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Consumer's Perception and Satisfaction About Household Water Filter at Taman Tunku, Miri Sarawak

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Abstract: Water filter have no longer becomes a desire but more to necessity. This is because humans need to consume water for their daily routine to stay hydrated. This allows the users to choose which water filter suits their preferences and what factors affect the decision-making buying a new water filter. Therefore, the objectives of this study are to investigate the level of understanding and knowledge of consumers about the household water filter identify the satisfaction level of a consumer once they used the water filter, to evaluate the response level of consumers towards the improvement of water quality using household water filters and to determine the satisfaction level of consumers using household water filters. This study employs a quantitative approach, employing the Cronbach's Alpha Test and the Chi-Square Test to assess the reliability and dependability of its variables. The Cronbach's Alpha test result for this study is 0.873, indicating that the variables provided are reliable enough. In contrast, the Chi-Square Test result shows the calculated value for gender and its level of satisfaction is 15.80, for the consumer's age and level of satisfaction is 55.01, for the consumer's profession and level of satisfaction is 35.29, and finally for the years settled, and the level of satisfaction is 35.29. These variables suggest that the variables have a significant relationship. To summarize, the decision to own a water filter is more likely to be driven by the consumer's knowledge of the importance of the water filter as well as the benefits that it provides over time, as these consumers have noticed that the water becomes more evident and have more confidence in drinking water directly from the water filter.

Keywords: Water Filter, Knowledge, Satisfaction

1. Introduction

One of the most basic requirements of human life is water. The human body requires clean and healthy water to be hydrated. Therefore, water system development, such as water pipe systems, has become one of the most significant necessities in everyday human existence as time has gone. Years after introducing of water pipe systems into human life, human concept and understanding have

improved, particularly the idea of ensuring that the water supplied by the water pipes is clean and safe enough to be utilized in our daily lives. Humans must consume safe drinking water as it may affect our body which can cause long-term or short-term effects. There are two classifications drinking water: pure water and also safe water. Pure water is described as free of all foreign substances, whether they are harmful or not. While safe water may contain impurities, these contaminants will not harm humans and must be kept under acceptable limits [1]. According to the study, the water filter system is believed to have eliminated 99 percent of the turbidity and suspended particles [2]. Because of the poor quality of piped water in Malaysia, the need for domestic water filters is increasing [3]. This is why installing a household water filter is vital to have safe drinking water [4].

Therefore, this study focused on which factors will affects these consumers' decision-making regarding purchasing the water filter. Thus, three objectives that have been made for this study which is to investigate the level of understanding and knowledge of consumers about the household water filter, to evaluate the response level of consumers towards the improvement of water quality using household water filters and also to determine the satisfaction level of consumers after using household water filters.

Water quality can be determined by a several parameters, including the concentration of dissolved oxygen in the water molecules, the amounts of bacteria present, the salinity of the water, and the number of debris suspended in the water molecules, to name a few. In some regions of the water, the absorption of tiny algae and the quantities of pesticides, herbicides, heavy metals, and any other contaminants will also contribute to the pH level of the water concentration. Water quality also can be defined as the chemical, physical and biological characteristics of water, usually in respect to its suitability for a designated use [5]. Natural contaminants, particularly inorganic contaminants derived from the geological layers through which the water flows, and anthropogenic pollution by microorganisms and chemicals, are present in all water [6].

There are several kinds of drinking water filtration activated carbon, reverse osmosis, ultraviolet (UV) light, and nanofiltration. Activated carbon can filter out a range of contaminants found in the drinking water including metals such as copper and lead, cleaning solvents and chlorination byproducts. An activated carbon filter functions as both an adsorbent for organic carbon and a substrate for microbial development [7]. As for reverse osmosis, the water will be going through a semipermeable membrane which will traps the suspended solids and gives us fresh and clean water. The process called reverse osmosis typically works in three simple ways it will be moved to sediments, chlorines, and any other small particulates. Next, for the Ultraviolet (UV) light, the absorption methods are used by many forms of water purifiers to eliminate chemical pollutants, but UV purification is different. UV light filters use ultraviolet light wavelengths to purify water. Although these UV filter compounds have a short half-life in seawater, they are constantly reintroduced through recreational activities and wastewater discharge, making them environmentally persistent [8]. Lastly, nanofiltration is a liquid separation membrane technology with many similarities to the reverse osmosis process. The pore size of the nanofiltration filter is roughly 0.001 micron. Most organic molecules, almost all bruises, most natural organics debris, and a variety of salts being removed using the nanofiltration.

