KNOWLEDGE, READINESS AND BARRIERS FACTORS TO SUPPORT THE SINGLE-USE PLASTIC REDUCTION PROGRAMME AMONG KELANTAN STREET FOOD HAWKERS USING A NEW MALAY VERSION QUESTIONNAIRE

DOCTOR IN PUBLIC HEALTH

(OCCUPATIONAL AND ENVIRONMENTAL HEALTH)

By

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(P-UD0110/18)

ACKNOWLEDGEMENT

Alhamdulillah, I praise for the greatness of ALLAH s.w.t that never stop helping me through the journey. He is the Almighty that gives me this journey and grants me to walk through this journey with His blessings and generosity.

First, I would like to express my greatest gratitude to my supervisor Dr. Ahmad Filza bin Ismail and Assoc. Prof. Dr Nor Azwany binti Yaacob from Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia. They have endlessly given me full support, inspiration and knowledge sharing throughout my journey. They never gave up upon me and always positive in educating and providing opportunities in the development of this thesis. They also guided me on the analytical process of my project. I would never go this far without their help and support. Their constructive comments made me understood the way to write a better piece intellectual writing until today. I will always respect them wholeheartedly.

My sincere thanks also go to Kelantan State Secretary Office for the help especially in sharing data on number of hawkers and data on selected night markets in Kelantan. Besides that, they have also given me permission to conduct my research at selected night market sites. I would also like to express my gratitude to all lecturers, staff, and my course-mates for sharing their knowledge and giving their support during this thesis writings.

Lastly, I would like to express my love and gratitude to my beloved family especially to my parents, Haji Abdullah bin Abdul Rahman, Hjh. Ruhanah binti Abdul Ghani, my husband Zulhisyam bin Baharudin and entire family for sharing my ups and downs through this journey. Their supports and prayers had given me the strength to complete this task.

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DECLARATION

I, Nur Baizura Aini binti Abdullah, declare that the work presented in this thesis is originally mine. The information which has been derived from other sources is clearly indicated in this thesis.

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Signed on 30th December 2021

LIST OF PAPERS AND CONFERENCES

During my Doctor of Public Health (DrPH) course, the following articles were drafted for the submission for the publication in journals indexed by Web of Science Group/ SCOPUS / PUBMED. Overall, the manuscripts were according to the study specific objectives.

First draft papers for submission:

Development and Validation of a New Questionnaire to Measure Knowledge Level of Street Food Hawkers to Support the Single-use Plastics Reduction Program in Kelantan

Nur Baizura Aini Abdullah, Nor Azwany Yaacob, Ahmad Filza Ismail[a]

Department of Community Medicine, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, Kelantan Darul Naim, Malaysia.

Development and Validation of a Street Food Hawkers Readiness and Barriers Questionnaire to Support Single-Use Plastic Reduction Program

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Knowledge, Readiness and Barriers of Street Food Hawkers to Support the Single-use Plastic Reduction Program

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Published paper

Food Poisoning Outbreak among School Children in Terengganu Year 2016: Its Characteristics and Associated Factors

Citation:

Abdullah, N.B.A. and Ismail, A.F., 2021. Food Poisoning Outbreaks among Schoolchildren in Terengganu and their Associated Factors. *Sains Malaysiana*, *50*(4), pp.1027-1036.

Conference presentation

UniSZA International Infectious Diseases Conference 2018, 17-18 August 2018

- **Food Poisoning Outbreak Among School Children in Terengganu Year 2016: Its Characteristics and Associated Factors (Best oral presenter)**

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LIST OF ABBREVIATIONS

CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CI	Confident interval
DOSM	Department of Statistics Malaysia
EFA	Exploratory Factor Analysis
HDPE	High Density Polyethylene
IQR	Inter quartile range
IRT	Item Response Theory
JSJPN	Jabatan Pengurusan Sisa Pepejal Negara
KAP	Knowledge, Attitude, Practice
KMO	Kaiser-Mayer Olkin
LDPE	Low Density Polyethylene
MPMA	Malaysian Plastics Manufacturers Association
OR	Odds ratio
PE	Phthalates
PET/PETE	Polyethylene Terephthalate

PP	Polypropylene
PS	Polystyrene
PVC	Polyvinyl chloride
RMSEA	Root Mean Square error of Approximation
SC	Sustainable consumption
SD	Standard Deviation
SFH-RS	Street Food Hawkers Readiness Scale questionnaire
TPB	Theory of Planned Behaviour

LIST OF SYMBOLS

>	More than
<	Less than
≥	More than or equal to
≤	Less than or equal to
=	Equal to
%	Percentage
n	Number of populations

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ABSTRAK

FAKTOR-FAKTOR PENGETAHUAN, KESEDIAAN DAN HALANGAN YANG MENYOKONG PROGRAM PENGURANGAN PLASTIK SEKALI GUNA DALAM KALANGAN PENJAJA MAKANAN JALANAN DI KELANTAN MENGGUNAKAN SOALAN KAJI SELIDIK VERSI MELAYU YANG BAHARU

Pengenalan: Penggunaan bekas plastik sekali guna yang berlebihan telah menyebabkan pencemaran alam sekitar dan masalah kesihatan yang serius kepada manusia. Penjaja makanan telah menyumbang kepada masalah ini kerana permintaan yang tinggi terhadap makanan sedia untuk dimakan dan ini perlu dikawal. Terdapat keperluan untuk menilai pengetahuan, kesediaan, dan halangan untuk menyokong program pengurangan plastik. Terdapat juga keperluan untuk mewujudkan dan mengesahkan borang kaji selidik baharu kerana terdapat sangat sedikit borang kaji selidik sedia ada serta tidak mencukupi kerana populasi sasaran yang berbeza.

