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Public Perception and Practices Towards Ethanol Content and Halal Assurances of Herbal Syrup Products

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Abstract

Background: *Herbal syrup is known to be an alternative medicine due to its safe material. However, the presence of ethanol content in herbal syrup as the extraction residue can be crucial in determining the halalness of the product.* ***Objectives:*** *The study aims to evaluate public perceptions and practices regarding the ethanol content and halal assurances of herbal syrup products in Yogyakarta City, Indonesia.* ***Methods:*** *A cross-sectional study using convenience sampling was conducted with 300 respondents for perception and 250 respondents for practices among the general public in 14 sub-districts across Yogyakarta City. A validated and self-administered questionnaire was developed and distributed both online and paper-based.* ***Results:*** *This study found that 51% of the respondents had positive perceptions and 62.80% of the respondents had positive practices regarding the ethanol content and halal assurances of herbal syrup products. Age ($p<0.001$) was found to have an association with perception, while religion ($p=0.0013$) was found to be associated with practices. The correlation between perception and practices was also found to be moderate ($p<0.001$; $r=0.340$).* ***Conclusion:*** *The majority of general public perceptions and practices in Yogyakarta City were found to be positive regarding the ethanol content and halal assurances of herbal syrup products and identified a correlation between perception and practices as well as sociodemographic characteristics with perception and practices. These findings can be used by various stakeholders, including the government and manufacturers, to improve the halal certification of herbal syrup products and raise public awareness about the ethanol content of herbal syrup products.*

Keywords: *ethanol, halal, perception, practices, syrup*

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INTRODUCTION

Herbal medicine is becoming increasingly popular around the world. The World Health Organization (WHO), reports that 80% or approximately 4 billion people rely on herbal medicine, prioritizing them in healthcare. Herbal medicines are medicinal products that are made from one or more plant parts that contain active ingredients and are then packaged and labeled as finished products (Embassy of The Republic of Indonesia in Brussels, 2021). Herbal medicines can be found as non-prescription medicines, which makes them easily accessible. People also believed that herbal medicines were safer, more easily accessible, and less expensive than modern medicines (Suryawati et al., 2023). Consumption of herbal medicines can help to alternatively treat various types of diseases, such as cough, fever, common cold, nausea, vomiting, and even lung diseases (Poursaleh et al., 2022; Sultana et al., 2016).

Among the various forms of herbal medicines, herbal syrup is a common liquid formulation that is easily absorbed orally (Goswami & Srivastava, 2016). Herbal syrups are often formulated from plant extracts, a process that commonly uses ethanol as a solvent. While ethanol is generally considered safe, the presence of its residue can pose a significant health concern. This is particularly true for vulnerable populations such as pediatrics, geriatrics, and pregnant women, as excessive consumption of ethanol can lead to toxicity (Neo et al., 2017). In addition, alcohol consumption can impair brain health and disrupt the blood-brain barrier at certain levels (Aziza et al., 2025; Haorah et al., 2005; Laksitorini et al., 2021). The Food and Drug Administration (FDA) and WHO have recommended limits for ethanol content in oral medicines, with level less than 10% for adults, less than 5% for children aged 6-12 years, and less than 0.5% for children under 6 years . Indonesian regulations from the Food and Drug Administration (BPOM) limit the ethanol content in traditional liquid medicines to no more than 1% and the presence of alcohol content must be stated on the packaging as a percentage (%). According to the research conducted by Rs et al. (2021) two samples of herbal medicine were discovered to contain 0.07 percent and 0.21 percent ethanol (Rs et al., 2021). Additionally, Neo et al. (2017) still found pediatric herbal cough syrup contained ethanol without any warning of its presence in the package (Neo et al., 2017). This showed that the regulations related to ethanol content in herbal syrups are still not adequately implemented in the market.

