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Public Knowledge of Microplastics, Plastic-Use Behaviors, and Readiness to Change among Adults in Saudi Arabia: A Cross-Sectional Study

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Abstract

Background: Microplastics (MPs), plastic particles smaller than 5 mm, are widespread in environmental media and have been detected in human tissues and biological samples, yet public understanding of their potential health implications remains limited. Objectives: This study assessed public knowledge of microplastics, plastic-use behaviors, perception of harm, barriers to behavior change, and readiness to adopt exposure-reducing practices among adults in Saudi Arabia. Methods: A cross-sectional survey was conducted between March 9 and April 3, 2026, using a 34-item self-administered online questionnaire. A convenience sample of 300 Arabic-speaking adults aged 18 years or older was analyzed. Three composite scores were computed: knowledge, behavioral exposure, and perception of harm. Results: The mean knowledge score was 65.47 ± 24.85%, with 41.0% of participants classified as having high knowledge. Female participants had higher knowledge scores than males (67.85% vs. 60.32%; U = 8231.5, p = 0.030). Bottled water consumption was the most frequent exposure-related behavior (3.76 ± 1.22). Knowledge was moderately correlated with perception of harm (rho = 0.416, p < 0.001) but was not significantly associated with behavioral exposure (rho = 0.020, p = 0.730). Lack of alternatives (34.7%) and time or convenience constraints (32.3%) were the most commonly reported barriers. Most participants (69.7%) expressed readiness to change at least one behavior. Higher knowledge and older age were independent predictors of readiness to change. Conclusion: Knowledge was positively associated with perceived harm and readiness to change but was not significantly associated with reported plastic-use frequency. The findings identify a discrepancy between knowledge and reported behavior and highlight practical constraints that should be considered alongside educational approaches in future intervention studies.

Keywords

Microplastics, Public Awareness, Plastic-Use Behavior, Knowledge-Behavior Gap, Saudi Arabia, Health Education

1. Introduction

Plastic production has increased substantially over recent decades, contributing to persistent plastic waste in the environment [1]. Microplastics (MPs) are commonly defined as plastic particles smaller than 5 mm [2]. Environmental weathering and degradation can progressively fragment larger plastic materials into smaller particles [3], and biodegradable plastics may also generate microplastic particles under natural environmental conditions [4]. MPs have been reported in air and street dust [5] and in marine surface waters [6]. Human exposure occurs mainly through ingestion of contaminated food and water and inhalation of airborne particles. One exposure assessment estimated that humans may ingest approximately 0.1 - 5 g of microplastics per week through various exposure pathways, while emphasizing substantial uncertainty in current exposure estimates [7]. Microplastics have been detected in multiple human organs and biological samples across several organ systems [8]. Individual human studies have also demonstrated their presence in testicular tissue and semen [9]. These findings have raised concern regarding possible health effects of chronic MP exposure, although long-term effects in humans remain incompletely understood [8]. Public knowledge and willingness to reduce plastic exposure have received increasing attention [10] [11], but community-level evidence on how knowledge relates to everyday plastic-use behaviors and readiness to change remains limited. This gap is particularly relevant in Saudi Arabia, where daily use of bottled water, food packaging, and other single-use plastic products is common. Evidence specifically examining the relationship between MP knowledge, reported plastic-use behaviors, perceived harm, barriers, and readiness to change in Saudi adults remains limited. This study therefore addressed four questions: 1) What is the level of public knowledge about microplastics among adults in Saudi Arabia? 2) What are the most prevalent plastic-use behaviors relevant to potential MP exposure? 3) What is the relationship between MP knowledge, perception of harm, and reported behavioral exposure? and 4) What barriers are reported by participants, and what factors are associated with readiness to change?

2. Methods

2.1. Study Design and Setting

A cross-sectional descriptive study was conducted between March 9 and April 3, 2026. The survey targeted adults from the five administrative regions of Saudi Arabia (Central, Western, Eastern, Northern, and Southern), with a small number of respondents reporting residence outside the Kingdom.

2.2. Sampling and Participants

A non-probability convenience sampling approach was used. Eligible participants were adults aged 18 years or older who were able to read and understand Arabic. Individuals younger than 18 years or unable to read Arabic were excluded. A total of 300 responses were retained for analysis. No formal a priori sample-size calculation was conducted. The achieved sample size was comparable with sample sizes used in related awareness surveys [12] [13].

