A research study on KAP (Knowledge, Attitude and Practice) Analysis of "Plastic Food Contact Materials" among Health professionals and Non-Health professionals.

(**5th March-5th June2019)**

Internship and Dissertation Report Submitted in Partial Fulfillment of the Requirements for the Award of

Post-Graduate Diploma in Health and Hospital Management

Batch 2017-19

By

Drishya Pathak

PG/17/017

Under the guidance of

Internal Mentor	**External Mentor**
Dr. Manish Priyadarshi	Dr. Kavya sharma
Associate Professor (IIHMR)	External Consultant
IIHMR, Delhi	IQVIA, Delhi

A research study on KAP (Knowledge, Attitude and Practice) Analysis of "Plastic Food Contact Materials" among Health professionals and Non-Health professionals.

(Completion of Dissertation from respective organization)

The certificate is awarded to

Drishya Pathak

In recognition of having successfully completed her

Internship in the department of

Public Health

and has successfully completed her Project on

A research study on KAP (Knowledge, Attitude and Practice) Analysis of "Plastic Food Contact Materials" among Health professionals and Non-Health professionals.

From 5th March -5th June 2019

IQVIA, Delhi

She comes across as a committed, sincere and diligent person who has a strong drive and zeal for learning.

We wish her all the best for future endeavors

Dr. Kavya Sharma

Consultant

IQVIA

Delhi

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Drishya Pathak**, student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from International Institute of Health Management Research, New Delhi has undergone internship training at IQVIA, Delhi from 5th March 2019-5th June 2019.

The student has successfully carried out the study "**A research study on KAP (Knowledge, Attitude and Practice) Analysis of "Plastic Food Contact Materials" among Health professionals and Non-Health professionals"** which she chooses to work on during her internship training and her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

We wish her all success in all her future endeavors.

PK Panda

Dr. Pradeep K. Panda
Dean, Academics and Student Affairs
IIHMR, New Delhi

Dr. Manish Priyadarshi
Internal Mentor
Associate Professor
IIHMR, New-Delhi

CERTIFICATE OF APPROVAL

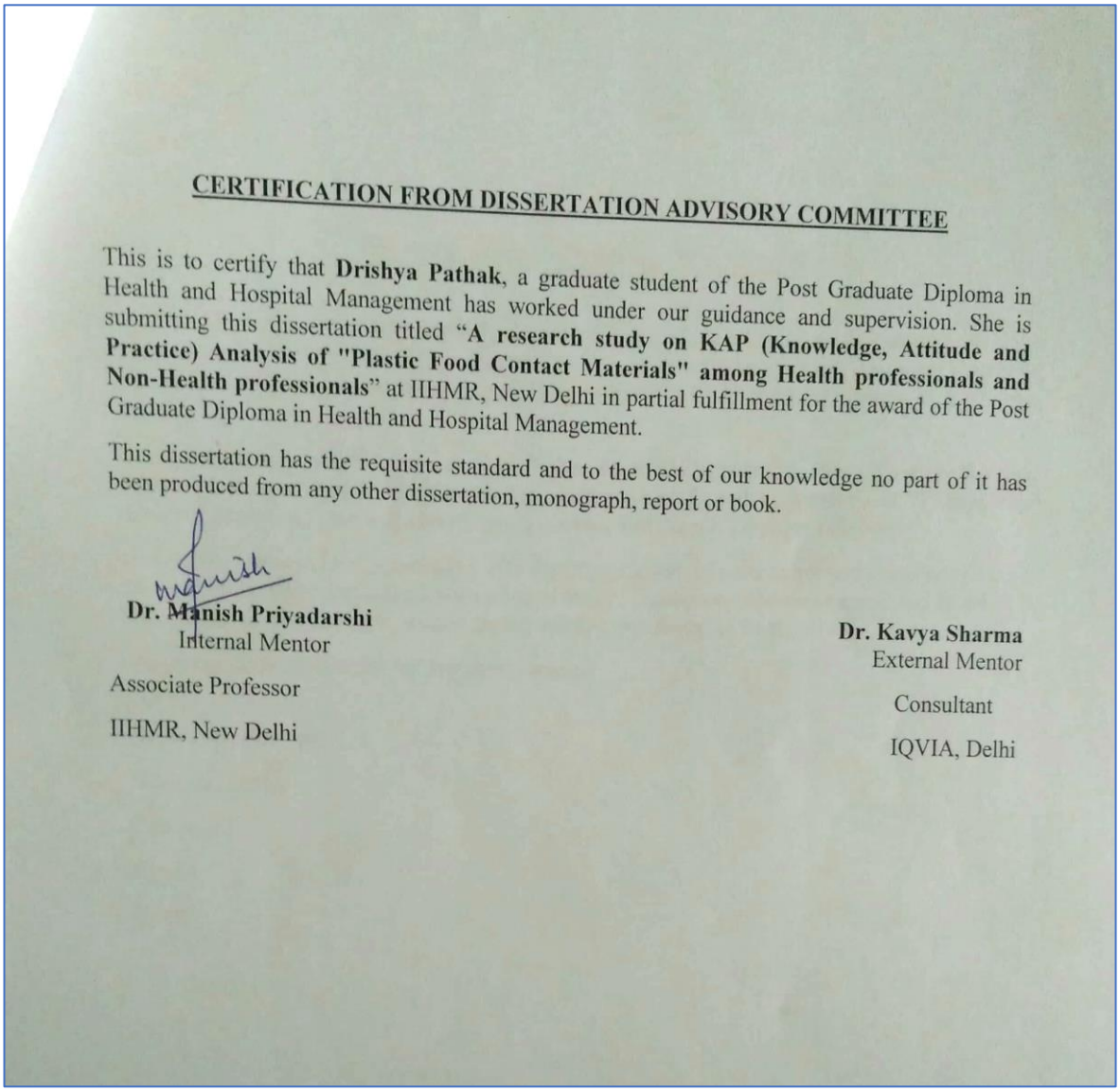
Certificate of Approval

The following dissertation titled **"A research study on KAP (Knowledge, Attitude and Practice) Analysis of " Plastic Food Contact Materials" among Health Professionals and Non-Health Professional" at "IQVIA, India"** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **Post Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expresser or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

Name:	**Signature:**
Dr. P. L. Joshi	
Dr. A. K. Khokhar	
Dr. Nishikant Belle	

CERTIFICATION FROM DISSERTATION ADVISORY COMMITTEE



CERTIFICATION FROM DISSERTATION ADVISORY COMMITTEE

This is to certify that **Drishya Pathak**, a graduate student of the Post Graduate Diploma in Health and Hospital Management has worked under our guidance and supervision. She is submitting this dissertation titled "**A research study on KAP (Knowledge, Attitude and Practice) Analysis of "Plastic Food Contact Materials" among Health professionals and Non-Health professionals**" at IIHMR, New Delhi in partial fulfillment for the award of the Post Graduate Diploma in Health and Hospital Management.

This dissertation has the requisite standard and to the best of our knowledge no part of it has been produced from any other dissertation, monograph, report or book.

Dr. Manish Priyadarshi
Internal Mentor

Associate Professor

IIHMR, New Delhi

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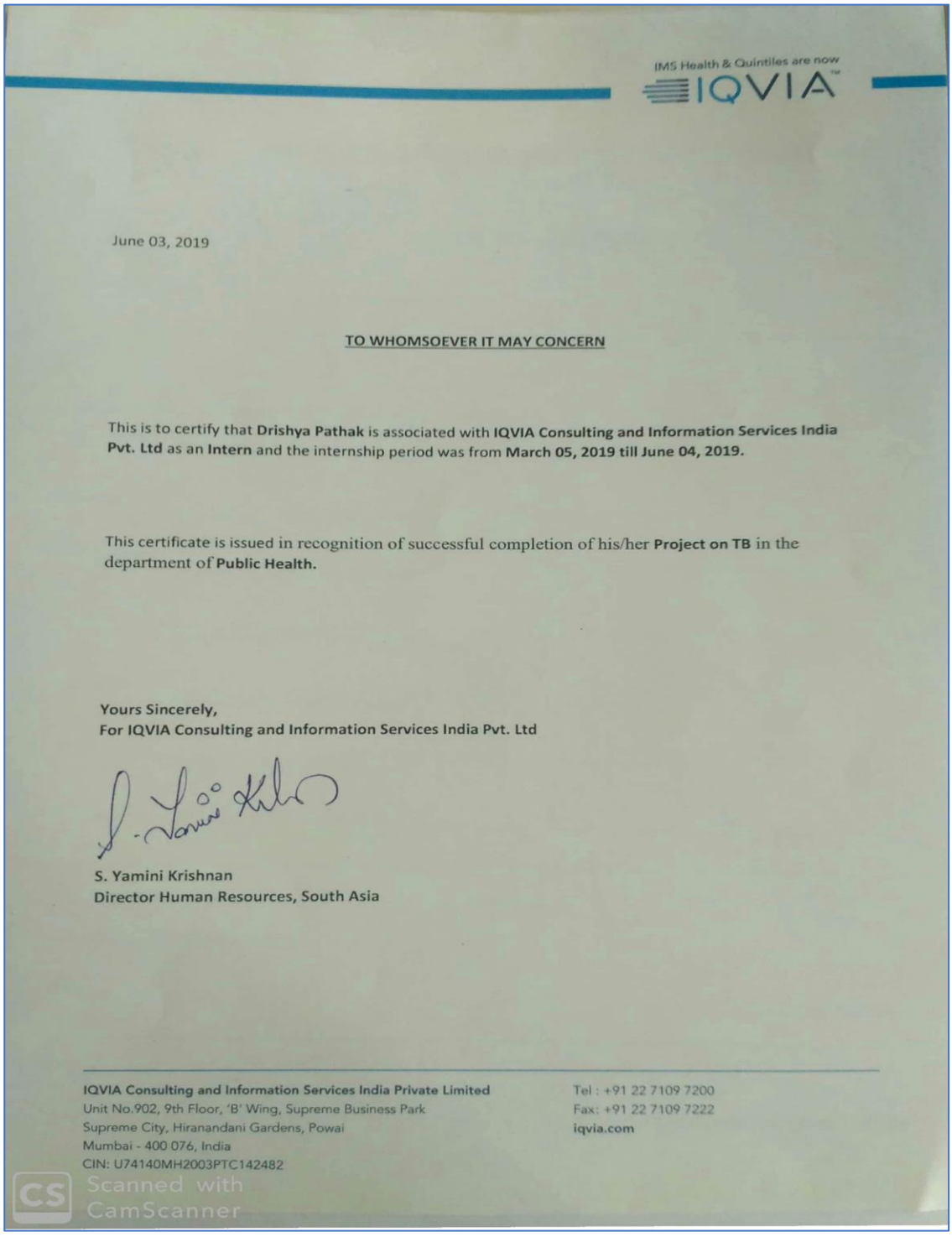
INTERNSHIP COMPLETION CERTIFICATE



