

Original Research Article

Knowledge, attitude and practice towards plastic pollution among residents in a rural area of Trivandrum district

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ABSTRACT

Background: Plastic pollution has emerged as one of the most significant environmental challenges, with severe impacts on ecosystems, wildlife, and human health. Knowledge on microplastics and their long-term effects, remains limited in some regions. Many individuals still perceive plastic waste management as primarily a governmental or corporate responsibility, rather than a personal one. Although some individuals actively engage in reducing plastic consumption and participating in recycling initiatives, a large portion continues to rely on single-use plastics due to convenience, cost, and a lack of accessible alternatives. Hence this study aims to explore the level of knowledge, attitude and practice (KAP) towards plastic pollution among residents of rural area of Trivandrum district.

Methods: A cross-sectional study was done among 246 study participants through convenience sampling. A semi structured questionnaire containing sociodemographic and KAP were prepared in kobo toolbox were used to collect the data. Data was analysed using SPSS software 25.

Results: Among the 246 study participants 37% were having good knowledge, 50% were having good attitude and 41% were having good practice. Majority that is 55% of the participants were of age between 18-30 years, 60% were females, 40% had education status upto higher secondary. The association with ration card colour with level of knowledge and attitude and gender with practice were found to be statistically significant.

Conclusions: There is a need to increase the level of KAP towards plastic pollution to achieve a plastic free society

Keywords: Plastic pollution, Rural area, Trivandrum, Microplastic

INTRODUCTION

Accumulation in the environment of synthetic plastic product is a significant source of environmental pollution. Synthetic plastic resins were introduced into world commerce in 1907 by Bakelite which brought about a revolution.¹ By the end of the 20th century, plastics had been found to be persistent polluters of many environmental niches. In the environment, plastic pollution can fragment into smaller pieces of plastic.

Microplastics are plastic particles ranging in size from five millimeters to one nanometer; nano plastics are plastic particles smaller than one micrometer.

According to Lundell and Thomas, the amount of plastic products that is manufactured globally is over 300 million. It was also estimated based on different countries that plastics are recycled between 9 to 10% of the yearly production, about 10% burnt and an average of 80% of the generated plastics are discarded.¹

Plastic waste decomposition is extremely slow and depends on the chemical composition and conditions.² Larger plastic products break down into smaller particles once they decompose. Less than 5 mm in size plastic fragments are called microplastics and these particles are so miniaturized, that they are quickly carried through the air or in water bodies.³ As a consequence, micro particles have been detected in air, soil, water, polar ice, deep seas, and living organisms.

Uptake of microplastic by any routes like contact, ingestion or respiration can result in bioaccumulation.^{4,5} The concept of bioaccumulation can also be explained as the rate at which a contaminant (MP) is more than the rate at which an organism can excrete. Eventually this leads to biomagnification which occurs when the concentration of the contaminant (microplastic) in one organism is more compared to its prey.⁶ There occurs tropic transfer of microplastic in the foodchain.⁷ Microplastics have a role in contamination of marine food web, land pollution, ground water pollution and air pollution.

The organization for economic cooperation and development estimated that in 2019, plastic products were responsible for 3.4% of global greenhouse gas emissions. 15% of global carbon emissions are predicted to be due to that plastic by 2050.⁸ The plastic waste generated in India is increased in last few decades. 4,126,997 tons of plastic waste was generated in 2020-21. Kerala, the southernmost state in India, generated about 1263.87 tons of plastic.⁹ Government of India has passed out plastic waste management rules in 2021 to minimize the generation of plastic.¹⁰ This study aims to understand of the knowledge and practice regarding plastic pollution among residents in rural area of Trivandrum district.

METHODS

It was a cross sectional study done among residents of Karakulam grama panchayat of Trivandrum district. The study was conducted from April to November 2024. Sample size is calculated using the formula

$$N = Z^2 (1-\alpha/2)^2 pq / d^2$$

p=28.9% (Proportion of knowledge about plastic pollution in Malaysia.¹¹ $\alpha=0.05$ (significant level) q=100-p= 71.1, d=relative precision, taken as 10% of the prevalence; d=5.78.