Objektif kajian: Kajian ini melibatkan pembangunan dan pengesahan borang kaji selidik baharu untuk menilai pengetahuan, kesediaan, dan halangan penjaja makanan jalanan untuk menyokong program pengurangan plastik sekali guna di Kelantan. Ini adalah kajian 2 fasa dengan Fasa 1 melibatkan proses pewujudan dan validasi borang kaji selidik baharu yang telah dijalankan pada bulan Disember 2019 sehingga bulan Mac 2020, manakala kajian Fasa 2 telah dijalankan pada bulan Mac 2020 sehingga April 2021 melibatkan penilaian pengetahuan, kesediaan dan halangan, faktor yang berkaitan dan hubungan antara semua domain yang dikaji.

Metodologi: Borang kaji selidik baharu telah diwujudkan selepas melalui kajian literatur dan pendapat daripada pakar dan wakil penjaja. Proses *cognitive debreifing* dan *pretesting* dilakukan. Analisis *Item Response Theory (IRT)*, *exploratory factor analysis (EFA),* dan *confirmatory factor analysis (CFA)* telah dijalankan dalam penilaian psikometrik borang kaji selidik ini. Seramai 660 penjaja makanan dari daerah Kota Bharu terlibat dalam kajian pengesahan yang diambil melalui persampelan bertujuan. Bagi kajian Fasa 2, kajian keratan rentas telah dijalankan melibatkan 440 penjaja makanan dari lima daerah di Kelantan. Kaedah pensampelan berkadar dilakukan untuk mendapatkan saiz sampel bagi setiap bilangan penjaja makanan dari setiap pasar malam. Tahap pengetahuan, kesediaan, halangan dan faktor-faktor berkaitan dianalisis menggunakan kaedah statistik deskriptif dan regresi logistik pelbagai. Manakala analisis korelasi Pearson digunakan untuk mengukur kekuatan hubungan antara ketiga-tiga domain ini.

Keputusan: Versi akhir borang kaji selidik SFH-RS terdiri daripada 46 item (22 item pengetahuan, 15 item kesediaan dan 9 item halangan). Analisis 2-PL IRT menunjukkan sifat psikometrik item yang baik untuk indeks diskriminasi antara 0.8-2.5, dan indeks kesukaran antara -3 hingga +3 ialah 86.7%. Nilai kebolehpercayaan marginal ialah 0.77. Analisis EFA yang telah dijalankan terhadap domain kesediaan dan halangan, menghasilkan empat faktor dengan nilai Cronbach alpha lebih daripada 0.7. Semua item dikelompokkan dengan nilai faktor bebanan > 0.4 dan nilai komunaliti item lebih daripada 0.25 dengan korelasi faktor adalah < 0.85. Dalam analisis CFA, model akhir terdiri daripada 24-item di bawah 4 faktor. Borang kaji selidik yang baharu ini menunjukkan nilai faktor bebanan >0.5, Tucker-Lewis Index (TLI) = 0.906; Comparative Fit Index (CFI) = 0.916; dan Root Mean Square Error of Approximation (RMSEA) = 0.056 dengan nilai Raykov Rho antara 0.757 hingga 0. 887.

Majoriti (71.8%) daripada responden mempunyai tahap skor pengetahuan yang baik, bersedia (60%) untuk menyokong program pengurangan plastik dan menganggap halangan (73%) mempunyai pengaruh yang rendah terhadap mereka. Umur penjaja makanan (aOR=0.952; 95% CI: 0.93,0.97; nilai-p <0.001), kesediaan untuk berubah (aOR=3.271; 95% CI:2.046,5.230, nilai-p <0.001), dan halangan yang ketara (aOR =3.577; 95% CI:2.204,5.805, nilai-p <0.001), dikaitkan dengan tahap pengetahuan yang baik. Manakala, penjaja makanan lelaki (aOR=1.706, 95% CI: 1.124, 2.590, nilai-p = 0.012), sumber maklumat daripada media sosial (aOR=2.914, 95% CI: 1.852, 4.584, nilai-p <0.001) dan sumber rasmi (aOR=2.269, 95% CI: 1.343 3.835, p-value = 0.002) telah dikaitkan dengan kesediaan untuk menyokong program pengurangan plastik sekali guna. Daripada dapatan kajian ini, terdapat korelasi sederhana yang signifikan antara skor pengetahuan dan skor kesediaan (r = 0.492, nilai-p < 0.001). Selain itu, skor halangan mempunyai korelasi yang kuat secara tidak langsung dengan skor pengetahuan (r = -0.503), nilai-p < 0.001). Di samping itu, skor halangan dan skor kesediaan mempunyai korelasi sederhana negatif yang signifikan (r = - 0.479, nilai-p <0.001).

Kesimpulan: SFH-RS adalah borang kaji selidik yang boleh dipercayai dan sah yang dapat digunakan untuk menilai pengetahuan dan kesediaan dalam kalangan penjaja makanan untuk menyokong program pengurangan plastik sekali guna. Keputusan keseluruhan dalam kajian Fasa 2 menunjukkan tahap pengetahuan dan kesediaan penjaja adalah baik, dengan majoriti penjaja makanan tidak menganggap halangan sebagai faktor signifikan yang mengubah tindakan mereka untuk menyokong program ini. Ia juga boleh mengenal pasti faktor-faktor penting untuk membantu dalam merancang aktiviti dan program pengurangan plastik pada masa hadapan.

Kata kunci: penjaja makanan, borang kaji selidik, validasi, program pengurangan plastic, versi Bahasa Melayu.

ABSTRACT

KNOWLEDGE, READINESS AND BARRIERS FACTORS TO SUPPORT THE SINGLE-USE PLASTIC REDUCTION PROGRAMME AMONG KELANTAN STREET FOOD HAWKERS USING A NEW MALAY VERSION QUESTIONNAIRE

Background: Excessive usage of single-use plastic containers has imposed a serious environmental pollutions and health problems to human. Food hawkers had been contributing to this problem from high demand of ready-to-eat food and this need to be controlled. There is a need to assess the knowledge, readiness and barriers to support plastic reduction programme among street food hawkers.