IMS Health & Quintiles are now IQVIA

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This is to certify that **Drishya Pathak** is associated with **IQVIA Consulting and Information Services India Pvt. Ltd** as an **Intern** and the internship period was from **March 05, 2019 till June 04, 2019.**

This certificate is issued in recognition of successful completion of his/her **Project on TB** in the department of **Public Health.**

Yours Sincerely,
For IQVIA Consulting and Information Services India Pvt. Ltd

S. Yamini Krishnan
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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Drishya Pathak**, student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from International Institute of Health Management Research, New delhi has successfully completed internship training at IQVIA, Delhi from 5th March 2019-5th June 2019.

During her tenure with the organization she has successfully completed the project on the topic "**A research study on KAP (Knowledge, Attitude and Practice) Analysis of "Plastic Food Contact Materials" among Health professionals and Non-Health professionals**".

During the tenure of her association with the organization, I found her sincere, hardworking and focused in the tasks and assignments allotted to her. Throughout the training she was found to be a keen learner and her performance during training was found to be excellent.

I wish her all success in all her future endeavors.

Dr. Kavya Sharma
External Mentor
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CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "**A research study on KAP (Knowledge, Attitude and Practice) Analysis of "Plastic Food Contact Materials" among Health professionals and Non-Health professionals**" in IQVIA, Delhi and submitted by **Drishya Pathak**, Enrollment No. PG/17/017 under the supervision of **Dr. Manish Priyadarshi**, for the award of Post Graduate Diploma in Hospital and Health Management of the Institute carried out during the period from 5th March 2019 to 5th June 2019 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Drishya Pathak

PG/17/017

FEEDBACK FORM

Name of the Student: Drishya Pathak

Dissertation Organization: IQVIA, Delhi

Area of Dissertation: "A research study on KAP (Knowledge, Attitude and Practice) Analysis of "Plastic Food Contact Materials" among Health professionals and Non-Health professionals"

Attendance: 97%

Objectives Achieved: Yes

Deliverables:

Strengths: Communication skills, writing skills and management skills

Suggestions for Improvement:

Suggestions for Institute:

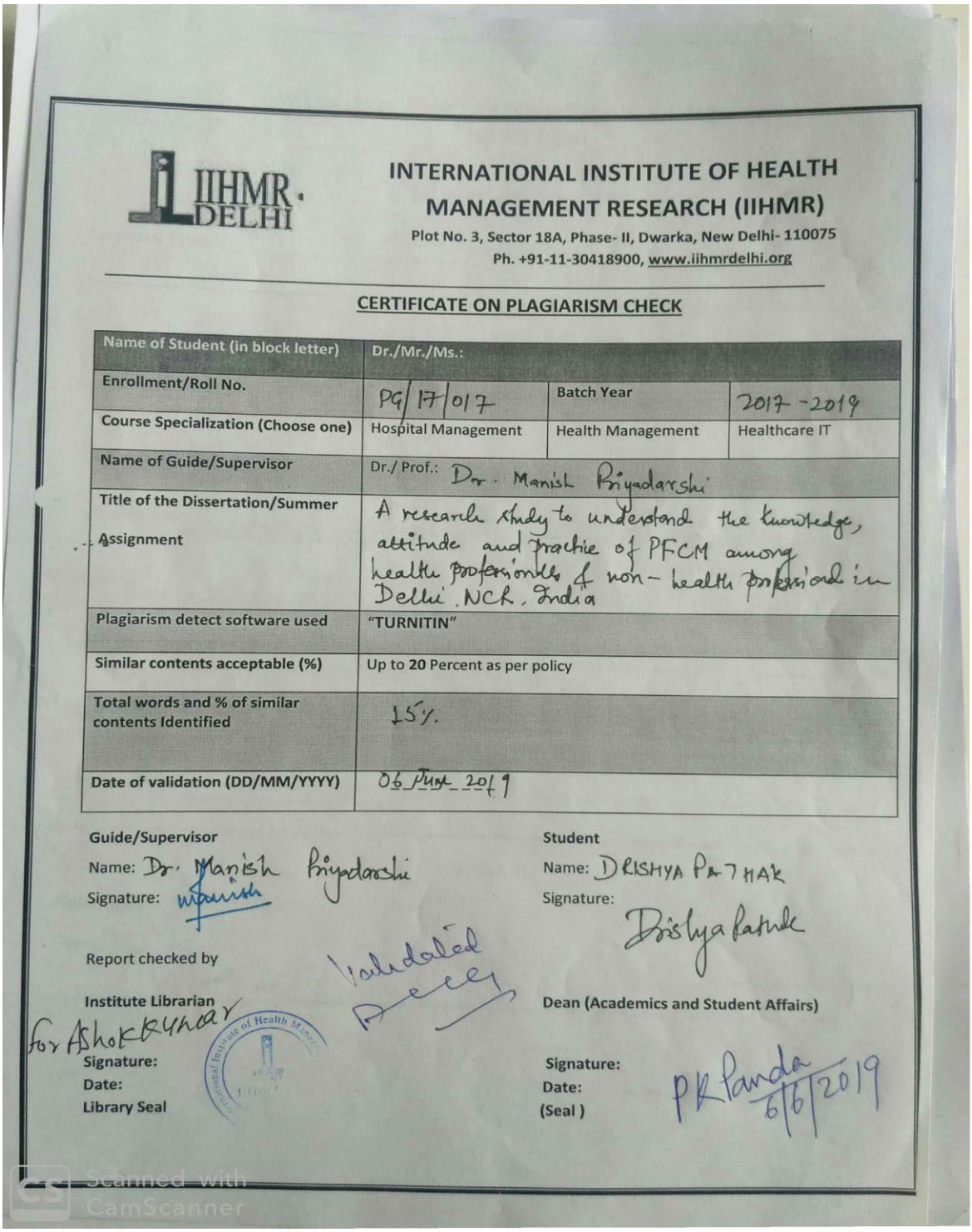
Dr. Kavya Sharma

(Technical Lead)

Date: 10th June 2019

Place: IQVIA, Delhi

PLAGIARISM CERTIFICATE



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Name of Guide/Supervisor	Dr./ Prof.: Dr. Manish Priyadarshi		
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Plagiarism detect software used	"TURNITIN"		
Similar contents acceptable (%)	Up to 20 Percent as per policy		
Total words and % of similar contents Identified	15%		
Date of validation (DD/MM/YYYY)	06 June 2019		

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I express my gratitude and sincere thanks to **Dr. Manish Priyadarshi (IIHMR)** at International Institute of Health Management and Research, New Delhi, for his valuable guidance and co-operation in my endeavor.

I am thankful to the management of **IQVIA**, Delhi, for giving me the opportunity to carry out Internship-cum-dissertation in the esteemed organization. I express my heartfelt gratitude to the functionaries and staff of all administrative departments of the organization who were helpful in familiarizing to me their tasks and duties performed by them. Their kind cooperation assisted me to have a holistic view of various departments and their linkages, thereby, providing me with an on-the-job insight into the functioning of the organization.

I wish to express my sincere gratitude and heartfelt thanks to **Dr. Kavya Sharma**, and **IQVIA**, for her foresight and full support, without which I wouldn't have been able to set my objectives for my Dissertation. Her mentoring and guidance during the Internship provided me with an opportunity wherein I improved my understanding.

Contents

Organizational Learning

Introduction

IQVIA is the world's leading provider with over 60 years of experience in healthcare survey, consulting & health intelligence services. It operates in more than 100 countries and serve over 5,000 healthcare customers across 6 countries. IQVIA has a strong country presence in India with over 13 years of experience across data, analytics and consulting services and is the only integrated healthcare informatics player in India, with solution across healthcare value chain. The range of services provided by IQVIA include business strategy, market research, and performance tracking tools, global market insights, regulatory policy support, operations improvement and allied technology solutions. IQVIA has extensive experience in carrying out monitoring and evaluation of health programs, laboratory assessments and conducting impact evaluation across disease areas.

Work Culture:

The environment is modern, open, friendly and creative. The organization gave various opportunities to show my talent. The atmosphere was interesting and encouraging which at every step challenged me to perform my best with rewards and acknowledgement given by all the team members providing a sense of professional satisfaction and encouragement.

