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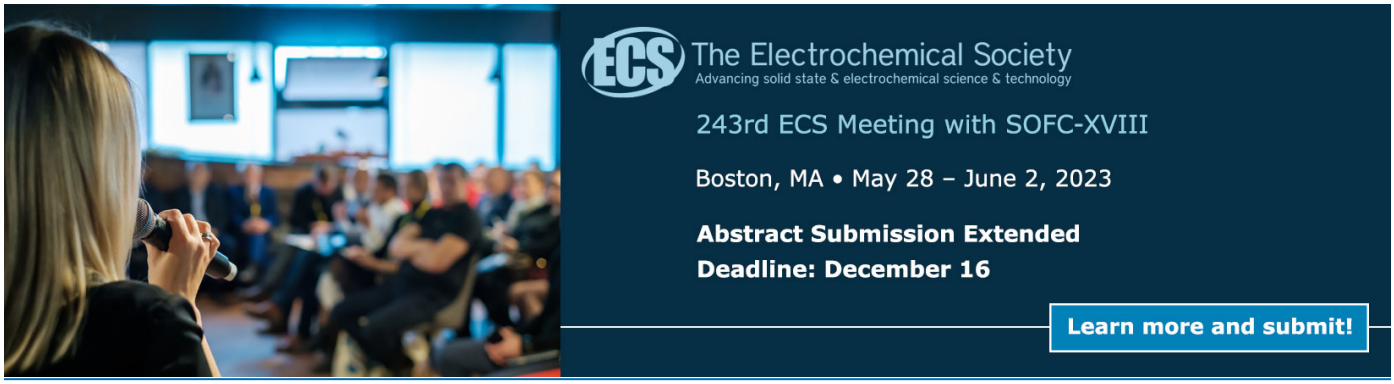

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Recycling Practices among B40 Community in Urban Area of Kota Bharu, Kelantan, Malaysia: An Insight Towards Environmental Sustainability

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Abstract. Recycling is one of the practical approaches in reducing solid waste disposal directly into landfills. Unfortunately, the recycling practices among the B40 community in urban areas of Kelantan are low compared to other states. Therefore, this study focused on identifying the recyclables generated by the B40 community and examined their knowledge and awareness level of recycling practices. The total number of respondents who participated in this study was 278. This study revealed that food waste is the most solid waste generated by the B40 community from PPR Kota Bharu. Moreover, this study also found that the B40 community's knowledge and awareness about recycling are good. However, this study has statistically proved that the knowledge level has a weak relationship and is not significant with the recycling practices among the B40 community ($r=0.111$, $p=0.065$). Besides that, this study found a significant weak association between recycling awareness and recycling practice among the B40 community ($r=0.153$, $p=0.012$). The findings of this study are important to local authorities to encourage recycling practices among the B40 community in PPR Kota Bharu and to make sure that the recyclable items are appropriately managed towards environmental sustainability.

1. Introduction

Over the years, the increase in solid waste generated because of the high consumption culture among urban communities and modern society has been a severe environmental problem [1]. As the human population grows, rapid development and urbanization continue, resulting in a rapid increase in solid waste. The main factors contributing to the increasing trend of solid waste generated are the high population rate and rapid economic growth, which contributes to a society with high per capita income [2]. The production and generation of solid waste have also been a concern when most landfills reach the limit of their capacity.

The 3Rs (Reduce, Reuse, Recycling) implementation and enforcement have been adopted to reduce the solid waste generated in Malaysia. For example, limiting materials usage and implementing coding labels for environmentally friendly products to advocate recycling and reduce environmental impacts [3]. The previous study highlighted the poor recycling practices among the urban community,

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especially the B40 community, because of a lack of knowledge and awareness of recycling [4]. The B40 community refers to Malaysia's bottom 40% household income group lower than average [5]. About 2.7 million households are in the B40, of whom 44% are in the rural areas and 56% are in the urban areas. These families have a collective household income of about RM2,537.00 a month and below. Within this category of the B40 are the vulnerable poor identified as families with incomes between the Poverty Line Income (PLI) and 2.5 times PLI [6].

