Asian Journal of Research in Business and Management
e-ISSN: 2682-8510 | Vol. 2, No. 2, 31-42, 2020
http://myjms.moe.gov.my/index.php/ajrbm

Development and Validation of Knowledge, Attitude and Practice Questionnaire on the Consumption of Gum Arabic among Users in Malaysia

Aimi Syifaa' Abdul Halim[1]*, Hayati Adilin Mohd Abd Majid[2], Zuraini Mat Issa[1], Ruhaya Hussin[3], Sarah Yusoff[4]

[1]Faculty of Hotel & Tourism Management, University Technology MARA (UiTM) Malaysia, Selangor Branch, Puncak Alam Campus
[2]Faculty of Hotel & Tourism Management, University Technology MARA (UiTM) Malaysia, Terengganu Branch, Dungun Campus
[3]Department of Psychology, Kulliyyah Of Islamic Revealed Knowledge & Human Sciences, International Islamic University Malaysia
[4]Faculty of Computer and Mathematical Sciences, University Technology MARA (UiTM) Malaysia, Terengganu Branch, Kuala Terengganu Campus

*Corresponding Author: mymasteraimi@gmail.com

Accepted: 1 June 2020 | Published: 15 June 2020

Abstract: *Globally, the Gum Arabic (GA) market has been expected to grow, particularly due to its multi-functionality and health benefits. Various clinical studies and functional properties studies of GA have been conducted. But the study from users' insight is scarce, resulting in the inadequacy of validated questionnaire of knowledge, attitude and practice of users' GA consumption. Hence, this study aimed to validate the questionnaire focusing on knowledge, attitude and practice of GA consumption among Malaysian users. A total of 100 respondents completed an online self-administered questionnaire. Construct validity was assessed using exploratory factor analysis with principal factoring axis and oblique rotation. Based on the factor analysis output, only factor loading of 0.5 and higher were considered. The number of factors retained was then assessed through the scree plot and parallel analysis. Finally, out of 43 items, 20 items remained as validated and reliable questions. The original Knowledge construct is represented separately as "objective knowledge" (OK) and "subjective knowledge" (SK). Attitude and practice remained as one factor each. All constructs have high reliability of Cronbach's Alpha ranging from 0.875 to 0.959. The result obtained has indicated that the instrument developed has high validity and reliability. The findings are essential and useful assessment tool to evaluate knowledge, attitude and practice of GA consumption among users in Malaysia.*

Keywords: Gum Arabic, Consumer Behavior, KAP

---

1. Introduction

Gum Arabic (GA) market has been expected to grow especially for its multi-functionality and health benefits (Micro Market Monitor, 2015). GA is natural product from the trees of Acacia that grow in Sudan (Mohammed, 2017). Locally, the popularity of natural products among food supplements has been expected to increase (Malaysia - Nutritional & Food, 2017). Beside its wide contribution to food industry as food additive, beneficial effects of GA in medical and health benefits are reported in literature. For example, it is a good dietary fibre, source of prebiotic, antioxidant and many more (Salih, 2018). The benefits of GA have been

discussed locally in Malaysia through television advertisement such as broadcasted on television, online newspaper, advertised in magazines and online.

2. Literature Review

The overlap between food and medicine is common in Sudan because foods containing active natural ingredients are commonly consumed (Karar & Kuhnert, 2017). These different create a limitation of no global consensus on the definition and category of the product lead to different legislation between countries and probably affecting how producer and consumer may understand and treat the product. Not to mention, it creates confusion to comprehend the information about the product, whether it should be treated as food, functional food or food supplement. Apart from that, the wide information from various sources could lead to an accumulation of misleading information (Karbownik et al., 2019). Some information might come from the unregistered product, experienced users' testimonial, or false claim from the advertisement, it could still create trust and caused a positive attitude among users towards the product. Eventually, unintentional misbelief may give a negative impact on users' practice in consuming the dietary supplement product (Durmaz, 2014). Therefore, it is important to identify the behaviour of GA users to understand their practice of consuming GA.

It is believed that Knowledge, Attitude and Practice (KAP) model by Schwartz (1975) will provide information on how knowledge and attitude may affect the practice of GA consumption among users. A study conducted by Rav-Marathe, Wan & Marathe (2014) shows a relationship between knowledge and attitude, while attitude was shown to influence practice. In another study, Macias and Glasauer (2014) mentioned that KAP is useful in acquiring insights into the factors that may influence user dietary habits.

