



UNIVERSITI PUTRA MALAYSIA

***THE LEVEL OF KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) ON
USAGE AND MANAGEMENT OF PLASTICS AMONG YOUTHS AT
KLANG VALLEY DURING COVID-19 PANDEMIC***

LEE YI JIA

**lp
FPSK4 2022 2**

**THE LEVEL OF KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) ON
USAGE AND MANAGEMENT OF PLASTICS AMONG YOUTHS AT
KLANG VALLEY DURING COVID-19 PANDEMIC**



**BY
LEE YI JIA**

**Thesis submitted in fulfilment of the requirement for the degree of Bachelor of
Science in Environmental and Occupational Health with Honours from the
Faculty of Medicine and Health Sciences, Universiti Putra Malaysia**

ACKNOWLEDGEMENTS

For the completion of this study, many parties were involved either directly or indirectly. There are few words for me to express my heartfelt gratitude to everyone who helped me in making this study a success.

First and foremost, I would like to thank my supervisor, Dr. Sharifah Norkhadijah Syed Ismail for her valuable time, patience, and support in guiding me to produce this dissertation. Her constructive suggestion and advice give significant improvement from the proposal stage till the end of the study. I would like to express my gratefulness to the respondents who volunteered to participate in this study and their cooperation given throughout the data collection process. My sincere appreciation also goes to my lecturers and friends who contributed their ideas in making my dissertation successful.

Lastly, thank you once again for all your kindness, help and support. May you all live a blissful life.

ABSTRACT

THE LEVEL OF KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) ON USAGE AND MANAGEMENT OF VARIOUS TYPES OF PLASTICS AMONG YOUTHS AT KLANG VALLEY DURING COVID-19 PANDEMIC

LEE YI JIA

Introduction: The Covid-19 pandemic coupled with the lifestyle changes has intensified the volume of plastic waste in many countries. These include the disposal of plastic-based personal protective equipment (PPEs) and other single-use plastics (SUPs) such as plastic bags, plastic containers, and many more. Due to this fact, the complexities of plastic waste compositions during this pandemic had caused the difficulties to be managed effectively. The plastic consumption and management patterns of youths as well as their KAP levels towards this issue are not well studied in Malaysia. **Objectives:** Therefore, this study assessed the knowledge, attitude, and practice (KAP) level on plastic usage and management among youths during the pandemic. **Methodology:** A cross-sectional study was conducted among 344 youths in Klang valley using a self-administered questionnaire on the level of KAP that was distributed via the online platform. Results were analyzed using SPSS. **Results and Discussion:** The major sources of plastic wastes during the Covid-19 pandemic were PPEs usage (77.3%), online shopping (68.9%), and food delivery packaging (68.9%). The majority of the respondents also disposed of the PPE and other SUP together with the mixed waste in the general dustbin, except for plastic bags where most of them chose to reuse it. A higher percentage of youths obtained a moderate level of knowledge (52%), good level of attitude (61.3%), and fair practice (55.2%) on plastic usage and management. The knowledge score was significantly different by age, marital status, and education level, while the attitude score was significantly different by educational level only. The knowledge level was associated with age groups and educational level, while the attitude was associated with educational level. This study found a significant association between attitude-practice and knowledge-attitude at $p < 0.05$. **Conclusion:** The youth have a moderate level of knowledge on plastic usage and management. This has significantly influenced their level of attitude and fair practice.

Keywords: KAP, plastics, youths, Covid-19 pandemic, Klang Valley

ABSTRAK

TAHAP PENGETAHUAN, SIKAP, DAN AMALAN (KAP) MENGENAI PENGUNAAN DAN PENGURUSAN JENIS PLASTIK YANG BERLAINAN DALAM KALANGAN BELIA DI LEMBAH KLANG SEPANJANG PANDEMIK COVID-19

LEE YI JIA

Pengenalan: Pandemik Covid-19 bersama dengan perubahan gaya hidup telah meningkatkan jumlah sisa plastik di banyak negara. Ini termasuk pelupusan peralatan pelindung diri (PPE) berasaskan plastik dan plastik sekali pakai (SUP) yang lain seperti beg plastik, bekas plastic dan banyak lagi. Disebabkan fakta ini, kerumitan komposisi sisa plastik semasa pandemik ini telah menyebabkan kesukaran dalam menguruskannya secara berkesan. **Objektif:** Oleh itu, kajian ini menilai tahap pengetahuan, sikap dan amalan (KAP) mengenai penggunaan dan pengurusan plastik dalam kalangan belia di Lembah Klang semasa pandemik. **Metodologi:** Kajian keratan rentas ini dijalankan di kalangan 344 belia di Lembah Klang dengan menggunakan soal selidik sendiri yang diedarkan melalui platform dalam talian. Keputusan dianalisis menggunakan perisian SPSS. **Keputusan dan Perbincangan:** Sumber utama sisa plastik semasa pandemik Covid-19 pandemic ialah penggunaan PPE (77.3%), membeli-belah dalam talian (68.9%) dan bungusan penghantaran makanan (68.9%). Kebanyakan responden juga melupuskan PPE dan SUP lain bersama dengan sisa campuran di dalam tong sampah am, kecuali beg plastik di mana kebanyakan mereka memilih untuk menggunakannya semula. Peratusan belia yang lebih tinggi memperoleh tahap pengetahuan sederhana (52%), tahap sikap baik (61.3%) dan amalan sederhana (55.2%) mengenai penggunaan dan pengurusan plastik. Skor pengetahun adalah berbeza secara signifikan berdasarkan umur, status perkahwinan, dan tahap pendidikan, manakala skor sikap adalah berbeza secara signifikan dengan tahap pendidikan sahaja. Tahap pengetahuan dikaitkan dengan umur dan tahap pendidikan manakala sikap dikaitkan dengan tahap pendidikan. Kajian ini mendapati perkaitan yang ketara adalah di antara tahap sikap- amalan, dan tahap pengetahuan-sikap pada $p < 0.05$. **Kesimpulan:** Golongan belia mempunyai tahap pengetahuan yang sederhana tentang penggunaan dan pengurusan plastik. Ini juga telah mempengaruhi tahap sikap dan amalan mereka dengan signifikan.

Kata kunci: KAP, plastik, belia, pandemik Covid-19, Lembah Klang

TABLE OF CONTENTS

	Page
DECLARATION	ii
SIGNATURE OF SUPERVISOR/ INTERNAL EXAMINER	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
ABSTRAK	vi
CONTENTS	vii
LIST OF TABLES	ix
LIST OF FIGURES	xi
LIST OF ABBREVIATIONS	xii
CHAPTER 1: INTRODUCTION	
1.1 Background of Study	1
1.2 Problem Statement	6
1.3 Study Justification	10
1.4 Research Questions	13
1.5 Research Objectives	14
1.5.1 General Objectives	14
1.5.2 Specific Objectives	14
1.6 Research Hypotheses	15
1.7 Definition of Terms	15
1.7.1 Conceptual Definition	15
1.7.2 Operational Definition	18
1.8 Conceptual Framework	21
CHAPTER 2: LITERATURE REVIEW	
2.1 Overview of Plastics	22
2.2 Plastic Waste Generation	25
2.2.1 Before Covid-19 Pandemic	26
2.2.2 After Covid-19 Pandemic	28
2.3 Plastic Waste Management	31
2.4 Impacts of Plastics	40
2.4.1 Human Health	40
2.4.2 Environmental Health	42
2.5 Knowledge, Attitude, and Practice (KAP) on Plastic Usage and Management	45
2.6 Associated variables with KAP on Plastic Usage and Management	54
2.7 Waste Management Related Acts, Regulations, and Policies	58
CHAPTER 3: METHODOLOGY	
3.1 Study Location	63
3.2 Research Design	63
3.3 Study Duration	64
3.4 Study Population and Sampling	64
3.4.1 Study Population	64
3.4.2 Sampling Criteria	65
3.4.3 Sampling Unit	65

3.4.4	Sampling Method	66
3.5	Sample Size	67
3.6	Study Instrument and Data Collection	68
3.7	Data Analysis	72
3.8	Quality Control	73
3.9	Ethical Consideration	73
CHAPTER 4: RESULTS		
4.1	Response Rate	75
4.2	Normality Test & Cronbach's Alpha Analysis	75
4.3	Respondent's Socio-demographic Characteristics	76
4.4	Plastic Usage and Management During Covid-19 Pandemic	77
4.4.1	Major Source of Plastic Waste	77
4.4.2	Frequency of Disposing PPEs and Other SUPs	78
4.4.3	Plastic Waste Management Methods on PPEs and Other SUPs	81
4.4.4	Reasons for Not Practicing Sustainable Plastic Waste Management	84
4.4.5	Awareness on Plastic Waste Issue	85
4.4.6	Media Types of Obtaining Plastic-Waste Related Information	85
4.5	KAP Levels on Plastic Usage and Management	86
4.6	Comparison between KAP Score by Sociodemographic Factors	91
4.7	Association between Socio-demographic factors with KAP Levels	96
4.8	Association between KAP Levels	102
CHAPTER 5: DISCUSSION		104
CHAPTER 6: CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH		
6.1	Conclusion	121
6.2	Study Strength	122
6.3	Study Limitation	123
6.4	Recommendation	124
REFERENCES		126
APPENDICES		
Appendix A: Sampling Location		145
Appendix B: Sample Size Calculation		146
Appendix C: Research Flowchart		147
Appendix D: Information Sheet & Informed Consent Form (ICF)		148
Appendix E: Questionnaire (English& Malay Version)		154
Appendix F: Ethical Approval of JKEUPM		168
Appendix G: Normality Testing		171
Appendix H: Cronbach's Alpha Analysis		173

LIST OF TABLES

		Page
Table 2.1	Types of plastics and examples	23
Table 2.2	Production and waste generation of plastic-based PPE in different countries during COVID-19 pandemic	29
Table 2.3	Summary of findings regarding knowledge on plastic usage and management	46
Table 2.4	Summary of findings regarding attitude on plastic usage and management	50
Table 2.5	Summary of findings regarding practice on plastic usage and management	52
Table 2.6	Regulations and policies related to Malaysia's waste management system	59
Table 4.1	Socio-demographic Characteristics (N=344)	77
Table 4.2	Level of knowledge on plastic usage and management (N= 344)	87
Table 4.3	Frequency and percentage on plastic usage and management knowledge items (N= 344)	87
Table 4.4	Level of attitude on plastic usage and management (N= 344)	88
Table 4.5	Frequency and percentage on plastic usage and management attitude items (N= 344)	88
Table 4.6	Level of practice on plastic usage and management (N= 344)	90
Table 4.7	Frequency and percentage on plastic usage and management practice items (N= 344)	90
Table 4.8	Comparison between the socio-demographics factors and score of knowledge on plastic usage and management	92
Table 4.9	Comparison between the socio-demographics factors and score of attitudes on plastic usage and management	94
Table 4.10	Comparison between the socio-demographics factors and score of practice on plastic usage and management	95
Table 4.11	Association between the socio-demographics factors and	97

the level of knowledge on plastic usage and management

Table 4.12	Association between the socio-demographics factors and the level of attitude on plastic usage and management	99
Table 4.13	Association between the socio-demographics factors and the level of practice on plastic usage and management	101
Table 4.14	Pearson's Chi-square test for the association of KAP level on plastic usage and management	103



LIST OF FIGURES

		Page
Figure 1	Conceptual Framework	21
Figure 4.1	Major source (s) of plastic waste thrown by the respondents	78
Figure 4.2	Frequency of disposing PPEs (gloves, face shield and face masks) during Covid-19 pandemic	79
Figure 4.3	Frequency of disposing PPEs (hand sanitizer bottles) during Covid-19 pandemic	80
Figure 4.4	Frequency of disposing other SUPs during Covid-19 pandemic	81
Figure 4.5	Plastic waste management methods on PPEs	82
Figure 4.6	Plastic waste management methods on other SUPs	83
Figure 4.7	Reasons for not practicing sustainable plastic waste management	84
Figure 4.8	The awareness of respondents who are aware of the increasing trend in plastic usage during pandemic	85
Figure 4.9	Media types of obtaining plastic waste related information	86

LIST OF ABBREVIATIONS

DOE	Department of Environment
HDPE	High-Density Polyethylene
JPSPN	Jabatan Pengurusan Sisa Pepejal Negara
KAP	Knowledge, Attitude, and Practice
KASA	Kementerian Alam Sekitar dan Air
KeTTHA	Kementerian Tenaga Teknologi Hijau dan Air
KPKT	Kementerian Perumahan dan Kerajaan Tempatan
LDPE	Low Density Polyethylene
MESTECC	Ministry of Energy, Science, Technology, Environment and Climate Change
PET / PETE	Polyethylene Terephthalate
PP	Polypropylene
PPEs	Personal Protective Equipment
PS	Polystyrene
PVC	Polyvinyl Chloride
SUPs	Single-Use Plastic
SWCorp	Solid Waste and Public Cleansing Management Corporation
WWF	World Wildlife Fund

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

A global health crisis, coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2) has brought the entire world to a halt, witnessing a new normal lifestyle across the globe. Apart from the declaration of nationwide lockdown, social distancing, travel restriction, the use of hand sanitizers, and plastic-based personal protective equipment (PPEs) for healthcare workers and common citizens were adopted as the precautionary measures to curb the spread of disease transmission (Patrício Silva et al., 2021). Apparently, this health crisis has highlighted the requisite role of plastics in our daily lives, from healthcare sectors to public health safety. This further increases the plastic burden in Malaysia as the report of WWF Malaysia 2019 disclosed that Malaysia ranks second with the annual per capita of plastic use at 16.78 kg per person, which outranks many larger nations such as China, Indonesia, Philippines, Vietnam, and Thailand (WWF-Malaysia, 2020).

Globally, the volume of plastic wastes from personal protective gear generated since the Covid-19 outbreak was estimated to be 1.6 million tonnes per day (Benson et al., 2021). These include face masks, gloves, face shields, hand sanitizer bottles, medical gowns and so on which are mostly made from polymeric materials such as polypropene (Benson et al., 2021; Fadare & Okoffo, 2020). During the one-month lockdown period in Bangladesh, face masks, gloves, and hand sanitizer bottles disposed of by the population were recorded at 455 million, 1216 million, 49 million respectively (Haque et al., 2021).

Plastic is also ubiquitously integrated into many products such as grocery plastic bags, containers, and bottles. It is synthetic organic polymers that are relatively cheap, durable, lightweight, and strong (Chen et al., 2021); thus, making it to be the most commonly used material in our daily lives. It is categorized as one of the municipal solid wastes that can be generated from household, commercial, institutional, and industries. Due to this fact, the lifestyle changes coupled with the Covid-19 pandemic had further intensified the demand for plastic products as people around the globe tends to have a higher purchasing power in online food delivery, online shopping, and takeaway services (Parashar & Hait, 2021). These activities generate many single-use plastics (SUPs) such as plastic food containers, bottles, bubble wraps, plastic packaging, and grocery bags. As reported by Filho et al. (2021), plastic packaging wastes was having a surge of 53% during the pandemic as people who spent more time at home experienced a shift in their consumption behaviour. A study conducted by Fan et al. (2021) also reported that during the pandemic in Singapore, online food delivery had increased by 73%. Likewise, there was a 50%

growth in online grocery shopping, where the highest frequency was among respondents aged 29 and younger (Elangovan, 2020). This is also supported by Muthupriya (2019) as he claimed that nearly 91% of youth were reported as online shoppers, although they shop at a different frequency. In terms of the amount of the generated waste, Adam (2021) reported that more than 200,000 tonnes of domestic waste had been generated by Malaysian almost monthly since the implementation of the first Movement Control Order (MCO) in March of 2020, and among the major contributors was plastic waste. This condition further exaggerates the disposal of single-use food plastic containers and plastic packaging at the landfill.

The extensive demand for plastic products during this unprecedented uncertainty has led to a significant change in plastic waste generation and composition dynamics (Parashar & Hait, 2021). Therefore, this had caused difficulties in managing plastic waste effectively due to the complexities of plastic waste compositions during this pandemic. Although it makes our life more convenient; mismanagement of plastic waste could turn out to be a serious problem in both environmental and public health. In Malaysia, landfilling is a common method to dispose of municipal solid waste (Chen et al., 2021). However, Sharifah Norkhadijah & Latifah (2013) highlighted the future challenges in finding suitable landfills in Malaysia. In respect to the recycling practices, the rate was recorded at 31% in 2020, and the value aimed to improve until it meets the recycling target of 40% by 2025 (Nur Hanani, 2020). Nevertheless, it was considered low when compared to other Asian countries such as South Korea and Singapore with 54% and 34% of the

recycling rate respectively (Department of Statistics Malaysia, 2020). It is also not sufficient to keep up with the increasing plastic waste generated in the country.

There are several plastic waste management methods available, such as incineration, landfilling, recycling, reusing, and reducing (Rubel et al., 2019). Among them, landfilling is the most preferable option around the globe (especially in low-and middle-income countries) as it is simple and cheap compared to the incineration method which involves high cost and requires advanced technology to operate. However, this disposal method brings up environmental challenges because leachate from the landfills will percolate the soils and contaminate the groundwater and surface water (Sharifah Norkhadijah & Latifah, 2013). Suitable landfill sites are difficult to find and many of them are near to reach maximum capacity. In Nigeria, about 79 % of secondary schools dispose of their waste via open burning activities (Adeolu et al., 2014). Verma et al. (2016) reported that open burning or incineration of plastics will release hazardous air contaminants such as dioxins and furans, which eventually result in severe health problems associated with the respiratory and nervous system through human inhalation.

On the other hand, 5Rs practices such as Refuse, Reduce, Reuse, Repurpose, Recycle are more environmentally friendly methods used to manage the waste. It seems like easy things to do but the public has a low willingness to participate in environmental issues, although various recycling campaigns were held to inculcate their awareness (Agamuthu & Fauziah, 2011). In Malaysia, public awareness in

environmental aspects were still insufficient despite environmental education being incorporated in the existing educational syllabus (Aminrad et al., 2012). Later, Aminrad et al. (2012) reported that students with greater educational level and age were more aware and behave good attitude towards environmental issues. The majority of students (77%) understand the harmful effects of plastic wastes and the best way to dispose of them is by recycling (Hammami et al., 2017). However, part of them still prefers throwing into the dustbin, open dumping, burning, and burying as the plastic waste disposal methods (Adane & Muleta, 2011; Hammami et al., 2017).

It can be concluded that the Covid-19 pandemic has led to the shift in plastic products demand and eventually increases the plastic footprint which is seen littering the roadsides, beaches, dumpsites, and parking lots. It is rational to focus on youths as they are the key resource in bringing the nation towards the concept of environmental citizenship (Ahmad et al., 2012). However, only a handful of studies had published data that determine where the plastic consumption and management patterns of youths stand as well as their KAP level towards this issue, specifically in Malaysia. Therefore, this study was designed to assess the level of knowledge, attitude, and practice (KAP) on plastic usage and management during the Covid-19 pandemic among youths. Associated sociodemographic factors were also investigated to identify the knowledge gaps, cultural beliefs, behavioural patterns so that more specific intervention measures can be planned and implemented to achieve a desirable plastic waste reduction rate and proper management practice in the near future.

1.2 PROBLEM STATEMENT

The aggravating statistics in terms of plastic waste generation had become a very concerning issue worldwide. Specifically, during the Covid-19 pandemic, the trend showed that people around the globe had a higher purchasing power in e-commerce activities such as online shopping, online food delivery, and takeaway services (Parashar & Hait, 2021). These activities generate many plastic wastes such as plastic food containers, bubble wraps, plastic packaging, and grocery bags. As reported by Filho et al. (2021), plastic packaging wastes was having a surge of 53% during the pandemic as people who spent more time at home experienced a shift in their consumption behavior. A study conducted by Fan et al. (2021) also reported that during the pandemic in Singapore, online food delivery had increased by 73%. Likewise, there was a 50% growth in online grocery shopping, where the highest frequency was among respondents aged 29 and younger (Elangovan, 2020). This is also supported by Muthupriya (2019) as he claimed that nearly 91% of youth were reported as online shoppers, although they shop at a different frequency.

Besides, a surge in the use of single-use PPE during Covid-19 is also the main contributor to plastic waste generation. These items mainly consist of plastics, which included face shields, gloves, face masks, hand sanitizer bottles (Prata et al., 2020). From the study of Sangkham (2020), they estimated that about 17 thousand total medical waste was generated per day in Asia with confirmed Covid-19 cases. Similarly, Benson et al. (2021) estimated that 1.6 million tonnes of plastic wastes

were generated globally since the occurrence of the outbreak. Their findings also showed that Asia was projected to discard the highest number of facemasks per capita per day, at approximately 1.8 billion.

In addition, Movement Control Order (MCO) during the pandemic had put several recycling facilities and campaigns on halt (Focus Malaysia, 2020). Challenges faced in current waste management systems, such as a lack of workers, limitation in the treatment facility, and mechanical recycling facility interruptions resulting from the pandemic, might lead to incorrect waste disposal and thereby damage the environment (BIR, 2019). The falling of oil prices during the pandemic also reduced the demand for recycled plastics as making virgin plastic was cheaper and had a greater financial sense (Hicks, 2020). It had caused plastic manufacturers to grow continuously while the recycling companies were experiencing a downturn which could eventually lead to plastic waste accumulation.

The condition above had intensified the plastic footprint in many countries. SWCorp data showed that the Malaysians had generated more than 200,000 tonnes of domestic waste almost monthly since the implementation of the first Movement Control Order (MCO) in March 2020, and among the major contributors was food waste and plastic waste (Adam, 2021). It was reported that the plastic wastes generated globally were at 1.6 million tonnes per day since the Covid-19 outbreak (Benson et al., 2021). A survey conducted had shown that Singaporeans generated an additional 1334 tonnes of plastic waste from takeout packaging and food delivery

during the 2-months lockdown period (Elangovan, 2020). Moreover, nearly 30% rise in plastic waste especially plastic bags happened in Thailand (Bengali, 2020). In terms of hazardous plastic waste, about 14500 tons of contaminated gloves, disposable face masks, and polythene bags during the first lockdown in Bangladesh (ESDO, 2020).

In addition, the improper disposal of plastic waste by people will exacerbate the plastic pollution issue. In developing countries, waste management problems were worrying because of the insufficient knowledge and awareness related to solid waste accumulation (Adelou et al., 2014). As the leaders of tomorrow, students only possess a moderate level of attitude and practice on sustainable consumption although the level of knowledge among them is high (Ahamad & Ariffin, 2018). Srinivasan et al. (2019) also reported that there were almost 50% of the students in different fields of studies have good knowledge and only 30% of them were identified to have good practice in terms of plastic waste usage and disposal. A survey conducted by Nowakowski et al. (2020) showed that most of the Poland citizens (42%) disposed of their PPE waste together with their household waste; 29% and 26% disposed of it in separate bags or together with other plastic wastes.

People who overuse and fail to practice sustainable waste disposal behaviour pose a huge threat to environmental and human health. Improper management of plastic wastes causes small plastic particles (majorly Polyethylene and Polypropylene) to be introduced from landfills into the leachate, thereby inducing a new

environmental challenge (He et al., 2019). Among the wide range of chemical additives in plastics, Bisphenol A (BPA), Phthalates and Brominated Flame Retardants, and heavy metals are the most relevant chemicals that pose negative threats to the environment, wildlife, and human health (Chen et al., 2021; Verma et al., 2016). Over time, these chemicals will easily leach into the surrounding environment and bioaccumulate in the tissue of the organism, which may eventually lead to a range of health outcomes such as reproductive disorders, cancer, cardiovascular disease, and diabetes if marine organisms were consumed by humans (Chen et al., 2021; Shankar & Teppala, 2011; Wilson et al., 2019). Besides, plastic waste will also lead to physical problems for marine life, such as entanglement or ingestion of plastics. The emission of greenhouse gases (GHG) from plastic burning will create environmental problems such as ozone depletion and climate change (Afroz et al., 2017). It is dangerous to health as the changes in climatic conditions could speed up the transmission of infectious disease, as well as limit the food yields and water supplied for humans (McMichael et al., 2006).

By looking at this current trend of statistics, data, and reports, plastic usage and management among youths during the pandemic are scarce. The data is important because it advocates the planning of future initiatives to equally emphasize public and environmental health in order to effectively tackle the global plastic waste footprint along with its underlying consequences. Therefore, this study is designed to determine the level of knowledge, attitude, and practice (KAP) on usage and management of various types of plastics among youths at Klang Valley during Covid-19 pandemic. The findings of this study will provide a clearer picture of

public consumptions and management patterns on plastic waste which is useful for planning the intervention programs in the future.

1.3 STUDY JUSTIFICATION

This research was conducted at Klang Valley, which is a densely populated area that comprises of Federal Territory of Kuala Lumpur & Putrajaya, and its neighbouring districts in Selangor such as Petaling, Klang, Gombak, Hulu Langat, and Sepang (Chan & Vu, 2017). This area serves as the country's administrative, economic, and educational centre (Tey, 2012). Higher opportunities for employment and learning in these settings cause the population tends to be younger and have a higher level of education (Tey, 2012). This location was selected due to the high pace of urbanization and active e-commerce activities. Due to the Covid-19 pandemic, e-commerce activities have been further accelerated as people tend to spend more time at home to protect themselves. Mr. Mohd Norlisam Mohd Nordin, the general manager of corporate affairs at SWM Environment Sdn. Bhd agreed that the dumping of plastic packages was expected to increase gradually due to the growth of online purchases during the Covid-19 pandemic (Tang, 2021).

The focal group intended to study in this research were youths because they are highly influential and expected to become leaders of tomorrow who are responsible for environmental sustainability. Since students are youths, they are considered as a subgroup of the general population that can give a significant impact

on society as they have diverse backgrounds and characters (Nordin & Saliluddin, 2016). By determining their KAP level, it identifies the knowledge gaps, cultural beliefs, behavioural patterns that help to plan and implement the interventions among them. They are the key resource in bringing the nation towards the concept of environmental citizenship (Abdul Latiff et al., 2012).

Besides, it was important to specifically target youths because they are the tech-savvy generation who utilize technologies in their daily lives (Mallan et al., 2010). It was supported by Müller (2021) as almost half of the Malaysian youths aged between 20-29 years old were online consumers according to the data in 2016. This consumption behaviour was also shifted to a greater extent, especially during the Covid-19 pandemic. As reported by Elangovan (2020), the involvement in online grocery shopping during pandemic had increased by 50%, whereas the respondents aged 29 and younger had the highest frequency of involvement. To curb the Covid-19 transmission, the unusual dependency on e-commerce activities such as online shopping and food delivery services had been reported with a 53% increment in the disposal of plastic packaging (Filho et al., 2021). Personal protective equipment (PPE) that was used by the general population during the pandemic was also the major contributor to the increasing trend of plastic waste (Patrício Silva et al., 2021).

Assessing knowledge, attitude, and practice on plastic usage is important. The reason is, consumers who have inadequate awareness as well as reckless behaviour and attitude are the drivers resulting in mismanagement of waste which

causes plastics to be environmentally damaging items (Parashar & Hait, 2021). The problem becomes worrying as students with different fields of study had obvious differences in terms of knowledge and behaviour towards plastic waste issues (Situmorang et al., 2020). The study of Nordin (2016) reported that the majority of the university students showed a high level of knowledge (85.2%), negative attitudes (57.1%), and poor practice (51%) towards recycling practice. Another study also reported differences between university staff and students (Kelly et al., 2006). Their findings revealed that a lower proportion of students (27%) were agreed with their responsibility to recycle as compared to 48% of staff. In comparison to 49% of the staff, only 28% of all students felt guilty while discarding recyclable materials into a general dustbin (Kelly et al., 2006).

These studies reported the findings of KAP levels in terms of plastics; however, they only represented the pre-pandemic condition and have not been widely investigated in Malaysia. Assessing plastic usage and management among youths during Covid-19 pandemic will give a significant contribution because it is the major health crisis that Malaysian faced recently. This study highlights those future initiatives, whether in response to a public health emergency or not should strike a balance between public and environmental safety since both aspects are closely related to each other. Besides, it accelerates the process of target group determination so that more specific intervention measures can be planned and implemented among them to achieve a desirable plastic waste reduction rate and proper management practice in the near future. It also provides the baseline data to evaluate the successfulness of the program that is held in the future (Andrade et al.,

2020). Wise use and effective management of plastics will in turn reduce the health and environmental impacts, and eventually improve the quality of all forms of life (KPKT, 2019).

For city administrators and authorities, this study provided benchmark information to oversee where do the youths are positioned in terms of knowledge, attitude, and practice on plastic usage and management. Thus, it helps to facilitate the process of environmental framework development that promotes sustainable waste management. It also helps to facilitate the amendment of waste management-related legislation and enhance authorities' decision-making process for better preparation in future health crises. Any pitfalls in the regulations will be revised in order to meet the current requirements and targets.

1.4 RESEARCH QUESTIONS

1. What is the impact of Covid-19 pandemic on plastic usage and management among youths at Klang Valley?
2. What are the level of knowledge, attitude, and practice on usage and management of various types of plastics among youths at Klang Valley during Covid-19 pandemic?
3. How are socio-demographic factors, knowledge, and attitude associated with the practice of plastic usage and management during Covid-19 pandemic?

1.5 RESEARCH OBJECTIVES

1.5.1 GENERAL OBJECTIVE

To determine the level of knowledge, attitude, and practice (KAP) on usage and management of various types of plastics among youths at Klang Valley during Covid-19 pandemic.

1.5.2 SPECIFIC OBJECTIVES

1. To determine the sociodemographic characteristics of respondents.
2. To determine the plastic usage and management of the respondents during Covid-19 pandemic
3. To determine the KAP level on plastic usage and management during Covid-19 pandemic among youths at Klang Valley.
4. To compare the score of KAP on plastic usage and management among youths by their sociodemographic factors.
5. To determine the association between socio-demographic factors of youths with their KAP level on plastic usage and management during Covid-19 pandemic.
6. To determine the association between the KAP levels on the plastic usage and management among youths during Covid-19 pandemic.

1.6 RESEARCH HYPOTHESES

1. There is at least a significant difference in the score of KAP on plastic usage and management among youths by their sociodemographic factors.
2. There is a significant association between sociodemographic factors of youths with their KAP level on plastic usage and management during Covid-19 pandemic.
3. There is a significant association between plastic usage and management among youths during Covid-19 pandemic with the KAP levels.

1.7 DEFINITION OF TERMS

1.7.1 CONCEPTUAL DEFINITION

I. Plastics

Plastics are polymers (either synthetic or semi-synthetic materials) which are able to be moulded into various shapes. There are 2 categories of plastics, which are thermoplastics and thermosets (UNEP, 2018).

II. Plastic usage

Usage refers to the amount of something being used (Oxford Advanced Learner's Dictionary, 2021). In terms of plastics, it refers to the use of plastic items to fulfill a certain function in daily life.

III. Plastic waste management

Management refers to the action where a group of people works together to accomplish common objectives (Indeed Editorial Team, 2020). Public and various agencies are responsible to manage plastic waste, through the practices such as prevention and reduction, reuse, recycling, incineration, and landfilling (Rubel et al., 2019).

IV. Knowledge

Knowledge is defined as the gained information and experience that provide a foundation for a person to construct new insights (Mohajan, 2016).

V. Attitude

Attitude refers to feelings, values, and behaviours expressed in response to an incident (Loh et al., 2020).

VI. Practice

Practice refers to the actual performance and act of an individual or group that is usually associated with the theories, ideas, and beliefs (Merriam-Webster, n.d.; Oxford Dictionary, 2021).

VII. Youths

Youths refer to the people who are aged between 18-30, according to Youth Societies and Youth Development (Amendment) Act 2019 (Act 668) (Yunus & Landau, 2019).

VIII. Covid-19 pandemic

Covid-19 pandemic refers to the pandemic of Coronavirus disease 2019, which is an infectious disease that is occurring worldwide due to the infection of severe acute respiratory syndrome Coronavirus (SARS-CoV-2). The outbreak of this disease was reported in December 2019, in Wuhan city of China (WHO, 2020d).

1.7.2 OPERATIONAL DEFINITION

I. Plastics

Plastics in this study refers to plastic items that have been used or thrown as waste by the respondents during Covid-19 pandemic. The plastic items included in this study are plastic-based PPEs (e.g., facemasks, gloves, hand sanitizer bottles, face shield), and other types of single-use plastics (SUPs) (e.g., plastic bags, plastic cutlery, plastic food containers, plastic bottles, plastic courier bags, and bubble wraps).

II. Plastic usage

In this study, it refers to the plastic items used by the respondents during Covid-19 pandemic.

III. Plastic waste management

In this study, it refers to the plastic waste management methods practiced by the respondents. For example, throwing into the dustbin, segregation, reducing, reusing, and recycling.

IV. Knowledge

In this study, the knowledge on plastic waste was assessed by using the self-administered questionnaire with dichotomous questions. The questions are

related to the general knowledge on plastic waste and its impacts arising from improper management. The knowledge level is divided into three categories which are good, moderate, and poor.

V. Attitude

In this study, the attitude towards plastic usage and management was assessed by using the self-administered questionnaire with 5 points Likert-scale type questions. The questions are related to the feeling and intentions of respondents towards plastic usage and management. The attitude level is divided into three categories which are good, moderate, and poor.

VI. Practice

In this study, the practice of plastic usage and management was measured using a self-administered questionnaire with 5 points Likert-scale type questions. The questions are related to the usage and management of plastics. The practice level is divided into three categories which are good, moderate, and poor.

VII. Youths

Youths who fulfilled the inclusion criteria were recruited as the participants in this study. They need to respond to an online questionnaire that assesses their knowledge, attitude, and practice on plastic usage and management via Google Form.

VIII. Covid-19 pandemic

Covid-19 was declared as a pandemic on 11 March 2020 as it is a newly emerged disease that spreads around the world (WHO, 2020b, 2020c). This study is conducted during the Covid-19 pandemic, which is 15 weeks after the declaration date.