Furthermore, the presence of ethanol is also a crucial consideration in determining and ensuring the halal status of products. Halal is an obligation in Islam, as stated in the holy Quran and hadith, means permitted to consume. As a form of religious obedience, Muslims are required to consume only halal products and avoid haram products. Various countries with majority of Muslim population such as Malaysia and Indonesia surely taken product halalness seriously. Indonesia has the largest Muslim population in the world, with around 13% of the total number of Muslims in the world, product halalness is of utmost importance. In 2020, the Muslim population in Indonesia was around 229.12 million, accounting for 87.2% of the total population, and is expected to continue to increase (Djunaidi et al., 2021). The growing Muslim population has led to an increase in demand for halal-certified products in the country (Hamid et al., 2019). Halal assurance is provided through the inclusion of the Halal label and the granting of Halal certification. As in Indonesia, halal assurance is provided by the Indonesian Ulema Council (MUI). All products circulating in Indonesia must have certification and labeling as halal assurances, including traditional medicines, as stated in Law No. 33 of 2014 on Halal Product Assurances (Sembiring & Arpangi, 2023).

There is a common misconception that halal products only exclude non-halal ingredients like pork and alcohol. However, the concept of halal products encompasses not only the ingredients but also the preparation and production process that must meet halal requirements (Nayeem et al., 2020). Therefore, it is important to assess public perception and practices to determine the extent to which people understand and implement the concept of halal certification and labels also the possible content of alcohol in herbal syrup products. Similar studies regarding halal have been conducted in different settings around the world, for instance in Malaysia (Sadeeqa, Sarriff, Masood, & Farooqui, 2013; Sadeeqa, Sarriff, Masood, Saleem, *et al*., 2013; Sadeeqa & Sarriff, 2014; Santa *et al*., 2019; Xuan *et al*., 2022) and Palestine (Eid *et al*., 2022). The studies used different groups of respondents, including students (Sadeeqa et al., 2013; Santa et al., 2019; Xuan et al., 2022), healthcare workers (Eid et al., 2022; Sadeeqa & Sarriff, 2014), and the general public (Sadeeqa et al., 2013). Previous studies also evaluated pharmacist and community knowledge of the ethanol content in medication, but were more focused on pediatric medications and did not include herbal medicine (Wulandari et al., 2025).

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The study presented herein offers significant novel contributions to herbal medicine research, examining the public's perceptions and practices regarding the ethanol content and halal certification of herbal syrup products in Yogyakarta, Indonesia. This research is distinguished by its specific emphasis on herbal syrups, a subset of herbal medicine that previous literature has largely overlooked. In contrast to prior studies that have either broadly addressed the halal status of pharmaceutical products or explored the safety concerns associated with the ethanol content in medications, this investigation uniquely merges these two critical considerations. It thoroughly investigates the impact of ethanol content on the halal status of herbal syrups and assesses public awareness and regulatory compliance in this context. Furthermore, the choice of Yogyakarta as the geographical focus of the study—a region noted for its significant Muslim population and a rich tradition of herbal medicine use—provides insightful nuances that have the potential to extend beyond the Indonesian setting. This geographical lens provides a detailed exploration of how cultural and religious values influence consumer behaviors toward herbal syrups, offering implications relevant to similar contexts worldwide.

A notable innovation of this study lies in its comprehensive evaluation of public perceptions and practices. Through assessing the knowledge, attitudes, and perceptions (KAP) concerning the halalness and ethanol content in herbal syrups and correlating these insights with actual consumer practices, the research offers a holistic view of the societal implications of these factors. This analysis is further deepened by examining the role of sociodemographic variables on KAP, illuminating how different segments of the population understand and engage with the complexities of halal certification and ethanol content in herbal syrups. Additionally, the research provides pivotal insights that could significantly influence policy-making and regulation. Identifying lapses in regulatory compliance and gaps in public awareness concerning the ethanol content and halal certification of herbal syrups emphasizes the necessity for more rigorous policies and enhanced educational initiatives in this area. Moreover, this study broadens the scope of halal research to encompass herbal medicines, specifically herbal syrups, thus addressing a substantial gap in scholarly discussion regarding the halal status of drugs.

The studies conducted in Malaysia similarly assessed the knowledge, attitude, and perception (KAP) regarding halalness of pharmaceutical products with different population showed that the majority of the respondents have good score each domain. The studies also found the correlation between attitude and knowledge, perception and knowledge, knowledge and perception. It was found that general public knowledge regarding alcohol content present in pharmaceutical products still low, meanwhile hospital pharmacist, pharmacy student, and academicians had better knowledge and perception regarding alcohol content. Sociodemographic factors such as religion, age, gender, occupation, and level of education also had correlation with KAP (Sadeeqa et al., 2013; Sadeeqa & Sarriff, 2014; Santa et al., 2019; Xuan et al., 2022). However, research conducted in Indonesia is still rarely developed. Furthermore, studies on drug halalness have only been conducted on conventional drugs, with no studies on herbal drugs, particularly herbal syrups. Additionally, research on perceptions and practices related to ethanol content and halal assurance, such as halal certification and halal labeling of herbal syrup products, is still uncommon. Therefore, this study aims to evaluate public perception and practices regarding the ethanol content and halal assurances of herbal syrup products in Yogyakarta City, Indonesia.

