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A Survey on the Use of Plastic versus Biodegradable Bottles for Drinking Water Packaging in the United Arab Emirates

Himadri Rajput [1,2], Munjed A. Maraqa [1,2], Fatima Zraydi [3], Lina A. Al Khatib [4], Noor Ameen [5], Rime Ben ElKaid [6], Safia S. Al Jaberi [1], Noura A. Alharbi [1], Reka Howard [7] and Ashraf Aly Hassan [1,2,*]

1 Civil and Environmental Engineering Department, United Arab Emirates University, Al-Ain 15551, United Arab Emirates; himadri.rajput@uaeu.ac.ae (H.R.); m.maraqa@uaeu.ac.ae (M.A.M.); 201640142@uaeu.ac.ae (S.S.A.J.); 201702511@uaeu.ac.ae (N.A.A.)
2 National Water and Energy Center, United Arab Emirates University, Al-Ain 15551, United Arab Emirates
3 College of Education, Special Education Mild to Moderate Disability, United Arab Emirates University, Al-Ain 15551, United Arab Emirates; 201640419@uaeu.ac.ae
4 Electrical Engineering Department, United Arab Emirates University, Al-Ain 15551, United Arab Emirates; 201640099@uaeu.ac.ae
5 Mechanical Engineering Department, United Arab Emirates University, Al-Ain 15551, United Arab Emirates; 201735012@uaeu.ac.ae
6 Aerospace Engineering Department, United Arab Emirates University, Al-Ain 15551, United Arab Emirates; 201640422@uaeu.ac.ae
7 Institute of Agricultural and Natural Resources, University of Nebraska Lincoln, Lincoln, NE 68527, USA; rekahoward@unl.edu
* Correspondence: alyhassan@uaeu.ac.ae; Tel.: +971-03-7135334

Abstract: Due to intensive utilization and extensive production, plastic waste is becoming a serious threat to the environment and human health. The situation is even worse in countries such as the United Arab Emirates (UAE), where single-use plastic water bottles add to the load of plastic pollution. The main objective of this survey was to assess the extent of bottled water utilization by the UAE residents and their awareness of the environmental concerns arising from single-use plastic bottles. The aim was also to evaluate their willingness to shift towards using biodegradable plastic bottles. This study involved the feedback of 2589 respondents living in the UAE. The eigenvalue decomposition (EVD) was applied to determine the most responsible variables explaining the variability of our data set. A chi-square analysis was also used to determine the significance among the responses. Most of the respondents to this survey were UAE nationals (79.8%) of ages ranging from 21 to 35 years (42%), who were educated, with most holding a university degree (69.6%). Regardless of their gender, age, occupation, education, and income, a large group of respondents (40.7%) was concerned about the impact of their purchased items on the environment; however, the frequency of plastic products recycled was observed to be low (49.7%). According to the findings of this survey, 42.4% of the respondents were likely to purchase 100% biodegradable bottles, and about 70% of the respondents expressed a willingness to spend at least AED 1 more for purchasing 100% biodegradable bottles.

Keywords: plastic pollution; single-use plastic bottles; United Arab Emirates; survey; eigenvalue decomposition

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1. Introduction

Plastic litter is one of the major issues of environmental concern that the world is currently facing [1]. As plastic possesses characteristics such as a long-lasting nature, mouldability, low production cost, lightness, and versatility, it is widely used in numerous different sectors [2]. Due to its high demand, plastic has been manufactured at a large scale, and its production has increased exponentially. Plastic production increased from 1.5 million metric tons in the 1950s to around 367 million metric tons in 2020 [3], with the

expectation being that it will triple by the end of 2050 [4]. Due to its extensive use and production, plastic severely pollutes the land and water bodies, and adds up to financial burdens and waste management complexities [5].