Management:

Lokesh Sharma - Senior Principal, Public Health AMESA

Nilesh Maheshwari – Technical Advisory

Sukhmeet Singh – Engagement Manager

Kaartik Chauhan- Engagement Manager

Dr. Anita Gupta- Project Manager, Public Health

Dr. Kavya Sharma- Technical Lead (My Mentor)

Dr. Isha Sharma- Senior research Associate

Specific Objectives:

- To assist the TB team during the roll-out of IDAT a USAID project on a pilot basis
- To assist the TB team under the BMGF project conducting and providing trouble shooting support and prepare the project closure report
- To assist the CBNAAT assessment team during the assessment of the CBNAAT utilization rate across private and public facilities
- To assist the TB team in writing the proposals

Conclusive learning: It was a great opportunity to work with the TB team. Within a time of only three months I get to work closely with more than 10-12 colleagues who were specialist and had a wide range of work experience working as consultants on different projects. Each opportunity gave me a chance to work and learn different skills. I became a part of different project running in different phases, so all together I got exposed to all the possible phases in a project management. From proposal writing to planning of a project, on field training, data collection and assessment, management of an ongoing project, report writing and dissemination of results. I was a part of the national level training program of IDAT, Integrated Digital Adherence Technology. The task assigned to me included literature survey, coordination with the government staff at the technical unit of various districts, monthly generation of reports working on technical proposals and expression of

interests that added a great value at both personal and professional level as it helped establishing a strong base in terms of knowledge, making me aware of how massive the healthcare sector is and what are the various interventions running to eliminate TB by 2025. But the biggest learning is how profit, affordability, scalability and quality can be put together in a package to provide healthcare solutions to the client.

Limitations: There were no limitations as such but because I joined the organization when the project was at its ending phase it took me a while to understand the basic terminologies of TB. To familiarize myself with dense structure of the nation-wide spread TB setup I had to read a lot, along with all the responsibilities allotted to me in the final phase of the project.

Introduction:

What is plastic:

Plastic is the most essential, most used and most easily available material in the modern civilization. It has changed our lives in many ways and is believed to have made our life easier and better. They are composed of a network of molecular monomers bound together to form materials that can be used by human beings. The dependency on plastic is increasing day by day because of its characteristics such as inert, durability, flexibility and versatility and so on. The durability, flexibility and versatility all these characteristics are not the properties of the plastic as it requires other monomers and polymers to combine its molecules and these chemicals comes along with this material. "Every stage of the plastic lifecycle poses significant risks to human health due to these macro molecules, and most people worldwide are exposed to plastic at multiple stages of this lifecycle"(1). And these products manufactured from plastics promote risks to health and the environment(2)

What is PFCM and Its use:

Food contact materials are all those materials intended to come in contact with food, such as containers, cutlery, dishes, bottles, kitchen equipment's and packaging materials. These articles can be made from a variety of materials, plastic is one of such materials called as "Plastic Food Contact Materials" or "Plastic Type Food Contact Materials" PFCM. The safety of food contact materials is evaluated as chemicals associated with these substances are scientifically proven to migrate from the materials into the food. Studies in Korea and Japan revealed a heavy reliance on PTFCMs as plastic food containers (71.6 and 64.6%)(3). However, limited studies are documented on PFCMs in other regions, especially developing countries, thus the present study is important to be carried out in

evaluating the KAP of Health and Non-Health professionals as India has published the "Food Safety and Standards (Packaging) Regulations, 2018, to be implemented from 1st July 2019, to regulate the food contact materials.

Why study on PFCM is important?

Plastics are composed of a network of molecular monomers bound together to form materials that can be used by human beings. The dependency on plastic is increasing day by day because of its characteristics such as inert, durability, flexibility and versatility and so on. The durability, flexibility and versatility all these characteristics are not the properties of the plastic as it requires other monomers and polymers to combine its molecules and these chemicals are comes along with this material. The additive response of even a small quantity of a chemical can be lethal as it can act in combination with the other chemicals already present or the other chemicals people get exposed to(4).

There are 2 types of chemicals that can be incorporated in the final plastics materials used for making plastic packaging these are NIAS (non-intentionally added substances) and IAS (intentionally added substances). The NIAS are the side products of the polymerization process and impurities from the starting material batches and other sources used while the production of plastic materials. The identification of NIAS is difficult and not all compounds can be detected even if the structure and composition of the starting compounds is known. These for move materials who are although not added intentionally are made up of week bonds which easily break due to heat or simply because of storing, some acidic or basic components are fat soluble or water soluble making it easier for the goods made of chemicals to break and let these chemicals enter inside the food chain of the humans and

animals. The chemical migration occurs when the food is stored in plastics materials exposed or treated with IAS and NIAS due to certain factors affecting the chemical migration. It has been found in many researches done in different countries that chemicals found in food packaging has been associated with certain diseases. So, studies like these

are required to firstly, determine the knowledge level of people and secondly, their behavior pattern, to support all the experimental studies that are conducted to access the direct and indirect exposure, risk and effect of such material used to store food(5).

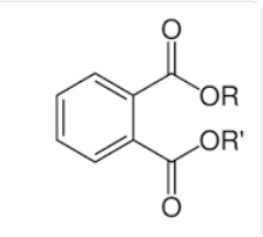
The IAS and NIAS released into the food and then entering inside human body, many of these are known endocrine disrupting compounds that have been linked to a variety of health impacts and especially mimic as hormones and causes adverse effects including cancers, heart problems, obesity and diabetes, birth defects, impacting immune, nervous system and reproductive system(6).2 types of chemicals can be incorporated in the final plastics materials used for making plastic packaging these are Intentionally added substances (IAS), such as monomers used to make the polymers, additives added to polymers to impart a desired property or function and other chemicals added, and Non-

intentionally added chemicals (NIAS). The NIAS are the side products of the polymerization process and impurities from the starting material batches and other sources used while the production of plastic materials. The estimation of comprehensive overview of these two products in plastic is a difficult job to do as plastic packaging are made of multiple polymer types or IAS with large variety of chemicals additives and identification, estimation NIAS is rarely addressed also because not all compounds can be detected even if the structure and composition of the starting compounds is known(7).

Types of chemicals added

Chemical	Use	Exposure	Chemical Contaminants
Phthalates	Production of plastics and resins	Vegetable oils, chocolate, cookies, snacks, milk, cheese, butter, pizza, baby food/ Migration from food packaging. Carry-over to ruminant from contaminated pastures	• Dimethyl phthalate (DMP) • Diethyl phthalate (DEP) • Di-n-butyl phthalate (DBP) • Butyl benzyl phthalate (BBP) • Butyl decyl phthalate (BDP) • Di (2-thylehexyl) phthalate (DEHP)
Phenols	Production of plastics and resins	Cereal, fish, meat, milk, canned food and beverage, honey, baby-food/Migration from packaging as coating, in food cans	

Phthalates



These are diesters of ortho-phthalic acid, organic lipophilic compounds, which are principally used as plasticizer to increase the flexibility of plastic such polyvinyl chloride (PVC) and called phthalates. It is used in other products as well e.g. printing inks and lacquers, to which they

are added to improve surface adhesion, flexibility and wrinkle resistance. Phthalates have acquired much attention because of their high production volumes and wide usage in different types of substances, especially packaging materials(8). They constitute a significant proportion, by weight, of PVC. They can leach out of products because they are not chemically bound to the plastic matrix.

Some common types of phthalates are di (2-ethylhexyl) phthalates (DEHP), diisononyl phthalate (DiNP) and disodecyl phthalates (DiDP), di-n-butyl phthalate (DnBP), benzyl butyl phthalate (BBP).

BPA

BPA is the monomer used to produce polycarbonate plastics as well as used as an additive to produce poly vinyl chloride (PVC).

Definition of release: Polymers and monomers added as additives in packaging and storing material can degrade under the influence of acidic and alkaline foodstuffs. UV light, and heat. As a result, monomers can leach – this process is called release/ leaching/ chemical migration.

For example, A German consumer magazine reported leaching of bisphenol A, (an EDC) it was from microwave- heated PC baby bottles into tap water the levels were far higher, with up to 157 ppb found. At first microwave was suspected to be the reason of degraded polymers but later it was found it is not the case. As the tap water used was hard it contained Calcium (Ca2+) ions and Co2, as Co2 gas out over time due to heat leading to a change in the buffer system, ultimately leading to change in the PH level. Hence water which is alkaline in nature can degrade PC (poly chloride) plastic and release of BPA.

This gives an explanation of what factors can lead to leaching; PH, temperature, polymer age.(4)

Polymers age as mentioned in the study bring another issue as different type of plastics are made from different chemical compounds. So, what is the correct way to define the age of polymer plastic. For example, plastics made of melamine-formaldehyde resin, styrene-acrylonitrile resin all these are monomers but have proven adverse effects. And single use plastics, like polyethylene terephthalate (PET) water or soda bottles are reused by consumers again and again, refilled with tap water (rich in salts) which are assessed for this type of use in common practice.

These are the external factors leading to leaching. But what about the food contact material, can that also be a relevant source of chemical contaminants. Dry food material stored in a packaging can also meet volatile components of the chemicals through the gas phase as in the partitioning in environmental media takes place. For example, transfer of phthalates from recycled paperboard packaging into infant food showed in the study conducted by S. Gartner, 2009 and C.Droz, 1997(9). Migration has also been show to be relevant in the study conducted by A.S. Silva, 2008, for dry foods packaged in low density polyethylene(LDPE) packaging, where the triclosan was shown to leach into wheat flour and rice at low levels(10). This triclosan is not authorized in US but in EU, it can be used on an authorized application, used and added intentionally, so that it is released in the food as a way of extending its lifecycle.