Poor recycling practices will cause many solid wastes to be generated and disposed of in landfills. Approximately 95% of Municipal Solid Waste in Malaysia is disposed of in landfills rather than being recycled or treated using alternative methods such as composting, which is not sustainable and causes several environmental, public health, social, and economic concerns [7]. Liu et al. [8] discovered that majority of the poor urban community were unaware of solid waste recycling. In addition, Omran et al. [9] surveyed public knowledge on household solid waste recycling in Malaysia, discovering that awareness significantly influences the recycling practice. The increase in waste also happens because of low recycling practices in the community. A study found that 31.8% of those respondents participated in recycling activities. The remaining 68.2% of respondents said they had never participated in a recycling activity in their community [10].

Moreover, most of the urban communities in the East Coast of Malaysia have low knowledge and are not aware of the importance of recycling [11]. Most recyclables are being dumped without segregation [12]. The solid waste generated in Kota Bharu has increased by days. The primary factor contributing to the escalated solid waste number is the increase in population number. In Kota Bharu, the population in 2018 was 339,000 in 2018 and increased to 352,000 in 2021. In Kelantan, the recycling system is still unsatisfactory because of the lack of facilities to support recycling activity [12].

The previous study by Li et al. [13] found an association between recycling knowledge and practices with the sociodemographic profile of the respondent. Besides that, many studies highlighted the relationship between knowledge and awareness about recycling with the sociodemographic status of respondents, such as gender, age, level of education and income [14, 15]. Therefore, this study explored the types of solid waste generated and examined the factors that influence the recycling practice among the B40 community in Kota Bharu, Kelantan.

2. Methodology

2.1. Study area

The study focusses on the B40 community in urban area which is *Program Perumahan Rakyat* Kota Bharu (PPR Kota Bharu). The '*Program Perumahan Rakyat*' is an initiative by the Ministry of Housing and Local Government to help the B40 community to buy their first house. PPR Kota Bharu consist of 1000 of houses which divided into three different blocks (Block A, B, and C). PPR Kota Bharu has been selected as study area because the characteristics of the occupant which are B40 community. Besides that, the location of PPR Kota Bharu that located in the Kota Bharu city centre (Figure 1).

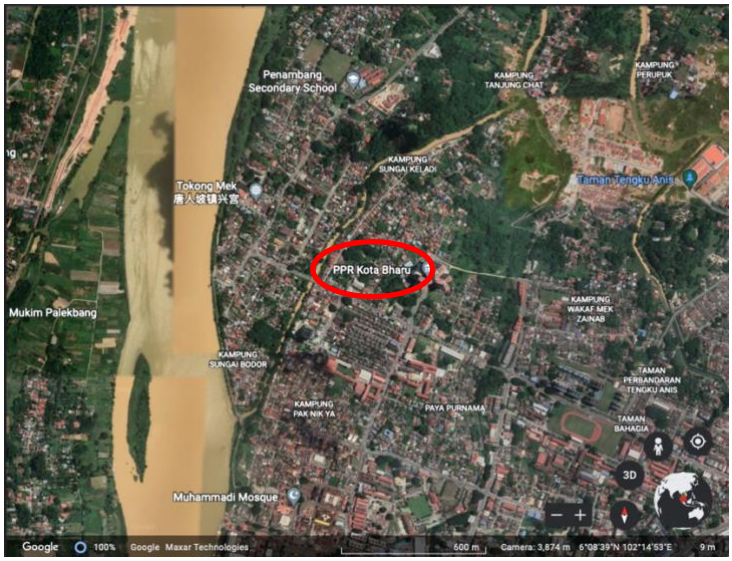

Figure 1. The location of PPR Kota Bharu in the Kota Bharu City Centre. (Source: Google Earth)

2.2. Data Collection

2.2.1. Sample size. The sample size of respondents being determined using the Krejcie and Morgan table. Based on the Krejcie and Morgan table, the minimum number of households required for the total 1000 households is 278 [16].

