



Survey of Knowledge, Attitude, and Performance of Students at Hamadan University of Medical Sciences Regarding Solid Wastes Recycling

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Abstract

This descriptive, cross-sectional study aimed to assess the correlations between the knowledge, attitude, and performance of the students of Hamadan University of Medical Sciences, Iran, regarding waste recycling in 2020-2021. A questionnaire was used for data collection, and the sample population consisted of 70 male and female students. Data were analyzed using SPSS version 21 by Mann-Whitney and Kruskal-Wallis ($\alpha=0.05$). The sample population included 87.1% women and 12.9% men. In total, 22.9% of students received special training to recognize the adverse effects and management of waste while 77.1% of them received no training. In addition, 22.9% of students reported the contraction of infectious diseases in themselves or others around them due to contact with garbage or contaminated equipment. The marital status had a significant difference with the amount of knowledge of the studied students for determining the type of awareness regarding the importance of recycle waste while gender represented no substantial difference in this regard. Based on the results, a positive correlation was observed between attitude and awareness, as well as the performance with knowledge and attitude. Knowledge, attitude, and performance are meaningful predictors of waste management. According to the results, the importance of waste management should be emphasized to student in the community in terms of the current health conditions. It also seems that the influential factors in waste management should be fully identified in interventional programs, and appropriate interventions should be planned and implemented accordingly.

Keywords: Knowledge, Attitude, Performance, Students, Waste Management

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1. Introduction

Waste management is currently among the most complex issues of human life and an essential source of environmental pollutions, challenging policymakers, planners, and implementers across the world (1). A significant cause of this issue is daily human population growth and the increasing rate of waste production. Therefore, the management of exposure to these pollutants becomes more complex every day since it is a human health and environmental hazard (2). Recycling is an essential principle in solid waste management, which refers to the process that separates various wastes and processes some wastes as raw materials for the production of new materials (3). In most cases, the recyclable dry components in municipal waste consist of plastic, paper, cardboard, glass, metals, textiles, and dry bread (4).

Recycling and reuse of solid waste have long been proposed as an economic model considering reducing raw material costs, energy saving, waste reduction, scarcity/depletion of resources, and increased environmental pollutions. Although these approaches diminish the problems in urban services, they could also increase national incomes (5). It is noteworthy that recycling waste materials could remarkably affect waste disposal costs (6). Studies in Denmark show that the recycling of paper and cardboard is the most viable option environmentally compared to burying/burning due to the reduced emission of air pollutants (7). The most prominent advantages of waste recycling management are less waste generation, optimization of proper waste collection and disposal, attention to recycling, health education and raising the understanding of different groups of students, attention

to resources and production, along with the awareness of the composition and rate of waste production, and laying the basis of proper solid waste management.

According to the literature, the type of generated wastes in urban areas is directly correlated with the activity system of production facilities and lifestyle (8). Studies indicate that pro-environmental attitudes, awareness of recycling, adequate home space, and distance from residence to recycling sites/disposal bins, social norms, and financial incentives are among the primary influential factors in the recycling behavior of individuals. Furthermore, previous studies have confirmed that women have better recycling behaviors compared to men (9). Involvement in recycling activities has been reported to be higher in individuals with a high income compared to those with a low income (9), as well as in educated individuals compared to those who are illiterate (10) and in the elderly compared to the youth (11).

Some reports indicated that effective policies for waste management could influence household recycling behaviors (12,13). Additionally, developing appropriate waste management policies could contribute to the success of the interventions and programs. Therefore, the adoption of adequate policies should be based on specific programs and strategies, particularly for students who are outside the target organizations. Comprehensive support is an effective strategy for changing organizational policies. Comprehensive support plays a crucial role in developing new rules or providing the required funding for the execution of various programs (14). The statistics regarding the status of waste disposal in Iran demonstrate that the recycling order and landfilling have received insufficient or partial attention, respectively (15). In the first step of performance, the success of material recycling programs depends on cooperation, without which the most essential part of recycling (i.e., separation of materials from the source) utterly represents a failure (16). In their study, Almasi et al evaluated the knowledge and performance of the students in Yazd (Iran) regarding the management of municipal solid waste and reported that the performance of the citizens in terms of waste separation from the source and waste transportation to the collection vehicle was unfavorable. On the other hand, performance in the timely delivery of waste to the Municipality of Yazd was observed to be acceptable. In contrast, the citizens' communication with waste recycling organizations and storage at home before waste delivery was poor. Evidence attests to the average or adequate awareness of the recycling of various waste items such as paper/cardboard, glass, metals, and plastics. However, the reduction of waste production and efficacy of waste disposal methods have been reported to be moderate or poor. Citizens' awareness regarding diseases transmitted through waste and their effects has been found to be acceptable (17). In the study conducted