Although countries FDA have a procedure to measure the content of these FCM, these levels of measurement varies among different countries, these measurements are made totally based on the body weight and the amount of food consumed. For example in US

FDA measures how much of a type of food is in contact with what specific FCM type, and then calculate the migration level of the FCM, based on the minimum quantity identified by FDA i.e. 6.45dm2(decimeter, $1/10^{th}$ of a meter) of FCM in contact with 1kg of food, this quantity was found to be 30% lower than the harmful quantity identified by Portugal(11). If we talk about infants and children, they consume up to 10 times more food per kg bodyweight. Furthermore, small packaging sizes are especially made targeting children, with a larger surface-to-volume ratio and therefore higher migration per kg food(12).

This shows that there are enough number of evidences present to support the fact the plastic food contact materials release chemicals and that it depends upon not a few but a lot of factors.

RATIONALE

Plastic is the most common substance used today. We use plastic to store, package, in toys and in almost everything. Figure 1 shows the rate of plastic consumed and converted into waste by four major metro cities. Delhi is one the most plastic waste generating city in India. According to a research a person uses plastic more than 10 no of times in a day. So, it becomes even more important to understand what we are getting exposed to indirectly every day. Everything that is manufactured in an industry is not made organically but is made after getting treated and exposed to 4283 numbers of chemicals for plastic packaging specifically, some of these chemicals are mixed with the final product to make it colorful, flexible and more usable for the customers. It is important to understand the level of chemicals that we are getting exposed to unintentionally. The study of chemicals that can acts as endocrine disrupting chemicals is needed because they are known to cause some sever damage to our reproductive system and the progeny also. So, the research like this is required for developing countries where not enough research is conducted.

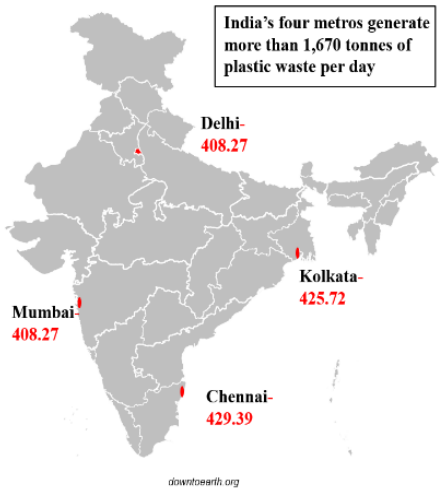


Figure 1: Amount of Plastic consumed and converted into waste

A research is needed to understand the level of knowledge people have about the exposure, its risk and how well people understand the effect of these chemicals. Their attitude towards the usage of PFCM (Plastic food contact materials) in daily life and the frequency at which they are practicing the use of PFCM based on their knowledge.

LITERATURE REVIEW

Rate at which materials are used and what is the level of preference:

FICCI (Federation of Indian Chambers of Commerce and Industry) published a report in 2014 on the potential of plastics industry in northern India with special focus on plasticulture and food processes. The report gives the breakup of plastic consumption across various regions of India with western region (47%) being the highest consumer of plastic, followed by Northern India (23%), Southern India (21%) and Eastern Indian (9%). The report also mentions that commodity plastic accounts for the bulk of the plastic comprising of Polyethylene (PE), Polypropylene (PP), Polyvinyl Chloride (PVC) and Polystyrene (PS). According to the report (42%) of this plastic is used by packaging industry, which shows India has a strong penetration of plastics as compared to the global standards which is (32%). To review the rate of consumption of different raw materials across the globe we conducted literature review and found different surveys have been done. KFDA (Korea Food and Drug administration) conducted a survey in 2007, on the use of various food containers and packaging materials, according to it mostly used raw materials were that of synthetic resins (71.6%), followed by glass (10.6%0, metal (10%), and paper (7.5%)(3). The same survey also reported the kinds of synthetic resins used for plastic food containers as PE (34.2%), PET (15.2%), PP (11.5%), PC (7.1%), and PS (3.5%). A similar kind of a survey was conducted in Japan, which gave the similar kinds of findings, indicating synthetic resin used (64.6%) rate followed by glass (7.0%), and metal (15.6%), with the use of types of synthetic resins for plastic containers or bottles being PE(26.8%), PET (13.8%), PP (13.3%), PS (5.6%)(3). A different kind of study was done to understand the level of plastic material purchased and consumed for food storage which captures the different aspects of a consumer. Chong Kah Hui et all (2017), conducted

a cross sectional study on university students' knowledge, attitude and practice of endocrine disrupting chemicals and use of selected plastic-type food contact materials in Kuala Terengganu. The study concluded that most of the respondents commonly used polypropylene (PP) as either liquid or food container(13).

Degree of presence of Chemicals:

Of the global 380 Mt annual plastic production in 2015, an estimated 40% was being used for plastic packaging. A large part of this packaging is used for foods and beverages. But this consumption is increasing day by day with online food ordering. Ksenia Groh et al (2018) conducted a study on chemicals in plastic packaging prioritization of hazardous substances explaining how plastic packaging is a source of chemicals which may migrate into the environment during use, disposal and recycling of the packaging material or even into food. Where the authors consulted the scientific literature along with commercial product information source to identify chemicals that are expected to be present in the plastics during manufacturing, such as monomers, polymerization aids, solvents or catalysts, along with plastic additives such as pigments, filters, antioxidants, stabilizers, plasticizers, slip agents and non-intentionally added substances and ranked these substances according to their hazards for human health and environment using the CLP (Classification, Labelling and Packaging) methodology. In the study they identified hundreds of compounds that are hazardous for human health and the environment that are being used in plastic packaging as additives or monomers(14). A similar study was conducted in Switzerland by J. Groh et al in (2018). The study gives an overview of known plastic packaging-associated chemicals and their hazards. The authors explained about the

2 types chemicals present in the manufactured plastic knowns as IAS (intentionally added substances) and NIAS (non-intentionally added substances). The study has listed 906 chemicals likely associated with plastic packaging from the database of Chemicals associated with Plastic packaging (CPPdb) and 3377substances that are possibly associated. Out of this they ranked 63 highest for human health hazards and 68 for environmental hazards according to CLP methodology. 7 out of the 906 substances are classified as persistent, bio accumulative, and toxic or very persistent and 15 as endocrine disrupting chemicals (EDC) and 34 as potential EDC according to European Union(7).

An experimental study was conducted by Bauer at el in (2018) to identify unexpected chemical contaminants in baby food coming from plastic packaging migration by high resolution accurate mass spectrometry where the author talks about the multi layers plastic packaging and migration of food contact materials (FCM) into baby food. A comprehensive migration of IAS and NIAS was studied to assess the safety of these multilayered packaging materials. The experimental study identified 42 unexpected migrants in the food including eight NIAS, that were detected first time. Two oligomers were also identified exceeding the level of 0.010 mg/kg limit for baby food(15).

According to the previous study mentioned the various chemicals that were identified and found dangerous were basically phthalates and Bisphenol and other associated compounds. There are many studies conducted to analyze these chemicals in food in contact with plastic. One such study was done by Fierens et al (2012) to analyze the phthalates in food products and packaging materials sold on the Belgian market. The study gives details about presence of eight phthalates compounds – dimethyl phthalate (DMP), diethyl phthalate (DEP), diisobutyl phthalate (DiBP), di-n-butyl phthalate (DnBP), benzylbutyl phthalate

(BBP), di(2-thyl hexyl) phthalate (DEHP), dicyclohexyl phthalate (DCHP) ad di-n-octyl phthalate (DnOP) investigated in 400 food products and divided over eleven groups. Suitable extraction techniques were developed and validated for four different matrices and the analysis was performed using gas chromatography-low resolution-mass spectrometry with electron impact ionization. It was found that a wide variety of phthalate concentrations were present and DEHP was found in the highest concentration in the four groups namely high-fat foods, low-fat food products, aqueous-based beverages and packaging materials(16).

How these Endocrine disrupting chemicals are released:

By far most food packaging materials and storage containers or PFCM have been found to be associated with hazardous chemicals but the phenomenon leaching of these chemicals into the food is also an important task of food packaging risk assessment. One such study was conducted by Muncke (2010) in Switzerland on Endocrine disrupting chemicals and other substances of concern in food contact materials: An updated review of exposure, effect and risk assessment. The study reflects on quantifying the exposure of the general population to the substances leached by FCM relies on the estimates of the food consumption and factors causing leaching. The author also mentioned about shifting the focus of assessment from only to mutagenicity and genotoxicity to sensitive population such as new toxicological paradigms women of child bearing age and during pregnancy on obese person in which change in metabolism of xenobiotics is observed. The author has also mentioned about the type of food stored such as dry foods that are underestimated over leaching(17). Bang et al (2012) conducted a similar study on human risk assessment of endocrine disrupting chemicals derived from plastic food container. In this study they

calculated hazard index based on exposure of chemicals i.e. phthalates, BPA and styrene. They also derived the issues concerning to the EDCs where they estimated that HI value higher than 1, shows the exposure above the safety limits of chemicals. When a study was conducted by Hui in (2017) to analyze the KAP of Endocrine disrupting chemicals he found that (84%) of the respondents had low knowledge of EDCs and PTFCMs and suggested that they are required to improve their knowledge level to minimize the adverse health effects(13).

GOALS AND OBJECTIVE OF THE STUDY:

The goal of the study is to understand the knowledge, attitude and practice of PFCM among health professionals and non-health professionals in Delhi National Capital Region, India.