The estimated sample size was 246. The Sampling technique followed was convenience sampling. Among relatives of patients attending inpatient and outpatient department in a tertiary care center in Trivandrum district. All bystanders >18 years and who were permanent resident of Karakulam grama panchayat were included. Those who were mentally incapable of making a decision, those with any organic diseases and not willing to participate in the study were excluded. A semi structured questionnaire was prepared via Kobo toolbox for humanitarian response.

Questionnaire consists of sociodemographic details and questionnaire taken from Malaysia.¹³ The data obtained would be coded and entered in Microsoft excel worksheet and analysis performed using the statistical software statistical package for social sciences (SPSS version -23). Each question on KAP questionnaire were gives a score of 1, the total score was calculated and mean score were analysed. Those participants who score below the mean were considered to have poor knowledge, poor attitude and poor practice.

Ethical consideration

Study was conducted after obtaining institutional ethical clearance number 130/IEC/SUTAMS/2025. Also after obtaining informed consent from the study participants. Involvement was voluntary. Data collected was totally anonymous and no identifying features were incorporated. No expenses were incurred from the study participants.

RESULTS

The study was conducted among 246 study participants of rural population of Karakulam grama panchayat of Trivandrum district. Table 1 shows the socio demographic profile of the study participants, 55% (135) study participants were in the age group 18 to 30 years, 60.2% (148) were female, 44.3% (109) participants were holding white ration card.

Table 2 shows the distribution of knowledge towards plastic pollution among rural residents of Trivandrum district. The 90.2% (222) study participants are aware that degraded plastic fragments (e.g., microplastic, nano plastics) can accumulate in the food chain and are consumed by humans. The 98% (241) participants are aware that plastics affects human health and environment at every stage of its lifecycle. The 96.7% (238) participants know that incineration or burning of plastic waste can release toxic metals, organic substances, acidic gases and other toxic substances to the air, water and soil.

The mean score knowledge 10 ± 1.584 SD, those who scored above 10 were considered to have good knowledge and those who scored below 10 were considered to have bad knowledge. Among the 246 participants 91 (37%) were having good knowledge and 155 (63%) were having bad knowledge

Table 3 shows distribution of attitude towards plastic pollution among rural residents. The 94.3% (232) participants are willing to use eco-friendly bags instead of plastic bags. 93.5% (230) individuals think that plastic ends up in landfills or the ocean can harm human health and the environment. The 93.5% (230) think that littering or mismanagement of plastic waste is the cause of plastic pollution.

The mean score attitude 9 ± 1.541 SD, those who scored above 9 were considered to have good attitude and those who scored below 9 were considered to have bad attitude.

Among the 246 participants 122 (49.6%) were having good attitude and 124 (50.4%) were having bad attitude.

Table 4 distribution of practice of study population towards plastic pollution. The 93.5% (230) participants participate in plastic pollution related awareness creation campaigns. The 93.5% (230) use recycle containers to takeaway foods and drinks.

The mean score practice 6 ± 1.021 SD, those who scored above 6 were considered to have good practice and those

who scored below 6 were considered to have bad practice. Among the 246 participants 102 (41.5%) were having good practice and 144 (58.5%) were having bad practice.

Table 5 shows the association between the level of KAP with the contributing factors. The colour of ration card and education had a significant association with the level of knowledge on plastic pollution. whereas only the ration card colour had a significant association with the level of attitude. Only gender had a significant association with the level of practice on plastic pollution.

Table 1: Sociodemographic profile of study participants.

Variables	Frequency (%)
Age (in years)	
18-30	135 (55)
31-45	47 (19)
46-60	51 (21)
>60	13 (5)
Gender	
Male	98 (39.8)
Female	148 (60.2)
Education	
Upto 10 th	31 (12.6)
Higher secondary	100 (40.7)
Graduate	90 (36.6)
Postgraduate	25 (10.2)
Ration card color	
Yellow	22 (8.9)
Pink	68 (27.6)
White	109 (44.3)
Blue	47 (19.1)

Table 2: Distribution of knowledge towards plastic pollution among rural residents of Trivandrum district.

