Beverage and Soft Drinks Packaging: An Awareness Survey

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ABSTRACT

An extensive survey was performed to investigate awareness of beverage and soft drink packaging among consumers. Foods and beverages are generally packed in glass, metal, multi-layered paper and plastic containers. During recent decades, the use of polyethylene terephthalate (PET) containers has been increased not only for packing beverages but also for other foods products. Easy availability, low cost, diversity are the few reasons for the excessive use of plastic in the packaging industry. Keeping in mind the importance of plastic, one cannot deny the fact that it has a direct relationship with human health and bioenvironmental issues. The survey deals with consumer's awareness in the field of plastic packaging, alternatives to plastic and the effect of plastics on the environment. This research discusses the different types of plastic packaging they have observed in the market. It also deals with the reasons for their preference towards plastic knowing about its ill effects on the environment. The survey helps to understand the awareness about the alternative packaging among the respondents and the suitable alternative that they prefer for plastics. This analysis also discusses the knowledge of single use plastic among them. Further, this research attempts to analyze the role of few demographics like age, educational qualification on the consumer's awareness.

Finally, the researchers have tried to inspect the trend of plastic packaging in the beverage industry and consumers' awareness in respect of advantages and disadvantages of plastic packaging. Moreover, the appropriate alternative for packing was investigated from the consumer's viewpoint.

Keywords: *Packaging, Beverages, Soft drink, Health Impacts, Awareness*

1. Introduction

The aim of food packaging is to contain food in a cost-effective way that satisfies industry requirements and meets consumer's desires, maintains food safety as well as minimizes environmental impact[1]. The packaging for the food product must provide optimum protection to keep it enclosed in good condition for its required shelf-life period. The development and design of packaging has now made it possible to offer consumers a wide variety of food to choose from, with complete trust in its wholesomeness and availability throughout the year[2].

Beverage packaging is manufactured in large quantities, soft drinks packaging options are immense varying in volume and type of material used include aluminum, polyethylene terephthalate PET or glass[3]. Beverage makers are researching for original closures and caps to seal and protect their products, while being appealing to the consumers. Beverage packaging is adapting with modern trends which are focusing on the structural modification of packaging materials and expansion of materials used for packaging[4].

Plastic pollution is considerably one of the most serious environmental issues. Once present in the natural environment, plastic takes up to 500 years to decompose. Plastics pose significant hazards to both terrestrial as well as marine lives. Overexploitation and negligent discarding of plastic materials, on a large scale, particularly plastic bags, have been found in the respiratory tracts and stomachs of thousands of different terrestrials as well as aquatic species.[8]

2. Literature View

2.1 *General Packaging*

Packaging sector is in a state of constant flux, driven by innovations such as alternative, bio-based packaging in order to be more environment friendly and attentive to the needs of consumers. Food packaging plays an important role in the total environmental footprint of food items, affecting both product shelf life and waste recyclability.

The global packaging market in 2015 was estimated at 4,300 billion packaging units, of which 73% were for food and beverage. In European Union 1,130 billion packages

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were used for food and drinks only in 2018[13,14]. The packaging is part of our daily lives and plastics are responsible for half of the global packaging market. It is the material that is not degraded many times, and might take hundreds of years for destruction. Plastics are highly diverse and one of the most commonly used materials for food packaging examples of plastic food packaging include bottles, foils, trays, cups, bowls and many more[15]. In 2015, approximately 20 million metric tons of plastic packaging were used in Europe[16].

After conducting a survey in 2017 by the International Food Information Council Foundation it was found that from the consumer's point of view the main reason to buy packaged foods are convenience, time saving, and ease of meal preparation. Most of the consumers think ease of opening is highly important packaging functionality along with product reseal-ability property[17].

According to the International consumer survey commissioned by global chemicals company Kemira conducted in 2019, the key consumer priorities across all markets relate to the hygiene and leak proof properties of the container, but packaging material itself is also considered important. Over half respondents affirmed that they would be willing to pay more for food packaging if it is made from renewable materials. Also, the majority of respondents were hoping to reduce the use of plastics in their daily lives.

The European survey in 2018 (All4pack) revealed that consumers want non-recycled packaging and over packaging being banned. These radical measures prove that consumers are aware about packaging and keener than ever about eradicating unnecessary packaging, encouraging alternative and bio- friendly packaging options as well as focusing on recycling. The recyclability and ease of open and reseal without the risk of leakage are two factors more important to consumers (Millennial) regarding functionality of packaging.

2.2 *Beverage Packaging*

According to the Fruit Products Order (FPO) 1955 Act, Fruit Beverage or Fruits Drink means a beverage or drink which is prepared from fruit juice and water or carbonated water and contains sugar, dextrose, invert sugar or liquid glucose.

Plastic Containers: Fruit juices consist of organic substances, which are sensitive to bacterial contamination. PET bottles are usually used for hot filling application of the fruit juices. The package is suitable for the temperature resistance of the containers.

Flexible plastic packages offer better economic savings over conventional glass and metal containers but they are permeable to oxygen. Flexible laminated pouches like polyester/ polyethylene are used for hot fill packaging method without retorting for acidic fruit juices. These are either in the form of flat pouches or stand-up pouches. However, the shelf-life of the product in these pouches are quite limited.

Aseptic Packages: Ready to serve fruit beverages and fruit pulps / concentrates, packed in aseptic packages provide excellent protection for fruit juices / pulps. These aseptic packages are manufactured by combining thermoplastic with paperboard and aluminum foil. The multi-layered construction enables the carton to protect the contents from different factors responsible for spoilage.

The aluminum foil layer is a strong barrier for gases and light. The inner plastic layer made of polyethylene is heat sealable. The outer paper layer provides stiffness to maintain the brick shape, thus helps enable maximum utilization of available storage and transportation space.