Objectives: This study involved the development and validation of a new questionnaire to assess knowledge, readiness and barriers of food hawkers to support single-use plastic reduction programme in Kelantan. This was a 2-phase study with Phase 1 involved the development and validation of a questionnaire done from December 2019 till March 2020, while Phase 2 involved the assessment of knowledge, readiness and barriers, their associated factors, and relationships between all these domains which was done from March 2020 till April 2021.

Methodology: In Phase 1 study, the questionnaire was developed after thorough literature review and experts' opinions from experts and hawkers' representatives. Response process was done via cognitive debriefing and pretesting process. Item Response Theory (IRT), exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were done in psychometric evaluation of questionnaire. Internal consistency of all the items was also conducted. A total of 660 food hawkers from

Kota Bharu district involved in the validation study recruited through purposive sampling. For Phase 2 study, a cross-sectional study was conducted involving 440 food hawkers from five districts in Kelantan. Proportionate sampling was done to get the sample size for each night market food hawkers. Level of knowledge, readiness and barriers, their associated factors were measured using descriptive statistics and multiple logistic regression. While Pearson correlation was used to find the relationship, strength and directions of these three domains.

Results: The final version of SFH-RS tool consisted of 46 items (22 items on knowledge, 15 items on readiness and 9 items from barriers). 2-PL IRT analyses indicated good psychometric properties of items for discrimination index between 0.8-2.5, and difficulty index between -3 to +3 was 86.7%. The marginal reliability value was 0.77. In EFA analysis for readiness and barriers domains, all four factors showed acceptable reliability with Cronbach alpha of more than 0.7. All items loaded with factor loading of > 0.4 and item communality of more than 0.25 and factor correlations were < 0.85 between all the factors. In CFA analysis, the final model consists of 24-items under 4 factors. This newly developed tool demonstrated acceptable factor loading with >0.5, Tucker-Lewis Index (TLI) = 0.906; Comparative Fit Index (CFI) = 0.916; and Root Mean Square Error of Approximation (RMSEA) = 0.056 with composite reliability of Rykov's Rho value between 0.757 to 0. 887.

Majority (71.8%) of the respondents had good level of knowledge score, ready (60%) to support plastic reduction program and consider barriers (73%) had low influence on them. Age (aOR=0.952; 95% CI: 0.93,0.97; p-value <0.001), readiness to change (aOR=3.271; 95% CI:2.046,5.230, p-value<0.001), and significant barriers (aOR=3.577; 95% CI:2.204,5.805, p-value<0.001), were found to be associated with

knowledge level. Meanwhile, male food hawkers (aOR=1.706, 95% CI: 1.124, 2.590, p-value = 0.012), information source from social media (aOR=2.914, 95% CI: 1.852, 4.584, p-value <0.001) and official source of information (aOR=2.269, 95% CI: 1.343 3.835, p-value = 0.002) has been associated with readiness to support single-use plastic reduction program. It was found that there was a significant and direct moderate correlation between knowledge score and readiness score ($r = 0.492$, p-value < 0.001). Besides that, barrier's score has a strong indirect correlation with knowledge score ($r = -0.503$), p-value < 0.001) and barriers and readiness score have a significant negative moderate correlation ($r = -0.479$, p-value < 0.001).

Conclusion: The SFH-RS is a reliable and valid tool used to assess knowledge and readiness among food hawkers to support single-use plastic reduction programme. Overall results in Phase 2 study showed good knowledge and readiness level, with majority of food hawkers did not consider barriers as significant in changing their action in supporting this programme. It also could identify significant factors to help in future or activities in plastic reduction program.

Keywords:

Food hawkers, Malay version, plastic reduction programme, questionnaires, validation

CHAPTER 1 INTRODUCTION

Plastic materials are made up of large, organic (carbon-containing) molecules that can be formed into a variety of useful products. Primary plastics production had increased nearly 200 folds to 407 million tonnes, with around three-quarters (302 million tonnes) ended up as waste. With the largest population, China had produced the largest quantity of plastics, at nearly 60 million tonnes. This was followed by the United States at 38 million, Germany at 14.5 million and Brazil at 12 million tonnes. Top 3 countries with the highest plastic waste per person were Kuwait (0.69 kg per person/day), Guyana (0.59 kg per person/day) and Germany (0.48 kg per person /day) (Oguge et al., 2021).

Plastic packaging is the dominant generator of plastic waste, responsible for almost half of the global total plastic with 42 percent of plastics entering the use phase. The special characteristics of plastic such as inexpensive, easily available, strong, durable, corrosive resistance (Vanapalli et al., 2018) make plastics the most favourable material to be used in food business (Thompson et al., 2009). However, packaging has a very short in-use lifetime typically around 6 months and study in United States showed that the average lifespan of a single-use plastic bags is only 12 minutes (NSW EPA, 2016) . The global plastic waste by disposal are 19% being recycled, 25% being incinerated and most of the plastics were discarded (55%) (Bott, 2014).

Malaysia, being a developing country has used relatively huge amount of single-use plastic particularly in food packaging purposes (Maidin and Latiff, 2015). Data in 2016 had showed that Malaysia had produced 0.94 million tonnes of mismanaged plastic waste per year (MESTEC, 2018). Malaysia had been producing the higher per

capita production of plastic waste of 0.2 kg per person /day as compared to their neighbouring countries such as Singapore (0.19 kg per person /day), Thailand (0.14 kg per person /day), and Indonesia (0.06 kg per person /day). Plastic waste has contributed to 23.2% from Malaysia commercial sector waste that includes food courts, restaurants, hotels and business lots (JSJPN, 2013). The magnitude plastic waste problem has been contributed by takeaway culture by consumers that has led many hawker stalls and fast-food restaurants using more plastic bags. Despite the government National Roadmap towards Zero Single-Use Plastics in 2018 (MESTEC, 2018), the takeaway culture has resulted in many hawker stalls and food and beverage outlets using plastic bags, the cheapest and most convenient method to pack readily cooked food.