The consumption of single-use plastic bottled drinking water has made the problem of plastic pollution even worse [6]. Despite the associated environmental implications, an increasing trend in bottled drinking water consumption has been noticed [7]. Regions with high temperatures and heat waves are expected to be the major consumers of bottled drinking water [6]. In the Middle East, where consumption of desalinated water for drinking purposes is common, a nearly doubled bottled water consumption trend was observed [8]. As the United Arab Emirates (UAE) is in a desert landscape with a prevailing dry climate and no fresh water supply, its main freshwater supply comes from desalinating saline water. After performing an economic study, the Dubai Chambers of Commerce stated that the consumption of bottled drinking water in the UAE is anticipated to reach 1.153 billion liters in 2025, with an annual growth rate expected to be 1.4% by volume from 2020 to 2025 [9]. As per this analysis, the UAE ranked first in the Middle East and seventh in the world for per capita bottled water consumption in 2019. According to the Abu Dhabi Emirate single-use plastic policy published in 2020, plastic bottles are listed among 16 priority single-use plastic items [10]. The severity of plastic pollution in the UAE could be alarming, given that camels residing in this region are facing a 1% mortality rate due to ingesting plastic waste [11]. As plastic pollution has severe emerging implications for the environment, it is fetching increasing attention from public, scientists, and policy makers [12]. Plastic debris (mainly microplastics) poses a direct threat to wildlife, with many and varied species documented as being negatively impacted by plastic items. Microplastics—including additives such as polybrominated diphenyl ethers (PBDE), phthalates, nonylphenols (NP), bisphenol A (BPA), and antioxidants—have been found in all marine compartments worldwide [13–15].

The focus on biodegradable plastic is limited to international protocols rather than local bills. In 2012, the USA released a National Bioeconomy Blueprint focusing on fuels produced from CO_2 and biodegradable plastics made from renewable biomass [16]. Reducing single-use plastic is important, and consumers play a pivotal role in this. Taking this into account, a survey has been conducted to analyze the understanding, awareness, and behavior of the UAE residents towards environmental pollution due to single-use plastic water bottles. The study was conducted at the UAE University; however, the respondents to this survey were from different emirates. The questions asked in this survey were framed in such a way that we could understand the plastic consumption pattern of end-users, as well as their willingness to shift towards biodegradable water bottles. The responses obtained were statistically analyzed and reported. The outcomes of this study bring forth the opinion of the UAE residents on water utilization and the impact of plastic pollution on the environment. Furthermore, this study could provide a foundation for future government policies and private initiatives that could be helpful in handling this emerging threat.

2. Materials and Methods

2.1. Study Context

The present study was conducted in the UAE. This country is comprised of seven emirates, namely, Abu Dhabi, Dubai, Sharjah, Ajman, Umm Al Qaiwain, Ras Al Khaimah, and Fujairah. Throughout the year, the UAE encounters a tropical dry climate along with relatively high temperatures, especially in the summer. The estimated population of the UAE in 2021 was about 9.99 million, as per the data provided by the United Nations [17]. The UAE is considered one of the most important economic centers of the Middle East, having an estimated gross domestic product (GDP) of USD 358.87 billion in 2020 [18].

2.2. Survey Form

First, a preliminary survey form was prepared and distributed to a limited number of UAE residents to ensure that the questions were understandable to common residents, not

long-winded, and free of technical jargon. Based on their feedback, the survey form was modified, and a copy of the finalized survey form is shown in Supplementary Figure S1. The survey form consisted of 26 questions. Questions 1–7, 25, and 26 were intended to identify demographic factors (gender, residence location, nationality, age, education, income, and occupation). Questions 8–10 focus on the use of tap water. Questions 11–15 are related to bottled water consumption and spending. Questions 16–19 focus on the environmental awareness of the respondents. Questions 20–22 were intended to assess respondents' willingness and motivation to purchase water bottled in 100% biodegradable material. Questions 23–24 relate to the source(s) available to obtain information about recycling and bottled water quality.

The survey form was formulated based on the stated preference approach. In some of the survey questions, respondents were asked to choose one answer from a given list. In other questions, respondents were requested to choose all applicable answers from a given list. The survey form was published in both Arabic and English languages.

2.3. Data Collection and Analysis

The survey was conducted over a period of 60 days, and the respondents were selected randomly irrespective of their age, gender, occupation, or educational status, as long as they were willing to take part. However, individuals of less than the age of 15 years were not considered in this study. The total number of respondents to this study was 2589. The survey questionnaire was conducted online using an electronic version of survey sheets on social media platforms and through SurveyMonkey. This study was also done through offline means through the distribution of the survey questionnaire at shopping malls and conference venues, where there were gatherings of large numbers of people. All the sheets had bar codes for scanning, and all the collected data was systematically stored for future study and prediction purposes. The eigenvalue decomposition (EVD) was applied to determine which variables explained the variability among the data set the most. EVD is a method that takes advantage of the eigenvalues and eigenvectors corresponding to a square matrix, where the first component is the one that explains the largest variability existing in the data set of the explanatory variables. This is a tool for visualizing the structure of the data based on the explanatory variables (which are the coded responses to the survey questions). For a cross-tabulation study of the data, a chi-square analysis was performed, and the significance was identified based on the obtained p-value.