Questions	Yes (%)	No (%)
Most plastics are made from fossil fuels (Example: natural gas, petroleum, coal etc.).	186 (75.6)	60 (24.4)
Plastic affects human health and the environment at every stage of its lifecycle	241 (98)	5 (2)
Incineration/ burning of plastic wastes can release toxic metals, organic substances, acidic gases, and other toxic substances to the air, water, and soils	238 (96.7)	8 (3.3)
Discarded plastic, if digested, will not cause any harmful effect on organisms.	230 (93.5)	16 (6.5)
Some cosmetic products contain plastic in it.	217 (88.2)	29 (11.8)
Plastic will not degrade into plastic fragments.	199 (80.9)	47 (19.1)
A plastic bag will take 10 years to degrade.	195 (79.3)	51 (20.7)
Degraded plastic fragments (e.g., microplastics, nano plastics) can accumulate in the food chain and consume by humans.	222 (90.2)	24 (9.8)
Microplastics can be inhaled through air.	214 (87)	32 (13)
Among municipal solid wastes produced in Kerala, plastic wastes are the second highest in composition.	218 (88.6)	28 (11.4)
Kerala is one of the top ten countries with mismanaged plastic waste in the world.	203 (82.5)	43 (17.5)

Table 3: Distribution of attitude of study population towards plastic pollution.

Questions	Yes (%)	No (%)
Do you think that plastic pollution is one of the biggest environmental problems of our time?	186 (75.6)	60 (24.4)
Do you think the plastic pollution situation in Kerala is severe?	227 (92.3)	19 (7.7)
Do you think Kerala government has sufficient effort in reducing plastic pollution?	214 (87)	32 (13)

Continued.

Questions	Yes (%)	No (%)
Do you think the public has the responsibility in reducing plastic pollution in Kerala?	150 (61)	96 (39)
Do you think an increase in public's awareness can help to reduce plastic pollution?	225 (91.5)	21 (8.5)
Do you think littering or mismanagement of plastic wastes is one of the causes of plastic pollution?	230 (93.5)	16 (6.5)
Do you think that the taxation of single-use plastics in Kerala could be an appropriate action toward reduction of plastic uses?	239 (97.2)	7 (2.8)
Do you think that single-use plastics should be banned completely in Kerala?	207 (84.1)	39 (15.9)
Do you think plastic that ends up in landfills or the ocean can harm human health and the environment?	230 (93.5)	16 (6.5)
Do you think you can stop using the single-use plastics in your daily life?	59 (23.9)	187 (70.7)
Are you willing to use eco-friendly bags instead of plastic bags?	232 (94.3)	14 (5.7)

Table 4: Distribution of practice of study population towards plastic pollution.

Questions	Yes (%)	No (%)
Do you separate plastic waste from other household wastes?	219 (89)	37 (11)
Do you recycle your plastic waste at home?	229 (93.1)	17 (6.9)
Do you use reusable bag(s) during groceries shopping?	207 (84.1)	39 (15.9)
Do you bring and use reusable container(s) to takeaway food or drinks?	230 (93.5)	16 (6.5)
Do you frequently purchase plastic-made product(s) or plastic-packaged product(s)?	191 (77.6)	55 (22.4)
Do you participate in plastic pollution related awareness creation campaigns?	230 (93.5)	16 (6.5)

Table 5: Association between the level of KAP with the contributing factors of plastic pollution.

Variables	Level of knowledge		P value	Level of attitude		P value	Level of practice		P value
	Good	Poor		Good	Poor		Good	Poor	
Age (in years)									
18-30	61 (45)	74 (55)	0.09	73 (55)	62 (46)	0.323	56 (42)	79 (58)	0.823
31-45	9 (19)	38 (81)		22 (47)	25 (53)		19 (41)	28 (59)	
45-60	16 (31)	35 (69)		23 (46)	28 (55)		23 (45)	28 (55)	
>60	5 (39)	8 (61.5)		4 (30.7)	9 (69)		4 (30)	9 (70)	
Gender									
Male	93 (60)	62 (40)	0.946	47 (48)	51 (52)	1.115	52 (53)	46 (47)	0.003
Female	55 (60.4)	36 (40)		75 (51)	73 (49)		50 (34)	98 (66)	
Education									
Upto 10 th	8 (25.8)	23 (74)	0.000	16 (52)	15 (48)	0.965	17 (54.8)	14 (46.1)	0.246
Higher secondary	23 (23)	77 (77)		51 (51)	49 (49)		44 (44)	56 (56)	
Graduate	49 (55)	41 (46)		43 (48)	47 (52)		32 (36)	58 (64.4)	
Post-graduate	11 (44)	14 (56)		12 (48)	13 (52)		9 (36)	16 (64)	
Ration card									
Yellow	5 (23)	17 (77)	0.046	7 (32)	15 (68)	0.05	9 (41)	13 (59)	0.131
Pink	19 (28)	49 (72)		28 (41)	40 (59)		230 (34)	45 (66)	
White	50 (46)	59 (54)		63 (58)	46 (42)		54 (50)	55 (50)	
Blue	17 (36)	30 (64)		24 (51)	23 (49)		16 (34)	31 (66)	

