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FYP FSB

**MICROBEADS IN FACIAL SCRUBS: A STUDY
ON UNIVERSITY STUDENTS' PERCEPTION
AND PARTICIPATION**

by

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A report submitted in fulfilment of the requirements for the degree of
Bachelor of Applied Science (Sustainable Science) with Honours

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THESIS DECLARATION

I declare that this thesis entitled Microbeads in Facial Scrubs: A Study on University Students' Perception and Participation is the result of my own research except as cited in the references. The thesis has not been submitted for higher degrees to any universities or institutions.

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I certify that the report of this final year project entitled Microbeads in Facial Scrubs: A Study on University Students' Perception and Participation by Aqilah Binti Zubir, matric number E17A0005 has been examined and all recommendations needed by examiners have been done for the degree of Bachelor of Applied Science (Sustainable Science) with Honors, Faculty of Earth Science, University Malaysia Kelantan.

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Microbeads in Facial Scrubs: A Study on University Students' Perception and Participation

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ABSTRACT

Microbeads is one of the well-known particles among microplastic sub-categories that becomes dangerous towards environment including marine ecosystem. All the original and traditional substances where it is biodegradable alternatives are replaced over these years by a non-biodegradable, cheap, tiny plastic particle which is called microbead. The pollution that caused by microbead particles from the personal care products such as facial scrubs has been well established around the world and leads a concern at local, regional, national and global levels due to the adverse effects towards aquatic marine ecosystem. Students that basically consists of young generation plays crucial role in reducing the occurrence of microbead particles in marine ecosystem since they probably be the one that will prevent the microbeads pollution happen in future years. Hence, students' perception needs to be understood to help reduce the microbeads pollution. Therefore, this study analysed perception of 365 female students from University Malaysia Kelantan regarding the microbead particles in facial scrubs by conducted survey that consist of three sections of questionnaire survey. The data then was analysed by using Statistical Package for the Social Science (SPSS). The female students were chose because skincare has always been associated with female. Most of female students had bad perception regarding microbeads particles and its pollution towards marine ecosystem. This study also analysed the students' participation in the future in reducing the occurrence of microbead pollution in marine ecosystem. From the study, it showed that younger people appear to have a higher understanding and knowledge of the use of microbeads in personal care products.

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Manik Mikro Di Dalam Skrub Muka: Kajian Persepsi dan Penglibatan Terhadap Pelajar Universiti

ABSTRAK

Manik mikro adalah salah satu zarah yang terkenal di antara subkategori mikroplastik yang menjadi berbahaya terhadap persekitaran termasuk ekosistem laut. Semua bahan asli dan tradisional di mana ia adalah biodegradasi alternatif diganti selama bertahun-tahun oleh zarah plastik yang tidak terbiodegradasi, murah dan kecil yang disebut manik mikro. Pencemaran yang disebabkan oleh zarah manik mikro dari produk penjagaan diri seperti skrub muka telah terbukti dengan baik di seluruh dunia dan menimbulkan kebimbangan di peringkat tempatan, serantau, nasional dan global kerana kesan buruk terhadap ekosistem laut akuatik. Pelajar yang pada dasarnya terdiri daripada generasi muda memainkan peranan penting dalam mengurangkan kejadian zarah manik mikro di dalam ekosistem laut kerana mungkin inilah yang akan mencegah pencemaran manik mikro di tahun-tahun mendatang. Oleh itu, persepsi pelajar perlu difahami untuk membantu mengurangkan pencemaran manik mikro. Oleh itu, kajian ini menganalisis persepsi 365 pelajar perempuan dari Universiti Malaysia Kelantan mengenai zarah manik mikro dalam skrub muka dengan tinjauan yang terdiri daripada tiga bahagian tinjauan soal selidik. Data kemudian dianalisis dengan menggunakan Statistical Package for the Social Science (SPSS). Pelajar perempuan dipilih kerana penjagaan kulit selalu dikaitkan dengan wanita. Sebilangan besar pelajar perempuan mempunyai persepsi buruk mengenai zarah manik mikro dan pencemarannya terhadap ekosistem laut. Kajian ini juga menganalisis penyertaan pelajar di masa depan dalam mengurangkan kejadian pencemaran manik mikro di ekosistem laut. Dari kajian itu, menunjukkan bahawa orang muda nampaknya memiliki pemahaman dan pengetahuan yang lebih tinggi mengenai penggunaan manik mikro dalam produk penjagaan diri.

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LIST OF ABBREVIATIONS

PCCPs	Personal Care and Cosmetic Products
EU	European Union
SPSS	Statistical Package for the Social Science
PE	Polyethylene
ESDO	Environment and Social Development Association
WWTP	Wastewater Treatment Plant
HDPE	High Density Polyethylene
PES	Polyester
PVC	Polyvinyl Chloride
PP	Polypropylene
PET	Polyethylene Terephthalate
PMMA	Polymethyl Methacrylate
PA	Nylon
POPs	Persistent Organic Pollutants
PCBs	Polychlorinated Biphenyls
DDT	Dichlorodiphenyltrichloroethane
ANOVA	Analysis of variance

LIST OF SYMBOLS

%	Percentage
>	More than
<	Less than
α	Alpha
r	Correlation coefficient
N	Frequency
N	Population size
n	Sample size
p	Significant value

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Plastic usage is continuing rise at a rapid rate globally. Global production of plastics increasing by 620% since 1975 and was estimated at 288 million tons in the year 2012 (Jambeck et al., 2015). Owing to longstanding atmospheric conditions and insufficient practices in waste management, the burden of the waste regarding plastic to the environment continues to rise globally, posing environmental and economic problems with diverse challenges and effects. The plastic waste that reaches marine environments produced from many types of sources that most of it was from activity related to land based. One of the source is from the microbead that contain in the facial scrubs (Environment and Social Development Organization, 2016).