1.1 Problem statement

Packaging waste is the most pressing global environmental issues that must be addressed in sustainable manner (Chen et al., 2021). Environmental problems related to plastic waste has become a major problem globally and also in Malaysia where Malaysia has been ranked as the 8th among the top-ten countries with mismanaged plastic waste in the world (Jambeck et al., 2015). The important concerns that lead to plastic packaging are solid waste disposal, food safety issues (Jayaraman et al., 2011) and poses health risk to human if it is left mishandled. Production, consumption, and management of single-use plastic food containers poses problems to human health and the environment. Single-use plastics might degrade into smaller particles (microplastics) and eventually get inside the water and food chain (Fauziah et al., 2021).

Recently, the takeaway food market has been growing fast due to the convenience, competitive pricing, modern and quick lifestyle. It should be alerted that majority of the street food hawkers in Malaysia usually did not aware that they should use more environmentally friendly food packaging materials and support the environmentally friendly practice in their business. Most of the street hawkers did not know the type of plastics that can be used as food containers. In addition to that, plastic bags or plastic food containers used by hawkers do not have plastic identification codes (PIC) on them and may not be safe for food packaging. Plastic materials that had been banned in the developed countries such as polystyrene still being widely used in our country by the hawkers as they are relatively cheaper, and this will further contribute to the problem.

Environmental laws exist in Malaysia, but their effectiveness must be supported by strong enforcement. The Malaysian government often conduct campaign to reduce single-use plastic, the impact has not yet proven successful especially in small food businesses. The plastics especially food and beverage plastic containers seen littered, clogged out in the drain, and water channels and streets. No plastic bag day (NPBD) has been launched in Malaysia with the aim to reduce usage in 2011, however, not all business owners pay attention to this campaign and plastic bags has still been used in retail shops and other small business including food business. Food hawkers did not favour regulatory measures as any other alternatives to control the use of plastic has not yet introduced properly by the government (Jayaraman et al., 2011). Ministry of Energy, Science, Technology, Environment & Climate Change (MESTEC) has introduced Malaysia's Roadmap Towards Zero Single-use Plastics (2018-2030) with the vision to towards zero single-use plastic by 2030 by using a phased, evidenced based approach, however, the implementation is inconsistence as

this task is put under ministry responsibility rather than by placing the responsibility on the relevant agencies (Lynn, 2019).

In addition to that, Malaysia has waste management systems that are inadequate for dealing with the amount of plastic waste produced. The main ways of dealing with plastic waste in the country are disposal in landfills and domestic burning since it is cost-effective and simple. A key problem for the disposal of plastics within the solid waste management cycle is, plastics cannot be permanently eliminated from the environment when left to degrade in landfills (Alias et al., 2018).

Low recycle rate in Malaysia had been contributed to recycling industries in Malaysia that only focuses on materials with higher value and easily collected. Due to the lack of recycling values, materials such as transparent polyethylene terephthalate (PET) bottles are recycled in greater volume than polystyrene products, food packaging and straws. Besides that, lack of recycling technologies in Malaysia also contributed to this problem. Only three of the seven types of recyclable plastic that fall into the categories of 1, 2, and 5 may be processed in Malaysia's recycling businesses. In Malaysia, these three types of plastic can be 99 percent recycled (Chen et al., 2021).

1.2 Study rationale

Previous studies had only stressed on the environmental concern for examples the ocean pollution by plastics waste, the source of waste generation and the plastic solid waste management. There were very limited evidence assessing the knowledge on the health effect, environmental impact, the type of single-use plastic food container, readiness and barriers done among food hawkers on the single-use plastic food container usage. Many previous studies done focusing on the customers' view on this matter rather than food hawkers' view.

Proper development and validation of the new questionnaire did help in producing a well validated questionnaire that focusing on food hawkers' views on single-use plastic reduction program support. Therefore, with this new validated questionnaire in Malay language can be used by another researcher to explore widely on the scope of knowledge, readiness, and barriers of street food hawkers to support this environmentally friendly business practice.

This study also will address the research gap in exploring the street food hawker's knowledge, readiness, and barriers in supporting the single-use plastic reduction program. The finding will delineate some important significant associated factors that can be modified and used as a shred of evidence and contribute to body of literature to understand hawker's knowledge, readiness and the barriers that prevent them to support this environmental campaign. The study findings could also be used to formulate interventional program on the behaviour changes in the future by the National and local governments.

1.3 Research Questions

1. Is the new questionnaire a valid tool to measure the knowledge, readiness, and barriers of street food hawkers in Kelantan to support the single-use plastic reduction program?

2. What is the level of knowledge and readiness of street food hawkers in Kelantan to support the single-use plastic reduction program?

3. What is the barriers level that prevent the street food hawkers in Kelantan from supporting the single-use plastic reduction program?

4. What are the associated factors with the knowledge and readiness level of street food hawkers in Kelantan to support the single-use plastic reduction program?

5. Is there any correlation between knowledge, readiness, and barriers of street food hawkers in Kelantan to support the single-use plastic reduction program?

1.4 Objective

General:

To develop and validate a new questionnaire as well to determine the level of knowledge, readiness, and barriers of street food hawkers in Kelantan to support the single-use plastic reduction program and their associated factors.

Specific:

Phase 1

- To develop and validate a new questionnaire assessing the knowledge, readiness level and barriers of street food hawkers in Kelantan to support the single-use plastic reduction program

Phase 2

1. To determine the knowledge and readiness level of Kelantan Street food hawkers to support the single-use plastic reduction program

2. To assess the proportion of barriers that prevent Kelantan Street food hawkers to support the single-use plastic reduction program

3. To establish the association between demographic factors, knowledge, readiness level and barriers, of street food hawkers in Kelantan to support the single-use plastic reduction program.