2.3. Questionnaire Development and Distribution

The 34-item questionnaire comprised eight sections covering demographic characteristics, basic knowledge of microplastics, characteristics of paper and plastic products, awareness of potential health harms, plastic-use behaviors, perception of harm and readiness to change, information sources and trust, and applied behavioral scenarios. Before full distribution, the questionnaire was piloted with approximately 10 adults to assess clarity, readability, and completion time, and minor wording refinements were made. The final questionnaire was administered through Google Forms and distributed through social media platforms. Participation was voluntary and responses were anonymous.

2.4. Outcome Measures and Score Calculation

Three composite scores were computed. The knowledge score was based on 10 items (questions 7 - 16) with correct/incorrect coding and was expressed as the percentage of correct responses; scores were categorized as high (≥75%), moderate (50% - 74%), or low (<50%). The behavioral exposure score was the mean of eight items (questions 17 - 24) rated on a 5-point Likert scale from 1 (Never) to 5 (Always). The perception score was the mean of four items (questions 25 - 28) rated from 1 (Do not agree) to 5 (Strongly agree).

2.5. Questionnaire Review and Reliability

Questionnaire content and wording were reviewed by the research team and supervising faculty for relevance and clarity before distribution. Internal consistency was assessed using the Kuder-Richardson coefficient (KR-20) for the dichotomous knowledge scale and Cronbach's alpha for the behavioral exposure and perception scales. The coefficients were 0.754, 0.726, and 0.710, respectively.

2.6. Ethical Considerations

Participation was voluntary and anonymous. No personal identifiers, biological samples, clinical procedures, or sensitive personal information were collected. Electronic informed consent was obtained from all participants before participation. Data were collected through an anonymous online questionnaire and used solely for research purposes. In accordance with applicable local regulations for anonymous survey research, National Committee of Bioethics (NCBE), Kingdom of Saudi Arabia, Version 3, 2025, formal ethical approval and written informed

consent were not required.

2.7. Statistical Analysis

Analyses were performed using IBM SPSS, with statistical significance set at $p < 0.05$. Normality was assessed using the Shapiro-Wilk test, skewness, and kurtosis. Descriptive statistics included frequencies, percentages, means, standard deviations, medians, and interquartile ranges. Spearman's rank correlation was used to examine associations among knowledge, behavioral exposure, and perception scores. Mann-Whitney U and Kruskal-Wallis tests were used for group comparisons, with epsilon-squared effect sizes and Bonferroni-corrected post-hoc comparisons where applicable. Chi-square tests with Cramer's V were used for categorical associations. When small expected cell counts affected the assumptions of Pearson's chi-square test, Monte Carlo inference was used to estimate statistical significance. For adjusted binary logistic regression, readiness to change was dichotomized as Yes = 1 and No/Not sure = 0. Predictors were knowledge score entered per 10-point increase, behavioral exposure mean, perception mean, gender, age category, and education category. Gender was coded as male = 0 and female = 1. Age and education were entered as ordinal trend variables according to ascending categories; their odds ratios therefore represent the change in odds associated with a one-category increase rather than comparison with a single reference category. This coding was selected to estimate ordered trends while limiting model parameters. Adjusted odds ratios (ORs) with 95% confidence intervals were reported.

3. Results

3.1. Participant Characteristics

Table 1 presents the demographic characteristics of the participants (N = 300). Females constituted 68.3% of the sample, while males represented 31.7%. Participants were distributed across different age groups, with the largest proportion aged 18 - 24 years (28.7%). Most participants resided in the Western (48.7%) and Central (40.0%) regions of Saudi Arabia. Regarding educational attainment, 56.7% held a bachelor's degree, whereas 14.0% held a master's degree and 3.7% held a doctorate degree.

Table 1. General characteristics of participants (N = 300).

Variable	Category	n	%
Gender	Male	95	31.7%
	Female	205	68.3%
Age group	18 - 24 years	86	28.7%
	25 - 34 years	71	23.7%
	35 - 44 years	31	10.3%

Continued

	45 - 54 years	55	18.3%
	55 years or older	57	19.0%
Region	Central	120	40.0%
	Eastern	13	4.3%
	Western	146	48.7%
	Northern	7	2.3%
	Southern	10	3.3%
	Outside Saudi Arabia	4	1.3%
Education level	Secondary or below	47	15.7%
	Diploma	30	10.0%
	Bachelor's degree	170	56.7%
	Master's degree	42	14.0%
	Doctorate	11	3.7%
Occupation/field	Student	63	21.0%
	Education	80	26.7%
	Administrative	30	10.0%
	Private sector	25	8.3%
	Health	21	7.0%
	Non-health scientific	39	13.0%
	Other	42	14.0%

3.2. Overall Knowledge, Behavioral Exposure, and Perceived Harm

Overall, findings from Tables 2-6 indicate a moderate level of knowledge (65.47% ± 24.85%), a behavioral exposure score of 3.00 ± 0.69, and a perception score of 3.56 ± 0.91. Knowledge was positively associated with perceived harm (rho = 0.416, $p < 0.001$), whereas no significant association was observed between knowledge and behavioral exposure. Higher knowledge scores and older age were associated with greater readiness to change.

