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Knowledge and Attitude Regarding Hazards of Plastic Use among Secondary School Students in Gaindakot-5, Nawalparasi

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ABSTRACT

Background

The chemical composition of plastics, such as bisphenol A (BPA) and phthalates, can leach into the environment, contaminate food and water sources, potentially disrupting hormonal balance and causing adverse health effects in humans. The study to assess the knowledge and attitude regarding hazards of plastic use among secondary school students in Janak higher secondary school.

Methods

An analytical cross-sectional study was conducted among 189 students using a self-administered questionnaire. Data were analyzed using SPSS (version 18.0), and the Chi-square test were used to find associations between socio demographic variable, level knowledge and attitude.

Results

Study result shows that majority (81%) of the respondents demonstrated average knowledge regarding the hazards of plastic use. Attitude towards plastic were mostly with significant differences in knowledge and attitude based on demographic factors like education level and gender.

Conclusions

Respondents had varied level of understanding regarding the hazards of plastic use, with a significant proportion demonstrating awareness of key issues such as plastic's non-biodegradability and its environmental consequences. Most students had negative attitude towards plastic use, expressing concerns about its health and environments effects. Most students had negative attitudes towards plastic use, expressing concerns about its health and environmental effects.

Keywords: attitude; hazards of plastic use; knowledge; secondary level students.

INTRODUCTION

Plastic pollution has become a worldwide concern, leading to its effects on living organisms. Research indicates that the extensive use of plastic triggers life-threatening physiological alterations in organisms and threatens ecosystem.[1-4] If recycling efforts and control mechanisms failed, researchers predict that by 2050, the world will be burdened with approximately 13 billion tons of plastic waste.[5] Khanam N. conducted a cross-sectional study in Wardha city of Western India, showed that 88.42% of students had knowledge that plastic waste causes health hazards, and furthermore, 74.74% had knowledge that storing hot food items in plastics is injurious to health. However, more than half (66.32%) said that plastics are not recyclable.[6] Adolescence is a critical phase in life, where young individuals actively explore and gain knowledge from their surroundings, applying what they learn and they develop into future adults and also responsible to safeguard the beauty of the environment.

METHODS

An analytical cross-sectional study was conducted among 189 students of Janak Higher Secondary school, Gindakot-5. Structured questionnaire was distributed among students of grade 9 and 10.

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Questionnaires were used to assess of knowledge and level of attitude regarding hazards of plastic use among secondary school students of Gaindakot-5, Nawalparasi. Non probability sampling technique (Convenient sampling) was used. Ethical approval was taken from Institutional Review Committee of College of Medical Sciences (Ref No. COMSTH-IRC/2024-036). Collected data was check for completeness and then coded with numbering. Then data was entered in Excel and data was analyzed by using SPSS 18. Data was analyzed by using descriptive and inferential statistical tools. In the descriptive statistics for categorical variable frequency and percentage were calculated. In the inferential statistics to find the association between dependent variable (level of knowledge and awareness) and independent variables. p-value less than 0.05 were considered as statistically significant.

RESULTS

Table 1 depicts socio-demographic characteristics of the respondents. It shows that majority (65.1%) of the respondents were 13-15 years age group, while 34.9% were 11-13 age group. In terms of gender, 55.6% were females and the rest 44.4% were male. Regarding level of education, 52.4% were in 9th grade, and 47.6% were in 10th grade. When examining the educational status of father, largest group has completed higher secondary level education (33.3%), followed by secondary education (30.7%), 15.3% had basic education (1-8 class), 11.1% had undergraduate and above, 6.9% had can read and write and the rest 2.6% of the respondents had no formal education. Similarly, mothers' educational status shows a considerable percentage with secondary education (33.9%) and higher secondary education (29.1%) whereas, 13.8% had basic education, 9.5% had undergraduate and above education, 7.9% had can read and write and the rest 5.8% had no formal education. Concerning source of information about plastic hazards, majority of the respondents rely on school teachers and the curriculum (57.7%), followed by mass media and social media (54.0%). Television and radio contribute to the awareness of 24.9%, while parents and friends account for 19.6%. Magazines and newspapers were the least common source of information, cited by 14.8% of the respondents. It is noteworthy that a small portion (9.5%) of the students reported having no information about plastic hazards. Overall, the data provides a comprehensive snapshot of the socio-demographic characteristics and sources of information among the respondents, which is crucial for understanding the context of their knowledge and attitude towards plastic use hazard.