1.8 CONCEPTUAL FRAMEWORK

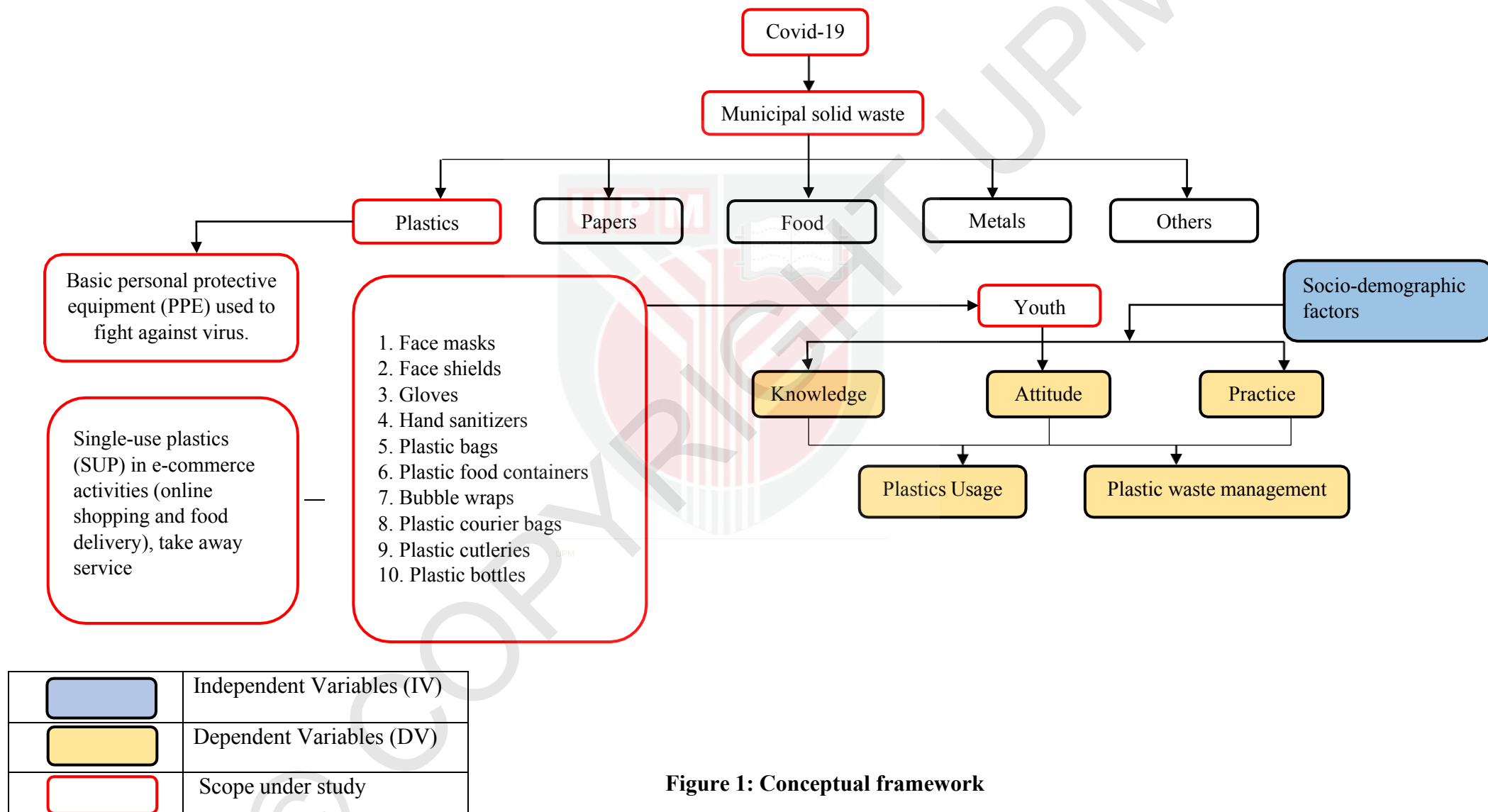


Figure 1: Conceptual framework

CHAPTER 2

LITERATURE REVIEW

2.1 OVERVIEW OF PLASTICS

According to Giacobelli (2018) and Hopewell et al. (2009), plastic is a versatile, lightweight, and inexpensive material that can be shaped in several ways and used for a variety of purposes. It is made up of various chemical elements bound together, such as carbon, oxygen, and hydrogen. Plastics are also called polymers when all the monomers are linked up through either of 2 major processes such as polymerization or polycondensation (American Chemistry Council, 2005; Rogers, 2015).

As reported by Giacobelli (2018), plastics have two major categories, which are thermoplastics and thermosets. Heating thermoplastics causes it to melt, and cooling causes it to harden. However, thermosets cannot be remelted and reformed once it is being heated (Rogers, 2015). Generally, the plastic items that are commonly used in daily life are made up of thermoplastics. Table 1 shows the types of thermoplastics classified with different SPI codes (Society and Plastic Industry code) and their respective examples.

Table 2.1: Types of plastics and examples (Mertes, 2020; Wong, 2017)

Code	Symbols	Types	Examples
1		Polyethylene Terephthalate (PET or PETE)	Mineral bottles, medicine jars, carpet, food tray, cookie jars, carpets
2		High-Density Polyethylene (HDPE)	Milk containers, shampoos and soap bottles, grocery bags, bleach containers, toys
3		Polyvinyl Chloride (PVC)	Cling wrap, plumbing pipes, grocery bags, ducts
4		Low Density Polyethylene (LDPE)	Bubble wrap, grocery bags, cling film, squeezable bottles, grocery bags
5		Polypropylene (PP)	Cookie jars caps, take-out container, bottles caps, yogurt containers, medicine bottles, disposable cups, and plates
6		Polystyrene (PS)	Plastic cutlery, plastic food containers, disposable coffee cups, and plates, packaging foam
7		Other	CD, DVD, baby bottles, medical storage box

In Malaysia, the common plastics that are usually recycled are Code 1: PET, Code 2: HDPE, and Code 5: PP (Chen et al., 2021). A study reported that the proportion of respondents who often identify the plastic code numbers before making the purchase was only 5% (Babu & James, 2016). Improper management of these plastics could lead to the accumulation of plastic wastes in the environment.

Plastic waste is defined as unwanted plastic products build up in the environment which pose significant threats to humans, the environment, and other living organisms (Westminster City Council, 2021). It is categorized as one of the municipal solid wastes that can be generated from the area such as household, commercial, institutional, and industries (JPSPN, 2013). Among Asia countries, the study had reported that Malaysia's plastic composition in solid waste was at 24%, which was the second-highest after Philippines (25%) (Moh & Abd Manaf, 2014). Likewise, the report of WWF Malaysia 2019 disclosed that Malaysia ranks second with the annual per capita of plastic use at 16.78 kg per person, which outranks many larger nations such as China, Indonesia, Philippines, Vietnam, and Thailand (WWF-Malaysia, 2020).

During Covid-19 pandemic, many studies were conducted to study the worldwide issue of plastic waste challenges since there is a shift in consumer behavior and their waste management pattern. For example, personal protective equipment (PPE) such as facemasks, gowns, hand sanitizer, gloves are experiencing high demand as it acts as preventive measures for health care workers and the public to prevent transmission of the virus (Syam, 2020). Generally, these PPE especially face masks have contained the materials such as polypropylene and polyethylene (Fadare & Okoffo, 2020). Benson et al. (2021) reported an estimation of 1.6 tonnes of global plastic wastes was generated per day and 3.4 billion facemasks disposed of since the Covid-19 outbreak. Another study also showed that Covid-19 pandemic had led to the increased public dependency on online shopping and take-out services;

which inevitably plays a role in plastic production rates, plastic waste generation, and plastic management (Laato et al., 2020; Parashar & Hait, 2021).

The increasing need for plastics during this pandemic indicates that good management of plastics is of growing importance to reduce plastic footprints. Plastics are originated from raw materials such as crude oil, natural gas, and coal. Besides, chemical additives such as BPA, phthalates, PBDE are often added to modify the degree of softness and appearance (Kumar, 2018). The life cycle of plastics start from extraction, manufacturing, usage, and management could somehow release pollutants that adversely affect human, the environment, and wildlife; with the impacts ranging from eye irritation to cancer development, air and water pollution; physical injury towards aquatic life and many more (Azoulay et al., 2019). The mismanagement of plastic waste such as open dumping and burning, low recycling rate also jeopardize the progress in tackling climate change. Therefore, this highlights the need to do more plastic waste-related research to achieve environmental sustainability goals in Malaysia.

2.2 PLASTIC WASTE GENERATION

Increasing plastic production and consumption rate are commonly associated with plastic waste generation. This section explained the plastic waste generation before and during the time of Covid-19 pandemic, within the context of Malaysia as well as the global view.

2.2.1 BEFORE COVID-19 PANDEMIC

In the early year of 2018, China had imposed an import ban on plastic waste. Therefore, it caused plastic waste shipment to be rerouted to other countries, especially in Southeast Asia, where Malaysia became the primary recipient (Lee, 2021). Malaysia had received the highest amount of plastic (15.7%) waste as compared to other recipient countries, such as Thailand (8.1%) and Vietnam (7.6%) of total imports during 2018 (Murgese, 2020). Besides, Greenpeace found that more than double of the plastic waste in the first seven months of 2018 was exported from the U.S. to Malaysia as compared to the year before (Krausz, 2020).

Although the country had sent back some of the plastic waste to the exporters, the scenario still became worsening as the generation of plastic waste was remaining a high rate. It was a global crisis as the plastic production rate exceeded 300 million tonnes each year with much of it in different sizes polluting the marine habitats (Law, 2017). The highest amount of plastic wastes recorded at 14.5 million tonnes was came from the containers and packaging category (US EPA, 2021). Ritchie (2018) also reported that the packaging sector was the primary plastic waste generator that accounts for nearly half of the global generated plastic waste in total, which recorded producing 141 million tonnes of plastic wastes per year. For example, the majority of plastic packaging includes grocery bags, single-use plastics, containers, bottles, and many more (UNEP, 2018). Specifically for items with a plastic polymer such as PP, it had achieved the highest production at 68 million tonnes (Geyer et al., 2017).

In the UK alone, approximately 5 million plastic was consumed each year, with only 25% of it being recycled and the remaining were landfilled (Alabi et al., 2019). It is important to know that the improper plastic consumption rate will result in a substantial increment of plastic waste generation, where nearly 12 billion metric tonnes will be landfilled or persists in the environment when projected to 2050 (Geyer et al., 2017). A report of WWF-Malaysia (2020) also estimated about 1070 thousand tonnes of total annual plastic waste being generated by post-consumer in Malaysia in 2016.

Single-use plastics received the high interest of many people as it is very convenient. In Malaysia, it has been reported that plastic wastes constituted 19% of the total waste generated, while 74% of it was comprised of single-use plastic film (Wahab et al., 2007). Among Asia countries, the country was positioned at the second-highest plastic wastes generated country, just after the Philippines (Moh & Abd Manaf, 2014). Another study conducted by Jaafar et al. (2018) reported that the respondents in a small town of Terengganu had more than 24 kg monthly generation of dominant solid waste which included plastic waste. Household plastic generation was accounted for 9% of the total solid waste generated (Siti Rohana et al., 2019). While in Can Tho City, Vietnam, Thanh et al. (2011) reported that the respondents generated an average household plastic waste at about 17g every day; while plastic packaging accounted for 73% of total generated plastic waste.

2.2.2 DURING COVID-19 PANDEMIC

Many countries are facing challenges to manage their waste systematically and sustainably before the declaration of the Covid-19 pandemic. As reported by Nua (2020), about 2-3 billion people worldwide were inaccessible to waste collection and waste disposal services. The severity of this condition was amplified as it was even more challenged to ensure waste collection during the COVID-19 pandemic. For example, changes in consumption patterns and low waste collection rates during this health crisis will reduce the waste to be sent to recycling facilities (World Bank Group, 2021). Besides, the reduction of oil prices during the pandemic also increased the demand for using virgin plastic rather than recycled plastic (World Bank Group, 2021). This condition could lead to a global plastic waste footprint; thereby posing harm to the environment as well as affecting the life of the whole ecosystem.

During the time COVID-19 pandemic, there was an intensification usage of hand sanitizer and PPE among healthcare workers and common citizens, such as facemasks, gloves, face shields, and many more to curb the transmission of the disease (Parashar & Hait, 2021; Sangkham, 2020). The increased usage of these plastic-based PPE in the time of pandemic had led to a significant rise in plastic waste production and consumption, hence generating a large amount of plastic waste globally. Prata et al. (2020) reported an estimated 130 billion face masks and 64 billion gloves were used globally each month. A similar projection reported by WHO, (2020), stated that a monthly requirement of 89 million surgical masks, 76 million gloves, and 1.6 million goggles were needed by healthcare settings for precautionary

measures against COVID-19. It is an important issue to discuss as face masks made from polypropylene and other plastic derivatives were the source of microplastic which could give rise to the negative impacts on terrestrial and environment if it were being managed improperly (Selvaranjan et al., 2021). The table below shows the production and waste generation of plastic-based PPE in several countries, as reported in different studies.

Table 2.2: Production and waste generation of plastic-based PPE in different countries during COVID-19 pandemic

Country	References	PPE production and waste generation during COVID-19 pandemic
China	(Benson et al., 2021; Singh et al., 2020)	- Estimated 3.4 billion of PPE waste disposed daily, such as facemask and face shield. - In Wuhan city, more than 240 tons of medical waste were generated each day during the peak time of disease.
Malaysia	(Agamuthu & Barasarathi, 2020)	- More than 25% weight increment of clinical waste, mainly attributed to the PPE.
India	(Ojha, 2020; Sangkham, 2020)	- Daily production of PPEs recorded at 4.5 lakh to curb the transmission of COVID-19. - The highest amount of medical waste disposed daily, which was estimated at about 6500 tons.
Bangladesh	(ESDO, 2020; Haque et al., 2021)	- About 14500 tons of plastic waste were generated, such as contaminated gloves, disposable face masks, and polythene bags - The plastic wastes disposed by population such as face masks, gloves, and hand sanitizer bottles were 455 million, 1216 million, 49 million respectively, during the one-month lockdown period in 2020 (26 March – 25 April).
Thailand	(Simachaya, 2020)	- About 1.75 million medical masks are used per day
Japan	(Fadare & Okoffo, 2020)	- As reported by the Ministry of Economy, Trade, and Industry (METI), more than 600 million was generated per day in April 2020.

People may mismanage their contaminated PPE wastes as the usage of PPE increases during COVID-19 pandemic. For example, the contaminated masks, gloves were often mixed with the domestic garbage, they need to be discarded properly before being collected by specialist waste management operators or municipal waste collectors (Bavani, 2020).

Besides, many people spent more time in-house due to this pandemic had driven them to rely on online shopping and takeaway services for things such as food or non-food products, groceries, and other essential items (Parashar & Hait, 2021; Vodus, n. d.). Hyun (2020) reported that there was an increase of 92.5 % and 44.5% in online food purchases and daily necessities respectively in comparison to last year due to the occurrence of the pandemic in South Korea. As well as in Singapore, the involvement in online grocery shopping had increased by 50%, where the highest frequency was among respondents aged 29 and younger (Elangovan, 2020). It was also supported by Müller (2021), as almost half of the Malaysian youths aged between 20-29 years old were online consumers according to the data in 2016.

The reliance on these services had resulted in the surge of plastic waste generated from single-use plastic bags, take-out containers, and other plastic packaging materials for delivery purposes (Bengali, 2020). Due to hygienic concerns, a survey conducted had shown that Singaporeans generated an additional 1334 tonnes of plastic waste from takeout packaging and food delivery during the 2-months lockdown period (Elangovan, 2020). In Bangladesh, polyethylene grocery bags were recorded as the highest source of plastic wastes, accounting for 5800

tonnes of plastic waste discarded during the one-month lockdown period (ESDO, 2020; Haque et al., 2021). Moreover, nearly 30% rise in plastic waste especially plastic bags happened in Thailand (Bengali, 2020). While for Bangkok alone, 62% of plastic consumed in April was higher than 1 year before, and most of it was contaminated by food that was not easy to be recycled (Simachaya, 2020).

2.3 PLASTIC WASTE MANAGEMENT

In Malaysia, the responsibility in waste management falls under two major ministries, which are the Ministry of Housing and Local Government and Ministry (KPKT) and Environment and Water (KASA). For example, the entities below KPKT are National Solid Waste Management Department (JPSPN) and Solid Waste Management Corporation (SWCorp); while under KASA is the Department of Environment (DOE) (WWF Malaysia, 2020). The federal government, entities below ministry, state, and local government are working together towards sustainable waste management in Malaysia. As plastic waste is one of the types of municipal solid waste, it was managed based on a basic waste management hierarchy such as landfilling, incineration, and recycling. The public is also encouraged to minimize their plastic waste through reducing, reusing, and recycling.

2.3.1 LANDFILLING

According to DOE (2009), landfill refers to the location to dispose of solid waste either onto or buried underground. In Malaysia, landfills are the most preferred method as it is convenient, save cost, and easy to manage. It was the highest waste treatment practice which recorded at 30.9% in 2006 (Samsudin & Mat Don, 2013).

Landfills are comprised of 2 types, which are sanitary and unsanitary landfills. For sanitary landfills, it is fully equipped with environmental control facilities, while unsanitary landfills are equipped with incomplete control facilities. As reported by SWCorp Malaysia (2016), only 24 sanitary landfills were available in the country although 157 disposal sites were operated to dispose the wastes. 90% of unsanitary landfilling was practiced to manage municipal waste in Malaysia (Agamuthu & Fauziah, 2011; Johari et al., 2012). Although it was the common and easy conventional approach, it was the least favored option to dispose of waste according to the waste management hierarchy (Leblanc, 2019).

The population and consumption rate in Malaysia is increasing accompanied by the high generation of plastic waste. The daily amount of solid waste that was dumped at Malaysia's landfills was recorded at about 29000 tonnes (Agamuthu & Fauziah, 2011). However, according to USEPA (2021), 27 million tons of plastic were dumped at landfills in 2018. Likewise, in Malaysia, about 19% of plastic in total solid waste was dumped at the landfills, which was the second-highest amount of waste after food waste (Agamuthu & Fauziah, 2011).

Since landfilling methods dumped the plastic waste on the land, it raises many environmental problems such as leachate percolation, soil, and water contamination and eventually leads to human health problems and endangers the ecosystems. For example, a study conducted by Johari et al. (2012) projected the emission of landfill gases methane at 370 thousand tonnes in 2020, while CO₂ emission was at 7350 thousand tonnes. These landfills problems were also exaggerated as Malaysia did not have a proper gas ventilator system, leachate treatment, lack of land availability, and suitability (Abas & Wee, 2014). Another study also highlighted the future difficulties in finding suitable landfills to locate in Malaysia (Sharifah Norkhadijah & Latifah, 2013). Therefore, plastic waste disposal at landfills is facing challenges whereby it cannot be the ultimate option in the future.

2.3.2 INCINERATION

Incineration is a solid waste destruction method that involves the burning of solid waste under a controlled high temperature at about 800⁰C and above with oxygen supply (Patil et al., 2014). This process is accompanied by heat emission which in turn offers the opportunity for energy recovery. With proper environmental controlled equipment in the incinerator, it could somehow be a beneficial way to choose as it reduces the waste dumped in landfills.

The Cabinet Committee of the Malaysian government had suggested incineration as an alternative method to dispose of municipal solid waste at the landfill. In the 10th and 11th of Malaysia Plans, the government proposed the waste-to-energy (WtE) concept and aimed to develop waste-to-energy incineration plants to incinerate waste that are impossible to recycle (Government of Malaysia, 2010). As reported by Aziz (2019), KPKT had established the waste-to-energy incinerator in Malaysia as an initiative to phase out the traditional landfilling practices particularly in disposing of plastic waste. The minister also suggested the construction of WtE facilities in each country's state by 2020. Besides, 29/2014. (XI. 28.) Regulation of the Ministry of Agriculture in Hungary had banned plastic waste burning and specified that the plastic waste incineration can only be done in the licensed plastic waste incineration plants (Nagy & Kuti, 2016). However, environmental NGOs did not agree on incineration as a method to manage plastic waste as it will exert risks to human and environmental health (Bunyan, 2019).

Incineration is the alternative to replace landfilling practices but the potential problem that could arise from this disposal method is atmospheric emission of hazardous chemicals during the process. For example, burning plastic wastes release toxic fumes into the environment such as Dioxin, Furan, Mercury Polychlorinated Biphenyls (PCB) (Verma et al., 2016). The generated compounds and their associated health impacts during the incineration of PVC were also presented in Nagy & Kuti (2016). They had reported mild to severe health impacts ranging from eye, skin, and throat irritation, lack of consciousness and central nervous system disruption, carcinogenic effect, and many more. Besides, the pollutants emission

from the incineration process will also settle on the plants and soils, and further exerting the effects on the aquatic environment. Eventually, the incorporation of toxic substances into the food chain allows the growing threats on the wildlife. Due to the potential pollution impact on the environment, plastic incineration is less employed for waste management in comparison to recycling and landfilling.

2.3.3 RECYCLING AND UPCYCLING

Plastic recycling refers to the method of reprocessing plastic scraps into useful items (Merrington, 2011). Compared to landfills, recycling is a low-cost and environmentally-friendly waste management alternative to expand the lifespan of the landfills (Samsudin & Mat Don, 2013). Owing to the fact that most plastics are non-biodegradable in nature, the primary focus of plastic waste management should be on waste reduction, and waste recycling to manage waste more effectively. With proper waste management such as recycling, an estimation of 8 million tonnes of plastic waste could be reduced from entering the ocean yearly, which in turn protects the aquatic environment (Alabi et al., 2019).

General waste generated by each Malaysian was 1.44 kg per day, of which 55% can be recycled (Wong, 2017). Founder of social enterprise UrbanR+ Recycle, Vincent Chung explained that the plastic types that are majorly being recycled are PET, HDPE, and PP (Wong, 2017). Other types of plastics were dependent on the availability of recycling facilities as it was not economically viable and required

advanced facilities to be processed. However, as reported in Chung (2019), a study showed that the PET bottles collected for recycling were only at 16%. Besides, 1.4 million tons of plastics were consumed per year while only 0.3 tons of plastic key resins (PET, HDPE, and PP) were collected for recycling (World Bank Group, 2021).

In Malaysia, the recycling rate in 2019 (28.1%) was exceeded the set target in 2020, which was 22% according to the goal set in National Solid Waste Management Policy 2016 (Department of Statistics Malaysia, 2020). The national recycling rate was recorded at 31% in 2020, and the value aimed to improve until it meets the JPSPN recycling target of 40% by 2025 (Nur Hanani, 2020). The positive attitude towards recycling was possibly due to the fairly developed recycling centre in Malaysia, producing 1.5 million tonnes of recycled plastic each year which can generate revenue of about RM 4.5 billion (Muhd Amin, 2021). However, the recycling rate was considered low when compared to other Asian countries such as South Korea and Singapore as they recorded 54% and 34% of the recycling rate respectively (Department of Statistics Malaysia, 2020).

During the Covid-19 pandemic, many Southeast Asian countries also reduced 35% in the demand for recycled plastic as the oil prices were dropping (Parashar & Hait, 2021). Marketing analysts in Independent Commodity Intelligence Services (ICIS) revealed the reduction in the number of drinks bottles made from recycled plastics since the cost to make them is more expensive compared to the new plastics for bottles (Brock, 2020). Besides, people who stayed at home during this period had increased the generation of recycling waste, thereby causing the recycling industry to

be unable in coping with this situation. In addition, some of them might face challenges in managing plastic waste as Movement Control Order (MCO) during pandemic had put several recycling facilities and campaigns on halt (Focus Malaysia, 2020).

In addition, plastic recycling practices was feasible only if it was being separated according to the plastic code number. The contamination with food waste and mixing up plastics, especially low-quality plastics with various pigments and additives will make the recycling process to be more difficult and costly. As reported by International Solid Waste Association (ISWA), most of the PPE used for Covid-19 prevention such as face masks and gloves are not recyclable although they are made of plastics (cited in Sahni, 2020). Therefore, the public plays an important role to adopt recycling practices at home by segregating the wastes before disposed or sending them to recycling facilities. Usually, they had high awareness but only a few were translated into sustainable recycling practices (Sreenivasan et al., 2012). It is also important to have an implementation of a recycling campaign as this activity helps to reduce greenhouse gas emissions and prevent resource depletion (Chandegara et al., 2015).

Recycled plastics are described as “downcycled” plastics as it converts plastic wastes into lower-quality plastic product (Daley, 2020). As compared to this, upcycling is a new and innovative approach as it involves the process of transforming waste materials with low intrinsic value into a new product with greater value and contents (Afronelly, 2021). This process uses technology to modify the

chemical structure of the plastic waste, thereby revolutionizing the lifecycle of plastics with greater function while reducing the impacts that it brings to the environment (U.S. Department of Energy, 2019). Besides, people can also practice with plastic upcycling without any requirement of technical training. It involves the creative reuse of plastic waste by making a minimal physical change on it. For example, turning plastic bottles into flower pots, pencil cases, sprinkler systems, and many more (Ladd, 2020). This is a preferred alternative of reducing wastes, which eventually minimizing the use of natural resources and energy, as well as reducing plastic waste to be ended up in the landfills.

2.3.4 REUSE

Reusing referred to using the same item more than once, either reused for the same application (conventional reuse) or the different function (new-life reuse) (Sreenivasan et al., 2012). In the context of plastic, it has been reported that plastic bags, plastic containers, and plastic bottles are the items that are generally reused by the public. Many innovative ways are also presented to promote this reusing practice. As reported by Khanam et al. (2019), the majority of the students agree plastic reusing practice is able to reduce its hazards. Although reusing plastic items can help to avoid waste generation, it is not encouraged to practice during the COVID-19 pandemic. The reason being is that virus can spread through fomite transmission, but the chances are relatively low as compared to direct contact and airborne and droplet transmission (CDC, 2021). A study conducted by van Doremalen et al. (2020) aimed to analyze the stability of SARS-CoV-2 on surfaces and in aerosols. Their results

showed higher stability of SARS-CoV-2 on plastic and stainless steel, which remained viable for up to 3 days after applying on these surfaces. Likewise, another study revealed that the same virus was detected on plastic surfaces for up to one week (Chin et al. 2020).

2.3.5 REDUCTION

Last but not least, reduction in the use of plastics is the most favourable approach in the waste management hierarchy as it reduces the waste at the source. In Malaysia, several efforts were made to reduce plastic consumption. For example, the Ministry of Domestic Trade Cooperatives and Consumerism (MDTCC) had launched a campaign named as “*No Plastic Bag Day*” campaign in 2011 (Singh, 2011). It is on a weekly basis, whereby the free provision of plastic bags was not provided at selected supermarkets on every Saturday. A levy of RM0.20 was needed for each plastic bag if customers requested upon it at the payment counter. This movement was aimed at reducing the use of plastic bags in order to prevent environmental degradation resulting from plastic waste (Afroz et al., 2017). Besides, this movement was targeted to expand to all types of business premises at the beginning of 2022 (Bernama, 2019). Other than that, several states had implemented the “*Straws on Request*” campaign, which was also a key initiative under the Roadmap Towards Zero Single-Use Plastics 2018-2030.

2.4 IMPACTS OF PLASTICS

The production of plastics requires a great number of chemicals that are majorly made from oil extracted from fossil fuels. In the lifecycle of plastics, which are extraction, refining and manufacturing, usage, and management stages, some hazardous chemicals released can induce significant effects on humans and the environment (Azoulay et al., 2019).

2.4.1 HUMAN HEALTH

Along the plastic lifecycle, humans will expose to a wide range of hazardous chemicals through inhalation, ingestion, and dermal contact. Extensive use of plastics and improper management of plastics could lead to pollution whereby this condition poses undue risks on human health.

The extraction process of oils will cause the chemicals to release into the air and waterways. A review from Webb et al. (2016) discussed the health effects due to the exposure of air pollutants emitted from the oil extraction process, which included benzene, particulate matters, formaldehyde, and silica dust. They claimed that such exposure was often associated with respiratory function impairment, lung inflammation, and asthma aggravation, especially among infants and children.

Furthermore, the population that lives in the proximity with the plastic industries has higher risks to expose toxic pollutants released from the plastic production process. A review from the Union of concerned Scientists (UCS) claimed that hazardous air pollutants associated with plastic manufacturing are styrene, benzene, toluene, and 1,3-butadiene (cited in Azoulay et al., 2019). These pollutants are associated with many health effects ranging from eyes and throat irritation, blood pressure reduction, and central nervous system dysfunction; increasing the possibility of leukemia and cancer risks (Azoulay et al., 2019).

The chemical released during the plastics weathering process will bioaccumulate in the tissue of living organisms and goes up in the food chain, such as marine resources for food. It will also percolate through the soil and contaminate the water resources used for drinking purposes (Alabi et al., 2019). Subsequently, humans are suffered from health risks as the toxicity will integrate into their body if they unintentionally consume these “contaminated” foods. For example, a study reported that plastic polymers such as PUR, PVC, polyacrylonitrile were made up of monomers that can give rise to carcinogenic and mutagenic effects after exposure (Lithner et al., 2011). In addition, plastic products are often added with chemical additives such as BPA, PBDE, and phthalates to modify the degree of softness. It was being reported that many additives can affect the endocrine system, which eventually decreases human reproduction ability by disrupting the hormone levels (Kumar, 2018). Review form Seachrist et al. (2016) justified that the disturbance of estrogen increases the probability of breast and prostate cancer if humans are exposed to BPA in their early life. Besides, a study also found that BPA is a potential cause of

diabetes mellitus (DM) since they found a positive relationship between these two variables (Shankar & Teppala, 2011). Managing plastic waste through the incineration process will release hazardous air pollutants and contaminate waterways, which eventually results in nervous system impairment and respiratory illness exacerbation (Verma et al., 2016).

Human can also be exposed to these chemical additives through dermal contact. It had been reported that workers were suffering from contact dermatitis on hand as they contact with some chemical additives at certain plastic production stages (Mwanga, 2011). Thus, plastics and their waste need to be handled and managed properly as they could affect human health from various types of means.

2.4.2 ENVIRONMENTAL HEALTH

The chemical bonds formed in the plastics are strong which causes the decomposition process to be more difficult. Depending on the types and materials of plastics, it generally takes 20-500 years to degrade (Davis, 2021). Thus, it can persist longer in the environment and induce a series of environmental problems, such as land, water, and air pollution, which inevitably threaten wildlife as well as human life.

Due to the rise of the face masks production and consumption rate during Covid-19 pandemic, the management of these masks had become an environmental challenge. According to Lee et al. (2021), disposable surgical face masks had contributed to approximately 0.6 kg of carbon dioxide (CO₂) emission, which could potentially lead to climate change. Similarly, plastic waste that was dumped at the landfill will release CO₂ and methane gas into the atmosphere during the degradation process (Chandegara et al., 2015). A study reported an estimation of 20 million tonnes of CO₂ released from solid waste when it was being decomposed at the landfills in 2008 (Alabi et al., 2019). These gases are capable to trap radiant heat by preventing it from leaving the planet, eventually increasing the earth's temperature and resulting in global warming.

Besides, Verma et al. (2016) claimed that improper plastic management such as open burning results in toxic gases emission of mercury, dioxins, furans, and polychlorinated biphenyls. They also stated this action can lead to the emission of particulate matters (soot) and black carbon ash. Another study conducted by Shemwell & Levendis (2000) reported that the combustion of Polystyrene releases the highest amount of soot with the particle size of 2 µm or lower at 1500 K, as compared to other types of plastics. The small particle size of air pollutants could adhere at the surface of the crops or dissolve in the rivers, harming the marine habitats and human health due to consumption of plastic contaminants.

The emerging biodegradable plastics received increasing interest as it is believed to be more eco-friendly. However, Levis and Barlaz (2011) reported that

biodegradable plastic named poly (3-hydroxybutyrate-co-3-hydroxyoctanoate) (PHBO) was estimated to have the highest global warming potential compared to others as the microbial degradation of plastics release powerful greenhouse gas, methane. Besides, PET also released abundant ethylene and methane gases when it was degraded through weathering process (Royer et al., 2018).

Improper plastic waste disposal cause various environmental consequences. Selvaranjan et al. (2021) explained that the improper disposal of face masks will further endanger marine animals as they will be entangled by the plastic waste present in the seawater and rivers. Due to the environmental factors, the plastic waste that breaks down into smaller pieces will make the debris to be more easily swallowed by marine animals. Due to this fact, their stomach is accumulated with indigestible materials, which in turn reduces their food intake, and subsequently leads to death (Selvaranjan et al., 2021). Besides, fragmentation of the plastics could also happen in the landfill during the degradation process based on biotic and abiotic factors. This process imparts the plastic additives into the leachate and thereby contaminates soil and water when the leachate seeps through. For example, a study by Alam et al. (2019) discovered that heavy metals such as Pb, Cr, Cd, As, Cu and Zn had the highest contents in the plastic bags made from PE, HDPE, LDPE and PVC. Several studies also found out that this condition is a potential cause to incorporate microplastics in the landfill's leachate (He et al., 2019; Su et al., 2019). The reduction of size in the plastics increases their surface-to-volume ratio. Therefore, more pollutants from the environment will adhere to the surface of the microplastics (Rochman et al., 2013). For example, adherence to persistent organic

pollutants (POPs) on microplastics are more toxic and pollute the water resources for drinking purposes (Eerkes-Medrano et al., 2019; Verma et al., 2016).

2.5 KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) ON PLASTIC USAGE AND MANAGEMENT

KAP levels towards usage and management of various types of plastics were identified in many previous studies. However, limited or almost none of the study was conducted to determine KAP levels on this issue during Covid-19 pandemic.