Microplastics are defined as plastic particles which the size is between 0.33 mm and 5.0 mm (Arthur et al., 2009). This microplastic in the environment comes from two types of sources. Firstly, primary microplastics that produced and go into environment with small particles size microbeads that contain in the facial scrubs. Next, secondary microplastic which is the microplastic comes originally from disintegration of the bigger plastic into the environment (Cheung & Fok, 2017).

One well known particle among microplastic sub-categories is the microbead. It is primary microplastics that are produce and go into environment with small particles size (Cheung & Fok, 2017). Microbead is the tiny plastic that was put in as exfoliates to health and beauty product such as cleansers and toothpastes. Moreover, this microbead becomes one of the ingredients to some of personal care and cosmetic products (PCCPs) including facial scrubs because of their strength which is less cost and able to prolong shelf life of the products. Microbead has been replaced the original materials such as inorganic powders, crushed shells and fruit stones as scrubbing agent (Fendall & Sewell, 2009). In fact, microbead particles which is found in PCCPs have already been recognised as a source of pollution (Zitko & Hanlon, 1991) due to their small size that lead the microbead substances pass very easily through the water filtration systems and then ends up in the ocean. Since 1970, marine ocean contamination caused from the tiny plastic particles has been known as a critical environmental issue (Kalčíková et al., 2017).

Previous study shows that there is low awareness regarding the content of microbead in the marine environment yet there are clear signs that recent work indicates a ban on their inclusion will be generally accepted (Anderson et al., 2016). The Environmental Audit Committee of the House of Commons published a report asking the government to ban microbead use in cosmetics as part of a broader

investigation into the potential for microplastic harm to the environment (University of Plymouth, 2016). In the Southeast Asia country, there are no previous study regarding the microbead awareness but there has been previous research study on the microbeads awareness among environmentalist, beauticians and university students in South West England (Anderson et al., 2016). It included a series of focus groups, where participants were asked a series of questions and also informed about the amount of microbeads used in personal care products. Qualitative research found that although environmentalists were initially aware of the issue, there was a lack of awareness and immediacy for beauticians and students. However, all participants demonstrated considerable surprise and concern about the quantity and potential impact of plastics on a variety of common everyday personal care products (Anderson et al., 2016).

For the banning of microbead particles, there are campaigns that have been done in voice out for the banned of the use of microbeads in PCCPs that have had some success with legislation being implemented in certain countries and some of the companies starting to phase microbead out from becoming the ingredients of PCCPs (Badore, 2013; Barlas, 2015; United Nations Environment Programme, 2015; Carrington, 2016; Whyte and Sherden, 2016). Moreover, media attention to the problem has made consumers feel responsible, who are now checking whether selected cosmetic products contain microbeads. In fact, consumers stated the need to clearly indicate the content of microbeads on product labels (Anderson et al., 2016), since the association between the International Nomenclature of Cosmetic Ingredients (INCI) nomenclature of the list of ingredients on cosmetic packaging and the presence of plastics is not immediate for all consumers. In addition, the European Union (EU)

Ecolabel standards have forbidden the use of microbeads in rinse-off cosmetics since 2014.

Driven by consumer demands, various standards for cosmetic products, including the veto on the use of polyethylene (PE) microbeads, have been developed and are increasing, especially in Europe. Alternatives to plastic microbeads, used in cosmetic products approved according to some requirements that do not authorise them, are defined by a long list of abrasive substances ranging from inorganic powders, such as silica and perlite, sodium chloride, to organic, such as sugar crystals and cellulose, milled shells and fruit seeds. The challenge in replacing the ingredients in the light of some of the requirements is that the latter cannot admit the irradiation of raw materials in powder used to improve the shelf life, which is not appropriate for plastic substances (Guerranti, 2019).

Consumers have the main role to play at shaping the market for the goods and thus any implications of the related environmental. It is therefore necessary to consider the level of perception in order to help reduce microplastic pollution and also to raise understanding of microbead issues (Anderson et al., 2016). Therefore, in this study, survey on the perceptions of the respondents regarding microbead particles that contains in one of PCCPs which is facial scrub will be determined by using the data analysis from statistical analysis of Statistical Package for the Social Sciences (SPSS) software.

1.2 Problem Statement

The pollution that caused by microbead particles from the personal care products such as facial scrubs has been well established around the world and leads a

concern at local, regional, national and global levels due to the adverse effects towards aquatic marine ecosystem (Andrady, 2011; Eriksen et al., 2013; Vegter et al., 2014; Eerkes-Medrano et al., 2015; Perkins, 2015). In certain countries, microbead particle has been banned from becoming one of the ingredients in the facial scrubs (Strifling, 2016). The awareness among the consumers is low regarding the presence of the microbead in the facial scrubs. Moreover, young generation plays crucial role in reducing the occurrence of microbead particles in marine ecosystem since they probably be the one that will prevent the microbeads pollution happen in future years and they appear to have a higher understanding and knowledge of the use of microbeads. Hence, students' perception and their participation in future to reduce the occurrence of microbeads pollution needs to be understood to help reduce the microbeads pollution.

1.3 Objectives

The objectives of this study:

- i) To analyse the perceptions of female students from UMK regarding microbead in facial scrubs ingredients.
- ii) To analyse the participation in the future of female students from UMK in reducing the occurrence of microbead pollution in marine ecosystem.