For the characteristics in the water filter system involving the sequestration filter, ion exchange filter, reverse osmosis filter. Compared to metal oxidation and removal, sequestration is a less costly treatment option. The iron and manganese sequestration combinations to avoid precipitation and associated water quality issues such as turbidity, color, and stains. Metals are complexed with polyphosphates during sequestration, but not eliminated. As for the ion exchange filter, polymer that binds positively charged ions is utilized in the resin of a calcium exchange filter. Calcium and magnesium bond to the polymer more effectively than sodium. The sodium ions in the polymer are initially saturated, which indicates that sodium ions are available for exchange at the surface of each bead. The calcium and magnesium ions link to the polymer when hard water runs through it, displacing the sodium.

Although the water that emerges is softer, it contains more sodium. When the resin is depleted, it can be regenerated by immersing it in a strong salt solution, which causes the sodium to reattach to the

resin, reusing it. Other ions, such as bicarbonates or heavy metals, can be extracted in the same way using different types of resin. Lastly, for the reverse osmosis filter. It is a process where pressure is applied to drive water through a partially permeable membrane, which will cause the pollutants to be removed from the supply at the end of the day. The particles will pass through the small holes (known as pores) in the membranes, but not the molecules that make up the contaminants in the water. Impurities can be found in desalination systems, and pollutants and silt in residential reverse osmosis filters. The reverse osmosis process generates two fluids: purified water and brine, which includes all contaminants from the source water that could not pass through the membrane. Reverse osmosis water filtration has few stages: sediment pre-filter, carbon pre-filter, semi-permeable membrane, storage, and lastly post-filter.

2. Materials and Methods

This study applied a quantitative approach, with structured questionnaires distributed to Taman Tunku, Miri Sarawak residents as the targeted respondents. This survey was conducted at the Taman Tunku Miri area as the target of the study was located in an area that has around 1,000 units of houses. However, for this study, the target respondents are about 100 people only in which one person represents one unit of the house, and as for one place, there should be one water filter.

The online platform has been used to connect with these respondents to achieve an appropriate number of targeted respondents. The sample questions will be given to the respondents using Google Form. The questionnaires are divided into four sections that correspond to the study's objectives. Section A will cover the demography of respondents, Section B is general knowledge about household water filters, Section C is to cover the satisfaction of these consumers after using a water filter and Section D is Evaluating the level of response of consumers after a using water filter. Furthermore, respondents must assign a scale from 1 to 5 ranging from strongly disagree to agree strongly. In other words, 1-strongly disagree, 2-disagree, 3-moderate, 4-agree, 5-strongly agree [9] and while another part uses satisfaction indicator with the 5-point Likert scale technique which is 1-very dissatisfied, 2-dissatisfied, 3-moderately satisfied, 4-satisfied and 5-strongly satisfied.[10]

Table 1: Likert Scales to measure satisfaction

Level of Satisfaction	Very Dissatisfied	Dissatisfied	Moderately Satisfied	Satisfied	Strongly Satisfied
Scale	1	2	3	4	5

Table 2: Likert Scales to measure agreement

Level of Agreement	Strongly Disagree	Disagree	Moderate	Agree	Strongly Agree
Scale	1	2	3	4	5

The Cronbach Alpha test will be used and conducted by using SPSS software to obtain the consistency of the parameters to test the reliability set of data. To ensure validity, a test's internal consistency should be validated before it being used for study or examination. Furthermore, reliability estimates demonstrate how much measurement error there is in a test. Simply put, the correlation of a test with itself is this understanding of dependability. It indicates that the variables given were reliable enough as in standard value, the value of 0.70 can be considered as a sufficient measure of reliability or internal consistency of an instrument [11]

Apart from that, the Chi-Square Test is also being used to determine whether the variables given in this study are have a significant relationship or not. This will determine whether the null hypothesis is accepted or being rejected depending on the results that it gains. The formula that can be used in calculating the is as follows:

$$\sum x^2{}_{i-j} = \frac{(O-E)^2}{E} \, Eq. 1$$

3. Results and Discussion

There are 4-four questions to discover the background of the respondents who participated in the survey. The questions asked to the respondents are regarding their range of gender, age, profession status and years settled at Taman Tunku, Miri.