3. Results

3.1. Demographic Profile of Respondents

The data was collected from 2589 respondents, of which 1889 were females, 692 were males, and 8 did not specify. The number of female respondents was much higher than that of the male respondents, since females showed more willingness to fill out the provided questionnaire. Based on the gathered data, the respondents were grouped under different categories, as shown in Figure 1. Most of the respondents were UAE nationals (~80%) and belonged to the age group 21–35 years (42%). First, some descriptive data analysis was considered to examine the relationship among the variables. For this part of the analysis, all the explanatory variables were examined, but the focus was mainly on the ones that were considered informative in terms of the results related to people's willingness to purchase biodegradable water bottles. Looking at the created Figures 2 and 3, conclusions must be drawn carefully. Even though it is clear that significantly more female than male participants responded that they would never or rarely consider drinking tap water, it must be considered that the number of female participants was very much higher than the male participants in this study.

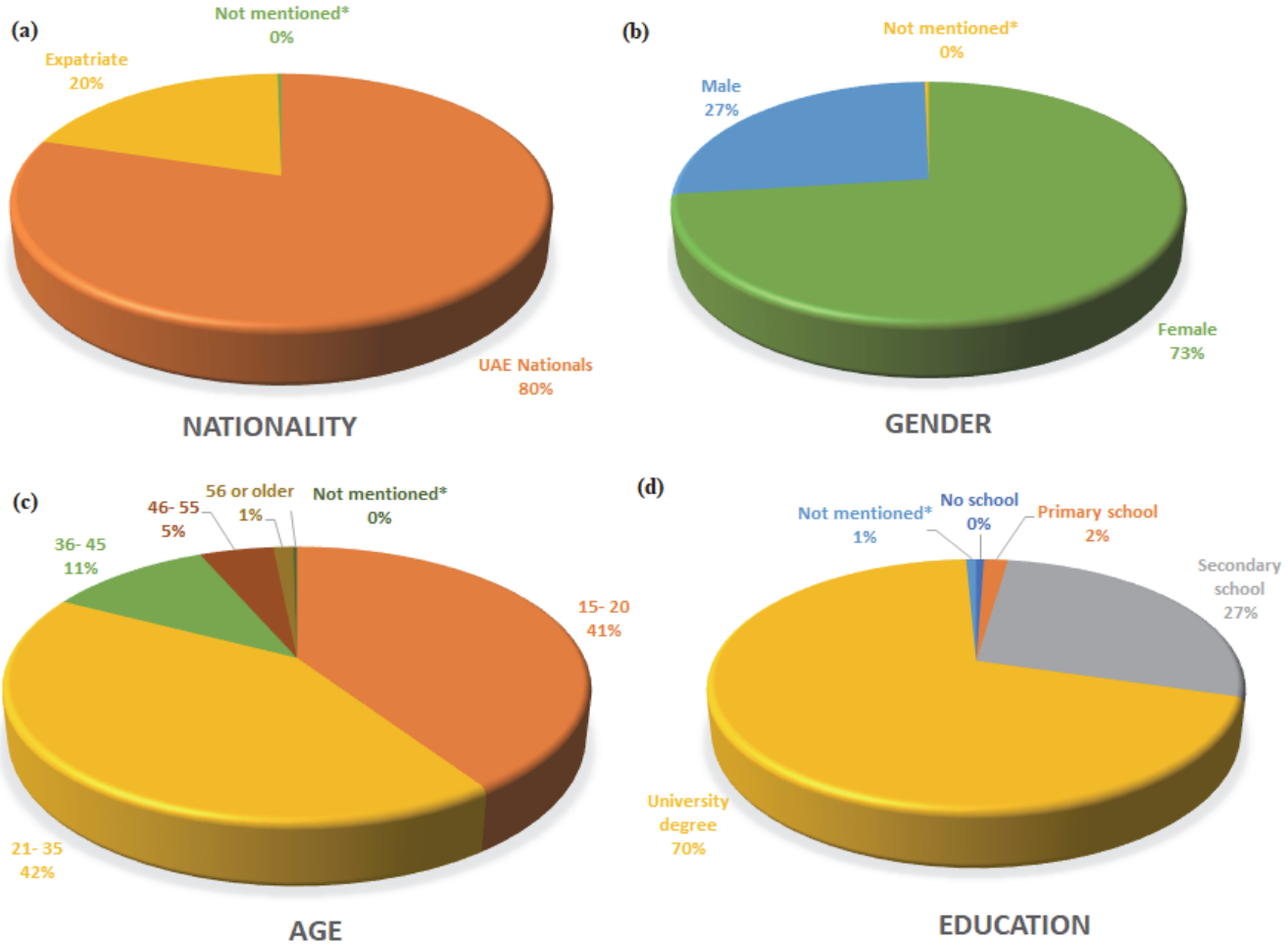


Figure 1. Demographic profile of respondents participating in this survey based on (**a**) nationality, (**b**) gender, (**c**) age, and (**d**) education. * Information not provided by the respondents.

