respect to participation in community service.

TABLE 4.22

DIFFERENCE BETWEEN PARTICIPATED IN COMMUNITY SERVICES AND NOT PARTIPATED IN COMMUNITY SERVICES COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS

Awareness on detrimental effects of single-use plastics	**Participation in Community service**	**N**	**Mean**	**S.D**	**Calculated 't' value**	**Remarks**
	Yes	163	14.80	1.979	0.03	NS
	No	137	14.79	2.421		

(At 5% level of significance the table value of „t" is 1.96, S - Significant, NS - Not Significant) It is inferred from the above table that there is no significant difference between students participating in community services and those who are nor participating in community services in their awareness on detrimental effects of single-use plastics.

TABLE 4.23

DIFFERENCE BETWEEN SCHOOL LEVEL EDUCATED FATHERS AND COLLEGE LEVEL EDUCATED FATHERS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS

	Fathers' Education	N	Mean	S.D	Calculated 't' value	Remarks
Awareness on detrimental effects of single-use plastics	School level	148	15.17	3.617	0.40	NS
	College level	152	15.34	3.527		

(At 5% level of significance the table value of „t" is 1.96, S - Significant, NS - Not Significant)

It is inferred from the above table that there is no significant difference between school level and college level educated fathers in their awareness on detrimental effects of single-use

NULL HYPOTHESIS

There is no significant difference between awareness on detrimental effects of single-use plastics and mothers' education of college students.

TABLE 4.24

DIFFERENCE BETWEEN SCHOOL LEVEL EDUCATED MOTHER'S AND COLLEGE LEVEL EDUCATED MOTHER'S IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS

	Mothers' Education	N	Mean	S.D	Calculated 't' value	Remarks
Awareness on detrimental effects of single-use plastics	School level	164	15.72	2.068	1.55	NS
	College level	136	15.34	2.161		

(At 5% level of significance the table value of „t" is 1.96, S - Significant, NS - Not Significant)

It is inferred from the above table that there is no significant difference between school level and college level educated mothers in their awareness on detrimental effects of single-use

NULL HYPOTHESIS

There is no significant difference among the mean scores of college students in their awareness on detrimental effects of single-use plastics with respect to type of college.

TABLE 4.25

DIFFERENCE AMONG THE MEAN SCORES OF COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS WITH RESPECT TO TYPE OF COLLEGE

	Type of college	Sum of squares	Mean of squares	Calculated 'F' value	Remarks
Awareness on detrimental effects of single-use plastics	Between	81.541	40.770	1.88	NS
	Within	6442.179	21.691		

(At 5% level of significance, for 2,297, df the table value of 'F' is 3.03, S -

Significant, NS - Not Significant)

It is inferred from the above table that there is no significant difference among the mean scores of college students in their awareness on detrimental effects of single-use plastics with respect to type of college.

NULL HYPOTHESIS

There is no significant difference among the mean scores of college students in their awareness on detrimental effects of single-use plastics with respect to their father's occupation.

Table: 4.26

DIFFERENCE AMONG THE MEAN SCORES OF COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE

PLASTICS WITH RESPECT TO FATHER'S OCCUPATION

	Nature of college	Sum of squares	Mean of squares	Calculated 'F' value	Remarks
Awareness on detrimental effects of single-use plastics	Between groups	12.200	6.100	1.18	NS
	Within groups	1523.037	5.128		

(At 5% level of significance, for 2,297, df the table value of 'F' is 3.03, S - Significant, NS - Not Significant)

It is inferred from the above table that There is no significant difference among the mean scores of college students in their awareness on detrimental effects of single-use plastics with respect to their father's occupation.

NULL HYPOTHESIS

There is no significant difference among the mean scores of college students in their awareness on detrimental effects of single-use plastics with respect to their mother's occupation.

TABLE 4.27

DIFFERENCE AMONG THE MEAN SCORES OF COLLEGE STUDENTS IN THEIR AWARENESS ON DETRIMENTAL EFFECTS OF SINGLE-USE PLASTICS WITH RESPECT TO MOTHER'S OCCUPATION.