To provide easy and convenient access to the contents, beverage cartons offer a variety of opening devices. The most common opening feature of the pack is the drinking straw, which is often attached to the package. Some other recent trends custom designed caps and closures for easier pouring and for enhancing the brand image. Also, the beverage cartons are now available in new prism shapes, making it comfortable to hold, and the unique shape attracts the consumers. These packs are shelf-stable at room temperature.

According to the study done by Mahdavi (Mazdeh etal., 2014) a large number of consumers are relatively aware about the disadvantages of PET containers. However, they consider its use to be inevitable because of the following factors like lightness, ease of use, non-fragility, availability and most importantly inexpensiveness. In the case of drinking water and other beverages, lack of any other alternative products was the main reason for the continuous use of PET containers.[18]

A survey was done (Van den Berg et al., 2018) among 293 consumers to determine their knowledge and utilization practices regarding plastic as food and beverage packaging and containers. The aim of this study was to investigate and describe consumers' subjective and objective knowledge regarding plastic food and beverage packaging and containers in order to assess if consumers utilize these plastics safely.

The results indicated that although most respondents had a fair subjective knowledge, they lacked objective knowledge regarding plastic food and beverage packaging and containers

Another research conducted in South Africa regarding consumer awareness, concluded that consumers are unaware of the harmful chemicals in plastics and their associated health effects. These findings highlight the need for consumer education regarding the correct utilization practices of plastic food and beverage packaging and containers.[19]

An assessment done by (Gebre, H 2016) regarding the reverse logistics on used water and beverage plastic bottles were found to be less effective due to lack of awareness on source separation, risky and inconsistent collection processes due to the fall on the selling price of collected plastic bottles, high cost involved in transporting plastic bottles, lack of safe and sufficient storage space and low contribution of bottling companies to environmental protection.[20]

Another problem noted in recycled bottles was the traces of chemicals present in the reusable PET bottles which led to off odours in the water and soft drinks. This was majorly because of the misuse of the bottles by the consumers. Substances believed to be responsible for the production of off odours were dimethyl disulfide, petroleum products, ethanol with isoamyl alcohol and a series of other ethers. In some cases, the origins of the off-odours are believed to be previous consumer misuse of food products (liquorice-flavoured alcohol, home-made alcohol containing fuel oil) or non-food products (cleaning products, petroleum products).

2.3 Harmful Effects

The excessive production and consumption of plastic packaging materials has proven to affect human health and the environment notably.[36] Awareness concerning the negative impacts has risen over recent years and as a result many organizations and businesses along with the government are being increasingly pressured to find ways to reduce plastic packaging.[37]

We are exposed to all kinds of plastic and hundreds of additives every day. Certain products need several chemical compounds to provide or enhance plastic characteristics such as, color, malleability, plasticity, durability and sometimes hardness.These chemicals can be hormone disruptors like BPA and BPF, or brominated flame retardants.Many of these additives are endocrine disruptors which have proven to have harmful effects on life, especially when exposed to, during the developmental stages.

Most of the single use plastics discarded in the open, be it dump yards, after a period of time degrade into smaller components called microplastics,which gradually penetrate into the soil and then to the water table, finally making their way towards the food chain and end up causing massive health hazards.

Irresponsible individual behavior is one of major reasons for Single-use plastics ending up cluttering up the environment. While the lack of awareness about the hazardous nature of plastic plays a role, the insensitive attitude of people who have all the knowledge about the impact of plastic on the environment is much more disheartening. Only by creating awareness about the hazards of plastic pollution, the use of single use plastic products or the way it is discarded cannot be curtailed. Consistent positive augmentation for judicious responsible use of plastic,cutting down waste generation and prevention of cluttering may help in the long run.[8]

Corresponding to a few researches carried out, it was found that the level of awareness regarding the harmful effects of plastic packaging material was significant among the sample population.

According to the survey carried out by Dr MGR Educational and Research Institute (Deemed to be university), Chennai, a remarkable relationship could be observed between the awareness levels and the nature of attitude people have, towards the firm steps taken by the government to safeguard the environment. The study also concluded that the subjects in their early adulthood have significantly higher levels of awareness about the harmful effects of these plastic products as compared to the subjects in their middle adulthood.[8]

In a study aimed to assess the awareness about the health hazards associated with plastic bag usage, the consumer preferences revealed that a large proportion of people do not actually value the various environmental aspects related to plastic.[38]

A recent study conducted in Turkey, have revealed that a majority of the population have a high level of awareness of plastic pollution and are aware of the harmful effects on the environment. However, it was determined that the participants are not willing to transform their awareness to implementation.[39]

An Indian survey carried out at Mangalore disclosed that the participants were aware of at least one health hazard of plastics. In addition, an enormous 81.9% of the participants were well adapted to the fact that plastics are non-biodegradable while 23.1% were aware that plastic contained carcinogenic substances.[40]

3. Objectives

3.1 *Reasons for Survey*

1. To check the awareness of consumers related to plastic packaging.
2. To inspect the trend of plastic packaging material in the food industry with respect to the consumers.
3. To understand the consumer's view regarding plastics used for beverage and soft drinks.

3.2 *Intended Use*

1. The data can be used as an industrial guide to manipulate an existing product and strategize marketing, based on public preferences.
2. It can be used to raise awareness among the general public about the existing packaging materials and their effects on the environment.
3. It can be used in Research and Development in the

field of packaging or in the formulation of new products for packaging of beverages and soft drinks.

4. It can be used to address sustainable development goals through packaging, by ensuring responsible production and consumption
5. It can be used to introduce and promote various alternatives available for packaging besides plastic.
6. It can be used as an informative and powerful tool to cause a reduction in the usage and disposal of plastic packaging material.
7. It can be used to achieve long term solutions to the problems underlying plastic packaging materials.