by Rodrigues et al, the citizens of Gorgan, Gonbad, and Aliabad Katoul (Iran) had adequate knowledge of the environmental effects of waste. Conversely, they had moderate awareness of recycling, approaches for the reduction of waste at home, and waste disposal methods. Moreover, performance in waste segregation at source ranked average in the mentioned study (18). Likewise, Zeng et al focused on investigating public awareness and economic value of the separate collection of rural waste at source in China. The sample population included 518 residents of rural areas. According to the obtained results, some rural households performed waste recycling and food discretion. In the mentioned research, public awareness of the importance of waste segregation was reported to be enhanced through the mass media and more than 50% of students were able to separate their waste. On the other hand, the main obstacles of waste recycling were the inadequate knowledge of recycling and the lack of recycling facilities (19). The acceptance of various responsibilities by scholars at a national level in the future could contribute to the promotion and transfer of environmental information to students in the community and enhance their knowledge, attitude, and performance in providing educational solutions and policymaking in this regard. In this regard, the present study aimed to evaluate the correlations between the knowledge, attitude, and performance of the students of the School of Health at Hamadan University of Medical Sciences, Iran regarding waste management in 2020-2021.

2. Materials and Methods

The present descriptive-analytical, cross-sectional study was conducted on the students of Hamedan University of Medical Sciences selected based on the schedule of virtual university classes due to the current coronavirus pandemic. The sample population was determined to be 70. Data were collected using a researcher-made questionnaire, and the content validity was used to assess its validity. To this end, the questionnaire was presented to three faculty members of the School of Health to be examined based on the objectives of the target community and the title of the research, as well as the items regarding knowledge and attitude in terms of content and compliance with the research objectives. In addition, the retest method was applied to determine the reliability and the reliability of the questionnaire based on Pearson's correlation coefficient. The participants were selected via a random sampling technique. The sample size was calculated based on the schedule of virtual university classes due to the current pandemic, and the statistics on the number of students attending the university was determined using Eq. (1):

$$z = \left(z^2 pq \right) / d^2 \quad (1)$$

Considering $d=0.05$ and $\alpha = 0.05$ and based on the

previous studies in this regard, 70 students were selected as the final sample population (20). The inclusion criterion was studying at Hamedan University of Medical Sciences while the exclusion criterion included an unwillingness to participate in the study. The questionnaire was organized into three sections. The first section included the demographic variables of the students (Table 1), and the second section had 30 items, each of which was assigned a score (Table 2). Finally, the third and fourth sections contained 20 items on attitude (Table 3) and 24 functional

items (Table 4) each given three points, respectively. The community data were transferred to SPSS (version 21) as raw data. Mann-Whitney U and Kruskal-Wallis tests were used for comparing the group and determining the mean significance of the variables of knowledge, attitude, and performance, respectively. Data were reported as mean \pm standard deviation, and linear regression analysis and means comparison were conducted as well.

3. Results and Discussion

3.1. Demographic Characteristics of the Students

Table 5 presents the descriptive information of the studied students. In total, 61 participants were females (87.1%), and nine of them were males (12.9%). In general, the number of female students completing the questionnaire was higher than that of male students. In terms of age, 60, 5, and 4 students were in the age range of 24-20 (85.7%), 25-28 (7.1%), and 29-31 (5.7%) years, respectively, and one student aged 35-32 years (1.4%). In addition, 64 students were single (91.4%) while six cases were married (8.6%). According to the results, female students had more knowledge and better performance in waste management.