	Mothers occupation	Sum of squares	Mean of squares	Calculated 'F' value	Remarks
Awareness on detrimental effects of single-use plastics	Between groups	32.457	16.229	0.574	NS
	Within groups	8396.913	28.272		

(At 5% level of significance, for 2,297, df the table value of 'F' is 3.03, S - Significant, NS - Not Significant)

It is inferred from the above table that there is no significant difference among the mean scores of college students in their awareness on detrimental effects of single-use plastics with respect to their mother's occupation.

CHAPTER-V

FINDINGS, INTERPREATIONS, RECOMMENDATIONS AND SUGGESTIONS

INTRODUCTION

The investigators have carried out a survey on "Awareness on Detrimental Effects of Single-Use Plastics of College Students" On the basis of the analysis of data collected through a distribution of questionnaire on the sample of 300 students in Tirunelveli District, the findings are summarized below.

FINDINGS

I. Awareness on detrimental effects of single-use plastics

1.1. Findings based on percentage analysis

a. 20.7% of college students have high level of awareness on detrimental effects of single-use plastics.

b. 19.1% of male and 2.0% of female college students have high level of awareness on detrimental effects of single-use plastics.

c. 14.33% of days-scholar and 6.33% of hosteller college students have high level of awareness on detrimental effects of single-use plastics.

d. 25.4% of joint and 22.9% of nuclear family college students have high level of awareness on detrimental effects of single-use plastics.

e. 16.4% of arts and 23.2% of science group college students have high level of awareness on detrimental effects of single-use plastics.

f. 21.7% of rural and 20.2% of urban area college students have high level of awareness on detrimental effects of single-use plastics.

g. 23.7% of girls and 24.3% of co-education college students have high level of awareness on detrimental effects of single-use plastics.

h. 21.0% of social media using and 22.7% of non-social media using college students have high level of awareness on detrimental effects of single-use plastics.

i. 22.1% of participants in community service and 12.4% of non-participants in community service college students have high level of awareness on detrimental effects of single-use plastics.

j. 17.1 % of the students whose fathers are educated up to school level, 18.3 % of whose fathers are graduate have high level of awareness on detrimental effects of single-use plastics.

k. 11.0 % of the students whose mothers are educated up to school level and 12.5% of whose mothers are graduate have high level of awareness on detrimental effects of single-use plastics.

l. 20.8% of government, 22.0% of aided and 19.3% self-financed college students have high level of awareness on detrimental effects of single-use plastics.

m. 19.7% of the students whose fathers are government employed, 18.7% of whose fathers are private employed and 22.1% whose fathers are self- employed have high level of awareness on detrimental effects of single-use plastics.

n. 27.4% of the students whose mothers are government employed, 21.8% of whose mothers are private employed and 23.9% whose mothers are self- employed

have high level of awareness on detrimental effects of single-use plastics.

b. Findings

a. There is significant difference between male and female college students in their awareness on detrimental effects of single-use plastics. While comparing the mean scores of male (mean=26.12) and female college students (mean=27.28) in their awareness, the female college students are higher than the male college students.

b. There is no significant difference between days-scholar and hosteller college students in their awareness on detrimental effects of single-use plastics.

c. There is significant difference between nuclear and joint family students in their awareness on detrimental effects of single-use plastics. While comparing the mean scores of nuclear family (mean=26.16) and joint family students (mean=27.28) in their awareness, the joint family college students are higher than the nuclear family college students.

d. There is no significant difference between arts and science group college students in their awareness on detrimental effects of single-use plastics.

e. There is significant difference between rural and urban college students in their awareness on detrimental effects of single-use plastics. While comparing the mean scores of rural (mean=14.50) and urban college students (mean=14.92) in their awareness, the urban college students are higher than the rural college students.

f. There is significant difference between girls and coeducation college students in their awareness on detrimental effects of single-use plastics. While comparing the mean scores of girls college students (mean=20.75) and co-education college students (mean=21.74) in their awareness, the co-education college students are higher than the girls college students.

g. There is no significant difference between social media users and social media non-users college students in their awareness on detrimental effects of single-use plastics.

h. There is no significant difference between college students those who participated in community services and not participated in community services in their awareness on detrimental effects of single-use plastics.

i. There is no significant difference between school level and college level educated fathers of college students in their awareness on detrimental effects of single-use plastics.

j. There is no significant difference between school level and college level educated mothers of college students in their awareness on detrimental effects of single-use plastics.

k. There is no significant difference among government, aided and self-financed college students in their awareness on detrimental effects of single-use plastics.

l. There is no significant difference among government, private and self-employed fathers of college students in their awareness on detrimental effects of single-use plastics.

m. There is no significant difference among government, private and self-employed mothers of college students in their awareness on detrimental effects of single-use plastics.