The study of knowledge is the first step in shaping behavioural change. However, knowledge alone is rarely enough to bring about a behavioural change. Researchers identified that substantial awareness and extra knowledge have a significant impact on attitude towards food and the level of consumption (Stobbelaar et al., 2007). Verbeke (2008) pointed out that users must acquire enough knowledge of food products or substances as this knowledge will affect their food choice. The information gained may also help shape the attitude in deciding food products to consume (Stobbelaar et al., 2007; Verbeke, 2008; Mielmann, Steyn, Bothma, & Hugo, 2017). It was reported that the different types of knowledge such as objective knowledge (OK) and subjective knowledge (SK) are important and affect differently in terms of information search and perceived decision making among users (Raju, Lonial, & Glynn Mangold, 1995).

Many studies related to GA were conducted before but mostly related to clinical studies (Alkarib, Saeed, Khalid, Groun, & Ghalib, 2017; Kaddam et al., 2017; Balla, & Ismail., 2016) and on functional properties of GA (Ahmed, 2018; Daoub, Elmubarak, Misran, Hassan, & Osman, 2016). However, the study on the consumer perspective is limited. To the best of the researcher's knowledge upon conducting the literature review, quantitative studies on GA are scarce, especially the ones concerning knowledge, attitude, and practice. Hence, the questionnaire survey concerning this topic is limited.

A questionnaire survey is important where it is the main research instrument that will help in the data collection of a quantitative study. The step preceding questionnaire design starts by developing the tool from previous literature, followed by deciding the measurement scale, translating, and validating the instrument (Tsang, Royse, & Terkawi, 2017). The validity and

reliability process are important when the set of questions is developed by adapting items from past studies to ensure that the objectives of the study can be measured (Bulmer, Gibbs, & Hyman, 2006). However, when adapting items and that inadequately serve the same purpose being study, then the new item construct needs to be validated (Boateng, Neilands, Frongillo, Melgar-Quinonez & Young, 2018).

Validity is the accuracy of the measure that has been used to ensure that the measurement used truly represents what is being measured (Zikmund, Babin, Carr, & Griffin, 2012). While for the assessment of reliability, it is an indicator for measuring internal consistency (Zikmund et al., 2012). Therefore, this study aims to develop a valid and reliable questionnaire on knowledge, attitude, and practice of GA consumption among users in Malaysia.

3. Material and Methods

Participants

One hundred or more samples are required to load the sample factor more precisely in estimating the populations loading (MacCallum, Widaman, Zhang, & Hong, 1999). Thus, this study collected data involving 100 GA users to test the adequacy of the instruments. Previous studies on the intake of dietary supplement set up at least people who consume supplementary product a week for a year or longer can be the respondents (Ishihara et al., 2001). Therefore, Malaysian users with the following criteria were asked to participate in this study:

i. at least the age of 18 and above, and
ii. consumed Gum Arabic for at least a week in the past year

Instrument Development

A set of questions was prepared by adapting items from past literature on knowledge, attitude and practice in the context of food studies (Zezelj et al., 2018; Küster-Boluda & Vidal-Capilla, 2017; Willers, Heinemann, Bitterlich, Pickel, and Hahn, 2015; Mehralian, Yousefi, Hashemian & Maleksabet, 2014; Fan, Lee, Frazier, Leannie & Moser, 2014; Snyder, Dundas, Kirkpatrick & Neil 2009; Castillo, 2003) while some literatures were taken from National Pharmaceutical Regulatory Agency [NPRA] (2019), Awad, Rabah, Ali, and Mahmoud, (2018) and Bnuyan, Hindi, Jebur, and Mahdi (2015). Since the Malay language is the primary language in Malaysia, the adopted items were translated in Malay by a bilingual expert. Moreover, it is to ensure Malaysian respondents can fully comprehend the questions.

Next, the first draft of the questionnaire was sent for content validity by recruiting a convenience sample of seven experts from various field of expertise, namely Pharmacist, Medical officer, Food Safety and Quality Officer, and academicians in several fields such as:

i. food science and technology,
ii. food science, nutrition, food safety, food toxicology, and foodservice management, and
iii. industrial/organisational psychology, positive psychology, wellbeing and quality of life.

The content validity by expert resulted of 44 items involved some amendment and improvement to the final questionnaire such as deleting questions that were not relevant, re-wording, re-structuring, adding some new necessary questions, and finalising the main

questionnaire. After that, the second draft was pre-tested through face validity among ten GA users. Based on the pre-testing, all except one item was discarded due to a confusing statement. Hence, the final instrument that would be usable for the pilot test consists of 43 items. In addition, this study employed a 6-point Likert scale with responses ranging from 1 (Strongly Disagree), 2 (Disagree), 3 (Slightly Disagree), 4 (Slightly Agree), 5 (Agree), and 6 (Strongly Agree). According to Chomeya (2010), the 6-point Likert scale point gives a few advantages over the 5-point Likert Scale such as:

i. higher value of discrimination and reliability where it reduces the thought of respondents who did not want to answer or answer involuntarily or answer simply to finish without considering the issues that the researcher wants to address
ii. appropriate to be used when the research has some factors, and it will not stress the subjects while the reliability complies with the requirements of the psychological testing

