

ORIGINAL ARTICLE

A Preliminary Survey on Knowledge and Attitudes of University Students Regarding Microplastic Pollution and Its Impact on the Environment

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ABSTRACT

Introduction: Daily use and improper management of plastic materials by the public contributes to the occurrence of microplastic pollution. It can be acknowledged that knowledge and attitudes are one of the keys to reducing the release of microplastic into the environment. Therefore, enhancing student's understanding may play an important role in effective solution innovation and readiness to take specific actions for environmental protection. **Method:** This cross-sectional study was conducted among university students using an online questionnaire to assess their knowledge and attitudes about microplastic pollution. For data analysis, Pearson's Chi-square was conducted using SPSS version 26. **Results:** Findings revealed that students have moderate knowledge (4.66) and attitudes (5.42) towards microplastic pollution. However, neither age, gender, CGPA, nor the course in which they studied had any significant association with their level of knowledge and attitudes ($p > 0.05$). In fact, the level of knowledge and attitude reported by respondents indicate that it is necessary to address this deficiency by providing education through structured education and mass media, along with vigorous policy enforcement and replacement of conventional plastics. **Conclusion:** Education on microplastics among the younger generation is key to curbing the problem of microplastic pollution. As future consumers, the demand for alternative products that does not contribute to microplastic can help encourage brands and markets to come up with better solution that is critical to prevent this problem from worsening. *Malaysian Journal of Medicine and Health Sciences* (2023) 19(5):168-174. doi:10.47836/mjmhs19.5.24

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INTRODUCTION

Plastics are among the most common type of waste produced and found all over our ecosystem. Plastic is a synthetic material made from a variety of organic polymers such as polyethylene, polyvinyl chloride, polystyrene, and polypropylene (1). It can be moulded into any shape and due to its versatility (lightweight, strong, inexpensive, durable, and corrosion-resistant properties), plastic is used in a wide range of application such as packaging, construction, healthcare, agriculture, and more (1). Plastic, while useful, can actually cause harm to both the ecosystem and human health. This is

because plastics do not degrade, and even if they do, will take a number of years, making it difficult to remove plastics entirely from the environment. For instance, the degradation time of plastic bags is claimed to be between 10 and 20 years or 500 and 1000 years, whereas that of "plastic" bottles is reported to be between 70 and 450 years (2). The range of time for degradation of plastics is relatively broad due to the differences in the chemical composition and molecular structure of each type of plastic (2). Additionally, some plastics can degrade more quickly than others because they are more susceptible to environmental factors such as heat, sunlight, and oxygen (2). One major problem related to plastics is microplastics. Microplastics are plastic fragments with a size of fewer than 5 millimeters. Plastic beads in cosmetics, and personal care items are examples of primary microplastics, which have the characteristic size of microplastics at the time of manufacture (3).

Secondary microplastics are developed when plastics are fragmented and crushed by internal or external forces, and the producing pieces can have a variety of morphologies (3). They are becoming more common in the environment as a result of decades of plastic production and use in practically every industry (4).

Microplastic is ubiquitous in the environment, as it contributes to land pollution and marine pollution, putting humans and other biotas at risk (1). In addition, extensive use of plastics in daily life, as well as the resultant contamination of the environment, means that humans will continuously be exposed to microplastics. However, the focus of previous studies was on the impact of microplastic pollution in the marine environment and on the bioaccumulation in aquatic life (5-8). As part of the efforts to reduce the amount of plastic waste in the environment, people are making more effort to be environmentally conscious of plastics. Some of the actions include using eco-bag when buying groceries, using reusable straws or going straw-less when drinking and using reusable containers to pack take away foods. However, very little public action has been done in reducing microplastic pollution in the environment, largely due to the lack of attention being given in the media, compared to other plastic problems. In fact, the lack of media reporting on microplastics highlights the question; are the public even aware of the issue of microplastics? If they are aware, what actions have they taken to reduce the use of plastics, and by default, microplastics, and in managing the disposal of plastics? Though there may be an increase in research about microplastic pollution, there are not many studies that have been carried out about students' knowledge and attitude towards microplastic pollution and its impact on the environment. Therefore, this research study needs to be conducted to answer the questions above.