INTERPRETATIONS In terms of gender

The 't' test result shows that female students have higher awareness on detrimental

effects of single- use plastics than the male college students. This may be due to the fact that female college students are aware of the adverse effects of plastic bag wastes on the environment, animal, and human health. They are more sensitized by seminars, workshops, debates, boost programs, celebrating special days like world environmental day, world earth day, world population day, wildlife day, world water day, forest conservation day, etc. They have more expansive knowledge about alternatives for plastic. Female college students participated in numerous co-curricular activities, which play an essential role in awareness and a positive environmental education attitude. Since they take part in the household activities with their mothers, they are aware of plastic bags and materials side effects. Female students adopt more eco-friendly practices because they are more perseverant towards their families and environment. Moreover, females have a special connection to the environment through their daily interaction with it. They are more aware of the problems around them and consider saving the planet Earth is the only solution to save the future generation. Since they show much interest in social media nowadays, they update themselves about environmental problems and ways to overcome the problems caused by single-use plastics. They participate in various campaigns and environmental activities held inside and outside the college campus to mobilize the public and other stakeholders (Government agencies, business associations, retailers, research institutions, non- governmental media) against indiscriminate use and disposal of plastic bags in order to minimize the excessive accumulation of plastic bag wastes in the environment. Since they spend most of the time with their family, friends, and pet animals, they focus on creating pollution less nature. They display digital banners for creating awareness on the use of bags alternative to plastic ones. They recognize the need to protect the environment in homes, businesses, and cities. They show a high level of social responsibility in greening the nature and conservation of biodiversity. The participation in the various organization such as National Green Corps, Eco-clubs, and other similar clubs in schools need to strengthen for better practices. They can participate in the framework of protecting the environment by holding sustainable principles. Essentially, females have higher expectations of a sustainable climate than males and therefore feel that they cannot influence their extent. The present study's findings supported the results of Manoj **(2019)** previous research, which shows that female students have a higher awareness of environmental hazards caused by single-use plastic products compared to male students.

In terms of locality of residence

The 't' test result shows that urban students have a higher awareness on the detrimental effects of single-use plastics than rural students. It may be due to the intervention and impact of media, the internet, and social media that is more available to urban students. Hence, urban students become more familiar with environmental issues. They come across Pamphlets or handbills on hazards of plastic bags placed near the cash counters in supermarkets and shopping malls. They receive mass dissemination of information about the dangerous effects of single-use plastics on human health through radio and television. Continuous reference from social media about plastics' ill-effects motivates both parents and children to use alternate eco-friendly bags like paper, cloth, or jute bags, respectively. They have a high level of ecological awareness due to their active participation in environmental activities. Since urban college students habituated to carry their bags for shopping, they reduce single-use plastic bags. They participate in various rallies and awareness programs about in and around their college and home environment. They distribute brochures, inserts, and posters on

the single use plastic usage make sense as a means of communicating scientific investigation results quickly and effectively and also as an essential teaching and learning aid. Ongoing awareness campaign attended by the urban students reduces

the intake of outside packed food, water sachets (Low-Density Polyethylene), PET (Polyethylene terephthalate) bottles, and packed beverages (carbonated drinks). Continuous awareness campaign attended by the urban students reduces the intake of outside packed food, water sachets (Low-Density Polyethylene), PET (Polyethylene terephthalate) bottles, and packed beverages (carbonated drinks). This reduces single-use plastics like plastic cups, bottles, plastic spoons, plastic forks, and plastic cutleries also reduced. They expressed that they are experiencing the difficulty of disposing of the discarded single-use plastic materials like the plastic bags that accumulate as trash at home, which is frustrating. In urban areas, they face water clogging during heavy rain and floods due to the plastic bags. Due to this reason, urban students are more aware than rural students. The findings of the present study supported by **Singh(2016) show** that there is a significant difference between rural and urban college students. In his study, he showed that urban students have a level of environmental awareness compared to urban undergraduate students.