4. To explore the correlation between knowledge, barriers, and readiness level of street food hawkers in Kelantan to support the single-use plastic reduction program.

1.5 Research hypotheses

1. The newly developed questionnaire is valid and reliable tool to be use for assessment of knowledge, readiness, and barriers of street food hawkers to support the single-use plastic reduction program.

2. The knowledge and readiness level of street food hawkers to support the single-use plastic reduction program is satisfactory.

3. The proportion of barriers had strong influence that prevent Kelantan Street food hawkers to support the single-use plastic reduction program.

4. There are significant association between demographic factors, knowledge, readiness level and barriers, of street food hawkers in Kelantan to support the single-use plastic reduction program.

5. There are significant correlations between knowledge, barriers, and readiness level of street food hawkers in Kelantan to support the single-use plastic reduction program.

CHAPTER 2 LITERATURE REVIEW

2.1 Use of plastics among food hawkers

Plastic bags has been introduced in 1970's and gained an increasing popularity amongst consumers and retailers (Adane and Muleta, 2011). Because of their characteristics of being economical, lightweight, strong, durable, corrosion-resistant, and having great thermal and electrical insulating capabilities, single-use plastics have grown in popularity among company owners and customers (Issa and Rahim, 2018).

Being a developing nation, Malaysia seems to consume relatively large number of single-use plastics on daily basis particularly for purpose of food packaging (Ipsos, 2020). The packaging market is a highly important industrial sector with food and beverage packaging constituting more than half of all packaging uses which 41% of plastic used as food containers and 14% had been used for beverages containers However, the massive use of plastics among food business owners has raised the issues of solid waste disposal and food safety issues (Jayaraman et al., 2011).

Single-use plastics as food containers had also given benefit to the food hawkers. It can improve the food safety by alleviating bacterial contamination resulting from exposure to air, moisture, or pH changes associated with the food or its surrounding atmosphere. Food packaging also extends the shelf life of products, which allows for broader distribution and reduced food waste (Raheem, 2013). Besides that, the need to package foods in a versatile manner allow the transportation and storage, along with the increasing consumer demand for fresh, convenient, and safe food products (McKeen, 2013). Single-use plastics can be used as beverage containers,

utensils, and food containers. Disposable food containers are cheap, easily available and can be carried out without any fear of breakage and moreover it is used once so no need have cleaning at all (Hanga, 2015).

2.2 Chemical hazard in plastic packagings

Plastics can be categorized into two categories that are thermoplastics and thermosets. Thermoplastics had the properties of easily melt under heat and can be reformed repeatedly. The example of these type of plastics are polypropylene (PP), high- and low-density polyethylene (HDPE and LDPE), polyvinyl chloride (PVC) and polystyrene (PS). These type of plastics offers versatility and may be used as mineral water bottles, microwave containers, food containers. Whereas thermosets had the property of permanent once moulded and do not deform in heat. So, it is valued for its durability and strength, the example is melamine (Jayaraman et al., 2011, MPMA, 2016).

In the concept of food safety concept, food can be contaminated by potential chemical hazard in plastics during preparation, storage, serving, and consumption of foods within food services. It may also present from packaging, contact with food containers, and surface such as cutting board and utensils (Geueke et al., 2018, Hahladakis and Iacovidou, 2018). Food can be contaminated by polyvinyl chloride (PVC), polyethylene (PET) and polystyrene (PS) especially hot foods carried in plastic bags; particularly among consumers that had been consuming tea, coffee, milk, rice, and curries carried in plastic bag. Due to lack of chemical bonding, polyethylene, a well-known food contaminant can easily release and migrate into food beverages and

drinking water from the packaging or bottling material or manufacturing process (Manoli and Voutsa, 2019).

Hawkers should know the proper type of single use plastic that can be used for food packaging. Polypropylene (PP) a type 5 plastic is suitable for use in hot-filled and microwavable packaging product, and it has a good oxygen barrier capacity, moisture barriers, and strength that is used for ketchup and dressing bottles. Type 1 plastic that is polyethylene terephthalate (PET/PETE) had the characteristic of strong, heat resistant and resistant to gas and acidic food. Besides that, it widely recyclable. It is important to instil the knowledge on polystyrene (PS) that is very dangerous to be used as food containers. Styrene from PS food containers can leach to food and styrene is reasonably anticipated to become human carcinogen. Food wrapping also is a potential chemical food contaminant where it contains phthalates (PEs). Phthalates (PEs) represent the most important class of plasticisers a type of plastic additives for flexibility, workability, and durability of plastics and 80% of plasticisers are used in manufacturing PVC that is used for food wrapping (Manoli and Voutsa, 2019).

Factors related to increased risk for chemical migration to food are longer contact time, higher food temperature, smaller container size, physical state of food containers, and food type. Migration rates are higher for fats, acids and liquids in contact with plastic as food containers and migration is also likely with older, heavily used, and damaged items (Singh et al., 2017) . A study done in India found that the corrosive nature of turmeric that can be found in curry seems to react with the lighter plastics used for bags, making them sticky, slimy or have holes and therefore migration of chemicals to the food is likely. In addition to that, most of the oils react and can break down the plastic, therefore it is advised not to pack Indian food (especially liquid

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food such as tea/coffee), yogurt, spicy food like curries, kebabs and oil rich meat masala in the plastic bags (Kurunthachalam, 2013).

2.3 Environmental impact of plastic use

Accumulation of single-use plastic waste had been the culprit for environmental pollution. This increased production and widespread utilization, however, has become the negative impacts on the globe because a lot of disposed plastic products end up becoming litter, waste, and pollutants. Between 1.15 and 2.41 million tonnes of plastic waste currently enters the ocean every year from rivers and the top 20 polluting rivers, mostly located in Asia, account for 67% of the global total plastics in marine pollution (Eriksen et al., 2014).