2.5.1 KNOWLEDGE

Table 2.3: Summary of findings regarding knowledge on plastic usage and management

Subject	Location	Key Findings	References
Usage of Plastic Bags and Health Hazards: A Study to Assess Awareness Level and Perception about Legislation Among a Small Population of Mangalore City	India	- About 90% of the adult who aged 18 years and above was aware of minimum one health hazard related to the usage of plastic bags. - There is a significant association of good awareness among females and those with higher education, but only about 5% of the respondents in used eco-bags while shopping.	(Joseph et al., 2016)
Knowledge, Attitude and Practices Towards Household Solid Waste Management among Semi-Urban Residents- A Community based Cross Sectional Study from Southern Part of Coastal Karnataka, India	India	- The residents had a good awareness of health and environmental effects caused by solid waste.	(Eshwari et al., 2019)
Assessment of Knowledge, Attitude and Practice Regarding Single Use Plastics among the Residents of a Rural Area in a Coastal District of Karnataka - A Descriptive Study	India	- Over half of the residents (70%) were well informed about the harmful health effects of SUP on human; while 95% of them did not know plastics can cause impacts on the environment.	(Shaira et al., 2020)

Assessment of the Knowledge and Attitude Regarding Plastic Use and its Health Effects among Nursing Students of Selected Nursing Colleges of Ambala, Haryana	India	- Among nursing students, only 1 % had very good knowledge regarding plastic use and its health impacts; 15.7% had a good knowledge level while the majority of them, 59% showed a moderate level of knowledge.	(Bhasin et al., 2021)
A Study to Assess the Knowledge Regarding Health Hazards of Plastic in Domestic Use and Attitude toward the use of Alternatives in Women Residing at Mohan Kumar Nagar, Bengaluru	India	- Majority of the respondents (45%) demonstrated a moderate knowledge level on plastic health hazards while none of them had good knowledge on it.	(Praveena, 2019).
A Study to Assess The Effectiveness of Structured Teaching Programme Regarding Hazards of Plastic Use Among School Going Children In Hilton Matriculation Higher Secondary School, Chrompet, Chennai-44	India	- Only a low percentage of higher secondary school students (13.3%) had a high knowledge level on plastic use hazards	(Punitha & Hemavathy, 2016).
Assessment of knowledge and practice on plastics among the professional course students of Annamalai University, Tamil Nadu	India	- Students with good knowledge level on plastics reported at only 46%, which was relatively low compared with the previous studies. - About 28% of students were recorded with good practice on plastic usage and disposal.	Srinivasan et al. (2019)
The Difference of Knowledge and Behavior of College Students on Plastic Waste Problem	Taiwan	- There was a difference between knowledge and practice level because people tend to forget shortly after they acquire the information (Kennedy et al., 2004). However, a	(Situmorang et al., 2020).

		significant association between the student's knowledge and their practice in reducing plastic usage were recorded, with a positive correlation coefficient reported at 0.361.	
The knowledge, awareness, attitude and motivational analysis of plastic waste and household perspective in Malaysia	Malaysia	-The household participants demonstrated a poor knowledge level (mean 2.61) towards the recycling problem.	(Afroz et al., 2017)
Knowledge, Attitude, And Practices of Recycling and Its Associated Factors Among Undergraduate Students In Universiti Putra Malaysia, Serdang	Malaysia	- 85% of undergraduate students at University Putra Malaysia had a high knowledge level on recycling practices. - Those who have past recycling experience of recycling was significantly associated with a higher level of knowledge.	(Nordin, 2016)
Knowledge, Attitude and Practices on Recycling Activity Among Primary School Students in Hulu Langat, Selangor, Malaysia	Malaysia	Good knowledge level of over 70% was possessed among urban and rural primary school students.	(Nur Aisyah & Haliza, 2016)
No plastic bag campaign day in Malaysia and the policy implication	Malaysia	66% of the consumers knows the plastic bag campaign brings the benefits to reduce the amount of solid waste generation	(Zen et al., 2013)
Application of theory of planned behavior in measuring the behavior to reduce plastic consumption among students at University Putra	Malaysia	- Significant and positive correlation towards the use of plastics was found between the environmental knowledge and attitude among UPM students.	(Hasan et al., 2015)

Malaysia, Malaysia			
--------------------	--	--	--

For the knowledge on solid waste management, many respondents think that municipal waste collection services at the regular interval were the safer waste disposal methods compared to composting; while the unsafe management was burning, followed by dumping (Eshwari et al., 2019). Inappropriate management methods will result in environmental contamination by chemical additives in plastics. In respect to this, half of the respondents did not know Bisphenol A is a chemical that will leak from the plastic products and cause harmful effects on biota (Babu & James, 2016).

2.5.2 ATTITUDE

Attitude represents the key driver of human behaviour, whether favourable or unfavourable towards certain issues (Situmorang et al., 2020). It also represents a person's behavioural intention, feelings, and perception towards a thing (Balasubramanian, 2012). Many studies were conducted to assess attitudes towards plastics usage and practices but generally, it showed inconsistent findings on different aspects.

Table 2.4: Summary of findings regarding attitude on plastic usage and management

Subject	Location	Key findings	References
Assessment of Knowledge, Attitude and Practice Regarding Single Use Plastics among the Residents of a Rural Area in a Coastal District of Karnataka - A Descriptive Study	India	- 80% of residents think that single-use plastic (SUP) banning is necessary and over 60% of them had positive attitudes to replace SUP by other means.	(Shaira et al., 2020)
Survey on Plastic Usage among the Teenagers of Alappuzha Town, Kerala	India	- Almost all of the respondents were well-prepared in reducing the usage of plastic bags.	(Babu & James, 2016)
A Study to Assess the Knowledge Regarding Health Hazards of Plastic in Domestic Use and Attitude toward the use of Alternatives in Women Residing at Mohan Kumar Nagar, Bengaluru	India	- Only 3% of women had positive attitudes toward using alternatives instead of plastic items.	(Praveena, 2019)
Assessment of the Knowledge and Attitude Regarding Plastic Use and its Health Effects among Nursing Students of Selected Nursing Colleges of Ambala, Haryana	India	- In terms of attitude towards plastic use and its health effect, only 4.4% of nursing students showed a highly favorable attitude although the majority of them (80.3%) were moderately favorable	(Bhasin et al., 2021)
The knowledge, awareness, attitude and motivational analysis of plastic waste and household perspective in Malaysia	Malaysia	- The willingness to participate in recycling campaigns was recorded as 35% at household levels. - The elder people, higher education, and incomes group were more willing to perform recycling practices.	(Afroz et al., 2017)
Knowledge, Attitude,	Malaysia	- Only 43% of	(Nordin &

And Practices of Recycling and Its Associated Factors Among Undergraduate Students In Universiti Putra Malaysia, Serdang		undergraduate students in Malaysia had a positive attitude towards plastic recycling.	Saliluddin, 2016)
Household plastic waste habits and attitudes: A pilot study in the city of Valencia	Valencia (Spain), Utrecht (The Netherlands) and Alba Iulia (Romania)	- 95% of citizens strongly believed that plastic recycling can help to turn waste into new products which serve as valuable resources for the community.	(Roche Cerasi et al., 2021).
Investigating students' environmental knowledge, attitude, practice and communication	Malaysia	- Generally, student's attitude towards environment was good. However, lower percentage was observed in 2 items: 78.6% of people had interest to gain more knowledge on sustainable environment; 68.9% has interest to take part in environmental activities. - Attitude is not a good predictor for sustainable environment practice as it showed a poor relationship to each other.	(Ahmad et al., 2015)

2.5.3 PRACTICE

Table 2.5: Summary of findings regarding practice on plastic usage and management

Subject	Location	Key findings	References
Assessment of Knowledge, Attitude and Practice Regarding Single Use Plastics among the Residents of a Rural Area in a Coastal District of Karnataka - A Descriptive Study	India	- Single-use plastics items particularly plastic bags recorded a high amount of usage (82.4%), followed by plastic bottles and plastic food containers at 32.5% and 24.5% respectively.	(Shaira et al., 2020)
Survey on the usage of plastic bags, their disposal and adverse impacts on environment: A case study in Jimma City, Southwestern Ethiopia	Ethiopia	- 77% of the residents used plastic bags more often than other plastic items. - Many respondents disposed of their plastic bag wastes through open dumping, followed by burning and burying, with the percentage of 59.6%, 40.86%, and 18.69% respectively	(Adane & Muleta, 2011)
Assessment of knowledge and practice on plastics among the professional course students of Annamalai University, Tamil Nadu	India	- In terms of general practice level on plastic usage and disposal, 27.6% of students of various study courses demonstrated good practice on it.	(Srinivasan et al., 2019).
Survey on awareness and attitudes of secondary school students regarding plastic pollution: implications for environmental education and public health in Sharjah city, UAE	Sharjah city, United Arab Emirates	- 82% of students throw plastic waste in the dustbin; despite they know the fact that recycling practices are the best disposal methods	(Hammami et al., 2017)

Individual Attitude toward Recycling of Municipal Solid Waste in Lagos, Nigeria.	Nigeria	- 38% of respondents were involved in waste recycling practices.	(Otitoju, 2014)
Investigating students' environmental knowledge, attitude, practice and communication	Malaysia	- There was a significant but poor relationship between level of knowledge and sustainable environment practices ($r=0.217$, $p<0.001$); and attitude and practices ($r=0.311$, $p<0.001$) - Mean score for practice ($M=3.34$). was lower than knowledge ($M=4.03$) and attitude ($M=4.13$).	(Ahmad et al., 2015)
Knowledge, Attitude, And Practices of Recycling and Its Associated Factors Among Undergraduate Students In Universiti Putra Malaysia, Serdang	Malaysia	- Almost half of the undergraduate students adopt positive recycling behaviour.	(Nordin & Saliluddin, 2016)
Survey on Plastic Usage among the Teenagers of Alappuzha Town, Kerala	India	- A lesser number (37%) of teenagers prefer to use plastic bags while the majority (77%) of them will use plastic bottles the most to carry drinking water. - Only 5% of respondents often identify the plastic code numbers before making the purchase.	(Babu & James, 2016).
The Difference of Knowledge and Behavior of College Students on Plastic Waste Problems	Taiwan	- Better practices to reduce plastic waste were found among environmental science students in Taiwan compare to those in social sciences. These practices include purchasing plastic packaging products, bringing own shopping bag, lunch box, reusing plastic bags, and many more.	(Situmorang et al., 2020)

Disposal of Personal Protective Equipment during the COVID-19 Pandemic Is a Challenge for Waste Collection Companies and Society: A Case Study in Poland	Poland	- Most of the respondents (42%) dispose their PPE waste together with their household waste; 29% and 26% disposed it in separate bags or together with other plastic wastes.	(Nowakowski et al., 2020)
Determinants of 3Rs behaviour in plastic usage: A study among Malaysians	Malaysia	- Attitude is positively and significantly affect a person's behavior in applying 3Rs concept on plastic usage ($r=0.627$, $p<0.001$) - Other variables such as subjective norm, perceived behavioral control, behavioral intention, and facilitating conditions habit also influenced plastic usage behavior	(Loh et al., 2020)

2.6 ASSOCIATED VARIABLES WITH KAP ON PLASTIC USAGE AND MANAGEMENT

2.6.1 SOCIODEMOGRAPHIC FACTORS

Several socio-demographic factors can be collected from the respondents and serve as an associating factor regarding knowledge, attitude, and practice on usage and management of various types of plastics. The details are discussed below.

Age

Students aged between 15-19 had significantly higher attitudes (32.3%) and practice (24%) as compared to the rest of the age groups (Adeolu et al., 2014). In the same study, 35.4% of respondents in this age group had a higher knowledge level in waste management than the rest, but not statistically significant. However, adolescent girls from 4 age groups (16-22 years old) demonstrated a significant association with knowledge regarding health hazards of plastic use (Kaur & Jeganathan, n.d.).

Another study in the household population of Malaysia concluded that the respondents with increasing age had more frequent practices in recycling plastic waste (Afroz et al., 2017).

Gender

There are associations between gender with KAP level on usage and management of plastics. Several studies proved that female was more likely to participate in environmentally friendly practice as compared to male (Intel, 2018; Otitoju, 2014). However, a study among secondary school students in Ibadan, Nigeria showed that males and females did not show significant differences in terms of knowledge level (Adeolu et al., 2014). But this study revealed that the attitude and practice of waste management among females that reported at 32.7% and 23.9%

respectively was significantly higher than male students at 22.7% and 13.9% (Adeolu et al., 2014). In contrast, Chaudhary et al. (2020) reported that 88.52% of male students had significantly higher knowledge regarding the nature of non-biodegradable plastic, as compared to female 87.17% students at $p < 0.05$.

Ethnicity

Only a handful of studies had the published data on the relationship between ethnicity and KAP levels on plastic waste. In a similar study conducted among university students at Serdang, ethnicity showed no relationship with KAP levels on recycling (Nordin & Saliluddin, 2016). Several studies also reported the insignificant relationship between race with waste recycling and segregation (Otitoju, 2014; Otitoju & Seng, 2014). Therefore, further in-depth study need to be conducted to confirm the relationship between these variables.

Marital Status

In the study that examine the environmental literacy on environmental issues and challenges, Mihanpour et al. (2018) reported that the knowledge score was significantly different across marital status, but single [4.98 (SD 2.17)] shows higher score than married group [4.85 (2.17)] at $p = 0.037$. Furthermore, study proved that the married status was significantly associated with the Quality-of-Life scores

($p < 0.001$), and the single person in both male and female obtained significantly higher scores than the rest of the groups (Han et al., 2014).

Level of education

Hasan et al. (2015) reported there is no statistically significant difference in the behaviour with the undergraduates and postgraduates ($t(388) = 2.20$, $p = 0.687$). Similar findings was obtained in the study of Otitoju (2014) as they found that education is an insignificant factors towards waste recycling. They further explained that youths do not need to hold a form of certification before enabling them to do the sustainable practices.

However, several studies reported a significant association between level of education with knowledge and attitude towards the plastic-related matter. For example, a study highlighted the increase in the respondent's education level contributing to the significant association between source separation and recycling knowledge, as well as their willingness towards recycling ($p < 0.0001$) (Babaei et al., 2015). Besides, the results were also corroborated by the findings from Aminrad et al. (2013), where they reported the PhD holder had significantly higher environmental awareness scores than Bachelor's and Master's degree holders. However, no statistically significant environmental attitude scores were observed among these 3 groups.

Occupational Status

A limited study was done to assess the association between occupational status and KAP levels on plastic waste. Joseph et al. (2016) reported that occupational status was significantly associated with the awareness on hazards due to plastic usage ($\chi^2=35.3$, $df=4$, $p<0.001$). They found that the semi-professional/professional's group had a higher awareness level than the other groups. This might be explained by the differences in their educational level and socio-economic status, which may influence their opportunity to obtain knowledge and participate in green activities.

2.7 WASTE MANAGEMENT RELATED ACTS, REGULATIONS, AND POLICIES

In Malaysia, the fundamental waste management legislation is Solid Waste and Public Cleansing Act 2007 (Act 672) (JPSPN, 2007). Only several peninsular states are adopting this act, which are Johor, Perlis, Kedah, Pahang, Negeri Sembilan, Federal Territories of Kuala Lumpur & Putrajaya, and Malacca; and an opened adoption are still provided to other states (KPKT, 2015). Besides, Solid Waste and Public Cleansing Corporation Act 2007 (Act 673) empowers the role of Solid Waste and Public Cleansing Corporation (SWCorp) in enforcing Act 672 and the related policies.

Besides, many national policies are introduced and implemented by the federal government in order to improve the existing solid waste management system as well as the recycling rate in the country. However, some national policies such as Separation at Source 2015 and the National Solid Waste Management Policy 2016 enforced under Act 672 show a diverse degree of successfulness in Non-Act states as they are not adhering to it (WWF-Malaysia, 2020). The table below shows the summarized regulations and policies in relation to Malaysia's waste management system. The general aims of these legislations and policies are intended to reduce environmental pollution by using cost-effective and holistic approaches to waste management. It encourages active involvement from all parties, with the aim to ensure high quality of life among citizens.

Table 2.6 : Regulations and policies related to Malaysia's waste management system

Policies	Sources	Description and respective goals
National Green Technology Policy 2009	(MESTECC, 2009)	Green Technology is an advanced technology that develops and applies the products and systems to maintain a healthy environment as well as improve the quality of all forms of life. It emphasizes the use of green technology, especially in the water and waste management sector so that the water resources utilization, wastewater treatment, solid waste, and sanitary landfill can be managed in a systematic manner.
Separation at Source regulations 2015	(KPKT, 2015)	It is the regulation enforced under Act 672. It emphasizes the need for every citizen under Act states to separate their wastes according to their composition (recyclable, residual, and garden waste).

		It aims to increase the recycling rate of the country, maximize the lifespan of the landfills, and save the cost of managing solid waste.
National Solid Waste Management Policy 2016	(JPSPN, 2016)	This policy was amended based on National Solid Waste Management Policy (DPSP) 2006. It aims to reduce waste generation by implementing a comprehensive and cost-effective waste management hierarchy, such as 3Rs practices at household, institutional and industrial levels. The new initiatives under this policy include: - Encourage separation at source practices - Implement “Pay as you throw” system - Encourage the utilization of “waste to energy” technology and anaerobic digester
Green Technology Master Plan 2017-2030	(KeTTHA, 2017)	This master plan was built upon the Eleventh Malaysia Plan (2016-2020). The roles of waste sectors are mentioned in this plan, with an emphasis on the goals of waste reduction, waste to energy conversion as well as waste recovery which could generate the source of income to the country. Specific targets to realize the goals are: - Achieve 22%, 25% and 28% recycling rate 2020, 2025, and 2030 respectively. - 1 Waste-to-Energy (WtE) thermal plant in 2020, and 3 plants in 2030. - Installation of biogas capture facilities in 500 palm oil mills in 2020 for a better resource recovery rate.
Malaysia’s Roadmap Towards Zero Single-Use Plastics 2018-2030	(MESTECC, 2018)	This roadmap addresses the plans to cut off single-use plastic products such as straws and plastic bags and encourage the replacement of “green” products. It is a phased approach that emphasizes the needs of the multisectoral collaboration in overcoming Malaysia’s environmental issue on single-use plastic pollution.
National	(KPKT, 2019)	This policy aims to increase the

Cleanliness Policy (2019)		awareness of society in maintaining personal and environmental sanitation through proper waste disposal methods. It is used to ensure human well-being and promotes environmental sustainability through collaboration from every stratum of society. Several action plans in this policy include: - Promote waste separation practices - Promote 3Rs (Reuse, Reduce, Recycle practices) - Encourage circular economy adoption - Promote the concept of “waste-to-money”
Circular Economy Roadmap	(MPMA & MPRA, 2019)	Part of the initiatives under Malaysia’s Roadmap Towards Zero Single-Use Plastics (2018-2030). It encourages the principles of reduce, reuse, and recycle to extend the lifecycle of the products; thereby minimizing the accumulation of the waste and boosting the country’s economy.
	(APEC, 2020)	It is necessary to have Circular Economy for plastics as it promotes environmental sustainability as well as economic and social benefits.
National Plastics Recycling Policy (upcoming)	(Ong, 2019)	Currently, the National Plastics Recycling policy has not ready although it was targeted to be released in 2020. This policy aims to boost Malaysia’s plastic recycling industry by providing a more comprehensive mechanism and guidelines in terms of plastic waste management. It would give a significant improvement for the country’s economy and at the same time protecting the environment to be polluted by improper disposal of plastics.
Extend Produce Responsibility (EPR) Scheme	(Hailey, 2020; WWF-Malaysia, 2020)	The scheme was proposed in the 12 th Malaysia Plan 2021-2025. It aims to extend the responsibility of producers to the end-life of their products for the purpose of reducing the environmental impacts and financial costs. With the shared responsibility of plastic

		manufacturers in reducing plastic packaging, it helps to reduce waste generation, as well as increase the plastic recycling rate in the country.
--	--	--



CHAPTER 3

METHODOLOGY

3.1 STUDY LOCATION

This study was conducted at Klang Valley, which is located at the central of Selangor state. The regions include the Federal Territory of KL & Putrajaya, Petaling district, Klang district, Gombak district, and Hulu Langat district and Sepang district (see Appendix A) (Chan & Vu, 2017). These regions had recorded the highest pace of urbanization and active e-commerce activities, which could lead to a rapid rise in plastic waste generation. In addition, a high number of youths are studying and working in this area as there are many educational institutions and job opportunities located here. This increases the study feasibility as youths are the population where this study specifically focussed upon.

3.2 RESEARCH DESIGN

The research design of this study was a cross-sectional study that aimed to assess the level of knowledge, attitude, and practice (KAP) on usage and management of various types of plastics among youth at Klang Valley during Covid-

19 pandemic. This type of study design measures variables at a particular point in time without intervening in the participant's responses (Levin, 2006). It explains the relationship between variables after the collected data are analyzed using mathematical and statistical approaches. This study design was chosen as it is relatively inexpensive and simple to conduct.

3.3 STUDY DURATION

This study was conducted from 26 July to 10 October (11 weeks).

3.4 STUDY POPULATION AND SAMPLING

3.4.1 STUDY POPULATION

Youths at Klang Valley were the study population in this research. This group was being focused upon as they are leaders of tomorrow who are responsible for environmental sustainability. It is also a global need to have citizens be more environmentally conscious so that they can have a great influence to educate their social network in participating in the “green’ activities”.

3.4.2 SAMPLING CRITERIA

Youths with inclusive and exclusive criteria below were the respondents in this study.

3.4.2.1 INCLUSIVE CRITERIA

- Both male and female
- Malaysian
- All ethnic groups
- Aged between 18 -30 years old
- Staying at Klang Valley

3.4.2.2 EXCLUSIVE CRITERIA

Youth who practices a minimalist and/or zero waste lifestyle are excluded in this study.

3.4.3 SAMPLING UNIT

A youth aged between 18-30 years old and fulfills the sampling criteria during the course of data collection was selected as a sampling unit.

3.4.4 SAMPLING METHOD

This study was held using the convenience sampling method to recruit the respondents. It is a type of non-probability sampling method where the sample is chosen from a group of people that is easy to access (Etikan et al., 2016). The non-random sampling method was chosen because the population (youths at Klang Valley) is not well-defined, which makes it difficult to reach them by using the random sampling method. Besides, the subjects that meet certain criteria such as readily available and easy accessibility will increase the suitability of this sampling method in this study (Etikan et al., 2016). Therefore, they will be approached through social media platforms (e.g.: WhatsApp, Facebook, and Instagram) during this pandemic.

The procedures and purpose of this study were made known to the respondents before the distribution of the consent form and questionnaire. Those who had given their consent to participate in this study were required to respond to a Google Form questionnaire by clicking the link given. Due to the non-probabilistic sampling method, the data obtained from the respondents in this study cannot guarantee good representativeness of the general population and was likely to be biased (Etikan et al., 2016). However, this sampling technique was relatively quick, cheap and simple to be implemented (Taherdoost, 2016). As supported by Jager et al. (2017), increasing the homogeneity of the convenience samples could limit their disadvantages and give clearer generalizability than conventional convenience samples.

3.5 SAMPLE SIZE

The estimation of sample size was performed by using the one-sample proportion formula (Charan & Biswas, 2013), as the study determined the prevalence of respondents with good knowledge, attitude, and practice, at a 95% confidence level. The highest sample size, 307 respondents were chosen for this study. It was increased to 338 respondents after considering 10% of the non-response rate. The formula and the method to estimate sample size were presented below, while the estimated sample size for other variables was illustrated in Appendix B.

One sample proportion formula:

$$\text{Sample size } (n) = \frac{Z_{1-\frac{\alpha}{2}}^2 P(1-P)}{d^2}$$

Whereby:

$\alpha = 0.05$ level of significance; $Z_{1-\frac{\alpha}{2}} = 1.96$ of 95% confidence level

P= The prevalence of **good practice** on general plastic usage and disposal among professional course students at Annamalai University is 27.6% (0.276) (Srinivasan et al., 2019).

d= 5% or 0.05 of desired precision level

$$\begin{aligned}\text{Sample size (n)} &= \frac{1.96^2 \times 0.276 (1 - 0.276)}{0.05^2} \\ &= 307 + (307 \times 10\%) \\ &= 338\end{aligned}$$

3.6 STUDY INSTRUMENT AND DATA COLLECTION

3.6.1 QUESTIONNAIRE

The respondents need to understand the purpose and importance of the study, as well as give their consent before answering the questionnaire (see Appendix D). A self-administered questionnaire written in English and Malay was used to assess the knowledge, attitude, and practice on usage and management of various types of plastics during Covid-19 pandemic (see Appendix E). Then, the questionnaire was distributed to the respondents using online Google Forms via various social media platforms, such as WhatsApp, Facebook, and Instagram. They were also assured that their collected personal information and responses will be kept confidential by the researcher throughout and after the study.

The questionnaire is divided into 3 sections, which are Section A: Socio-demographic information (6 items), Section B: Plastic usage and management during Covid-19 pandemic (8 items), Section C: Knowledge (10 items), attitude (12 items),

and practice (11 items) on plastic usage and management. The questionnaire components are comprehensively adapted from previous studies. The knowledge components were adapted from Tan & Siti Najihah (2020), Nowakowski et al. (2020), Parashar & Hait, (2021), and Situmorang et al. (2020). The attitude components were adapted from Afroz et al. (2017) and Hammami et al. (2017); while the practice components were adapted from Khanam et al. (2019), Joseph et al. (2016) and Gündoğdu et al. (2018). The questions are in a close-response format where the respondents were responded to a predetermined list of options. They are required an estimated time of around 10 minutes to complete this questionnaire. The scoring and classification methods of KAP levels are shown as below:

SECTION C: KNOWLEDGE, ATTITUDE, AND PRACTICE

I. KNOWLEDGE ON PLASTIC USAGE AND MANAGEMENT

This section has 10 items. Each item had 3 options which were “Yes”, “No” or “Not sure”. Items 4 and 5 were negatively worded. With this, they were reversed and re-coded during the data analytical stage. The scoring method for knowledge level is stated as below:

Correct answer : score 1

Incorrect answer : score 0

The individual respondent’s score on knowledge was summed up and classified into good, moderate, and poor levels. The range of knowledge scores was 0-10. The

classification of respondents into 3 groups of knowledge level is shown as below (Ahamad & Ariffin, 2018):

Good knowledge : scores > 80% (9-10)

Moderate knowledge: scores 60-80% (6-8)

Poor knowledge : scores <60% (0-5)

II. ATTITUDE ON PLASTIC USAGE AND MANAGEMENT

This section has 12 items, and every item was measured using a 5-point Likert scale ranging from “strongly disagree, disagree, neutral, agree, and strongly agree”. The scoring method for attitude level is shown as below (Sullivan & Artino, 2013):

Strongly disagree : score 1

Disagree : score 2

Neutral : score 3

Agree : score 4

Strongly agree : score 5

The individual respondent's score on attitude was summed up and classified into good, moderate, and poor levels. The range of attitude score was 1- 60. The classification of respondents into 3 groups of attitude levels is as below (Ahamad & Ariffin, 2018):

Good attitude : scores > 80% (49-60)

Moderate attitude : scores 60-80% (36-48)

Poor attitude : scores <60% (1-35)

III. PRACTICE ON PLASTIC USAGE AND MANAGEMENT

This section has 11 items, and every item was measured using a 5-point Likert scale ranging from “never, seldom (1-2 times/semester), sometimes (1-2 times/ month), often (1-3 times per week), and always (>3 times/ week). Question 1 was negatively worded. With this, it was reversed and re-coded during the data analytical stage. The scoring method for practice level is shown as below (Sullivan & Artino, 2013).:

Never : score 1

Seldom : score 2

Sometimes : score 3

Often : score 4

Always : score 5

The individual respondent's score on practice was summed up and classified into good, moderate, and poor levels. The range of attitude score was 1- 55. The classification of respondents into 3 groups of attitude level is as below (Ahamad & Ariffin, 2018).:

Good practice : scores > 80% (45-55)

Moderate practice : scores 60-80% (33-44)

Poor practice : scores<60% (1-32)

3.7 DATA ANALYSIS

All data collected were analyzed using IBM Statistical Package for Social Science (SPSS) version 25.0. Descriptive analysis was performed to obtain the mean, frequency, percentage (%) of sociodemographic characteristics of the respondents, their frequency on plastic usage and management, and the KAP scores. The normality test, such as Kolmogorov-Smirnov and Shapiro-Wilk were conducted to determine the distribution of all the continuous variables such as age, the total score of knowledge, attitude, and practice. The bivariate analysis such as the Chi-square test (X^2) was used to determine the significant association between study variables with categorical data. More than 20 % of the cells that had an expected count of less than 5 were replaced by Fisher's Exact test. For normally distributed data, the independent t-test and one-way ANOVA will be used; otherwise, the Mann-Whitney and Kruskal-Wallis test will be replaced to compare the score of KAP among independent samples. The post hoc test will then be conducted to determine the significant pair of groups that are different from each other. Lastly, the significance level in this study was decided at $p<0.05$, which is at a 95% confidence interval. The analysed data was then presented in the form of tables, pie charts, and bar graphs.

3.8 QUALITY CONTROL

The questionnaire content was discussed and validated by an expert in the field of environmental health. The modifications were noted and corrected accordingly to improve the clarity of the questions and prevent the respondents from producing a biased answer.

The questionnaire was pre-tested on 10% of the sample size by randomly selected youths who were not from Klang Valley. Their feedback and comments were collected in order to make the appropriate improvements. The number of questions was reduced, and the grammar was corrected accordingly.

After pre-testing on 10% of the sample size, Cronbach's alpha analysis was conducted by using SPSS software to measure the internal consistency between multiple questions. The high degree of internal consistency means questions are relatable in testing the same concept (Tavakol & Dennick, 2011).

3.9 ETHICAL CONSIDERATION

Ethical approval was obtained from the Ethical Committee for Research involving Human Subjects of University Putra Malaysia (JKEUPM) with the

reference number JKEUPM-2021-377 before conducting the data collection process (see Appendix F). Only youths who gave their consent to participate in this study were recruited. Therefore, all the participation was voluntary, and the responses were assured to treat with strict confidentiality.



CHAPTER 4

RESULTS

4.1 RESPONSE RATE

The response rate of this study was 102%. Based on the sample size calculation, 338 respondents should be recruited from the study. However, the number was exceeded the calculated sample size as there were 344 respondents recruited by the end of the study to produce reliable results.

4.2 NORMALITY TEST & CRONBACH'S ALPHA ANALYSIS

The age of the respondent was not normally distributed where the Kolmogorov-Smirnov and Shapiro-Wilk significance level was <0.001 . Likewise, the scores of knowledge and attitude were also not normally distributed as the significance level was <0.001 for both. The only normally distributed variable was practice scores, in which the significance level for the test of normality was >0.05 ($p=0.061$). The graphical distribution of normality testing is shown in (see Appendix G).

The Cronbach's alpha value was 0.712 for knowledge, 0.891 for attitude, 0.768 for practice (see Appendix H). It is considered acceptable as the value is above 0.7 to 0.95 (Tavakol & Dennick, 2011).

4.3 RESPONDENT'S SOCIO-DEMOGRAPHIC CHARACTERISTICS

Table 4.1 described the socio-demographic characteristics of the respondents. All respondents were Malaysian with a mean age of 22.5 ± 2.7 years old and over half (54.1%) of them were aged between 21-23 years old. Meanwhile, the majority of the respondents comprised of females (59.3%), and the major ethnicity group was Chinese (61.3%), followed by Malay (35.5%) and Indian (2%). The majority of them were single (96.5%) and 3.5% married. As for educational level, most of the respondents hold a Bachelor's degree (67.2%), followed by Pre-university (21.5%), secondary education (5.5%), Master's degree (5.5%), and Doctoral degree (0.3%). In terms of occupational status, the highest number of the respondents were students (75.6%), followed by employee (18.6%), self-employed (3.8%), and unemployed (2%).

Table 4.1: Socio-Demographic Characteristics (N=344)

Socio-demographics characteristics	Mean (SD)	Frequency (n)	Percentage (%)
Age			
18-20	22.5 (2.7)	70	20.3
21-23		186	54.1
24-26		60	17.4
27-30		28	8.1
Gender			
Male		140	40.7
Female		204	59.3
Ethnicity			
Malay		122	35.5
Chinese		211	61.3
Indian		7	2
Others		4	1.2
Marital Status			
Single		332	96.5
Married		12	3.5
Highest Education level			
Secondary education		19	5.5
Pre-University		74	21.5
Bachelor's degree		231	67.2
Master's degree		19	5.5
Doctoral degree		1	0.3
Occupational Status			
Students		260	75.6
Employee		64	18.6
Self-employed		13	3.8
Unemployed		7	2.0

4.4 PLASTIC USAGE AND MANAGEMENT DURING COVID-19

PANDEMIC

4.4.1 MAJOR SOURCE OF PLASTIC WASTE

Figure 4.1 shows the sources of plastic waste that were majorly thrown by the respondents during this pandemic. The majority of the plastic waste came from

personal protective equipment (PPE) (n= 266, 77.3%,) such as facemasks, gloves, and hand sanitizer bottles. This was followed by online shopping (Lazada, Shopee) (n= 237, 68.9%) and food delivery (Food Panda, Grab food) (n= 237, 68.9%), food takeout (n= 178, 51.7%), online grocery shopping (n= 169, 49.1%) and grocery shopping in person (n=116, 33.7%).