The self-administered questionnaire consists of three parts including Part A for Knowledge, Part B for Attitude and Part C for Practice with a total of 43 questions, and another five questions to assess respondents' demographic profile. Part A highlighted about knowledge (16 items coded with A01-A16) including the content of GA, potential benefits of GA and individual's knowledge if users have enough information about GA. Part B assessed attitude (13 items coded with B01-B13) of GA among users such as rewarding feeling, feeling of confidence and safety concern. Part C involved questions used to explain practice (14 items coded with C01-C14) such as frequency of consuming GA, reason of use, and safety concern during consumption of GA. The last section assessed the demographic profile, including gender, age, education, occupation, and income.

Statistical Analysis

Descriptive analysis was conducted to analyse demographic profile. The evaluation of validity and reliability assessment of the construct were conducted through factor analysis and assessed Cronbach's Alpha for internal consistency reliability. Exploratory Factor Analysis (EFA) was performed to detect the structure in the relationship between variables. Principal Factoring Axis (PFA) was used because the goal is to find a latent structure of observed variables by excluding error and unique variance (Tabachnick and Fidell, 2007; Park, Dailey, & Lemus, 2002). Pallant (2016) outlined that Kaiser's criterion, scree test, and parallel analysis are techniques used to help researchers regarding the number of factors to retain. Names were given for each identified factor. Meanwhile, the reliability assessment is an indicator for measuring internal consistency (Zikmund et al., 2012). All data were gathered, coded, and analysed via IBM SPSS version 26.

Results

Demographic Characteristics

A total of 100 respondents completed an online self-administered questionnaire. From the demographic features in Table 1, most respondents were female (60%) and followed by the male (40%). Majority of the respondents was in their 40s (35%), followed by those who were in their 30s (26%) and above 50 years old (23%). The remaining respondents were 30 years old and less (16%).

Slightly more than 75% of the respondents obtained at least tertiary education certificate which explains the involvement of higher proportions of government officers in this study

(41%), followed by business owners/self-employed (23%) and private sector employees (21%). Almost equal proportion was observed between those who earned less than RM3,000 (47%) and above RM3,000 (53%).

Table 1: Demographic and characteristics of consumer of GA

Variable		n (100)	Percentage (%)
Gender			
	Male	40	40%
	Female	60	60%
Age			
	18 – 24	2	2%
	25 – 30	14	14%
	31 – 40	26	26%
	41 – 50	35	35%
	51-60	15	15%
	61 and above	8	8%
Education			
	Primary School	1	1%
	Secondary School	22	22%
	Undergraduate (e.g., Diploma, Degree)	51	51%
	Postgraduate (e.g., Master, PhD)	22	22%
	Professional Certificate	4	4%
	Others	0	0%
Occupation			
	Private sector employee	21	21%
	Student	5	5%
	Business owner/ Self-employed	23	23%
	Government Officer	41	41%
	Retirees	1	1%
	Housewife	9	9%
Income			
	RM 1500 and below	24	24%
	RM 1501 - RM 3000	23	23%
	RM 3001 - RM 4500	15	15%
	RM 4501 - RM 6000	17	17%
	RM 6001 - RM 7500	8	8%
	RM 7501 and above	13	13%

Result of Factor Analysis

An EFA was run on 43 items using PFA and Oblique rotation. Kaiser-Meyer-Olkin (KMO) measures sampling adequacy with a suggested threshold of 0.6 (Kaiser, 1977) and Bartlett's Test of Sphericity should be significant ($p < .05$) for an appropriate factor analysis (Pallant, 2016). The number of factors to remain were determined by considering the eigenvalues (>1) and interpretability of the factor (Pallant, 2016). Factor loadings of 0.5 or greater can be considered as adequate indicators for that factor (Maskey, Fei, & Nguyen, 2018). Hence, this study sorted the factor coefficients by size and suppressed all factor coefficients of less than 0.5.

Results of the KMO test was 0.858 and Bartlett's test of sphericity (chi-squared, df= 4237.753, 903; p-value <0.001) showed that the items met the criteria required for factor analysis. EFA revealed the presence of nine factors with eigenvalues exceeding 1. The total variance explained by the nine factors was 77.54%. Scree plot was observed to confirm the number of factors to retain.

Scree plot is an observation to look for a change (or elbow) in the shape of the plot where only factors above this point are retained. This is because retaining all factors above the elbow or break in the plot contributes the most to the explanation of the variance data, while the rest is not too beneficial for further analysis (Pallant, 2016). Based on Figure 1, the scree plot shows there is quite clear that factor one and two explain much more of the variance than the remaining factors. However, there is also another little break between factor three and five, where Pallant (2016) added depending on the research context, this little break between factors might also be worth exploring. Hence, factor three to five may still at the relevant point to further explore number of factors should be retained by using Parallel Analysis (PA).