Plastic waste can become medium for pathogen and parasite vectors replication. Both large and small plastic debris can act as a substratum for pathogenic micro-organisms and parasites. It has been found that plastic debris of the Belgian coast to contain human pathogenic bacteria (Eriksen et al., 2014). Human pathogens, such as bacteria, can colonise plastic surfaces in stable biofilms when they come into contact in wastewater treatment plants or in households where wastewater from washing machines. In addition to that, plastic debris are capable of holding stagnant water on land can also create habitats for mosquito larvae that transmit parasites or viruses such as zika and dengue and able to block sewage system and create a flood like situation (Geyer et al., 2017a). Poorly designed landfills and poorly managed solid waste can lead to the attraction of vectors such as *Aedes aegypti*. It was shown in India that 25% of plastic containers were positive for mosquito larvae (Vidyavathy, 2018).

Plastic degradation components also may lead to the release of greenhouse gases that may contribute to global warming and air pollution. The release of most potent greenhouse gases such as methane (CH_4) and ethylene (C_2H_4) from raw and aged plastics over time indicates that polymers continue to emit gases to the environment for an undetermined period (Royer et al., 2018). Dumping of plastics on land or landfilling plastics leads to abiotic and biotic degradation of the plastics, where plastic additives (e.g. stabilizers, harmful colorant moieties, plasticizers and heavy metals) can leach and eventually percolate into various aspects of the environment, thereby causing soil and water contamination (Alabi et al., 2019). Landfilling produce leachate which may contaminate ground water, rivers, streams and may act as a source of microplastics (Silva et al., 2021). Environmental pollution and risks to public health can be reduced if the landfills are well-managed, although there are possibilities of soil and groundwater contamination by disintegrated plastics by products and additives that can persist in the environment on long-term basis (Okunola et al., 2019).

Furthermore, plastic pollution can also affect the marine life. The characteristic of plastic may also contribute to the environmental pollution. Plastic is buoyant in water and extensive number of plastic debris mount up on the surface of the sea and may be washed ashore. Plastic debris has been found in all major ocean basins, with an estimated 4 to 12 million metric tonnes of plastic waste generated on land entering the marine environment and representing 60%-80% of shoreline debris (Geyer et al., 2017b). Marine organisms may also become entangled in plastic debris particularly macroplastics. The small size of microplastics makes them readily accessible for ingestion by a wide range of organisms including whales, fishes, mussels, oysters and shrimps (Dauvergne, 2018) and can enter into human food chain. It can also destruct the habitat's natural environment where 80% of marine litter originates from land, with

densely populated or industrialized areas being the major source. This plastic litter can be transported to the oceans by wind, municipal wastewater, and freshwater systems (Ncube et al., 2021).

2.4 Health impact of plastics

There are at least 175 hazardous compounds used to manufacture plastic food contact articles (PFCAs). Adverse health outcomes are identified in all major groupings that are carcinogenicity, mutagenicity, reproductive, and developmental on both chronic and acute exposures (Geueke et al., 2018) . Bisphenol A (BPA) is related to heart disease, diabetes and abnormally high in certain liver enzymes while phthalates can cause adverse male reproductive problem (Jayaraman et al., 2011). Diethylhexyl phthalate (DEHP) is used as plasticiser in plastic drink bottles that are made from polyethylene terephthalate (PET) can cause renal problem, abdominal obesity and insulin resistance (Vidyapeeth et al., 2014).

Diethylstilbestrol, phthalates, dioxin can affect the endocrine system by becoming endocrine disruptor. Many endocrine disrupting compounds adversely impact the following function such as metabolic rate, sex development, insulin production and utilization, growth, stress response, gender behaviour, reproduction. Elucidation of the role of endocrine disruptors in human health will provide insights into the assessment of environmental exposure and risk. Further epidemiological and toxicological studies are needed to evaluate the exposure to multiple endocrine disrupting compounds (Darbre, 2020).

Furthermore, the BPA component found in polycarbonate plastic, which is used to make some beverage containers and many foods and beverage can liners, may function as an endocrine disruptor. BPA can interfere with human hormonal system; especially, it mimics oestrogen. Moreover, BPA can arouse many additional health problems, including weight gain, early-onset of puberty, infertility, behavioural changes, cardiovascular effects and diabetes (Kumar, 2018). One recent study even found that the early exposure to BPA can lead to prostate cancer. BPA is also a thyroid disrupting chemical that effect the thyroid function especially among pregnant women (Kasemsup and Neesanan, 2011). Exposure with BPA was estimated to be associated with 12,404 cases of childhood obesity and 33,863 cases of newly diagnosed incident coronary heart disease (Muncke et al., 2017).

Microplastics are major contaminants that can bioaccumulate in the food chain after ingestion by a wide range of freshwater and marine lives leading to a public health risk. Microplastics as contaminants in the wider environment represent a concern because it has been shown that they can be ingested by a wide range of aquatic organisms, both marine and freshwater, and thus have the potential to accumulate through the food chain (Galloway, 2015) .

2.5 Environmental law and regulation related to plastic waste management in Malaysia

The management of plastic waste in Malaysia is handled by National Solid Waste Management Department (NSWMD), under the Ministry of Housing and Local Government (MHLG) (NSWMD, 2015). Previously, the solid waste management was handled by independently by local and state government (NSWMD, 2015). Malaysia

has come with several initiatives to reduce single-use plastic usage and waste management problems.