4. Methodology

A non-experimental research design was adopted to carry out this study. 484 individuals (164 Males and 320 Females) were randomly selected from different zonal regions of India (mainly Northern India), from all age groups, (ranging from below 18 to above 40 years) and of different educational qualifications and professions. Criteria for sample selection was:

a) Respondents who can read English; and
b) Respondents who have smartphones with access to the internet and social media.

A two-section questionnaire, in the form of Google forms was shared with the random population through various social media platforms, in the month of March-April, 2020.

The first section of the questionnaire was designed to recognize the demographic characteristics of the population (*Fig.4.1)*, which included name, age, gender, educational qualification, profession, zonal region of India, and state/union territory of the respondents.

The next section was designed to apprehend the awareness of the population regarding Beverage and Soft drinks Packaging. This part consisted of a series of 20 questions related to different subsections of this study, namely, Awareness on: a) General Plastic Packaging, b) Beverage Packaging, c) Harmful effects of plastics. The questions were sketched in simple and clear language, with pictorial representations, to make it easy for all age groups to understand the questions, and to remove ambiguity.

The questionnaires were carefully distributed and the results were analyzed to aid a reasonable conclusion. Multiple pie charts and bar graphs were used to determine: a) Is the population aware about beverage and soft drinks packaging; and b) Is the population aware about the alternatives to plastic packaging for beverage and soft drinks packaging. The data analysis procedure was carried out on Microsoft Office Excel workbook (2007). The results are depicted in the sections mentioned below.

5. Results

5.1 *General Packaging*

A survey was conducted to understand consumer awareness regarding beverage and soft drink packaging.

The respondents were asked commonly used packaging material for food that was available in the market *(Table 5.1.1)* and out of a wide range of options 58% responded that it was plastic, while 24%responded paper *(Fig. 5.1.1)*.The respondents use plastic as packaging for food commodities very often. 27% of respondents use it on a daily basis while 28% of the population can't say because they might have not noticed the frequency of usage of plastic for food.

Respondents are aware that use of plastic packaging has an environmental impact and 94.8% think it is harmful to the environment. Respondents prefer plastic as a packaging material due to its 18% lightweight while, 24% feel it is easy to carry and 13% find it is versatile *(Fig. 5.1.3)*. However half of respondents were against using plastic and Respondents are aware about different types of plastics available, 30%have heard about Polyethylene terephthalate, 29% have heard about Polyvinyl Chloride *(Fig. 5.1.2)*.

Respondents were aware of the use of Tetra Paks (*Fig. 5.1.4)* and its composition 41% knew that it was made of paper, plastic & aluminum; 23% thought it was made of paper alone.

5.2 *Beverage Packaging*

The respondents were asked about their awareness regarding the commonly used packaging material for soft drinks *(Table 5.2.1)*. The options given to them were plastic, glass, metal or paper board. Out of which, for 93.38% respondents, plastic was the most familiar material to them in case of beverage packaging followed by glass, paperboard and metal *(Fig.*5.2.1).

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The respondents were also asked whether the above selected material is environment friendly or not*(Table 5.2.2)*. Out of the 454 respondents who selected "plastic", 80% of them believe it to be harmful for the environment and 8% of them consider it to be eco-friendly whereas the remaining 10% of them are not sure about its sustainability. A small percentage of people were not sure about the sustainability of the material that they had chosen. *(Fig 5.2.2; Fig. 5.2.3)*.

The respondents were asked whether or not they use straws for the consumption of soft drinks. *(Table 5.2.3)*.

About 41.5% of people do not prefer the use of straws whereas 38.4% consumers occasionally use straws while the remaining 20% of the people often use straws for the consumption of soft drinks.

Consumers were then asked about the materials that are used to make the straws with the maximum number of consumers opting for plastic followed by paper, steel and glass. A small percentage of people have never thought about the material used in the manufacture of the straws*(Fig 5.2.4)*.

Answering the possibility of whether the soft drink bottles are recyclable or not, about 66.3% respondents agreed to the above said question *(Fig 5.2.5)*, 16.7% of them denied the possibility and the remaining were unsure.

The respondents were asked how they generally discard the used plastic bottles and about half of the sample population often crush and throw the bottles in the bin while some of the reuses if for other purpose and a very small category of the respondents segregate the plastics*(Fig 5.2.6)*.

5.3 Harmful Effects

A few questions, regarding the environmental concerns relating to the use of plastic packaging materials and its alternatives, were raised on the respondents (*Table 5.3.1)*. When asked whether paper can be considered more environment friendly than plastic, out of the total responses recorded, a majority 81.2% was found to be inclining towards paper, while, among the rest, 15.1% considered plastic to be friendlier to the environment. A population of 3.7% was not sure which among the two was the better one (*Fig. 5.3.1)*.

Responding to the question about the time taken by plastic bottles used for soft drinks to degrade, 77.3% of the entire sample population agreed to the point that it usually takes several months for the degradation process to complete. However, a considerable figure summing up to 15.3% were not sure about the time plastics take to degrade, revealing the fact that they were unaware (*Fig. 5.3.2)*.

When a concluding question aimed at collecting the facts on public awareness towards the harmful effects of plastic packaging materials was posed, the number of responses showed almost a uniform distribution over all the listed options (*Fig. 5.3.3)*.

Although plastics posing a threat to human health was a concern for the majority respondents, the responses for the effect on marine life counted up to 79.75% which is clearly having a slight difference from the former. Responses recorded regarding concerns about plastic, threatening flora and fauna and poisoning the food chain, were equal 73.55% each, while the issue of bioaccumulation in the environment was given least importance amongst all 71.48% respondents.