2.2.2. Sampling technique. The respondents were selected using the convenience sampling method. Convenience sampling method being used in this study because it can collect data quicker and easier because the sample are more easily accessible [17]. Besides that, this method is adopted because cost effective and time saving compared to other sampling methods.

2.2.3. Instrument development. Structured questionnaires being designed and distributed to the respondents in the area to collect the data based on the objectives of this study. The questionnaires will consist of three parts which are A: Demographics Profile of Respondent, B: The Knowledge and Awareness of the Respondents about Recycling, and C: The Practices of Recycling. The validations of the questionnaire were done by the expert to obtain good data for the study. A pilot test also was conducted using 30 respondents in the study area to make sure that all the questions can be understand by the respondents and to test the reliability of the questionnaire. Table 1 shows the reliability test of all items in the questionnaire revealed an alpha value of associated variables, indicating moderate internal consistency. Cronbach's Alpha value was used to calculate the reliability test. The purpose of this test was to determine the questionnaire's reliability by taking into consideration zero or very few random measurements error. Alpha scores between 0.70 and 0.95 were considered acceptable [18]. If the Cronbach's alpha value is unsatisfactory, the question is untrustworthy and must be altered.

Table 1. Reliability Test

Variables	Cronbach Alpha
Knowledge	0.751
Awareness	0.891
Practices	0.841

2.3. Data analysis

2.3.1. Normality test. Normality test being used to determine whether the data that been collected are normal distribution or not. In this study, the normality test used by using Kurtosis and Skewness test. Skewness is a representation of a distribution's symmetry. The skewness of a symmetrical dataset would be 0. As a result, a regular distribution has a skewness of 0. Skewness is a metric that compares the size of the two tails. Meanwhile the total size of the two tails is calculated by kurtosis. It's a metric on how much chance there is in the tails. The kurtosis of the regular distribution, which is equal to 3, is often used as a comparison point. Table 2 shows the skewness and kurtosis were far from 1.0, indicating that the variables' distribution was not normally distributed, as a normal distribution has no skew. When the data was not normal, a non-parametric test was applied. So, for the sociodemographic gender, the Mann-Whitney U test conducted for age, education, and income of the respondent, the Kruskal Wallis being executed.

Table 2. Normality Test

	Skewness	Kurtosis
Knowledge	-5.284	10.884
Awareness	-2.199	6.188
Practices	-2.440	3.149

2.3.2. Descriptive analysis. Using the data obtained based on the study, a descriptive analysis conducted. The table of percentage of Part A: Socio-demographic Profile of Respondents was created. In this Part A, it will be including the percentage of the gender, age, education, and occupation to determine the analysis of the socio-demographic of the respondents. For Part B and C: Knowledge and Awareness, and Recycling practices, the data obtained to measures frequency and percentage. In this part, the frequency and percentage of the respondent's knowledge and awareness, and recycling practices to know whether it is high level or low level of percentage. For the mean score of awareness and practices in this study the Likert scale have been provided. The interpretation of the mean score have been done to know the scale of the awareness and practices. Table 3 shows the scale of mean score to measure knowledge level that has been proposed by Bringula et al. [19].

Table 3. Scale of Mean Score to measure knowledge level

Mean Score	Scale
0.00–1.50	Very low
1.51–2.50	Low
2.51–3.50	Moderate
3.51–4.50	High
4.51–5.00	Very high

2.3.3. Inferential analysis. the Man-Whitney U method was conducted to determine the significant different between mean within the group based on the socio-demographic result which are for gender (male/female) of knowledge and awareness of recycling and Kruskal Wallis test for the age, education, employment, and income level of the respondent of knowledge and awareness. It is to compare the sociodemographic influence in recycling practices among the urban community. Then, the knowledge and awareness, and the recycling practices also being calculated using the inferential statistic which is