Table 1. Socio-demographic characteristics of the respondents. (n=189)

Variables	Frequency (%)
Age	
11-13 years	66 (34.9)
13-15 years	123(65.1)
Sex	
Male	84(44.4)
Female	105(55.6)
Level of education	
9th standard	99(52.4)
10th standard	90(47.6)
Father's educational status	
No formal education	5(2.6)
Can read and write only	13(6.9)
Basic education (class_1-8)	29(15.3)
Secondary education (class 9-10)	58(30.7)
Higher secondary (class 11-12)	63(33.3)
Undergraduate and above	21(11.1)
Mother's educational status	
No formal education	11(5.8)
Can read and write only	15(7.9)
Basic education (class 1-8)	26(13.8)
Secondary education (class 9-10)	64(33.9)
Higher secondary (class 11-12)	55(29.1)
Undergraduate and above	18(9.5)
Source of information about plastic hazards (multiple response)	
No information	18(9.5)
School teachers/ Curriculum	109(57.7)
Television/ Radio	47(24.9)
Parents/ Friends	37(19.6)
Magazines/ Newspapers	28(14.8)
Mass media/ social media	102(54.0)

Table 2 outlines knowledge of secondary level school students regarding the hazards of plastic use. It shows that most of the respondents correctly identified that plastic is the non-biodegradable substance (95.2%). They are also awareness of the impact of improperly

disposed plastic waste on soil health is relatively high, with 84.1% recognizing earthworm infertility as a consequence. They said meaning of plastic as a synthetic material made from a wide range of organic polymers (83.6%) and the basic component of common plastic was identified by 82% as polyvinyl chloride. Table further shows a significant majority of the respondents had knowledge regarding proper disposal method of plastic as recycling (76.2%), plastic waste never fully goes away, it just breaks into little pieces when left in the environment (70.4%) and allergic asthma as the ill effect of burning plastic on the human body (63.5%). Whereas, poor knowledge was observed in method the plastic chemical enters the human body (inhalation and ingestion reported by 41.3%), gases produced by burning plastic (dioxin reported by 42.3%) and least recyclable item (cigarette butts reported by 39.7%). And very poor knowledge was observed in plastic most dangerous to health (polypropylene reported by 21.7%) and way to minimize contact of plastic with food items (wrap the food items with leaf or paper reported by 7.4%).

Table 2. Knowledge regarding hazards of plastic use. (n=189)

Variables	Frequency (%)
Meaning of plastic	
A synthetic material made from a wide range of organic polymers	158(83.6)
Basic component of common plastic	
Polyvinyl Chloride	155(82.0)
Non-biodegradable substance	
Plastic	180(95.2)
Plastic most dangerous to health	
Polypropylene	41(21.7)
What happens to plastic waste when left in the environment	
It never fully goes away; it just breaks into little pieces.	133(70.4)
Method by which the plastic chemical enters the human body	
Inhalation and ingestion	78(41.3)
Gases produced by burning plastic	
Dioxin	80(42.3)
Ill effect of burning plastic on the human body	
Allergic asthma	120(63.5)
Impact on soil impact on soil if plastic waste is improperly disposed	
Earthworm infertility in soil	159(84.1)
Least recyclable item	
Cigarette butts	75(39.7)
Proper disposal method of plastic	
Recycling	144(76.2)
Way to minimize contact of plastic with food items	
Use alternatives to alternatives to use_wrap the food items -such as leaf or paper	14(7.4)

Table 3-Level of knowledge regarding hazards of plastic use.

Level of knowledge	Frequency (%)
Poor	14(7.4)
Average	153(81.0)
Good	22(11.6)

Table 3 presents respondent's level of knowledge regarding hazards of plastic use. It indicates that most (81%) of the respondents had average knowledge, indicating a moderate understanding of the subject. Meanwhile, 11.6% exhibit a good level of knowledge, suggesting a more comprehensive grasp of the hazards associated with plastic. On the other hand, 7.4% had poor knowledge, signifying a segment of the population that may benefit from targeted educational interventions to enhance their awareness and understanding of the topic.

Table 4 presents association of respondent's level of knowledge with selected variables. It shows that level of knowledge is statistically significant with level of education (χ^2= 26.114, p-value <0.001) and not significant with age group (χ^2 = 4.184, p= 0.123), gender (χ^2 = 4.878, p= 0.087), father's educational status (χ^2= 7.154, p= 0.711) and mother's educational status (χ^2= 16.205, p-value= 0.094).