1. To understand the present knowledge of the potential adverse effects that can be caused due to leaching of chemicals by PFCM among health and non-health professionals
2. To understand the knowledge level of how much aware the health and non-health professionals are about the use of PFCM
3. To evaluate the attitude and pattern in practicing the use of PFCM by health and non-health professionals
4. To understand the challenges perceived by the health and non-health professionals in substituting plastic with non-plastic material to carry and store food.

STUDY METHODOLOGY

Study Methodology:

Type of Study: Qualitative study

Data Source: In-depth interviews, key informants' interviews, distribution of questionnaire and focused group discussions were conducted with health and non-health professionals, in Delhi NCR, India to understand the KAP of PFCM among them.

Describing the methods

The data collected and analyzed in the research included literature review, questionnaire responses, in-depth interviews, key informant interview and focused group discussions to develop an in-depth understanding of the specific target groups and individuals based on their knowledge, attitude and practice of the event. The data collected for the study, was from an identified area and focuses on pre-selected criteria- based sampling techniques to reach their target groups.

Justifying choice of the methods

The study is a qualitative study using a mixed tool. Data collection and analysis was done simultaneously to know if there is any redundancy in the data collected or whether there is any saturation point in the quality of data collected. To avoid data redundancy the questionnaire was created very carefully, elimination of his/her own biases and analysis was done continuously to bring the validity to the data collected.

Open ended questions and FGDs were complementing a KAP survey and allowed further exploration of a situation, identifying the problems and potentially highlighting aspects that were not yet known.

The study was undertaken with the guidance and active participation of IQVIA (IMS & QUINTILES HEALTH). The current study follows a qualitative research design in which interviews and FGDs were conducted with the respondents. The data collected from the selected sites within the region of Delhi NCR.

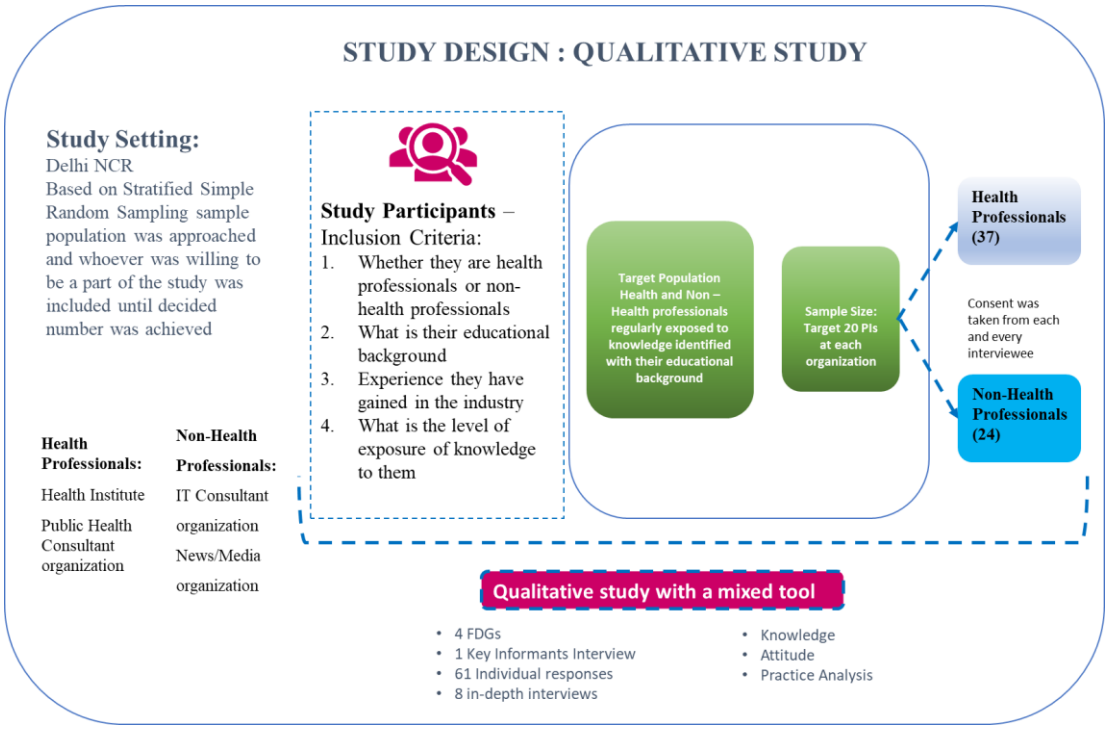


Figure 2: Diagram showing the study-methodology

Data Collection Process: Face-to-Face interactions was preferred over telephonic conversations. Most IDIs were approximately 15-20 mins in length. These were recorded, and the recordings were then transcribed and checked for accuracy before conducting analysis.

The respondents were approached from two health and two non -health organizations to collect the data from the identified strata, based on the inclusion criteria. The **total limit**

set was 20 individuals per organization but due the time constraints the final 20 number was not achieved from any of the organizations.

Type of Interview	Health Professionals	Non-Health Professionals
In-depth Interview	4	4
Focused group Discussions	2	2
Key Informant Interview	1	

Inclusion and Exclusion criteria:

1. Participants were selected based on their educational background
2. Experience of 2- 20 years in their respective field

Criteria for Selection:

The key informant interviewed were selected based on their experience working on similar social topics directly or indirectly related to environment and social well-being.

The selection of 2 participants from each organization was based on the marital status, the willingness and availability of the participants to be a part of the interview.

The focused group discussion conducted had five participants minimum in each discussion and there was one FGD conducted at each organization.

a. Informed Consent

Participants were clearly explained about:

i) The objectives of the research;

ii) How the outcomes are intended to be used; and

iii) The value of their inputs.

Informed consent was obtained from all respondents by describing the purpose of the research. Both verbal and written consent was obtained from the study respondents.

Ethics statement

Statement 1: (For Interviews)

I am Drishya Pathak. I'm currently conducting a research work on "Plastic Food Contact Materials" and the chemicals associated. I want to ask you some questions about your Knowledge, attitude and practice towards Plastic Food Contact Materials. The questions asked during the interview will supplement your knowledge base and generate awareness about the use of plastic and chemicals associated with it. If you agree with the purpose stated by me, please say yes and if you do not agree then I will not ask any questions from you.

Thank you for your valuable response and time!

Statement 2: (For questionnaire)

I am Drishya Pathak. I'm currently conducting a research work on "Plastic Food Contact Materials". Please take a few minutes to fill this form. The questionnaire will supplement your knowledge base and generate awareness about the use of plastic and chemicals associated with it. I assure you that the data collected from the respondent will not be shared in any means and the confidentiality of the data will be maintained. Also, it's my personal request to not google questions if you are not sure and provide the response as per best of your knowledge. (Please Press the submit button once you are done)

Selection criteria description of study participants

Stratified sampling was used to select the participants on the basis of their educational background, work experience and sector in which they are working. For the key informant

interviews, participants were selected based on experience and are those who are doing research in this area. For in-depth interviews, face to face communication and telephonic interviews were used. For focus group discussions, participants include participants with a range of experience in the health sector or non- health sector from 2 to 20 years of experience.

Materials:

Qualitative Instrument

The study comprised a qualitative design for the purposes of doing KAP analysis and used frequencies, patterns and practice of PFCM usage, in addition to the additives added affecting the usage of PFCM.

The questionnaire comprised of four sections that included closed-ended, open ended, multiple choice and involved discussions.

Below is the figure showing how the questionnaire was developed.