the spearmen-rho correlation method to obtain the information about the relationship between knowledge, awareness, and practices to know whether the level of knowledge and awareness can influence the practices of recycling in the community. The coefficients of Spearman's correlation range from -1 to +1. It is a positive or negative monotonic connection depending on the sign of the coefficient. For the positive correlation, it happens when one variable rises, the other tends to rise as well while the negative correlation indicates that when one variable rises, the other tends to fall. Stronger links are represented by values near to -1 or +1 than by values close to zero. The null hypothesis is a common mathematical theory that states that no statistical link or significance exists between two sets of observed data and measurable events in a set of single observable variables. Hypotheses are crucial in determining the significance of variations in experiments and data. The null hypothesis of no difference is denoted by H_0. It is assumed to be true unless proof to the contrary is shown using the p-value of the data that being measured [20].

For the Man-Whitney Test the null hypothesis have been determined as:

Null Hypothesis H_0: Socio-demographic of gender differences do not affect the knowledge and awareness of the urban community on recycling.

For the Kruskal Wallis Test the null hypothesis have been determined as:

Null Hypothesis H_0: Socio-demographic of age, education level, employment and incomes differences do not affect the knowledge and awareness of the urban community on recycling.

3. Results and Discussion

3.1. Socio-demographic profile

Table 4 shows that 27.3% of respondents have a secondary school level followed by Diploma (25.9%), Bachelor's degree (16.5%), certificate (12.9%), primary school (6.8%) and postgraduate (0.7%). The level of education is significant because, according to Saat et al, [12], a lack of knowledge and low education level may be one of the reasons why most respondents are likely not to participate in the necessity of environmental protection.

Besides that, the highest total income is from B4 (RM3,971 - RM4,850) (33.8%) followed by B3 (RM3,171 - RM3,970) with 77 respondents. Majority of respondents participated in this study are adult with age more than 30 years old. The majority religion of the head household is Islam with 84.2 % made up from 278 respondent, followed by Hindu and Buddha religions with have same percent, which were 6.1% followed by Kristian 3.6%.

Table 4. Sociodemographic profile of respondents

Variables	Frequency	Percent (%)
Gender of Head of Household		
• Male	204	73.4
• Female	74	26.6

Variables	Frequency	Percent (%)
Age of Head of Household		
• 25 and below	18	6.5
• 26-30	26	9.4
• 31-40	60	21.6
• 41-50	79	28.4
• 51-60	66	23.7
• 61 and above	29	10.4
Race of Household		
• Malay	231	83.1
• Chinese	30	10.8
• India	17	6.1
Religion of Head of Household		
• Islam	234	84.2
• Hindu	17	6.1
• Buddha	17	6.1
• Kristian	10	3.6
Employment of Head of Household		
• Not working/ Housewife	20	7.2
• Self-employed	78	28.1
• Government	72	25.9
• Non-government	78	28.1
• Retired	30	10.8
Household income		
• B1 (Below 2500)	48	17.2
• B2 (RM2,501 - RM3,170)	59	21.2
• B3 (RM3,171 - RM3,970)	77	27.8
• B4 (RM3,971 - RM4,850)	94	33.8
Education background of Head of Household		
• Primary School	19	6.8
• Secondary School	76	27.3
• Skill certificate	36	12.9
• Diploma	72	25.9
• Degree	46	16.5
• Postgraduate	2	0.7
• No formal education	27	9.7
The number of years settled in the present residence		
• <1 year	6	2.2
• 1-3 years	52	18.7
• 4-5 years	168	24.5
• 6-9 years	52	18.7
• >10 years	0	0

3.2. Knowledge level of B40 community about recycling

Table 5 shows that the knowledge of community in PPR Kota Bharu towards the recycling is high because most of the statement got 90% of correct answer. Besides that, approximately 0.4% of respondent score low in knowledge, 1.1% of respondents score moderate level in knowledge and the majority (98.5%) of respondents score the high level in recycling's knowledge. According to Rashid et al [21], researchers can employ several theories and create their own index based on the study's aims. As a result, the mean score has been used to categories the mean value of low, moderate, and high scores. The lower score the number of respondents that get 1-3 total score, for moderate it is 4-5 total score and high is 6-8 total score based on previous study that also have the 3 indicators which are low, moderate, and high [21]. Table 5 also mention about the total mean for all the question in this survey also showed that the level of knowledge can be classify as high with total mean score 7.86/8.