3.1 Cronbach's Alpha Test

The first one is regarding the Cronbach's Alpha test. Cronbach's Alpha tests measure the internal consistency between the test items. And then it will be calculated using SPSS and the results given later will determine whether the data can be considered as reliable or not.

Table 1: The mean, standard deviation and Cronbach's Alpha value.

No.	Consumer's perception and satisfaction about household water filter at Taman Tunku, Miri Sarawak	Mean	Standard Deviation	Cronbach's Alpha
1	General knowledge about household water filter	9.36	1.348	
2	Satisfaction of these consumers after using a water filter	25.92	7.166	
3	The level of response of consumers after using a water filter	24.43	4.706	0.873

Based on the table above, the value of Cronbach's Alpha reliability statistic generated from analyses reliability by SPSS software is 0.873 for 21 questions that is in the questionnaire. Therefore, a value of 0.70 can be deemed a sufficient assessment of an instrument's reliability or internal consistency.

3.2 Analysis of the respondents based on general knowledge about household water filter

Table 2: General knowledge of the respondents about household water filter

No	Element	Percentage (%)
1.	Are you the water filter user?	90.9
2.	Do you know the function of a water filter?	95.0
3.	Do you know that water filter has many types of brands?	94.0
4.	Based on your understanding, did the water filter, filter out the bacteria and virus that is in the water?	76.8
5.	Did you know that water filter has different types of characteristics system?	83.0
6.	Did you buy the water filter to increase the water quality at home?	91.9
7.	In your opinion, does it necessary for every household to have a water filter?	92.0
8.	Did you buy the water filter because of the trends nowadays?	64.6

Based on the figure of the percentage below, there are 90.9% of respondent uses the water filter at home while the other 9.1% of the respondent did not use the water filter at home. According to the pie chart below, it can be concluded that almost all of the respondents who live at Taman Tunku, Miri use a water filter for drinking water in their daily consumptions. There are 95% of the respondents who knows the function of the water filter. Almost all the respondents at Taman Tunku who use the water filter understand that the water filter can remove all the impurities, taste and odor for a better quality of drinking water. For the percentage of the respondents regarding the knowledge about various brands of water filter, there are 94% of the respondents know about the different brands of household water filter that has been sold in Malaysia's current market and 6% of that still do not know about the various brands of water filter. These days, many promoters have promoted the variety of water filter in the shopping mall. The highest percentage of respondents who knows about the water filter that can filter out the bacteria is 76.8%, as these respondents have seen the evidence that stating the water filter can remove the bacteria and also, they think that the water filter can remove the bacteria as the water seems clearer, odorless and cleaner from the previous state. Besides, 83% of the respondents know that household water filter has different characteristics systems. If the consumers want to buy the new household water filter, the promoter will explain the details about the water filter. The respondents, as consumers must be alert when purchasing the household water filter. About 91.9% of respondents who purchased the household water filter to increase the quality of water at home as these respondents knew and had believed with the ability of the water filter to make the water more safety to be drink and 92% of the percentage that responded that it is necessary to have a household water filter. The respondents also believe that a water filter is important and must for every house to have in their home to be used for daily activity. Lastly, 64.6% is the number of respondents who do not purchase the water filter due to current trends. Maybe the promotion or advertisement on television affects their decision to buy the water filter.

3.3 Analysis of the respondent's satisfaction after using a water filter

The Chi-square test to determines if a difference observed data and expected data is due to chance or if it is due to a relationship between the variables that currently being studied. These variables will also be tested with the Chi-Square Test to see if the computed value is lower or greater than the table value. In a nutshell, the Chi-Square Test can reveal which group is responsible for any observed variances.

Null hypothesis: There is no significant relationship between the gender of consumers with the level of satisfaction when using a water filter.

Table 3: Chi-Square Test Gender and Level of Satisfaction

Observe	Expected	(O-E)	(O-E) ^{2}	(O-E) ^{2}/E
10	9	1	1	0.11
46	55	-9	81	1.46
38	53	-15	225	4.23
110	95	15	225	2.38
104	96	8	64	0.67
10	11	-1	1	0.09
80	71	9	81	1.15
83	68	15	225	3.32
105	120	-15	225	1.87
114	122	-8	64	0.52
				x^2 calculated = 15.80

Degree of freedom	(Columns-10) (rows-1)
	(5-1) (2-1)
	4
Significance level, (α) =0.05	x^2 tabular
	9.49
	x^2 calculated
	15.80
	x^2 calculated > x^2 tabular

Result of tested Null Hypothesis: In the chi-square test calculated value is 15.80, the table value is equal to 9.49. The degree of freedom is 4, and the significance level is 0.05. Therefore, the calculated value is larger than the table value. Hence, the hypothesis null is rejected. In conclusion, there is significant relationship between the gender of the consumer with the level of satisfaction when using the water filter.