1.4 Scope of Study

This research study was focussed on the survey of the perceptions and participations of the university students regarding the microbead particles contain in

the facial scrubs. The survey was conducted in Kelantan, Malaysia specifically on female students from Universiti Malaysia Kelantan in all campus which is Jeli, Pengkalan Chepa and Bachok. The respondents consist of 365 female students who potentially give more attention into facial care and used facial scrubs in their daily life.

1.5 Significance of Study

The findings on this study can be beneficial to the scientists, policy makers and cosmetic or skin care industry. Throughout this study, it will help to increase the level of awareness among consumers on the use of the facial scrubs that contain microbeads particle that will harm the marine ecosystems by examining their perceptions towards it. Moreover, this study will be able to improve the awareness regarding microbead and its bad impact towards the environment especially marine ecosystem.

CHAPTER 2

LITERATURE REVIEW

2.1 Microplastic

Plastic pellets and plastic particles produced for specific uses, such as beauty products and abrasives, are also referred to as primary microplastics (Group of Experts on the Scientific Aspects of Marine Environmental Protection, 2015). Microplastics consisting of synthetic particles, fibres and films with a diameter of 1-5000 μm have been commonly identified in marine environments, including estuaries, coastal biomes, open oceans and polar waters. It is either directly made, such as through exfoliates, air blast media, or is extracted over time from the fragmentation of larger plastics (Bergmann et al., 2015). Due to its size, a variety of species such as zooplankton, bivalves and fish intended for human consumption and marine ecosystems are bioavailable across trophic levels (Rochman et al., 2015). Microplastic

exposure studies in the past have highlighted the detrimental effects of microplastic ingestion on marine organisms such as copopods, shellfish, benthic invertebrates and fish with implications that include reduced feed, fertility, growth and survival, premature moulding, altered behaviour and changes in ecological functionality (Lindeque et al., 2020).

2.2 Sources of Microplastics

The microplastics in the environment usually comes from two types of sources. Firstly, primary microplastics that are produce and go into environment with small particles size which is microbeads that contain in the PCCPs. Next, secondary microplastic which is the microplastics comes originally from the disintegration of the larger plastic in environment (Fok & Cheung, 2015). The primary sources of microplastics are not limited to microbeads but also include materials such as synthetic fibers that are released during washing in high quantities from fabrics which is where the released per laundry load is estimated 900 microplastics (Isobe, 2016).

The sources of microplastics that end up in the ocean include 37 per cent of wastewater, including primary plastics such as microbeads and microfibers and secondary plastics, and 44 per cent of road runoff, primarily from tyre dust, which are secondary plastic particles abraded by pneumatics (Boucher & Friot, 2017). Although these fractions include both primary and secondary microplastics, more than 5 trillion plastic particles are estimated to float in the oceans, and field studies show that small microplastics consist mostly of secondary microplastics (Eriksen et al., 2013). However, it is not easy to distinguish between microbead particles and secondary microplastics unless they maintain their spherical form.

2.3 The Uses of Microbead in PCCPs

Within this percentage, between the sources of primary microplastics, those containing PCCPs represent a majority of approximately 93 per cent with respect to industrial pellets, another type of percentage on a weight basis is a minimum of 0.1–1.5 per cent of the total debris input into the North Sea (Gouin et al., 2015), but is highly important in terms of number, given the small size of the particle. Microbead is primarily used in beauty items and glitters that are frequently formed microbeads are also used in nail decorations. Moreover, it also may be found in lipstick, eyeliner, deodorant, sunscreen and others. Microbeads used in scrubs have an irregular shape and surface (Kalcíkova et al., 2017), characteristics that also suggest a high-risk potential due to the high surface ratio and the likelihood of adsorbing potentially harmful molecules. Previous studies have recorded that 4130 tonnes of microbeads per year are used in cosmetics in EU countries, including Switzerland, to give an image of the global scale of the phenomenon (Guerranti et al., 2019).

2.4 Microbeads in Facial Scrubs

The tiny plastic materials in question are synthetic, water insoluble, solid materials made up of polymers mixed with additives to give the materials the desired properties and functionality and have been replaced from biodegradable alternatives to nondegradable over these years (Environment and Social Development Organization, 2016). These substances are working as an abrasive or bulking agent. The functions of these materials in the products also include film formation, viscosity regulation, skin conditioning, emulsion stabilizing and many others. Plastic

ingredients fulfil these functions in a wide range of cosmetic and personal care product types, such as facial scrubs (Leslie, 2014).

In personal care products, synthetic polymers associated with microbead are polyethylene (PE), including high density polyethylene (HDPE), polyester (PES), and polyvinyl chloride (PVC), polypropylene (PP), polyethylene terephthalate (PET), polymethyl methacrylate (PMMA) and nylon (PA) (Li et al., 2016). Moreover, polyethylene beads or microbeads are commonly used as their smoothness causes less redness and skin damage than certain other materials, such as ground fruit pits. They were found to be between 4 μm and 1 mm in size, making them a form of microplastic (Fendall & Sewell 2009). Figure 2.1 showed the microbeads particles in face scrubs.