MATERIALS AND METHODS

Study design and participants

A cross-sectional study was conducted, and data were collected among the general public based in Yogyakarta City. Yogyakarta City is located in Indonesia, specifically on Java Island, which has 14 sub-districts. The sampling method used was convenience sampling to obtain respondents based on the predetermined criteria. The inclusion criteria include individuals residing in Yogyakarta city, aged 18 years and older, and willing to participate and complete the questionnaire. An additional criterion for the practices data was applied exclusively to respondents with prior experience using herbal syrup. Data collection took place from November 2023 to December 2023.

Questionnaire structures

A self-administered questionnaire was developed specifically for this study by synthesizing and adapting relevant questions from existing academic literature, as well as adding a few adjustment, specific questions to address our research objectives. This approach allowed for a tailored instrument that precisely aligned with our research aims. The questionnaire then translated into Bahasa Indonesia and underwent a rigorous validation process mentioned in the Pilot Study section below to ensure all questions demonstrated validity and

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reliability. The survey was made available in both an online format and a paper-based format to maximize accessibility and ensure a robust data set from a diverse range of respondents (Sadeeqa & Sarriff, 2014; Xuan et al., 2022). The questionnaire consisted three sections. Section one involved collecting the respondent's sociodemographic data, such as gender, age, occupation, education, and religion. Respondents were also questioned about their experiences with herbal syrup consumption, with the intention of using this information for further analysis of practical data. Section two examined perceptions regarding ethanol content and halal assurances in herbal syrup products. Section three examined practices regarding the usage of herbal syrup products with ethanol content and halal assurances (Larasati, 2024).

Scoring method

There are total 14 statements to evaluate perception and practices with four-point Likert Scale: "Strongly Agree" (SA), "Agree" (A), "Disagree" (D), and "Strongly Disagree" (SD). The statements include favorable and unfavorable point. Favorable statements was scored as follow: SA = four (4) marks; A = three (3) marks; D = two (2) marks; and SD = one (1) marks. Meanwhile unfavorable statements was scored as follow: SA = one (1) marks; A = two (2) marks; D = three (3) marks; and SD = four (4) marks.

Ethical consideration

The Gadjah Mada University Ethics Commission granted permission to conduct this study by issuing an ethical clearance letter with the number KE/UGM/067/EC/2023.

Pilot study

The translated questionnaire was then tested for further validation through a pilot study conducted with 36 respondents outside the study sample before data collection. Public feedback was obtained from the pilot study to validate and improve the questionnaire. All questions demonstrated validity and reliability tests. The Pearson correlation test was used to determine the validity of the questionnaire. The reliability test scored 0.72 for perception and 0.68 for practices indicating that Cronbach's alpha exceeded 0.6 thus the questionnaires were reliable to be used.

Data analysis

The study utilized SPSS version 23 (IBM Corporation, America) for data collection. Descriptive analysis was conducted on sociodemographic characteristics. Perception and practice-related data were also presented descriptively based on the distribution of answers of each question. Perceptions and practices are categorized into positive and negative categories. Kolmogorov-Smirnov normality tests were conducted to categorize perceptions and practices. Furthermore, the relationship between sociodemographic characteristics with respondents' perceptions was assessed through crosstab analysis with the Chi-Square Test and also relationship between perception and practices was assessed through the Rank Spearman Test with p-values of less than 0.05 were regarded as statistically significant.

RESULTS AND DISCUSSION

Respondent's sociodemographic characteristics

Sociodemographic characteristics of respondents are displayed in Table 1. A total 300 respondents from 14 sub-districts in Yogyakarta city participated in the survey. Age range was between 18 – 88 years with a mean ± Standard Deviation of 43.5 ± 20.81 years.

