

KNOWLEDGE AND AWARENESS OF MUSLIM CONSUMERS TOWARDS GELATINE EXISTENCE IN HALAL PHARMACEUTICAL PRODUCTS: A CASE STUDY OF DUOPHARMA BANGI

Muhammad Ikmal Haaziq Bin Othman¹

Lokman Bin Abdul Rasol^{2*}

Nurshahira Binti Ibrahim²

Rasyad Afif Bin Ibrahim²

Nurul Hidayah Binti Che Hassan²

Md Hamzaimi Azrul Bin Md Baharudin²

¹Academy of Contemporary Islamic Studies, Universiti Teknologi MARA, Kampus Shah Alam, Malaysia
(E-mail: 2022958735@student.uitm.edu.my)

²Academy of Contemporary Islamic Studies, Universiti Teknologi MARA, Kampus Pahang, Malaysia
Corresponding author: lokman_87@uitm.edu.my)

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Abstract: *This study investigates the knowledge and awareness levels of Muslim consumers regarding the presence of gelatin in pharmaceutical products, specifically focusing on employees at Duopharma Bangi, Malaysia. Gelatin, commonly derived from animal sources including non-halal ones, poses significant religious concerns for Muslim consumers. Through a quantitative approach using survey methodology, data was collected from 150 Muslim respondents working in various departments at Duopharma. The findings revealed that while respondents demonstrated a moderate to high level of knowledge about gelatin in pharmaceuticals (mean scores ranging from 3.66 to 4.16), their awareness of its implications was even higher (mean scores ranging from 4.15 to 4.55). The study highlights the importance of transparent labeling, regulatory oversight, and consumer education in ensuring Muslim consumers can make informed choices aligned with their religious requirements. These findings have implications for pharmaceutical manufacturers, regulatory bodies, and Muslim consumers navigating the complex landscape of halal pharmaceutical products.*

Keywords: *Halal pharmaceuticals, gelatin awareness, Muslim consumers, pharmaceutical ingredients, religious compliance*

Introduction

The global halal industry has witnessed significant growth, with the halal pharmaceutical sector emerging as an important area of development. Halal pharmaceuticals refer to medicinal products that comply with Islamic law (Shariah) in all aspects, including sourcing of ingredients, manufacturing, packaging, storage, and distribution. They must be free from prohibited (haram) substances such as porcine derivatives and alcohol, and any permissible animal-based ingredients must be obtained from animals slaughtered according to Islamic rites (Mohamad et al., 2016; Hashim & Mat Hashim, 2013). Gelatin is a colorless, tasteless, and water-soluble protein obtained by the partial hydrolysis of collagen, a structural protein found in the skin, bones, and connective tissues of animals. It is widely used in food, pharmaceuticals, and cosmetics as a gelling, stabilizing, and thickening agent (GMIA, 2019; Schrieber & Gareis, 2007). A key concern for Muslim consumers is the use of gelatin, a protein derived from animal collagen, widely applied in capsules, coatings, and drug delivery systems (Farahi et al., 2018). Most commercial gelatin comes from porcine sources, prohibited in Islam, while bovine-derived gelatin is only halal if obtained through proper Islamic slaughtering methods (Tukiran et al., 2023).

For the world's 1.8 billion Muslims, this presents a religious dilemma, particularly in pharmaceuticals where life preservation (dharuriyyat) must be balanced with religious compliance. The issue is compounded by limited transparency, unclear labeling, and low consumer awareness (Eryilmaz et al., 2017).

Although previous studies have explored consumer awareness of halal food in general, little research has specifically addressed halal pharmaceuticals, particularly among those within the industry. Malaysia, with its strong halal certification framework, has positioned itself as a leader in halal pharmaceuticals (Malaysian Standards, 2010). This study examines the knowledge and awareness of Muslim consumers at Duopharma Bangi regarding gelatin in pharmaceuticals, aiming to provide insights that strengthen transparency, compliance, and consumer confidence in the industry (Baker et al., 2020).