DISCUSSION

This study provides valuable insights into the knowledge, attitudes, and practices regarding plastic pollution among rural population of Trivandrum district. The findings suggest that while there is substantial awareness of the environmental and health impacts of plastic, this knowledge does not always translate into corresponding behavioral changes. This discrepancy between knowledge and practice is a key finding that warrants further

exploration, as it has significant implications for developing more effective environmental policies and public health strategies.

The study participants demonstrated the need for a high level of awareness regarding the environmental and health risks of plastic, with the majority recognizing that plastics are made from fossil fuels (75.6%) and that plastic waste can have harmful effects on both human health and the environment. This is consistent with other studies that

show growing awareness about the dangers of plastic pollution in both developing and developed regions.^{12,14-16}

Furthermore, the overwhelming majority (96.7%) understood that the incineration of plastic waste can release toxic substances, and 90.2% acknowledged that microplastics can enter the food chain. This demonstrates a strong understanding of the complex nature of plastic pollution, from its lifecycle to its potential impacts on ecosystems and human health. The awareness around microplastics and their role in the food chain is particularly notable, as this issue has only recently gained attention in environmental science and media. This suggests that the population is well-informed about emerging environmental threats, which is promising for the future of plastic pollution management.

However, despite this robust knowledge base, there were a few areas where misunderstandings persisted. For example, 80.9% of participants mistakenly believed that plastic would not degrade into smaller fragments, which may reflect a gap in understanding about the process of plastic degradation and the persistence of plastic pollution in the environment. This finding indicates the need for more detailed educational campaigns that clarify these misconceptions and explain the long-term environmental consequences of plastic waste.

The attitudes of the study participants towards plastic pollution were almost negative, with 75.6% agreeing that plastic pollution is one of the biggest environmental problems of our time. This indicates a high level of concern, which is consistent with global trends showing increased public concern about plastic pollution.¹⁶

A notable finding is the strong support for government intervention to address plastic pollution. A majority of respondents (92.3%) felt that the plastic pollution situation in Kerala was severe, and 87% believed that the government should take stronger actions to reduce plastic pollution. This highlights the importance of policy-driven solutions in managing plastic waste. Additionally, the support for taxation (97.2%) and the banning of single-use plastics (84.1%) suggests that the population is willing to embrace more stringent regulations, provided that these measures are enforced effectively.

Only 23.9% of participants believed they could completely stop using single-use plastics, which suggests that while people recognize the severity of the issue, personal convenience and habits remain barriers to behaviour change. This finding underscores the need for interventions that address not just knowledge but also the behavioral and psychological factors that influence plastic consumption. Public awareness campaigns should be complemented with practical, actionable steps to help individuals reduce plastic use in their daily lives.

In terms of practices, the study found that a large proportion of participants were actively engaging in

environmentally friendly behaviors, such as recycling (93.1%) and using reusable containers for takeaway food (93.5%). These findings align with previous studies that suggest recycling and waste segregation are becoming more common in urban populations. Additionally, 84.1% of participants used reusable bags while shopping, demonstrating a positive shift towards more sustainable consumption patterns.

However, a significant issue remains: 77.6% of participants reported frequently purchasing plastic-made or plastic-packaged products. This is a critical finding as it reveals a disconnect between environmental awareness and consumer behavior. Despite the high level of knowledge about the harmful effects of plastic, the demand for plastic products and packaging remains strong, which highlights the pervasive nature of plastic in modern life. The persistent use of single-use plastics in everyday consumer choices indicates that environmental awareness alone is insufficient to drive large-scale behavior change. There is a clear need for structural changes that make sustainable alternatives more accessible and convenient.