3.3. Knowledge about Microplastics

Table 2 summarizes participants' knowledge regarding microplastics and the overall knowledge score. The highest correct-response rates were observed for the risks of leaving plastic bottles exposed to heat (90.3%) and heating food inside plastic containers (87.0%). In contrast, the lowest correct-response rates were observed for awareness of microplastics in human tissues (39.3%) and the presence of microplastics in some drinking water sources (45.7%). The overall mean knowledge score was 65.47% ± 24.85%, and 41.0% of participants were classified

Table 2. Knowledge about microplastics and overall knowledge level (N = 300).

Section	Item/measure	n/Correct n	%/Summary value	Notes
Knowledge item	Definition of microplastics	191	63.7%	Incorrect/don't know: 109 (36.3%); Missing: 0
	Common route of entry into the body	209	69.7%	Incorrect/don't know: 91 (30.3%); Missing: 0
	Detection in human tissues	118	39.3%	Incorrect/don't know: 182 (60.7%); Missing: 0
	Inner lining in paper cups for hot drinks	173	57.7%	Incorrect/don't know: 127 (42.3%); Missing: 0
	Type of take-away food boxes	199	66.3%	Incorrect/don't know: 101 (33.7%); Missing: 0
	Material of ready-made coffee cup lids	249	83.0%	Incorrect/don't know: 51 (17.0%); Missing: 0
	Single-use cutlery as a potential exposure source	157	52.3%	Incorrect/don't know: 143 (47.7%); Missing: 0
	Risk of heating food inside plastic	261	87.0%	Incorrect/don't know: 39 (13.0%); Missing: 0
	Risk of leaving plastic bottles in heat	270	90.3%	Incorrect/don't know: 29 (9.7%); Missing: 1
	Presence of microplastics in some drinking water	137	45.7%	Incorrect/don't know: 163 (54.3%); Missing: 0
Composite score	Knowledge score (%)	300	Mean = 65.47; SD = 24.85	Median = 70; Q1 - Q3 = 50 - 80; Min-Max = 0 - 100
Knowledge level	High knowledge level	123	41.0%	High = 75% or above
	Moderate knowledge level	116	38.7%	Moderate = 50% to <75%
	Low knowledge level	61	20.3%	Low ≤ 50%

as having a high level of knowledge.

3.4. Behavioral Exposure and Perceived Harm

Table 3 presents the distribution of behavioral exposure and perceived harm scores. Daily bottled water consumption had the highest behavioral exposure mean (3.76 ± 1.22), followed by drinking hot beverages in paper cups (3.44 ± 1.23) and the use of single-use cutlery (3.40 ± 1.15). Heating food inside plastic containers had the lowest behavioral exposure mean (1.95 ± 1.16). Regarding perceived harm, participants showed the strongest agreement with the statement that microplastics are a health issue (3.81 ± 1.33), whereas the statement regarding potential effects on male reproductive health had the lowest mean score and the highest proportion of neutral responses.

3.5. Information Sources, Barriers, and Readiness to Change

Table 4 summarizes information sources, trusted sources, barriers, readiness to change, and intended behavioral changes. Social media platforms were the most common source of information about microplastics (40.7%), followed by participants who had not previously heard of microplastics (21.3%). Figure 1 illustrates the distribution of participants according to their primary information sources.

Table 3. Behavioral exposure and perceived harm scores (N = 300).