Microplastics remain in the environment for a long time. Microplastics in soil or sediments are carried via water and wind from a variety of sources, including sewage sludge, plastic mulch, street runoff, trash, landfill leachate, and air dust (9). Microplastic pollution not only occurs on land but also takes place in the marine environment. This is due to insufficient trash management, where a significant amount of plastic trash ends up in the marine ecosystem from incineration, landfills, household items, industrial discharge, wastewater treatment facilities, and rivers (10). Since microplastics are small particles in aquatic settings, they can be readily eaten by aquatic creatures, causing build-up of microplastics to harm tissues, organs, and digestive tracts. Additionally, dichlorodiphenyltrichloroethane (DDTs), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), alkylphenols, and bisphenol A (BPA) are some of the pollutants linked to plastic debris in the aquatic environment. Not only that, the build-up of these pollutants with microplastics in aquatic food webs can lead to toxicity, and once in the food chain,

may influence human health (11).

Microplastics are causing rising public and academic worry that they may harm not just ecosystem sustainability but also human food safety and public health (12). Microplastics research started in the early 21st century, and the attention on microplastics has expanded in recent years (13). While there is a rise of literature on microplastics and their effects on the environment, there is limited research on knowledge and attitudes on microplastics pollution, especially among the much younger generations in Malaysia, particularly students. Students' attitudes on environmental issues are crucial because they directly contribute to the development of knowledge-based solutions to our environmental problems (14). Depending on how much environmental education they have received, students may also influence their parents, teachers, and community members' awareness, attitudes, and behaviours (15). This research, therefore, aims to address this gap in microplastics research by evaluating both knowledge and attitude of students on this matter.

MATERIALS AND METHODS

Study design and data collection

This cross-sectional study was designed to evaluate knowledge and attitude on microplastic pollution and its impact on the environment among Health Sciences students in Universiti Teknologi MARA (UiTM) Puncak Alam. There are 8 programs under the Faculty of Health Sciences which are Nursing, Medical Laboratory Technology (MLT), Medical Imaging (MI), Environmental Health and Safety (EHS), Physiotherapy (PT), Occupational Therapy (OT), Optometry (OPTO), and Dietetics.

An electronic questionnaire was created in Google Forms and a URL link was distributed to students through the "WhatsApp" application. This survey was conducted from December 2021 to January 2022 through an online platform following social distancing restriction implemented by the government to curb the spread of COVID-19 (16). Following a similar protocol by Zulkarnain et al. (16), this study successfully recruited a total of 105 participants using a snowball sampling technique. Participants who were initially recruited were encouraged to distribute the survey link to other Health Sciences students on the campus. All full-time Bachelor students of the Faculty of Health Sciences were eligible to participate in this study. The study was approved by the Ethics and Research Committee of UiTM [Reference no: REC/12/2021 (UG/MR/1154)]. All the necessary information regarding the study was given to the participants, and informed consent was asked at the start of the electronic questionnaire. The participants were also informed that their participation in this research was entirely voluntary, and they may refuse to take part in the study or withdraw from participation in the research

at any time. Their identities were kept anonymous, and all the information are kept confidential by researchers.

Questionnaire and data analysis

The structured questionnaire used in this research was adopted from the English version published in previous studies (17). The questionnaire, which was only available in English version, was divided into three sections. The first section was designed to determine the demographic characteristics (QG) of the participants, including; 1] age, 2] gender, 3] program courses, and 4] current Cumulative Grade Point Average (CGPA). The second and third sections focused on respondent's knowledge (QK) and attitudes (QA) on microplastic pollution. One point was awarded for each correct or agreed answer, while a score of 0 was given for "maybe" or "I do not know", and -1 for wrong or negative answer. Descriptive statistics, including frequencies, standard deviations, percentages, and mean scores, were used to summarise each research study variable. A non-parametric test (Pearson's Chi-square) was used to identify the relationship between demographic variables and their knowledge and attitudes. The statistical analysis was performed using IBM SPSS version 26 and significance level was set at 0.05.