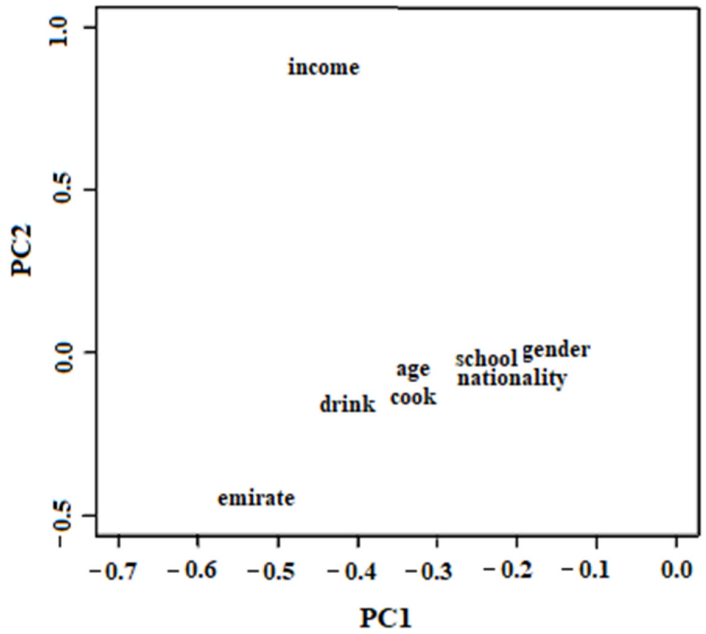


Figure 2. Principal components plot (components 1 and 2) derived from the X′X matrix containing the information of 8 variables.

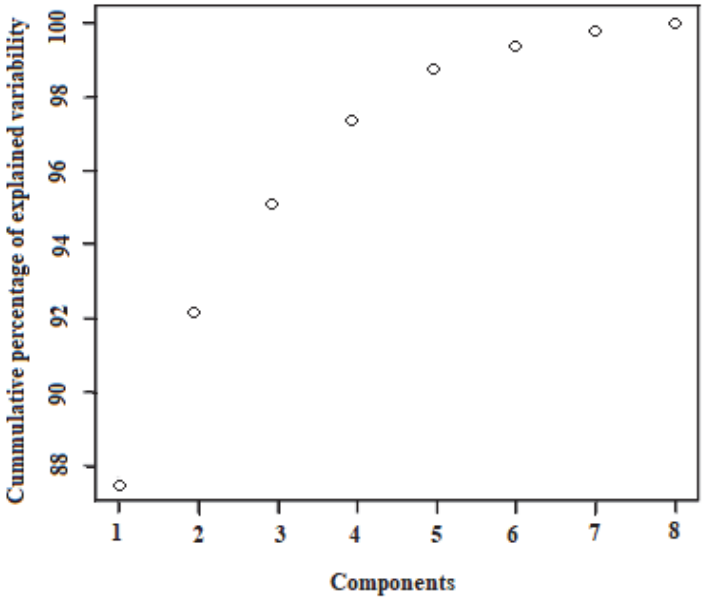


Figure 3. Cumulative percentage of explained variability accounted by the first k (k = 1, ..., 8) components derived from the eigenvalue decomposition of X′X.

For this study, matrix X was constructed with rows that correspond to the individuals participating in the survey (2589) and columns that correspond to the selected questions asked of the participants (8). Using X, the covariance structure was computed as G = X′X, where (′) represents the transpose of a matrix. To reduce the complexity of the problem, some of the questions were removed from the data set for the EVD and only considered eight questions (questions 1–4 and 6–9) that were consistent in terms of missing values and categories. It was found that some of the answers to questions were difficult to group for the purpose of EVD. The covariance matrix, G, was used to calculate the EVD. It was also observed that the emirate the person lived in was the most influential variable among the ones considered, as this variable explained the highest amount of variability in the data. In addition, 'income' can be considered the second-most influential variable among the explanatory covariates. Figure 2 is a principal components plot representing components 1 and 2. The components were derived from the covariance matrix containing the information on the eight variables that were considered. The X-axis represents the first principal component (PC1), which explained most of the variability among all the 8 covariates; the Y-axis represents the second principal component (PC2), which explained the second-largest portion of the variability explained by the variables, and was not contained in PC1. The largest absolute values on the plot correspond to the most influential variables. In this case, in PC1, 'emirate' was the most influential variable, while 'income' was the most influential in PC2.