Domain	Item/score	Response distribution/summary	Mean ± SD
Behavioral exposure	Drinking hot beverages in a paper cup	Never 25 (8.3%); Rarely 41 (13.7%); Sometimes 84 (28.0%); Often 76 (25.3%); Always 74 (24.7%)	3.44 ± 1.23
	Using a plastic lid with a hot drink	Never 40 (13.3%); Rarely 54 (18.0%); Sometimes 85 (28.3%); Often 70 (23.3%); Always 51 (17.0%)	3.13 ± 1.27
	Using single-use cutlery	Never 17 (5.7%); Rarely 45 (15.0%); Sometimes 105 (35.0%); Often 66 (22.0%); Always 67 (22.3%)	3.40 ± 1.15
	Receiving food in a plastic box	Never 23 (7.7%); Rarely 39 (13.0%); Sometimes 103 (34.3%); Often 76 (25.3%); Always 59 (19.7%)	3.36 ± 1.16
	Heating food inside plastic	Never 155 (51.7%); Rarely 48 (16.0%); Sometimes 68 (22.7%); Often 16 (5.3%); Always 13 (4.3%)	1.95 ± 1.16
	Drinking bottled water daily	Never 15 (5.0%); Rarely 36 (12.0%); Sometimes 68 (22.7%); Often 68 (22.7%); Always 113 (37.7%)	3.76 ± 1.22
	Ordering food delivery more than once weekly	Never 35 (11.7%); Rarely 106 (35.3%); Sometimes 93 (31.0%); Often 37 (12.3%); Always 29 (9.7%)	2.73 ± 1.12
	Drinking tea/coffee in a plastic cup	Never 98 (32.7%); Rarely 80 (26.7%); Sometimes 86 (28.7%); Often 17 (5.7%); Always 19 (6.3%)	2.26 ± 1.16
Behavioral score	Overall behavioral exposure mean	Median = 3.00; Q1 - Q3 = 2.50 - 3.50; Min-Max = 1.12 - 4.75	3.00 ± 0.69
Perceived harm	Microplastics are a health issue	Do not agree 25 (8.3%); Neutral 41 (13.7%); Slightly agree 25 (8.3%); Agree 83 (27.7%); Strongly agree 126 (42.0%)	3.81 ± 1.33
	High single-use plastic consumption increases exposure	Do not agree 15 (5.0%); Neutral 59 (19.7%); Slightly agree 25 (8.3%); Agree 115 (38.3%); Strongly agree 86 (28.7%)	3.66 ± 1.22
	Reducing single-use plastic reduces exposure	Do not agree 11 (3.7%); Neutral 50 (16.7%); Slightly agree 23 (7.7%); Agree 128 (42.7%); Strongly agree 88 (29.3%)	3.77 ± 1.15
	Microplastics may affect male reproductive health	Do not agree 19 (6.3%); Neutral 137 (45.7%); Slightly agree 18 (6.0%); Agree 75 (25.0%); Strongly agree 51 (17.0%)	3.01 ± 1.28
Perception score	Overall perception mean	Median = 3.50; Q1 - Q3 = 2.75 - 4.25; Min-Max = 1.25 - 5.00	3.56 ± 0.91

Table 4. Information sources, barriers, readiness to change, and intended behavior change.

Domain	Category	n	%	Valid n
Primary information source	Had not heard about it before	64	21.3%	300
	Social media platforms	122	40.7%	300
	News	35	11.7%	300
	Official health body	23	7.7%	300
	University or lecture	31	10.3%	300
	Scientific paper	18	6.0%	300
	Doctor or specialist	7	2.3%	300

Continued

Most trusted source	I do not trust any source	9	3.0%	300
	Social media platforms	12	4.0%	300
	Official health bodies	204	68.0%	300
	Universities	11	3.7%	300
	Researchers	45	15.0%	300
	Doctors	19	6.3%	300
Main barrier	I do not see a problem	16	5.3%	300
	Habit	45	15.0%	300
	Time and convenience	97	32.3%	300
	Price	24	8.0%	300
	Lack of alternatives	104	34.7%	300
	Other	14	4.7%	300
Readiness to change	No	20	6.7%	300
	Yes	209	69.7%	300
	Not sure	71	23.7%	300
Intended behavior change	Use a reusable water bottle	32	15.5%	206
	Avoid heating food inside plastic	63	30.6%	206
	Reduce single-use cutlery	31	15.0%	206
	Use a personal cup at cafes	35	17.0%	206
	Choose glass or stainless-steel containers	45	21.8%	206