Table 5. Percentage of correct and wrong answer-based respondent's knowledge about recycling

Statements	**Correct**	**Wrong**
	N (%)	**N (%)**
1. Plastic, newspapers, cans are among the materials that can be recycled.	277 (99.6)	1 (0.4)
2. By adapting 3R (reduce, reuse and recycle), it can reduce the quantity of solid waste disposed	277 (99.6)	1 (0.4)
3. Food waste can be composted and used for plants as fertilizer.	270 (97.1)	8 (2.9)
4. Recycling can reduce waste disposal directly to landfills.	276 (98.9)	3 (1.1)
5. Recycling can help to save energy.	266 (95.7)	12 (4.3)
6. Recycling can help to reduce pollution to the environment.	276 (99.3)	2 (0.7)
7. By adapting the concept of recycling, it can preserve nature for a longer period.	271 (97.5)	7 (2.8)
8. Preserving the sustainability of the environment, can help to ensure that future generations are able to live better.	272 (97.8)	6 (2.2)
Mean score of knowledge:	**7.86/8 (High)**	

3.3. Awareness level of B40 community about recycling

The statistical analysis shows that majority of respondents (>60%) are aware about recycling (Table 6). Besides that, limited number of respondents (<5%) declare that they are not aware about the importance of recycling. Table 6 shows the total average mean score of awareness towards the importance of recycling is 4.05 which indicates that respondent's awareness about recycling is high.

Table 6. The descriptive results of respondent's awareness about recycling

Statements	**Mean (SD)**	**1 (Strongly Disagree)**	**2 (Disagree)**	**3 (Neutral)**	**4 (Agree)**	**5 (Strongly Agree)**
		N (%)	**N (%)**	**N (%)**	**N (%)**	**N (%)**
1. I am aware that recycling practices can help in minimizing the waste in the residence.	4.04 (0.81)	12 (4.3)	0 (0)	14 (5.0)	190 (68.3)	62 (22.3)
2. I am aware of the label of recycling bins for segregation.	4.10 (0.93)	12 (4.3)	1 (0.4)	33 (11.9)	132 (47.5)	100 (36.0)
3. I am aware that the identification of biodegradable and non-biodegradable are important for waste segregation	4.00 (0.88)	12 (4.3)	4 (1.4)	24 (8.6)	170 (61.2)	66 (24.5)
4. I realize that recycling is important for myself, family, economy and environment.	4.02 (0.87)	12 (4.3)	2 (0.7)	25 (9.0)	168 (60.4)	71 (25.5)
5. I am aware that without proper segregation of waste or garbage can lead to the spread of infectious diseases	4.08 (0.87)	11 (4.0)	1 (0.40	26 (9.4)	156 (56.1)	84 (30.2)
6. I realize that by applying recycling practices, I can live in a cleaner and healthier	4.10 (0.91)	12 (4.3)	4 (1.4)	18 (6.5)	153 (55.0)	91 (32.7)
Total average mean: 4.05/5 (High)						

3.4. Recycling practices among B40 community

Table 7 shows that the mean score of recycling practices is 3.61 which categorized as good practices towards recycling. However, there are still improvement can be done to enhance the practices of recycling among B40 community in PPR Kota Bharu.