Factors associated with Knowledge, Attitude and Practice

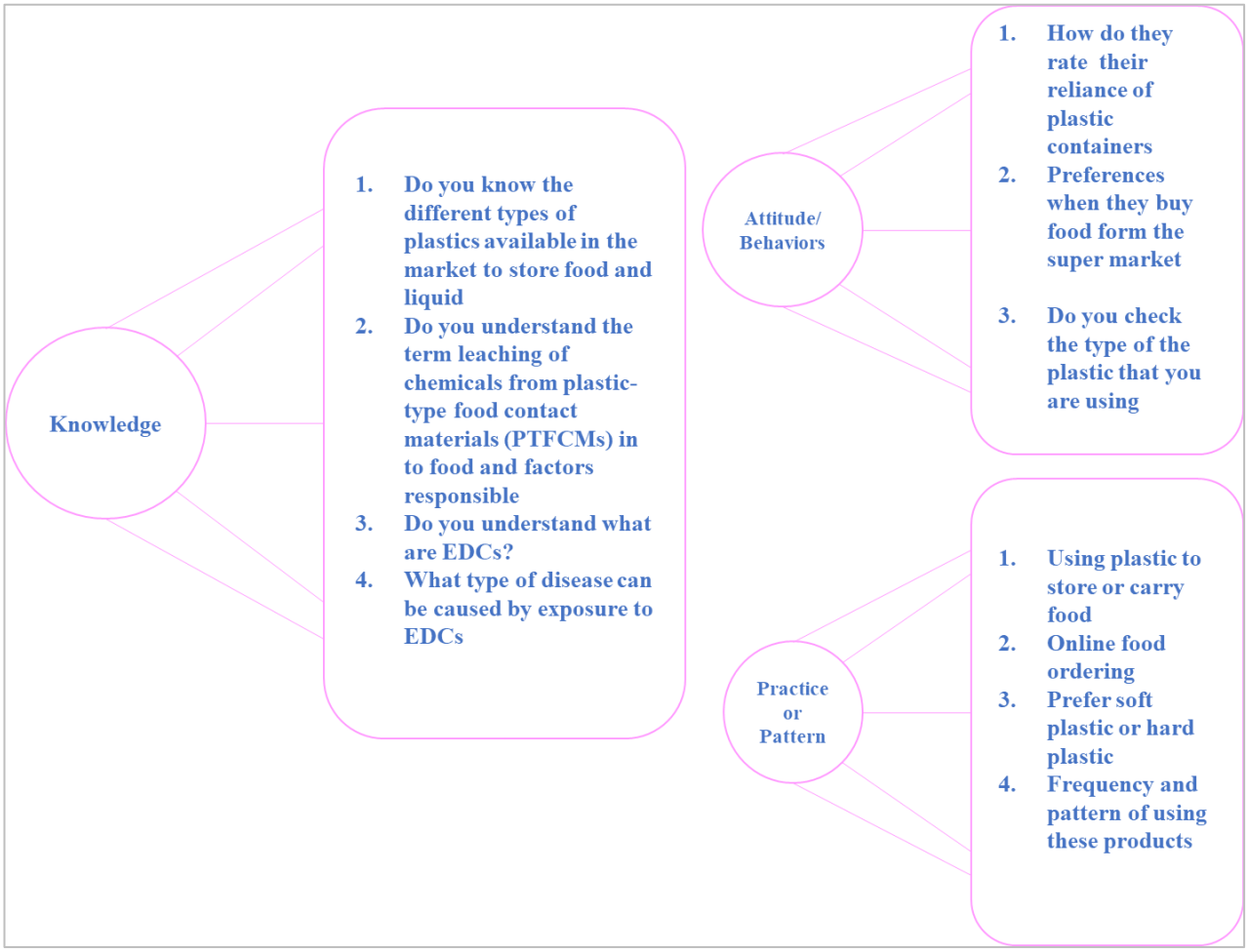


Figure 3: Factors associated with KAP indictors

RESULTS & DISCUSSION

The research questions were divided into five sections, basic information, knowledge, attitude, practice and the challenges. The data collected in the knowledge, pattern and challenges section have been qualitative to get a basic understanding of the above-mentioned aspects whereas the attitude section had some quantitative aspects.

To analyze the quantitative aspects of the questions asked in the attitude section e.g. "what is your reliance on the plastic food contact material in your daily life?" the response was recorded on a Likert scale which was then categorized as "low, moderate and extreme" based on the number given by the respondents themselves. 1-3 score was categorized as low, 4-6 score was categorized as medium and 7 above was categorized as extreme.

The participants of the study were selected based on their educational qualification and number of experiences in their job.

Demographic Profile:

Below table represents demographic profile for all 61 respondents, including gender, age, race, current educational status, marital status and if they have kids, household income and courses of study (n=61). Most participants were females. The health professionals were tend to be more education and had more annual family income.

Age Group	18-24 years	15
	25-39 years	39
	40-60 years	7
Gender	Male	28
	Female	33
Educational Qualification	High School/ Associate Degree	-
	Bachelor' s Degree (BA, BBA, BSc., B.com, BS and Btech., etc.)	10
	Master's Degree (MA, M. Com, MSc. MTech etc.)	17 (3 health professional has

		non-health professional degree)
	Professional Degree (MBBS, BDS, BHMS, BAMS, MBA, MS etc.)	34
Marital Status	Single/ Unmarried	36
	Married	25
	Divorced	-
	Widowed	-
Having Kids	Yes	19
Household Income	5 - 10 lakhs	17
	20 lakhs and above	19
	10- 20 lakhs	21
	Less than 5 lakhs	4

Table of responses for qualitative Interviews

Age group	23-40 years	25-40 years
Occupation	Health Professionals	Non-Health Professionals
Education Background	Professional Degree course	Bachelors' and Masters'

Knowledge:

Knowledge about different types of plastic available in the market:

The knowledge of the interviewed professionals regarding the plastic food contact materials is very limited. Mostly the responses were that they are unaware of the difference in the type of plastic material and how is it represented, by a definite number coding marked on the plastic product or name of the plastic. It was also observed that response of people was mixed towards the type of plastic, in in-depth interviews it was found that health as well as non-health professionals were not aware about the plastic type and those who said they know, categorized PET bottles to be Type 5 plastic which is polypropylene and not PET. For most of them a brand defines if the plastic is good plastic or bad plastic and so

they trust brands like Tupperware or Milton etc. In an in-depth interview one of the respondents said, “I am not aware of the type of plastic, but I usually go by the brand basically, so if we know, if there is Tupperware or if there is a brand then it is anyways a good brand and must be considered safe, but if you are buying it from road side, and we know that they are not taking the necessary requirements then we throw it”. The type of plastic is generally not known to them and then they go by basic terminologies like “virgin plastic” and consider that it should be used to store food.

Understanding of the term leaching in PFCM: The health professional reveled that being a science student they have heard of leaching, but they don’t understand the term leaching technically when used in reference to PFCM.

When compared the knowledge level of health professionals with the non-health professionals it was quite evident that the knowledge percentage varied with a visible margin. Out of the total “yes” (33) response generated (66%) were health professionals and (34%) were non-health professionals.

Knowledge about the different factors causing leaching:

The study also found that the people do understand that temperature or food in plastic kept in microwave can be a possible cause of leaching, but they don’t really understand what is the mechanism. They believe an oily food, acidic food or dry food if kept in a direct contact within a plastic container will not cause leaching of chemicals. Although some health professional did mention about some other factors like i.e. the more you keep them, the food you keep in them, duration, exposure to air etc., but due to low awareness they were not confident about the reasons that they mentioned.

Knowledge about the Endocrine disrupting chemicals in PFCM:

General understanding about EDC among health professionals was low and among non-health professionals was found extremely low.

- Whether Health professional or non-health professional the understanding of endocrine chemicals was very low, 95% of the population was not aware of EDCs

- 80% of the respondents out of the total (61) had no idea about the names of the chemicals PFCM can release, and only 13 % mentioned that "yes" we have heard of BPA irrespective of the fact that they are health professionals or non-health professionals

> *One of the health professionals on asking what EDCs mean, said "These are steroid or steroid like molecules which end up disrupting the hormonal balance in your body but particularly I think thyroid dysfunction and estrogen and testosterone dysfunction can also happen".*

- Most of the respondents who answered the question whether they are aware of the diseases leaching of chemicals from PFCM can cause, majority of them mentioned that chemicals released due to leaching from the plastic can cause cancer and whereas rest of them were only guessing.

Health professionals said when asked if they are aware of the kind of chemicals that are added in a PFCM like phthalates, BPA etc. they were totally blank they mentioned that haven't heard about these chemicals. There was one response in health professional FGD that yes, "I have heard of BPA but not phthalates" and rest all others answered that they are totally unaware what it can cause or what are these chemicals.

Knowledge about the kind of diseases leaching of EDCs can cause:

Study participants including health professionals and non-health professionals indicated that they are aware that the use of plastic in contact with food does have an adverse effect on human health, but the knowledge of the severity and implications of the issue are not known to them.

> *One of the health professionals said, "No I don't believe that they are safe to be consumed and in regular use we probably do not even pay attention to the amount of chemicals we are consuming by using these plastic materials in our daily life. So, I agree that we are at high risk of these chemicals by consuming the food in contact with plastic but not really have the details about what amount and quantity of these chemicals we are getting exposed to"*

They had very limited knowledge on aforementioned topics and it involved a lot of guessing. Most of them responded that it can cause cancer but according to their understanding it cannot have an immediate effect and may cause any illness after 40-50 years of consumption. Although the health professionals mentioned about some disease like gastro-intestinal diseases, skin diseases in the FDGs and in the in-depth interviews but also thought that it can only affect if present in a large amount, a small amount of chemical present will not cause such a sever damage to the body. Whereas the non-health professionals were not sure if leaching from PFCM can cause any diseases. Their knowledge was found extremely in the subject matter.

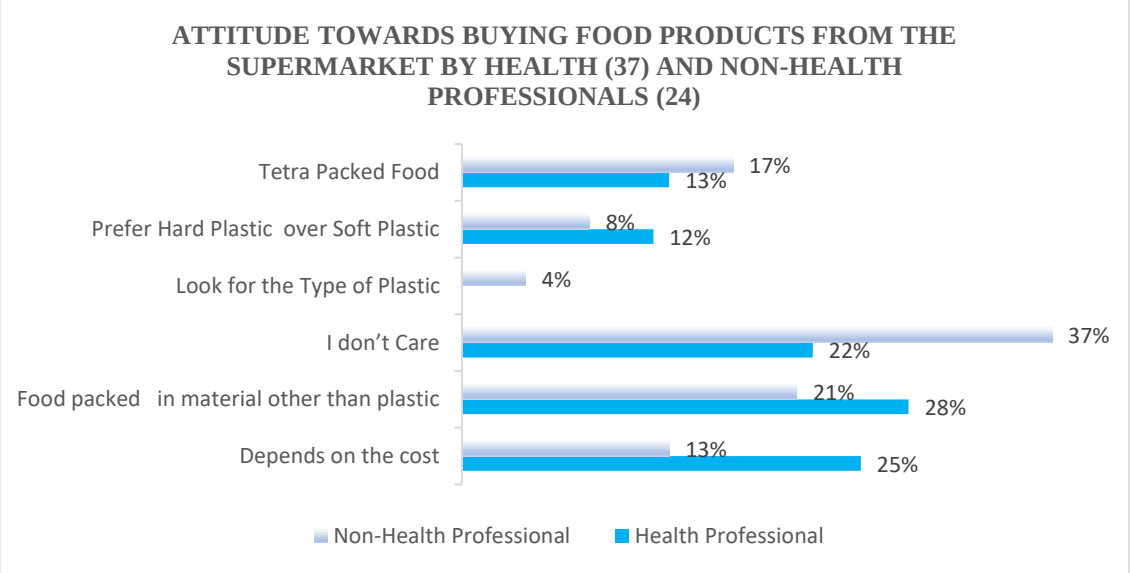
"Knowledge about PFCM" and "leaching" i.e. chemicals migration from the plastic container to the food in contact, was found low among the health professionals. Out of the total respondents (61), (60%) were health professionals, (36%) health professionals were found to be aware of the term leaching. When these (36%) were further asked whether they are aware of EDCs (Endocrine Disrupting Chemicals), only (21%) health professionals were found to have some idea about EDCs and **out of the total health professionals only**