6. Discussion

6.1 *General Awareness*

It was observed that respondents mainly found plastic as a food packaging material in the markets, it correlates with the fact that many industries use plastics for food packaging. Relative to other packaging materials such as metal, glass, paper; plastic based packaging accounts for 40-85% market demand for packaging.

A large population daily uses plastic as packaging material for food commodities. Plastic food containers and plastic bottles on repeated use leaches harmful hormone disrupting chemical Bisphenol A (BPA) into food items which causes many diseases. The take out restaurant orders come in Polystyrene containers that have been associated with skin, eye and respiratory irritation and central nervous system damage. The safest choice for packaging of food commodities can be glass or stainlesssteel containers.

The respondents realize that use of plastic is harmful to the environment since plastic is very stable and stays in the environment a very long time after being buried in the landfills. They take several years to decompose, and act as chemical burden on the environment as it releases toxic chemicals including trichloroethane, benzene, methyl chloride, sulfur oxides, nitrous oxides and volatile organic compounds on production of plastic.

Plastics have always been used to replace heavier, less flexible, less safe material. Modern plastics are designed to be hygienic and have high impact strength[59]. That is why respondents prefer plastic as a packaging material due to its lightweight, ease of carrying around as well as its versatility in design and shape.

Respondents are mostly aware of PET and PVC and other plastics since the PET bottle market has seen a considerable growth in recent years. In many countries PET bottles are displacing those made from PVC for products such as mineral water and carbonated drinks. PET bottles have better resistance to impact, is more economical, tougher, has uniform wall thickness and is lightweight. PVC bottles are still used for non – carbonated drinks, for example squashes and cordials. PVC being grease resistant is used in salad oil bottles.[2]

6.2 *Beverage Packaging*

Studies have shown that a large number of consumers are aware about the harmful effects of plastic on the environment but still tend to continue its use. The results obtained by this survey confirms the wide use of plastic as a packaging material as almost 93% of respondents have chosen plastic as the most commonly used packaging material for soft drinks or beverages.The rest have opted for materials like glass, metal and paper board. 34% of the market share for packaging material is contributed by

paper or paperboard manufacturers. Glass and beverage cans contribute at the rate of 11% and 6% respectively to the market share.

Among the total respondents, 80% of them agree to the fact that plastics are harmful for the environment and therefore its continuous use in the market portrays the inevitable usage. However, most of the consumers tend to avoid the use of straws for consuming the beverage as most of them believe it to be made from plastic.

In India, almost 60% to 65% of plastic is recycled and the rest is disposed of in the environment. Out of which 65% is recycled at registered facilities, 15% in the organized sector and 10% of them is reused at homes. Among the respondents, 66% of them stated that the plastic bottles are recyclable and the remaining considered it to be non-recyclable. Almost half of the respondents discarded the bottles by crushing them, some of them reused it at home for other purposes and the remaining category of people actually segregated the plastic. People should be encouraged more to segregate plastic from other food waste so that the plastic could be taken for recycling and does not get mixed with the biodegradable waste as it could harm the environment.

6.3 *Harmful Effects*

From our findings we can conclude that most of the participants were aware about the harmful effects of plastic as a packaging material. This might have happened because of their attentiveness towards the rising issues of environmental pollution and other means of information such as governmental actions, media industry etc.

A majority considered paper to be friendlier to the environment,as a packaging material, than plastic because they could determine how long it takes for plastic to decompose in the environment and correlate this fact to come down to this conclusion.

The participants were missing out the fact about the harm that is caused to the environment due to the cutting down of millions of trees for manufacturing paper.

The majority of responses recorded in favor of plastic affecting human health was due to the growing health-conscious nature of the people. But an almost equal weightage given to the effect on all the components of the ecosystem shows that people have rationalized thinking about the harmful effects. This awareness shows a positive attitude of the people towards their duty to the environment.

Surprisingly price and quality remain the top concerns of consumers and despite criticizing plastics and their usage, they themselves are never willing to pay a little higher amount for those materials which they consider as 'environmentally-friendly' and 'sustainable'.