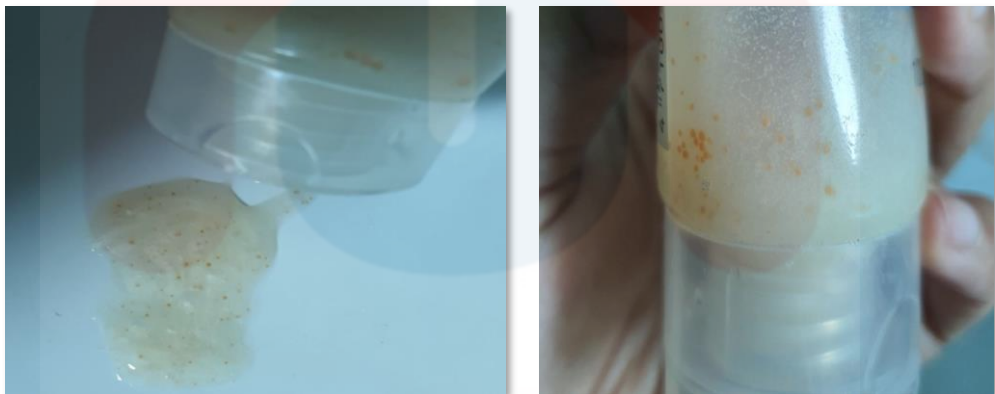


Figure 2.1 Microbeads in Face Scrubs

2.5 Contamination of Microbeads in Marine Environment

It is becoming increasingly apparent that microbeads, which are made of polyethylene like plastic bags, are a toxic and wasteful pollutant. It has been proven that the microbead surface attracts and absorbs persistent organic pollutants (POPs), which is polychlorinated biphenyls (PCBs) and dichlorodiphenyltrichloroethane (DDT) in marine environment ((Environment and Social Development Organization,

2016). On the contrary, several monitoring of sewage and sea, lake and river waters showed the presence of microbead (Eriksen et al., 2013; Cheung and Fok, 2016; Isobe, 2016; Kalcíková et al., 2017; Ziajahromi et al., 2017) into the marine ecosystem. The microbeads will be collected in wastewater as a result of the use of the facial scrubs and it is estimated that between 4594 and 94,500 microbeads will be discharged in one use only (Napper et al., 2015).

Moreover, there is research indicated the usage of microbeads in consumer products such as facial scrubs has attracted widely attention from researchers and has been suggested that they can pose a threat to the marine ecosystems such as fish (Fendall & Sewell, 2009; Eriksen et al., 2013; Wright et al., 2013; Law & Thompson, 2014). It happen when microbeads are washed into the domestic drains from the facial scrubs and are transferred to wastewater treatment plants (WWTPs) where a large amount is stored at the various treatment levels of the wastewater treatment plants (Murphy et al., 2016). However, some of these particles will eventually pass through sewage treatment plants and enter the marine environments due to their smaller size (Duis & Coors, 2016).

In particular, the marine ecosystem is influenced by the presence of large amounts of microplastics that significantly contaminate the sea surface and the water column, resulting in a long-term accumulation matrix in the sediment (Cincinelli et al., 2018; Martellini et al., 2018), even in protected or remote areas (Fastelli et al., 2016; Cincinelli et al., 2017; Guerranti et al., 2017). Owing to their low density, the microbeads float on the surface of the water and then, having become heavier due to microalgae and other epibiontal colonisation, slowly descend the water column and enter the sediments (Woodall et al., 2014; Isobe et al., 2015).

2.6 Banning the Microbead Ingredients

Even though microbead contributes to a comparatively small portion of the total plastic added in the world, it has been widely known in the media, and many campaigns have been initiated to advocate for a phase out of microbead. Both upstream regulation and customer preference can be effective in reducing microbead emissions from the environment, even if legislations for phasing out microbead in cosmetic products are likely to reach just a limited decrease for debris.

The first alert issued about microbeads does not appear until in 1991 (Zitko & Hanlon, 1991; Sellers, 2015). Throughout 2012, there were scientists and advocates calling on the companies responsible for making the products to ban microbead particles from being one of the ingredients in the PCCPs. In addition, in 2018 the world was well on track to get microbeads banned on stage within the next decade. This in stages gives insight into why, when and how the latest environmental policies will spread quickly through change in government, market practices and global consumption. Furthermore, lobbying and public concern were extremely strong in the USA and Canada, with the US leading the way in a federal ban on microbead particles (Dauvergne, 2018). Furthermore, the major cosmetics companies in the European Union (EU) have committed themselves to voluntarily removing microbeads from their goods by 2021 (Cheung and Fok, 2016).

Under the Microbead-Free Waters Act, which takes effect from 1 July 2017 for manufacturing and 1 July 2018 for interstate trade, the US has imposed a ban on personal care items containing plastic microbeads. The Act seeks to preserve the marine ecosystem, rivers and the Great Lakes area of the United States, which it shares with Canada. However, the scope of the items covered by the ban, however, is

especially limited and refers only to 'rinse-off cosmetics' for exfoliating or cleaning purposes. Canada is also taking steps to prohibit microbeads by adding them to the hazardous substances list of the Canadian Environmental Protection Act, which has very broad toxicity requirements. This helps the Government of Canada to propose new 'risk management instruments' for microbeads, including a ban on their use in personal care products.

In addition, on 18 March 2016, the independent Environmental Audit Committee of the UK Parliament launched an investigation into the environmental effects of microplastics, methods to resolve the problem, and the state of awareness. On 2 September 2016, the UK Government announced that it would enforce a regulatory ban on the sale by the end of 2017 of plastic microbeads in cosmetics and other toiletries. For goods containing microbeads, this is a broader definition of scope than the one applied by the United States. Media reports suggest that the European Union has also lobbied the Netherlands, Sweden, Austria, Belgium, Italy and Luxembourg to ban microbeads.

At the same time, public attention to microbead contamination has increased in recent years, as scientists have documented multiple cases of microplastic ingestion by various marine organisms and expressed concern about the potential for bioaccumulation and transfer of toxic chemicals via microplastic ingestion in food webs (Napper et al., 2015). However, there are no past studies that have been mentioned about banning the microbead particles from becoming one of the ingredients in the Southeast Asia.