Malaysian government has come out with several initiatives on single-use plastic reduction program to tackle the excessive single-use plastic waste problem. "No Plastic Bag Day" (NPBD) has been launched in 2011 by the Ministry of Domestic Trade Cooperative and Consumerism (MDTCC), under which the provision of free plastic bags in grocery stores was banned nationwide (Oguge et al., 2021). The NPBD was introduced with the goal of promoting awareness and reducing the usage of single-use plastics. A 0.20 MYR fee was levied per plastic bag in an attempt to modify the consumer behaviour (Zen et al., 2013). However, studies have suggested very different level of support for the campaign, with lower willingness percentage of consumers in regions with higher incomes such as Kuala Lumpur with only 35% support as compared to Selangor with 66% willingness percentage (Asmuni et al., 2015). Even so, the Malaysian government also needs stronger enforcement of its legislation and further efforts to promote environmental awareness and public engagement. Lack of enforcement has also hindered the success bans on plastic in this country. Legislation in Malaysia is often unclear, and enforcement of waste separation varies between municipalities and states (Chen et al., 2021).

Furthermore, the federal government initiated a ban on plastic straws which started in January 2019 for Putrajaya, Kuala Lumpur, and Labuan. However, newspaper reports have found that there is little to no reduction in plastic straws usage as there was no enforcement done on date. There may be "No Straw" signs plastered on counters and tables, but there is little attention towards it. What is supposed to be a

ban looked like a campaign to discourage the use of straws instead. However, it may take some time until individuals and businesses are acclimatized to the ban.

2.6 Knowledge of food hawkers on the use of plastic as food containers

Environmental knowledge can be defined as one's ability to identify a number of symbols, concepts and behaviour patterns related to environmental protection (Laroche et al., 2001). Two main approaches have been used to analyse the environmental knowledge of individuals that are objective and subjective knowledge (Barber et al., 2009). Objective knowledge (actual knowledge) refers to how much a person knows about a type of product, issue, or object. Subjective knowledge (also called perceived knowledge) shows much a person thinks that he/she knows. Some studies find no significant relationship between environmental knowledge and pro-environmental behaviour. Other studies reveal that a deeper knowledge of environmental issues and how to solve them increases the likelihood of individual taking actions to protect the environment. People who have greater knowledge of environmental problems are more prone to behave in a pro-environmental way (Kollmuss and Agyeman, 2002).

A recent study was conducted at Kuala Selangor, Malaysia in 2018 on the perception of plastic packaging usage of hot food among night markets food hawkers. The study found out that food hawkers had good perceptions towards environmental hazard and regulation, but poor perceptions on awareness and health hazard (Issa and Rahim, 2018). Dalila et al., (2020) had been interviewing business and public

organizations and had shown that environmental issues have been the main concern in their organizations. In order to address the excessive use of plastic bags, many campaigns have been organized by the Malaysian government to cater this environmental issues (Willis et al., 2018), such as Go-green campaign, days without plastic bags and recycling campaign (Afroz et al., 2017) which could result in higher perception towards and enlightenment regarding environmental hazards.

Moreover, nearly 84% of food handlers that worked at students' universities food accommodation in Egypt respondents had a poor knowledge score on selected plastic type of food contact material. They were aware of adverse effects from plastic use but required extra knowledge about proper plastic to be used. The knowledge and proper selection of plastic to be used as food containers were better among the food handlers with basic science knowledge. This infers that science stream food handlers have slightly more complicated attitudes driven by higher levels of subject-related knowledge that may drive their choice on proper plastic usage (Elsheikh, 2016).

On top of that, the program to instil knowledge such as publicity program of the danger of using plastic bag for hot edible food was not significant to change the habit of plastic usage as the consumers continue to use plastic bags even though there was great effort made. This may be attributed to the consumers' habit of buying food in plastic bags and the inconvenience to bring their own containers and the containers are usually bigger and heavier than plastic bags. The habit of using plastic bags may be cultivated since their childhood and need several years to break the poor habit and ready to support the pro-environmental programme. The total banning of plastic programme will still not as effective as imposing charges for the requested plastic bags as it showed that this policy can clearly show support from the consumers as 82.8% of

the consumers would bring their own containers for hot edible items if they are required to pay for plastic bags (Oguge et al., 2021).

2.7 Readiness level of street hawkers to support the reduction of single-use plastic usage

Readiness behavioural changes need long time and rarely occur in a discrete, single event. There is a process of stages that people must pass before behavioural change can occur. Transtheoretical model describe five stages of readiness that are pre-contemplation, contemplation, preparation, action, and maintenance.

Pre-contemplation is the stage at which there is no intention to change behaviour in the foreseeable future. Most people in this stage are unaware or under-aware of the problem. Contemplation is the stage in which patients are aware that a problem exists and are seriously thinking about overcoming it but have not yet made commitment to act. Preparation is a stage that combines intention and behavioural criteria. Individual in this stage is intending to act in the next month and are frequently taking small steps. Action is the stage in which individuals modify their behaviour, experience, and environment to overcome their problems. Action involves the most overt behavioural changes. Maintenance is the stage in which people work to prevent relapse and consolidate the gains attained during action. Stabilizing behaviour change and avoiding relapse are the hallmarks of maintenance (Stephens and Krebs, 2019) . In this study, readiness measures the preparation stage for the hawkers to support pro-environmental behaviour of reducing single-use plastics.

Knowledge may have the effect on the readiness to support pro environmental behaviour, but the findings are contradicted with Mustafa and Yusoff, (2011) that found respondents without prior knowledge exhibited significantly more positive attitudes towards discontinuing their personal use of plastics than the respondents with prior knowledge. It is shown that freshmen without prior knowledge of the dangers of plastics were more likely to have positive attitudes towards the ban and more likely to follow the plastic banning programme. Correct knowledge has been shown to predict behaviour, although knowledge must be regarded as a necessary but not sufficient condition for salutary decision-making specially to hold up the pro environmental behaviour (Dalila et al., 2020).