RESULTS

Demographic characteristics of study participants

Table I summarizes the demographic characteristics of the respondents. Majority of the respondents were between 21 to 23 years old (60.00%) with 69.52% being female. Out of 105 respondents, 37.14% were from EHS, 11.43% from Nursing and the rest were from OT (9.52%), PT (9.52%), MLT (8.57%), OPTO (8.57%), MI (8.57%), and Dietetics (6.68%). Most respondents' CGPA values ranged from 3.51 to 4.00.

Knowledge and attitudes on microplastic pollution

Table II shows the respondents' knowledge and attitudes on microplastic pollution. According to the responses on the knowledge set of questions, low percentage of study participants (13.49%) provided incorrect answers, with the highest level of incorrect answers (23.81%) were found in QK6 concerning how microplastic are created (Table II). The majority of the respondents also responded positively to the topic regarding their attitudes, including their willingness to pay and take action to reduce their plastic waste (average 86.42%, Table II). However, a large percentage are uncertain (41.9%) of whether they are prepared to give up using cotton buds in their daily lives.

Relation of the knowledge and attitudes on microplastic pollutions with demographic characteristics

This study revealed that those between the ages of 18 and 20 (87.50%) had better knowledge of microplastic pollution than those between the ages of 21 to 23 and 24 to 25, as shown in Table III. However, a higher

Table I: Demographic characteristics of study participants (n=105)

Sociodemographic Variables	Frequency	Percentage (%)
Age (Years)		
18 – 20	8	7.62
21 – 23	63	60.00
24 – 25	31	29.52
26 and above	3	2.86
Gender		
Male	32	30.48
Female	73	69.52
Course Program		
Nursing	12	11.43
MLT	9	8.57
EHS	39	37.14
PT	10	9.52
OT	10	9.52
OPTO	9	8.57
Dietetics	7	6.68
MI	9	8.57
Current CGPA		
2.50 – 3.00	1	0.95
3.01 – 3.50	39	37.14
3.51 – 4.00	65	61.91

percentage of individuals between the ages of 24 and 25 expressed positive attitudes toward microplastic pollution (70.97%). When comparing gender, female students had better attitudes (68.49%) and knowledge (64.38%) regarding microplastic pollution. Comparison between courses, on the other hand, showed OT students scoring highest in knowledge (80.00%) and attitudes (90.00%) on microplastic contamination. Additionally, the highest knowledge and attitude scores are among students with CGPAs between 3.0 and 3.50. However, based on the statistical analysis, there are no significant relationship between study participants' knowledge and attitudes on microplastic pollution with any of their demographic characteristics ($p > 0.05$).

DISCUSSION

This study examined the knowledge and attitudes of Health Sciences students from UiTM Puncak Alam on microplastic pollution as well as the relationship between these two domains with respondents' demographic characteristics. Most of respondents believed that microplastics are widely used in cosmetics, followed by synthetic clothing, pharmaceutical products and food productions. This result is similar to studies by Charitou et al. (17). Besides, numerous studies have shown that personal care and cosmetic products are important sources of environmental microplastics around the world, including Malaysia (18-20), which indicates that some knowledge of microplastics do reach the public. In addition, majority of the respondents considered human activities as major contributors to marine plastic pollution. However, this finding is different from a

Table II: The participants' responses to the Knowledge (QK) and Attitudes (QA) questions

Item	Question/Statement	Frequency, n (%)
QK1	Do you know the impacts of plastics on marine ecosystems?	
	Yes	101 (96.19)
	No	1 (0.95)
QK 2	Do you know about the No Plastic Bag campaign?	
	Yes	93 (88.57)
	No	12 (11.43)
QK 3	Do you know what microplastics are?	
	Yes	84 (80.00)
	No	13 (12.38)
QK 4	Do you think that plastic that ends up in the ocean is a threat to human health?	
	Yes	96 (91.43)
	No	3 (2.86)
QK 5	Do you think that plastic pollution is one of the biggest environmental problems of our time?	
	Yes	99 (94.29)
	No	2 (1.90)
QK 6	Do you know how microplastics are created?	
	Yes	72 (68.57)
	No	25 (23.81)
QK 7	Where do you think microplastics are used?	
	Pharmaceutical products	23 (21.90)
	Synthetic clothing	28 (26.67)
QK 8	Where do you think that the biggest number of plastics that enter the ocean comes from?	
	Industrial	33 (31.43)
	Human activities	49 (46.67)
QA 1	Do you believe that banning products that include microplastics contributes to the preservation of the marine environment?	
	I agree	100 (95.24)
	I do not agree	2 (1.90)
QA 2	Would you change the store you go shopping to opt for environmentally friendlier products?	
	I agree	97 (92.38)
	I do not agree	8 (7.62)
QA 3	Would you buy a product that does not contain microplastics or not made from plastics even if it costs more?	
	I agree	87 (82.85)
	I do not agree	3 (2.86)
QA 4	Are you ready to stop using plastic bottles in your daily life?	
	Agree	89 (84.76)
	Disagree	7 (6.67)
QA 5	Are you ready to stop using plastic bags in your daily life?	
	Agree	92 (87.62)
	Disagree	4 (3.81)
QA 6	Are you ready to stop using cotton buds in your daily life?	
	Agree	47 (44.76)
	Disagree	14 (13.33)
QA 7	Are you ready to stop using plastic straw in your daily life?	
	Agree	92 (87.62)
	Disagree	7 (6.67)