Regarding the education level, 61 subjects were studying for a bachelor's degree (87.1%), and 3 (4.3%) and 6 (8.6%) cases were master's students and Ph.D. candidates, respectively. According to the findings, most of the students, who completed the questionnaire, studied environmental health (n=26, 37.1%). Among the

Table 1. Demographic Information

No.	Question
1	Gender
2	Age
3	Marital status
4	Education
5	Discipline
6	Have you found a particular training course on waste management?
7	Have you encountered the method of recycling or managing Learning how to recycle and manage waste in the university or internship field using posters or other methods.
8	What references do you obtain for your information on waste management?
9	Have you or anyone around you contracted an infectious disease due to contact with solid waste?
10	

Table 2. The Knowledge Questions

No.	Question
1	What do you think are the most appropriate waste disposal methods?
2	Do you think waste recycling is cost-effective?
3	Which of the following do you think is more economical to recycle?
4	Which of the following do you think is the most significant amount of waste?
5	What is your motivation and goal for waste sorting?
6	How leaving gloves, Kleenex, masks, and the like on the streets and passages can cause more infectious diseases (e.g., coronavirus)?
7	What do you think are the ways to participate in the waste management process?
8	Do you think there is a relationship between waste recycling and the concept of a resistive economy?
9	Do you think waste sorting at home affects the municipality's performance in managing municipal waste?
10	When do you think is the best time for waste collection by the municipality?
11	Do you think that timely discharge of waste containers by the municipality will play a role in preventing waste dumping?
12	Do you think the implementation of public education programs on waste by the municipality effectively increases public awareness and participation about waste and its management?
13	Do you have information about private places in the municipality for waste processing and recycling?
14	Do you think that the disposal of waste containers by the municipality effectively prevents waste dumping?
15	Do you think the increase of waste containers by the municipality will be adequate in preventing waste dumping?
16	Do you think the proper placement of the containers by the municipality will be adequate in preventing waste dumping?
17	Do you think preventing waste dumping by the municipality will increase the neighborhood's health and its residents?
18	Do you think the municipality should prevent the activities of waste pickers (people who collect and sort garbage illegally) in the streets?
19	Do you think taking advantage of a contractor company will improve waste management?
20	Do you think the hospital and medical wastes should be collected along with other waste?

Table 3. The Attitude Questions

No.	Question
1	Do you agree with selling garbage to peddlers?
2	Is waste recycling and sorting necessary?
3	Is it practical to recycle recyclable waste in the economy?
4	Is the separation and sorting of hazardous waste and its decontamination effective in the health of the environment and society?
5	Is at-home waste separation and sorting time-consuming?
6	Is waste recycling effective in conserving natural resources?
7	Is waste sorting effective in controlling environmental pollutions?
8	Does waste recycling somehow prevent wastefulness?
9	Can participating in waste management training programs be helpful?
10	How much do you know about waste-related diseases?
11	To what extent are you involved with recycling organizations or the district municipality?
12	To what extent has media culturalization (radio and television, cyberspace, and the like) increased your awareness of waste management?
13	Do you think there is a relationship between education level and knowledge of waste management?
14	Do you cooperate in collecting waste left in the environment?
15	Do clean and lid-waste containers prevent the spread of annoying odors and the formation of ugly scenery?
16	Is leachate (the liquid that spills out of the waste containers which is caused by not collecting waste promptly) a threat?
17	Should the municipality legally deal with the people who cause the scattering and accumulation of waste in the streets?
18	Does the municipality pay attention to the health and safety conditions of waste workers?
19	Are incineration and landfilling the only quick-return waste disposal solutions?
20	Does using painted, clean, and uniform waste containers beautify our living places?