Figure 3 represents the cumulative percentage of the explained variability accounted for by the first k (k = 1, ..., 8) components derived from the EVD of the covariance matrix, G = X′X. The first component (PC1) explained around 88% of the total variability, while the first two components (PC1 and PC2) together explained around 92% of the total variability.

3.2. General Information of Respondents Participated in This Survey

Respondents involved in this study were from the different emirates of the UAE (Table 1). Most participants were from Abu Dhabi (1407, 54.34%); however, 268 (10.35%) were from Dubai, 256 (9.88%) were from Fujairah, 243 (9.38%) were from Sharjah, 235 (9.07%) were from Ras Al Khaimah, 125 (4.82%) were from Ajman, and 50 (1.9%) were from Umm Al Quwain. In addition, most of the expatriates who participated in this survey had stayed in the UAE for 5 or more years (76.5%), which makes this study closer to practical knowledge, as the participants were aware of the UAE and its potential environmental

problems. The respondents were well-educated and involved in various reputable occupations, such as education and academia (23.8%), engineering (25.1%), the medical professions (5.2%), and banking (4.5%). About 67% of the total participants were associated with the public sector, and almost a quarter preferred not to disclose their monthly income (24%). Additionally, almost 30% of the respondents indicated that they did not have an income, likely to be associated with those in the age group 15–20.

Table 1. General information on survey respondents.

Variable	Categories	No. of Respondents	Percentage (%)
Emirate of residence	Abu Dhabi	1407	54.34
	Dubai	268	10.35
	Fujairah	256	9.88
	Sharjah	243	9.38
	Ras Al Khaimah	235	9.07
	Ajman	125	4.82
	Umm Al Quwain	50	1.9
	Not mentioned *	5	0.19
Duration of expatriate's stay	Less than 1 year	22	4.27
	1–2 years	42	8.15
	3–4 years	57	11.06
	5 years or more	394	76.50
Occupation	Agriculture	43	1.66
	Banking	117	4.51
	Business	164	6.33
	Education and academia	616	23.79
	Engineering	651	25.14
	Hospitality	56	2.16
	Medical Professions	134	5.17
	Retail	54	2.08
	Other	657	25.37
	Not mentioned *	97	3.74
Job sector	Public Sector	1737	67.09
	Private Sector	594	22.94
	Not mentioned *	258	9.96
Monthly income in AED **	No income	769	29.70
	Preferred not to tell	622	24.02
	Less than 5000	424	16.37
	5000–10,000	240	9.26
	10,000–35,000	361	13.94
	35,000–50,000	96	3.70
	Over 50,000	59	2.27
	Not mentioned *	18	0.69

* Information not provided by the respondents. ** AED 1 was about USD 0.27.

3.3. Water Utilization Patterns of Respondents

The water utilization practice and the trend of expenditure on drinking water by the respondents is summarized in Table 2. It should be noted that tap water in the UAE, mostly originating from desalinated seawater, is potable and meets very high and strict standards. However, most of the participants (about 89%) responded that they would never or rarely consider drinking tap water. This response is similar to a previously reported study conducted in the UAE, where 88% of the respondents said that they never drank tap water [19]. This question was also examined based on whether the participant was a UAE national or an expatriate; but in this case, too, we had unbalanced data (2067 UAE nationals and only 515 expatriates). The only finding that we considered useful regarding question 8 (on the frequency of drinking tap water) was that the largest number of participants responding that they would consider drinking tap water most of the time resided in Abu Dhabi. Dubai also showed a similar trend, but the other emirates showed an opposite trend. This may have to do with a lower quality of desalinated water provided to residents through the municipal distribution system in the northern emirates, due to the significantly lower GDP there compared to Abu Dhabi and Dubai. When the question was whether participants would consider using tap water for cooking, we did not see any significant differences in terms of the responses when we compared gender, education level, or emirate