previous study conducted in Europe by Potts et al. (21) where it is the industries that were considered to be the biggest contributor to plastic pollution in the marine environment. Regardless of the difference in opinion, apart from industries, human activities also contribute to marine plastic pollution. This is due to our habit of littering everywhere, including on the beach, where most of the rubbish is made from plastic; such as food packaging and kites, among others (22). Therefore, the government should strengthen the law on littering on the beach or provide more bins at the beach for the people to throw away their trash.

In general, students who participated in this study showed moderate knowledge and attitudes on microplastic pollution. However, statistical analysis revealed that there is no significant relationship between knowledge and attitudes on microplastic pollution with demographic characteristics of the study participants. This result is similar to the findings of the previous study (23) with the exception of the gender variable, which was significant to attitude and behaviour in that study. As seen in this study, despite the lack of significant relationship, female students were more concerned on microplastic pollution, as they were more knowledgeable and showed positive attitudes regarding this issue. This finding is aligned with similar surveys conducted in India (23) and Greece (17). Gender, it seems plays quite an important role in determining knowledge and attitude in certain topics and evidence indicate that women nowadays are possibly more interested in science than they were in the past, and that educational trends may have changed over time (24). In fact, research by Buckley et al. (25) revealed that women are significantly more concerned about environmental issues than males.

This study also discovered that students between the ages of 18 and 20 have more knowledge of microplastic pollution than older students, however, level of knowledge does not correspond to positive attitudes, nor does the result indicate age to be a significant factor associated with either knowledge or attitude on microplastic. Regardless, studies highlighted that younger age groups actually have lower pro-environmental attitudes compared to older age groups (17, 21, 25), indicating a contradictory result where age is a significant factor in attitude which have been highlighted in other studies (26, 27). It appears, age encourages stronger engagement with environmental concerns, pro-environmental attitudes, and corresponding behaviours. Clearly, the younger generations play an important role to the future environmental sustainability, hence it is important to raise their awareness and motivate them to adopt pro-environmental attitudes and behaviours.

Apart from age, education could also be significant factor to consider when addressing the issues of anthropogenic pollution, and appropriate discourse on the subject in the

Table III: Relation of knowledge and attitudes on microplastic pollution with demographic characteristics