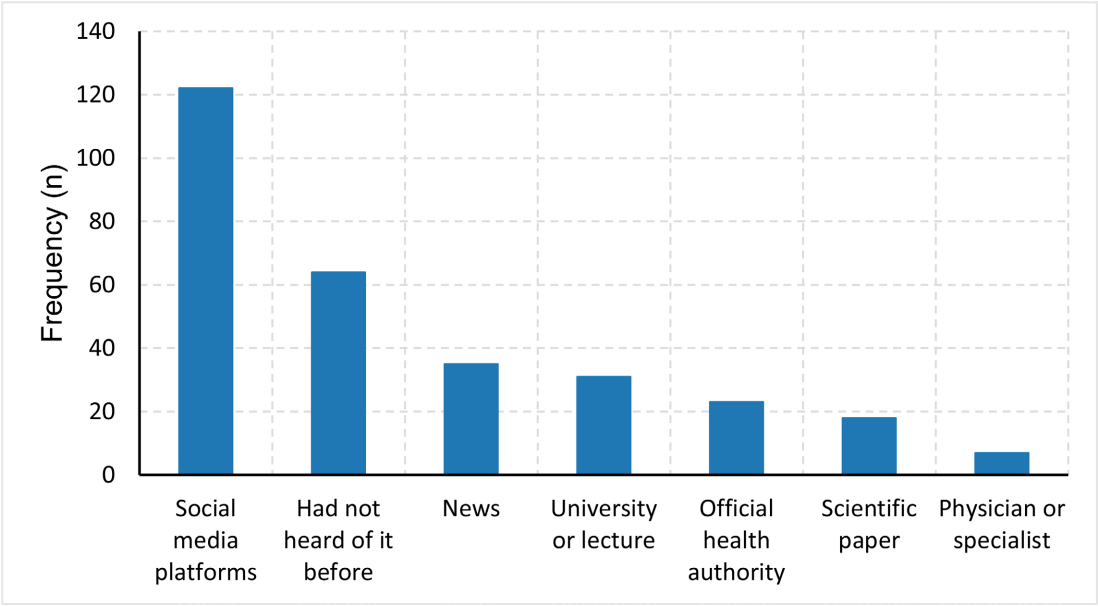


Figure 1. Distribution of main information sources about microplastics (N = 300).

Official health bodies were identified as the most trusted source of information (68.0%). The most frequently reported barriers to reducing plastic use were lack of alternatives (34.7%) and time or convenience constraints (32.3%). Most participants reported readiness to change at least one plastic-related behavior during the following month (69.7%), as illustrated in Figure 2.

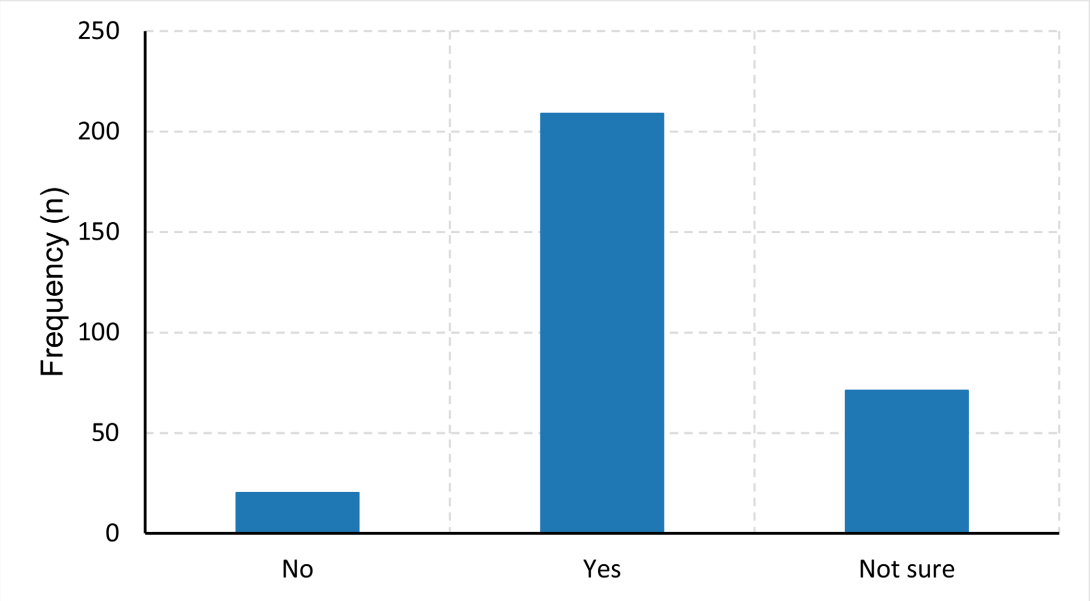


Figure 2. Distribution of readiness to reduce plastic use (N = 300).

Among participants willing to change their behavior, avoiding heating food inside plastic containers was the most frequently selected intended behavior change (30.6%), followed by choosing glass or stainless-steel containers (21.8%).