2.7 Perception of the Microbead in Facial Scrubs Ingredients

In view of these issues, which are actually timely and topical, it is important to consider how people view the issues and their regulatory attitudes. Research standards need to be met, since beliefs can have real consequences in the world, even though they turn out to be totally incorrect, as can be shown in the case of disagreements about measles, mumps and rubella (MMR) and genetically modified (GM) crops. Focus groups with potential customers may provide significant insight into beliefs and trust-based positions such as attitudes towards business and government and interference with nature that are not generally regarded by scientists or systematic approaches to risk management (Pidgeon et al., 2012). Beliefs affect engagement and dispute where the public may have a strong influence by their purchase habits or market demand and active resistance through endorsing campaigns through signing petitions and others.

Moreover, perceptions of the people of environmental risk include a range of concerns and value-based problems, including factors such as trust in decision-makers, attitudes to specific issues, the extent to which emotional responses are evoked, and the degree of exposure and risk-related uncertainty (Pidgeon et al., 2012). There are previous research regarding the perceptions on the microbead among environmentalist, beauticians and university students in South West England (Anderson et al., 2016). In the research, they tried to examine perceptions by first collecting spontaneous reactions to these items and microbeads, and then analysing attitudes until more knowledge was given, and the issue became measurable and evident. The present study was able to draw on a recently published analysis of microplastic samples in cosmetics using samples extracted to visualise the problem and to gather people's reactions (Napper et al., 2015).

CHAPTER 3

METHODOLOGY

3.1 Respondents

The respondents of this research study were female students from University Malaysia Kelantan in all campus which are Jeli, Pengkalan Chepa and Bachok. Generally, skincare including facial scrubs has always been associated with the women and people have acknowledged that cosmetics are always associated with feminism, so it is not unreasonable to assume if they are often associated with the world of women (Maulina & Ridwan, 2017).

3.2 Sample Size

The population size of female students in all campus was $N = 7442$. While the sample size of this research study was $n = 365$. The sample size was calculated by using equation (3.1) and (3.2):

$$n_0 = \frac{Z^2 \times pq}{e^2} \quad (3.1)$$

$$n = \frac{n_0}{1 + \left(\frac{n_0 + 1}{N}\right)} \quad (3.2)$$

Where, n_0 is the sample size, Z is the z-score that the value is 1.96 for confidence level 95%, while p is the population proportion that is was assumed 50% = 0.05, q is 1- p and e is the margin of error where usually it was 0.05 or 5%. For the equation (2), n is the adjusted sample size and N is the population size (Yakhontov et al., 1972). Equation (3.1) and (3.2) are named as Cochran's formula, where if it has been pointed out that if the population is finite, the sample size can be marginally reduced. This is because a very large population provides proportionally more data than a smaller population (Cochran, 1977).

3.3 Questionnaire Survey

A baseline survey for respondents was conducted as a random basis for analysed the university students' perceptions and participation. The survey was carried to measure the degree of level of perceptions about the microbeads (Environment and Social Development Organization, 2016). There were three sections of questionnaire were prepared which the first one was Section A regarding on the socio-demographic where it consists of age, ethnic, level of education, campus, year of study, field of the

study, whether the respondents use facial scrub or not and lastly the frequency of using the facial scrubs in daily life. Next, Section B contained 5 questions that indicates the perceptions and awareness of the respondents regarding microbeads issue and lastly, Section C contained 5 questions and was about the participation or action in the future to reduce the occurrence of microbead pollution in marine ecosystem. Both Section B and Section C had 5-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree). The questionnaire was conducted via online platform which is Google Forms.

In analysing huge sample size or responses which is more than 200 respondents, determine or examine the responses descriptive statistics was the first thing need to be done to rule out the discussion of the results. The mean value from the descriptive analysis of each questions provides a good indicator of the aggregate direction towards both ends of the scale for each question (Cheung, 1997). If the value is less than 3 then it all indicates to the disagreement direction, moreover, when the value is 3 where it is the mid-point value then the value indicates a 'neutral' stance and for the value higher than 3 then it indicates to the agreement of the aggregate responses of each questions.

3.4 Pilot Test

In preparation for the full study, a pilot study is a mini version of a full-scale study or a trial run. Before distributing the questionnaire, the pilot test was conducted to 33 respondents in order to get a better understanding and proper organization of the question before the final survey was distributed to the respondents (Van & Hundley, 2002). The Cronbach alpha was used in determined the reliability of the questionnaire

survey (Bonett & Wright, 2015). For most social science research contexts, the acceptable reliability coefficient is 0.6 or higher (Ursachi et al., 2015). The question was changed when it is not reliable based on the Cronbach alpha test. Table 3.1 showed showed an acceptable α -value, where it was more than 0.60. From the findings it proved that the questionnaire was reliable before distributed to the targeted respondents.

Table 3.1: The results from the pilot test.

Section	Cronbach's Alpha (α)	Internal Consistency
Perception and participation of university students regarding microbeads in facial scrubs	0.673	Acceptable

Note: N = 33

3.5 Data Analysis

The perceptions of female students from UMK regarding microbead in facial scrubs ingredients and the participation in the future of female students from UMK in reducing the occurrence of microbead pollution in marine ecosystem were analysed by using statistical analysis SPSS consists of independent sample T-test, one-way analysis of variance (ANOVA) and a two-tailed Pearson correlation coefficient analysis. From the completed survey, the data was analysed by statistical analysis SPSS software. In SPSS, the descriptive statistic for the demographic distribution was analysed where it represented frequency and percentage. Then, analysis of variance (ANOVA) and independent sample T-test were analysed to determines whether the populations are statistically different from one another. The independent sample T-test was conducted to analyse the comparison of students' perception and participation between students use or do not use the facial scrub and one-way ANOVA was conducted to analyse the

comparison of students' perception and participation between selected demographic variables. Lastly, correlation of data analysis, a two-tailed Pearson correlation coefficient analysis was conducted to analyse the relationship between students' perception and selected demographic variables which are the age, year of study and field of study. The questionnaire survey represented 365 female university students from University Malaysia Kelantan.



CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Demographic Distribution

Table 4.1 showed the demographic distribution of female students from three campuses. From the conducted survey, about 39.2 % of the students are in Year 4, 33.4 % are in Year 3, 17.5 % in Year 2 and the least are in Year 1 which is 9.9 %. Meanwhile, the majority students are between the aged of 22-25 years old which is 216 out of 365 students and another 144 students are in the aged of 17-21 years old. Next, most of the students are from Jeli campus where it is 62.7 % (229) students, 24.7 % (90) students from Pengkalan Chepa campus and 12.6 % (46) students from Bachok campus. In Jeli campus, all the courses are generally in Science field. In this study, since most of the students are from Jeli campus, majority of the students are in Science field, 72.3 % (264) students. Another two campuses are majority the students from

Art, 16.2 % (59) students, Business 6.0 % (22) students, Entrepreneurship 2.2 % (8) students, Tourism 1.9 % (7) students, Hospitality 0.5 % (2) students and 0.8 % (3) students in the Finance field.

Table 4.1: Distribution of students by campus

Factor		Campus (Frequency)			Percentage (%)	Total
		Jeli	Pengkalan Chepa	Bachok		
Age	17-21 years old	91	35	18	39.5	144
	22-25 years old	137	53	26	59.8	216
	26-29 years old	1	1	1	0.8	3
	30 years old	-	1	1	0.5	2
Year of study	Year 1	15	12	9	9.9	36
	Year 2	30	25	9	17.5	64
	Year 3	88	22	12	33.4	122
	Year 4	96	31	16	39.2	145
Field of study	Science	227	35	2	72.3	264
	Art	2	13	44	16.2	59
	Business	-	22	-	6.0	22
	Entrepreneurship	-	8	-	2.2	8
	Tourism	-	7	-	1.9	7
	Hospitality	-	2	-	0.5	2
	Finance	-	3	-	0.8	3

Table 4.2 shows from the conducted survey on 365 female students of UMK, 73.4 % (278) number of the students use facial scrubs and 26.6 % (97) number of students do not use facial scrubs in one of their skincare routines. Therefore, in this finding, it showed that majority of the students from UMK in all campuses use facial scrubs in their daily life. Out of 268 students who use facial scrubs, most of them use the facial scrubs twice a week which is 33.4 % (122) students, followed by 31.5 % (115) students who use them once a week, 4.7 % (17) students who use them daily, 2.7 % (10) students who rarely use them, and finally only 0.8 % (3) students who use the facial scrubs 3 times a week.

Table 4.2: Frequency and percentage of students whether they use or not facial scrubs and their frequency of using it in daily life

Variable		Frequency	Percentage (%)
Do you use facial scrubs in your skincare routine?	Yes	268	73.4
	No	97	26.6
Frequency of using in daily life.	Daily	17	4.7
	Once a week	115	31.5
	Twice a week	122	33.4
	No	98	26.8
	Rarely	10	2.7
	3 times a week	3	0.8

4.2 Perceptions on Microbead Pollution

The questions were represented as B1 to B5 (please refer in appendix A) where these questions were from section B in the questionnaire survey. Questions B1 to B5 were restricted in range of 1 to 5 of the Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree) based on the conducted survey. Questions B1-B5 in the survey were used to determine the students' perceptions regarding the facial scrubs that contain microbeads particle.

Table 4.3 showed mean values and standard deviation of students' perception regarding microbeads particles in facial scrubs. For the question B1, B2, B3, B4 and B5, the mean values are 3.55, 3.65, 2.80, 3.83 and 3.62 respectively. From the results, question B1, B2, B4 and B5 get the mean values higher than 3 that implicates most of students agreed that all facial scrubs have microbeads in their ingredient and became one of the important ingredients. They also agreed that fish from the polluted marine ecosystem because of microbeads gives bad effects to human health. For question B3, the mean value is lower than 3 and it indicated that the students disagreed that aquatic organisms do not affected by polluted marine ecosystem due to microbeads particles. Through these findings, it showed majority of female students in UMK are aware about the microbeads particles and their effects for aquatic organism and human health.

Previous study shows that younger people appear to have a higher understanding and awareness of the use of microbeads in personal care products (Greenpeace, 2016).

Table 4.3: Mean and standard deviation of students' perception

Variable	Mean	Std. Deviation
B1	3.55	1.064
B2	3.65	1.021
B3	2.80	1.134
B4	3.83	0.973
B5	3.62	1.006

To analyse the comparison of students' perception between students use or do not use the facial scrub, an independent sample t-test was conducted. The level of significant that was used for this analysis is 0.05. Table 4.4 showed the results from the independent sample t-test conducted on. From the results in the table, it showed that there is no significant difference of perception between students use or do not use facial scrubs because the p -value is $p > 0.05$ where the value is $p = 0.155$.

Table 4.4: Perceptions of students based on whether they use or not the facial scrubs in skincare routine

Variable	N	Mean	SD	t-test	Sig
Do you use facial scrubs in your skincare routine?	Yes	268	3.5455	-1.424	.155
	No	97	3.6371		

Next, Table 4.5 showed a one-way between groups analysis of variance (ANOVA) data of students' perception based on age, frequency of using facial scrubs in daily life, year of study and field of study. As presented in Table 4.5, it showed the findings between the age is $F = 4.058$, $p = 0.007$, frequency is $F = 2.391$, $p = 0.038$, year of study is $F = 4.028$, $p = 0.008$ and lastly field of study is $F = 4.058$, $p = 0.007$. From the finding, there was a statistically significant difference at the $p < 0.05$ in

students' perception between age, frequency of using facial scrubs in daily life, year of study and field of study.