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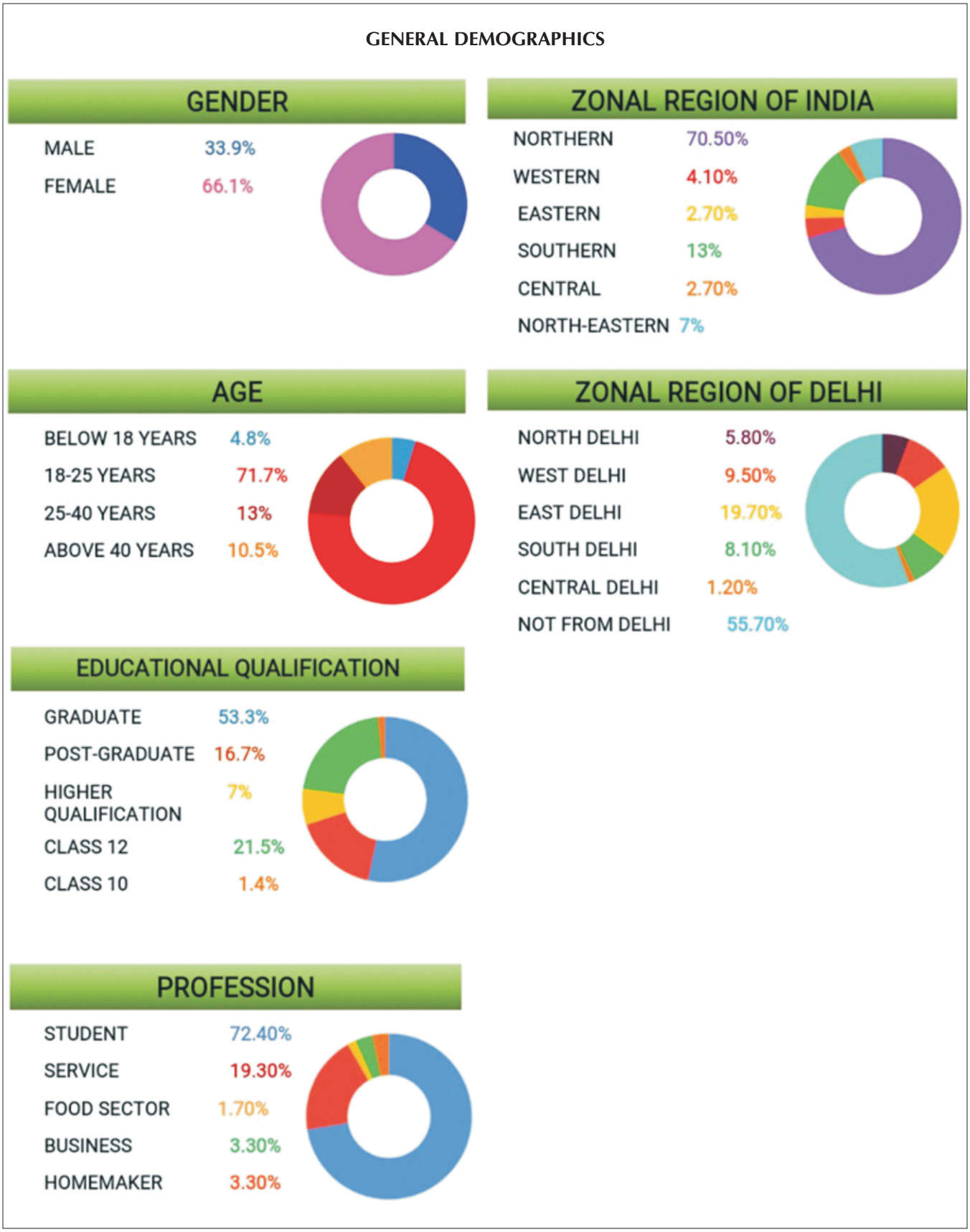

Fig. 4.1: *Generaldemographics*

Table 5.1.1: *Awareness on General Plastic Packaging*

Question	Response	Percentage (%)
How often do you use plastic as a packaging material for food commodities	Daily	27.7%
	Weekly	25.6%
	Monthly	18.4%
	Can't say	28.3%
What do you think of the above option from an environmental point of view?	Environmental friendly	1.4%
	Harmful to the environment	94.8%
	Not sure	3.7%
Why do you prefer "Plastic" as a packaging material?	Lightweight	18.8%
	Reasonable	12.2%
	Easy to carry	24.2%
	Attractive	2.2%
	Reusable	13.2%
	Availability	12.6%
	Versatile	13.5%
	Others	3.1%
What are the different kinds of plastics you are aware of?	PET	30.9%
	LDPE	20.8%
	HDPE	18.4%
	PVC	29%
	Others	0.7%

Table 5.2.1: *Awareness on Beverage Packaging*

Question	Response	Percentage (%)
What is the most commonly used packaging material for packing soft drinks (carbonated non-alcoholic beverages)?	Plastic	93.33%
	Paperboard	2.06%
	Glass	2.47%
	Metal	1.23%
	Any other	0.82%

Table 5.2.2: *Response to health impacts of most common beverage packaging material*

Question	Response	Percentage (%)
What is the most commonly used packaging material for packing soft drinks (carbonated non-alcoholic beverages)?	Plastic	93.33%
	Paperboard	2.06%
	Glass	2.47%
	Metal	1.23%
	Any other	0.82%

Table 5.2.3: *Awareness on beverage and soft drinks packaging materials*

Question	Response	Percentage (%)
Do you use straws for soft drink/ beverage consumption?	Yes	20.0%
	No	41.5%
	Sometimes	38.4%
What is the material used for making straws?	Plastic	90.49
	Paper	32.43
	Steel	3.51
	Glass	0.08
	Never thought of it.	2.68
Do you think it is possible to recycle the plastic bottles used for soft drinks or beverages?	Yes	66.33%
	No	16.7%
	Sometimes	16.9%
How do you discard your plastic bottles used for soft drinks?	I Reuse it	38.01
	Crush and throw in bin	50
	Throw as it is in garbage bin	23.34
	Segregate plastics	12.39

Table 5.3.1: *Awareness on Harmful effects of Plastic packaging*

Question	Response	Percentage (%)
In your opinion is PAPER as a packaging material environment friendly in comparison to PLASTIC?	Yes	81.2%
	No	15.1%
	I don't know	3.7%
How long do you think it takes for plastic bottles used for soft drinks to degrade?	Few days	2.9%
	Few months	4.5%
	Several months	77.3%
	Not sure	15.3%
What according to you are the harmful effects of "Plastics" as a packaging material for food?	Affects human health	79.95%
	Affects marine life	79.75%
	Threatens flora and fauna	73.55%
	Poisons our food chain	73.55%
	Bioaccumulates in the environment	71.48%