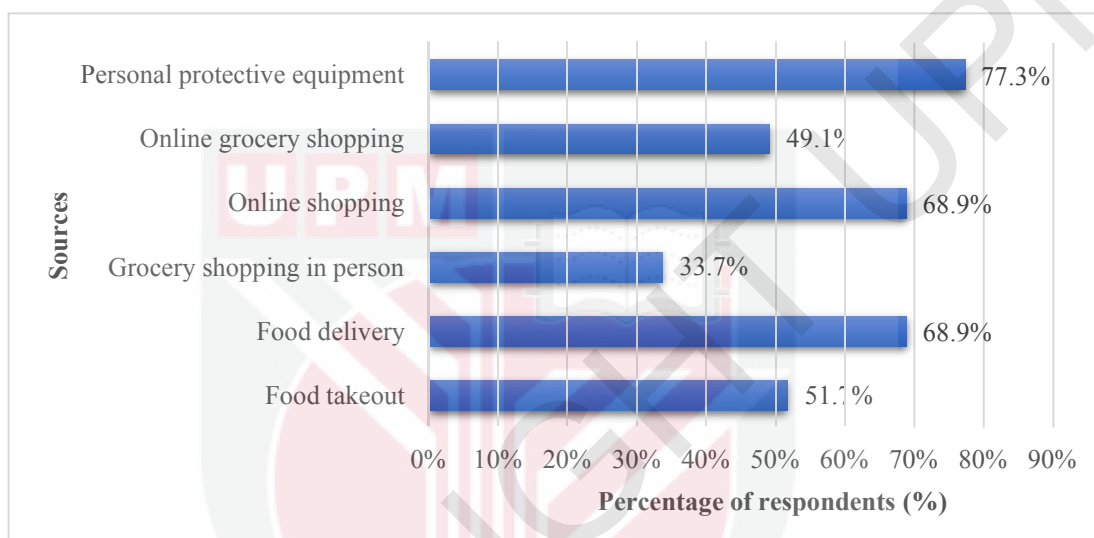


Figure 4.1: Major source (s) of plastic waste thrown by the respondents

4.4.2 FREQUENCY OF DISPOSING PPES AND OTHER SINGLE-USE PLASTIC

The majority of the respondents disposed of 1-2 pieces of PPEs (i.e., gloves, face mask, face shield) per week (Figure 4.2). For PPEs such as facemasks, highest number of youths (n=105, 30.5%) disposed it in 1-2 pieces per week, followed by 3-4 pieces per week (n=99, 28.8%), 5-6 pieces per week (n=77, 22.4%) and >7pieces per week (n=50, 14.5%). Similarly, most of the people disposed of 1- 2 pieces of face shield and gloves per week, which were recorded at 121 (35.2%) and 112 (32.6%) respectively. Only 20 (5.8%) and 26 (7.6%) of the total respondents throw the face

shield and gloves in 3-4 pieces per week, followed by 5-6 pieces per week (n=13, 3.8% and n=22, 6.4%) and >7 pieces per week (n=9, 2.6% and n=17, 4.9%). However, almost half of the respondents did not commonly use gloves and face shields in their daily life.

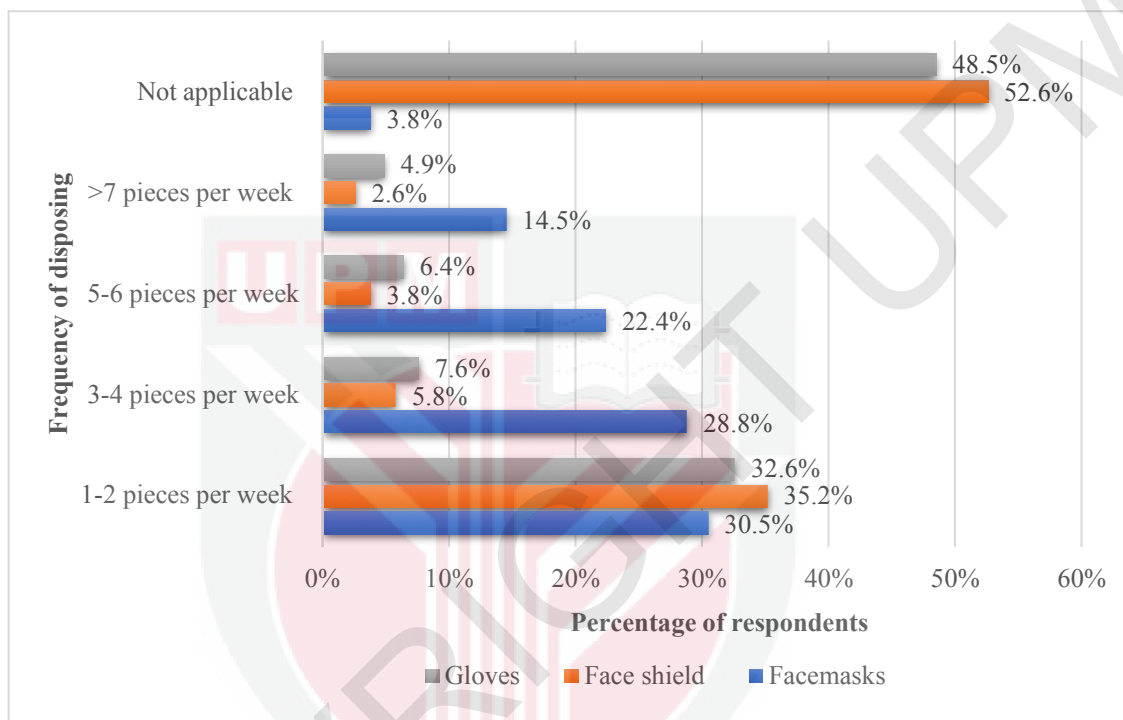


Figure 4.2: Frequency of disposing PPEs (Gloves, Face shield and Face masks) during Covid-19 pandemic

Figure 4.3 shows the frequency of disposing hand sanitizer bottles by respondents. Majority of the respondents (n=169, 49.1%) disposed 1-2 hand sanitizer bottles over 6 months, followed by 1-2 bottles per month (n=60, 17.4%) and 3-4 bottle(s) over 6 months (n=56, 16.3%). Meanwhile, only 2.0% (n=7) disposed 1-2 bottle(s) per week.

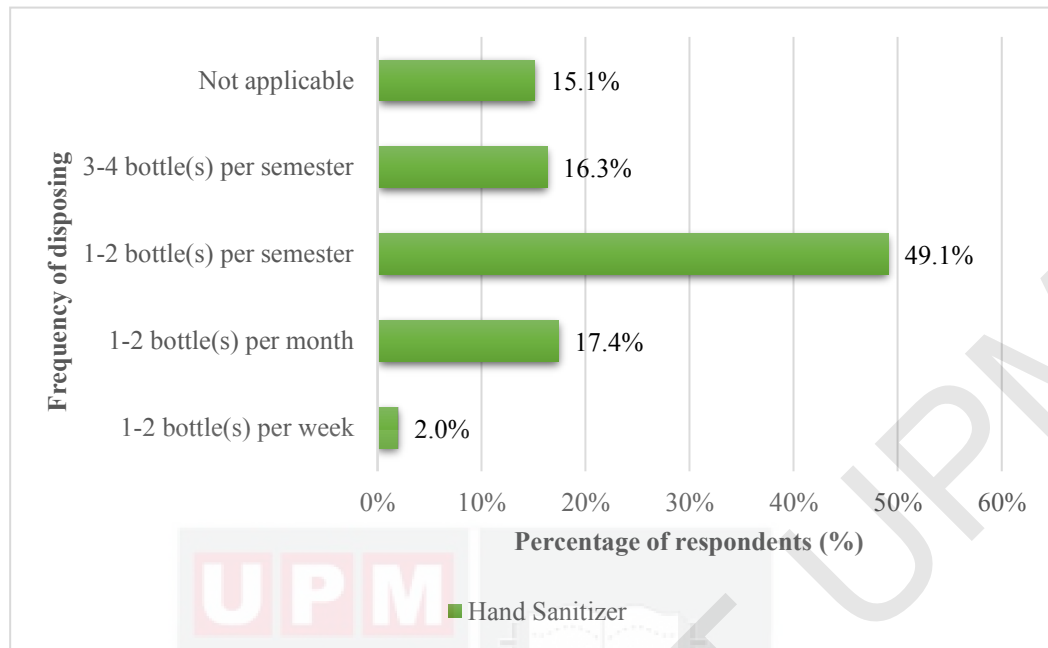


Figure 4.3: Frequency of disposing PPEs (hand sanitizer bottles) during Covid-19 pandemic

A minimum of 1-2 pieces of single-use plastics (i.e., bubble wrap (n=132, 38.4%), plastic courier bags (n=129, 37.5%), plastic bottles (n=125, 36.3%), and plastic cutleries (n=118, 34.3%)) were disposed every week by majority of the respondents during the pandemic. Plastic bags (n=110, 32%) and plastic food container (n=109, 31.7%) recorded a higher frequency of disposal, in 3-4 pieces per week. An only a small group of them (<20%) disposed of more than 7 pieces of single-use plastics per week during the pandemic.

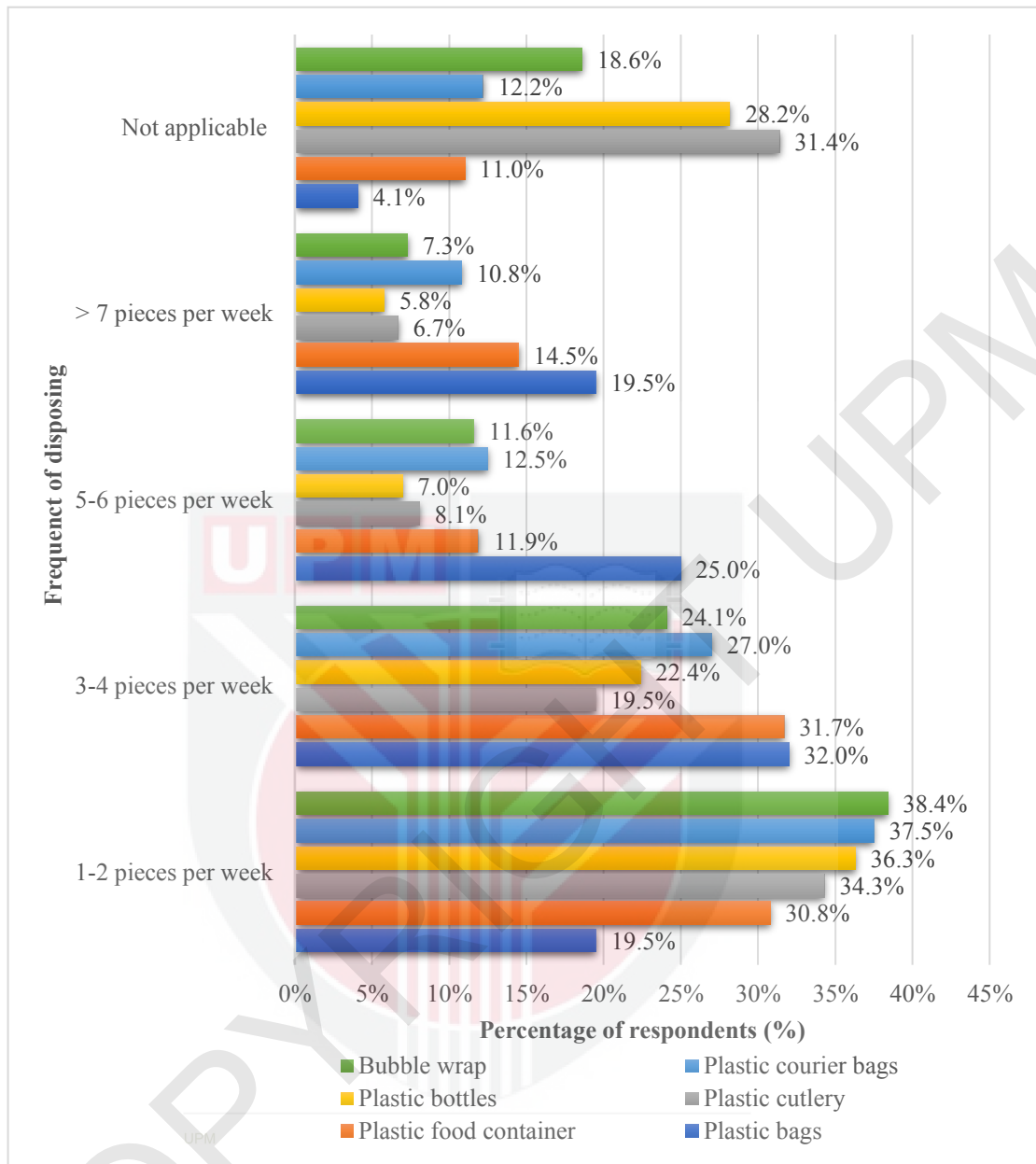


Figure 4.4: Frequency of disposing other single-use plastics during Covid-19 pandemic

4.4.3 PLASTIC WASTE MANAGEMENT METHODS ON PPES AND OTHER SUPS

In Figure 4.5, over half of the respondents disposed of face masks (n=217, 63%), face shields (n=121, 35.2%), gloves (n=127, 36.9%), and hand sanitizer

bottles (n=164, 47.7%) together with mixed domestic waste. A lesser number of the respondents disposed of them in separate bags (between 12.5% to 14.5% respondents). Few of the respondents (between 4.1% to 12.2%) disposed the PPEs together with recyclable waste and together with plastic waste (3.5% to 9.6%). Besides, between 2.3% to 7.6% of respondents were found to dispose of the PPEs wherever possible. The rest of the respondents claimed that they did not use the PPEs mentioned in the survey.

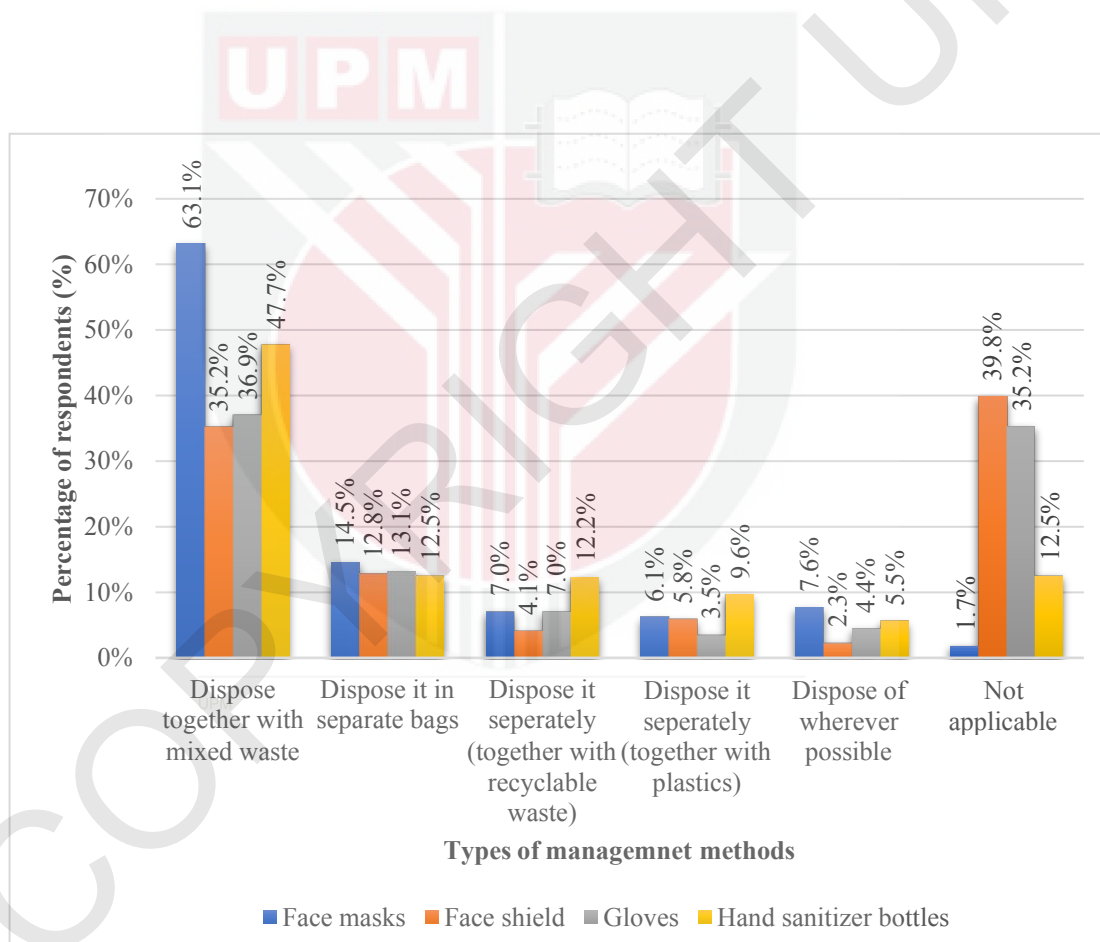


Figure 4.5: Plastic waste management methods on PPEs

As depicted in Figure 4.6, the highest number of respondents threw most of their plastic waste into the dustbin, such as bubble wrap (n=185, 53.8%), plastic courier bags (n=180, 52.3%), plastic cutlery (n=155, 45.1%), plastic food container

(n=146, 42.4%) and plastic bottles (n=127, 37%). Most of the respondents (n=169, 49.1%) chose the reusing method to manage the plastic bags despite 116 or 33.7% of them throwing their plastic bags in the dustbin. Some respondents were recorded to reuse the rest of the single-use plastics such as plastic food containers (n=124, 36%), plastic bottles (n=71, 20.6%) and plastic courier bags (n=78, 22.7%). The least number of people (n=47, 13.7%) was opted to reuse plastic cutlery. Other than that, between 7.3% to 15.4% of respondents go for reducing method to manage the single-use plastics in this study. As for recycling, respondents who recycle plastic bottles were the highest (n=73, 21.2%) as compared to other types of plastics.

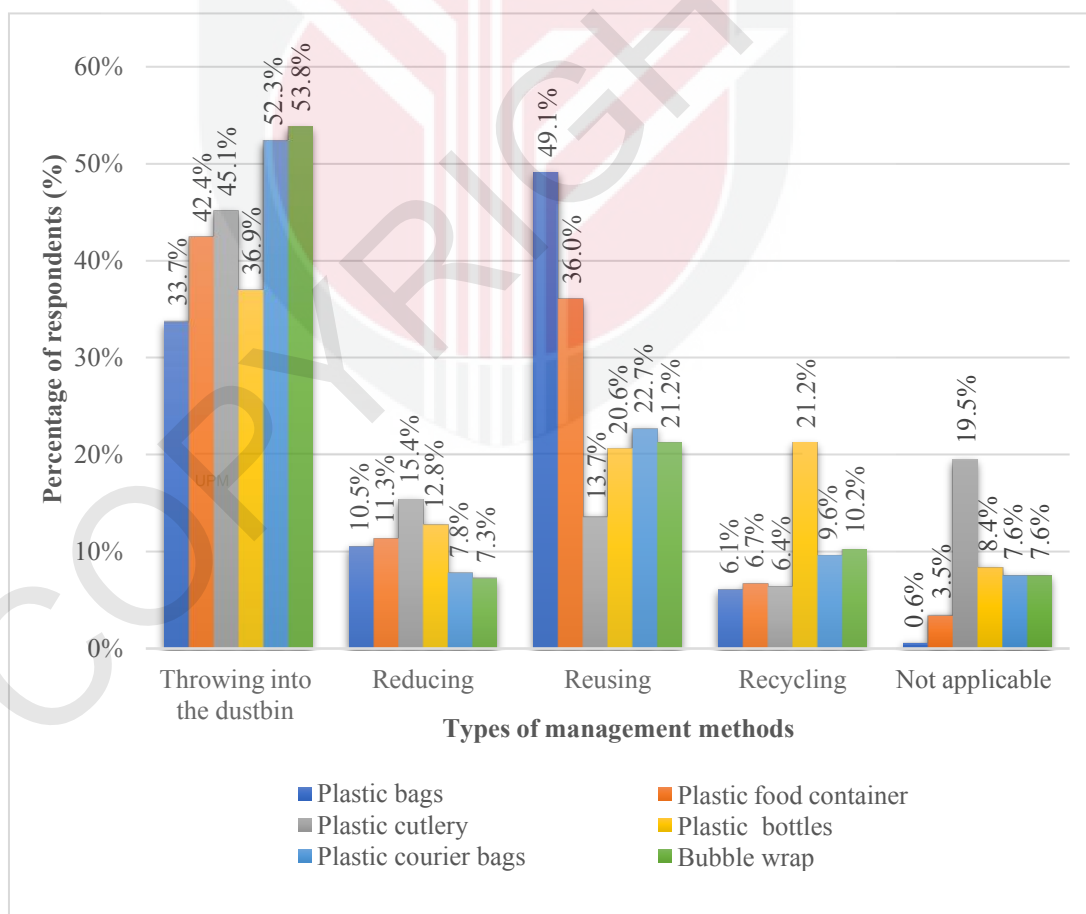


Figure 4.6: Plastic waste management methods on single-use plastics

4.4.4 REASONS FOR NOT PRACTICING SUSTAINABLE PLASTIC WASTE MANAGEMENT

About 35.3% (n=121) of respondents in this study were always practicing sustainable plastic waste management. A greater number of youths (n=142, 41.3%) stated that they were not used to a custom of sustainable plastic waste management where they felt it was troublesome and inconvenient (n=104, 30.2%), time-consuming (n=46, 13.4%). Meanwhile, 7 (2%) respondents claimed that they don't care about the environment.

Part of the respondents also gave other reasons for not implementing sustainable plastic waste management such as shortages of plastic waste management services and facilities around their residence, no support from family members, and insufficient knowledge of managing and handling plastic waste correctly.

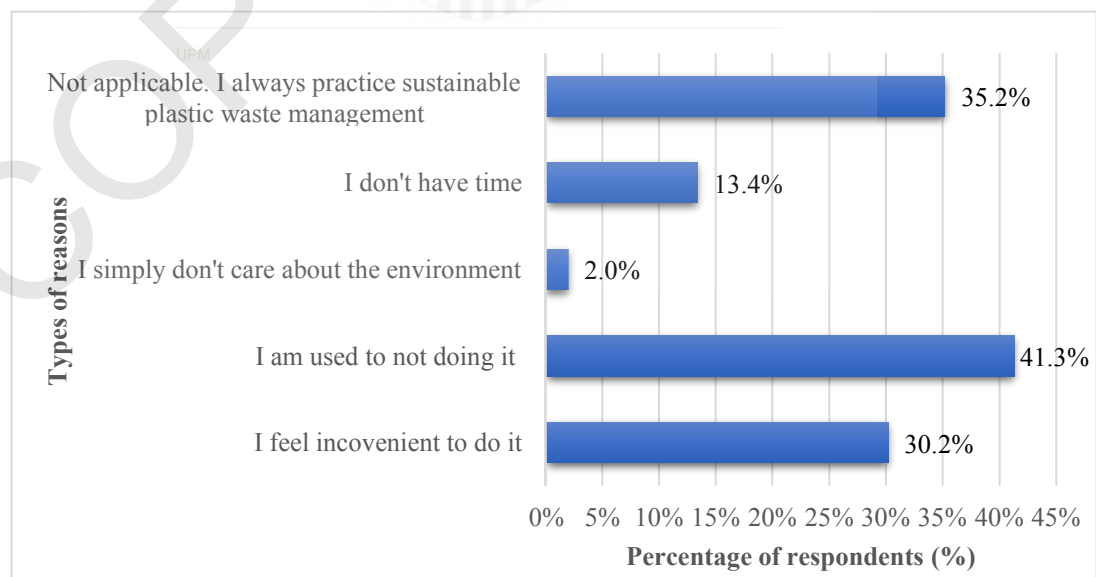


Figure 4.7: Reasons for not practicing sustainable plastic waste management

4.4.5 AWARENESS OF PLASTIC WASTE ISSUE

The majority of youths (n=285, 82.8%) were aware of the plastic waste problem that happened during the Covid-19 pandemic. Figure 4.8 shows that over half of the respondents (n=228, 66.3%) agreed that their trend of plastic usage was increasing during the Covid-19 pandemic whereas 12.2% (n=42) respondents indicate a decreasing trend of plastic usage or no obvious changes. Meanwhile, 32 respondents (9.3%) did not aware of their plastic usage trend.

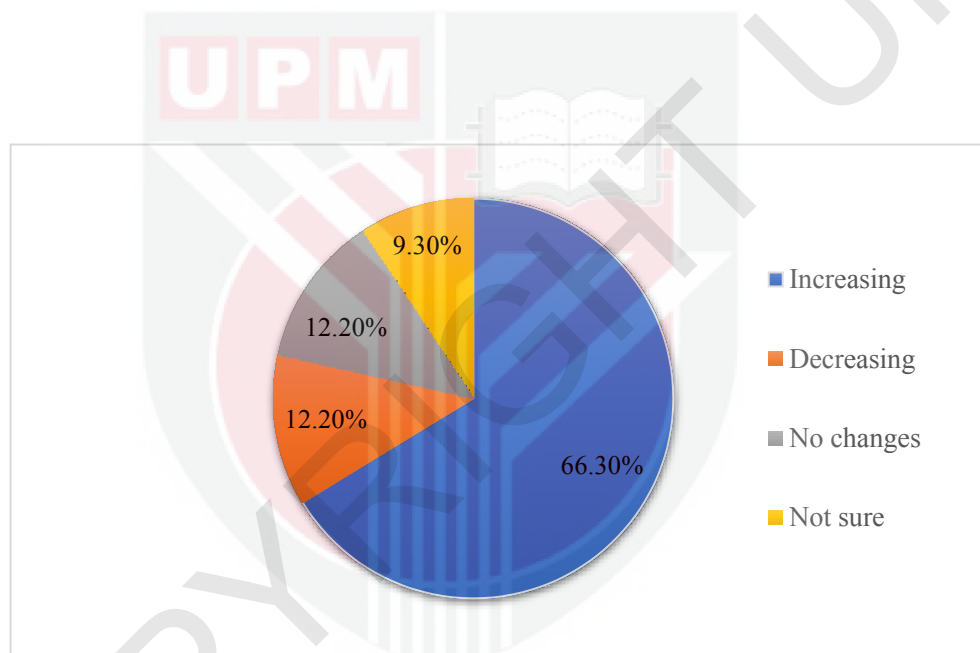


Figure 4.8: The percentage of respondents who are aware of the increasing trend in plastic usage during pandemic

4.4.6 MEDIA TYPES OF OBTAINING PLASTIC WASTE-RELATED INFORMATION

Figure 4.9 indicates 4 major media types were the sources of obtaining plastic waste-related information. Social media (n=209, 60.8%) was the most popular source of information, followed by mass media (n=97, 28.2%), personal sources (n=69,

20.1%), and formal sources (n=41, 12%). However, there were 115 respondents (33.4%) who mentioned that they did not receive any related information during this Covid-19 pandemic.

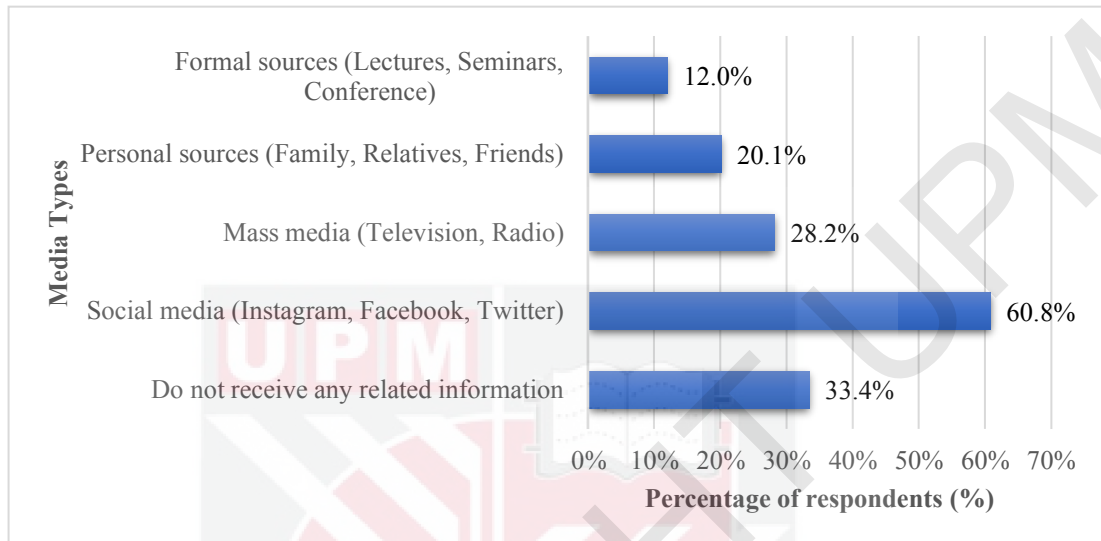


Figure 4.9: Media types of obtaining plastic waste-related information

4.5 KAP LEVELS ON PLASTIC USAGE AND MANAGEMENT

4.5.1 KNOWLEDGE LEVEL ON PLASTIC USAGE AND MANAGEMENT

Table 4.2 illustrates the respondent's level of knowledge on plastic usage and management, while Table 4.3 describes the frequency and percentage on each knowledge items. Overall, the mean score for knowledge among respondents in this study was 7.8 (SD 1.8), indicating that majority of them have a moderate level of knowledge about plastic usage and management (n=179, 52%). Meanwhile, 39.8%

of respondents (n=137) have good knowledge and only 8.1% (n=28) have poor knowledge regarding plastic usage and management.

Table 4.2: Level of knowledge on plastic usage and management (N= 344)

Knowledge Levels	Mean (SD)	Frequency (n)	Percentage (%)
Poor (0-5)		28	8.1
Moderate (6-8)	7.8 (1.8)	179	52
Good (9-10)		137	39.8

Table 4.3: Frequency and percentage on plastic usage and management knowledge items (N= 344)

No.	Items	True n (%)	False n (%)	Not sure n (%)
1	One of the major components of municipal solid waste (MSW) is plastic.	248 (72.1)	8 (2.3)	88 (25.6)
2	In Malaysia, many of the generated plastic waste is end up in landfills.	294 (85.5)	15 (4.4)	35 (10.2)
3	Covid-19 pandemic causes the increase of plastic usage in Malaysia	276 (80.2)	20 (5.8)	48 (14)
4	All plastics used can be recycled.	98 (28.5)	173 (50.3)	73 (21.2)
5	All plastics used will be decomposed over time.	87 (25.3)	197 (57.3)	60 (17.4)
6	All plastics used will be decomposed over time.	328 (95.3)	5 (1.5)	11 (3.2)
7	Increase of plastic waste will harm marine life due to entanglement and ingestion of plastic debris.	325 (94.5)	6 (1.7)	13 (3.8)
8	Increase of plastic waste will increase the potential to affect human health.	299 (86.9)	12 (3.5)	33 (9.6)
9	The possible reasons for the increase in the utilization of single-use plastics are cheapness, durability, and availability.	281 (81.7)	13 (3.8)	50 (14.5)
10	The plastic waste management approaches consist of reduce, reuse, recycle, incineration and landfilling.	262 (76.2)	25 (7.3)	57 (16.6)

4.5.2 ATTITUDE LEVEL ON PLASTIC USAGE AND MANAGEMENT

Table 4.4 illustrates the respondent's level of attitude on plastic usage and management, while Table 4.5 describes the frequency and percentage on each attitude items. The mean was recorded at 49.9 (SD 7.1) which indicates the majority of youths (n=211, 61.3%) have a good attitude toward plastic usage and management, while 34.9% of them (n=120) have moderate attitude and 3.8% (n=13) have a poor attitude.

Table 4.4: Level of attitude on plastic usage and management (N=344)

Attitude Levels	Mean (SD)	Frequency (n)	Percentage (%)
Poor (1-35)		13	3.8
Moderate (36-48)	49.9 (7.1)	120	34.9
Good (49-60)		211	61.3

Table 4.5: Frequency and percentage on plastic usage and management attitude items (N= 344)

No.	Items	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)
1	I feel guilty of my excessive use of plastics during Covid-19 pandemic.	3 (0.9)	17 (4.9)	77 (22.4)	140 (40.7)	107 (31.1)
2	I prefer to use eco-friendly bags rather than plastic bags	4 (1.2)	13 (3.8)	43 (12.5)	103 (29.9)	181 (52.6)
3	I am concerned about the risks of plastic wastes that could potentially bring to me	2 (0.6)	14 (4.1)	73 (21.2)	133 (38.7)	122 (35.5)
4	I would like to read for more information related to the effects resulting from excessive	3 (0.9)	17 (4.9)	90 (26.2)	114 (33.1)	120 (34.9)

5	plastic consumption I would like to disseminate the information regarding the issue of plastic waste problem to my friends and family members.	2 (0.6)	22 (6.4)	88 (25.6)	118 (34.3)	114 (33.1)
6	I feel that the proper plastic waste disposal is important.	2 (0.6)	4 (1.2)	29 (8.4)	111 (32.3)	198 (57.6)
7	I feel guilty if I throw plastic waste at an improper place	2 (0.6)	8 (2.3)	51 (14.8)	98 (28.5)	185 (53.8)
8	I think the 3Rs practices are a good option to reduce plastic waste.	3 (0.9)	7 (2)	38 (11)	105 (30.5)	191 (55.5)
9	I would like to reduce my use of single-use plastics	3 (0.9)	4 (1.2)	34 (9.9)	119 (34.6)	184 (53.5)
10	I tend to reuse plastic items that could be useful for me.	2 (0.6)	6 (1.7)	43 (12.5)	107 (31.1)	186 (54.1)
11	I am willing to participate in the recycling campaign that held in the future	6 (1.7)	8 (2.3)	95 (27.6)	109 (31.7)	126 (36.6)
12	I am willing to pay more for an item containing biodegradable packaging.	7 (2)	20 (5.8)	99 (28.8)	108 (31.4)	110 (32)

4.5.3 PRACTICE LEVEL ON PLASTIC USAGE AND MANAGEMENT

Table 4.6 shows the level of practice on plastic usage and management among the respondents, while Table 4.7 describes the frequency and percentage on each practice items. Overall, the mean was reported at 36.6 (SD 7.1) which indicates the majority of the youths have a moderate level of plastic usage and management practice (n = 190, 55.2%). About 55 respondents (16%) with good practice levels and 99 (28.8%) with poor practice levels.