Table 4. The Performance Questions

No.	Question
1	Do you sort recyclable waste at home?
2	Do you recommend others to waste sorting and recycling?
3	If you separate and sort recyclable wastes, how do you deliver them to relevant workers?
4	Do you use separate containers to waste sorting?
5	Do you put used masks and gloves in separate, sealed plastic bags?
6	In case of negligence and failure to collect waste in time, do you report this violation to relevant authorities?
7	Do you cooperate in collecting waste left in the environment?
8	Do you attempt to hygienically waste disposal and not disperse them by animals such as cats and the like?
9	Are you trying to reduce waste? If your answer is yes, please mention your solutions.
10	Are there enough waste containers in your neighborhood?
11	Are the waste containers in the right place in your neighborhood?
12	Are waste containers in your neighborhood regularly washed by the municipality?
13	Is the size of municipal waste containers suitable for your neighborhood population?
14	Does the municipality completely collect the waste from your place of residence each time?
15	Does the municipality collect waste from your place of residence on time?
16	Did the municipality take any action when you contacted "center 137" on the waste?
17	Do you know what hours of the day the municipality comes to collect wastes from the containers?
18	Has the municipality implemented public education programs in the field of waste management in your neighborhood?
19	Does the municipality prevent the activities of waste pickers (people who collect and sort garbage illegally) in your neighborhood?
20	Do workers in your neighborhood use appropriate gloves, masks, and boots when collecting wastes?
21	Do waste workers behave appropriately in dealing with you?
22	Has the municipality provided brochures on sorting dry and wet waste to the residents of your neighborhood?
23	Does the municipality receive waste taxes annually?
24	Has the municipality taken any measures to reduce waste production?

Table 5. Descriptive Information of the Studied Students

Independent Group		Respondent's Number (%)
Gender	Female	87.1 (61)
	Male	12.9 (9)
Marital status	Single	91.4 (64)
	Married	8.6 (6)
Age	20-24	85.7 (60)
	25-29	7.1 (5)
	29-31	5.7 (4)
	32-35	1.4 (1)
Academic degree	BSc	87.1 (61)
	MSc	4.3 (3)
	PhD	8.6 (6)
Discipline	Environmental health	37.1 (26)
	Physiotherapy	1.4 (1)
	Health information technology	1.4 (1)
	Orthopedics	2.9 (2)
	Midwifery	7.1 (5)
	Radiology	1.4 (1)
	Occupational therapy	1.4 (1)
	Surgical technician	5.7 (4)
	Nursing	8.6 (6)
	Laboratory sciences	2.9 (2)
	Medical library	10 (7)
	Anesthesia	8.6 (6)
	Speech therapy	4.3 (3)
Public health	5.7 (4)	
Health professional	1.4 (1)	

participants, 16 cases (22.9%) received special training on recognizing the adverse effects and management of waste while 54 of them (77.1%) received no prior training. Furthermore, 38 students (54.3%) were exposed to posters/other methods of municipal solid waste recycling or management within an academic or work environment (internship). In comparison, no such exposure was reported in 32 students (45.7%). Based on our findings, the source of information on waste segregation were radio and television, newspapers and magazines, advertisements of municipal organizations, and other sources in 21 (30%), 12 (17.1%), 13 (18.6%), and 24 (34.3%) students, respectively. Moreover, 16 students (22.9%) claimed the contraction of infectious diseases due to contact with garbage or contaminated equipment in themselves or others around them while no such cases were reported in 54 students (77.1%).

3.2. Analytical Section

Table 6 provides the mean scores of knowledge and attitude, which were considered acceptable, while the

mean performance score was average. Table 7 presents a positive correlation between attitude and awareness, as well as the performance with knowledge and attitude.

Data on the correlations between knowledge variables with contextual, demographic, and main variables are summarized in Table 8. Based on the results, the amount of the knowledge of the studied students for recycling management was structured in three factors of academic degree, subject study, and education train. Additionally, among the average of knowledge among male and female students, there was no meaningful difference ($P > 0.05$). However, the obtained results indicated significant correlations between knowledge with marital status, as well as knowledge with previous training courses regarding waste management ($P < 0.05$). According to data in Tables 9 and 10, the average attitude among all students was not meaningful ($P < 0.05$) except for environmental health students, and other students were trained through media and posters, and the like. In addition, the highest amount of performance was related to college graduation and primary education. According to the statistical test, this difference was meaningful. In comparison, no significant associations were observed between performance with other variables ($P > 0.05$). Notably, knowledge, attitude, and performance were considered as predictors of waste management. Table 11 summarizes data on the linear regression model regarding predicting waste management with knowledge, attitude, and performance. Performance derived from the survey is considered relevant from a previous train education and their knowledge ($P < 0.05$). The application of knowledge, attitude, and practice studies is a developing popular way to survey community psychology and performance related to environmental issues. In this study, the knowledge, attitude and practices (KAP) survey was used through a cross-sectional research design to capture the knowledge, attitude, and performance of the students of Hamadan University of Medical Sciences, particularly on solid waste recycling during 2020-2021. Among the enrolled subjects,