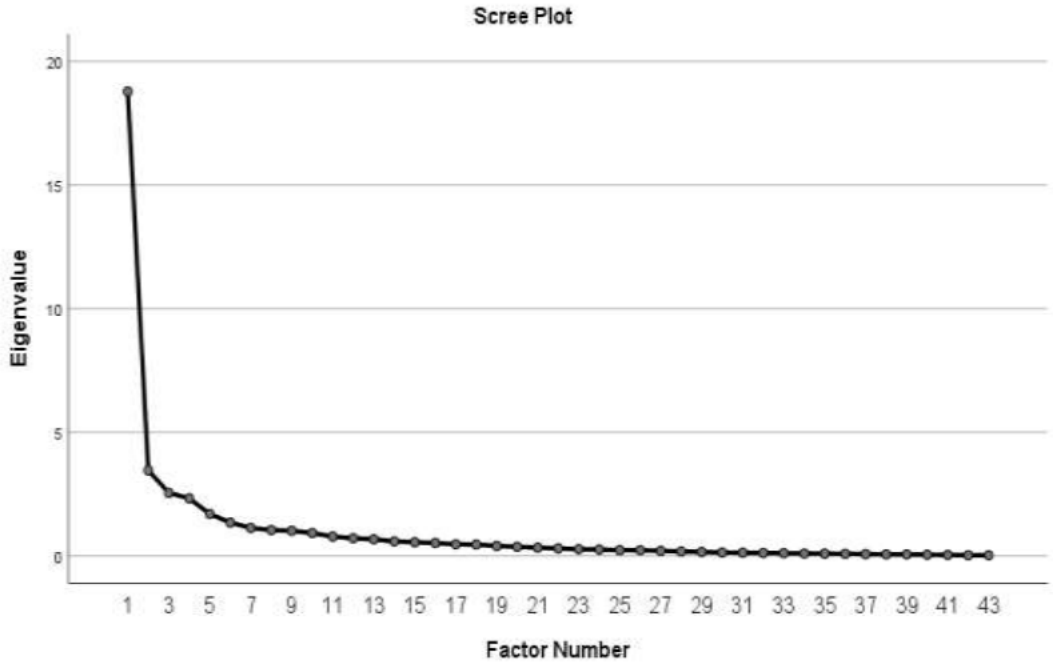

Figure 1: Scree Plot

Parallel analysis (PA) (Horn, 1965) is the most accurate technique among others when Kaiser's criterion and scree test tend to overestimate the number of factors. It involves comparing the size of the eigenvalues with those obtained from a randomly generated data set of the same size which only those eigenvalues that exceed the corresponding values from the random data set are retained (Pallant, 2016). Table 2 shows the actual eigenvalue from factor analysis (FA) larger than the criterion value from the parallel analysis is retained. But when it is less, then the factor is rejected. Therefore, the results of the parallel analysis support the researchers' decision from the scree plot to retain only four factors for further investigation.

Table 2: Comparison of eigenvalues from FA and the criterion value from Parallel Analysis

Factor number	FA eigenvalue	PA eigenvalue	Decision
1	18.542	2.115	Accept
2	3.190	1.914	Accept
3	2.286	1.768	Accept
4	2.044	1.631	Accept
5	1.370	1.505	Reject
6	.995	1.407	Reject
7	.762	1.305	Reject
8	.722	1.237	Reject
9	.670	1.130	Reject

Subsequently, the researcher retained the first four factors represents the largest percentage variance with 43.12%, followed by 7.42%, 5.35% and 4.75%. Each with eigenvalues of 18.781, 3.462, 2.548, and 2.325, respectively.

First, the items that load on the first factor with loading ranging from 0.822 to 0.520 with six items were named attitude. There is one item from practice scale load into attitude, making the total number of items measuring attitude to be seven items. The second factor load four items ranged from 0.721 to 0.527 and named objective knowledge (OK). The third factor was named subjective knowledge (SK) load seven items including one item from the attitude subscale ranging from 0.765 to 0.531 (not considered whether the correlation is positive or negative). Lastly, two items load into factor-four with loading ranging from 0.794 to 0.745 and this factor was named practice.

Overall, only factors with the loading of 0.5 and higher were counted; hence, items below 0.50 were deleted. In addition, items that load into factors five, six, seven, eight and nine were also deleted. Six items were deleted from the knowledge's scale, six items were deleted from the attitude's scale and ten items were removed from practice's scale. One item from attitude falls under the knowledge scale, while the other two items from practice load under the attitude scale. Hence, the researcher rearranged the items accordingly. The summary of the construct shows in Table 3.