Table 4.6: Level of practice on plastic usage and management (N=344)

Practice Levels	Mean (SD)	Frequency (n)	Percentage (%)
Poor (1-32)		99	28.8
Moderate (33-44)	36.6 (7.1)	190	55.2
Good (45-55)		55	16

Table 4.7: Frequency and percentage on plastic usage and management practice items (N= 344)

No.	Items	Never n (%)	Seldom n (%)	Sometimes n (%)	Often (%)	Always (%)
1	I ask for single-use plastic cutlery when taking out food	83 (24.1)	112 (32.6)	72 (20.9)	46 (13.4)	31 (9)
2	When I buy anything, I take care that the packaging is plastic or not.	43 (12.5)	71 (20.6)	112 (32.6)	78 (22.7)	40 (11.6)
3	I dispose plastic waste in a responsible manner	9 (2.6)	39 (11.3)	118 (34.3)	107 (31.1)	71 (20.6)
4	I separate the recyclable plastic waste from the general waste before disposal.	56 (16.3)	68 (19.8)	95 (27.6)	84 (24.4)	41 (11.9)
5	I bring reusable bags when going shopping.	9 (2.6)	31 (9)	58 (16.9)	105 (30.5)	141 (41)
6	I use my own container to take away food.	44 (12.8)	62 (18)	98 (28.5)	78 (22.7)	62 (18)
7	I reuse my plastic bags after their initial usage.	2 (0.6)	14 (4.1)	51 (14.8)	108 (31.4)	169 (49.1)
8	I upcycle (creative reuse) the plastic waste.	36 (10.5)	72 (20.9)	90 (26.2)	89 (25.9)	57 (16.6)
9	I throw the recyclable plastic waste into the recycle bin.	19 (5.5)	50 (14.5)	101 (29.4)	100 (29.1)	74 (21.5)
10	I collect plastic waste and sell it to the recycling agent.	80 (23.3)	74 (21.5)	80 (23.3)	68 (19.8)	42 (12.2)
11	I search for any information related to plastic waste management.	66 (19.2)	78 (22.7)	90 (26.2)	71 (20.6)	39 (11.3)

4.6 COMPARISON BETWEEN THE SCORE OF KAP ON PLASTIC USAGE AND MANAGEMENT AMONG YOUTHS BY THEIR SOCIO-DEMOGRAPHIC FACTORS

4.6.1 SOCIO-DEMOGRAPHIC FACTORS VS SCORE OF KNOWLEDGE ON PLASTIC USAGE AND MANAGEMENT

The knowledge score was significantly different between age ($\chi^2= 20.765$, $p<0.001$), marital status ($z= -2.076$, $p=0.038$), and highest education level ($\chi^2=19.256$, $p=0.001$) (Table 4.8). From the post hoc test, the score of knowledge among those who aged 21-23 [7.9 (SD 1.7), $p=0.02$], 24-26 [8.1 (SD 1.6), $p=0.003$], and 27-30 [8.3 (SD 2), $p=0.001$] were significantly higher than those who aged between 18-20 [7.1 (SD 1.9)]. Besides, youths who have married [8.6 (SD 1.9)] showed a higher knowledge score than single person [7.8 (SD 1.8)]. The respondents with Bachelor's degree [8 (SD 1.6), $p=0.022$] and Master's degree [8 (SD 2.4), $p=0.032$] had greater knowledge scores as compared to those with secondary education [6.4 (SD 2.5)].

Table 4.8: Comparison between the socio-demographics factors and score of knowledge on plastic usage and management

Variables	Score of Knowledge	z	χ^2	p- value
	Mean (SD)			
Age^b				
18-20**	7.1 (1.9)		20.765	<0.001*
21-23**	7.9 (1.7)			
24-26**	8.1 (1.6)			
27-30**	8.3 (2)			
Gender^a				
Male	7.8 (1.8)	0.361		0.718
Female	7.8 (1.7)			
Ethnicity^b				
Malay	7.8 (1.7)		0.816	0.846
Chinese	7.8 (1.8)			
Indian	8.4 (0.8)			
Others	8 (0.8)			
Marital Status^a				
Single	7.8 (1.8)	-2.076		0.038*
Married	8.6 (1.9)			
Highest Education level^b				
Secondary education**	6.4 (2.5)		19.256	0.001*
Pre-University	7.5 (1.8)			
Bachelor's degree**	8 (1.6)			
Master's degree**	8 (2.4)			
Occupational Status^b				
Students	7.7 (1.8)		6.895	0.075
Employee	8.1 (1.8)			
Self-employed	8.5 (1.6)			
Unemployed	8 (1.3)			

* Significant at $p < 0.05$

** Significant differences obtained by Post hoc test ($p < 0.05$)

18-20 – 21-23, $p = 0.02$

18-20 – 24-26, $p = 0.003$

18-20 – 27-30, $p = 0.001$

Secondary education- Bachelor's degree, $p = 0.022$

Secondary education- Master's degree, $p = 0.032$

a. Mann- Whitney U Test

b. Kruskal-Wallis Test

4.6.2 SOCIO-DEMOGRAPHIC FACTORS VS SCORE OF ATTITUDE ON PLASTIC USAGE AND MANAGEMENT

The attitude score in this study was significantly different by the education level ($\chi^2 = 20.605$, $p < 0.001$) (Table 4.9). For example, the score of attitude among youths from pre-university [49.6 (SD 6.8)] and Bachelor's degree [50.7 (SD 6.9)] was significantly higher compared to those from secondary education [43.3 (SD 6.9)], at $p = 0.019$ and $p < 0.001$ respectively.

Table 4.9: Comparison between the socio-demographics factors and score on attitude on plastic usage and management

Variables	Score of Attitude Mean (SD)	z	χ^2	p-value
Age^b				
18-20	48.6 (7.5)			
21-23	50.7 (6.4)		3.565	0.312
24-26	49.9 (6.8)			
27-30	48.1 (10.2)			
Gender^a				
Male	49.5 (7.4)	-0.907		0.364
Female	50.3 (7)			
Ethnicity^b				
Malay	50.9 (7.2)			
Chinese	49.3 (7.1)		6.762	0.08
Indian	53 (7.2)			
Others	49.5 (4.4)			
Marital Status^a				
Single	49.9 (7.2)	-0.998		0.318
Married	51.9 (6.5)			
Highest Education level^b				
Secondary education**	43.3 (6.9)			
Pre-University**	49.6 (6.8)		20.605	<0.001*
Bachelor's degree**	50.7 (6.9)			
Master's degree	50.1 (6.8)			
Occupational Status^b				
Students	50 (7)			
Employee	49.8 (7.2)		1.171	0.760
Self-employed	47.5 (10.3)			
Unemployed	52.1 (4.3)			

* Significant at $p < 0.05$.

** Significant differences obtained by Post hoc test ($p < 0.05$)

Secondary education - Pre-university, $p = 0.019$

Secondary education - Bachelor's degree, $p < 0.001$.

a. Mann-Whitney U Test

b. Kruskal-Wallis Test

4.6.3 SOCIO-DEMOGRAPHIC FACTORS VS SCORE OF PRACTICE ON PLASTIC USAGE AND MANAGEMENT

From Table 4.10, the results indicate that there were no significant differences between all sociodemographic factors with the score of practice on plastic usage and management among youths as all the p-values were greater than 0.05.

Table 4.10: Comparison between the socio-demographics factors and score of practice on plastic usage and management

Variables	Score of Practice	z	χ^2	p-value
	Mean (SD)			
Age^b				
18-20	35.7 (7.2)			
21-23	36.9 (6.9)			
24-26	36.5 (7)		1.905	0.592
27-30	36.9 (9.1)			
Gender^a				
Male	37.4 (6.9)			
Female	36.1 (7.3)	1.877		0.061
Ethnicity^b				
Malay	36 (7.5)			
Chinese	37 (6.7)			
Indian	38.1 (9.4)		3.094	0.377
Others	30 (10.9)			
Marital Status^a				
Single	36.6 (7.2)			
Married	37 (6.8)	-0.219		0.827
Highest Education level^b				
Secondary education	33.9 (6.3)			
Pre-University	37 (6.3)			
Bachelor's degree	36.7 (7.3)		7.465	0.113
Master's degree	38.2 (7)			
Occupational Status^b				
Students	36.4 (7.1)			
Employee	36.5 (7.3)			
Self-employed	39.3 (6.2)		2.744	0.433
Unemployed	38.9 (6.8)			

a. Mann- Whitney U Test

b. Kruskal-Wallis Test

4.7 ASSOCIATION BETWEEN THE SOCIO-DEMOGRAPHICS FACTORS WITH THE KAP LEVEL ON PLASTIC USAGE AND MANAGEMENT

4.7.1 SOCIO-DEMOGRAPHICS FACTORS WITH THE LEVEL OF KNOWLEDGE ON PLASTIC USAGE AND MANAGEMENT

In this study, there was a significant association between age and knowledge level on plastic usage and management ($\chi^2=14.191$, $df=6$, $p=0.028$). Majority of the respondents (57.1%) aged between 27-30 had good knowledge, followed by those who aged between 24-26 (46.7%), 21-23 (41.4%), and 18-20 (22.9%).

Besides, this study also revealed that there was a significant association between educational level with the level of knowledge ($\chi^2=35.354$, $df=8$, $p<0.001$), in which 68.4% of respondents with Master's degree, 43.3% with Bachelor's degree, 27% from pre-university, and 21.1% from secondary education had good knowledge on plastic usage and management. However, gender, ethnicity, marital status, and occupational status were not significantly associated with the knowledge level.

Table 4.11: Association between the socio-demographics factors and the level of knowledge on plastic usage and management

Variables	Knowledge level			Test statistics		
	Poor n (%)	Moderate n (%)	Good n (%)	χ^2	df	p-value
Age[^]						
18-20	9 (12.9)	45 (64.3)	16 (22.9)	14.191	6	0.028*
21-23	13 (7)	96 (51.6)	77 (41.4)			
24-26	4 (6.7)	28 (46.7)	28 (46.7)			
27-30	2 (7.1)	10 (35.7)	16 (57.1)			
Gender[^]						
Male	12 (8.6)	72 (51.4)	56 (40)	0.073	2	0.964
Female	16 (7.8)	107 (52.5)	81 (39.7)			
Ethnicity[#]						
Malay	14 (11.5)	59 (48.4)	49 (40.2)	4.038	6	0.633
Chinese	14 (6.6)	114 (54)	83 (39.3)			
Indian	0	3 (42.9)	4 (57.1)			
Others	0	3 (75)	1 (25)			
Marital Status[#]						
Single	27 (8.1)	176 (53)	129 (38.9)	4.055	2	0.108
Married	1 (8.3)	3 (25)	8 (66.7)			
Highest Education level[#]						
Secondary education	6 (31.6)	9 (47.4)	4 (21.1)	35.354	8	<0.001*
Pre-University	4 (5.4)	50 (67.6)	20 (27)			
Bachelor's degree	14 (6.1)	117 (50.6)	100 (43.3)			
Master's degree	3 (15.8)	3 (15.8)	13 (68.4)			
Doctorate degree	1 (100)	0	0			
Occupational Status[#]						
Students	23 (8.8)	141 (54.2)	96 (36.9)	5.182	6	0.470
Employee	4 (6.3)	31 (48.4)	29 (45.3)			
Self-employed	1 (7.7)	4 (30.8)	8 (61.5)			
Unemployed	0	3 (42.9)	4 (57.1)			

* Significant at $p < 0.05$

Fischer's Exact Test

[^] Pearson Chi-square Test

4.7.2 SOCIO-DEMOGRAPHICS FACTORS WITH LEVEL OF ATTITUDE ON PLASTIC USAGE AND MANAGEMENT

The association between socio-demographic factors with the level of attitude regarding plastic usage and management is described in Table 4.12. The only factor that was significantly associated with attitude level was the education level of the respondents ($\chi^2=23.217$, $df=8$, $p<0.001$). The respondents who have secondary education had a higher percentage (63.2%) of having a moderate level of attitude towards plastic usage and management. The higher number of respondents who come from pre-university (56.8%), Bachelor's degree (66.7%), and Master's degree (52.6) were reported as having good attitude levels.

Table 4.12: Association between the socio-demographics factors with level of attitude on plastic usage and management (N=344)

Variables	Attitude level			Test statistics		
	Poor n (%)	Moderate n (%)	Good n (%)	χ^2	df	p-value
Age[#]						
18-20	3 (4.3)	28 (40)	39 (55.7)	10.407	6	0.086
21-23	3 (1.6)	64 (34.4)	119 (64)			
24-26	3 (5)	20 (33.3)	37 (61.7)			
27-30	4 (14.3)	8 (28.6)	16 (57.1)			
Gender[^]						
Male	7 (5)	52 (37.1)	81 (57.9)	1.743	2	0.418
Female	6 (2.9)	68 (33.3)	130 (63.7)			
Ethnicity[#]						
Malay	6 (4.9)	34 (27.9)	82 (67.2)	5.688	6	0.432
Chinese	7 (3.3)	82 (38.9)	122 (57.8)			
Indian	0	2 (28.6)	5 (71.4)			
Others	0	2 (50)	2 (50)			
Marital Status[#]						
Single	13 (3.9)	116 (34.9)	203 (61.1)	0.061	2	1.000
Married	0	4 (33.3)	8 (66.7)			
Highest Education level[#]						
Secondary education	2 (10.5)	12 (63.2)	5 (26.3)	23.217	8	<0.001*
Pre-University	2 (2.7)	30 (40.5)	42 (56.8)			
Bachelor's degree	7 (3.0)	70 (30.3)	154 (66.7)			
Master's degree	1 (5.3)	8 (42.1)	10 (52.6)			
Doctorate degree	1 (100)	0	0			
Occupational Status[#]						
Students	7 (2.7)	95 (36.5)	158 (60.8)	8.110	6	0.186
Employee	5 (7.8)	18 (28.1)	41 (64.1)			
Self-employed	1 (7.7)	6 (46.2)	6 (46.2)			
Unemployed	0	1 (14.3)	6 (85.7)			

* Significant at $p < 0.05$

Fischer's Exact Test

^ Pearson Chi-square Test

4.7.3 SOCIO-DEMOGRAPHICS FACTORS WITH THE LEVEL OF PRACTICE ON PLASTIC USAGE AND MANAGEMENT

Table 4.13 indicates that there was no significant association between the socio-demographic factors of youths with their level of practice on plastic usage and management in this study.



Table 4.13: Association between the socio-demographics factors with level of practice on plastic usage and management (N=344)

Variables	Practice level			Test statistics		
	Poor n (%)	Moderate n (%)	Good n (%)	χ^2	df	p-value
Age[^]						
18-20	22 (31.4)	37 (52.9)	11 (15.7)	1.670	6	0.947
21-23	52 (28)	105 (56.5)	29 (15.6)			
24-26	19 (31.7)	32 (53.3)	9 (15)			
27-30	6 (21.4)	16 (57.1)	6 (21.4)			
Gender[^]						
Male	34 (24.3)	79 (56.4)	27 (19.3)	3.323	2	0.190
Female	65 (31.9)	111 (54.4)	28 (13.7)			
Ethnicity[#]						
Malay	41 (33.6)	64 (52.5)	17 (13.9)	4.792	6	0.531
Chinese	54 (25.6)	121 (57.3)	36 (17.1)			
Indian	2 (28.6)	3 (42.9)	2 (28.6)			
Others	2 (50)	2 (50)	0			
Marital Status[#]						
Single	96 (28.9)	184 (55.4)	52 (15.7)	0.989	2	0.659
Married	3 (25)	6 (50)	3 (25)			
Highest Education level[#]						
Secondary education	7 (36.8)	11 (57.9)	1 (5.3)	12.638	8	0.093
Pre-University	14 (18.9)	51 (68.9)	9 (12.2)			
Bachelor's degree	72 (31.2)	119 (51.5)	40 (17.3)			
Master's degree	5 (26.3)	9 (47.4)	5 (26.3)			
Doctorate degree	1 (100)	0	0			
Occupational Status[#]						
Students	79 (30.4)	141 (54.2)	40 (15.4)	7.374	6	0.252
Employee	19 (29.7)	35 (54.7)	10 (15.6)			
Self-employed	1 (7.7)	8 (61.5)	4 (30.8)			
Unemployed	0	6 (85.7)	1 (14.3)			

Fischer's Exact Test

[^] Pearson Chi-square Test

4.8 ASSOCIATION BETWEEN KAP LEVEL OF PLASTIC USAGE AND MANAGEMENT AMONG THE RESPONDENTS

Table 4.14 showed that there was no significant association between the knowledge and practice regarding plastic usage and management ($\chi^2=5.968$, $df=4$, $p=0.202$). Out of the 179 respondents with a moderate level of knowledge, most of them also practice moderately ($n=109$, 60.9%).

There was a significant association between attitude and practice ($\chi^2=25.146$, $df=4$, $p<0.001$) where respondents with a good level of attitude in this study ($n=211$) were found to practice moderately ($n=121$, 57.3%).

Furthermore, there was also a significant association between knowledge and attitude level of plastic usage and management ($\chi^2=28.233$, $df=4$, $p<0.001$). Among 179 of the respondents with a moderate level of knowledge, most of them ($n=102$, 57%) had a good level of attitude.

Table 4.14: Pearson's Chi-square Test for the Association of KAP levels on Plastic Usage and Management

Variables		Practice			Test statistics		
		Poor n (%)	Moderate n (%)	Good n (%)	χ^2	df	p-value
Knowledge	Poor	9(32.1)	15(53.6)	4(14.3)	5.968	4	0.202
	Moderate (n=179)	47(26.3)	109(60.9)	23(12.8)			
	Good	43(31.4)	66(48.2)	28(20.4)			
Attitude	Poor	7(53.8)	5(38.5)	1(7.7)	25.146	4	<0.001*
	Moderate	48(40)	64(53.3)	8(6.7)			
	Good (n=211)	44(20.9)	121(57.3)	46(21.8)			
Variables		Attitude			Test statistics		
		Poor n (%)	Moderate n (%)	Good n (%)	χ^2	df	p-value
Knowledge	Poor	5(17.9)	13(46.4)	10(35.7)	28.233	4	<0.001*
	Moderate (n=179)	5(2.8)	72(40.2)	102(57)			
	Good	3(2.2)	35(25.5)	99(72.3)			

* Significant at $p < 0.05$

CHAPTER 5

DISCUSSION

5.1 PLASTIC USAGE AND MANAGEMENT OF RESPONDENTS DURING COVID-19 PANDEMIC

The Covid-19 pandemic not only brings a devastating effect on the population's health but also on the environment. To date, only a handful of studies had published data that determine where the plastic consumption and management patterns of youths stand as well as their KAP level towards this issue, specifically in Malaysia. The shift in plastic consumption behaviour along with its uncertainties makes it critical for the government to plan future initiatives that strike the balance between public and environmental safety. Therefore, it is of utmost importance for KAP levels of youths to be investigated to guide this effort.

As reported, the top 3 sources of plastic waste that were majorly generated by youths was coming from personal protective equipment (PPE), followed by online shopping (Lazada, Shopee) and food delivery (Food Panda, Grab food). This was supported by Patrício Silva et al. (2021) who they reviewed that the Covid-19 pandemic has led to the surge of plastic-based PPEs and single-use plastics (SUPs) that are generated from takeaway services and e-commerce shopping. Compared to

the pre-Covid-19 pandemic, the containers and packaging category contributed to the greatest plastic waste volume with over 14.5 million tons in 2018 (US EPA, 2021). This shows that the plastic-based PPEs are the newly added plastic burden that could impose a significant impact on human and environmental health.

In terms of frequency of PPEs disposal, the majority of respondents disposed of facemasks, face shields, and gloves for 1-2 pieces per week, while hand sanitizer bottles were disposed of less frequently in 1-2 bottles per semester. People are wearing these PPEs because they are mandated and recommended by the government to minimize the risk of disease transmission. The minimal frequency of PPEs disposal was achieved as most of the youths are currently studying at home. The hand sanitizer is also refillable and can be used for a certain period. These plastic-based PPEs with high demand during pandemics have led to the increase of plastic waste generation. As reported by Prata et al. (2020), an estimated 130 billion face masks and 64 billion gloves were used globally each month during the pandemic.

Besides, a minimum of 1-2 pieces of single-use plastics (bubble wraps, plastic courier bags, plastic cutleries, and plastic bottles) were disposed of every week by the majority of the respondents during the pandemic. People who disposed of plastic food containers and plastic bags were recorded in a more frequent means, with 3-4 pieces per week. This was justified by the Juwai IQI's latest survey on Covid-19, in which 57% of Malaysians are more frequent to shop online compared to pre-pandemic (Bernama, 2021). Yeo (2021) also reported the emerging plastic threats in Malaysia as 148 thousand tonnes of plastic waste came from food

packaging alone. No exact data was reported on the plastic waste volume in the landfills of Malaysia during the pandemic. However, an estimated 1.6 million tonnes of global plastic wastes were discarded daily as a result of Covid-19 (Benson et al., 2021).

It is also important to note that the mismanagement of plastic waste will induce significant challenges to human and environmental health. In this study, the used PPEs and other single-used plastics were commonly disposed of with the general waste which will eventually end up in the landfills. This is similar to the survey conducted by Mejjad et al. (2021), where 70% of the Moroccan population discarded their masks and gloves in the general dustbin after their first use. According to USEPA (2021), 27 million tons of plastic were dumped at landfills in 2018. This is the least favoured option to dispose of waste according to the waste management hierarchy as the study conducted by Sharifah Norkhadijah and Latifah (2013) highlighted the future difficulties in finding suitable landfills to locate in Malaysia. However, the majority of the youths (49.1%) in this study claimed that they tend to reuse plastic bags rather than other practices. This number is 2 times higher than the study in Joseph et al. (2016), where they disclosed that only 20% of the participant like to reuse plastic bags after the initial usage. The plausible reasons for them to reuse plastics bags were quoted as being inexpensive, multipurpose, lightweight, and convenient as it is easy to store and carry (Hammami et al., 2017; Srinivasan et al., 2019). However, this data is not sufficient to support sustainable environmental practices as the cases of plastic bags pollution at the river, ocean, and roadside are often reported in many news media and studies (Hyde, 2018; Jambeck et al., 2015).

Improper plastic waste ended up in the environment could lead to the emission of CO₂ and methane gas into the atmosphere during the degradation process (Chandegara et al., 2015). Lee et al. (2021) also disclosed that the disposable surgical face masks had contributed to approximately 0.6 kg of carbon dioxide (CO₂) emission to climate change. Furthermore, the plastic degradation process based on abiotic and biotic factors could impart the plastic additives into the leachate and thereby contaminate soil and water when the leachate seeps through. This toxicant will integrate into the human body and eventually poses undue risks to human health. For example, the review from Seachrist et al. (2016) justified that the disturbance of estrogen increases the probability of breast and prostate cancer if humans are exposed to BPA in their early life.

5.2 KAP LEVEL ON PLASTIC USAGE AND MANAGEMENT

5.2.1 KNOWLEDGE LEVEL

From this study, over half of the respondents (52%) had a moderate level of knowledge, while about 40% of them had a good level of knowledge on plastic usage and management. The result was consistent with Praveena (2019), where 45% of the respondents demonstrated a moderate level of knowledge of plastic health hazards, however, none of the respondents had a good knowledge level. Likewise, Srinivasan et al. (2019) performed a study to assess the knowledge on plastics among the

professional course students in India and noted to obtain a similar result (46% of respondents) with good knowledge level. They also claimed the result was relatively low compared with the previous studies. Although the majority of youths had a knowledge status on plastics that was above the moderate level, a lower percentage was observed in 2 items: “only 50.3% and 57.3% of the respondents know that not all plastics used can be recycled or decomposed over time”. These findings were found lower as compared to the university students in University Putra Malaysia Serdang, where 85.2.% of them had higher knowledge levels about recycling (Nordin & Saliluddin, 2016). Chaudhary et al. (2020) also disclosed that 88% of the students knew the non-biodegradable nature of the plastics, and it was increased to 94% after the plastic-related information has been delivered during the seminar. In Malaysia, the common plastics that are usually recycled are Code 1: PET, Code 2: HDPE, and Code 5: PP (Chen et al., 2021). However, many types of plastics are not because it is not economically viable, and the end-product is of lower quality than what has been put in.

It is not surprising that the majority of youths are having knowledge above moderate level as they have higher literacy levels. It is also depending on the sources of acquiring information, which includes formal resources, personal resources, social media, and media massa (Ahamad & Ariffin, 2018). In this study, social media was the primary source in obtaining plastic-related information, thus denoting the importance of the internet among youths. It is one of the most utilized platforms for disseminating news and information to the public throughout the world (Westerman et al., 2014). It can also be explained by the easy and increasing access to the internet as they are considered as the tech-savvy generation nowadays. Although most of the

respondents acquired a moderate level of knowledge on plastic usage and management, many of them were still aware of their trend of plastic usage during this pandemic.

5.2.2 ATTITUDE LEVEL

Furthermore, the favorable attitude level found in this study has corresponded to the results of studies from Nelamangala and Wardha city in India (Khanam et al., 2019; Malik & Roy, 2015). Out of 12 items, 8 items received more than 70% of the agreement. Item 6 (proper plastic waste disposal is important) received the highest agreement from the respondents at 90%. It is supported by Roche Cerasi et al. (2021), where 95% of citizens strongly believed that good plastic disposal methods such as recycling can help to turn waste into new products which serve as valuable resources for the community, and 97% agreed that reducing and recycling of plastics helps to protect the environment from the pollution. Besides, about 88% of respondents were agreed to reduce the use of single-use plastics in their daily lives. These findings were similar to the study in India where almost all of the respondents were well-prepared in reducing the usage of plastic bags (Babu & James, 2016).

The item on the willingness to participate in the recycling program in the future has received the agreement at only 68.3%. However, it was 2 times higher as compared to the household levels in Malaysia, which recorded at 35% (Afroz et al., 2017). The plausible reason behind this is that the respondents did not see the benefits of what they do. As supported by Otitoju, (2014), they claimed that people

are more likely to participate in recycling programs if they knew the benefits of recycling and methods of managing waste, and involve in the program designing stage.

Besides, the respondents also showed slightly lower results regarding “willingness to pay more for an item containing biodegradable plastics”, “willingness to disseminate information regarding the issue of plastic waste problem to friends and family members”, and “willingness to read for more information related to the effects resulting from excessive plastic consumption”. The former item was corroborated by the review conducted by Ketelsen et al. (2020), where they found that a possible reason for not selecting green packaging is because consumers perceived price and product quality more highly than eco-friendly packaging. In addition, the finding could also be due to the impact of socio-economic status as the majority of the respondents were still students. Lack of proactivity in disseminating information to others is owing to the over-reliance on the information obtained from the internet. It is highlighted in the study conducted by Smyth (2016), whereby the society nowadays tends to depend on technology which in turn limits them to participate in wider information dissemination.

5.2.3 PRACTICE LEVEL

A good attitude was found not necessarily to have better practice as this study showed a higher percentage of youths had only fair practice level (55.2%). Similarly, Ahamad & Ariffin (2018) revealed that most of the students (49.2%) had an

acceptable level of practice on sustainable consumption. Besides, this is also consistent with the residents in Thailand as the majority of them (59%) performed moderate practice on solid waste management (Laor et al., 2018). Barloa et al. (2016) also conducted a similar study among undergraduate students in Philippines, and they reported that only less than half (43.1%) of the students had satisfactory practice level on waste management, while 56.9% needs further improvement. However, this study shows a positive result when compared to the study of Srinivasan et al. (2019), where they disclosed that only 38.7% of students from various study courses demonstrated moderate practice on it.

The highest item practiced was “bring reusable bags when going shopping” and “reuse the plastic bags after initial usage”, where the respondents who always practice this were recorded at 41% and 49.1% respectively. These items translate into sustainable consumption where the plastic footprint will be increased if an immense amount of plastics are used.

In addition, youths were asked to identify their reasons for not practicing sustainable plastic waste management. Many of them claimed that they were not used to a custom of sustainable practices as it was troublesome and time-consuming. Some of them claimed that they are simply don't care about the environment. The result on “not used to practice it” was higher as compared to the result in Ahamad & Ariffin (2018), which recorded as 28.3% of respondents. Some also believe that it is due to the limited plastic waste management services and facilities and lack of support from family members. As reported by Nua (2020), about 2-3 billion people

worldwide were inaccessible to waste collection and waste disposal services. People feel that it was inconvenient for them as they need to drive far away to drop their recyclable waste at the facilities. Other reasons include insufficient knowledge of managing and handling plastic waste correctly. This is supported by the study of Kearney & Young (1995), where people prefer to avoid an action as the likelihood of uncertainties is great due to insufficient knowledge received by them.

5.3 SOCIO-DEMOGRAPHIC FACTORS AND KAP OF PLASTIC USAGE AND MANAGEMENT

5.3.1 AGE

Age influences the knowledge, attitude, and practice of plastic usage and management in many similar studies. In this study, age was noted to have a significant association with the level of knowledge ($p=0.028$). The knowledge score was also significantly different between age groups ($p<0.001$). It revealed that the respondents in the age group (21-23, 24-26, 27-30 years old) were more knowledgeable than the younger age groups (18-20 years old). This is also supported by Adeolu et al. (2014) where the students from different age groups differ significantly in terms of the knowledge towards waste management with $p<0.001$. A plausible reason is that the increasing of ages is accompanied by higher educational level, which in turn gives them greater learning chances that lead to better knowledge among them.

However, in this study, it was found that there was no significant association between age and level of attitude towards plastic usage and management ($p=0.086$). The attitude score was found higher among those aged between 21-23 and 24-26 years old, but the results were not significantly different ($p=0.312$). The finding is consistent with a similar study in Aminrad et al. (2011), where they reported a significant difference in the environmental attitude scores among the Iranian students in Malaysian universities.

Regarding practice, age was also noted to have no significant association with the practice towards plastic usage and management ($p=0.0947$). No significant difference in practice scores was found between different age groups ($p=0.592$). However, a study conducted among the household population of Malaysia disclosed that the respondents with increasing age had more frequent practices in recycling plastic waste, which is statistically significant at $p<0.001$ (Afroz et al., 2017).

5.3.2 GENDER

In this study, gender was found not significantly associated with KAP level on plastic usage and management. Both males and females had almost the same knowledge scores. This shows that both genders have the same ability in receiving the information. This is also consistent with a study among secondary school students in Ibadan, Nigeria (Adeolu et al., 2014). Otitoju (2014) also reported the

insignificant relationship for the gender in participating the waste segregation. Therefore, the use and management of plastic waste can be practiced irrespective of gender. This could be due to the government's effort in promoting gender equality so that everyone has an equal chance to assess various resources and opportunities.

In contrary to this finding, Joseph et al. (2016) reported that the female shows a significantly higher awareness of the hazards associated with plastic usage ($p=0.027$). In terms of attitude and practice of waste management, Adeolu et al. (2014) also reported that the female students had a significantly positive attitude and practice than the male ($p<0.05$). This was justified by market research company Mintel, where they revealed the existence of eco-gender gap as female is more likely to maintain environmental friendly attitude and behavior as compared to male (Mintel, 2018). This could be due to the fact that most of the girls are consistently take charge in the household activities such as cleaning and recycling activities. However, the gaps seem not present in the current study.

5.3.3 ETHNICITY

No association and significant difference were observed between the ethnicity groups with KAP level of plastic usage and management. In a similar study, the result was consistent as ethnicity showed no relationship with the KAP on recycling among the university students at Serdang (Nordin & Saliluddin, 2016). Studies also reported the insignificant relationship between races with waste recycling and segregation (Otitoju, 2014; Otitoju & Seng, 2014). This means that there are no racial disparities in terms of KAP level on plastic waste.

5.3.4 MARITAL STATUS

Besides, the knowledge score was found significantly different between those who are single and married ($p=0.038$). It showed that youths who have married [8.6 (SD 1.9)] had a significantly higher knowledge score than the single person [7.8 (SD 1.8)]. It was similar to the study that examine environmental literacy on environmental issues and challenges. Mihanpour et al. (2018) reported that the knowledge score was significantly different across marital status, but single [4.98 (SD 2.17)] shows higher score than married group [4.85 (2.17)] at $p=0.037$ which contrasts with the current study. Furthermore, the study proved that the married status was significantly associated with the Quality-of-Life scores ($p<0.001$), and the single person in both male and female obtained significantly higher scores than the rest of the groups (Han et al., 2014). Quality of life is grounded on several standard indicators and one of them is the quality of the natural and living environment. It demonstrated that different categories of marital status showed a different level of environmental consciousness in ensuring their quality of life.

5.3.5 HIGHEST EDUCATION LEVEL

The current study revealed that educational level was associated with the level of knowledge ($p<0.001$) and attitude of plastic usage and management, but not with the level of practice ($p=0.093$). It means that the practice of sustainable

consumption of plastic and its management can be done irrespective of the individual's educational level as it can be carried out efficiently without formal education. This is supported in Otitoju (2014) as they found that education is an insignificant factor towards waste recycling. It proves that youths do not need to hold a form of certification before enabling them to do sustainable practices.

On the contrary, the knowledge ($p=0.001$) and attitude score ($p<0.001$) were significantly different among the educational groups. The results show that respondents with educational levels such as Bachelor's degree and Master's degree had higher knowledge scores as compared to those who had only secondary education. For attitude scores, it was found that those from Pre-university and Bachelor's degree were significantly higher as compared to secondary education. Another similar study also highlighted the increase in the respondent's education level contributing to the significant association between source separation and recycling knowledge, as well as their willingness towards recycling ($p<0.0001$) (Babaei et al., 2015). Besides, the results were also corroborated by the findings from Aminrad et al. (2013), where they reported the Ph.D. holder had significantly higher environmental awareness scores than Bachelor's and Master's degree holders. However, no statistically significant environmental attitude scores were observed among these 3 groups. As the majority of the respondents in this study were students, the possible reason for higher knowledge and attitude scores with increasing educational levels is because they have a greater chance to learn more in the process of completing their academic tasks. The older age group due to more experience in the life events and higher study levels could also receive more environmental-related information than younger ages.

5.3.6 OCCUPATIONAL STATUS

There was no association and significant differences were observed between the occupational status with KAP level of plastic usage and management. A limited study was done to assess the association between these 2 variables. However, a similar study by Joseph et al. (2016) showed that occupational status was significantly associated with the awareness of hazards due to plastic usage ($\chi^2=35.3$, $df=4$, $p<0.001$). They found that the semi-professional/professional's group had a higher awareness level than the other groups. This might be explained by the differences in their educational level and socioeconomic status, which may influence their opportunity to obtain knowledge and participate in green activities.