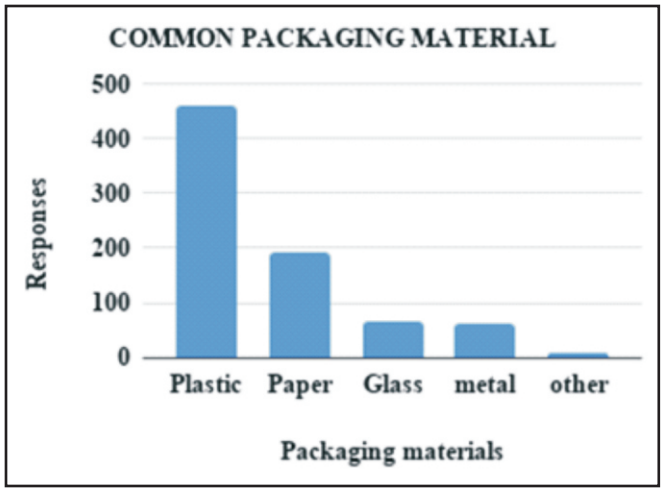

Fig.5.1.1: *Awareness on Common Packaging material*

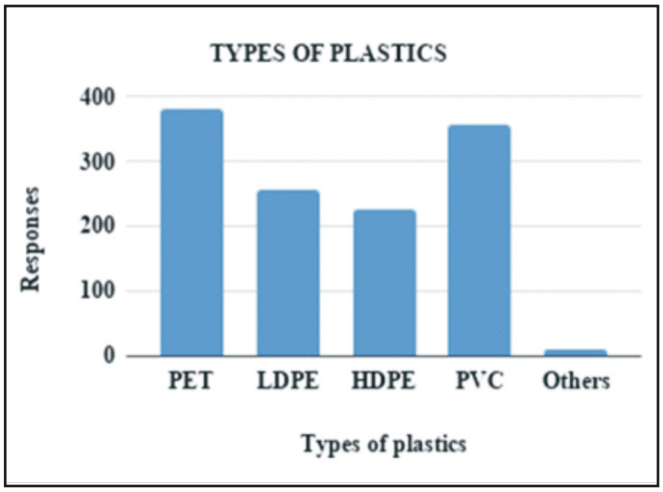

Fig.5.1.2: *Awareness on Types of plastics*

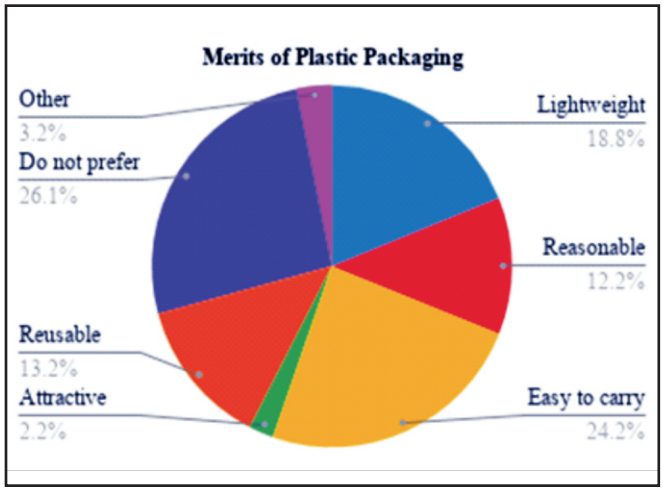

Fig.5.1.3: *Advantages of Plastic Packaging*

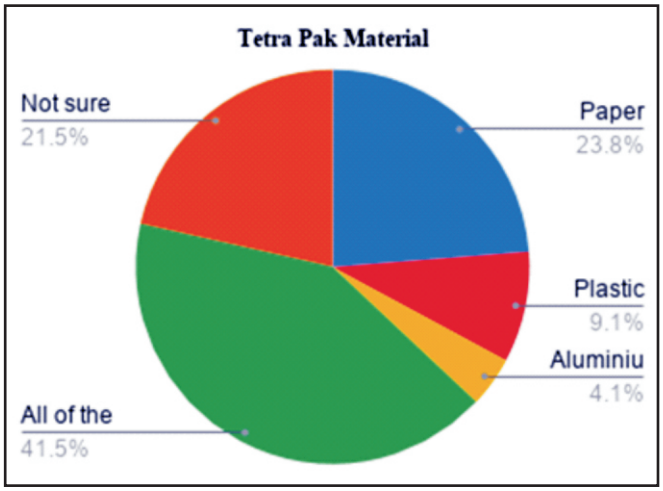

Fig.5.1.4: *Awareness on Tetra Paks*

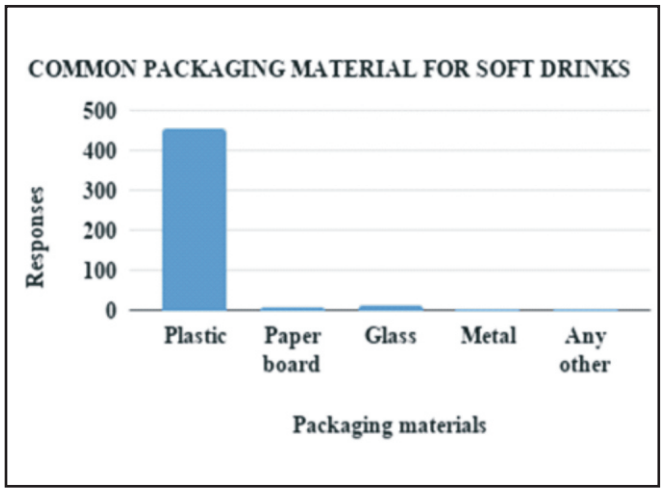

Fig.5.2.1: *Packaging materials for soft drinks*