of residence. When the question was about when the participants were drinking tap water, 65% responded that they did not drink tap water, 20% responded that they drank tap water at home, 5% said they did so while traveling, and 0.03% said they did so at work and in restaurants. Interestingly, when participants had to identify the reasons why they preferred bottled water over tap water, 10% identified liking cold water, 9% identified convenience, 13% mentioned the taste, 9% said they preferred bottled water because of social habit, and 9% mentioned the chlorine smell. It should also be pointed out that 14% of the participants were concerned about microbial contamination, and 12% had concerns about chemical pollution. When a chi-square test was applied to the income of residents and how they considered the cost of bottled water, the *p*-value was observed to be 0.006; hence, this signifies that there was a significant difference between the income of respondents and their beliefs about the cost of bottled water. In the UAE, it has been noticed that the residents did not find tap water fit for drinking, as was also observed in another study, where most respondents (76.9%) stated that they never used tap water for drinking purposes [20]. The most common reasons behind this trend were also similar, including the taste, contamination of bacteria, smell, color, temperature, and wrong blend of minerals [20]. Another survey conducted in the UAE also suggested that most of the participants (87%) used bottled water for drinking purposes due to similar reasons to those stated above [21].

Table 2. Water utilization patterns of survey respondents.

Variable	Categories	No. of Respondents	Percentage (%)
Frequency of tap water drinking	Never	1678	64.81
	Rarely	632	24.41
	Most of time	204	7.87
	All the time	67	2.58
	Not mentioned *	8	0.30
Use of tap water for cooking	Never	705	27.23
	Rarely	689	26.61
	Most of time	691	26.68
	All the time	490	18.92
	Not mentioned *	14	0.54
Use of tap water for drinking	At home	543	20.9
	At work	33	1.27
	At restaurants	24	0.92
	While travelling	137	5.29
	At home and while travelling	41	1.58
	At home and work	9	0.34
	At home and restaurants	9	0.34
	At restaurants and while travelling	9	0.34
	At work and while travelling	5	0.19
	At work and restaurants	1	0.03
	At home, work, and restaurants	6	0.23
	At work, restaurant, and while travelling	1	0.03
	At home, work, and while travelling	7	0.27
	At home, restaurant, and while travelling	5	0.19
	At home, work, restaurant, and while travelling	18	0.69
	Did not drink tap water at all	1708	65.97
	Not mentioned *	33	1.27
Average expenditure on single-use plastic bottled water per week in AED	Less than 10	514	19.85
	10–30	941	36.34
	30–100	493	19.04
	More than 100	240	9.26
	Was unsure	344	13.28
	Did not buy bottled water	47	1.81
	Not mentioned *	10	0.38

Table 2. *Cont.*

Variable	Categories	No. of Respondents	Percentage (%)
Cost of bottled water	Cheap	1176	45.42
	Reasonable	1322	51.06
	Expensive	81	3.12
	Not mentioned *	10	0.38
Preference of bottled water brand	Locally manufactured brand	1191	46.00
	Imported brands	221	8.53
	No preference when choosing between locally and imported brands	1090	42.10
	Did not drink bottled water	60	2.31
	Not mentioned *	27	1.04
Criteria used to purchase bottled water			
Cost	Strongly disagreed	103	3.97
	Disagreed	124	4.78
	Neutral	804	31.05
	Agreed	1030	39.78
	Strongly agree	512	19.77
	Not mentioned *	16	0.61
Brand	Strongly disagree	115	4.44
	Disagreed	116	4.48
	Neutral	786	30.35
	Agreed	1106	42.71
	Strongly agreed	448	17.30
	Not mentioned *	18	0.69
Quality	Strongly disagreed	71	2.74
	Disagreed	85	3.28
	Neutral	662	25.56
	Agreed	1159	44.76
	Strongly agreed	592	22.86
	Not mentioned *	20	0.77
Availability	Strongly disagreed	58	2.24
	Disagreed	104	4.01
	Neutral	556	21.47
	Agreed	1177	45.46
	Strongly agreed	669	25.84
	Not mentioned *	25	0.96
Personal preferences	Strongly disagreed	119	4.59
	Disagreed	133	5.13
	Neutral	760	29.35
	Agreed	978	37.77
	Strongly agreed	578	22.32
	Not mentioned *	21	0.81
Packaging	Strongly disagreed	138	5.33
	Disagreed	135	5.21
	Neutral	821	31.71
	Agreed	993	38.35
	Strongly agreed	445	17.18
	Not mentioned *	57	2.20
Information source on bottled water quality	TV	158	6.10
	Books/journals	59	2.27
	Newspaper	63	2.43
	None	183	7.06
	Internet	850	32.83
	Bottle label	643	24.83
	Friends/relatives	318	12.28
	Other	278	10.73
	Not mentioned *	37	1.42

* Information not provided by the respondents.