Most of the respondents were female 220 respondents (73.3%), mostly aged 18 – 25 years with 114 respondents (38%) and the majority of them were students with 104 respondents (34.7%). The level of education can be seen in Table 1 that 153 respondents (51.3%) have graduated from senior high school, this indicates more than half of the respondents have completed their 12-year compulsory education in compliance with the regulations in Indonesia (Kusumah, 2021). Meanwhile for religion, the majority of respondents identify as Islam are 266 respondents (88.7%) which is consistent with the religion of the majority of the Indonesian population.

As for experiences of herbal syrup consumption, 250 respondents (83.3%) have previously consumed herbal syrup products, whereas the remaining 50 respondents (16.7%) have not. This also relevant with the result of the Indonesian Basic Health Research conducted in 2013 stated that 60% of people in Indonesia over the age of 15 have already used herbal medicine (Suryawati et al., 2023). This distribution is utilized for the practices analysis in this study. Since it is more relevant to focus on subjects who have consumed herbal syrup for practices analysis.

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Table 1. Sociodemographic characteristics of respondents (n = 300)

Variable	Category	n(%)
Gender	Male	80 (26.7)
	Female	220 (73.3)
Age	18 - 25 years	114 (38.0)
	26 - 35 years	17 (5.7)
	36 - 45 years	20 (6.7)
	46 - 55 years	41 (13.7)
	56 - 65 years	56 (18.7)
	> 65 years	52 (17.3)
Occupation	Students	104 (34.7)
	Self-employed	37 (12.3)
	Private sector employee	28 (9.3)
	Civil servants	7 (2.3)
	Retired	26 (8.7)
	Housewife	91 (30.3)
	Other	7 (2.3)
Level of education	No formal education	8 (2.7)
	Elementary school	16 (5.3)
	Junior high school	31 (10.3)
	Senior high school	153 (51.3)
	Diploma/Bachelor degree	79 (26.3)
	Master degree	9 (3.0)
	Doctoral Degree	3 (1.0)
Religion	Islam	266 (88.7)
	Christian	16 (5.3)
	Catholic	17 (5.7)
	Buddhist	1 (0.3)
Experiences of herbal syrup consumption	Yes	250 (83.3)
	No	50 (16.7)

Table 2. Perception towards ethanol content and halal assurances of herbal syrup products (n = 300)

No	Statement	SD* n (%)	D* n (%)	A* n (%)	SA* n (%)
1.	The public has the right to know the halal status of a herbal syrup product	12 (4.0)	4 (1.3)	121 (40.3)	163 (54.4)
2.	Not all people need detailed information about the halal status of a herbal syrup product	63 (21.0)	130 (43.3)	90 (30.0)	17 (5.7)
3.	Herbal syrup products that are certified and labeled halal have relatively expensive prices	32 (10.7)	177 (59.0)	70 (23.3)	21 (7.0)
4.	Guaranteeing the halalness of herbal syrup products should be determined by religious institutions	8 (2.7)	29 (9.7)	150 (50.0)	113 (37.7)
5.	The absence of halal certification and labels can still guarantee the safety of a herbal syrup product	68 (22.7)	145 (48.3)	71 (23.7)	16 (5.3)
6.	The inclusion of a halal label without being proven by halal certification is sufficient to guarantee the halalness of a product	81 (27.0)	150 (50.0)	57 (19.0)	12 (4.0)
7.	Herbal syrup products that contain alcohol in accordance with Indonesian Ulema Council (MUI) regulations can be categorized as halal	26 (8.7)	73 (24.3)	148 (49.3)	53 (17.7)
8.	Only people who want to know about halal should be educated	74 (24.7)	130 (43.3)	75 (25.0)	21 (7.0)
9.	Considering the halalness of herbal syrup products is an important step in maintaining consumer confidence in the products they consume	13 (4.3)	15 (5.0)	143 (47.7)	129 (43.0)

* SD is strongly disagree, D is disagree, A is agree, SA is strongly agree

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Table 3. Practices towards ethanol content and halal assurances of herbal syrup products (n = 250)