Literature Review

Halal and Non-Halal Gelatin

The discourse on halal and non-halal gelatin encompasses intricate processes and considerations essential for ensuring compliance with Islamic dietary laws. Halal certification extends beyond merely assessing the final product; it encompasses the entire production chain, including the sourcing of gelatin and additives incorporated into the product. Given that porcine gelatin dominates the global market, there is an urgent need for halal alternatives derived from permissible sources such as poultry, cattle, or marine origins (Zamzahaila et al., 2021). The distinction between halal and non-halal gelatin is fundamentally rooted in Islamic dietary laws, which prohibit the consumption of pork and its derivatives, as well as products from animals not slaughtered according to Islamic practices. Rakhmanova et al. (2018) emphasize that the primary challenge in ensuring halal gelatin lies in both the source of the raw material and the adherence to halal slaughtering methods for permissible animals. They note that approximately 40% of global gelatin production comes from porcine sources, creating significant challenges for Muslim consumers seeking halal alternatives.

The verification of gelatin sources presents considerable challenges for regulatory bodies and consumers alike. According to Hassan et al. (2018), incorrect gelatin origin labeling is a

common issue in pharmaceutical products. When a product simply lists “gelatin” as an ingredient without specifying its source (whether fish, pork, cattle, or another animal), consumers face significant difficulty in determining its halal status. This ambiguity affects millions of consumers who abstain from certain animal products for religious reasons. Technological advancements have enabled the development of analytical methods to detect non-halal materials in gelatin products. Eryilmaz et al. (2017) discuss various techniques, including FTIR spectrophotometry and PCR-based methods, that can be employed to authenticate gelatin sources. However, these sophisticated detection methods are rarely accessible to average consumers, who must rely on certification logos and manufacturer declarations to make informed choices.

Halal Pharmaceutical Products

Halal pharmaceuticals are defined as products that comply with Islamic Shariah requirements throughout their development, production, and distribution. Baker et al. (2020) define halal pharmaceuticals as drug products obtained from permissible sources that adhere to Islamic principles. Despite their significant market potential and religious importance, halal pharmaceuticals remain understudied and contentious, particularly regarding ingredients and manufacturing processes. The Malaysian Standards (2010) established comprehensive guidelines for halal pharmaceuticals, requiring all halal medicines to comply with strict regulations set by the Drug Control Authority. These guidelines encompass everything from defining halal medicine to detailing manufacturing requirements, ensuring industry growth in a trustworthy manner. The MS 2424:2012 standard specifically addresses halal pharmaceuticals, providing a framework for manufacturers seeking halal certification. Saha et al. (2019) note that despite the importance of halal considerations in medicine, the concept remains relatively unexplored among medical practitioners and students. Their research indicates that most pharmaceutical products available in markets do not comply with Islamic halal requirements, creating a significant gap between consumer needs and product availability. The economic potential of halal pharmaceuticals is substantial. Mohezar et al. (2015) highlight that transitioning to a halal-based economy could significantly enhance a country’s economic success. Their study of the Malaysian halal industry reveals promising potential due to several strengths, including the Islamic compliance of its products and a growing population that can be leveraged to advance halal pharmaceuticals and other halal products and services.

Consumer Awareness of Halal Products

Halal awareness serves as a fundamental concept shaping consumer behavior and purchase intentions in the context of halal pharmaceutical consumption. It encompasses the level of knowledge and understanding among Muslim consumers regarding product adherence to Shariah principles and guidelines. This awareness reflects a broader trend influenced by factors such as media, technology, and cultural shifts (Mutmainah, 2018). The increasing prevalence of halal awareness correlates with the expanding global Muslim population and growing demand for halal-certified products. As consumers become more informed about halal practices and certifications, their confidence in the authenticity and compliance of halal products also grows. Mutmainah (2018) identifies a positive association between halal awareness and consumer purchase intention, emphasizing the crucial role of education and awareness campaigns in addressing the needs and preferences of Muslim consumers in the halal market. Islam et al. (2023) highlight the challenges in halal standards and certification that affect consumer awareness and confidence. They note that the proliferation of different halal certification bodies and varying standards across countries creates confusion for consumers attempting to identify genuinely halal products. This fragmentation in the certification

landscape complicates consumer decision-making and underscores the need for harmonized standards and increased consumer education. Kotler and Armstrong (2001) emphasize that consumer awareness is a critical factor in the purchase decision process. They argue that increased awareness leads to greater information-seeking behavior, more careful evaluation of alternatives, and ultimately more informed purchase decisions. In the context of halal pharmaceuticals, this translates to consumers actively seeking information about ingredient sources, manufacturing processes, and certification status before making a purchase. The literature consistently identifies halal certification as a tangible assurance of a product's adherence to Islamic dietary laws and quality standards. This certification serves as a crucial decision-making tool for consumers who may lack the technical knowledge to evaluate ingredients independently. However, the effectiveness of certification depends heavily on consumer awareness of its significance and trust in the certifying bodies.