Demographic Variables	Frequency, n (%)	Knowledge				Attitudes			
		Good	Moderate	Poor	p-value	Good	Moderate	Poor	p-value
Age (Years)									
18-20	8 (7.62)	7 (87.50)	1 (12.50)	0 (0.0)	0.614	5 (62.50)	2 (25.00)	1 (12.50)	0.948
21-23	63 (60.00)	37 (58.73)	16 (25.40)	10 (15.87)		41 (65.08)	16 (25.40)	6 (9.52)	
24-25	31 (29.52)	18 (58.06)	6 (19.36)	7 (22.58)		22 (70.97)	5 (16.13)	4 (12.90)	
≥26	3 (2.86)	2 (66.67)	1 (33.33)	0 (0.0)		2 (66.67)	1 (33.33)	0 (0.0)	
Gender									
Male	32 (30.48)	17 (53.12)	9 (28.13)	6 (18.75)	0.547	20 (62.50)	7 (21.88)	5 (15.62)	0.521
Female	73 (69.52)	47 (64.38)	15 (20.55)	11 (15.07)		50 (68.49)	17 (23.29)	6 (8.22)	
Course Program									
Nursing	12 (11.43)	8 (66.67)	1 (8.33)	3 (25.00)	0.155	7 (58.33)	5 (41.67)	0 (0.00)	0.301
MLT	9 (8.57)	6 (66.67)	2 (22.22)	1 (11.11)		7 (77.78)	1 (11.11)	1 (11.11)	
EHS	39 (37.14)	22 (56.41)	14 (35.90)	3 (7.69)		20 (51.28)	12 (30.77)	7 (17.95)	
PT	10 (9.52)	7 (70.00)	2 (20.00)	1 (10.00)		8 (80.00)	2 (20.00)	0 (0.00)	
OT	10 (9.52)	8 (80.00)	2 (20.00)	0 (0.00)		9 (90.00)	1 (10.00)	0 (0.00)	
OPTO	9 (8.57)	5 (55.56)	0 (0.00)	4 (44.44)		7 (77.78)	1 (11.11)	1 (11.11)	
Dietetics	7 (6.68)	3 (42.86)	2 (28.57)	2 (28.57)		6 (85.71)	1 (14.29)	0 (0.00)	
MI	9 (8.57)	5 (55.56)	1 (11.11)	3 (33.33)		6 (66.67)	1 (11.11)	2 (22.22)	
Current CGPA									
2.50-3.00	1 (0.95)	0 (0.0)	1 (100.00)	0 (0.0)	0.239	0 (0.0)	1 (100.00)	0 (0.0)	0.164
3.01-3.50	39 (37.14)	27 (69.23)	8 (20.51)	4 (10.26)		30 (76.92)	7 (17.95)	2 (5.13)	
3.51-4.00	65 (61.91)	37 (56.92)	15 (23.08)	13 (20.00)		40 (61.54)	16 (24.62)	9 (13.84)	
Total average score		4.66				5.42			

higher education sector may contribute to the successful regulation of microplastic pollution (23). From the data, majority of EHS students have good knowledge and positive attitudes towards microplastics as they were exposed to the topic in their curriculums. Additionally, while data on CGPAs indicate some difference in knowledge and attitude between the different levels, as the results are not significant, a bigger and more varied sample size would be needed to determine whether this affect knowledge and attitude at all. Previous studies, such as Charitou et al. (17), for instance, highlighted education to be a significant factor, but does not focus on grades, but rather on general academic qualifications. Nevertheless, environmental issues, with a focus on plastic and microplastic pollution, must be included in every educational curriculum without further delay to raise awareness. While education alone does not specifically determine attitudes and behaviours, it may have an impact on higher awareness and subsequently influence individual pro-environmental attitudes and behaviours see (17, 23, 28-29).

This preliminary study is designed to give a snapshot of the prevailing knowledge and attitudes of health sciences students toward microplastic pollution. In this study, the fact that the questionnaire was primarily distributed online, and the study participants were recruited using snowball technique might have biased the results. The distribution strategy for the questionnaire, in general, would indicate that most participants were already interested in environmental issues. This further highlight on how much the microplastic pollution is unknown, even to individuals who are already concerned about the environment. Therefore, it is suggested that a thorough study be conducted in the future with a larger sample size involving students in different programs from various universities and more levels of assessment. Additionally,

a study on environmental education in relation to the curriculum’s content structure and teaching materials for university students is necessary.

CONCLUSION

Students have moderate knowledge and attitudes towards microplastic pollution. Concerning microplastic pollution, this study highlights the need to increase our knowledge on microplastics pollution in the environment starting from a young age. The government should take action to improve education on the environment and promote the use of non-plastic or reusable products in schools and universities. By increasing the education and providing more information about microplastic pollution, the public will start to be more aware of the consequences of using plastic products or products that contain microplastics. Thus, it can lead to an increase in conscious buying habit, by avoiding products with too much packaging or containing microplastics. Furthermore, it can encourage the market to sell various alternative products that does not contribute to microplastic pollution. Ultimately, this current research fills the gap highlighted in literatures, especially within a Malaysian context, even though further research is required.

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