Table 4.5: ANOVA of perceptions of students based on age, frequency of using facial scrubs in daily life, year and field of study

Variable		N	Mean	SD	F	Sig
Age	17-21 years old	144	3.4833	0.4953	4.058	0.007
	22-25 years old	216	3.6324	0.5586		
	26-29 years old	3	2.9333	0.7572		
	30 years old	2	4.0000	0.8485		
Frequency of using facial scrubs in daily life.	Daily	17	3.8353	0.5159	2.391	0.038
	Once a week	115	3.5704	0.5097		
	Twice a week	122	3.4639	0.5486		
	No	98	3.6408	0.5516		
	Rarely	10	3.6000	0.5888		
	3 times a week	3	3.9333	0.7572		
Year of study	Year 1	36	3.4167	0.3924	4.028	0.008
	Year 2	64	3.4375	0.4463		
	Year 3	122	3.5639	0.6171		
	Year 4	143	3.6727	0.5310		
Field of study	Science	264	3.5795	0.5724	4.058	0.007
	Art	59	3.6034	0.4906		
	Business	22	3.4455	0.2824		
	Entrepreneurship	8	3.4500	0.3162		
	Tourism	7	3.6286	0.4231		
	Hospitality	2	2.9000	0.9910		
	Finance	3	3.6000	0.8718		

4.3 Participation in Reducing the Occurrence of Microbead Pollution

For the question in Section C which is from C1 – C5 (please refer in appendix A) were about the participation or action of students in the future to reduce the occurrence of microbead pollution in marine ecosystem. Table 4.6 presented the results of the means value for questions C1, C2, C3, C4 and C5, where the values are 3.97, 3.96, 2.75, 4.03 and 2.99 respectively. As the questions C3 and C5 were negative questions, majority of students had the mean values less than 3 which implied that they disagreed to continue using the facial scrubs that contain microbeads and they disagreed to let their family and friends use the microbeads facial scrubs. Then, for

questions C1, C2 and C4, the mean values were higher than 3 which means majority of students agreed to buy facial scrubs that do not have microbeads in the future. Most of students also agreed to explain negative impact of using facial scrubs that contain microbead particles to their family and friends and lastly, they agreed to give fully support if their country ban the usage of microbead particles contain in facial scrubs or any skin care products.

Based on previous study, public support for the ban on microbeads is increasing and has spurred action by international corporations, NGOs and policy makers (Rochman et al., 2015). Therefore, these findings indicate that majority of the students would likely be agreed to contribute in their purchasing behaviour in order to reduce the occurrence of microbeads pollution in marine ecosystem.

Table 4.6: Mean and standard deviation of students' participation

Variable	Mean	Std. Deviation
C1	3.97	0.924
C2	3.96	0.893
C3	2.75	1.260
C4	4.03	0.960
C5	2.99	1.204

Same with the previous data analysis, ANOVA and also independent sample T-test were conducted to compare between students' participation and selected demographic factors which are age, frequency of using the facial scrub, year of study and field of study. Table 4.7 presented the analysed t-test data it showed the p -value is $p = 0.023$ where it was $p < 0.05$. The analysed data means there is significant differences with students' participation in reducing the occurrence of microbeads between students that use or do not use the facial scrubs in their skincare routine.

Table 4.7: Participation of students based on whether they use or not the facial scrubs in skincare routine

Variable		N	Mean	SD	t-test	Sig
Do you use facial scrubs in your skincare routine?	Yes	268	3.5948	0.6524	-2.275	0.023
	No	97	3.7753	0.7149		

The ANOVA analysis data in Table 4.8 demonstrated out of four variables, two of them had $p < 0.05$ where it was between the age and field of study variables. This means both variables have significant differences between students' participation. The p -value for another two variables; the frequency and year of study were 0.062 and 0.510 respectively. Based on the analysed data, there are no statistical differences of students' participation between frequency and year of study at the level of significant 0.05.

Table 4.8: ANOVA of participation of students based on age, frequency of using facial scrubs in daily life, year and field of study

Variable		N	Mean	SD	F	Sig
Age	17-21 years old	144	3.7167	0.6587	2.945	0.033
	22-25 years old	216	3.6083	0.6763		
	26-29 years old	3	2.6667	0.5033		
	30 years old	2	3.5000	0.4243		
Frequency of using facial scrubs in daily life.	Daily	17	3.3647	0.6092	2.122	0.062
	Once a week	115	3.6191	0.6675		
	Twice a week	122	3.5852	0.6352		
	No	98	3.7673	0.7155		
	Rarely	10	3.6600	0.6867		
Year of study	3 times a week	3	4.3333	0.6429	.772	0.510
	Year 1	36	3.5500	0.7049		
	Year 2	64	3.6906	0.6657		
	Year 3	122	3.6951	0.6924		
Field of study	Year 4	143	3.6000	0.6535	2.959	0.008
	Science	264	3.7273	0.7030		
	Art	59	3.4373	0.5439		
	Business	22	3.3273	0.3881		
	Entrepreneurship	8	3.6750	0.5651		
	Tourism	7	3.4571	0.8059		
	Hospitality	2	3.2000	0.8485		
Finance	3	3.2000	0.2000			

4.4 Correlation between Perception and Age, Year of Study and Field of Study

For the correlation of data analysis, a Pearson correlation coefficient analysis of two-tailed was conducted to analyse the relationship between students' perception and selected demographic factors, which are showed in Table 4.4. The product-moment correlation coefficient (r) of Pearson concerns the relationship between more variables and defines the direction and also strength of the relationship in the range between +1 (Kameli & Baki, 2013). In 1956, Guilford presented a guide in the understanding of the strength of the relationship between variables. Based on the Guildford Rule of Thumb, the strength of the relationship is shown to be negligible (less than 0.2), low (0.2 to 0.4), moderate (0.4 to 0.7), high (0.7 to 0.9), and very high (0.9 and more than). If the p -value is less than 0.01, it is considered as significant (Guilford, 1956).