Table 5 illustrates the attitude of respondents about the hazards of plastic use. Findings shows that significant majority of the respondents strongly disagreed (57.7%) with the statement that plastic material usage is good for our lives, indicating a prevalent negative attitude towards overall impact of plastic on well-being. Furthermore, a substantial proportion (63.0%) believed that plastic is made from chemicals that harm our health, reinforcing concerns about the health implications associated with plastic

Table 4. Association of respondent's level of knowledge with selected variables.					
Variables	**Poor**	**Average**	**Good**	**Chi-squalue**	**pvalue**
Age in years					
11-13	7(10.61)	55(83.33)	4(6.06)	4.184	0.123
13-15	7(10.61)	98(148.48)	18(27.27)		
Gender					
Male	6(9.09)	73(110.61)	5(7.58)	4.878	0.087
Female	8(12.12)	80(121.21)	17(25.76)		
Level of education					
9th standard	13(19.70)	84(127.27)	2(3.03)	26.114	<0.001
10th standard	1(1.52)	69(104.55)	20(30.30)		
Father's educational status					
No formal education	1(1.52)	4(6.06)	0(0.00)	7.154	0.711**
Can read and write only	1(1.52)	10(15.15)	2(3.03)		
Basic education (class 1-8)	1(1.52)	26(39.39)	2(3.03)		
Secondary education (class 9-10)	5(7.58)	43(65.15)	10(15.15)		
Higher secondary (class 11-12)	5(7.58)	51(77.27)	7(10.61)		
Undergraduate and above	1(1.52)	19(28.79)	1(1.52)		
Mother's educational status					
No formal education	0(0.00)	11(16.67)	0(0.00)	16.205	0.094**
Can read and write	2(3.03)	10(15.15)	3(4.55)		
Basic education (class1-8)	3(4.55)	22(33.33)	1(1.52)		
Secondary education (class 9-10)	4(6.06)	48(72.73)	12(18.18)		
Higher secondary (class11-12)	4(6.06)	45(68.18)	6(9.09)		
Undergraduate and above	1(1.52)	17(25.76)	0(0.00)		

** *Likelihood Ratio*

Table 5. Attitude regarding hazards of plastic use (n=189)					
Statements	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Plastic material usage is good for our lives	1(0.5%)	6(3.2%)	30(15.9%)	43(22.8%)	109(57.7%)
Plastic is made from chemicals that harm our health	119(63.0%)	59(31.2%)	10(5.3%)	1(0.5%)	0(0.0%)
Using low- density plastic is safer for human life	22(11.6%)	63(33.3%)	75(39.7%)	22(11.6%)	7(3.7%)
Plastic materials affect liver and brain	48(25.4%)	82(43.4%)	37(19.6%)	19(10.1%)	3(1.6%)
Plastic toxicity affects the child	93(49.2%)	82(43.4%)	12(6.3%)	1(0.5%)	1(0.5%)
Plastic usage is harmful to environment	131(69.3%)	47(24.9%)	6(3.2%)	2(1.1%)	3(1.6%)
A clean cloth bag is better than a plastic bag	119(63.0%)	57(30.2%)	5(2.6%)	4(2.1%)	4(2.1%)
A plastic container is best for storing food in the refrigerator	7(3.7%)	26(13.8%)	53(28.0%)	62(32.8%)	41(21.7%)
Segregating the plastic and sending it for recycling is good for our environment	95(50.3%)	60(31.7%)	21(11.1%)	11(5.8%)	2(1.1%)
I favor, a ban on plastic bag usage	75(39.7%)	78(41.3%)	27(14.3%)	5(2.6%)	4(2.1%)

use. In terms of safety, a notable percentage (39.7%) agreed that using low-density plastic is safer for human life, while a majority (69.3%) acknowledge that plastic usage is harmful to the environment. This reflects awareness of the dual impact of plastic on both human health and the environment. Interestingly, a significant proportion (63.0%) of the respondents strongly agreed that clean cloth bag is better than plastic bag, indicating positive attitude towards eco-friendly alternatives. However, there is division of

opinion on using plastic containers for storing food in the refrigerator, with 32.8% strongly disagreeing and 28.0% agreeing. Concern the environment, half (50.3%) of the respondents expressed favorable attitude towards segregating p lastic for recycling, highlighting an awareness of waste management practices. Finally, there is considerable support for reducing plastic usage, with 39.7% favoring ban on using plastic bags. Overall, the data underscores a nuanced set of attitudes among the students, with a strong inclination towards recognizing the negative impacts of plastic on health and the environment, as well as an openness to alternative, more sustainable practices.