When purchasing bottled drinking water, 39% of the respondents considered the cost an important factor, 42% considered the brand, 44% considered the quality, 45% considered the availability, and 38% considered the packaging. A proportion of 32% of the respondents relied on the internet, while 24% relied on the label on the water bottle for the information regarding bottled water's quality.

3.4. Environmental Awareness of Respondents

The majority of respondents (69%) admitted that they were concerned about the environmental pollution caused by single-use plastic bottles. However, 11% were not concerned, and 19% did not know enough about this issue (Table 3). The *p*-value of the chi-square test was found to be 0.01 when it was applied to gender and concerns about environmental pollution, so the null hypothesis was rejected—which means that environmental awareness was significantly different between male and female respondents. When the test was applied to concerns towards environmental pollution and recycling practices, the *p*-value came out to be 0.02, which is again less than 0.05. So, the null hypothesis was rejected, signifying that the concern of respondents about environmental pollution was significantly different from the recycling practices which they followed. For 40% of the participants, it was very important to purchase a product which had a minimal or no harmful impact on the environment. Moreover, nearly 50% of the participants were unaware of the difference between 100% biodegradable and recyclable plastic products. Almost the same ratio was realized in all age groups. The interest of consumers in eco-friendly plastic products is currently limited due to the small range of available products made of eco-friendly plastic, a lack of experience, and high price [22]. In the UAE, recycling is mainly used to dispose of plastic waste [23]; however, the practice of recycling used plastic bottles was found to be very rare (almost 50%) among the residents. Another study conducted at Sharjah, UAE showed a similar trend, where 22% of the respondents knew about the recycling benefits of plastic; however, only 16% were found to practice recycling always [24]. Due to this low recycling practice and the overwhelming production of waste, the disposal capacity has been exceeded, which has resulted in the problem of plastic waste in the UAE [25].

Table 3. Awareness of participants of environmental pollution.

Variable	Categories	No. of Respondents	Percentage (%)
Concern about pollution due to single-use plastic bottles	Yes	1785	68.94
	No	286	11.04
	Did not know enough about the topic	504	19.46
	Not mentioned *	14	0.54
Importance of purchasing a product having minimal/no harmful impact on the environment	0 (not important)	108	4.17
	1	26	1.00
	2	55	2.12
	3	93	3.59
	4	130	5.02
	5	255	9.84
	6	182	7.02
	7	228	8.80
	8	230	8.88
	9	211	8.14
	10 (very important)	1053	40.67
	Not mentioned *	18	0.69
Frequency of recycling plastic products	Always	243	9.38
	Occasionally (>50% of the time)	718	27.73
	Rarely (<50% of the time)	1288	49.74
	Never	306	11.81
	Not mentioned *	34	1.31

Table 3. *Cont.*

Variable	Categories	No. of Respondents	Percentage (%)
Knowledge of the difference between 100% biodegradable vs. recyclable plastic	Yes	1169	45.15
	No	1307	50.48
	Was not interested in knowing	90	3.47
	Not mentioned *	23	0.88
Information source on recycling initiatives in the UAE	Television	282	10.89
	Books/journals	96	3.70
	Newspapers	119	4.59
	None	169	6.52
	Internet	1347	52.02
	Friends/relatives	228	8.80
	Other	318	12.28
	Not mentioned *	30	1.15

* Information not provided by the respondents.

3.5. Willingness of Respondents to Switch to Biodegradable Bottles

On a scale of 0 (never) to 10 (very likely), 42% of the respondents indicated that it was very likely that they would switch to 100% biodegradable water bottles once those were available in the market, while less than 20% were unlikely to switch (i.e., they selected 0 to 4) as shown in Figure 4a. As for their willingness to spend more on the purchase of biodegradable bottles, 70% of the respondents indicated they were willing to spend at least AED 1 to switch to 100% biodegradable bottles (Figure 4b).