In terms of the nature of college

The 't' test result shows that the co-education college students have a higher awareness of single-use plastics' detrimental effects than the girl's college students. This may be due to the fact that co- education students have good environmental behavior. They often view videos related to ecological awareness compared to girl's college students. Co-education college students always feel very active in participating in various environmental protection activities, such as volunteering in cleaning the trash in the campus area. The college students think that protecting the environment from damage is essential and should be performed daily. They show the actions to protect the environment by reducing single-use plastics, using alternative plastics such as paper/cloth bags, and participating in environmental programs. Students prefer reusable tableware such as ceramic, stainless steel, or glass instead of single-use plastics. Co-education Urban students spread awareness among shop keepers about the harmful effects of plastic bags. They also encourage paper bags manufacturing by donating old newspapers and magazines to small scale bag manufacturers and the college canteen. They also avoid packed foods and soft drinks to reduce plastic garbage in their surroundings. They often arrange many rallies and environmental awareness programs inside and outside the college. Some students also like to participate in environmental protection activities, e.g., volunteering to clean the trash at the campus.

In terms of the type of family

The' test result shows that the joint family students have a high awareness of single-use plastics' detrimental effects than the nuclear family students. This may be due to the fact that in nuclear families, the number of people is less and naturally tending to be in a closed group there is consistency in the way of thinking among the members. But in a joint family system, since the number of members is high and the members of all age groups are present, there can be variation in the ways of thinking among these members, which could influence students' environmental attitude. Grandparents are the magic pot of the customs, traditions, and moral values. In the nuclear family, there is not much time to spend with their children in a nuclear family, with both parents working. Grandparents fill the place of parents and intimate the importance of the environment to the students. Radio and television can also help in the mass dissemination of information. This will motivate both adults and children to use alternate eco-friendly bags like paper or cloth bags. They narrate stories regarding the importance of a clean environment that increases the youngsters' environment attitude compared to the children from the nuclear family system. The present study's findings contradict Manoj's **(2019)** results, showing that the students from nuclear families have a higher awareness of environmental hazards caused by single-use plastic products than joint family students.

RECOMMENDATIONS OF THE STUDY

In light of the findings of the present study, the investigators offer the following recommendations to overcome or beat single-use plastic pollution:

Suggestions to the students

- Students must be provided with extensive multi-media awareness-raising campaigns through TV, radio, newspapers, and various social media
- Door-to-door campaigns can be provided in small towns, communities, and the Islands.
- Showcasing and distributing alternative options to single-use plastics such as reusable bags, reusable bottles, etc.
- Teachers should induce the practice of plan a litter collection day once a month.
- The students can undertake · Short term projects or research work on single-use plastics.
- Students should be initiated to start a campaign about the ill effect of single-use plastics.
- Journals of single-use plastics can be displayed in the college library.
- Seminars regarding plastic waste can be organized in college.
- A plastic-free campus can be initiated in the college.
- Students can be initiated to participate in the environmental awareness program such as poster presentation, PPT, Essay writing competition, etc.
- Separate dustbins can be placed on the college campus to collect the plastic waste inside the college campus.
- Hold an educational film screening or talk for students.
- College canteens must be provided with reusable utensils for tea and snacks.
- Celebration in the college can avoid the distribution of chocolates to reduce waste.
- Special lectures, seminars, and guidance of experts regarding plastic pollution should be arranged for proper utilization of the natural resource.
- Students should be trained in all appropriate waste management skills.
- The curriculum should be designed to increase the environmental interest of the students.
- Environmental education should be provided as an elective to all the group students.
- They should give preference to alternatives of non-recyclable plastic bags.
- Students should be educated not to buy or use plastic cups, plates, or spoons, especially the "use and throw" ones because mostly they are non-recyclable.
- They should try to avoid purchasing plastic-wrapped products.
- Students should try their best to reuse the plastic bags, bottles again and again instead of one use and disposal.

Suggestions to the Government

- The government should conduct various campaigns and awareness programs to

create awareness of plastic bag usage illness.