Null hypothesis: There is no significant relationship between the age of the consumer with the level of satisfaction when using the water filter**.**

Table 4: Chi-Square Test Age of the Consumer and Level of Satisfaction

Observe	Expected	(O-E)	(O-E) ^{2}	(O-E) ^{2}/E
19	12	7	49	4.15
86	75	11	121	1.61
93	71	22	484	6.78
118	127	-9	81	0.64
97	128	-31	961	7.51
1	4	-3	9	2.05
27	28	-1	1	0.04
17	27	-10	100	3.76
45	47	-2	4	0.08
64	48	16	256	5.36
0	4	-4	16	4.21
14	24	-10	100	4.14
11	23	-12	144	6.26
52	41	11	121	2.96
56	41	15	225	5.46
			x² calculated =	55.01

Degree of freedom	(Columns-10) (rows-1) (5-1) (3-1) 8
Significance level, (α) =0.05	x² tabular 15.51 x² calculated 55.01 x² calculated > x² tabular

Result of tested Null Hypothesis: In the chi-square test calculated value is 15.80, the table value is equal to 9.49. The degree of freedom is 4, and the significance level is 0.05. Therefore, the calculated value is larger than the table value. Hence, the hypothesis null is rejected. In conclusion, there is a significant relationship between the genders of the consumers with the level of satisfaction when using the water filter.

Null hypothesis: There is no significant relationship between the professions of the consumer with the level of satisfaction when using the water filter.

Table 5: Chi-Square Test Profession and the Level of Satisfaction

Overserve	Expected	(O-E)	(O-E) ^{2}	(O-E) ^{2}/E
13	13	0	0	0.0
74	81	-7	49	0.6
93	77	16	256	3.3
142	138	4	16	0.1
126	139	-13	169	1.2
7	5	2	4	0.8
48	33	15	225	6.8
22	31	-9	81	2.6
50	56	-6	36	0.6
55	56	-1	1	0.0
0	2	-2	4	2.0
5	13	-8	64	5.0
6	12	-6	36	3.0
23	22	2	4	0.2
36	22	14	196	9.0
			x^2 calculated =	35.29

Degree of freedom	(Columns-10) (rows-1) (5-1) (3-1) 8
Significance level, (α) = 0.05	x^2 tabular 15.51 x^2 calculated 35.29 x^2 calculated > x^2 tabular

Result of Tested Hypothesis: From the data above, in chi-square test calculated value is 35.29. The table value is 15.51. Therefore, the degree of freedom is 8, and the significance level is 0.05. Hence, the hypothesis is given, which is the null hypothesis was rejected. Meaning that there is a relationship between the profession of a person and the level of satisfaction that they can get when using the water filter.

Null hypothesis: There is no significant relationship between the years settled and level of satisfaction when using the water filter.

Table 6: Chi-Square Test Years Settled and the Level of Satisfaction

Observe	Expected	(O-E)	(O-E) ^{2}	(O-E) ^{2}/E
13	10	3	9	0.94
73	61	12	144	2.36
64	58	6	36	0.62
101	103	-2	4	0.04
85	104	-19	361	3.47
0	5	-5	25	4.63
44	34	10	100	2.92
33	33	0	0	0.00
47	58	-11	121	2.08
65	59	6	36	0.61
7	5	2	4	0.80
10	32	-22	484	15.24
24	30	-6	36	1.19
67	54	13	169	3.14
67	54	13	169	3.12
				x² calculated = 41.16

Degree of freedom	(Columns-10) (rows-1) (5-1) (3-1) 8
Significance level, (α) = 0.05	x² tabular 15.51 x² calculated 41.6 x² calculated > x² tabular

Result of Tested Hypothesis: Based on the table above, the chi-square test for the calculated value equals to 41.6 while the table value is 15.51. The degree of freedom is 8, and the significant level is 0.05. Therefore, the null hypothesis is being rejected. The study, it was found that a significant relationship between the numbers of years of the residents who had settled at Taman Tunku, Miri and the satisfaction when using the water filter.