No	Statement	SD* n (%)	D* n (%)	A* n (%)	SA* n (%)
1.	I always choose to use halal herbal syrup products	2 (0.8)	17 (6.8)	125 (50.0)	106 (42.4)
2.	I always use herbal syrup products that already have the halal logo	4 (1.6)	21 (8.4)	131 (52.4)	94 (37.6)
3.	I always use halal herbal syrup products without considering the price	11 (4.4)	82 (32.8)	106 (42.4)	51 (20.4)
4.	I just need to look at the halal logo on the packaging to ensure there is halal certification for the herbal syrup product	5 (2.0)	44 (17.6)	142 (56.8)	59 (23.6)
5.	I did not notice the presence of alcohol when using herbal syrup products	34 (13.6)	116 (46.4)	75 (30.0)	25 (10.0)

* SD is strongly disagree, D is disagree, A is agree, SA is strongly agree

Perception towards ethanol content and halal Assurances of herbal syrup products

The frequency of respondents' perception towards ethanol content and halal assurances of herbal syrup products is shown in Table 2. There are 9 statements with minimum and maximum potential score is 9 and 36.

Regarding the right to know about halal status, 284 respondents (94.7%) of the respondents Strongly Agreed and Agreed that the public has the right to know halal status. More than 60% of respondents believed that the public needs detailed information about the halal status of herbal syrup products, and that herbal syrup products that have already obtained halal assurances such as certification and halal label are not relatively expensive, despite the fact that the process of obtaining the halal assurance can costs money (Santoso et al., 2021). Regarding the perception of halal assurances determination, total of 87.7% respondents both Strongly Agreed and Agreed that halal assurances should be determined by religious institutions.

Respondents also emphasized the importance of halal certification and labeling to ensure the safety of herbal syrup products for public consumption and that halal certification is required in order to obtain a halal label. In terms of alcohol content in herbal syrup products, more than half of the respondents believed that herbal syrup products containing alcohol in the formula could be considered halal if they met the criteria established by The Indonesian Ulema Council or *Majelis Ulama Indonesia* (MUI). Most of them also believed that the public should be educated about halal, not just those who wanted to be educated. Lastly, 90.7% of the respondents consider the halalness of herbal syrup products an important step in maintaining consumer confidence in the products they consume.

Practices towards ethanol content and halal assurances of herbal syrup products

Table 3 shows the respondents' practices towards ethanol content and halal assurances of herbal syrup products. There are 5 statements with minimum and maximum potential score is 5 and 20.

It can be seen that 231 respondents (92.4%) of the respondents have always chosen to use herbal syrup products that have already stated halal and 225 respondents (90%) of the respondents have always used products that have halal logo. In terms of the price of herbal syrup products, more than 60% of respondents did not mind or did not consider the price of herbal syrup products labeled halal. Meanwhile, only 49 respondents (19.6%) out of 250 respondents are aware that the halal logo cannot ensure halal certification presence directly, implying that they didn't double-check for halal label and the presence of halal certification. Regarding the presence of alcohol content, 60% of the respondents noticed the presence of alcohol or the alcohol labeling when using herbal syrup products, but many people still do not pay attention to the presence of alcohol or alcohol labeling on herbal syrup products.

Categorization of general public perceptions and practices

Based on normality test with Kolmogorov-Smirnov, the results revealed that the data exhibited a normal distribution in perception statements ($p=0.200$), whereas it did not show normal distribution in practices statements ($p<0.001$). Therefore, for perception categorization the mean value is used, while for practices categorization the median value is used. The mean value of the perception score is 27, and if the score obtained is greater than or equal to 27, it is in the positive perception category; otherwise, it is in the negative perception category. The results show that 153

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respondents scored greater than or equal to 27, while 147 scored less than 27.

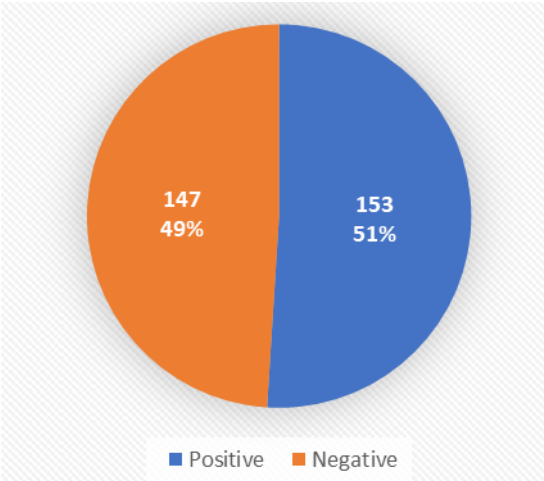

Figure 1. Distribution of general publics' perception (n = 300)