Table 7. The descriptive results of respondent's recycling practices

Statements	Mean (SD)	1 (Never)	2 (Rarely)	3 (Sometimes)	4 (Very Often)	5 (Always)
		N (%)	N (%)	N (%)	N (%)	N (%)
1. I segregate household waste before throwing it in the trash bins.	3.34 (1.30)	54 (19.4)	88 (31.7)	68 (24.5)	27 (9.7)	41 (14.7)
2. I send old books and other recyclable items to a recycling center.	3.23 (1.02)	13 (4.7)	50 (18.0)	105 (37.8)	80 (28.8)	30 (10.8)
3. I reuse old clothes as	4.35	1	18	27	70	162

cleaning cloths for the kitchen, wipe mirrors and cars.	(0.93)	(0.4)	(6.5)	(9.7)	(25.2)	(58.3)
4. I bring my own eco-friendly bag while going shopping.	3.30 (1.17)	23 (8.3)	46 (16.5)	78 (28.1)	87 (31.3)	44 (15.8)
5. I collect recycled items to be sold to the recycling center	3.46 (1.11)	16 (5.8)	34 (12.2)	88 (31.7)	87 (31.3)	53 (19.1)
6. I buy items such as clothes, food and electronics based on my needs and not according	3.61 (1.12)	11 (4.0)	39 (14.0)	69 (24.8)	87 (31.3)	72 (25.9)
Total average mean: 3.61 (High)						

3.5. Socio-demographic factors influence the knowledge and awareness

A Mann-Whitney U test indicated that the level of knowledge towards recycling of the female participants (Mean Rank = 141.32, n = 74) were slightly higher than those of the male participants (Mean Rank = 138.84, n = 204), U = 741.30, z = –0.49 (corrected for ties), p = 0.63. For the level of awareness of recycling, the Mann- Whitney U test also indicated that the female participants (Mean Rank = 149.08, n =74) were slightly higher than those of the male participants (Mean Rank = 136.84, n = 204), U = 683.90, z = –1.23 (corrected for ties), p = 0.219. Based on this result, it's shows that, there are no significant value of the different between gender and level of knowledge and awareness of recycling. In this result, the null hypothesis being accepted as the significant value of the p value is larger than 0.05. This result proved that the different gender (male/ female) did not influence the level of knowledge.

A Kruskal-Wallis test indicated that there were no statistically significant differences between the knowledge of recycling with the age of respondents assigned to the 18-25 years old (Mean Rank = 150.50), 26-30 years old (Mean Rank = 145.35), 31-40 years old (Mean Rank = 146.03), 41-50 years old (135.78), 51-60 years old (Mean Rank = 135.78) and for age 61 above (Mean Rank = 135.90), H (corrected for ties) = 4.72, df = 4, N = 278, p = 0.318. Next, Kruskal-Wallis tests also revealed that no statistically significant differences in recycling awareness among respondents aged 18-25 years (Mean Rank = 136.92), 26-30 years (Mean Rank = 129.40), 31-40 years (Mean Rank = 128.86), 41-50 years (140.87), 51-60 years (Mean Rank = 147.57), and 61 years and older (Mean Rank = 150.07), H (corrected for ties) =4.67, df= 4, N= 278, p= 0.371. The Kruskal-Wallis also found that, people with the age 51 and above have higher mean rank towards awareness of recycling, while for knowledge the younger age had higher mean rank. The previous study shows that in comparison to younger individuals, persons aged 55 and over are reported to be more engaged in recycling due to their awareness towards recycling is better [22]. Counter to that, based on this result, the null hypothesis for the Kruskal Wallis have been accepted as the test showed that the age of head household has high value that the significant value which is 0.05 which showed different between the descriptive and inferential analysis.

The Kruskal Wallis test was also run to know the significance of education and the knowledge and awareness of recycling practices. For education level and knowledge, the result shows that no statically significant value among respondent that have no formal education background (Mean Rank =139.72), primary school (Mean Rank = 136.39), Secondary school (Mean Rank =134.03), Skill certificate (Mean Rank = 138.69), Diploma (Mean Rank = 141.93), Degree (Mean Rank = 144.48) and lastly Postgraduate (Mean Rank = 150.50), H (corrected for ties) =3.33, df= 6, N= 278, p= 0.76. Next, for education of head household and the awareness towards recycling, it can be seen that using Kruskal Wallis test, the result shows no statically significant value among respondent that have no

formal education background (Mean Rank =151.37), primary school (Mean Rank = 152.92), Secondary school (Mean Rank =132.24), Skill certificate (Mean Rank = 149.14), Diploma (Mean Rank = 145.13), Degree (Mean Rank = 120.88) and lastly Postgraduate (Mean Rank = 179.75), H (corrected for ties) =5.89, df= 6, N= 278, p=0.436.