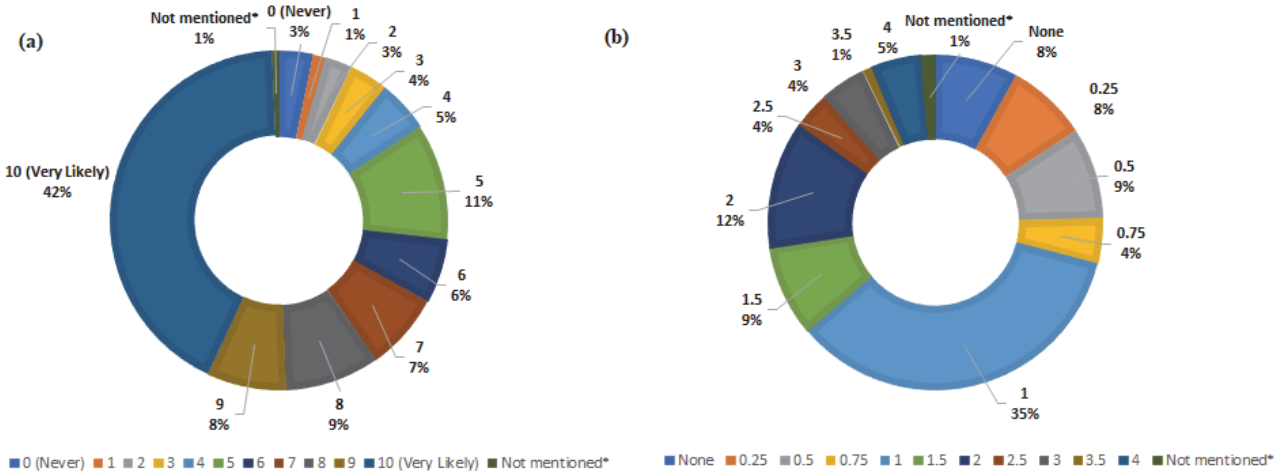


Figure 4. (**a**) Likeliness of switching to utilization of 100% biodegradable bottles and (**b**) willingness to spend more (in AED) on the purchase of 100% biodegradable bottles. * Information not provided by the respondents.

The environmental concern of an individual is a determinant of their eco-friendly practices, such as their recycling and choice of environment-friendly products [26]. Hence, it is useful to know how well a person's answers to the survey questions could predict the outcome of how willing the person was to purchase biodegradable water bottles, based on the results summarized in Figure 4. For this, we applied four machine learning techniques. The methods were Fisher's discriminant analysis (FDA), support vector machines (SVM), random forest (RF), and boosting [27]. Boosting performed the worst in terms of prediction, with an error rate of 45%, and the other three methods also had a high error rate of 42%. This means the variables were only able to predict the willingness to purchase biodegradable water bottles a little over 50% of the time.

4. Discussion

For drinking purposes, UAE residents have three clear options: tap water, reusable 5-gallon bottled containers, and single-use bottled water. Tap water in the UAE originates mostly from desalinated seawater. The tap water produced in the UAE is potable and follows stringent and high water quality standards [28]. However, impurities could be induced in water after its treatment through the water distribution network or through the ground or roof water tanks located in residential premises, especially if these tanks are not regularly cleaned [29]. This is probably the main reason UAE residents prefer drinking bottled water and do not find tap water fit for drinking. A study showed that the main perceived concerns of UAE residents regarding tap water quality are the taste, contamination of bacteria, smell, color, temperature, and wrong blend of minerals [19]. Using reusable bottled containers is less harmful to the environment; however, the utilization of single-use bottles is widely practiced in the country. Environmentally friendly packaging is currently not commercially available. There are no directives or guidelines for future plastic water packaging worldwide; however, a plan should contain at least (1) a reduction at the source by limiting production and distribution, (2) promoting alternatives by limiting consumption, (3) improving the design by promoting eco-design, (4) improving the end-of-life outcome by optimizing collection and recycling, and (5) informing citizens by raising public awareness [30].

The availability, quality, brand, and cost were the important factors for residents when purchasing bottled drinking water. It was also observed that concern about the environment was significantly different between male and female respondents. The residents had limited knowledge regarding the difference between 100% biodegradable and recyclable plastic products. The analysis of responses collected in this survey study affirms that, although most of the participants showed concern about environmental pollution caused by single-use plastic water bottles, they were not practicing recycling very often. To increase the habit of plastic recycling among residents, information related to effective recycling and its associated environmental advantages must be rolled out by awareness campaigns and segregation programs. To encourage plastic recycling, more recycling bins could be introduced in public areas to provide easier access and convenience. In addition, a reward system could be introduced to encourage the recycling practice. The interest of UAE residents in eco-friendly plastic products was found to be limited, probably due to their lack of experience and the high price. Thus, efforts should be made to spread the knowledge of available products made of eco-friendly plastic and their long-term environmental benefits. Authorities should also provide firm regulations for recycling, and must check its ability to deal with the issue of growing plastic pollution.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su14052664/s1, Figure S1: Questionnaire about use of plastic versus biodegradable bottles for drinking water in the UAE.

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