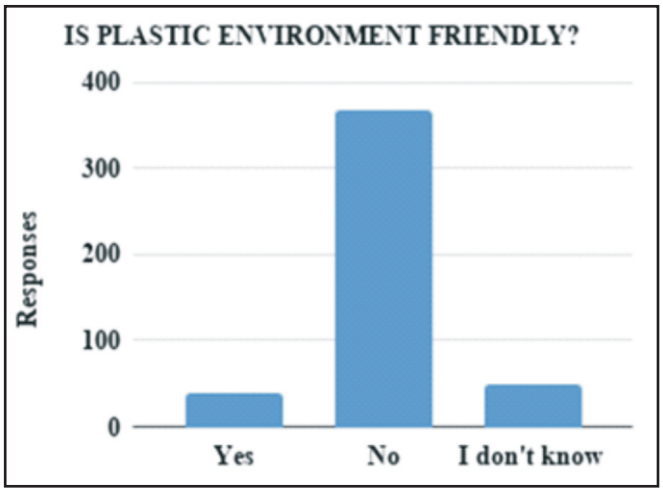

Fig.5.2.2: *Awareness on Harmful effects of plastics*

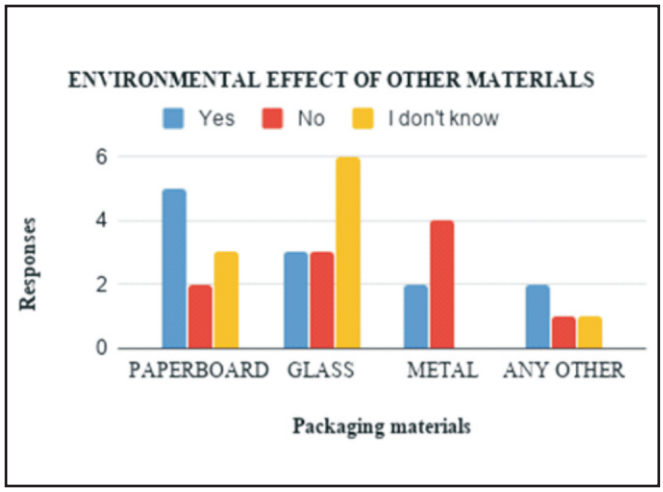

Fig.5.2.3: *Awareness on Harmful effects of other materials*

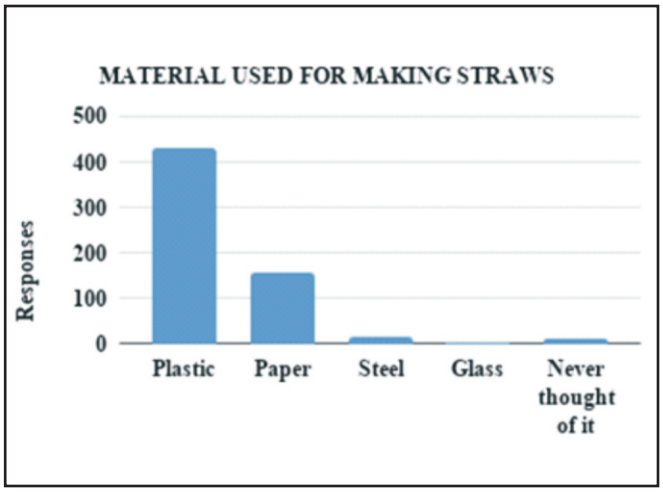

Fig.5.2.4: *Materials used for making straws*

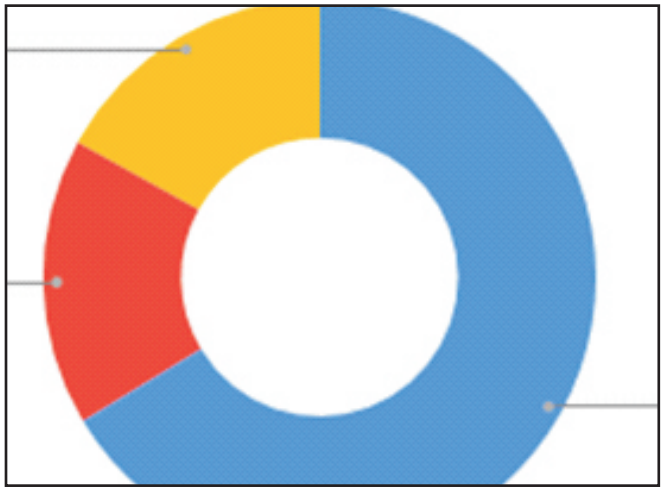

Fig.5.2.5: *Recyclability of Plastic bottles for soft drinks*

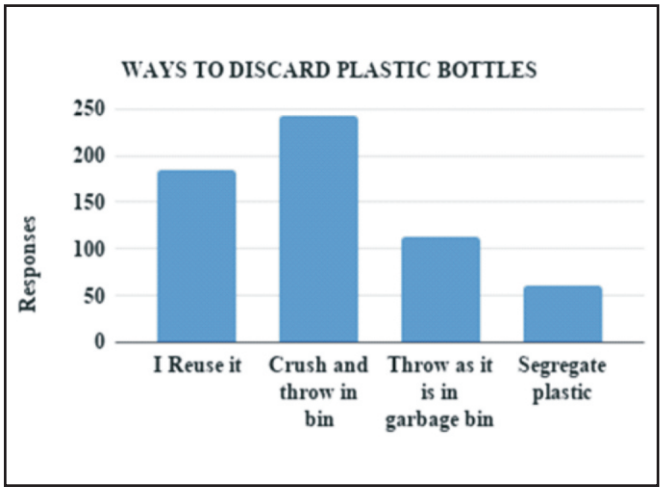