Besides that, a study done among food truck entrepreneurs in Malaysia found that they are in favour of using biodegradable packaging materials and support the eco-friendly initiative for their food truck businesses. They hope that their efforts will be appreciated and motivate other sectors of the food industry to follow the good environmental practice. But some respondents admitting that profit margins matter more than environmental concerns when it comes to packaging materials. Support, demand, and regulatory conditions will make them comfortable to make compromises. Readiness to support was driven by social desirability to participate in environmental initiatives for themselves and others, and the fulfilment of an ideal self-identity as an environmental friendly entrepreneur (Hoogendoorn et al., 2019).

Majority of restaurant owners in Penang responded that they were concerned on the environmental issues, and they feel that environmental preservation is important in their life. They also believe that they are educated about environmental issues, aware of an existing local programme and would consider applying Environmental

Management System (EMS) at their premises. But some would not consider prioritizing environmentally friendly practices in business because they are more focus on revenue, cost and profit. From this study, it can be concluded that food handlers in Malaysia are worried about the environmental problems and ready to support reduce plastic programme with proper support and programme by the government. In 2014, study done to assess the drivers or the motivational factors of SME corporation regarding support on the green management initiative. It was found that four most important drivers that motivate them were the regulation enforcement for implementation, social responsibility, pro-environmental culture, and organizational support (Camilleri, 2017) .

Besides that, customer demand might affect the readiness of hawkers to use plastics as food containers. It was found that 62.5% customers responded that they were buying hot edible items in plastic bags and the remaining 37.5% stated that they never favoured plastic bags to pack hot edible items. The customers still purchasing hot edible items in plastic bags on a daily and weekly basis because of cost effectiveness, easy storage, and convenience. Consumers that are not willing to buy hot edible item in plastic bags had high score on awareness, health hazards, spoilage of plastic, environmental hazard, and regulations. So, education to customers can also be strengthened to affect the purchasing power of not supporting the use of plastic as food containers that may indirectly change the attitude of the food hawkers later on (Jayaraman et al., 2011) .

2.8 Barriers of Street Food Hawkers to Support the Single-Use Plastic Reduction Program

The barriers which impede peoples' environmental choices can be divided into two categories that are external and internal factor. Examples of external or structural factors are institutional, economic, social, and cultural factors. Besides that, the internal or individual barriers factors are motivation, pro-environmental knowledge, awareness, values, attitudes, emotion, locus of control, responsibilities, and priorities.

According to Manolas (2015) , there are seven individual barriers to pro-environmental behaviour that includes ignorance or lack of knowledge, confidence in the power of technology to solve problems, reluctance to change lifestyles, fatalism such as "We can't do anything", or "It's a waste of time", helplessness, inertia (habit, or acting just as in the past) and fear. Feeling fearful in facing environmental problems can lead to consequence of fear is that it may cause people to deny the threat. Barriers had been associated with obstacle in practicing pro-environment behaviour. Behaviours that are exercised with minimal external influence (voluntary) might indeed have different barriers than those that are promoted, encouraged, or required. Besides that, lack of infrastructure, process inefficiency, communication issues among stakeholders, inadequate legal provision, and lack of skilled manpower can also be the possible barriers among food hawkers to practice proper solid waste management (USM, 2018).

Besides that, public awareness on the importance to practice green behaviour among the food hawkers is important to increase the support of this pro-environmental initiative. Food business holders may not aware that practicing environmentally

friendly practice for examples eco-savings had many advantages, as there inadequate legal provision from the government, the restaurateur continue to manage their operations in the conventional way (Kasim and Ismail, 2012). Barriers that may present in small and medium enterprise that include the food business holder are; excessive financial constrain, all pro-environmental efforts were way too expensive to carry out, penalty for violation of government environmental legislations was not severe enough for making any extra efforts, lack of availability of skilled staff, and penalty for violation of government environmental legislations was light (Loke et al., 2014).

2.9 Factor associated with support of pro-environmental behaviour

The personal factors that may be associated to support pro-environmental behaviour are age, educational background and gender. Respondents who were older (31-45 years old), had higher level of training diploma and university degree, and higher income would recycle more than their counterparts (Afroz et al., 2017). Many studies reported that older people engaging in more pro-environmental behaviour than younger people. These findings may support the hypothesis that the environmental event of concern did not happen to older generation during their younger age (Geueke et al., 2018). A study on buying over packaging grocery product in French showed that younger people were more willing to give up their convenience in order to help the environment (Heidbreder et al., 2019).

In plastic bag banning programme, more educated people were less willing to pay for plastic bags (Madigele et al., 2017) and more likely to participate in a no-plastic-bag-campaign thus showing stronger plastic avoidance than less educated

people. Course studied (science and non-science stream) play significant difference in the knowledge and awareness score on the plastic usage among food handlers in university in Egypt (Elsheikh, 2016).

Various study have shown that gender was found to have a strong relationship with pro-environmental behaviour (Xu et al., 2017) because environmental activities are more likely to be carried out by women in both advanced and emerging countries. Furthermore, women are more concerned about the environment, more committed and emotionally involved in resolving environmental issues even if they have lesser knowledge compared to men (Bojanowska and Kulisz, 2020). Lim (2018) had reported that green voluntarism at SEA games Kuala Lumpur 2017 showed 70% of green volunteers were female and the volunteers had higher degree of education, i.e., 22.6% were diploma students and 50.2% were degree students.

Urban and rural communities showed different knowledge and attitude towards environmental issues. A study among college student in Jakarta showed that 57% of them had high environmental awareness. Some students admitted that it was important to have environmental awareness, especially because they are living in urban area that has been heavily polluted by human (Ningrum and Herdiansyah, 2018). Households in India with lower income reused waste themselves, while households with higher income gave it away for reuse and recycling, suggesting that socioeconomic differences within a country might play a role as well (Heidbreder et al., 2019).

In addition to that, a greater intention to adopt pro-environmental behaviours was found in the individual-based and community based religious consumers. Religious groups were actively interrelated with a religious community in any of the pro-environment activity. Culture, norms and individual social desirability has an