Table 3: Summary of Construct and Cronbach's Alpha

Construct	The initial number of items	Dimension	Code	Total items each construct	Cronbach's Alpha
Knowledge	16	Objective Knowledge	OK	4	.875
		Subjective Knowledge	SK	7	.939
Attitude	13	-	-	7	.959
Practice	14	-	-	2	.951

Hair, Black, Babin, & Anderson, (2014) mentioned the threshold value of 0.7 or higher for good internal consistency measurement through Cronbach's Alpha. Cronbach's Alpha shows in Table 2 value ranging from 0.875 to 0.959, which greater than the threshold value of 0.7. Hence the validity and reliability of the questionnaire were confirmed. Overall, the pilot study was an important step in verifying the reliability and validity of the questionnaire. All the remaining items in each construct can be usable for further research as in Table 4.

Table 4: Result of Factor Analysis

Code	Items	Adapted from
OK1	I am aware that Gum Arabic contain prebiotic	Awad et al. (2018)
OK2	I am aware that Gum Arabic is an anti-oxidant	Awad et al. (2018)
OK3	I am aware that Gum Arabic is a natural gum	Awad et al. (2018)
OK4	I am aware that Gum Arabic is a dietary fibre	Awad et al. (2018)
SK1	I have information that none of my family members or friends ever has problems with Gum Arabic	Snyder et al. (2009)
SK2	I have sufficient information on the proper administration of Gum Arabic	Mehralian et al. (2014)
SK3	I have sufficient information on the proper storage of Gum Arabic	Mehralian et al. (2014)
SK4	Overall, I have sufficient knowledge about Gum Arabic	Mehralian et al. (2014)
SK5	I have sufficient information about the dosage of Gum Arabic	Mehralian et al. (2014)
SK6	I have sufficient information on the effectiveness of Gum Arabic	Mehralian et al. (2014)

	(e.g., information from scientific or clinical studies)	
SK7	I believe the safety of the use of Gum Arabic has been very thoroughly studied	Küster-Boluda & Vidal-Capilla, (2017)
ATT1	I believe my health performance improves when I take Gum Arabic	Küster-Boluda & Vidal-Capilla, (2017)
ATT2	I believe Gum Arabic makes it easier for me to lead a healthy lifestyle	Küster-Boluda & Vidal-Capilla (2017)
ATT3	I believe Gum Arabic promotes my well-being	Küster-Boluda & Vidal-Capilla, (2017)
ATT4	I believe that I can take care of my health by consuming Gum Arabic gives me pleasure	Küster-Boluda & Vidal-Capilla (2017)
ATT5	I believe Gum Arabic helps to improve my health	Küster-Boluda & Vidal-Capilla, (2017)
ATT6	I consume Gum Arabic to maintain good health	Zezelj et al. (2018)
ATT7	Overall, the idea that Gum Arabic give me reward may cause me to have a positive attitude towards it	Küster-Boluda & Vidal-Capilla, (2017)
P1	I consume Gum Arabic at the recommended amount of dosage as provided in the product label	Castillo (2003)
P2	I follow the instructions as provided in the product label	Castillo (2003)

4. Discussion

A questionnaire on knowledge, attitude and practice towards GA was validated to be used for Malaysian consumer who consumed GA at least a week in the past one year. PFA was conducted as the main goals are to determine the number of latent constructs underlying a set of items, to provide means of explaining variation among items and to define the content or meaning of factor. Factor loading played an important role in the deletion of item as it showed the correlation between an item and its respective factor. Only items with the factor loading ≥ 0.50 retained in the questionnaire. Result of the PFA loaded nine factors. Researcher proceeds to observe scree plot to identify the number of factors to be extracted. The scree plot clearly showed two factors explain the variance than the remaining factors, but there might be another few factors worth exploring. Hence, the researcher used PA to confirm the number of factors that should be retained. The PA revealed four factors should be remained for further investigation.

Generally, finding from factor analysis showed that there were two factors load for construct Knowledge, and they were labelled as Objective Knowledge and Subjective Knowledge. These two factors were in line with House et al., (2004) suggest that knowledge should not be viewed as a unidimensional construct. Factor-two (OK) and factor-three (SK) were in keeping in line with several studies such as by Brucks (1985), Flynn & Goldsmith (1999), and Selnes & Grønhaug (1986), where they distinguished knowledge by presenting OK and SK. There are four items coded with OK1-OK4. There were taken from Awad, Rabah, Ali, & Mahmoud, (2018) that point of the literature about GA. Previously, Macias and Glasauer (2014) define knowledge as the capability to memorize and recall food and nutrition-related terms, specific information, and facts (Macias & Glasauer, 2014). This is in line with previous studies that measured knowledge relate to dietary supplement by including the information about health benefits (Alhomoud, Basil, & Bondarev, 2016; Axon et al., 2017); and sources of supplements (Alhomoud et al., 2016; Abdulmalek (2017). Hence, the items measured represent the health benefit that can be referred to as nutrient content (prebiotic, source of antioxidant and dietary fibre) of GA, and source of supplement (natural gum).