5.4 ASSOCIATION BETWEEN KNOWLEDGE, ATTITUDE, AND PRACTICE ON PLASTIC USAGE AND MANAGEMENT

5.4.1 KNOWLEDGE AND PRACTICE

In this study, the results indicated that youths with moderate knowledge levels tend to practice moderately. However, it was noted to have no significant association between the subject variables as $p = 0.202$. In contrary to this, it was observed that there was a significant positive correlation between knowledge and practice in managing waste ($r = 0.187$, $p = 0.000$) (Laor et al., 2018). It reaffirms that the respondents with higher knowledge scores are more likely to demonstrate good practices in an environmentally sound manner. In addition, sustainable consumption in terms of plastic usage and proper waste management could promote sustainable development in the country. It could minimize the plastic waste generated and in turn reduce the negative impacts to the environment as well as the population. This was found important as in the study by Ahamad & Ariffin (2018), knowledge and practice on sustainable consumption among University students in Selangor were found to be significantly associated at $p < 0.05$. It further stresses the significance of the adequate knowledge level as it could lead to a positive attitude and good practice.

5.4.2 KNOWLEDGE AND ATTITUDE

Furthermore, there was also a significant association between knowledge and attitude level of plastic usage and management ($p < 0.001$). Over half of the respondents (57%) with a moderate level of knowledge were found to exhibit a good level of attitude. As compared to an association study conducted among Nursing students in India, a significant and mild positive correlation between the knowledge and attitude scores on plastic use and its health effects ($r = 0.07$, $p = 0.02$) was reported (Bhasin et al., 2021). This study showed that increasing knowledge on the plastic health effects will increase the attitude in reducing plastic usage. However, the present study revealed that youths with a lower level of environmental knowledge still demonstrated a good attitude level although they claimed that they obtained the plastic-related information through various resources. One of the reasons behind this is that people often forget the information shortly after it is acquired (Ferdous & Das, 2014). Therefore, the received information should be always repeated so it has an influence on attitude which could subsequently affect the translation into sustainable practice

5.4.3 ATTITUDE AND PRACTICE

Attitude and practice on plastic usage and management showed a significant association in this study ($p < 0.001$). A higher percentage of respondents with a good level of attitude were found to practice moderately (57.3%). This shows a similar finding in Laor et al. (2018), where the association between attitude and practice on

solid waste management showed a significant positive correlation ($r=0.253$) at $p<0.01$. They disclosed that the majority of the respondents had a neutral attitude and moderate practice although their knowledge level is high. In contrary to this finding, Nordin and Saliludin (2016) found that there was no significant association on the attitude and practice of waste recycling among university students. Although the youths had a good attitude with plastic usage and management, the ratio of attitude translated into practice is shown to be lower. The plausible reason behind this is insufficient information received by them as they don't know where and how to start with sustainable practices. Lack of clarity about the reason and outcome of doing certain tasks causes a person less likely to devote the whole effort to it (Patankar, 2020). To minimize the gap between attitude and practice, it is important to ensure sufficient awareness and knowledge as it can affect their willingness to start a change.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 CONCLUSION

This study identified that a higher percentage of youths obtained a moderate level of knowledge, high level of attitude, and fair practice on plastic usage and management. The majority of the respondents claimed that they were aware of plastic waste issues that happened during Covid-19 pandemic. Majority of them also agreed that their trend of plastic usage during Covid-19 pandemic was increasing as compared to the period before. From the results, the top 3 sources of plastic wastes came from PPEs, online shopping, and food delivery. Regarding the waste management practices, the majority of youths often threw plastic waste into the general dustbin, except for plastic bags where they tend to reuse it rather than other practices.

The knowledge score showed significant variation different by the age, marital status, and education level of the youths. Meanwhile, the attitude score was significantly different by educational level only. The practice scores showed no significant variation by the sociodemographic of youths.

Similarly, the knowledge level was associated with age groups and educational level, while the attitude was associated with educational level. Practice showed no association to any of the sociodemographic variables. Lastly, our findings also highlighted the significant association between attitude-practice and knowledge-attitude. This notably tells us that knowledge on plastics does have an influence on attitude while it can in turn affect the translation into sustainable practice.

6.2 STUDY STRENGTH

This study is the first to report the knowledge, attitude, and practice of plastic usage and management among youths at Klang Valley during Covid-19 pandemic. Its response rate and sampling size were very high as compared to other similar studies. Therefore, it minimizes the influence of the extreme observations so that the results could be more representative of the population. Besides, the questionnaire in this study was validated with good internal consistency as the questions were pre-tested until the desired result was attained.

Findings from this study research provided benchmark information to oversee where do the youths are positioned in terms of knowledge, attitude, and practice on plastic usage and management. It provides early information in terms of the current needs and problems to the stakeholders in the government, which helps them to plan and implement future interventions among youths. The findings also help to facilitate the improvement in environmental policies and programmes so that the outcome is more holistic and cost-effective in tackling the plastic issues.

In addition, it emphasizes the necessity of future initiatives to strike a balance between public and environmental health as this study proved that the Covid-19 pandemic is exacerbating plastic pollution due to the lifestyle changes of the population. Furthermore, this study could increase public awareness and knowledge in the problems with plastics through the community survey during the data collection stage. With this, environmental citizenship could be promoted, which strengthen the achievement of sustainability goals.

6.3 STUDY LIMITATION

Several limitations should be considered in this study. Firstly, the results obtained from “frequency of disposing PPEs and other single-use plastic” only give brief information on the plastic usage and cannot accurately predict the actual amount of the plastics disposed of. Moreover, only the commonly used plastic items were assessed in this study. Due to the current pandemic, the non-probability sampling method chosen in this study cannot guarantee good representativeness of the general population, but it gives overall pictures to see where the KAP levels of youths are positioned. Besides, the study was conducted among youths at Klang Valley, where it does not represent the whole youth population in Malaysia.

6.4 RECOMMENDATION

The findings of this research provided benchmark information to oversee where do the youths are positioned in terms of knowledge, attitude, and practice on plastic usage and management. It has proven that even with a strong willingness to reduce plastic usage and practice good management behaviour, youths with insufficient knowledge could reduce the success in converting into action as they don't know where and how to start with sustainable practices. Therefore, future studies could investigate the barriers to translating knowledge into practice. More possible risk factors or predictors that could affect the KAP should also be studied to understand their causal relationship. Besides, in-depth exploration about the health risk that arises from the generated plastic waste could also be investigated. An estimated amount of plastic waste generated by youths in this period should be conducted to give a holistic picture of the plastic waste problem in our country. In addition, it is recommended to use random sampling methods such as cluster sampling methods to enable the good representativeness of the results to the target population. It is also important to study this issue in the Malaysian context rather than at a specific state or area. Re-conducting this study can help to compare the findings so that the effectiveness of certain efforts could be seen to ensure continual improvement.

Furthermore, the most important issue should be focused on the group of youths aged between 18-20 years old. In this target group, appropriate intervention programmes and policies could help to enhance environmental knowledge and

thereby promote their environmental citizenship and consciousness. Besides, the KAP level among youths can be influenced by various methods. Since social media was determined as the most widely used platform to receive environmental information, it is thereby important for the relevant authorities to circulate the information through this channel. For example, the respective authorities could use this opportunity to disseminate the information through infographics in their social media account and invite the expertise to discuss the plastic waste-relevant topics in the webinar. With this, the public's voice can be listened to and taken into consideration. Furthermore, more webpage that is aimed at achieving "zero waste" should be set up on social media to emphasize the importance of the plastic waste issue in the country as well as convey the tips to manage plastics properly. Rather than putting the biggest responsibility to the consumers, the scientific community, plastic manufacturers, merchants, and legislators share a common role in tackling the plastic pollution issue. It is also necessary to increase the vicinity of the recycling bin to the residential area to encourage green practices.

REFERENCES

- Abas, M. A., & Wee, S. T. (2014). Municipal Solid Waste Management in Malaysia: An Insight Towards Sustainability. In *SSRN Electronic Journal* (pp. 192–206). <https://doi.org/https://dx.doi.org/10.2139/ssrn.2714755>
- Abdul Latiff, A., Latiffah, P., Fauziah, A., & Samsudin, R. (2012). The Understanding of Environmental Citizenship among Malaysian Youths: A Study on Perception and Participation. *Asian Social Science*, 8(5). <https://doi.org/10.5539/ass.v8n5p85>
- Adam, A. (2021). *SWCorp data shows trashpile averaged slightly over 200,000 tonnes a month since MCO 1.0, mostly from food and plastics | Malaysia | Malay Mail*. <https://www.malaymail.com/news/malaysia/2021/03/11/swcorp-data-shows-trashpile-averaged-slightly-over-200000-tonnes-a-month-si/1956803>
- Adane, L., & Muleta, D. (2011). Survey on the usage of plastic bags, their disposal and adverse impacts on environment: A case study in Jimma City, Southwestern Ethiopia. *Journal of Toxicology and Environmental Health Sciences*, 3(8), 234–248. <http://www.academicjournals.org/JTEHS>
- Adeolu, A. T., Enesi, E. D. O., & Adeolu, M. o. (2014). Assessment of Secondary School Students' Knowledge, Attitude and Practice towards Waste Management in Ibadan, Oyo State, Nigeria. *Journal of Research in Environmental Science and Toxicology*, 3(5), 66–73. <https://doi.org/10.14303/jrest.2014.021>
- Afronelly, W. (2021). *Plastic Upcycling: What exactly is it? – FierceHazel*. Fierce Hazel . <https://fiercehazel.com/blogs/online-journal/p-span-data-preserver-spaces-true-plastic-upcycling-span-p-p-p>
- Afroz, R., Rahman, A., Masud, M. M., & Akhtar, R. (2017). The knowledge, awareness, attitude and motivational analysis of plastic waste and household perspective in Malaysia. *Environmental Science and Pollution Research*, 24(3), 2304–2315. <https://doi.org/10.1007/s11356-016-7942-0>
- Agamuthu, P., & Barasarathi, J. (2020). Clinical waste management under COVID-19 scenario in Malaysia. *Waste Management & Research : The Journal of the International Solid Wastes and Public Cleansing Association, ISWA*, 734242X20959701. <https://doi.org/10.1177/0734242X20959701>
- Agamuthu, P., & Fauziah, S. H. (2011). Challenges and issues in moving towards sustainable landfilling in a transitory country - Malaysia. *Waste Management and Research*, 29(1), 13–19. <https://doi.org/10.1177/0734242X10383080>
- Ahamad, N. R., & Ariffin, M. (2018). Assessment of knowledge, attitude and practice towards sustainable consumption among university students in

- Selangor, Malaysia. *Sustainable Production and Consumption*, 16, 88–98.
<https://doi.org/10.1016/j.spc.2018.06.006>
- Ahmad, J., Md. Noor, S., & Ismail, N. (2015). Investigating students' environmental knowledge, attitude, practice and communication. *Asian Social Science*, 11(16), 284–293. <https://doi.org/10.5539/ass.v11n16p284>
- Alabi, O. A., Ologbonjaye, K. I., Awosolu, O., & Alalade, O. E. (2019). Public and Environmental Health Effects of Plastic Wastes Disposal: A Review. *Journal of Toxicology and Risk Assessment*, 5(2). <https://doi.org/10.23937/2572-4061.1510021>
- Alam, O., Yang, L., & Yanchun, X. (2019). *Determination of the selected heavy metal and metalloid contents in various types of plastic bags*.
<https://doi.org/10.1007/s40201-019-00337-2>
- American Chemistry Council. (2005). *Plastics: How Plastics Are Made*.
<https://plastics.americanchemistry.com/How-Plastics-Are-Made/>
- Aminrad, Z., Sayed Zakaria, S. Z. B., & Hadi, A. S. (2011). Influence of age and level of education on environmental awareness and attitude: Case study on Iranian students in Malaysian Universities. *Social Sciences*, 6(1), 15–19.
<https://doi.org/10.3923/sscience.2011.15.19>
- Aminrad, Z., Sayed Zakariya, S. Z. B., Samad Hadi, A., & Sakari, M. (2013). Relationship between awareness, knowledge and attitudes towards environmental education among secondary school students in Malaysia. *World Applied Sciences Journal*, 22(9), 1326–1333.
<https://doi.org/10.5829/idosi.wasj.2013.22.09.275>
- Aminrad, Z., Sayed Zakariya, S. Z., Hadi, A. S., & Sakari, M. (2012). Environmental Education in Malaysia, Progresses and Challenges Ahead (Review). In *Life Science Journal* (Vol. 9, Issue 2).
<http://www.lifesciencesite.com>
<http://www.lifesciencesite.com>
<http://www.lifesciencesite.com>
- Andrade, C., Menon, V., Ameen, S., & Kumar Praharaj, S. (2020). Designing and Conducting Knowledge, Attitude, and Practice Surveys in Psychiatry: Practical Guidance. *Indian Journal of Psychological Medicine*, 42(5), 478–481.
<https://doi.org/10.1177/0253717620946111>
- Aziz, A. (2019). *First WTE incinerator to begin operation by June*. The Malaysian Reserve. <https://themalaysianreserve.com/2019/03/18/first-wte-incinerator-to-begin-operation-by-june/>
- Azoulay, D., Villa, P., Arellano, Y., Gordon, M., Moon, D., Miller, K., & Thompson, K. (2019). Plastic & Health - The Hidden Costs of a Plastic Planet. *Center for International Environmental Law*, 65. www.ciel.org/plasticandhealth

- Babaei, A. A., Alavi, N., Goudarzi, G., Teymouri, P., Ahmadi, K., & Rafiee, M. (2015). Household recycling knowledge, attitudes and practices towards solid waste management. *Resources, Conservation and Recycling*, 102, 94–100. <https://doi.org/10.1016/j.resconrec.2015.06.014>
- Babu, D., & James, R. (2016). Survey on Plastic Usage among the Teenagers of Alappuzha Town, Kerala. *Scholars Academic Journal of Biosciences*, 4(6). <https://doi.org/10.21276/sajb.2016.4.6.7>
- Balasubramanian, N. (2012). Likert Technique of Attitude Scale Construction in Nursing Research. *Asian Journal Nursing Education and Research*, 2(2). https://www.researchgate.net/profile/Bala-Subramanian-19/publication/249964188_Likert_Technique_of_Attitude_Scale_Construction_in_Nursing_Research/links/02e7e51e76ef967dba000000/Likert-Technique-of-Attitude-Scale-Construction-in-Nursing-Research.pdf
- Barloa, E. P., Lapie, L. P., Paul, C., & De La Cruz, P. (2016). Knowledge, Attitudes, and Practices on Solid Waste Management among Undergraduate Students in a Philippine State University. *Journal of Environment and Earth Science*, 6(6). www.iiste.org
- Bavani, M. (2020). *Hazard in rubbish bin*. The Star. <https://www.thestar.com.my/metro/metro-news/2020/03/25/hazard-in-rubbish-bin>
- Bengali, S. (2020). *COVID-19 pandemic creates tidal wave of plastic waste*. Los Angeles Times. <https://www.latimes.com/world-nation/story/2020-06-13/coronavirus-pandemic-plastic-waste-recycling>
- Benson, N. U., Bassey, D. E., & Palanisami, T. (2021). COVID pollution: impact of COVID-19 pandemic on global plastic waste footprint. *Heliyon*, 7(2), e06343. <https://doi.org/10.1016/J.HELİYON.2021.E06343>
- Bernama. (2019, October 26). *Plastic bag charge to be extended to all business premises in 2022*. New Straits Times. <https://www.nst.com.my/news/nation/2019/10/533470/plastic-bag-charge-be-extended-all-business-premises-2022>
- Bernama. (2021, June 7). *Survey reveals Malaysians are shopping online more than before COVID-19*. Astro Awani. <https://www.astroawani.com/berita-malaysia/survey-reveals-malaysians-are-shopping-online-more-covid19-302040>
- Bhasin, V., Dhaliwal, K. K., & Gautam, A. (2021). Assessment of the Knowledge and Attitude Regarding Plastic Use and its Health Effects among Nursing Students of Selected Nursing Colleges of Ambala, Haryana. *Medico-Legal Update*, 21(1), 1186–1190. <https://doi.org/10.37506/mlu.v21i1.2479>
- Brock, J. (2020, October 5). *The Plastic Pandemic: COVID-19 trashed the recycling*

dream. Reuters Investigates. <https://www.reuters.com/investigates/special-report/health-coronavirus-plastic-recycling/>

Bunyan, J. (2019). *Incineration not the way to deal with plastic waste, environmental NGO tells government*. Malay Mail.

<https://www.malaymail.com/news/malaysia/2019/07/19/incineration-not-the-way-to-deal-with-plastic-waste-environmental-ngo-tells/1773034>

Bureau of International Recycling (BIR). (2019, April 17). *Covid-19 Update: Fragmented picture for under-pressure recycling industry*.

<https://www.bir.org/news-press/covid-19-info-center/item/covid-19-update-fragmented-picture-for-under-pressure-recycling-industry>

Centers for Disease Control and Prevention (CDC). (2021, April 5). *Science Brief: SARS-CoV-2 and Surface (Fomite) Transmission for Indoor Community Environments*. <https://www.cdc.gov/coronavirus/2019-ncov/more/science-and-research/surface-transmission.html#ref1>

Chan, K. M., & Vu, T. T. (2017). A landscape ecological perspective of the impacts of urbanization on urban green spaces in the Klang Valley. *Applied Geography*, 85, 89–100. <https://doi.org/10.1016/j.apgeog.2017.06.002>

Chandegara, V. K., Cholera, S. P., Nandasana, J. N., Kumpavat, M. T., & Patel, K. C. (2015). Plastic Packaging Waste Impact on Climate Change and its Mitigation. *Water Management and Climate Smart Agriculture. Adaptation of Climatic Resilient Water Management and Agriculture*. Gyan Publishing House, 404–415.

Charan, J., & Biswas, T. (2013). How to calculate sample size for different study designs in medical research? *Indian Journal of Psychological Medicine*, 35(2), 121–126. <https://doi.org/10.4103/0253-7176.116232>

Chaudhary, V., Kathuria, K., Tomar, M., & Jain, M. (2020). Study to Assess the Knowledge, Attitude and Practice of Plastic Use among School students of Meerut, Uttar Pradesh. *Indian Journal of Public Health Research & Development*, 62–68. <https://doi.org/10.37506/ijphrd.v11i11.11348>

Chen, H. L., Nath, T. K., Chong, S., Foo, V., Gibbins, C., & Lechner, A. M. (2021). The plastic waste problem in Malaysia: management, recycling and disposal of local and global plastic waste. In *SN Applied Sciences* (Vol. 3, Issue 4, p. 437). Springer Nature. <https://doi.org/10.1007/s42452-021-04234-y>

Chin, A. W. H., Chu, J. T. S., Perera, M. R. A., Hui, K. P. Y., Yen, H.-L., Chan, M. C. W., Peiris, M., & Poon, L. L. M. (2020). Stability of SARS-CoV-2 in different environmental conditions. *The Lancet Microbe*, 1(1), e10. [https://doi.org/10.1016/s2666-5247\(20\)30003-3](https://doi.org/10.1016/s2666-5247(20)30003-3)

Chung, C. (2019). *Study shows low rate of recycling plastic bottles in M'sia*. The

- Star. <https://www.thestar.com.my/news/nation/2019/11/14/study-shows-low-rate-of-recycling-plastic-bottles-in-msia>
- Daley, J. (2020, June 25). *New approach for breaking plastics down shows promise for 'upcycling' them*. University of Wisconsin-Madison. <https://news.wisc.edu/new-approach-for-breaking-plastics-down-shows-promise-for-upcycling-them/>
- Davis, J. (2021). *How Long Does It Take for Plastic to Decompose? | Chariot Energy*. <https://chariotenergy.com/blog/how-long-until-plastic-decomposes/>
- Department of Environment (DOE). (2009). *Environmental Quality (Control of Pollution From Solid Waste Transfer Station and Landfill) Regulations 2009*. https://www.doe.gov.my/portalv1/wp-content/uploads/2015/01/Environmental_Quality_Control_of_Pollution_From_Solid_Waste_Transfer_Station_And_Landfill_Regulations_2009_-_P.U.A_433-2009.pdf
- Department of Statistics Malaysia. (2020). *Compendium of Environment Statistics, Malaysia 2020*. <https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=TjM1ZlFxb3VOakdmMnozVms5dUlKZz09>
- Eerkes-Medrano, D., Leslie, H. A., & Quinn, B. (2019). Microplastics in drinking water: A review and assessment. In *Current Opinion in Environmental Science and Health* (Vol. 7, pp. 69–75). Elsevier B.V. <https://doi.org/10.1016/j.coesh.2018.12.001>
- Elangovan, N. (2020). *Singapore households generated additional 1,334 tonnes of plastic waste during circuit breaker: Study*. TODAY. <https://www.todayonline.com/singapore/singapore-households-generated-additional-1334-tonnes-plastic-waste-during-circuit-breaker>
- ESDO. (2020). *ESDO's Online Press Briefing on COVID-19 Pandemic Outbreak 14,500 Tons of Hazardous Plastic Waste in a Month*. Environment and Social Development Organization (ESDO). <https://esdo.org/esdos-online-press-briefing-on-hazardous-plastic-waste-generation-in-a-month-during-covid-19-pandemic/>
- Eshwari, K., Shetty, R. S., Akhila, D., James, B. S., & Pandey, A. K. (2019). Knowledge, attitude and practices towards household solid waste management among semi-urban residents-a community based cross sectional study from southern part of coastal karnataka, india. *Indian Journal of Public Health Research and Development*, 10(9), 385–390. <https://doi.org/10.5958/0976-5506.2019.02457.4>
- Etikan, I., Abubakar Musa, S., & Sunusi Alkassim, R. (2016). Comparison of

- Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1–4.
<https://doi.org/10.11648/j.ajtas.20160501.11>
- Fadare, O. O., & Okoffo, E. D. (2020). *Covid-19 face masks: A potential source of microplastic fibers in the environment*.
<https://doi.org/10.1016/j.scitotenv.2020.140279>
- Ferdous, T., & Das, T. (2014). A study about the attitude of grade eight students for the use of plastic in Gwarko, Balkumari, Lalitpur district. *Procedia-Social and Behavioral Sciences*, 116, 3754–3759.
<https://doi.org/10.1016/j.sbspro.2014.01.836>
- Filho, W. L., Voronova, V., Kloga, M., Paço, A., Minhas, A., Salvia, A. L., Ferreira, C. D., & Sivapalan, S. (2021). COVID-19 and waste production in households: A trend analysis. *Science of the Total Environment*, 777, 145997.
<https://doi.org/10.1016/j.scitotenv.2021.145997>
- Focus Malaysia. (2020, April 23). *Covid-19 diminishes recycling industry and environmental protection efforts*. <https://focusmalaysia.my/mainstream/covid-19-diminishes-recycling-industry-and-environmental-protection-efforts/>
- Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, 3(7), e1700782.
<https://doi.org/10.1126/sciadv.1700782>
- Government of Malaysia. (2010). *Tenth Malaysia Plan 2011-2015*.
- Gündoğdu, S., Yeşilyurt, İ. N., Erbaş, C., & Gümüş, H. (2018). Survey on awareness and attitudes of citizens regarding plastic pollution in Hatay / Samandağ Turkey. *International Marine & Freshwater Sciences Symposium*, 134–138.
<https://www.researchgate.net/publication/328601209>
- Hailey, C. W. K. (2020). *12MP To Push Scheme To Cut Plastics Use, Up Recycling Rate*. <https://www.wwf.org.my/?28205/12MP-to-push-scheme-to-cut-plastics-use-up-recycling-rate>
- Hammami, M. B. A., Mohammed, E. Q., Hashem, A. M., Al-Khafaji, M. A., Alqahtani, F., Alzaabi, S., & Dash, N. (2017). Survey on awareness and attitudes of secondary school students regarding plastic pollution: implications for environmental education and public health in Sharjah city, UAE. *Environmental Science and Pollution Research*, 24(25), 20626–20633.
<https://doi.org/10.1007/s11356-017-9625-x>
- Han, K. T., Park, E. C., Kim, J. H., Kim, S. J., & Park, S. (2014). Is marital status associated with quality of life? *Health and Quality of Life Outcomes*, 12(1), 1–10. <https://doi.org/10.1186/S12955-014-0109-0/FIGURES/2>

- Haque, M. S., Uddin, S., Sayem, S. M., & Mohib, K. M. (2021). Coronavirus disease 2019 (COVID-19) induced waste scenario: A short overview. *Journal of Environmental Chemical Engineering*, 9(1), 104660. <https://doi.org/10.1016/j.jece.2020.104660>
- Hasan, S. N. M. S., Harun, R., & Hock, L. K. (2015). Application of Theory of Planned Behavior in Measuring the Behavior to Reduce Plastic Consumption Among Students at Universiti Putra Malaysia, Malaysia. *Procedia Environmental Sciences*, 30, 195–200. <https://doi.org/10.1016/J.PROENV.2015.10.035>
- He, P., Chen, L., Shao, L., Zhang, H., & Lü, F. (2019). Municipal solid waste (MSW) landfill: A source of microplastics? -Evidence of microplastics in landfill leachate. *Water Research*, 159, 38–45. <https://doi.org/10.1016/j.watres.2019.04.060>
- Hicks, R. (2020, April 6). *Coronavirus-induced oil price plunge is hurting the circular economy for plastic*. Eco-Business. <https://www.eco-business.com/news/coronavirus-induced-oil-price-plunge-is-hurting-the-circular-economy-for-plastic/>
- Hopewell, J., Dvorak, R., & Kosior, E. (2009). Plastics recycling: Challenges and opportunities. In *The Royal Society* (Vol. 364, Issue 1526, pp. 2115–2126). Royal Society. <https://doi.org/10.1098/rstb.2008.0311>
- Hyde, J. (2018, March 23). *Our beaches are plastered with plastic rubbish*. New Straits Time. <https://www.nst.com.my/opinion/letters/2018/03/348273/our-beaches-are-plastered-plastic-rubbish>
- Hyun, C. M. (2020, March 30). *Korea sees steep rise in online shopping during COVID-19 pandemic* | ZDNet. ZD Net. <https://www.zdnet.com/article/korea-sees-steep-rise-in-online-shopping-during-covid-19-pandemic/>
- Indeed Editorial Team. (2020). What Is Management? Definitions and Functions. <https://www.indeed.com/career-advice/career-development/what-is-management>
- Jaafar, I., Ibrahim, T. A., Ahmad, N. A., Kadir, A. A., Razali, M., & Tomari, M. (2018). Waste generation and characterization: Case study of Seberang Takir, Kuala Nerus, Terengganu, Malaysia. *Journal of Physics*, 12029. <https://doi.org/10.1088/1742-6596/1049/1/012029>
- Jabatan Pengurusan Sisa Pepejal Negara (JPSPN). (2013). *Survey on Solid Waste Composition, Characteristics & Existing Practice of Solid Waste Recycling in Malaysia*.
- Jager, J., Putnick, D. L., & Bornstein, M. H. (2017). More than Just Convenient: The Scientific Merits of Homogeneous Convenience Samples. *Monographs of the*

Society for Research in Child Development, 82(2), 13.

<https://doi.org/10.1111/MONO.12296>

Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., Narayan, R., & Law, K. L. (2015). Plastic waste inputs from land into the ocean. *Science*, 347(6223), 768–771.

<https://doi.org/10.1126/science.1260352>

Johari, A., Ahmed, I., Hashim, H., Alkali, H., & Ramli, M. (2012). Economic and environmental benefits of landfill gas from municipal solid waste in Malaysia. *Renewable and Sustainable Energy Reviews*, 16, 2907–2912.

<https://doi.org/10.1016/j.rser.2012.02.005>

Joseph, N., Kumar, A., Majgi, S. M., Kumar, G. S., & Prahalad, R. B. Y. (2016). Usage of plastic bags and health hazards: A study to assess awareness level and perception about legislation among a small population of Mangalore city.

Journal of Clinical and Diagnostic Research, 10(4), LM01–LM04.

<https://doi.org/10.7860/JCDR/2016/16245.7529>

JPSPN. (2013). Existing Practice of Solid Waste Recycling in Malaysia Main Report Survey on SW Composition, Characteristics & Existing Practice of SW Recycling in Malaysia Final Report.

Kaur, S., & Jeganathan, J. (n.d.). Assessment of knowledge regarding health hazards of plastic use among Students: Cross sectional study. *Journal of IPHA Chandigarh State Branch, Chandigarh*, 1–7.

Kearney, A. R., & Young, R. De. (1995). A knowledge-based intervention for promoting carpooling. *Environment and Behaviour*, 27(5), 650–678.

<https://doi.org/10.1177/0013916595275003>

Kelly, T. C., Mason, I. G., Leiss, M. W., & Ganesh, S. (2006). University community responses to on-campus resource recycling. *Resources, Conservation and Recycling*, 47(1), 42–55. <https://doi.org/10.1016/j.resconrec.2005.10.002>

Kennedy, T., Regehr, G., Rosenfield, J., Roberts, S. W., & Lingard, L. (2004). Exploring the Gap between Knowledge and Behavior: A Qualitative Study of Clinician Action Following an Educational Intervention. *Academic Medicine*, 79(5), 386–393. <https://doi.org/10.1097/00001888-200405000-00006>

Ketelsen, M., Janssen, M., & Hamm, U. (2020). Consumers' response to environmentally-friendly food packaging - A systematic review. *Journal of Cleaner Production*, 254, 120123.

<https://doi.org/10.1016/J.JCLEPRO.2020.120123>

Khanam, N., Wagh, V., Gaidhane, A. M., & Quazi, S. Z. (2019). Knowledge, Attitude and Practice on Uses of Plastic Products, Their Disposal and Environmental Pollution: A Study among School-going Adolescents. *Journal of*

- Datta Meghe Institute of Medical Sciences University*, 14(2), 57–60.
https://doi.org/10.4103/jdmimsu.jdmimsu_27_19
- Krausz, T. (2020). *Malaysia says “thanks, but no thanks” to plastic trash imports*. Sustainability Times . <https://www.sustainability-times.com/environmental-protection/malaysia-says-thanks-but-no-thanks-to-plastic-trash-imports/>
- Kumar, P. (2018). Role of Plastics on Human Health. *Indian Journal of Pediatrics*, 85(5), 384–389. <https://doi.org/10.1007/s12098-017-2595-7>
- Laato, S., Islam, A. K. M. N., Farooq, A., & Dhir, A. (2020). Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach. *Journal of Retailing and Consumer Services*, 57, 102224. <https://doi.org/10.1016/j.jretconser.2020.102224>
- Ladd, K. (2020, May 17). *10 Creative Ways to Upcycle Your Plastic Bottles*. Treehugger. <https://www.treehugger.com/creative-ways-upcycle-your-plastic-bottles-4864134>
- Laor, P., Suma, Y., Keawdounlek, V., Hongtong, A., Apidechkul, T., & Pasukphun, N. (2018). Knowledge, attitude and practice of municipal solid waste management among highland residents in Northern Thailand. *Journal of Health Research*, 32(2), 123–131. <https://doi.org/10.1108/JHR-01-2018-013>
- Law, K. L. (2017). Plastics in the Marine Environment. *Annual Review of Marine Science*, 9(1), 205–229. <https://doi.org/10.1146/annurev-marine-010816-060409>
- Leblanc, R. (2019). *The Waste Management Hierarchy*. <https://www.thebalancesmb.com/reduce-reuse-and-recycle-the-waste-management-hierarchy-2878202>
- Lee, A. W. L., Neo, E. R. K., Khoo, Z.-Y., Yeo, Z., Tan, Y. S., Chng, S., Yan, W., Lok, B. K., & Low, J. S. C. (2021). Life cycle assessment of single-use surgical and embedded filtration layer (EFL) reusable face mask. *Resources, Conservation and Recycling*, 170(September 2020), 105580. <https://doi.org/10.1016/j.resconrec.2021.105580>
- Lee, J. (2021). *Waste Not Want Not: Malaysia Moves to Become a Leader in Tackling Plastic Waste*. New Security Beat. <https://www.newsecuritybeat.org/2021/01/waste-not-malaysia-moves-leader-tackling-plastic-waste/>
- Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-Based Dentistry*, 7(1), 24–25. <https://doi.org/10.1038/sj.ebd.6400375>
- Lithner, D., Larsson, A., & Dave, G. (2011). Environmental and health hazard ranking and assessment of plastic polymers based on chemical composition. *Science of the Total Environment*, 409(18), 3309–3324.

<https://doi.org/10.1016/j.scitotenv.2011.04.038>

Loh, C. T., Moorthy, K., Yoon Mei, C., Pik Yin, F., Zhi Ying, W., Wei Khong, C., Zhao Chern, G., & Zin Lin, T. (2020). Determinants of 3Rs behaviour in plastic usage: A study among Malaysians. *Heliyon*, 6(12), e05805.