3.6. Reliability, Normality, and Correlation Analysis

Table 5 presents the reliability, normality, and correlation analyses. Internal consistency was acceptable for the knowledge scale (KR-20 = 0.754), behavioral exposure scale (Cronbach's alpha = 0.726), and perception scale (Cronbach's alpha = 0.710). Shapiro-Wilk testing indicated significant non-normality for knowledge and perception scores, whereas behavioral exposure scores did not significantly deviate from normality.

Spearman correlation analysis revealed a moderate positive association between knowledge and perception (rho = 0.416, $p < 0.001$). No significant associations were observed between behavioral exposure and knowledge (rho = 0.020, $p = 0.730$) or between behavioral exposure and perception (rho = 0.031, $p = 0.591$).

3.7. Inferential Analysis and Predictors of Readiness to Change

Table 6 summarizes the inferential analyses and predictors of readiness to change. Knowledge scores differed significantly across readiness categories ($p < 0.001$), as did perception scores ($p = 0.003$), whereas behavioral exposure scores did not

Table 5. Reliability, normality, and correlations between core scores.

Analysis area	Measure/relationship	Test	N	Result	p-value	Interpretation
Reliability	Knowledge (q7-q16)	KR-20	299	0.754	-	Acceptable internal consistency
	Behavioral exposure (q17-q24)	Cronbach's alpha	300	0.726	-	Acceptable internal consistency
	Perception/agreement (q25-q28)	Cronbach's alpha	300	0.710	-	Acceptable internal consistency
Normality	Knowledge score (%)	Shapiro-Wilk	300	W = 0.934; Skewness = −0.700; Kurtosis = −0.133	<0.001	Non-normal distribution
	Behavioral exposure mean	Shapiro-Wilk	300	W = 0.992; Skewness = −0.085; Kurtosis = −0.383	0.106	No significant departure from normality
	Perception mean	Shapiro-Wilk	300	W = 0.961; Skewness = −0.216; Kurtosis = -0.839	<0.001	Non-normal distribution
Correlation	Knowledge score (%) with behavioral exposure mean	Spearman's rho	300	rho = 0.020	0.730	Not significant
	Knowledge score (%) with perception mean	Spearman's rho	300	rho = 0.416	<0.001	Moderate positive correlation
	Perception mean with behavioral exposure mean	Spearman's rho	300	rho = 0.031	0.591	Not significant

Table 6. Inferential analysis and predictors of readiness to change.

Analysis block	Outcome/relationship	Test/predictor	Statistic/OR (95% CI)	p-value	Effect size/interpretation
Readiness comparison	Knowledge score by readiness category	Kruskal-Wallis	H = 18.603	<0.001	epsilon-squared = 0.056; medians: Yes 70%, Unsure 60%, No 40%
	Behavioral exposure by readiness category	Kruskal-Wallis	H = 3.539	0.170	epsilon-squared = 0.005; not significant
	Perception mean by readiness category	Kruskal-Wallis	H = 11.795	0.003	epsilon-squared = 0.033; medians: Yes 3.75, Unsure 3.50, No 3.25
Significant demographic difference	Knowledge score by gender	Mann-Whitney U	U = 8231.5	0.030	Effect size = 0.124; females 67.85% vs males 60.32%
	Behavioral exposure by age group	Kruskal-Wallis	H = 16.136	0.003	Effect size = 0.041; 55+ median 2.75, lower than 45 - 54 and 35 - 44
Categorical association	Readiness to change with main barrier	Chi-square	chi-square = 21.378; df = 10	Monte Carlo p = 0.020	Cramer's V = 0.189
	Readiness to change with knowledge level	Chi-square	chi-square = 26.041; df = 4	<0.001	Cramer's V = 0.208

Continued

	Readiness to change with perception level	Chi-square	chi-square = 7.488; df = 4	0.112	Cramer's V = 0.112; not significant
Logistic regression	Knowledge score per 10-point increase	Adjusted binary logistic regression	OR = 1.323; 95% CI: 1.166 - 1.500	<0.001	Significant predictor of readiness
	Behavioral exposure mean	Adjusted binary logistic regression	OR = 0.861; 95% CI: 0.578 - 1.281	0.460	Not significant
	Perception mean	Adjusted binary logistic regression	OR = 1.184; 95% CI: 0.859 - 1.632	0.304	Not significant
	Gender	Adjusted binary logistic regression	OR = 0.978; 95% CI: 0.509 - 1.877	0.946	Not significant
	Age category	Adjusted binary logistic regression	OR = 1.646; 95% CI: 1.330 - 2.037	<0.001	Significant predictor of readiness
	Education category	Adjusted binary logistic regression	OR = 1.076; 95% CI: 0.816 - 1.421	0.603	Not significant

differ significantly between readiness groups (p = 0.170).