1/3rd of them mentioned that they think the EDCs are present in the PFCM, which is a point of concern. Rachada Kesumsup and Naiyana Neesanan (2011) published a study called knowledge, attitudes and practices relating to plastic containers for food and drinks(18) mentioned that there was no differences in knowledge relating to plastic containers between parents and health personnel. They mentioned that even though 80 percent of the participants were using plastics containers for food and drinks, their knowledge about the plastic is inadequate and that they are aware of the health effects of plastic containers. But in the current study it clear that participants have very vague ideas about the kind of disease leaching of chemicals can cause. In one more study conducted in Kuala Terengganu (2017) by Hui et al mentions that most the respondents were aware and were using PP (polypropylene) which is a good type of plastic to store and carry food. Whereas in the current study people were not even aware about the different types of plastics available in the market to carry food.

Attitude:

Preference for the material packaging when they are buying food products:

In the current study it was found that there was a dire ignorance among the health or non-health professional. The reason for such ignorance is that, that the type of plastic used for packing food is the least of the concerns while buying food items for the participants at large. This is evident from the interview where one of the participants said, "I buy products that I need and don't bother much about the plastic". One of the participants during the FDG mentioned "I think for me if I am taking the food from my home the cost would be the deciding factor but if I am travelling I would prefer taking something which lighter in weight". It was also mentioned by the respondents that they do most of the purchasing online and in the online purchasing most of the time they don't even know what kind of packaging it is. The buying attitude for other materials example glass was seen only because of its reusable property.



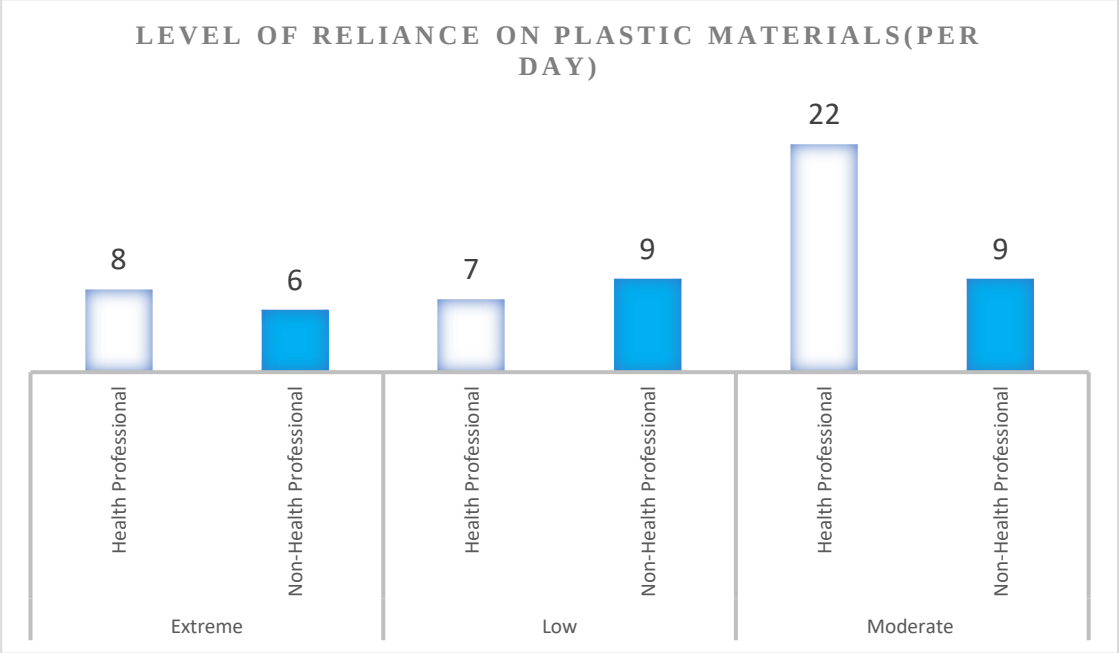
Reliance on the Plastic Food Contact Material:

> *"I think I drink 2 liters of water every day, if you count it like that then you can calculate that I use PFCM 10-11times a day and I have meals four times a day, so you can rate me somewhere around 9-10", a non-health professional.*

When asked during the in-depth interview about the reliance on plastic to contain liquid or food, the response of health as well non -health professionals was quite similar as they mentioned that they use PFCM to carry their lunches and water bottles because it is easy to carry.

The mothers representing a small share of the sample (6%) were also found using the plastic containers and water bottle to store food. When during the personal interview the mothers were asked if they carry baby food in a plastic container replied " Yes, I don't use plastic to carry adult food because we travel to work via car so a glass container is not difficult to carry, but yes, I use plastic containers to carry baby food here and there because it's easy to carry but I use, may be a Tupperware plastic container".

The below graph depicts the reliance of Health professionals and non-health professionals on plastic. 27% of the Health professionals show extreme reliance on plastic.



Check the quality of the Plastic Type before buying it:

The definition of a good plastic is a brand for most of responses collected. Other than that, they were not bothered or were found confused about the different categories. Most of them did not even knew that there is any such categorization of plastics.

In one of the interviews the respondents do mentioned about using a plastic container which is BPA free but that is only for the baby food products apart from that there are certain things for which it inevitable, things they must buy as the product is coming packed in a plastic packaging from the company itself.

While most of the responses were that the type of plastic used for packing food is the least of the concerns while buying food items and that they are not aware about the plastic that they are using. If they know then that is only PET kind of plastic which they think is of a superior quality. There were 32 % female Health professional who try to buy food packed

in material other than plastic. Similarly, 32% of men also keep the quality of food in mind before buying a food product

> *" My decision making criteria is based on three things, one is the cost, 2nd is the need, 3rd is ease of carrying and of course the FSSCI mark or any food quality mark, but I don't go about thinking the health effects of any materials unless of course, canned products I tend to avoid, but if its plastic or glass I would lean towards plastic because glass is very delicate*

Attitude towards already used plastic container to store food:

The study analyzed the attitude of the respondents towards the PFCM by asking them what they do with the plastic containers after using it once. The general response of the people was that they throw away PFCM if they visit some hotel or if they are outside, but if they are at home or buy a food product in plastic contact and brings it back home then it is generally reused.

A lot also depends on the company packaging the food in a plastic, like food packaging like biscuits, ice-cream etc. these containers are thrown away but water the bottles are used for some time and then sold to a vendor for recycle.

The health professionals were found to be more concerned about the plastic kind, they look for a sign which say throw away the container and based on that use it or throw it away. But some plastic materials coming from a good restaurant that they end using because they believe if it is coming from a good restaurant they it's a good plastic and can be used.

Practice

Plastic to store/ Carry food:

In the FDGs of non-health professionals who were in between the age group of 25-40, mentioned that they use PFCM in all forms i.e. bottle, containers, lunch boxes, food packaging and food containers as they are durable and easy to store. In-fact this practice has increased because plastic is very cheap, and all the food product manufacturing companies or online food delivery vendors provide these packaging materials for free in fancy form attracting the customer to buy them and reuse them without the understanding of it's type, affecting buyers behavior. The below table gives the percentage rate of usage of plastic containers and bottles by the health and non-professional, which shows the dependency is more on plastic bottles and plastic containers.

> *One of the responses was "It depends on the kind of plastic, if I am going to reuse it or not, I throw away the water bottles I purchase outside but use the ones which are used to carry coffee or juice vendors".*

Response	Health Professional	Non-Health Professional
Plastic Bottles		
No	18%	8%
Yes	82%	92%
Plastic Containers		
No	18%	25%
Yes	82%	75%
Plastic Bags		
No	16	50%
Yes	21	50%
Plastic Films		
No	73%	71%
Yes	27%	29%
Plastic Packaging		
No	18%	8%

Yes	82%	92%

One response was "I avoid using plastic to carry water, but the ROS are made up of plastic, so I couldn't really avoid it "

Frequency or pattern of reusing plastic:

The replacement of plastic bottles for health professionals understood was around 3-4 months. And for non-health professional it was until the bottle is damaged. Whereas when the enquired about the frequency of using a plastic cling film the health professionals were found using it in direct contact with the food and were using it to wrap as well as microwave the food.