Table 6. Distribution of Knowledge, Attitude, and Performance of Students Regarding Waste Management

Variable	Total	Mean	Minimum	Maximum
Knowledge	70	48.11	33	57
Attitude	70	14.44	17	52
Performance	70	12.23	1	21

Table 7. Correlations Between Knowledge, Attitude, and Performance of Students

Variable	Knowledge	Attitude	Practice
Knowledge	1		
Attitude	0.512	1	
Performance	0.281	0.439	1

Table 8. Correlations Between Knowledge Variables With Contextual, Demographic, and Main Variables

Variables	Mean	SE	SD	95% Confidence Interval		P Value
				Lower Limit	Upper Limit	
Knowledge						
Gender						
Female	48.1	48.75	5.75	-4.06	3.81	0.2
Male	48.22	48.22	3.38	-2.98	2.73	
Marital status						
Single	47.84	5.64	0.7	-7.8	1.49	<0.05
Married	51	1.78	0.73	-5.29	-0.01	
Age (y)						
20-24	47.88	5.43	0.7	46.48	49.29	0.422
25-28	47	7.14	3.19	38.13	55.87	
29-31	51.75	3.94	1.97	45.47	87.03	
32-35	53	0	0	0	0	
Academic degree						
BSc	47.98	5.44	0.69	46.59	49.38	0.04
MSc	43.67	7.5	4.33	25.02	62.31	
PhD	51.67	3.2	1.3	48.3	55.03	
Discipline						
	48.81	48.84	5.79	46.47	51.15	0.026
	41	41	-	-	-	
Environmental health	50	50	-	-	-	
Physiotherapy	50.5	50.5	0.7	56.85	44.15	
Health information Technology	49	49	2.55	52.17	45.83	
Orthopedics	47	47	-	-	-	
Midwifery	33	33	-	-	-	
Radiology	44.75	44.75	3.96	32.13	57.37	
Occupational therapy	47.17	47.17	2.28	41.29	53.04	
Surgical technician	52	52	1	39.29	64.71	
Nursing	47	47	1.29	43.84	50.16	
Laboratory sciences	51.67	51.67	0.8	49.6	53.73	
Medical library	45.67	45.67	6.36	18.3	73.03	
Anesthesia	48.75	48.75	1.6	43.66	53.85	
Speech therapy	45	45	-	-	-	
Public health						
Health professional						
Training education on waste management						
Yes	49.49	5.54	1.38	-1.73	4.51	<0.05
No	47.8	5.48	0.74	-1.85	4.63	
Exposure to posters/other methods						
Yes	47.92	5.61	0.91	-3.06	2.22	0.853
No	48.34	5.42	0.95	-3.06	2.21	
Other modes of exposure						
Radio/TV	47.19	5.82	1.27	44.54	49.84	0.577
Newspapers/magazines	47.58	6.73	1.94	43.30	51.86	
Advertisements of organization of municipalities	47.77	5.26	1.46	44.59	50.95	
Other cases	49.38	4.7	0.69	47.39	51.36	
Infectious diseases (themselves/others around)						
Yes	45.8	5.4	2.41	-7.58	2.59	0.739
No	48.29	5.49	0.68	-9.09	4.1	

Note. SE: standard error; SD: standard deviation.

Table 9. Correlations Between Attitude With Contextual, Demographic, and Main Variables