- The government should impose a hefty tax on plastic products, especially with fewer microns and non-recyclable plastic products, to reduce those.
- Plastic bag production companies should be ordered to produce plastic bags with high microns, biodegradable, more durable, and reused, and there would be a chance for recycling.
- The government should encourage environmentally-friendly alternative bags like jute bags, cloth bags, paper bags, etc.
- There should be a national policy should be formed regarding the problem of plastic usage.
- Availability of alternative bags should be assured.
- Throwing plastic wastes in public places should be fined.
- The government should have a transparent watch over the overuse of non-recyclable plastic and the production of such.

Alternatives to Single-Use Plastics

- Use of alternative plastic materials such as paper and cardboard.
- Converting plastic waste into poly fuel, which is a high-calorie fuel that is an alternative to kerosene.
- Converting plastic waste into fertilizer increases the yielding capability of crops.
- Converting plastics into electricity is a good option for our country with the scarcity of electricity.
- Plastic waste added to bitumen in road construction has proved to extend the road's life and improve quality.
- Using plastic waste as an additive to furnaces in cement kiln and power plants should be mandated.
- Converting plastic waste materials into value-added items.

SUGGESTIONS FOR FUTURE RESEARCH

Based on these findings, the investigators have proposed the following suggestions for further research.

1. The present study was confined only to college students. Similar studies can be conducted with prospective teachers, engineering college students, medical college students, technical institutes, schools, etc.,

2. The present study is limited to the Tirunelveli district. Similar studies can be done with students belonging to other districts of Tamil Nadu also.

3. Attitude towards single-use plastics can be studied.

4. Correlation between environmental knowledge and attitude can be studied.

5. The impact of plastic pollution can be studied.

6. Knowledge attitude and practice on plastic usage among the residents of Tirunelveli district can be studied.

Conclusion

Plastic material is any of a wide range of synthetic or semi-synthetic organic solids that are malleable. Due to their relatively low cost, ease of manufacture, versatility,

and imperviousness to water, plastics are used in an enormous and expanding range of products, from paper clips to spaceships. They have already displaced many traditional materials, such as wood, stone, horn and bone, leather, paper, metal, glass, and ceramic, in most of their former uses. College students as a community whose behavior and willingness to adopt environmentally sound policies will become a dominant force for a sustainable environment. The college students feel that protecting the environment from damage is essential and should be performed daily. The college students should protect the environment by adapting alternative activities like reducing single-use-plastic, using alternatives for plastic such as paper/cloth bags, and participating in environmental programs. To achieve a good quality of life on the Earth, we must spread awareness about the environment and sustainable development. A teacher is a useful tool in this regard. If the teacher is aware of single-use plastics only then, s/he can make the students aware of the environmental issues, their effects, solutions, and imbibe their ecological ethics. The government must restructure and enrich both in-service and pre-service teacher education programs with environmental awareness activities. More and more lectures, seminars, courses, debates, declamations, posters and paintings, essay writing competitions, innovation from disposed of items, or reciting environment-related poetry, celebrating environmental days or week can be introduced in this regard. The government can insist on the marketing industries to replace the thermocol/plastic packing materials with biodegradable pith from the shola/sola plant (Aeschynomene aspera). This plant product was used in massive quantities 1950s to make sola-topees or pith helmets for colonials and their armies. The government, NGOs, social workers, and people should participate in protecting our environment. The government should develop policies to help the students understand the interactions between human activities and the natural environment, which will help them solve the environmental problems they face locally and globally. In the meantime, waste management systems can be strengthened to help in reducing plastic pollution. Hence it's the need of an hour to save the mother earth from this hazardous single- use plastic pollution.

"The earth is what we all have in common" let's protect it together.

APPENDIX-A

ST. IGNATIUS COLLEGE OF EDUCATION (AUTONOMOUS), PALAYAMKOTTAI.

Topic**:** Awareness on Detrimental Effects of Single-Use Plastics among College Students

Principal Investigator: Dr.M.Maria Saroja

Co Investigators: Dr.L.Vasanthi Medona and Mrs.E.Michael Jeya Priya

Dear Students,

I request you to read the given statements & tick the answers. It shall be of immense helpful to our minor institutional project. I promise that the details furnished by you would be kept confidential and used only for my research purpose.