Knowledge scores were significantly higher among females than males (67.85% vs. 60.32%; U = 8231.5, p = 0.030), while behavioral exposure differed significantly across age groups (p = 0.003). Readiness to change was significantly associated with knowledge level (p < 0.001). The association between readiness and the main reported barrier remained significant using Monte Carlo inference (chi-square = 21.378, df = 10, Monte Carlo p = 0.020, Cramer's V = 0.189).

Figure 3 illustrates the relationship between readiness to reduce plastic use and the main reported barriers. High levels of readiness were observed even among participants who reported lack of alternatives or time and convenience as barriers.

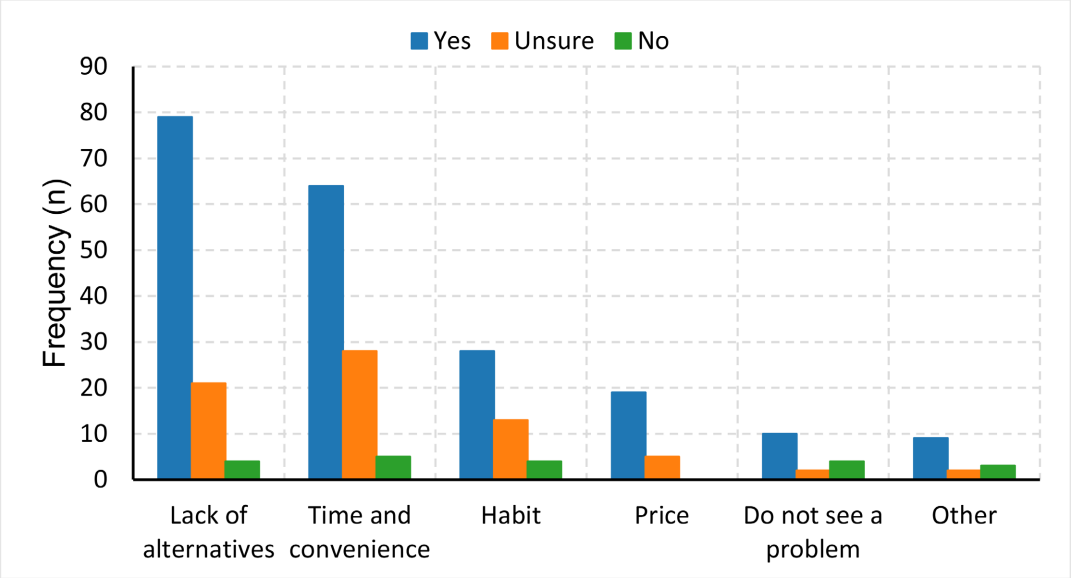


Figure 3. Readiness to reduce plastic use by main barrier to reducing plastic use (N = 300).

In the adjusted logistic regression model, higher knowledge and older age were independently associated with readiness to change. Each 10-point increase in knowledge score was associated with higher odds of readiness to change (OR = 1.323, 95% CI: 1.166 - 1.500, $p < 0.001$). Each one-category increase in age was also associated with higher odds of readiness to change (OR = 1.646, 95% CI: 1.330 - 2.037, $p < 0.001$). Behavioral exposure, perception score, gender, and education were not significant independent predictors.

4. Discussion

This study examined public knowledge of microplastics, reported plastic-use behaviors, perception of harm, and readiness to change among adults in Saudi Arabia. Three principal findings emerged. First, participants demonstrated a moderate level of knowledge. Second, knowledge was positively associated with perception of harm but was not significantly associated with reported behavioral exposure. Third, higher knowledge and older age were independently associated with readiness to change. The mean knowledge score of 65.47% is broadly consistent with moderate levels of awareness reported in other survey populations [12] [13]. Important knowledge gaps remained, particularly regarding the presence of microplastics in human tissues (39.3%) and drinking water sources (45.7%). Public understanding of microplastics has also been reported to vary across environmental and health-related domains [11]. Female participants had higher knowledge scores than males (67.85% vs. 60.32%, $p = 0.030$), although the effect was small. The present study was not designed to determine the reasons for this difference. Sociodemographic variation in plastic-related awareness and practices has been reported in other populations, but the direction and magnitude of these associations vary across studies [13] [14].