The high participation rate in plastic pollution awareness campaigns (93.5%) is encouraging, suggesting that there is considerable interest in addressing the issue at a community level. However, this enthusiasm for awareness does not necessarily translate into a reduction in plastic consumption. This calls for a shift from awareness campaigns to more focused efforts that promote actual behavior change, such as incentivizing reductions in plastic usage or promoting sustainable product alternatives. Limitation of our study is our research was confined to only one rural population in Trivandrum. From our study we recommend that there is a need to enhance public awareness campaign, need to strengthen policy and enforcement measures and encourage behavioral change communication. There is a need for continuous monitoring and evaluation.

CONCLUSION

The present study underscores that it is the need of the hour to increase the level of KAP towards plastic pollution among the rural residents of Trivandrum district. Among 246 study participants, majority 63% (155) were having poor knowledge, 59% (144) were having poor practice. Though the attitude towards plastic pollution were equivocal, 50% (122) were having a good attitude, and 50% (124) were having a bad attitude. The association with ration card colour, education qualification with the level of knowledge were found to be statistically significant.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Generation of plastic waste. Available at: <https://pib.gov.in/Pressre-leaseshare.aspx?PRID=1943210>. Accessed on 18 June 2025.
2. Chamas A, Moon H, Zheng J, Qiu Y, Tabassum T, Jang JH, et al. Degradation Rates of Plastics in the Environment. *ACS Sustain Chem Eng*. 2020;8(9):3494-511.
3. Fackelmann G, Sommer S. Microplastics and the gut microbiome: How chronically exposed species may suffer from gut dysbiosis. *Mar Pollut Bull*. 2019;143:193-203.
4. Garber K, Anderson B, Burkhard L, Doelling P, Sappington K, Steeger T, et al. User's Guide and Technical Documentation KABAM version 1.0 (KOW (based) Aquatic Bio Accumulation Model). 2009.
5. Simpson SL, Batley GE. Sediment quality assessment: A practical guide. 2016. Available at: <http://www.ebooks.com/2513076/sediment-quality-assessment/batley-graeme-simpson-stuart/>. Accessed on 18 June 2025.
6. Wang J, Tan Z, Peng J, Qiu Q, Li M. The behaviors of microplastics in the marine environment. *Mar Environ Res*. 2016;113:7-17.
7. Kelly BC, Ikonomou MG, Blair JD, Morin AE, Gobas FAPC. Food web-specific biomagnification of persistent organic pollutants. *Science*. 2007;317(5835):236-9.
8. Santos RG, Machovsky-Capuska GE, Andrades R. Plastic ingestion as an evolutionary trap: Toward a holistic understanding. *Science*. 2021;373(6550):56-60.
9. Generation of plastic waste. Available at: <https://pib.gov.in/Pressre-leaseshare.aspx?PRID=1943210>. Accessed on 18 June 2025.
10. The Plastic Waste Management (Amendment) Rules; 2021.
11. Duraisamy K, Muniyapillai T, Kulothungan K, Mahendran P, Ayyappan R, Rengaraj R, et al. Prevalence of Plastic Usage and the Factors Associated With It Among Adults in Perambalur District of South India: A Cross-Sectional Study. *Cureus*. 2023;15(9):e46294.
12. Pandey P, Dhiman M, Chopra P, Adlakha A. Investigating the Role of Tourists and Impact of Knowledge, Behaviour, and Attitude Towards Plastic Waste Generation. *Circular Economy Sustainab*. 2023;3(2):1013-27.
13. Chin KKC, Mahanta J, Nath TK. Knowledge, Attitude, and Practices towards Plastic Pollution among Malaysians. Preprints. 2022;2022090315.
14. Filho WL, Salvia AL, Bonoli A, Saari UA, Voronova V, Klöga M, et al. An assessment of attitudes towards plastics and bioplastics in Europe. *Sci Total Environ*. 2021;755(1):142732.
15. Miguel I, Santos A, Venâncio C, Oliveira M. Knowledge, concerns and attitudes towards plastic pollution: An empirical study of public perceptions in Portugal. *Sci Total Environ*. 2024;906:167784.
16. Davison SMC, White MP, Pahl S, Taylor T, Fielding K, Roberts BR, et al. Public concern about, and desire for research into, the human health effects of marine plastic pollution: Results from a 15-country survey across Europe and Australia. *Global Environmental Change*. 2021;69(1526):102309.

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