Fig.5.2.6: *Ways to discard plastic soft drinks bottles*

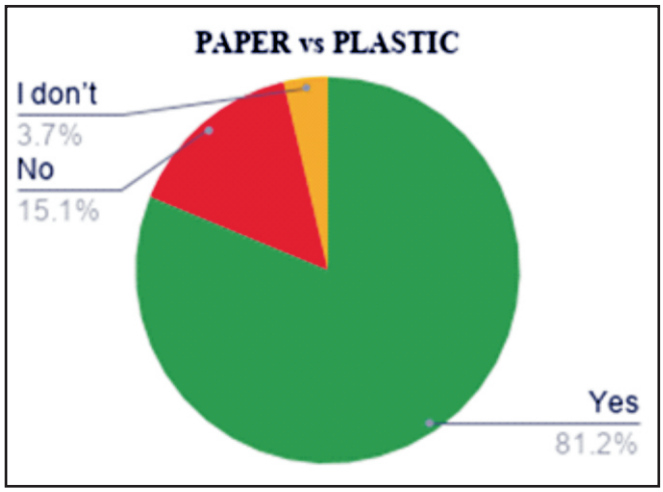

Fig.5.3.1: *Paper less harmful in comparison to plastic*

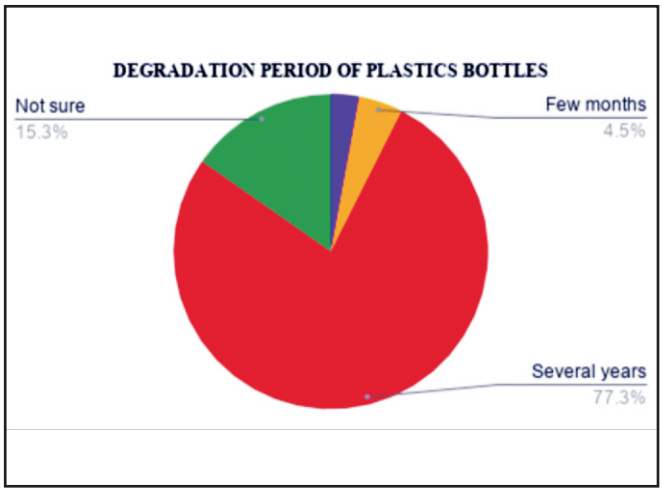

Fig.5.3.2: *Awareness on degradation period of plastic bottles*

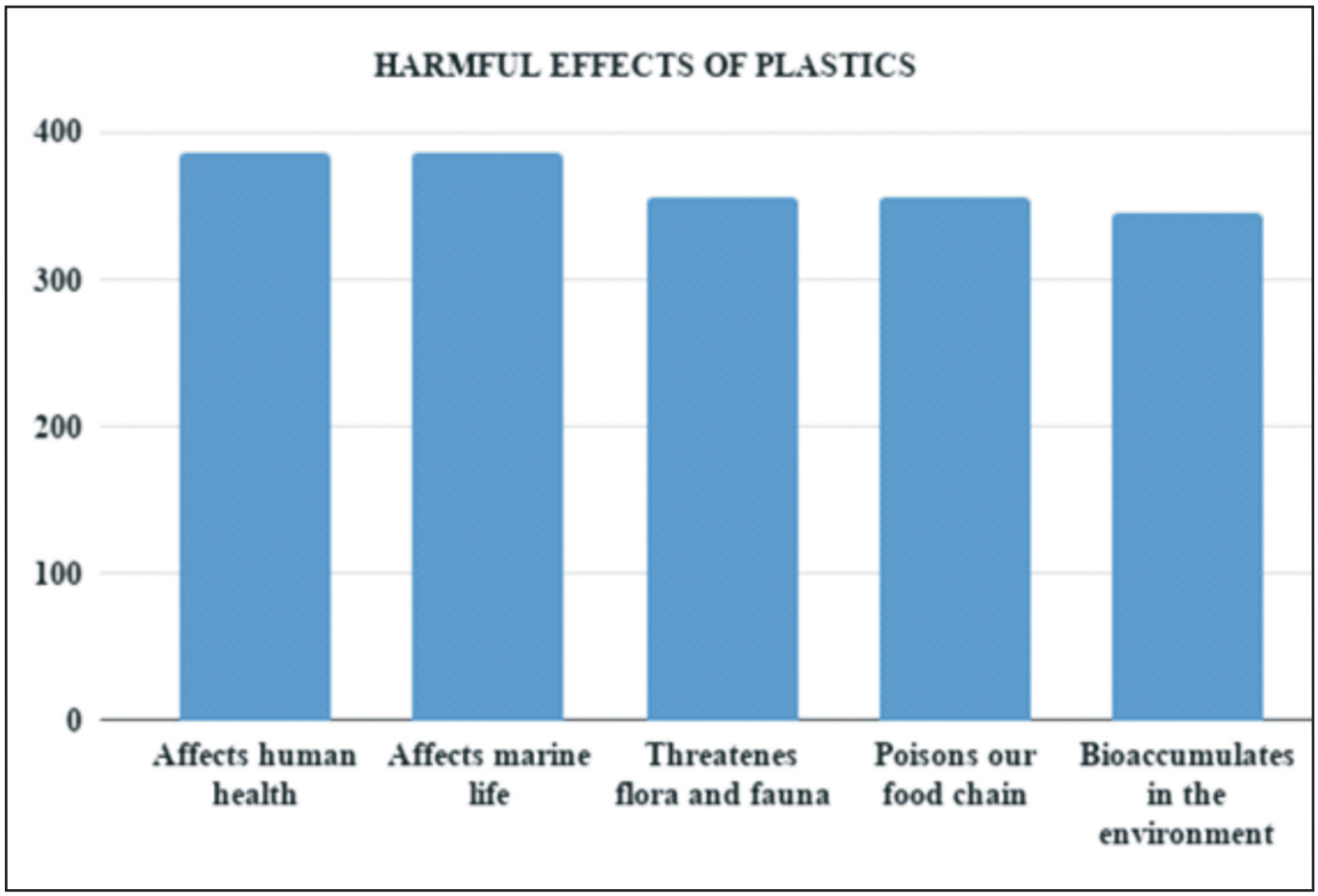

Fig.5.3.3: *Awareness on harmful effects of plastics*

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