Meanwhile, this section also assessed the respondent's SK, which measures what individual perceives that they know about GA. This part consists of seven items coded with SK1-SK7 relating to perception about their information regarding safety of GA. The perceive knowing

about the safety information was assessed by adapting items from several studies (Snyder, Dundas, Kirkpatrick, and Neill, 2009; Mehralian, Yousefi, Hashemian, and Maleksabet, 2014; Küster-Boluda and Vidal-Capilla, 2017). One of the items was adapted from Snyder, Dundas, Kirkpatrick, and Neill (2009) which measures information related to family members or friends that may have problem with GA in previous time. Another five items were adapted from Mehralian, Yousefi, Hashemian, and Maleksabet (2014), which were used to measure the safety information of dietary supplement in terms of the proper administration and storage, information about dosage and the effectiveness of the product, as well as sufficient knowledge in general. Lastly, an item was adapted from Küster-Boluda and Vidal-Capilla (2017) measures that safety use of GA has been thoroughly studied.

Attitude remained as a factor with seven items which were coded as ATT1-ATT7. Attitude is understood as the tendency to act or behave favourably and unfavourably manner toward GA (Eagly and Chaiken, 1993). Five items were adapted from Küster-Boluda and Vidal-Capilla (2017) which were used to measure through the feeling of rewarding from the idea that consuming GA can improve health, lead to healthy lifetyle, promotes well-being and give pleasure. An item was also adapted from Zezelj et al. (2018) which considers consuming GA can maintain good health. Lastly, an item that measures the overall idea of GA give reward cause a positive attitude towards GA was a self-developed as suggested by an expert with support from literature by Küster-Boluda and Vidal-Capilla (2017).

Practice remained one factor with two items adapted from Castillo (2003), which are acceptable (Hayduk & Littvay, 2012). Two items measure practice were coded with P1 and P2. Practice is defined as an act that can be observed, which may affect the individual during consumption of GA by measuring through several specific observable actions (Macias & Glasauer, 2014). The specific observable actions in this study can be referred to as following the instruction that was stated in on the product label. Registered products are required to follow the guideline set by NPRA (2019). There is some general instruction in the product label consists of several actions that the user should follow. For instance, the labelling information is intended to inform user how the product should be stored, to keep the product out of reach of children, to seek advice from health professionals as well as provide warning or specific labelling if applicable. One of the most crucial steps for the user is to comply with the instruction about the recommended amount of dosage as provided in the product label. Hence, follow the instructions from the labelling information can give the user a proper practice of handling the product and help to reduce any unforeseen risk in future. All the outcomes appeared to be satisfactory, indicating that this validated questionnaire is a reasonably reliable instrument to assess consumer's knowledge, attitude and practice on GA among consumer.

5. Conclusion

From 43 items composed, 20 items remained as validated and reliable questions. To our knowledge, this is the first questionnaire that may act as a tool to assess consumer knowledge, attitude and practice towards GA that has been validated in Malaysia. This study would certainly add some value to the existing literature regarding the need for valid and reliable questionnaire so that the shortcomings of the questionnaire do not bias the findings. In addition, using a reliable and valid questionnaire to test such constructs may lead to quality data which may be the basis for consumer assessment in the future.

Overall, this questionnaire seemed feasible, valid and reproducible for measuring knowledge, attitude and practice towards GA among Malaysian users. Thus, it indirectly contributes to future study that wishes to assess further the need for education and intervention among consumer in consuming GA. This can be conducted to develop and supply good information on the intake of this dietary supplement, likewise others too in the future.

References

Abdulmalek, L. J. (2017). Knowledge, attitude and practice regarding folic acid among pregnant women in Benghazi, Libya. *Ibnosina Journal of Medicine and Biomedical Sciences*, *9*(3), 67-71.

Ahmed, A. A. (2018). Health benefits of gum arabic and medical use. In *Gum Arabic: Structure, Properties, Application and Economics*.

Alhomoud, F. K., Basil, M., & Bondarev, A. (2016). Knowledge, attitudes and practices (KAP) relating to dietary supplements among health sciences and non-health sciences students in one of the universities of United Arab Emirates (UAE). *Journal of Clinical and Diagnostic Research*, *10*(9).

Alkarib, S. Y., Saeed, A. M., Khalid, S. A., Groun, E. A., & Ghalib, M. B. (2017). Gum Arabic role in high blood pressure among patients with stage III chronic kidney disease. *Journal of Pharmacology & Clinical Research*, *1*(4).