DISCUSSION

Result shows that out of 189 respondents participated in this study, majority (65.1%) were 13-15 years age group and 34.9% were 11-13 age group. In contrast, Chaudhary et al. (2020) indicated 53% of 13-16 years and 47% of 17-18 years in her study. Regarding gender, 55.6% were females and the rest 44.4% were male. This finding contrast with Chaudhary et al. (2020) Which included 61% of male and 39% of female in his study.[15] Comparing educational status of fathers and mothers, higher secondary education 33.3% of father and 29.1% of mother. The research conducted by Chaudhary et al. (2022) reveals 33.3% of fathers and 29.1% of mothers having completed higher secondary education. Furthermore, the data indicates a substantial percentage of parents with undergraduate and above education in both studies, with 11.1% of fathers and 9.5% of mothers in the present study, and 76% of fathers and 68% of mothers in Chaudhary et al. research. These findings underscore the importance of considering parental education in understanding the educational context and its potential impact on various outcomes.[15] While comparing the sources of information about plastic hazards between the present study and Khanam et al. (2019), research sheds light on the varied channels through which individuals acquire knowledge on this critical issue. In the present study, a significant portion of the respondents (57.7%) attributed their awareness to school teachers and curriculum, highlighting the role of educational system in disseminating information about plastic hazards. This is consistent with the finding of Khanam et al., where an even higher percentage (83.15%) of participants identified school teachers and curriculum as their primary source. Mass media and social media play a substantial role in the present study, with 54% of respondents gaining information through these platforms, a category not explored by Khanam et al. Meanwhile, television and radio, along with parents and friends, also contribute significantly to awareness in both studies, albeit with some variations in percentages.[22]

It is evident that a substantial proportion of participants in the present study exhibit a commendable awareness of the non-biodegradable nature of plastic, aligning closely with findings from similar studies by Chaudhary et al. [15] and Pandirajan et al.[23] Notably, the recognition of plastic's impact on soil health, specifically in terms of earthworm infertility, is pronounced in the study, with 84.1% of respondents acknowledging this consequence. This finding contrasts with the lower awareness reported by Pandirajan et al.[23], highlighting the variability in knowledge levels across different populations. Furthermore, present study indicates a significant awareness of recycling as a proper disposal method for plastic, with 76.2% of participants identifying it. However, the lower percentages have been reported in the finding of Chaudhary et al.[15] suggest a need for targeted educational efforts to enhance understanding and promote sustainable practices in plastic waste management. Analysis of the level of knowledge on hazards of plastic use between the present study and Bhasin et al. (2021) underscores the varying degrees of awareness within different study populations. In the present study, majority of participants demonstrate an average level of knowledge (81.0%), with a notably smaller percentage categorized as having poor (7.4%) or good (11.6%) knowledge. This distribution differs from the findings reported by Bhasin et al. (2021), where a substantial proportion of participants fall into the categories of poor (21.33%) and very poor (3.0%) knowledge. Interestingly, Bhasin et al. reports a higher percentage of participants with good knowledge

(15.67%) compared to our findings. These disparities highlight the importance of considering contextual and demographic factors that may influence the level of awareness regarding the hazards of plastic use.[16]

Present study reveals a predominantly positive orientation towards the hazards of plastic use, with 86.8% of participants holding a positive attitude, 13.2% expressing neutrality, and none of them indicating a negative attitude. This finding contrasts with the results reported by Hamza and Mahmoud (2023), where 80.1% of the participants exhibit a positive attitude, and a significant minority, 19.9%, hold a negative perspective. The notable absence of a negative attitude in the present study suggests a more optimistic outlook among participants, possibly indicating a greater awareness of the environmental impact of plastic use and a willingness to adopt positive practices.[20] Present study shows that level of knowledge regarding the hazards of plastic use is statistically not significant with gender (p=0.087). Similarly, Hamza and Mahmoud[20] reported p-value for the association between gender and level of knowledge as 0.640. These finding collectively suggest that, in both instances, there is no strong evidence to support a significant relationship between gender and the level of knowledge concerning plastic hazards. Findings of the present study reveal statistically significant associations between level of attitude towards the hazards of plastic use and both gender (p=0.001) and level of education (p=0.011). This indicates that respondent's level of attitude differs significantly based on their gender and educational background. In contrast, study conducted by Hamza and Mahmoud [20] reported a significant association with gender (p=0.001) but did not find a significant association with level of education (p=0.972). These comparative results highlight the nuanced nature of factors influencing attitude toward plastic use hazards.

CONCLUSIONS

The majority of participants, predominantly in 13-15 age group, exhibit a balanced gender distribution. The plastic's synthetic nature, its components like Polyvinyl Chloride. The overall attitude toward plastic is predominantly negative. Result shows that knowledge level is significantly associated with education, underscoring the role of education in shaping perceptions. Furthermore, attitude is influenced by gender, level of education, and faculty of study, highlighting the multifaceted nature of factors that shape individual perspectives on plastic hazards.

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