Figure 1 summarizes the category of respondents based on their perception. Overall, the perception of the general public in Yogyakarta City, Indonesia, demonstrated a positive stance (51%) regarding their beliefs in ethanol content and halal assurances for herbal syrup products. Meanwhile, practices categorization based on median value. The median value of the practices score is 14, and if the score obtained is greater than or equal to 14, it is in the positive practices category; otherwise, it is in the negative perception category. The results show that 157 respondents scored greater than or equal to 14, while 93 scored less than 14.

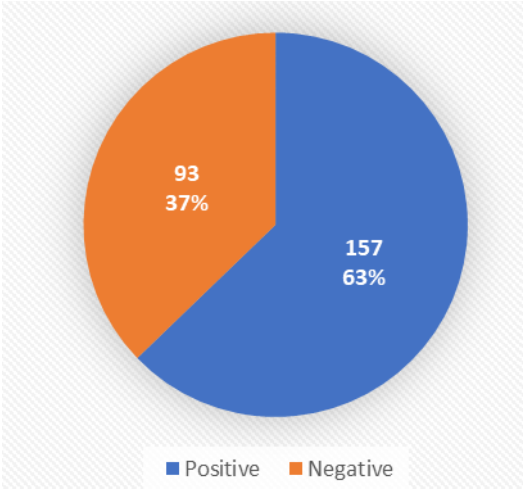

Figure 2. Distribution of general publics' practices (n = 250)

Similar to perception but slightly higher, Figure 2. summarizes the practices of the general public in Yogyakarta City, Indonesia showcased positive actions (62.80%) aligning with their beliefs in ethanol content and halal assurances for herbal syrup products.

Association between sociodemographic characteristics of respondents versus perception and practices

Table 4 shows the correlation between perception and sociodemographic characteristics including gender, age, occupation, education, and religion. The association was analyzed using Chi-Square test.

Table 4. Association between perception and sociodemographic characteristics

Variable	Perception Category		Total	p-*value*
	Positive	Negative		
Gender				
Male	41 (51.2%)	39 (48.8%)	80	0.958
Female	112 (50.9%)	108 (49.1%)	220	
Age				
Adults (≤45 years)	104 (68.9%)	47 (31.1%)	151	<0.001
Elderly (>45 years)	49 (32.9%)	100 (67.1%)	149	
Occupation				
Unemployed	115 (52.0%)	106 (30.8%)	104	0.548
Employed	38 (40.3%)	41 (38.7%)	79	
Education				
Non-College education	104(49.8%)	105 (50.2%)	209	0.515
College education	49 (53.8%)	42 (46.2%)	91	
Religion				
Muslim	136 (51.1%)	130 (48.9%)	266	0.901
Non-Muslim	17 (50%)	17 (50%)	34	

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Table 5. Association between practices and sociodemographic characteristics

Variable	Practices Category		Total	p-*value*
	Positive	Negative		
Gender				
Male	53 (71.6%)	21 (28.4%)	74	0.061
Female	104 (59.1%)	72 (40.9%)	176	
Age				
Adults (≤45 years)	95 (65.5%)	50 (34.5%)	145	0.296
Elderly (>45 years)	62 (59%)	43 (41%)	105	
Occupation				
Unemployed	166 (61.7%)	72 (38.3%)	188	0.532
Employed	41 (66.1%)	21 (33.9%)	62	
Education				
Non-College education	102 (60.4%)	67 (39.6%)	169	0.248
College education	55 (67.9%)	26 (32.1%)	81	
Religion				
Muslim	147 (65.3%)	78 (34.7%)	225	0.013
Non-Muslim	10 (40%)	15 (60%)	25	

If the p-value is less than 0.05, the result is statistically significant, indicating that there is an association between variables. Sociodemographic characteristics of the general public in Yogyakarta City, Indonesia which had a significant association with practices were religion (p=0.013), whereas gender (p=0.061), age (p=0.296), occupation (p=0.532), and level of education (p=0.248) showed p-value greater than 0.05 indicating that there are no association between the variables and practices.