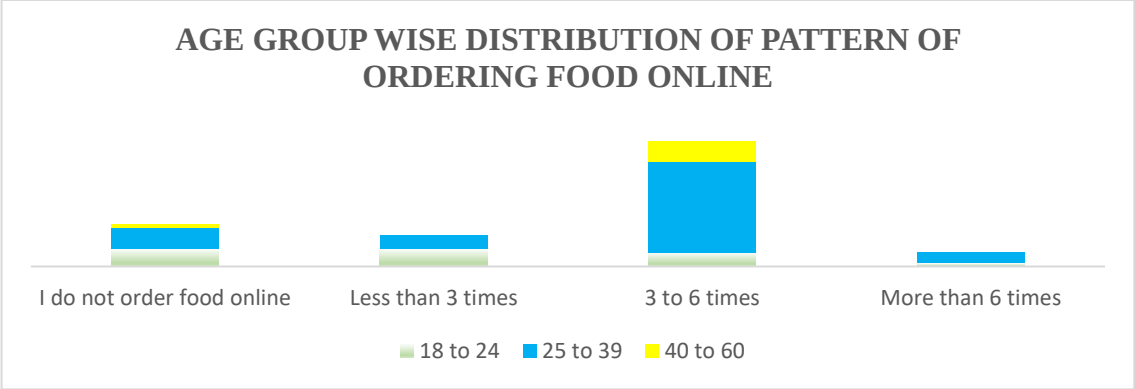
Water Bottle	Health Professional	Non-Health Professional
1-2 days per week	54%	46%
3-5 days per week	75%	25%
5-7 days per week	50%	50%
1 month	84%	16%
Till the bottle is damaged	60%	40%
[Food Cling Film]		
wrap fatty food	0	Absolute
Microwave with food	100%	0
Wrap to keep it hot	100%	0
Wrap in contact with food	40%	60%
wrap without food contact	66%	34%
PP [Food container]		
Holding acidic food	50%	50%
Holding food for long periods (> 5 hours)	42%	58%
Holding hot food	60%	40%
Holding oily Food	92%	8%
Holding food for short periods (<5 hours)	89%	11%

PS [Food Container]		
Holding acidic food	40%	60%
Holding food for long periods (> 5 hours)	50%	50%
Holding food for short periods (<5 hours)	83%	17%
Holding hot food	52%	48%
Holding oily Food	57%	43%

The health professionals between the age group of 25-30 years of age and are single when enquired about the frequency of using the plastic bottles responded that they usually reuse the plastic bottle, a coca-bottle, Café coffee day bottle, juice bottle again and again until it is totally damaged. Although the people who are married or are 30 years or above usually through away these bottles, containers and carry liquid in a plastic bottle that is usually available in the market to carry water only.

The non-health professionals usually don't care about the kind of material but what matters is the cost, and they usually use what can be used and rest is they throw it away. A lot also depends on, if they are living with their families, if they are living alone they compare how easy is it to carry a container and what is durability and if living with their families then it depends on their mother and they don't really care.

Pattern of Ordering food online:



- Age group between 25-60 years old order food online the most (whether has the knowledge of EDC or not)

- People have some idea that chemicals present in plastic can be harmful but still don't buy products packed in other materials

- Majority of them were not aware about the plastic that they are using and if know then they are using PET

Challenges:

The knowledge, attitude and practice of the consumers somewhere show similarity due to certain properties of the plastic and level of exposure to knowledge. So, when asked to replace the PFC material with some other material to carry and contain food the respondents replied in the questionnaire as well as in the interviews and FGDs that will fall under the following categories

1. Quality of the plastic material in comparison to others
2. Behavior change
3. Dependency on others
4. Cost of the material

A health professional said, *"Not much challenges, but convincing my family that give me my lunch in some other container or I can shift to zero, maybe my family uses a little more of plastic sometimes but yes that is it. Not much of challenges are there. I think the awareness is what is lacking to motivate people"*. The logistic issues of carrying food was the main point of concern for the health and non-health professionals. The people are ready to switch over to some other material but only if has the following properties

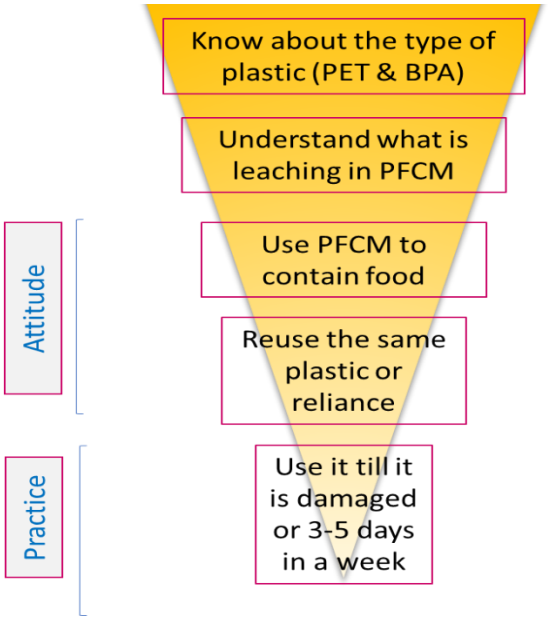
- Replacement should be pocket friendly
- Easy availability of disposable containers
- The property of plastic to hold things (Liquid) for quite long time is difficult to replace
- Day to day challenges and increased cost of maintenance

"I think lot of logistic issues would be there because everything available around us is somehow related or made up of plastic, so even if I have to, like if I am outside home and I have to drink some water so the bottles available is made up of plastic, like it would not totally depend on me if I can replace plastic. It has to be some sort of policy change that needs to be there, that all these materials and bottles and everything should not of plastic then only I will be able to replace plastic from my life"

When the same question was asked from the non-health professionals they also raised the same issue "At this stage of my life I think it's quite impossible to shift over to any other product other than plastic because we totally rely on food grade plastic as far as keeping, storing and transporting food is concerned. I think it begins from industry itself and it ends to the very last spoon that we use to put food in our mouth, while consuming that food, where cost play a major role. So, I think it's very difficult to switch to any other thing". The non-health professionals mentioned that they are open to accept any other material provided the quality of the material is like plastic e.g. cheap, durable and easy to carry.

"Provide a cheap & better solution, which actually can replace plastic, will happily accept that"

Findings from the current study illustrate that despite the majority of respondents having heard about the leaching, were found using at-least one kind of plastic material and were familiar to two types of plastic type only i.e. PET and BPA. Below is the trend of filtration of knowledge, attitude and practice where (35%) health professionals out of the total (37) and (46%) non-health professionals out of the total (24) were found using PFMC despite of being aware of the terms like leaching and EDCs being released from the PFCM.



Response by a health professional falling under the same category of people having knowledge about chemical leaching by PFCM "On top of our mind the only thing we change is our toothbrush which is also made of plastic but that is the only thing I would change, but the containers are not changed until they are totally break".

Figure 5: The attitude of pattern of using PFCM having the knowledge of leaching

The practice of using the same plastic material again was found majorly common amongst the non-health professionals. This study shows that not just health professionals, but also non-health professionals were found practicing the use of PFCM even after having the knowledge of the chemicals released showing their attitude towards practicing their knowledge.

As stated in the study conducted by Jane Munacke (2010), there is need to do assessment of the migration levels of chemicals in the food contact materials. There is a significant effort needed to close the knowledge gaps on the levels and sources of plastic releasing chemicals in to the food product, the accumulation of these chemicals and its associated impacts on human health. These gaps of knowledge and unawareness have contributed, in part, to the general lack of recognition in the society and the national laws about the potential risk and increased usage of PFCM in our daily life. In addition, without a greater understanding of the type and factors causing leaching and further disorder in the human body by acting as hormones or endocrine disrupting chemicals that are known to have diverse modes of action to affect human body and attack multiple endpoints with in the living organism, we cannot generate a backward shift from a plastic material to some other materials. Kasemsup et al(2011) in their study knowledge, attitude and practice relating to plastic containers for food and Drinks found that parents and health personnel are aware of the health effects of plastic containers, but they do not know how to use and plastic properly(18) which is similar to our findings that although health professionals and non-health professionals are aware of the leaching of chemicals from PFCM are still using the plastic to contain food due to the lack of knowledge that what type of plastic good to use to contain food materials.

CONCLUSION

Numerous plastic ingredients have been used for the manufacture of consumer products to store food and human safety concerns regarding the use of plastic food contact material have been raised in past as well. In terms of toxicological evaluation, PP containers are generally considered safe and non- EDC releasing plastic.

The dissonance in the behavior and the knowledge is quite evident among the health and non- health professionals about the use of plastic food contact materials. That is because of the amount of information that they are supposed to get about the concentration of the chemicals present in a plastic food contact material is not available to general population. This sort of awareness generation is lacking, although they know that chemicals are released but in what amount and what adverse effects it can cause is not out in the common platforms, so that people are mindful of the required knowledge.

The Study of health and non-health professional revealed a dire need for improvement in the attitude of participants towards the severity of the health concerns due to leaching of chemicals plastic food contact material and that the general psychology of the society is that they are only concerned about the immediate effects of consuming food in short term period.

RECOMMENDATIONS

"Suggestions by the Key Informants"

1. *Government should take some strict actions against the food packaged in PFCM*
2. *It is easy to replace plastic if the young ones are made aware about the harmful effects, exposure to such chemicals can cause*

1. The knowledge level of health professionals has been found extremely low so to sensitize people, there should be 2-3 hours discussion/ training session should be organized in their workplace.

2. The reason of toxicity should be known and practiced by health professionals as they cannot avoid being exposed to such chemicals due to the universally spreading use of plastic but can be minimized if awareness is created

3. People should check the type of plastic before they plan to buy a plastic product and that awareness can only be generated if proper social media campaigns are conducted, explaining not just about the adverse effect but the basics to make people the information given is reliable.

4. Government has recently announced a guideline which will be applicable from 1st July is only giving suggestions to the industries to use other materials rather than making it strictly follow them

5. The retailers must step up to drive out toxic chemicals out of plastics and act swiftly to phase out the worst plastics of concern like PVC, the poison plastic.

6. In terms of the wider issue of dealing with legal barriers include: a lack of definitions, clear targets and firm numerical limits in regulations

7. Type 5 (PP) container is reusable because of its properties i.e. semi-rigid and can withstand high temperatures and hence should be promoted to manufacture PFCM.

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