As demonstrated in Table 4.9, for the correlation between perception and the age of students, there is significant relationship between students' perception and age at the level of significant $p < 0.05$ where the r -value = 0.116 and the p -value = 0.026. The strength of both variables' relationship is considered weak and negligible because the r -value is less than 0.2. Next, the strength correlation between students' perception and their year of study also consider weak and negligible relationship but still have significant relationship between both variables where the r -value = 0.176 and $p = 0.001$ with their level of significant at 0.01. However, there is no significant relationship between students' perception and their field of study at the level of significant $p < 0.05$ where the r -value = -0.053 and $p = 0.316$.

Table 4.9: Correlation between perception and selected demographic factor among students

Variable	r-value	p-value
Age	0.116	0.026
Year of study	0.176**	0.001
Field of study	-0.053	0.316

N= 365; Significant at $p < 0.05$; **. Correlation is significant at the level 0.01 (2-tailed)



CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Microbeads contribute to plastic litter in the world. The continued use of microbeads could contribute to an increased in environmental pollution especially marine ecosystem. Throughout this research study, the objectives of this research study have been achieved. It can be concluded that generally, most of female students in University Malaysia Kelantan (UMK) had bad perception regarding on the consumption of microbeads particles and its pollution towards marine ecosystem but, there are majority of students still use facial scrubs in their skincare routine. Most students knew the gives bad effects of microbead consumption towards aquatic organisms and human health. In terms of the ingredients, some students believe all facial scrubs contain microbeads and became important ingredients. In addition, this

study showed that most of the students agreed to participate in reducing the occurrence of microbeads pollution in future. Lastly, this study found that there is weak relationship between students' perception and the age of students, the year of study and their field of study.

5.2 Recommendations

Meanwhile, to improve students' awareness about microbeads in facial scrubs, some recommendation needed. Education is also referred to as means of enhancing public awareness and moving for societal solutions to environmental problems. There are two types of education which are formal and informal (Dori & Tal, 2000). Firstly, for every university, environmental education should be one of the compulsory subjects in every courses. Since in university, students consist of youngsters, they are the one that should be involved in the creation of solutions to current and potential environmental problems. Moreover, they are next generation of adults with purchasing control and they will affect consumer choice decisions in their households (Siti et al., 2010). Lastly, let everyone aware about the microbeads pollution issues through varieties of platform whether through online or offline. By doing so, not just improves the awareness but the people can further actions in reducing the occurrence of microbeads pollution in marine ecosystem.

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APPENDIX A

QUESTIONNAIRE SURVEY

SECTION A: SOCIO DEMOGRAPHIC

1. Age

- 17-21 years old
- 22-25 years old
- 26-29 years old
- 30 years old

2. Ethnic

- Malay
- Chinese
- Indian
- Others

3. Level of education?

- Degree
- Master
- Doctorate

4. Campus

- Jeli
- Pengkalan Chepa
- Bachok

5. Year of study

- Year 1
- Year 2
- Year 3
- Year 4

6. Field of study

- Science
- Art
- Other

7. Facial scrub is a cream-based, oil-based or clay-based product that contains exfoliating pieces (microbead) that act as an agent for exfoliation. Do you use facial scrub in your skincare routine?

- Yes
- No

8. Frequency of using the facial scrubs in your daily life.

- Daily
- Once a week
- Twice a week
- Other

SECTION B: PERCEPTIONS OF THE RESPONDENTS REGARDING MICROBEAD IN FACIAL SCRUBS

Section B is about your perceptions and awareness regarding the facial scrubs that contain microbeads particle.

Instructions: For each of the following statement below, please indicate the extent of your agreement or disagreement based on the given scale by placing a tick (√) in the appropriate box.

5 = strongly agree 4 = agree 3 = neutral 2 = disagree 1 = strongly disagree

		1	2	3	4	5
1	All facial scrubs contain microbead particles.					
2	Microbead particle is one of the most important ingredients in facial scrubs.					
3	Aquatic organisms such as fish do not affected by the microbead particles that contaminated marine ecosystem.					
4.	I am aware fish that comes from the polluted ocean caused by microbead particles can gives adverse effects to human health.					
5	I am aware that microbead particles have been banned by certain country from becoming one of the ingredients in facial scrubs.					

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SECTION C: PARTICIPATION OF THE RESPONDENTS IN REDUCING MICROBEAD

Section C is about your participation or action in the future to reduce the occurrence of microbead pollution in marine ecosystem.

Instructions: For each of the following statement below, please indicate the extent of your agreement or disagreement based on the given scale by placing a tick (√) in the appropriate box.

5 = strongly agree 4 = agree 3 = neutral 2 = disagree 1 = strongly disagree

		1	2	3	4	5
1	I will buy the facial scrubs that do not have microbead particles in their ingredients.					
2	I will explain the negative impact of using facial scrubs that contain microbead particles to my family and friends.					
3	I will continuously use my facial scrubs containing microbead particles as long as my skin gets better and pretty.					
4.	I will give my fully support if my country ban the usage of microbead particles contain in facial scrubs or any skin care products.					
5	I will let others (family, friends, etc.) use the microbead facial scrubs instead of reprimanding them.					