Correlation between perception and practices

Assessing the correlation between perception and practice was using Rank Spearman test. If the significance value is less than 0.05, it indicates that there is a significant relationship between the variables. The result of the correlation test between perception and practices showed a significance value (2-tailed) of <0.001 which indicates that there is a significant relationship between the two variables. The correlation coefficient obtained indicates that the level of strength of the relationship or correlation between the perception and practice variables is 0.340, which means that the relationship or correlation between the perception and practice variables is moderate (0.3 – 0.7).

DISCUSSION

The methodological choices in this study were specifically designed to provide a comprehensive evaluation of public perceptions and practices. The use of a convenience sampling method enabled to gather a diverse sample of respondents that was essential for our comparative analysis. This approach was crucial for identifying the significant association between sociodemographic variables and consumer perceptions, a key finding that would be difficult to establish with a homogenous sample. Furthermore, the selection of the Chi-Square and Rank Spearman tests was deliberate, as these statistical methods are appropriate for analyzing the categorical and ordinal data collected via our questionnaire. This allowed us to rigorously assess relationships between consumer demographics, perceptions, and actual practices. Ultimately, our chosen methodology provided the necessary framework to address a notable gap in the literature by measuring the public's understanding of both ethanol content and halal assurances in herbal syrups.

This study examined the perception and practices of the general public in Yogyakarta City, Indonesia towards ethanol content and halal assurances of herbal syrup products. The main findings are: (1) The positive perception of general public in Yogyakarta City is quite high towards ethanol content and halal assurances of herbal syrup products (2) The positive practices of general public in Yogyakarta City is high towards the presence of ethanol content and halal assurances of herbal syrup products (3) The majority of the residents in Yogyakarta City still lack understanding of how to verify halal certification (4) Some residents in Yogyakarta City are still unaware of the alcohol content in herbal syrup products (5) Sociodemographic characteristics have a significant association with public perception and practices (6) There are positive correlation between public perception and practices. There is currently no research in Indonesia that specifically discusses the issue of halal assurances especially in herbal syrup regarding perception and practices of the general public.

As in Indonesia, all products in circulation must be halal certified required by Law No. 31 of 2014, which is part of the government's effort to ensure halal assurance

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and is mandatory. Regarding the situation, not only the manufacturer should be aware of and follow the regulations, but so should the general public. The general public's perception and practices play a critical role in how they perceive, accept, and implement halal assurances in their daily lives, particularly in relation to residual ethanol content in products such as herbal syrups, which are subject to limitations set by national and international organizations (Neo et al., 2017). A positive perception of halal assurance encourages the community to be more mindful and selective in their product selection. How the public perceives manufacturers' compliance with halal standards influences consumer decisions, creating pressure on the industry to adhere the existing regulations.

This study identified that positive perceptions regarding ethanol content and halal assurances of herbal syrup products are quite high. More than 90% of the respondents perceived that everyone has the right to know halal status and also the presence of halal assurance can give consumers confidence in the products they consume, this topic correlates with study by Sadeeqa et al. (2013) in which the respondents agreed that patient has a right to ask information about sources of ingredients in the medicine they are about to consume. Furthermore, the majority of respondents had a positive perception of halal assurances such as halal certification and halal labeling. They understood that in order to be able to include the halal logo on the packaging of the product, the manufacturer was required to show halal certification. Most of them believed that halal assurances should be determined by religious institutions. In Indonesia, religious institutions managing halal assurances are MUI along with BPJPH and LPH (Wajdi, 2021). More than 60% of the respondents also believed that herbal syrup products containing alcohol could be considered halal if they complied with MUI regulations. According to MUI Fatwa, regarding alcohol or ethanol content in medicines, the use of alcohol in medicine can be considered permissible (halal) if it is not harmful and given in proper doses (Indonesian Ulema Council, 2018).