<https://doi.org/10.1016/j.heliyon.2020.e05805>

Malik, H., & Roy, K. (2015). A Descriptive Study to Assess the Knowledge and Attitude of Adolescents Regarding Mismanagement of Plastic Wastes and its Environmental Hazards in Selected Community Area, Nelamangala. In *International Journal of Science and Research* (Vol. 6). www.ijsr.net

Mallan, K. M., Singh, P., & Giardina, N. (2010). The challenges of participatory research with “tech-savvy” youth. *Journal of Youth Studies*, 13(2), 255–272. <https://doi.org/10.1080/13676260903295059>

McMichael, A. J., Woodruff, R. E., & Hales, S. (2006). Climate change and human health: Present and future risks. In *Lancet* (Vol. 367, Issue 9513, pp. 859–869). Elsevier B.V. [https://doi.org/10.1016/S0140-6736\(06\)68079-3](https://doi.org/10.1016/S0140-6736(06)68079-3)

Mejjad, N., Cherif, E. K., Rodero, A., Krawczyk, D. A., Kharraz, J. El, Moumen, A., Laqbaqbi, M., & Fekri, A. (2021). Disposal behavior of used masks during the covid-19 pandemic in the moroccan community: Potential environmental impact. *International Journal of Environmental Research and Public Health*, 18(8). <https://doi.org/10.3390/ijerph18084382>

Merriam-Webster. (n.d.). *Practice*. Retrieved May 8, 2021, from <https://www.merriam-webster.com/dictionary/practice>

Merrington, A. (2011). Recycling of Plastics. In *Applied Plastics Engineering Handbook* (pp. 177–192). Elsevier Inc. <https://doi.org/10.1016/B978-1-4377-3514-7.10011-X>

Mertes, A. (2020). *What Are the Different Types of Plastic? | Quality Logo Products®*. <https://www.qualitylogoproducts.com/promo-university/different-types-of-plastic.htm>

Ministry of Energy, Green Technology and Water Malaysia (KeTTHA). (2017). Green Technology Master Plan Malaysia 2017-2030. <https://www.pmo.gov.my/wp-content/uploads/2019/07/Green-Technology-Master-Plan-Malaysia-2017-2030.pdf>

Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC). (2009). National Green Technology Policy. <https://policy.asiapacificenergy.org/sites/default/files/National%20Green%20Technology%20Policy%202009.pdf>

Ministry of Energy, Science, Technology, Environment & Climate Change

- (MESTECC). (2018). Malaysia's Roadmap Towards Zero Single-Use Plastics 2018-2030. <https://www.pmo.gov.my/wp-content/uploads/2019/07/Malaysia-Roadmap-Towards-Zero-Single-Use-Plastics-2018-2030-m-min.pdf>
- Mihanpour, H., Khashij, M., Shamsizadeh, Z., Gholami, M., Ebrahimi, A., Rezaeipandari, H., Malekhamadi, R., Arsham, A., Parizan, F., & Jafari, V. (2018). Assessment of the Awareness, Attitude and Environmental Literacy about Environmental Issues and Challenges (Case study: Yazd Citizen's View in 2017). *Preprints*, Nov(November), 1–11. <https://doi.org/10.20944/preprints201811.0375.v1>
- Ministry of Housing and Local Government (KPKT). (2015). *Solid Waste Management Lab 2015*.
- Ministry of Housing and Local Government. (KPKT). (2015). Separation at Source. <https://www.kpkt.gov.my/separationatsource/en/>
- Ministry of Housing and Local Government (KPKT). (2019). *The National Cleanliness Policy 2020*.
- Mintel. (2018, July 27). *UK women try to live more ethically than men* | *Mintel.com*. Mintel Press Office. <https://www.mintel.com/press-centre/social-and-lifestyle/the-eco-gender-gap-71-of-women-try-to-live-more-ethically-compared-to-59-of-men>
- Moh, Y. C., & Abd Manaf, L. (2014). Overview of household solid waste recycling policy status and challenges in Malaysia. In *Resources, Conservation and Recycling* (Vol. 82, pp. 50–61). Elsevier. <https://doi.org/10.1016/j.resconrec.2013.11.004>
- Mohajan, H. K. (2016). Knowledge is an Essential Element at Present World. *International Journal of Publication and Social Studies*, 1(1), 31–53. <https://doi.org/10.18488/journal.135/2016.1.1/135.1.31.53>
- MPMA, & MPRA. (2019). *An Advanced Plastics Recycling Industry for Malaysia*. 1–29.
- Muhd Amin, N. (2021). *Waste not want not: Malaysia moves to become leader in tackling plastic waste*. The Malaysian Reserve. <https://themalaysianreserve.com/2021/02/04/waste-not-want-not-malaysia-moves-to-become-leader-in-tackling-plastic-waste/>
- Müller, J. (2021, April 7). *Distribution of online shoppers in Malaysia in 2016, by age group*. Statista. <https://www.statista.com/statistics/878419/malaysia-online-shoppers-by-age/>
- Murgese, E. (2020). Illegal Trafficking of Plastic Waste: The Italy–Malaysia Connection. *IAI Commentaries*, 1–6. <https://www.iai.it/en/pubblicazioni/illegal->

trafficking-plastic-waste-italy-malaysia-connection

- Muthupriya, A. (2019). Online Shopping Attitude Among the Youth: A Study on Alagappa University Students in Karaikudi, Sivaganga District. *Shanlax International Journal of Management*, 7(1), 43–47. <https://doi.org/10.34293/management.v7i1.450>
- Mwanga, H. (2011). Allergies in the workplace. In *Current Allergy & Clinical Immunology* (Vol. 24, Issue 1).
- Nagy, Á., & Kuti, R. (2016). The Environmental Impact of Plastic Waste Incineration. *AARMS–Academic and Applied Research in Military and Public Management Science*, 15(3), 231–237. <https://doi.org/10.30564/jees.v2i2.2340>
- National Solid Waste Management Department (JPSPN). (2007). Solid Waste and Public Cleansing Management Act 2007. https://jpspn.kpkt.gov.my/resources/index/user_1/Perundangan/Akta-akta/act672bi.pdf
- National Solid Waste Management Department (JPSPN). (2007). Solid Waste and Public Cleansing Management Corporation Act 2007. <https://rehdaselangor.com/wp-content/uploads/Act-673-Solid-Waste-and-Public-Cleansing-Management-Corporation-Act-2007.pdf>
- National Solid Waste Management Department (JPSPN). (2016). Dasar Pengurusan Sisa Pepejal Negara 2016. https://www.pmo.gov.my/wp-content/uploads/2019/07/Dasar_Pengurusan_Sisa_Pepejal_2016.pdf
- Nordin, F. N., & Saliluddin, S. M. (2016). Knowledge, attitude, and practices of recycling and its associated factors among undergraduate students in Universities Putra Malaysia, Serdang. *International Journal of Public Health and Clinical Sciences*, 3(6), 154–170.
- Nowakowski, P., Kuśnierz, S., Sosna, P., Mauer, J., & Maj, D. (2020). Disposal of personal protective equipment during the covid-19 pandemic is a challenge for waste collection companies and society: A case study in poland. *Resources*, 9(10), 1–11. <https://doi.org/10.3390/resources9100116>
- Nua. (2020, April 9). *How to Continue Waste Management Services During the COVID-19 Pandemic – NUA Campus*. UN Habitat. <https://nuacampus.org/how-to-continue-waste-management-services-during-the-covid-19-pandemic/>
- Nur Aisyah, S., & Haliza, A. R. (2016). Knowledge, attitude and practices on recycling activity among primary school students in Hulu Langat, Selangor, Malaysia. *Indian Journal of Environmental Protection*, 36(10), 792–800.
- Nur Hanani, A. (2020). *KPKT: Six WTE plants planned towards 2025*. The Malaysian Reserve. <https://themalaysianreserve.com/2020/06/22/kpkt-six-wte->

plants-planned-towards-2025/

- Ojha, S. (2020, May 20). *India now manufactures 4.5 lakh PPE suits a day in the fight against Covid-19*. Mint. <https://www.livemint.com/news/india/india-now-manufactures-4-5-lakh-ppe-suits-a-day-in-the-fight-against-covid-19-11589951566951.html>
- Ong, S. (2019). *New plastic recycling policy to boost economy*. The Star. <https://themalaysianreserve.com/2019/10/02/new-plastic-recycling-policy-to-boost-economy/>
- Otitoju, T. A. (2014). Individual Attitude toward Recycling of Municipal Solid Waste in Lagos, Nigeria. *American Journal of Engineering Research*, 3(7), 78–88. www.ajer.org
- Otitoju, T. A., & Seng, L. (2014). Municipal Solid Waste Management: Household Waste Segregation in Kuching South City, Sarawak, Malaysia. *American Journal of Engineering Research (AJER)*, 03, 82–91. www.ajer.org
- Oxford Advanced Learner's Dictionary. (2021). *usage noun - Definition, pictures, pronunciation and usage notes*. Oxford University Press. <https://www.oxfordlearnersdictionaries.com/definition/english/usage>
- Oxford Dictionary. (2021). *Definition of Practice*. Oxford University Press. <https://www.lexico.com/definition/practice>
- Parashar, N., & Hait, S. (2021). Plastics in the time of COVID-19 pandemic: Protector or polluter? In *Science of the Total Environment* (Vol. 759, p. 144274). Elsevier B.V. <https://doi.org/10.1016/j.scitotenv.2020.144274>
- Patankar, U. (2020, August 28). *How do attitudes influence our behaviour?* Readers' Blog. <https://timesofindia.indiatimes.com/readersblog/udayanspeaks/how-do-attitudes-influence-our-behaviour-25236/>
- Patil, A. A., Kulkarni, A. A., & Patil, B. B. (2014). Waste To Energy By Incineration. *Journal of Computing Technologies*, 3(6), 2278 – 3814.
- Patrício Silva, A. L., Prata, J. C., Walker, T. R., Duarte, A. C., Ouyang, W., Barcelò, D., & Rocha-Santos, T. (2021). Increased plastic pollution due to COVID-19 pandemic: Challenges and recommendations. *Chemical Engineering Journal*, 405, 126683. <https://doi.org/10.1016/j.cej.2020.126683>
- Plastics Europe. (2016). *Plastics-the Facts 2016*, An analysis of European plastics production, demand and waste data.
- Prata, J. C., Silva, A. L. P., Walker, T. R., Duarte, A. C., & Rocha-Santos, T. (2020). COVID-19 Pandemic Repercussions on the Use and Management of Plastics. *Environmental Science and Technology*, 54(13), 7760–7765. <https://doi.org/10.1021/acs.est.0c02178>

- Praveena, B. G. (2019). A Study to Assess the Knowledge Regarding Health Hazards of Plastic in Domestic Use and Attitude toward the use of Alternatives in Women Residing at Mohan Kumar Nagar, Bengaluru. *International Journal of Nursing and Medical Investigation*, 4(3), 50–53. <https://doi.org/10.31690/ijnmi/50>
- Punitha, K., & Hemavathy, V. (2016). A Study to Assess The Effectiveness of Structured Teaching Programme Regarding Hazards of Plastic Use Among School Going Children In Hilton Matriculation Higher Secondary School, Chrompet, Chennai-44. *International Journal of Advances in Nursing Management*, 1(1), 43–48. <https://doi.org/10.5958/2454-2652.2016.00010.x>
- Roche Cerasi, I., Sánchez, F. V., Gallardo, I., Górriz, M., Torrijos, P., Aliaga, C., & Franco, J. (2021). Household plastic waste habits and attitudes: A pilot study in the city of Valencia. *Waste Management and Research*. <https://doi.org/10.1177/0734242X21996415>
- Rochman, C. M., Browne, M. A., Halpern, B. S., Hentschel, B. T., Hoh, E., Karapanagioti, H. K., Rios-Mendoza, L. M., Takada, H., Teh, S., & Thompson, R. C. (2013, February 14). Policy: Classify plastic waste as hazardous. *Macmillan Publishers Limited*, 494(7436), 169–170. <https://doi.org/10.1038/494169a>
- Rogers, T. (2015). *How Plastics Are Made And What You Need To Know About Them*. <https://www.creativemechanisms.com/blog/how-plastics-are-made-and-what-you-need-to-know-about-them>
- Royer, S. J., Ferrón, S., Wilson, S. T., & Karl, D. M. (2018). Production of methane and ethylene from plastic in the environment. *PLoS ONE*, 13(8), e0200574. <https://doi.org/10.1371/journal.pone.0200574>
- Rubel, H., Follette, C., Felde, A. M. zum, Appathurai, S., Díaz, M. B., & Jung, U. (2019, July 15). *A Circular Solution to Plastic Waste*. Boston Consulting Group. <https://www.bcg.com/en-sea/publications/2019/plastic-waste-circular-solution>
- Sahni, A. (2020, April 23). *Could COVID-19 worsen the global plastic waste problem? - CGTN*. CGTN. https://news.cgtn.com/news/2020-04-23/Could-COVID-19-worsen-the-global-plastic-waste-problem--PJMzLhZYY/index.html?fbclid=IwAR3IDyq2hZdHaB2r7GhA_iNBII3gvL659KchC4wobgJBNnqIrniDgOzAT3E
- Samsudin, M. D. M., & Mat Don, M. (2013). Municipal solid waste management in Malaysia: Current practices, challenges and prospect. *Jurnal Teknologi (Sciences and Engineering)*, 62(1), 95–101. <https://doi.org/10.11113/jt.v62.1293>
- Sangkham, S. (2020). Face mask and medical waste disposal during the novel COVID-19 pandemic in Asia. *Case Studies in Chemical and Environmental*

- Engineering*, 2, 100052. <https://doi.org/10.1016/j.cscee.2020.100052>
- Seachrist, D. D., Bonk, K. W., Ho, S. M., Prins, G. S., Soto, A. M., & Keri, R. A. (2016). A review of the carcinogenic potential of bisphenol A. *Reproductive Toxicology*, 59, 167–182. <https://doi.org/10.1016/j.reprotox.2015.09.006>
- Selvaranjan, K., Navaratnam, S., Rajeev, P., & Ravintherakumaran, N. (2021). Environmental challenges induced by extensive use of face masks during COVID-19: A review and potential solutions. *Environmental Challenges*, 3, 100039. <https://doi.org/10.1016/j.envc.2021.100039>
- Shaira, H., Ismail, I., Ahmed, N., Zeena, N., Arooj, P., Shreya, P., Shafir, R., & Nazeer, R. (2020). Assessment of Knowledge, Attitude and Practice regarding single use plastics among the residents of a rural area in a coastal district of Karnataka - A descriptive study. *National Journal of Community Medicine*, 11(0), 1. <https://doi.org/10.5455/njcm.20200207094558>
- Shankar, A., & Teppala, S. (2011). Relationship between Urinary Bisphenol A Levels and Diabetes Mellitus. *The Journal of Clinical Endocrinology & Metabolism*, 96(12), 3822–3826. <https://doi.org/10.1210/jc.2011-1682>
- Sharifah Norkhadijah, S. I., & Latifah, A. M. (2013). The challenge of future landfill: A case study of Malaysia. *Journal of Toxicology and Environmental Health Sciences*, 5(6), 86–96. <https://doi.org/10.5897/jtehs12.058>
- Shemwell, B. E., & Levendis, Y. A. (2000). Particulates generated from combustion of polymers (plastics). *Journal of the Air and Waste Management Association*, 50(1), 94–102. <https://doi.org/10.1080/10473289.2000.10463994>
- Simachaya, W. (2020). *There is a good foundation for the development of resource efficiency and sustainability*. Thailand Environment Institute (TEI). http://www.tei.or.th/en/blog_detail.php?blog_id=49
- Singh, D. (2011, January 1). *Nationwide campaign on “No Plastic Bags on Saturdays” launched*. The Star. <https://www.thestar.com.my/news/nation/2011/01/01/nationwide-campaign-on-no-plastic-bags-on-saturdays-launched/>
- Singh, N., Tang, Y., Zhang, Z., & Zheng, C. (2020). COVID-19 waste management: Effective and successful measures in Wuhan, China. In *Resources, Conservation and Recycling* (Vol. 163, p. 105071). Elsevier B.V. <https://doi.org/10.1016/j.resconrec.2020.105071>
- Siti Rohana, M. Y., Ku Halim, K. H., Kamariah, N. I., Abdul Rashid, Z., Nur Ain, Z., Farah Ayuni, S., & Alia, A. (2019). Study on Waste Generation and Composition in Rapid Residential Development of Sub Urban Area in Kuala Selangor District, Selangor. *Journal of Wastes and Biomass Management*, 1(1), 01–05. <https://doi.org/10.26480/jwbm.01.2019.01.05>

- Situmorang, R. O. P., Liang, T.-C., & Chang, S.-C. (2020). The Difference of Knowledge and Behavior of College Students on Plastic Waste Problems. *Sustainability*, 12(19), 7851. <https://doi.org/10.3390/su12197851>
- Smyth, C. (2016). 'Where' Matters: Keeping Apace with Geo-Ubiquity in a Digital World. *Digital Information Strategies: From Applications and Content to Libraries and People*, 167–183. <https://doi.org/10.1016/B978-0-08-100251-3.00012-3>
- Sreenivasan, J., Govindan, M., Chinnasami, M., & Kadiresu, I. (2012). Solid Waste Management in Malaysia – A Move Towards Sustainability. In *Waste Management - An Integrated Vision*. InTech. <https://doi.org/10.5772/50870>
- Srinivasan, N., Swarnapriya, V., Felix, A. J. W., & Pravin, T. (2019). Assessment of knowledge and practice on plastics among the professional course students of Annamalai University, Tamil Nadu. *International Journal Of Community Medicine And Public Health*, 6(2), 510. <https://doi.org/10.18203/2394-6040.ijcmph20190099>
- Su, Y., Zhang, Z., Wu, D., Zhan, L., Shi, H., & Xie, B. (2019). *Occurrence of microplastics in landfill systems and their fate with landfill age*. <https://doi.org/10.1016/j.watres.2019.114968>
- Sullivan, G. M., & Artino, A. R. (2013). Analyzing and Interpreting Data From Likert-Type Scales. *Journal of Graduate Medical Education*, 5(4), 541–542. <https://doi.org/10.4300/jgme-5-4-18>
- Syam, N. (2020). *Is the pandemic triggering a spike in plastic pollution?* . <https://newseu.cgtn.com/news/2020-05-22/Is-the-pandemic-triggering-a-spike-in-plastic-pollution--QBobeagfok/index.html>
- Taherdoost, H. (2016). Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research. *International Journal of Academic Research in Management (IJARM)*, 5(2), 2296–1747. <https://ssrn.com/abstract=3205035>
- Tan, T., & Siti Najihah, C. S. (2020). *Public Survey: The Impacts of Movement Control Order (MCO) Towards Waste Generation in Penang Island*. <https://www.who.int/malaysia/emergencies/coronavirus-disease->
- Tang, A. (2021, July 9). 'Take care of e-commerce packaging waste.' The Star. <https://www.thestar.com.my/news/nation/2021/07/09/take-care-of-e-commerce-packaging-waste>
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. In *International journal of medical education* (Vol. 2, pp. 53–55). IJME. <https://doi.org/10.5116/ijme.4dfb.8dfd>

- Tey, N. P. (2012). Internal Migration in the Klang Valley of Malaysia: Issues and Implications. In *Malaysian Journal of Chinese Studies* (Vol. 1).
- Thanh, N. P., Matsui, Y., & Fujiwara, T. (2011). Assessment of plastic waste generation and its potential recycling of household solid waste in Can Tho City, Vietnam. *Environmental Monitoring and Assessment*, 175(1–4), 23–35.
<https://doi.org/10.1007/s10661-010-1490-8>
- U.S. Department of Energy. (2019). *Chemical Upcycling of Polymers: Revolutionizing the lifecycle of plastics*.
<https://science.osti.gov/bes/Community-Resources/Reports>.
- UNEP. (2018). *Single-use Plastics: A Roadmap for Sustainability* (C. Cannon (ed.)). United Nations Environment Programme.
<http://hdl.handle.net/20.500.11822/25496>
- US EPA. (2021). *Plastics: Material-Specific Data*. <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data>
- van Doremalen, N., Bushmaker, T., Morris, D. H., Holbrook, M. G., Gamble, A., Williamson, B. N., Tamin, A., Harcourt, J. L., Thornburg, N. J., Gerber, S. I., Lloyd-Smith, J. O., de Wit, E., & Munster, V. J. (2020). Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. *New England Journal of Medicine*, 382(16), 1564–1567.
<https://doi.org/10.1056/nejmc2004973>
- Verma, R., Vinoda, K. S., Papireddy, M., & Gowda, A. N. S. (2016). Toxic Pollutants from Plastic Waste- A Review. *Procedia Environmental Sciences*, 35, 701–708. <https://doi.org/10.1016/j.proenv.2016.07.069>
- Wahab, D. A., Abidin, A., & Azhari, C. H. (2007). Recycling trends in the plastics manufacturing and recycling companies in Malaysia. *Journal of Applied Sciences*, 7(7), 1030–1035. <https://doi.org/10.3923/jas.2007.1030.1035>
- Webb, E., Hays, J., Dyrszka, L., Rodriguez, B., Cox, C., Huffling, K., & Bushkin-Bedient, S. (2016). Potential hazards of air pollutant emissions from unconventional oil and natural gas operations on the respiratory health of children and infants. *Reviews on Environmental Health*, 31(2), 225–243.
<https://doi.org/10.1515/reveh-2014-0070>
- Westerman, D., Spence, P. R., & Van Der Heide, B. (2014). Social Media as Information Source: Recency of Updates and Credibility of Information. *Journal of Computer-Mediated Communication*, 19(2), 171–183.
<https://doi.org/10.1111/jcc4.12041>
- Westminster City Council. (2021). *Plastic Waste and Pollution -Everything You Need To Know* . <https://cleanstreets.westminster.gov.uk/plastic-waste-complete-guide/#1>

- Wilson, M., Arkin, C., Allen, C., Guerrero, L., & Khalid, H. (2019). *Plastic & Health*. www.ciel.org/plasticandhealth
- Wong, L. Z. (2017, August 29). *Types of plastics that can be recycled*. The Star. <https://www.thestar.com.my/lifestyle/living/2017/08/29/recyclable-plastics-types>
- World Bank Group. (2021). *Market Study for Malaysia: Plastics Circularity Opportunities and Barriers*. <https://www.worldbank.org/en/country/malaysia/publication/market-study-for-malaysia-plastics-circularity-opportunities-and-barriers>
- World Health Organization (WHO). (2020a). *Shortage of personal protective equipment endangering health workers worldwide*. <https://www.who.int/news/item/03-03-2020-shortage-of-personal-protective-equipment-endangering-health-workers-worldwide>
- World Health Organization (WHO). (2020b). *What is a pandemic?* World Health Organization; World Health Organization. http://www.who.int/csr/disease/swineflu/frequently_asked_questions/pandemic/en/
- World Health Organization (WHO). (2020c). *WHO Director-General's opening remarks at the media briefing on COVID-19*. World Health Organization. <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19--11-march-2020>
- World Health Organization (WHO). (2020d). *Coronavirus disease 2019 (COVID-19) Situation Report-94*. <https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200423-sitrep-94-covid-19.pdf>
- World Wildlife Fund (WWF) Malaysia. (2020). *Study on EPR scheme assessment for packaging waste in Malaysia*. September.
- WWF-Malaysia. (2020). *WWF Releases Report Proposing Effective Solution to Mitigate Plastic Pollution in Malaysia* | WWF Malaysia. <https://www.wwf.org.my/?28105/WWF-Releases-Report-Proposing-Effective-Solution-to-Mitigate-Plastic-Pollution-in-Malaysia>
- Yeo, A. (2021, August 2). *Annual plastic usage is getting worse - 148,000 tonnes for food packaging alone*. Astro Awani. <https://www.astroawani.com/berita-malaysia/annual-plastic-usage-getting-worse-148000-tonnes-food-packaging-alone-311794>
- Yunus, A., & Landau, E. (2019, July 3). *"Youth" now defined as those between 15 and 30*. New Straits Times. <https://www.nst.com.my/news/nation/2019/07/501288/youth-now-defined-those-between-15-and-30>

Zen, I. S., Ahamad, R., & Omar, W. (2013). No plastic bag campaign day in Malaysia and the policy implication. *Environment, Development and Sustainability*, 15(5), 1259–1269. <https://doi.org/10.1007/s10668-013-9437-1>



APPENDICES

Appendix A: Sampling Location

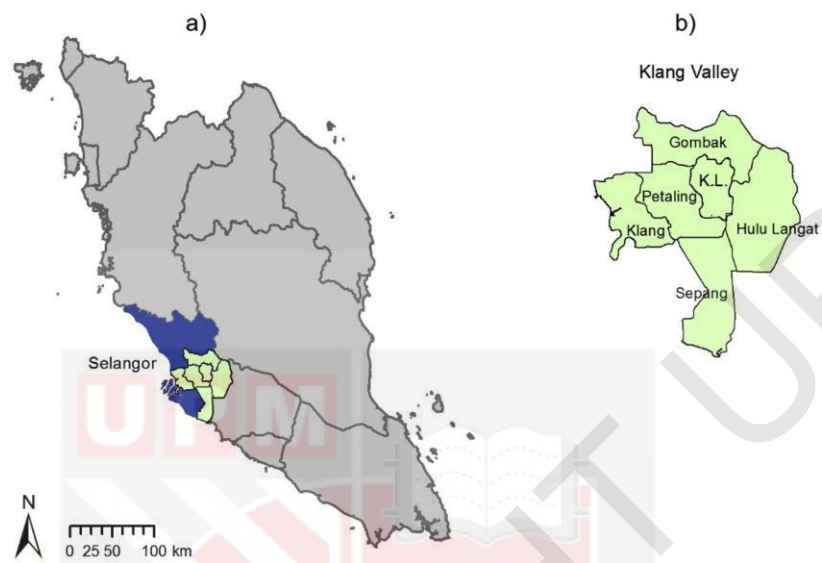


Figure A: Klang Valley Area (Chan & Vu, 2017)

Appendix B: Sample Size Calculation

One sample proportion formula:

$$\text{Sample size } (n) = \frac{Z_{1-\frac{\alpha}{2}}^2 P(1-P)}{d^2}$$

Whereby:

$\alpha = 0.05$ level of significance; $Z_{1-\frac{\alpha}{2}} = 1.96$ of 95% confidence level

P = The reference prevalence (in decimal place)

d = 5% or 0.05 of desired precision level

The estimated sample size for other variables is shown as below:

Study	Variables	Reference prevalence	Estimated sample size
(Bhasin et al., 2021)	Moderate favourable attitude regarding plastic use and its health effects among nursing students	$P=80.3\%$ (0.803)	$n= 244$ $=244+ (244 \times 10\%)$ $= 268$
(Punitha & Hemavathy, 2016)	Good knowledge on health hazards of plastics use among higher secondary school students	$P=13.3\%$ (0.133)	$n= 177$ $= 177+ (177 \times 10\%)$ $= 195$

Appendix C: Research Flowchart

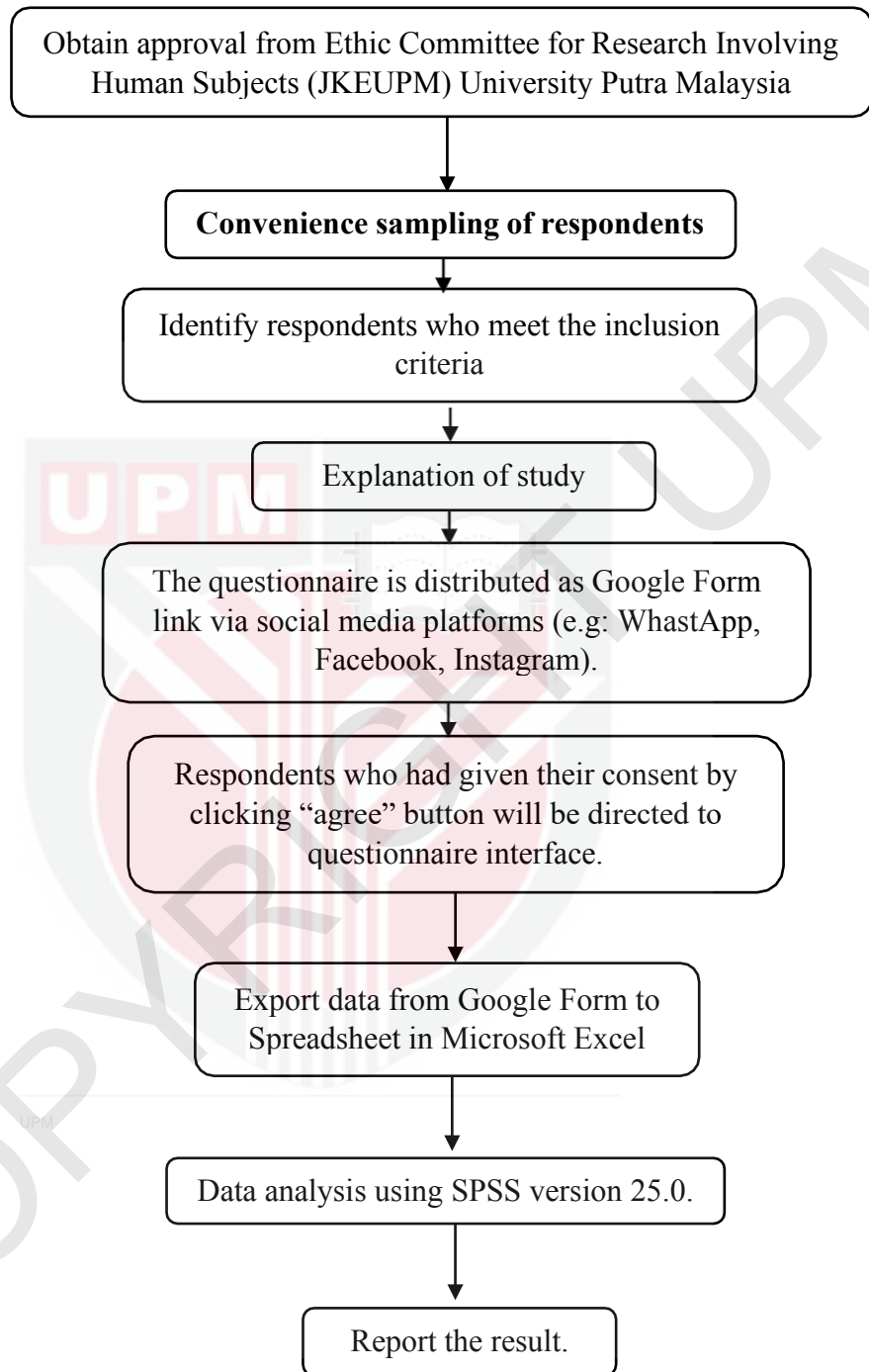


Figure C: Research flowchart

Appendix D: Information Sheet & Informed Consent Form



UPM
UNIVERSITI PUTRA MALAYSIA

**JAWATANKUASA ETIKA UNIVERSITI UNTUK
PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM)
UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG,
SELANGOR, MALAYSIA**

FORM 2.4: RESPONDENT'S INFORMATION SHEET AND INFORMED CONSENT FORM

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.

1. STUDY TITLE :

The Level of Knowledge, Attitude, and Practice (KAP) on Usage and Management of Plastics among Youths at Klang Valley during Covid-19 Pandemic.

2. INTRODUCTION:

Covid-19 pandemic had contributed to a surge of plastic waste in many countries. To prevent viral infection, many people use plastic-based personal protective equipment such as face masks, and hand sanitizer. Tech-savvy youths who showed an active engagement in e-commerce activities (such as online shopping and food delivery ordering) and food takeaway during this pandemic also contribute to the additional disposal of plastic bags, plastic food containers, and many more. The large volume of generated plastic wastes could pose harm to human and environmental health, as well as harming the wildlife. Thus, this study is aimed to assess the knowledge, attitude, and practice on usage and management of various types of plastics among youths at Klang Valley during Covid-19 pandemic. It provides the overview data for the stakeholders in the government and public organization to reduce the degree of this emerging threat.

3. WHAT WILL YOU HAVE TO DO?

This form is to get your permission and agreement on the participation in this study. Approximately 340 respondents will take part in this study. You are required to answer this questionnaire, which takes around 10 minutes to complete. You need not to write your name and any identification on the questionnaire to ensure the confidentiality of your information. You are allowed to withdraw from this study at any point of time without providing valid reasons.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

You are not eligible to participate in this study if you have either one of these criteria: aged less than 18 years old or more than 30 years old, not living at Klang Valley area (Federal Territory of KL & Putrajaya, Petaling district, Klang district, Gombak district and Hulu Langat district, Sepang district and Kuala Langat district).

5. WHAT WILL BE THE BENEFITS OF THE STUDY:

(a) TO YOU AS THE SUBJECT?

You have the opportunity to know your knowledge, attitude, and practice level on the usage and management of various types of plastics during the Covid-19 pandemic. It helps you to track your behavioral pattern and thereby plan the subsequent interventions to practice the wise use of plastics as well as proper plastic disposal method.

(b) TO THE INVESTIGATOR?

The investigator could obtain the baseline information related to knowledge, attitude, and practice level on usage and management of various types of plastics among youths in the Klang Valley area. It will be helpful for the researcher to recommend several strategies in order to tackle a similar problem that might be faced in the future.

6. WHAT ARE THE POSSIBLE RISKS?

You will not experience any risks during the research process. The level of knowledge, attitude, and practice on usage and management of various types of plastics are only assessed through the questionnaire. The data collected are analyzed through mathematical software only.

7. WILL THE INFORMATION THAT YOU PROVIDE AND YOUR IDENTITY REMAIN CONFIDENTIAL?

Your personal information and identity collected from this research will be kept private and confidential. Only the researcher will know the details and it will not be shared with or given to anyone else. You also have the right to access your record if you request it from the researcher.

8. WHO SHOULD YOU CONTACT IF YOU HAVE ADDITIONAL QUESTIONS DURING THE COURSE OF THE RESEARCH?

You can contact the researcher individually if there are additional questions to ask during the course of the research.

1. Lee Yi Jia
Undergraduate student
Department of Environmental and Occupational Health
University Putra Malaysia
Mobile number: +60178405296
E-mail: 195932@student.upm.edu.my

2. Dr Sharifah Norkhadijah Syed Ismail
Senior lecturer
Department of Environmental and Occupational Health
University Putra Malaysia
Mobile number: +60122646712
E-mail: norkhadijah@upm.edu.my

Please initial here if you have read and understood the contents of this page_____

9. CONSENT

I Identity Card No.
address.....
.....hereby voluntarily agree to take part in
the research stated above *(clinical /drug trial/video recording/ focus group/interview-based/
questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible
adverse
effects and complications (as written in the Respondent's Information Sheet). I understand
that I have the right to withdraw from this research at any time without giving any reason
whatsoever. I also understand that this study is confidential and all information provided with
regard to my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me
be used in any form of publication or presentation (if applicable)

* delete where necessary

Signature Signature
(Respondent) (Witness)

Date : Name :
I/C No. :

I confirm that I have explained to the respondent the nature and purpose of the above-
mentioned research.