Awad, S. S., Rabah, A. A., Ali, H. I., & Mahmoud, T. E. (2018). Acacia seyal gums in Sudan: Ecology and economic contribution. In *Gum Arabic: Structure, Properties, Application and Economics*.

Balla, S. E. H., & Ismail, A. M. (2016). Impact of hemodialysis on serum zinc and copper level in CKD patients. *Journal of Applied Pharmaceutical Science, 6*(4), 165-168.

Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quiñonez, H. R., and Young S. L. (2018). Best practices for developing and validating scales for health, social, and behavioral research: A primer. *Front. Public Health, 6*(149).

Bnuyan, I. A., Hindi, N. K. K., Jebur, M. H., & Mahdi, M. A., 2015. In vitro antimicrobial activity of gum Arabic (Al Manna and Tayebat) prebiotics against infectious pathogens. *International Journal of Pharmaceutical Research, 3*(3), 77-85.

Brucks, M. (1985). The effects of product class knowledge on information search behavior. *Journal of Consumer Research*, *12*(1), 1.

Bulmer, M., Gibbs, J., & Hyman, L. (2006). *The use of pre-existing survey questions: implications for data quality*. Paper presented at The Conference on Quality in Survey Statistics, Cardiff.

Castillo, E. M. (2003). *Patterns of dietary supplement use among active United States Marines (*Doctoral Thesis*).*

Chomeya, R. (2010). Quality of psychology test between likert scale 5 and 6 points. *Journal of Social Sciences*, *6*(3), 399–403.

Daoub, R. M. A., Elmubarak, A. H., Misran, M., Hassan, E. A., & Osman, M. E. (2016). Characterization and functional properties of some natural Acacia gums. *Journal of the Saudi Society of Agricultural Sciences*, *17*(3), 241–249.

Durmaz, Y. (2014). The impact of psychological factors on consumer buying behavior and an empirical application in Turkey. *Asian Social Science*, *10*(6), 194–204.

Fan, X., Lee, K. S., Frazier, S. K., Leannie, T, A., & Moser, D. K. (2014). The use of and perceptions about, dietary supplements among patients with heart failure. *European Journal of Cardiovascular Nursing, 13*(4), 311-319.

Flynn, L. R., & Goldsmith, R. E. (1999). A short, reliable measure of subjective knowledge. *Journal of Business Research*, *46*(1), 57–66.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate Data Analysis*. Pearson New International Edition.

Hassan, Z. A., Schattner, P., & Mazza, D. (2006). Doing a pilot study: Why is it essential. *Malaysian Family Physician : The Official Journal of the Academy of Family Physicians of Malaysia*, *1*(2-3), 70–73.

Hayduk, L.A., & Littvay, L. (2012). Should researchers use single indicators, best indicators, or multiple indicators in structural equation models? *BMC Med Res Methodol*, *12*, 159.

House, L., Lusk, J., Jaeger, S., Traill, W. B., Moore, M., Valli, C., … Yee, W. M. S. (2004). Objective and subjective knowledge: Impacts on consumer demand for genetically modified foods in the United States and the European Union. *AgBioForum*, *7*(3), 113–123.

IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.

Ishihara, J., Sobue, T., Yamamoto, S., Sasaki, S., Akabane, M., & Tsugane, S. (2001). Validity and reproducibility of a self-administered questionnaire to determine dietary supplement users among Japanese. *European Journal of Clinical Nutrition*, *55*(5), 360–365.

Kaddam, L., Fadl-Elmula, I., Eisawi, O. A., Abdelrazig, H. A., Salih, M. A., Lang, F., & Saeed, A. M. (2017). Gum Arabic as novel anti-oxidant agent in sickle cell anemia, phase II trial. *BMC Hematology*, *17*(1), 1–6.

Kaiser, H. F. (1977). An index of factorial simplicity. *Psychometrika*, *42*(2), 277–295.

Karar, M. E., & Kuhnert, N. (2017). Herbal drugs from Sudan: Traditional uses and phytoconstituents. *Pharmacognosy Reviews*, *11*(22), 83.

Karbownik, M. S., Paul, E., Nowicka, M., Nowicka, Z., Kowalczyk, R. P., Kowalczyk, E., & Pietras, T. (2019). Knowledge about dietary supplements and trust in advertising them: Development and validation of the questionnaires and preliminary results of the association between the constructs. *PLoS ONE, 14*(6).

Kotler, P., & Armstrong, G. (2016). *Principles of Marketing* (6th ed.).

Küster-Boluda & Vidal-Capilla, I.. (2017). Consumer attitudes in the election of functional foods. *Spanish Journal of Marketing, 21*(1), 65-70.

Losby, J., & Wetmore, A. (2012). Using likert scales in evaluation survey work. Retrieved March 20, 2020 from https://www.cdc.gov/dhdsp/pubs/docs/CB_February_14_2012.pdf

MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *4*(1), 84-99.