Variables	Mean	SE	SD	95% Confidence Interval		P Value
				Lower Limit	Upper Limit	
Attitude						
Gender						
Female	42.05	5.91	0.75	0.24	9.18	0.335
Male	37.33	8.47	2.82	-1.87	11.3	
Marital status						
Single	41.23	6.64	0.83	-7.91	3.05	0.274
Married	43.67	2.3	1.11	-5.64	0.6	
Age (y)						
20-24	47.88	5.43	0.7	46.48	49.29	
25-28	47	7.141	3.19	38.13	55.87	0.422
29-31	51.75	3.94	1.97	45.47	58.03	
32-35	53	-	-	-	-	
Academic degree						
BSc	41.07	6.51	0.83	39.4	42.73	
MSc	42.33	8.02	4.63	22.41	62.26	0.385
PhD	44.83	4.35	1.77	40.26	49.4	
Discipline						
Environmental health	41.22	9	1.76	37.48	44.75	
Physiotherapy	42	-	-	-	-	
Health information Technology	43	-	-	-	-	
Orthopedics	45	2.83	2	19.59	70.41	
Midwifery	43.2	3.86	1.77	38.28	48.12	
Radiology	25	-	-	-	-	
Occupational therapy	40	-	-	-	-	
Surgical technician	40.5	3.59	3.59	29.06	51.94	0.0428
Nursing	42.67	1.2	1.2	39.58	45.76	
Laboratory sciences	45.5	1.5	1.5	26.44	64.56	
Medical library	41.29	1.59	1.9	37.37	45.2	
Anesthesia	41	0.85	0.85	38.8	43.2	
Speech therapy	43.67	1.85	1.85	35.68	51.65	
Public health	40.75	0.47	0.47	39.23	42.27	
Health professional	38	-	-	-	-	
Training on waste management						
Yes	40.81	9.84	2.46	-4.48	2.85	<0.001
No	41.63	5.11	0.69	-6.5	4.46	
Exposure to posters/other methods						
Yes	41.82	7.77	1.26	-2.27	3.9	0.052
No	41	4.4	0.77	-2.14	3.78	
Other modes of exposure						
Radio/TV	41	5.63	1.23	38.43	43.57	
Newspapers/magazines	40.58	6.08	1.75	36.72	44.45	0.465
advertisements of organization of municipalities	39.92	7.19	1.99	35.58	44.27	
Other cases	43.08	6.85	1.39	40.19	45.7	
Infectious diseases (themselves/others around)						
Yes	43	6.16	2.75	-4.3	7.65	0.932
No	41.32	6.47	0.8	-5.85	9.19	

Note. SE: standard error; SD: standard deviation.

Table 10. Correlations Between Performance and Contextual, Demographic, and Main Variables

Variables	Mean	SE	SD	95% Confidence Interval		P Value	
				Lower Limit	Upper Limit		
Performance							
Gender							
Female	12.46	3.44	0.44	-0.69	4.32	0.284	
Male	10.78	5.21	1.73	-2.37	5.73		
Marital status							
Single	12.34	3.8	0.48	-2.01	4.36	0.362	
Married	11.17	2.71	1.1	-1.68	4.02		
Age (y)							
20-24	12.09	3.86	0.5	11.07	13.1	0.849	
25-28	13.6	2.79	1.24	10.13	17.07		
29-31	12.5	3.31	1.65	7.22	17.78		
32-35	13	-	-	-	-		
Academic degree							
BSc	12.1	3.86	0.5	11.1	13.11	0.72	
MSc	13.67	3.05	1.76	6.08	21.26		
PhD	12.83	2.63	1.07	10.06	15.6		
Discipline							
	12.77	3.92	0.76	11.18	14.35	0.05	
	3	-	-	-	-		
Environmental health	13	-	-	-	-		
Physiotherapy	14.5	3.53	2.5	-17.24	46.27		
Health information Technology	10.33	3.78	2.18	0.93	19.74		
Midwifery	11	-	-	-	-		
Radiology	5	-	-	-	-		
Occupational therapy	12.25	0.95	0.47	10.73	13.77		
Surgical technician	13.5	1.37	0.56	12.05	14.95		
Nursing	17.5	3.53	2.5	-14.27	49.27		
Laboratory sciences	12.86	3.48	1.31	9.63	16.08		
Medical library	11	1.67	0.68	9.24	12.76		
Anesthesia	12.33	5.5	3.18	-1.35	26.01		
Speech therapy	8.75	3.09	1.54	3.82	26.01		
Public health	15	-	-	-	-		
Health professional							
Training on waste management							
Yes	11.94	4.46	1.11	-2.52	1.74		0.391
No	12.33	3.5	0.48	-2.92	2.14		
Exposure to posters/other methods							
Yes	12.51	3.6	0.59	-1.2	2.42	<0.05	
No	11.9	3.89	0.69	-1.22	2.44		
Other modes of exposure							
Radio/TV	11.9	3.58	0.8	10.22	13.58	0.269	
Newspapers/magazines	12.83	3.76	1.08	10.44	15.22		
Advertisements of organization of municipalities	10.58	4.77	1.37	7.55	13.62		
Other cases	13.04	3.11	0.63	11.73	14.36		
Infectious diseases (themselves/others around)							
Yes	12	1.87	0.83	-3.73	3.22	0.161	
No	12.25	3.83	0.48	-2.53	2.02		

Note. SE: standard error; SD: standard deviation.