Thanking you

Place: Yours faithfully,

Date:

Investigators

PERSONAL DATA

Name	:		
Name of the College	:		
Gender	☐ Male	☐ Female	
Nature of College	☐ Girls	☐ Co education	
Locality of home environment	☐ Rural	☐ Urban	
Type of family	☐ Nuclear	☐ Joint	
Group of study	☐ Arts	☐ Science	
Locality of college	☐ Rural	☐ Urban	
Social media usage	☐ Yes	☐ No	
Participation in community service	☐ Yes	☐ No	
Fathers' education.	☐ School level	☐ College level	
Mothers' education	☐ School level	☐ College level	
Type of College	☐ Government	☐ Aided	☐ Self financed
Father's occupation	☐ Government	☐ Private	☐ Self employed
Mother's occupation.	☐ Government	☐ Private	☐ Self employed

FINAL TOOL

Kindly read the following carefully and put a tick mark (□) against any of the answers

Appendix -B

S.No	Type of Statement	Agree	Undecided	Disagree
1.	PET(Polyethylene terephthalate) bottles take more than 400 years to degrade naturally			
2.	Single use plastics upsets the food chain in the marine ecosystem			
3.	Meals packed in plastic bags leads to asthma and obesity			
4.	BPA(Bisphenol-A) present in the plastic bags are prone to health issues like liver toxicity .			
5.	Chemicals present in plastic bags can cause detrimental effects on the brain.			
6.	Plastic shopping bags is the major cause of drainage system clogging.			
7.	BPA leaches into the food and water through plastic can foods.			
8.	Phthalates found in polythene bags may cause lung problems in children.			
9.	Phthalates and BPA in plastic bags cause prostate cancer in men			
10.	Eating hot meals on melamine crockery increase the risk of Kidney stones in both children and adults.			
11.	Dioxin released in the plastic water bottles due to the exposure of sunlight leads to breast cancer.			
12.	Phthalates used in plastic wrappers affect male reproductive system and reduce male sperm count.			
13.	Formaldehyde present in the melanine utensils increase the risk of sinonasal and nasopharyngeal			
14.	PFAS(Per fluorinated substances) leads to birth defects.			
15.	Cadmium present in plastics alter endocrine hormones			
16.	Plastic bags transmit vector borne diseases such as malaria			
17.	Micro plastics present in water affects the marine life.			
18.	Styrene and benzene present in Styrofoam affect the nervous system of humans.			
19.	Marine mammals are killed each year after ingesting plastic or getting entangled in it.			
20.	Micro plastics in marine environment leads to seabird's death.			
21.	Accumulation of plastic bag waste cause environmental pollution			
22.	Plasticizer leads to genital abnormalities in male.			

23.	Repeated washing of plastic bottles and cans increase the leaching			
24.	Toxins in Styrofoam items are carcinogenic			
25.	Inhalation of toxic hydrocarbons fumes cause skin and respiratory problems in human.			
26.	Plastic waste affects the hormone levels of animals.			
27.	Plastic straws choke wildlife and block animals stomachs			
28.	Floating plastic debris in sea leads to sea animals death			
29.	Exposure of Plasticizers in the prenatal stage leads to low birth weights and body length.			
30.	Chemicals used in practices cause dermatitis in human.			
31.	PBD damage thyroid hormones			
32.	Bisphenol A affects gene expression			
33.	BPA decrease thyroid hormone receptor (TR) activity in human			
34.	BPA cause disruption in gonadal development and sperm production			
35.	Foods exposed to single use plastics can cause heart disease.			
36.	Single use plastic cutlery emit large amount of carbon during production			
37.	Vinyl chloride used in the production are carcinogenic to humans and animals			
38.	Benzene released during the production of single use plastics cause neurotoxin in humans			
39.	Burning of cutlery plastic waste release toxins into the atmosphere			
40.	Sea bed are affected due to single use plastic materials			
41.	Toxins released from the single use plastics develop kidney stones.			
42.	Plastic trash in the open yard affects the growth of plants			
43.	Burying the single use plastic materials release toxic substances and affects underground water.			
44.	Plastic waste materials increase the carbon footprint			
45.	Single use plastic cutlery leads to plastic pollution			
46.	Deposition of plastic cutlery in the waterways contaminate the water			
47.	Single use food containers thrown in forest zone leads to the extinction of animals			
48.	Burning of single use plastics lead to a myriad of respiratory disease			
49.	Single use plastics thrown in farming lands affects soil fertility.			
50.	Environmental degradation cause due to the over usage of single use plastics.			

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