The Kruskal Wallis result also shows that, the mean rank which is the descriptive analysis of the postgraduate is the highest for both knowledge and awareness, which shows that the same result with Callan and Thomas [23], who concluded that the high level of education have high level of recycling knowledge however the findings are contradicts with the results by Akil and Siong [3] that mention people with low level of educations are tend to be more aware of the recycling. Nonetheless, the null hypothesis for education of head household between knowledge and awareness are not significant as the null hypothesis being accepted. So, based on this result it showed knowledge and awareness do not have different between education oppose to other study that suggest education play crucial role in knowledge and awareness of respondents in recycling [22].

The income of the household (accumulated) and the knowledge also being test and the result also shows it is not significant among the income of B1 below RM2500 (Mean Rank = 144.65), B2 (Mean Rank = 134,.42), B3 (Mean Rank = 140.03), B4 (Mean Rank = 138.75), H (corrected for ties) =3.548, df= 3, N= 278, p= 0.74. Next, the income of the household (accumulated) and the awareness shows it is not significant among the income B1 which is below RM2500 (Mean Rank = 128.27), B2 (Mean Rank = 126.19), B3 (Mean Rank = 150.84), B4 (Mean Rank =148.95, H (corrected for ties) =5.63, df= 3, N= 278, p= 0.47. Based on study by Callan and Thomas [23] found that high level of income will lead to higher rate of recycling. It is same with this research findings that shows the respondent with the income between RM300-RM5000 have the higher mean rank of awareness and knowledge. However, for the inferential analysis, null hypothesis being accepted as the income of head household have no significant value between knowledge and awareness which contradict to study by Duggal et al. [24] who suggest their influence between knowledge and income of respondents.

3.6. Relationship between recycling practice with knowledge and awareness level about recycling

This study demonstrates the link between knowledge and practices. It reveals that there was a weak positive link between knowledge and practices, which is not significant as seen by the low correlation coefficient and a p-value greater than 0.05 (r=0.111, n=278, p=0.065). Based on this result it showed that, the knowledge and practices are not link to each other.

This study also found out that there is a weak link between awareness and practices. Nonetheless, there is a significant weak association between awareness and practices (r=0.153, n=278, p=0.012). However, the study by Barudin et al. [22] concluded that, while most people are aware of the need of recycling, this awareness does not always convert into recycling practices which contradict to the finding of this study that showed there are relationship between the awareness and practices of recycling.

In this study, it can be observed that the level of knowledge has no significant association with the recycling practices while awareness of recycling in PPR Kota Bharu showed that the relationship between awareness and practices of recycling did exist. It being determine that, in PPR Kota Bharu, the respondent have good level of awareness and can lead to good recycling practices however the link between these two relationships is still low which obviously need improvement. So, improvement in level of awareness could lead to lots of recycling practices in this area of study.

4. Conclusion

This manuscript aims to explore the recycling practices among the B40 community in the urban area of Kota Bharu Kelantan. This study has identified the recyclable materials that are able in the area of study, the level of knowledge, awareness and practices towards recycling, and the relationship between the factors that influence recycling practices. Food waste can be used as compost for the plants, and cooking oils can be sent to the recycling centre to be processed into other products. In PPR Kota Bharu, the waste generated includes the recyclable materials, which shows that if they actively

participate in the recycling practices, they will contribute to a very good sustainable lifestyle. Reduced and recycled home garbage has grown more critical in recent years as waste creation has increased owing to population growth and economic development. The outcomes of this study revealed that the age of the older respondent influences their high degree of recycling awareness. Still, the knowledge of the younger respondent is more advanced in terms of recycling knowledge. There is a high level of public knowledge and awareness for recycling households, but the practice level of recycling in PPR Kota Bharu still needs improvement.

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