Table 11. Linear Regression Analysis to Predict Waste Management With Knowledge, Attitude, and Performance (adjusted $R^2=0.117$)

Structures	β	B	SE	Lower Limit	Upper Limit	P Value
Knowledge	0.36	0.89	0.011	0.28	0.904	0.009
Attitude	0.118	0.172	0.01	0.113	0.197	0.035
Performance	0.145	0.115	0.016	0.114	0.182	0.028
Constant	-	2.067	0.474	1.121	3.014	0.00

Note. SE: standard error.

the results indicated that a more significant number of women completed the data collection instrument. In terms of marital status, single students were more likely than married students. Further, the majority of the students were studying for a bachelor's degree. Generally, the investigation demonstrated that most postgraduate students of environmental health engineering had proper knowledge and attitude. In any case, less than half of them had the right performance on several items on material recycling. This indicates that most postgraduate students, at the time of the study, were somehow aware of the meaning of appropriate solid wastes recycling and represented good attitudes toward these matters.

Desa evaluated students from secondary schools, universities, and colleges in Nigeria and reported unsatisfactory knowledge levels on environmental issues among student-respondents while finding good conception ratings. The students were at least aware but could not explain why environmental problems continue to exist in their community (21). In research conducted by Zeng et al, students were reported to have become aware of the importance of waste separation through the public media. In the present study, 22.9% of participants confirmed the contraction of various infections in themselves or others around them due to contact with contaminated equipment (19). Similarly, Rahmaddin et al researched the KAP about waste management in communities near Martapura River Bank in Indonesia. The community's attitude and their knowledge were considered suitable. However, the results on performance showed unsatisfied behaviors for handling and managing river-dumped wastes (22), demonstrating that the student's knowledge and attitude were completely correlated with their performance. The recycling of solid wastes counting plastic/glass, cans, and paper was also related to good knowledge rating rather than attitudes. Adeolu et al also reported the most positive correlations between knowledge and performance levels (23). Comparable to the result of this research, respondents with higher knowledge scores were more likely to represent good practices on solid waste management (24). The demographic information including gender and age did not indicate any statistically meaningful correlation with the students' KAP ratings. Similar research was performed by Adeolu et al, and the results revealed that the KAP level did not differ between male and female respondents (23). According

to the findings of the current research, the mean scores of knowledge and attitude were favorable in 77.1% of the students, which is consistent with the findings of Almasi et al (17) and Rodrigues et al (18), indicating the adequate knowledge of intelligent cities regarding the diseases caused by waste and the environmental impact of waste (18). On the other hand, Strydom proposed contradictory results in this regard (25), showing the lower knowledge level of students regarding waste hazards and an average performance score, which is in line with the results of Almasi et al (17). The findings of the current research demonstrated significant correlations between knowledge with marital status, as well as knowledge with previous training on waste management. In the study by Rodrigues et al, knowledge and waste management were correlated while no significant associations were denoted between knowledge and other statistical variables (18). Our findings also indicated a significant correlation between attitude and prior training on waste management, which corroborates with the results of Al-Khateeb et al (26), indicating the impact of this variable on students' attitudes toward waste recycling. According to the results of the present study, attitudes and other statistical variables represented no significant correlation. Simultaneously, a significant association was observed between performance and prior training on waste management. Conversely, no significant correlations were found between performance and other statistical variables. Based on our findings, knowledge, attitude, and performance could predict waste management. This is congruent with the findings of Ma et al, implying that attitude was predictive of waste management (27). To consider ethical issues, informed consent was obtained from the students, and data were anonymously collected through information coding for data analysis.

4. Conclusion

According to the results, the importance of waste management should be emphasized in the community, especially among students, and our findings could be beneficial for this purpose. Furthermore, proper planning is required to enhance the knowledge, attitude, and performance of the students of Hamadan University of Medical Sciences regarding waste management through appropriate identification of the influential factors.

Conflict of Interest Disclosures

The authors declare that they have no conflict of interests.

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