An important finding was the absence of a significant association between knowledge and reported behavioral exposure (rho = 0.020, $p = 0.730$). In contrast, knowledge showed a moderate positive association with perception of harm (rho = 0.416, $p < 0.001$). Thus, greater knowledge in this sample was associated with stronger perception of harm but not with lower reported frequency of exposure-related plastic-use behaviors. This pattern is compatible with a knowledge-behavior discrepancy, but the cross-sectional design does not establish that knowledge failed to cause behavioral change. Structural and practical factors are possible explanations. The Health Belief Model identifies perceived barriers as one factor relevant to health-related behavior [15], while the Theory of Planned Behavior includes perceived behavioral control among determinants of behavioral intention and action [16]. Lack of alternatives (34.7%) and time or convenience constraints (32.3%) were the most frequently reported barriers in this study. These findings are compatible with those theoretical frameworks, but the causal role of the reported barriers cannot be established from the present data.

Bottled water consumption was the most frequently reported exposure-related behavior. This finding is relevant to evidence documenting nano- and microplas-

tics in single-use plastic water bottles [17]. Heating food in plastic containers was the least frequently reported behavior and was the most commonly selected intended behavior change. Experimental evidence has shown migration of phthalates from plastic food containers into food simulants during microwave heating, with migration increasing under some heating and repeated-use conditions [18]. This evidence concerns chemical migration rather than microplastic exposure itself and should therefore be interpreted separately.

The study also identified a contrast between information exposure and trust. Social media was the most common source of information about microplastics, whereas official health bodies were the most trusted source. This contrast suggests a potential communication gap that warrants further study rather than demonstrating ineffective institutional communication. In addition, 21.3% of participants reported that they had not previously heard of microplastics. Future public communication may therefore benefit from accessible information delivered through trusted sources. Overall, the findings indicate moderate but incomplete knowledge, a positive association between knowledge and perceived harm, and substantial readiness to change despite continued plastic-use behaviors. Future intervention studies should examine whether educational approaches combined with practical changes in access to alternatives produce measurable changes in behavior.

Study Limitations

This study has several limitations that should be considered when interpreting the findings. First, the use of a convenience sample recruited through social media platforms may limit the representativeness of the sample, as individuals with greater digital literacy or interest in environmental and health topics may have been more likely to participate. Second, females constituted a larger proportion of the sample (68.3%), which may limit the generalizability of the findings to the wider Saudi population. Third, all measures were self-reported and therefore subject to recall bias and social desirability bias, potentially leading participants to overestimate their knowledge or underestimate exposure-related behaviors. Fourth, the cross-sectional design does not permit causal inference, preventing conclusions regarding whether knowledge directly influences readiness to change or whether other unmeasured variables contribute to this relationship. Fifth, data collection was conducted over a relatively short period, which may not fully capture temporal variations in public awareness or behavioral patterns. Finally, the study relied on self-reported behavioral indicators as proxies for microplastic exposure and did not include objective biological or environmental measurements of exposure.

5. Conclusions

This study found a moderate level of knowledge about microplastics among surveyed adults. Knowledge was positively associated with perception of harm and

independently associated with readiness to change, but it was not significantly associated with lower reported behavioral exposure. These findings indicate a discrepancy between knowledge and reported plastic-use behavior in this sample.

Higher knowledge and older age were independently associated with readiness to change. Lack of alternatives and time or convenience were the most commonly reported barriers. These barriers provide possible explanations for the observed pattern, but their causal influence cannot be determined from the cross-sectional data.

The contrast between social media as the most common information source and official health bodies as the most trusted source identifies an opportunity for future public-health communication. Educational approaches should be evaluated together with practical strategies that improve access to feasible alternatives.

Future longitudinal and intervention studies should test whether changes in information, access to alternatives, or other practical conditions lead to measurable changes in plastic-use behavior and objective indicators of exposure.

Author Contributions

Conceptualization, N.A.-S.; Methodology, N.A.-S.; Questionnaire development, N.A.-S.; Data collection, S.S. and N.A.; Data curation, S.S. and N.A.; Formal analysis, N.A.-S., S.S. and N.A.; Validation, N.A.-S.; Interpretation of results, N.A.-S.; Writing—original draft, N.A.-S.; Writing—review and editing, N.A.-S.; Visualization, N.A.-S.; Supervision, N.A.-S.; Project administration, N.A.-S. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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