Consistent with perception, the practices of respondent also showed to be positive regarding the presence of ethanol content and halal assurances in herbal syrup products. A majority of participants expressed a preference for herbal syrups labeled as halal and actively sought products with the halal logo on the packaging. The halal label will help especially Muslim consumers feel more confident in consuming products that meet their need (Maulana et al., 2022). Over 60% of respondents indicated that the price of herbal syrup was not a significant consideration as long as it carried a halal label. However, there was still a misunderstanding among 80.4% respondents regarding the process of checking for halal certification, as it may not be directly indicated on the packaging, such as the halal logo. It is recommended that individuals utilize the MUI website to verify the validity of halal certification. In terms of alcohol or ethanol content, exactly 60% of respondents said they would check for alcohol or ethanol content in herbal syrup products. Nonetheless, some participants did not test for alcohol or ethanol content, possibly due to a lack of awareness about the presence of alcohol in herbal preparations, which are frequently perceived as natural and safe for consumption. The study from Sadeeqa et al. (2013) also said that general public tend to have lack of awareness regarding alcohol content that present in pharmaceutical preparation.

Additionally, the association between sociodemographic characteristics and the perception of the respondents showed that age is significantly associated. Age is one of the factors that can influence perception of individual. In the settings, the age range is quite large, this is due to no presence of upper age restriction applied. As for the association between sociodemographic characteristics and the practices of the respondents showed that religion is significantly associated. Furthermore, Utami et al. (2022) discovered a link between religiosity and perceptions in order to encourage intentions for behavior change in the use of halal medicines in Indonesia. Meanwhile, Annisa et al. (2022) discovered that non-Muslims believe halal products are safe and quality guaranteed, but some non-Muslims do not consider halal certification and labeling to be important because it is not part of their religious teachings. Correlations between perception and practices were also examined for 250 participants in the study who filled out both the perception and practices sections. It was discovered that there is a significant positive relationship between variables, with a moderate level of relationship strength or correlation between perception and practice variables. This means that the better the perception, the better the community practice. The concept that actions/practices tend to be reflected in how people understand and assess things (perceptions) is relevant in relation to the issue of ethanol content and halal assurance.

Therefore, the perception and practices of general public in Yogyakarta City showed to be positive, with 51% of the respondents have positive perception, and

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slightly higher with 62.80% of the respondents have positive practice. However, the percentage reaches nearly half of the respondents, particularly in the perception section. This is likely due to the statements presented to the public, which are considered to require thoughtful consideration before responding. Additionally, the unfavorable statements in the perception section outnumber the favorable ones. Respondents may require additional comprehension to understand the intent behind these statements, contributing to the prolonged decision-making process.

In summary, this research emphasizes the crucial connection between ensuring the halal status of herbal syrup products and the presence of ethanol content. While the significance of halal considerations and the specific attention given to ethanol align with Islamic teachings, the broader concept of halalness serves as an important framework for ensuring consumer safety, particularly in the realm of medicinal products. The findings of this study highlight the general public preference for products with strong halal assurances, including certifications and clearly visible halal labels on packaging. Consequently, there is a compelling need for manufacturer to enhance the optimization of halal product guarantees in circulation throughout Indonesia, catering to the evident public preference for products with clear halal certification and labeling.

CONCLUSION

This study findings show that the perception and practices regarding the presence of ethanol content and halal assurances such as halal certification and halal label among general public in Yogyakarta City, Indonesia were found to be positive. This study also discovered the association between age with perception ($p<0.001$) and also religion with practices ($p=0.013$). Correlation between perception and practices was also found to be positive with moderate strength ($p<0.001$; $r = 0.340$). The study's findings are expected to provide information and strengthen regulations concerning alcohol residue content in herbal syrups. Furthermore, it aims to encourage herbal syrup manufacturers to ensure halal assurances through the process of obtaining halal certification, as well as prominently displaying the halal logo on their products. Additionally, active participation from the community, halal assurance organizations, and the government is crucial in educating the public about the presence of alcohol or ethanol content, as well as halal assurance through certification and halal labeling.

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AUTHOR CONTRIBUTIONS

Conceptualization, M.D.L, D.E.; Methodology, D.E., M.D.L., S.W.L.; Validation, S.W.L., N.V.U.; Formal Analysis, S.W.L., M.D.L., D.E.; Investigation, S.W.L., N.V.U.; Resources, M.D.L.; Data Curation, S.W.L., M.D.L., N.V.U.; Writing - Original Draft, S.W.L., M.D.L.; Writing - Review & Editing, D.E., M.D.L.; Visualization, S.W.L.; Supervision, D.E., M.D.L.; Project Administration, M.D.L.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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