4.4 Analysis of the response level of consumers towards the improvement of water quality using household water filters

Table 7: The level of response of consumers after using a water filter

No.	Evaluating the level of response of consumers after using water a filter	Level of agreement					Total number of respondents
		1	2	3	4	5	
1	Water filter can enhance the quality of water	1	1	15	36	47	100
2	Feel safer to drink the water from the water filter	1	2	15	39	43	100

3	The water came from water filter does not have any pungent smell or bad taste	3	1	12	37	47	100
4	The water from water filter clearer	2	2	10	35	51	100
5	Must buy the water filter for safe drinking water	1	3	19	39	38	100
6	The water that is being drink from water filter does not gives bad health to the consumer	20	16	12	19	33	100
	Total	28	25	83	205	259	600
	Percentage (%)	4.7	4.2	13.8	34.2	43.2	100%

The highest level of agreement for these overall items is number 4 and number 5 which most respondents agree and strongly agree with the questions given. This is because they feel safer to drink the water from the water filter as it is does not have any pungent smell, the water is clearer. Based on the table above, we can see that for level agreement of numbers 4 and 5, has the highest percentage of getting chose by the respondents as these two scales have 34.2% and 43.2% respectively. Apart from that, it can also be concluded that the respondent less likely to being disagree and strongly disagree. From the overall answer given by the respondent, it only receives 4.7% and 4.2% respectively as for the numbers of respondents who choose a moderate answer in all questions to receive a total percentage of 13.8%.

4. Conclusion

This research was carried out to establish the perceptions and the level of satisfaction that customers have after they use the water filter at home for their daily water consumption. As a result, the data obtained in this study should have met and respond to the objective that has been set. The analysis of the data shows that many of the consumers knows well about the water filter. It also brings meaning that these respondents would use water filter because of their capability to filter the unnecessary materials or substances out of the body. The researcher also believed that the respondents chose to use water filter as these respondents have basic knowledge regarding the water filter. Besides, these respondents also know how well and important it is for them to have one kind of water filter. For the satisfaction level of the consumer regarding the water filter, the consumers of the respondents mentioned that they agreed and were satisfied when they used the water filter, the condition of the water itself is clearer, which brings confidence in them to drink the water from the water filter directly. For recommendations to make this research study more accurate and dependable: increase the coverage amounts of residents when obtaining data. For better accuracy of information needed for this study, the coverage amounts at least increase up to 80 percent from the total amount of residents who lived at Taman Tunku, Miri. Lastly, the number of expert reviews which will review the questionnaire should be more than four to criticize and give their own opinions regarding the questions given. By doing this, the respondents could understand better and know which answers were suitable for their questions.

References

[1]   Bahari, M., Kamil, N. A. F. M., Akbar, N. A., & Mizad, M. (2018). Evaluation of fluoride concentration in a water filter system for households. International Journal of Integrated Engineering.

[2]   Butt, B. Z., & Rehman, K. U. (2010). A study examining the student's satisfaction in higher education. Procedia - Social and Behavioral Sciences.

[3]   Fatani, T. H. (2020). Student satisfaction with videoconferencing teaching quality during the COVID-19 pandemic. BMC Medical Education.

[4] Fawell, J., & Nieuwenhuijsen, M. J. (2003). Contaminants in drinking water. In British Medical Bulletin.

[5] Ferronato, N., & Torretta, V. (2019). Waste mismanagement in developing countries: A review of global issues. In International Journal of Environmental Research and Public Health (Vol. 16, Issue 6).

[6] Horricks, R. A., Tabin, S. K., Edwards, J. J., Lumsden, J. S., & Marancik, D. P. (2019). Organic ultraviolet filters in nearshore waters and in the invasive lionfish (Pterois volitans) in Grenada, West Indies.

[7] Hussain, W. A., Hadi, E. M., Ismail, M. M., & Alwan, L. H. (2020). Preparation of household water filter. Journal of Applied Science and Engineering.

[8] Lindgren, N., & Mortensen, J. (2018). Product development in low-income markets. Pdfs.Semanticscholar.Org.

[9] Patton, H., Krometis, L. A., & Sarver, E. (2020). Springing for safe water: Drinking water quality and source selection in central appalachian communities. Water (Switzerland), 12(3).

[10] Sadeddin, K., Naser, A., & Firas, A. (2011). Removal of turbidity and suspended solids by electro-coagulation to improve feed water quality of reverse osmosis plant.

[11] Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. Research in Science Education, 48(6).