Macias, F. Y., & Glasauer, P. (2014). *Guidelines for assessing nutrition-related knowledge-attitude-practice.* Retrieved March 20, 2020 from http://www.fao.org/docrep/019/i3545e/i3545e00.htm

Malaysia-Nutritional & Food. (2017). Retrieved March 20, 2020 from https://www.export.gov/article?id=Malaysia-Nutritional-and-Food-Supplements

Maskey, R., Fei, J., & Nguyen, H. O. (2018). Use of exploratory factor analysis in maritime research. *Asian Journal of Shipping and Logistics*, *34*(2), 91–111.

Mehralian, G., Yousefi, N., Hashemian, F., & Maleksabet, H. (2014). Knowledge, attitude and practice of pharmacists regarding dietary supplements: A community pharmacy-based survey in Tehran. *Iranian Journal of Pharmaceutical Research*, *13*(4), 1457–1465.

Mielmann, A., Steyn, F., Bothma, C., & Hugo, C. (2017). Consumers' knowledge about and attitudes towards lucerne (Medicago sativa l.). *Journal of Consumer Sciences, 2*, 69–82.

Micro Market Monitor. (2015). *Global Gum Arabic Market Analysis & Forecast (2014-2019)*. Retrieved March 20, 2020 from http://www.micromarketmonitor.com

Mohammed, A. M. E. (2017). Estimation of the active components in gum arabic collected

from Western Sudan. *International Journal of Science and Research*, *6*(3), 1262–1282.

National Pharmaceutical Regulatory Agency. (2019). *Drug Registration Guidance Document (DRGD).* Retrieved from https://www.npra.gov.my/easyarticles/images/users/1047/Drug-Registration-Guidance-Document-DRGD---Second-Edition-revised-January-2019.pdf

Pallant, J. (2016). *SPSS Survival Manual : A Step by Step Guide to Data Analysis Using SPSS.* (6th ed.). Open University Press.

Park, H. S., Dailey, R., & Lemus, D. (2002). The use of exploratory factor analysis and principal components analysis in communication research. *Human Communication Research, 28*(4), 562-577.

Raju, P. S., Lonial, S. C., & Mangold, W. G. (1995). Differential effects of subjective knowledge, objective knowledge, and usage experience on decision making: An exploratory investigation. *Journal of Consumer Psychology*, *4*(2), 153–180.

Rav-Marathe, K., Wan, T. T., & Marathe, S. (2014). A systematic review on the KAP-O framework for diabetes education and research. *Medical Researcn Archives*, *4*(1).

Salih, N. K. M. (2018). Applications of gum arabic in medical and health benefits. *Gum Arabic: Structure, Properties, Application and Economics*.

Schwartz, N. E. (1975). Nutritional knowledge, attitudes, and practices of high school graduates. *Journal of American Dietitian Association*, *66*(1), 28–31.

Selnes, F., & Grønhaug, K. (1986). Subjective and objective measures of product knowledge contrasted. *Advances in Consumer Research*, *13*(1), 67–71.

Snyder, F. J., Dundas, M. L., Kirkpatrick, C., & Neill, K. S. (2009). Use and safety perceptions regarding herbal supplements: A study of older persons in Southeast Idaho. *Journal of Nutrition for the Elderly, 28*(1), 81–95.

Stobbelaar, D. J., Casimir, G., Borghuis, J., Marks, I., Meijer, L., & Zebeda, S. (2007). Adolescents' attitudes towards organic food: A survey of 15- to 16-year old school children. *International Journal of Consumer Studies*, *31*(4), 349–356.

Tabachnick, B. G. & Fidell, L. S., (2007), *Using Multivariate Statistics*. Pearson Education Inc.

Tsang, S., Royse, C. F., & Terkawi, A. S. (2017). Guidelines for developing, translating, and validating a questionnaire in perioperative and pain medicine. *Saudi Journal of Anaesthesia, 11*(1), 80-89.

Verbeke, W. (2008). Impact of communications on consumers' food choices. *Proceedings of the Nutrition Sciences, 67*, 281-288.

Willers, J., Heinemann, M., Bitterlich N., Pickel S., & Hahn, A. (2015). Use of dietary supplements. Is there a risk of an excessive intake of vitamins and minerals? *Ernah-rungs Umschau International, 62*(10), 162–166.

Zezelj, S. P., Tomljanovic, A., Jovanovic, G. K., Kresic, G., Peloza, O. C., Dragas-Zubalk & Prokurica, I. P. (2018). Prevalence, knowledge and attitudes concerning dietary supplements among a student population in Croatia Sandra. *International Journal of Environmental Research and Public Health, 15*(1058).

Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business Research Methods* (9th ed.). Cengage Learning.