Date Signature
(Researcher)



BORANG 2.4: PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1. TAJUK KAJIAN

Tahap Pengetahuan, Sikap, dan Amalan (KAP) Mengenai Penggunaan Dan Pengurusan Plastik Dalam Kalangan Belia Di Lembah Klang Sepanjang Pandemik Covid-19

2. PENGENALAN

Pandemik Covid-19 telah menyumbang kepada lonjakan plastik sampah di banyak negara. Untuk mengelakkan jangkitan virus, banyak orang menggunakan alat perlindungan diri berasaskan plastik seperti topeng muka, dan pensanitasi tangan. Golongan belia yang mahir teknologi juga menunjukkan penglibatan aktif dalam aktiviti e-dagang (seperti membeli-belah dalam talian dan pesanan makanan dalam talian) dan “*food takeaway*” semasa wabak ini juga menyumbang kepada pembuangan beg plastik, bekas makanan plastik, dan banyak lagi. Peningkatan sampah plastik yang dihasilkan ini boleh mendatangkan bahaya kepada kesihatan manusia dan alam sekitar, serta membahayakan hidupan liar. Oleh itu, kajian ini adalah bertujuan untuk menilai pengetahuan, sikap, dan amalan mengenai penggunaan dan pengurusan jenis plastik yang berlainan dalam kalangan belia di Lembah Klang semasa pandemik Covid-19. Ini memberikan gambaran keseluruhan bagi para pemangku dalam pemerintah dan organisasi awam untuk mengurangkan tahap ancaman ini.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Borang ini adalah untuk mendapatkan kebenaran dan persetujuan anda mengenai penyertaan dalam kajian ini. Anda diminta untuk menjawab soal selidik ini yang memerlukan masa sekitar 15 minit untuk dilengkapkan. Anda tidak perlu menulis nama atau apa-apa identiti diri di dalam borang soal selidik untuk memastikan kerahsiaan maklumat anda. Tiada paksaan untuk menyertai dan anda dibenarkan untuk menarik diri dari kajian ini pada bila-bila masa tanpa memberikan sebarang alasan.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Anda tidak layak untuk menyertai kajian ini sekiranya anda mempunyai salah satu kriteria ini: berumur kurang daripada 18 tahun atau lebih daripada 30 tahun, tidak bertinggal di kawasan Lembah Klang (Wilayah Persekutuan KL & Putrajaya, daerah Petaling, daerah Klang, daerah Gombak, daerah Hulu Langat, daerah Sepang dan daerah Kuala Langat).

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

a) KEPADA ANDA SEBAGAI PESERTA?

Anda berpeluang untuk mengetahui tahap pengetahuan, sikap, dan amalan anda mengenai penggunaan dan pengurusan jenis plastik yang berlainan semasa pandemik Covid-19. Ini membantu anda untuk mengesan corak tingkah laku supaya anda boleh merancang langkah penggunaan plastik secara bijak dan juga kaedah pembuangan plastik yang betul.

b) KEPADA PENYELIDIK?

Penyelidik dapat memperoleh maklumat dasar yang berkaitan dengan tahap pengetahuan, sikap, dan amalan mengenai penggunaan dan pengurusan jenis plastik yang berlainan dalam kalangan belia. Ini adalah berguna bagi penyelidik dalam mencadangkan strategi untuk mengatasi masalah serupa yang mungkin dihadapi pada masa depan.

6. ADAKAH IA BERISIKO?

Anda tidak akan menghadapi risiko semasa proses penyelidikan. Tahap pengetahuan, sikap, dan amalan mengenai penggunaan dan pengurusan jenis plastik yang berlainan hanya dinilai melalui borang soal selidik. Data yang dikumpulkan akan dianalisa melalui perisian matematik sahaja.

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Maklumat dan identiti peribadi anda yang dikumpul dari penyelidikan ini akan dirahsiakan. Hanya penyelidik yang akan mengetahui perinciannya dan ini tidak akan dikongsikan atau diberikan kepada orang lain. Anda juga berhak untuk mengakses rekod anda sekiranya anda memintanya daripada penyelidik.

8. SIAPA YANG SAYA PERLU HUBUNGI SEKIRANYA SAYA MEMPUNYAI SOALAN TAMBAHAN SEMASA MENGIKUTI PENYELIDIKAN INI?

Anda boleh menghubungi penyelidik secara individu sekiranya mempunyai soalan tambahan semasa mengikuti penyelidikan ini.

1. Lee Yi Jia
Pelajar Ijazah Sarjana Muda
Jabatan Kesihatan Persekitaran dan Pekerjaan
Universiti Putra Malaysia
Nombor telefon: +60178405296
E-mel: 195932@student.upm.edu.my

2. Dr Sharifah Norkhadijah Syed Ismail
Pensyarah senior
Jabatan Kesihatan Persekitaran dan Pekerjaan
Universiti Putra Malaysia
Nombor telefon: +60122646712
E-mel: norkhadijah@upm.edu.my

Sila tandatangan di sini sekiranya anda telah membaca dan memahami kandungan halaman ini _____

9. PERSETUJUAN

Saya..... No Kad Pengenalan.
beralamat.....
.....dengan ini bersetuju untuk mengambil bahagian secara
sukarela dalam penyelidikan yang tersebut di atas *(kajian klinikal/percubaan ubat-
ubatan/rakaman video/kumpulan sasaran/temuduga/ soal selidik).

Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi
metodologi, risiko dan komplikasi (seperti tertulis pada Helaian Penerangan Responden).
Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa
tanpa memberi sebarang alasan. Saya juga memahami bahawa sebarang maklumat yang
berkaitan identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yang melibatkan saya.

I setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan dalam
apa jua bentuk penerbitan atau pembentangan. (sekiranya berkaitan).

*potong yang tidak berkenaan

Tandatangan Tandatangan
(Responden) (Saksi)

Tarikh : Nama :

No. K/P:

Saya mengesahkan bahawa saya telah menerangkan kepada responden ini sifat dan tujuan
penyelidikan yang tersebut di atas.

Tarikh Tandatangan
(Penyelidik)

APPENDIX E: QUESTIONNAIRE (ENGLISH & MALAY VERSION)



QUESTIONNAIRE/ *BORANG KAJI SELIDIK*

RESEARCH TITLE/ <i>TAJUK KAJIAN:</i>	THE LEVEL OF KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) ON USAGE AND MANAGEMENT OF PLASTICS AMONG YOUTHS AT KLANG VALLEY DURING COVID-19 PANDEMIC <i>TAHAP PENGETAHUAN, SIKAP, DAN AMALAN (KAP) MENGENAI PENGGUNAAN DAN PENGURUSAN PLASTIK DALAM KALANGAN BELIA DI LEMBAH KLANG SEPANJANG PANDEMIK COVID-19</i>
RESEARCHER NAME/ NAMA <i>PENKAKI:</i>	LEE YI JIA

This questionnaire contains 3 sections:

Borang soal selidik ini mengandungi 3 bahagian:

A	Socio-demographic information <i>Maklumat sosio-demografi</i>
B	Plastic usage and management during Covid-19 pandemic <i>Penggunaan and pengurusan plastik semasa pandemic Covid-19</i>
C	Knowledge, attitude and practice on plastic usage and management <i>Pengetahuan, sikap, dan amalan mengenai penggunaan dan pengurusan plastik</i>

SECTION A: SOCIO-DEMOGRAPHIC INFORMATION

BAHAGIAN A: MAKLUMAT SOCIO-DEMOGRAPHIK

INSTRUCTIONS: Fill in the relevant information and tick (✓) your answer based on the questions below

ARAHAN: Isi maklumat yang berkaitan dan tandakan (✓) jawapan anda untuk soalan di bawah.

1. Age/*Umur* (e.g.: 18): _____

2. Gender/*Jantina*

- ☐ Male/*Lelaki*
☐ Female/*Perempuan*

3. Ethnicity/*Bangsa*

- ☐ Malay/*Melayu*
☐ Chinese/*Cina*
☐ Indian/*India*
☐ Other (please specify)/*Lain-lain (sila nyatakan)*: _____

4. Marital Status/*Status Perkahwinan*

- ☐ Single/*Bujang*
☐ Married/*Sudah berkahwin*
☐ Divorced/*Widowed/ Bercerai/ Balu atau duda*

5. Highest education level/*Taraf pendidikan tertinggi*

- ☐ No education/*Tiada pendidikan*
☐ Primary education/*Sekolah rendah*
☐ Secondary education/*Sekolah menengah*
☐ Pre-university/*Pra-universiti*
☐ Bachelor's Degree / *Ijazah Sarjana Muda*
☐ Master's degree/*Ijazah Sarjana*
☐ Doctor of Philosophy/*Doktor Falsafah (PhD)*
☐ Others (please specify)/*Lain-lain (sila nyatakan)*: _____

6. Occupational status

- ☐ Students/ *Pelajar*
- ☐ Employees/ *Pekerja*
- ☐ Self-employed/ *Bekerja sendiri*
- ☐ Unemployed/ *Tidak bekerja*
- ☐ Other (please specify) /*Lain-lain (sila nyatakan)*: _____



**SECTION B: PLASTIC USAGE AND MANAGEMENT DURING COVID-19
PANDEMIC**

**BAHAGIAN B: PENGGUNAAN AND PENGURUSAN PLASTIK SEMASA
PANDEMIC COVID-19**

INSTRUCTIONS: Please tick (✓) your answer based on the questions below.

ARAHAN: Silat tandakan (✓) jawapan anda berdasarkan soalan di bawah.

1. Are you aware of the plastic waste problem that happened during Covid-19 pandemic?/ *Adakah anda menyedari masalah sampah plastik yang berlaku semasa pandemik Covid-19?*

- ☐ Yes/ *Ya*
☐ No/ *Tidak*

2. What is the trend of your plastic usage during Covid-19 pandemic, as compared to before Covid-19 pandemic?/ *Apakah trend penggunaan plastik anda semasa pandemik Covid-19, dibandingkan dengan pandemik Covid-19 sebelum ini?*

- ☐ Increasing/ *Semakin meningkat*
☐ Decreasing/ *Semakin menurun*
☐ No changes/ *Tiada perubahan*
☐ Not sure/ *Tidak pasti*

3. Where is/are your plastic waste during the pandemic majorly comes from?/ *Dari mana sampah plastik anda berasal semasa pandemik ini?*

- ☐ Personal protective equipment (eg: facemasks/gloves/ hand sanitizer bottles)/ *Alat perlindungan diri (cth: topeng muka / sarung tangan / botol pensanitasi tangan)*
- ☐ Online grocery shopping (e.g.: Tesco online, fresh produce delivery)/ *Membeli-belah barang runcit dalam talian (Cth: Tesco dalam talian, penghantaran hasil segar)*
- ☐ Online shopping (e.g: Lazada, Shopee)/ *Membeli-belah dalam talian (Cth: Lazada, Shopee)*
- ☐ Grocery shopping in person/ *Membeli barang runcit secara peribadi*
- ☐ Food delivery/ *Pesanan makanan dalam talian (e.g.: Food Panda, Grab food)*
- ☐ Food takeout/ *Bungkusan makanan*

4. How much of these plastic items that you used /disposed per week during the Covid-19 pandemic? (Please tick the relevant boxes)* For those who used/ disposed less than 1 piece/week, you may choose “Not applicable”. / *Berapa banyak barang plastik yang anda gunakan / buang setiap minggu semasa pandemik Covid-19? (Sila tandakan kotak yang berkaitan).** Bagi mereka yang menggunakan / membuang kurang daripada 1 helai seminggu, anda boleh memilih "Tidak berkenaan".

Types of plastics/ Jenis plastik		1-2 pieces per week/ 1-2 kepingan seminggu	3-4 pieces per week/ 3-4 kepingan seminggu	5-6 pieces per week/ 5-6 kepingan seminggu	> 7 pieces per week/ >7 kali kepingan seminggu	Not applicable/ Tidak berkenaan
Basic PPEs/ PPE asas	Face masks/ Topeng muka					
	Face shield/ Pelindung muka					
	Gloves/ Sarung tangan					
	Hand sanitizer bottles/ Botol pensanitasi tangan					
Other single-use plastics/ Plastik sekali guna yang lain	Plastic bags/ Beg plastik					
	Plastic food container/ Bekas makanan plastik					
	Plastic cutlery/ Alat makan plastik					
	Plastic bottles/ Botol plastik					
	Plastic courier bags/ Beg kurier plastik					
	Bubble wrap/ Pembungkus gemplung					

5. How often do you dispose the plastic waste below during the Covid-19 pandemic? (Please tick the relevant boxes)* For those who dispose less than 1 time per week, you may choose “Not applicable”. / *Berapa kerap anda membuang sampah plastik di bawah semasa pandemik Covid-19? (Sila tandakan kotak yang berkaitan).** Bagi mereka yang membuang kurang daripada 1 kali seminggu, anda boleh memilih "Tidak berkenaan".

Types of plastics/ <i>Jenis plastik</i>		1-2 times per week/ 1-2 kali <i>seminggu</i>	3-4 times per week/ 3-4 kali <i>seminggu</i>	5-6 times per week/ 5-6 kali <i>seminggu</i>	> 7 times per week/ >7 kali kali <i>seminggu</i>	Not applicable/ <i>Tidak berkenaan</i>
Basic PPEs/ PPE asas	Face masks/ <i>Topeng muka</i>					
	Face shield/ <i>Pelindung muka</i>					
	Gloves/ <i>Sarung tangan</i>					
	Hand sanitizer bottles/ <i>Botol pensanitasi tangan</i>					
Other single-use plastics/ Plastik sekali guna yang lain	Plastic bags/ <i>Beg plastik</i>					
	Plastic food container/ <i>Bekas makanan plastik</i>					
	Plastic cutlery/ <i>Alat makan plastik</i>					
	Plastic bottles/ <i>Botol plastik</i>					
	Plastic courier bags/ <i>Beg kurier plastik</i>					
	Bubble wrap/ <i>Pembungkus geplumbung</i>					

6. Usually, how do you manage the plastic waste below during Covid-19 pandemic? /
*Biasanya, bagaimana anda menguruskan sampah plastik di bawah semasa wabak
Covid-19?*

Types of plastics/ <i>Jenis plastik</i>	Dispose together with mixed waste/ <i>Buangkan bersama dengan sisa campuran</i>	Dispose it in separate bags/ <i>Buangkan dalam beg yang berasingan</i>	Dispose it separately (together with plastics)/ <i>Buangkan secara berasingan (bersama dengan plastik)</i>	Dispose of wherever possible/ <i>Buang sedapat mungkin</i>	Not applicable/ <i>Tidak berkenaan</i>

Basic PPEs/ PPE asas	Face masks/ <i>Topeng muka</i>					
	Face shield/ <i>Pelindung muka</i>					
	Gloves/ <i>Sarung tangan</i>					
	Hand sanitizer bottles/ <i>Botol pensanitasi tangan</i>					
Types of plastics/ <i>Jenis plastik</i>		Throwing into the dustbin/ <i>Membuang ke tong sampah</i>	Reducing/ <i>Pengurangan</i>	Reusing/ <i>Penggunaan guna semula</i>	Recycling/ <i>Kitar semula</i>	Not applicable/ <i>Tidak berkenaan</i>
Other single-use plastics/ <i>Plastik sekali guna yang lain</i>	Plastic bags/ <i>Beg plastik</i>					
	Plastic food container/ <i>Bekas makanan plastik</i>					
	Plastic cutlery/ <i>Alat makan plastik</i>					
	Plastic bottles/ <i>Botol plastik</i>					
	Plastic courier bags/ <i>Beg kurier plastik</i>					
	Bubble wrap/ <i>Pembungkus gemlumbung</i>					

7. Where do you get the information related to plastic waste during Covid-19 pandemic? / *Di manakah anda mendapatkan maklumat yang berkaitan dengan sampah plastik semasa pandemik Covid-19?*

- ☐ Do not receive any related information/ *Tidak menerima maklumat yang berkaitan*
- ☐ Social media / *Media sosial* (Instagram, Facebook, Twitter)
- ☐ Mass media/ *Media massa* (television, radio)
- ☐ Personal sources/ *Sumber peribadi* (family, relatives, friends)
- ☐ Formal sources/ *Sumber formal* (lectures, seminars, workshops, conferences)
- ☐ Other (please specify)/ *Lain-lain (sila nyatakan):* _____

8. Reason(s) for not practicing sustainable plastic waste management./ *Sebab-sebab tidak mengamalkan pengurusan sampah plastik yang lestari.*

- ☐ I don't have time/ *Saya tidak mempunyai masa*
- ☐ I simply don't care about the environment/ *Saya tidak peduli dengan persekitaran*
- ☐ I am used to not doing it/ *Saya sudah biasa tidak melakukannya*
- ☐ I feel inconvenient to do it/ *Saya berasa benda ini menyusahkan saya untuk melakukan*
- ☐ Other (please specify)/ *Lain-lain (sila nyatakan):* _____

SECTION C: KNOWLEDGE, ATTITUDE AND PRACTICE

BAHAGIAN C: PENGETAHUAN, SIKAP AND AMALAN

I) Knowledge on plastic usage and management / Pengetahuan mengenai penggunaan dan pengurusan plastik

INSTRUCTIONS: Please tick (✓) your answer in the “True”, “False” OR “Not sure” column based on the questions below.

ARAHAN: Silat tandakan (✓) jawapan anda di ruangan “Betul”, “Salah” ATAU “Tidak pasti” berdasarkan soalan di bawah.

No	Statement/ <i>Penyataan</i>	True/ <i>Betul</i>	False/ <i>Salah</i>	Not sure/ <i>Tidak pasti</i>
1	One of the major components of municipal solid waste (MSW) is plastic. / <i>Salah satu komponen utama sisa pepejal perbandaran (MSW) adalah plastik</i>			
2	In Malaysia, many of the generated plastic waste is end up in landfills. / <i>Di Malaysia, banyak sisa plastik yang dihasilkan berakhir di tapak pelupusan sampah.</i>			
3	Covid-19 pandemic causes the increase of plastic usage in Malaysia. / <i>Pandemik Covid-19 telah meningkatkan penggunaan plastik di Malaysia.</i>			
4	All plastics used can be recycled. / <i>Semua plastik yang digunakan boleh dikitar semula.</i>			
5	All plastics used will be decomposed over time. / <i>Semua plastik yang digunakan akan terurai dari masa ke masa.</i>			
6	Increase of plastic waste will cause negative effects to the natural environmental. / <i>Peningkatan sampah plastik akan menyebabkan kesan negatif terhadap persekitaran semula jadi.</i>			
7	Increase of plastic waste will harm marine life due to entanglement and ingestion of plastic debris. / <i>Peningkatan sampah plastik akan membahayakan hidupan laut kerana terjerat dan menelan serpihan plastik.</i>			
8	Increase of plastic waste will increase the potential to affect human health. /			

	<i>Peningkatan sampah plastik akan meningkatkan potensi untuk mempengaruhi kesihatan manusia.</i>			
9	The possible reasons for the increase in the utilization of single-use plastics are cheapness, durability, and availability./ <i>Sebab-sebab yang mungkin menyebabkan peningkatan penggunaan plastik sekali guna adalah murah, tahan lama, dan ketersediaan.</i>			
10	The plastic waste management approaches consist of reduce, reuse, recycle, incineration and landfilling. / <i>Pengurusan sampah plastik terdiri daripada pengurangan, penggunaan semula, kitar semula, pembakaran dan pelupusan sampah.</i>			

II) Attitude on plastic usage and management / Sikap mengenai penggunaan dan pengurusan plastik

INSTRUCTIONS: Please tick (✓) your answer for the questions below by using the following scale.

ARAHAN: Silat tandakan (✓) jawapan anda untuk soalan di bawah dengan menggunakan skala berikut.

Strongly disagree/ Sangat tidak setuju	Disagree/ Tidak setuju	Neutral/ Neutral	Agree/ Setuju	Strongly agree/ Sangat setuju
1	2	3	4	5

No.	Statements/ <i>Penyataan</i>	Scale/ <i>Skala</i>				
		1	2	3	4	5
1	I feel guilty of my excessive use of plastics during Covid-19 pandemic./ <i>Saya merasa bersalah kerana menggunakan terlalu banyak plastik semasa pandemik Covid-19.</i>					
2	I prefer to use eco-friendly bags rather than plastic bags./ <i>Saya lebih suka menggunakan beg mesra alam daripada beg plastik semasa pandemik Covid-19.</i>					
3	I am concerned about the risks of plastic wastes that could potentially bring to me./ <i>Saya prihatin dengan risiko sampah plastik yang berpotensi membawa kepada saya</i>					
4	I would like to read for more information related to the effects resulting from excessive plastic consumption. / <i>Saya ingin membaca untuk mendapatkan lebih banyak maklumat yang berkaitan dengan kesan akibat penggunaan plastik yang berlebihan.</i>					
5	I would like to disseminate the information regarding the issue of plastic waste problem to my friends and family members./					

	<i>Saya ingin menyebarkan maklumat mengenai masalah sampah plastik kepada rakan dan ahli keluarga saya.</i>					
6	<i>I feel that the proper plastic waste disposal is important. / Saya merasakan bahawa pembuangan sampah plastik yang betul adalah penting.</i>					
7	<i>I feel guilty if I throw plastic waste at an improper place. / Saya merasa bersalah jika membuang sampah plastik di tempat yang tidak betul.</i>					
8	<i>I think the 3Rs practices are a good option to reduce plastic waste./ Saya berpendapat amalan 3R adalah pilihan yang baik untuk mengurangkan sampah plastik.</i>					
9	<i>I would like to reduce my use of single-use plastics./ Saya ingin mengurangkan penggunaan plastik sekali pakai.</i>					
10	<i>I tend to reuse plastic items that could be useful for me./ Saya cenderung menggunakan semula barang plastik yang berguna untuk saya.</i>					
11	<i>I am willing to participate in the recycling campaign that held in the future./ Saya bersedia untuk menyertai kempen kitar semula yang diadakan pada masa akan datang.</i>					
12	<i>I am willing to pay more for an item containing biodegradable packaging./ Saya bersedia untuk membayar lebih banyak dalam bungkusan barang yang boleh terbiodegradasikan.</i>					

III) Practice on plastic usage and management / Amalan mengenai penggunaan dan pengurusan plastik

INSTRUCTIONS: Please tick (✓) your answer for the questions below by using the following scale.

ARAHAN: Silat tandakan (✓) jawapan anda untuk soalan di bawah dengan menggunakan skala berikut.

Never/ Tidak pernah	Seldom/ Jarang-jarang (1-2 times per semester/ 1-2 kali dalam satu semester)	Sometimes/ Kadang-kala (1-2 times per month/ 1-2 kali dalam sebulan)	Often/ Kerap (1-3 times per week/ 1-3 kali dalam seminggu)	Always/ Sangat kerap (>3 times per week/ >3 kali dalam seminggu)
1	2	3	4	5

No.	Statements/ <i>Penyataan</i>	Scale/ <i>Skala</i>				
		1	2	3	4	5
1	I ask for single-use plastic cutlery when taking out food. / <i>Saya minta alat makan plastik sekali pakai semasa membeli makanan.</i>					
2	When I buy anything, I take care that the packaging is plastic or not./ <i>Apabila saya membeli apa-apa, saya menjaga bahawa bungkusannya ialah plastik atau tidak.</i>					
3	I dispose plastic waste in a responsible manner. / <i>Saya membuang sampah plastik dengan cara yang bertanggungjawab.</i>					
4	I separate the recyclable plastic waste from the general waste before disposal. <i>Saya memisahkan sampah plastik yang boleh dikitar semula daripada sampah am sebelum membuangnya.</i>					
5	I bring reusable bags when going shopping. / <i>Saya membawa beg yang boleh digunakan semula ketika membeli-belah.</i>					
6	I use my own container to take away food./ <i>Saya menggunakan bekas sendiri untuk membeli makanan.</i>					

7	I reuse my plastic bags after their initial usage./ <i>Saya menggunakan semula beg plastik selepas penggunaan awal mereka.</i>					
8	I upcycle (creative reuse) the plastic waste./ <i>Saya upcycle (menggunakan semula secara kreatif) sampah plastik.</i>					
9	I throw the recyclable plastic waste into the recycle bin./ <i>Saya membuang sampah plastik yang boleh dikitar semula ke tong kitar semula.</i>					
10	I collect plastic waste and sell it to the recycling agent./ <i>Saya mengumpulkan sampah plastik dan menjualnya kepada ejen kitar semula</i>					
11	I search for any information related to plastic waste management./ <i>Saya mencari maklumat yang berkaitan dengan pengurusan sampah plastik.</i>					

**ETHICS COMMITTEE FOR RESEARCH INVOLVING HUMAN SUBJECTS
(JKEUPM)
UNIVERSITI PUTRA MALAYSIA**

Research title	: Assessing The Usage and Management of Various Types of Plastics Among Youths at Klang Valley During COVID-19 Pandemic.
Study Site	: Klang Valley.
JKEUPM Ref No.	: JKEUPM-2021-377
Researcher	: Lee Yi Jia
Supervisor	: Dr Sharifah Norkhadijah Syed Ismail

Documents received and reviewed with reference to the above study:

1. Ethics Application Form, Version 1 dated 14/06/2021
2. Respondent's Information Sheet / Consent (English), Version 2 dated 25/06/2021
3. Proposal (English), Version 2 dated 11/10/2021
4. Questionnaire / Interviews (English), Version 1 dated 14/06/2021
5. Curriculum Vitae of:
 - a. Dr. Sharifah Norkhadijah Syed Ismail

The University Research Ethics Committee, Universiti Putra Malaysia (JKEUPM) operates in accordance to the ICH-GCP Guidelines.

Decision by JKEUPM:

- ☒ Approved
- ☒ **Permission MUST BE OBTAINED from the respective hospitals/ institutions before conducting the research**
- ☐ Disapproved

Please note that the approval is **VALID UNTIL 11 OCTOBER 2022**

Researchers should comply with the following:

- I. Complete a Study Final Report upon study completion (Form 3.2).
- II. Ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.
- III. Applicable for Clinical Trial Studies and Clinical interventional Studies only: Progress Report has to be submitted to JKEUPM at every 6 months from the date of approval (Form 3.1). Report occurrences of all Serious Adverse Events (SAEs), Suspected Unexpected Serious Adverse Reaction (SUSARs) and Protocol Deviation/ Violation at all JKEUPM approved sites to JKEUPM. SAEs are to be reported within 15 calendar days from awareness of event by investigator. Initial report of SUSARs are to be reported as soon as possible but not later than

Appendix G: Normality Testing

Graphical Distribution of Normality testing for Continuous Variables

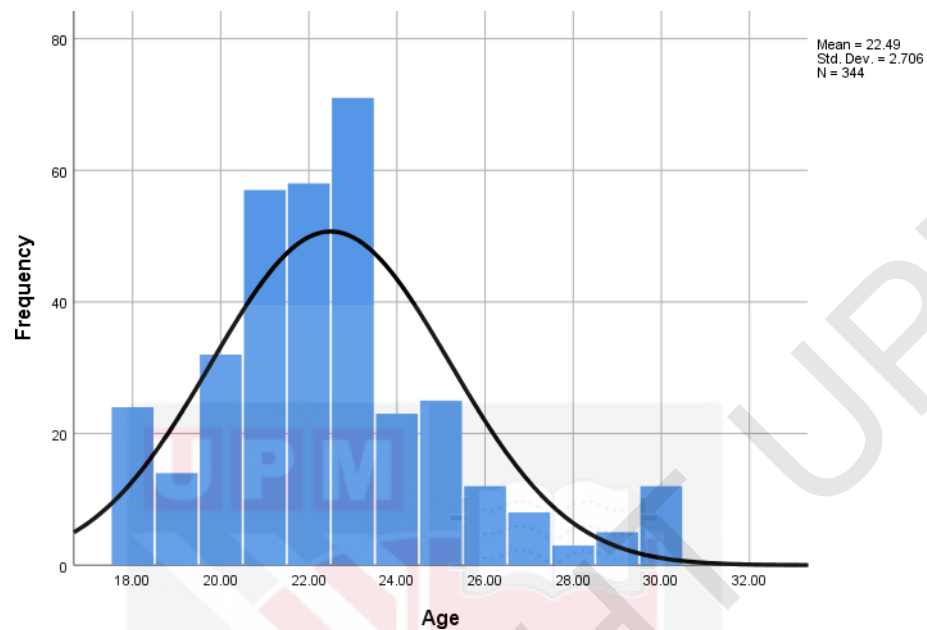


Figure G1: Histogram for distribution of respondent's age

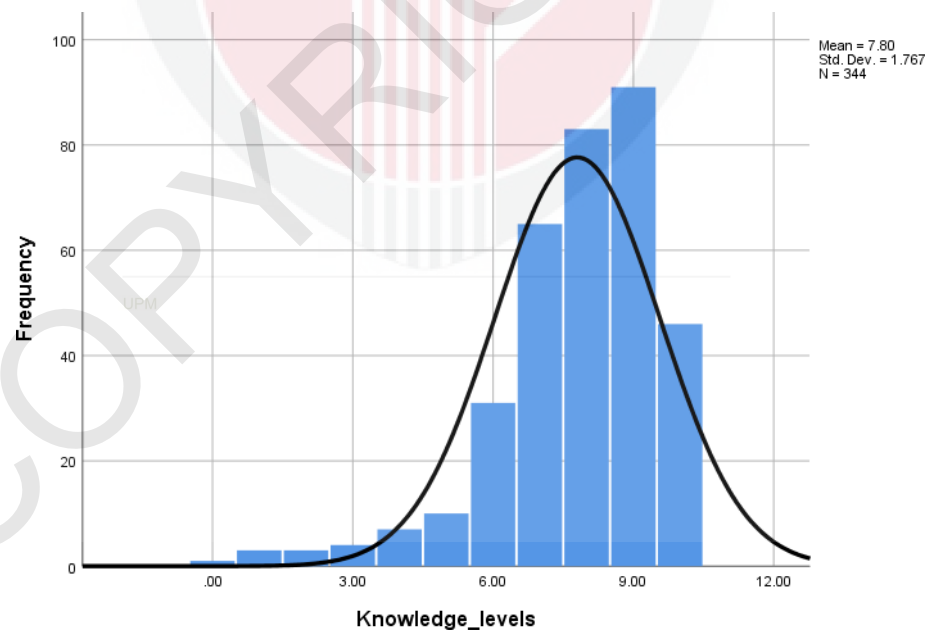


Figure G2: Histogram for distribution of knowledge score

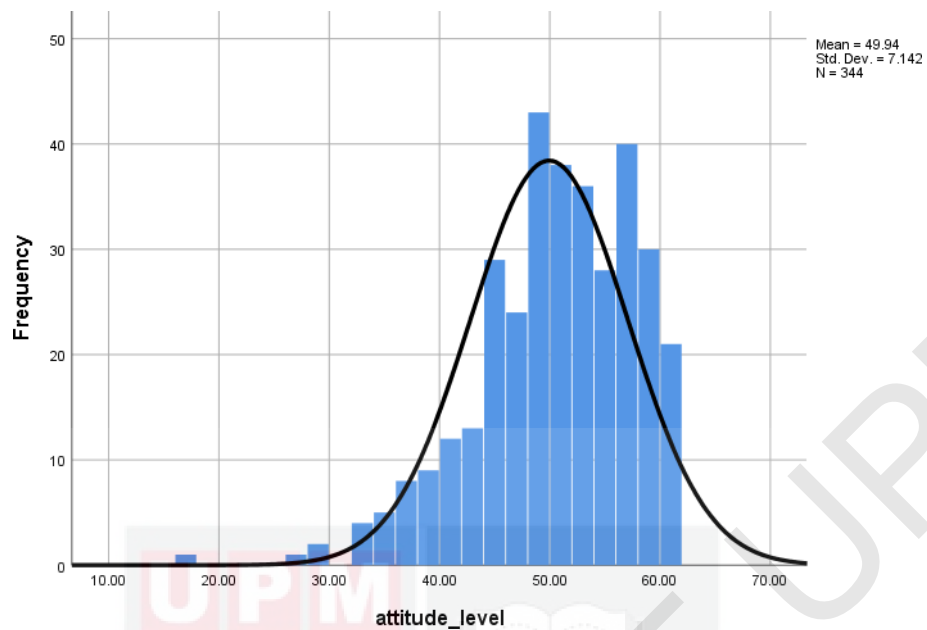


Figure G3: Histogram for distribution of attitude score

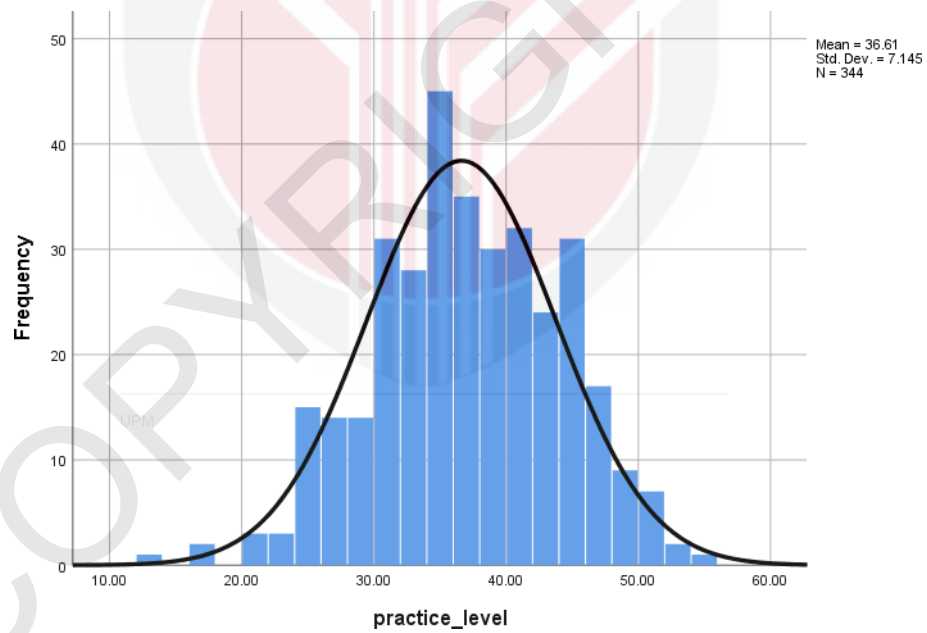


Figure G4: Histogram for distribution of practice score

Appendix H: Cronbach's Alpha Analysis

Knowledge items

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.712	.711	10

Attitude items

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.891	.893	12

Practice items

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.768	.767	11