Methodology

Research Design

This study employed a quantitative research design to investigate the knowledge and awareness of Muslim consumers regarding gelatin in halal pharmaceutical products. Quantitative research involves the systematic collection and analysis of numerical data from a predefined sample, aiming to identify patterns, determine averages, make predictions, test causal relationships, and extrapolate findings to a broader population (Patel & Patel, 2019). Unlike qualitative research, which gathers non-numeric data through methods such as interviews or observations, this study utilized structured questionnaires to collect quantifiable data. The quantitative approach was selected for its ability to provide objective measurements of knowledge and awareness levels across a relatively large sample. This method aligned with the study's objectives of observing and analyzing the level of knowledge and awareness among Muslim consumers regarding gelatin in pharmaceutical products. Additionally, quantitative research facilitated statistical analysis of the relationships between demographic variables and levels of knowledge and awareness.

Population and Sampling

The study targeted Muslim employees at Duopharma, Bangi, focusing on a population of approximately 200 Muslim staff members from various departments. This site was selected due to its significance in the Malaysian pharmaceutical industry and the relevance of staff perspectives on pharmaceutical ingredients. The sample size was determined using the Krejcie and Morgan (1970) table, which indicated that for a population of 200, a minimum sample size of 132 respondents would be appropriate. To ensure adequate responses and account for potential issues such as unreturned questionnaires, invalid answers, and blank responses, the researcher distributed 160 questionnaires, ultimately collecting 150 completed responses, giving a response rate of 93.75%. The sampling method employed was simple random sampling to ensure that every staff member had an equal chance of being selected. While this method helps reduce selection bias, it may not fully capture differences in opinions among smaller subgroups within the population. The sampling approach targeted Muslim employees across three main departments: office, production, and warehouse, with particular emphasis on respondents from the production department due to their direct involvement in handling and manufacturing pharmaceutical products, which was expected to provide valuable insights into awareness and knowledge levels.

Research Instrument

The primary data collection instrument was a structured questionnaire distributed through Google Forms. The questionnaire consisted of four sections:

- Section A: Demographic Information- Collected data on respondents' gender, age, academic level, and department.
- Section B: Knowledge of Muslim Consumers Towards Gelatin Existence in Halal Pharmaceuticals- Comprised five items measuring respondents' knowledge about gelatin, its sources, and halal pharmaceutical requirements.
- Section C: Awareness Level of Muslim Consumers Towards Gelatin Existence in Halal Pharmaceutical Products- Contained five items assessing respondents' awareness of gelatin in pharmaceuticals and its implications for halal compliance.

Sections B and C employed a five-point Likert scale for responses, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). This format was chosen to simplify data analysis and provide a standardized measurement of attitudes and perceptions. The questionnaire was designed based on previous research and adapted to address the specific objectives of this study. Before full implementation, the instrument was reviewed for face and content validity by subject matter experts in halal studies and pharmaceutical sciences.

Data Collection Procedure

The data collection process involved both primary and secondary sources. Primary data was collected through the distribution of the questionnaire to Muslim staff at Duopharma Bangi. The Google Form link was shared through WhatsApp and email, with clear instructions provided to potential respondents. The data collection period spanned approximately four weeks to ensure adequate response rates. Secondary data sources, including previous research papers, journals, articles, e-books, and relevant websites, were utilized to supplement the primary data and provide context for the findings. These sources offered additional information related to the study's topic and objectives, enhancing the researcher's understanding and knowledge base.

Data Analysis

The collected data was analyzed using the Statistical Package for Social Sciences (SPSS) version 29. Various statistical techniques were employed to examine the data:

- Frequency Analysis- Used to analyze demographic profiles (Section A) and response distributions across all items in Sections B and C.
- Descriptive Analysis- Mean scores and standard deviations were calculated to determine the central tendencies and dispersion of responses for each item. Mean scores were interpreted using the following scale: 1.00 - 1.80: Very Low
- 1.81 - 2.60: Low
- 2.61 - 3.40: Moderate
- 3.41 - 4.20: High
- 4.21 - 5.00: Very High

Reliability Analysis

Cronbach's Alpha test was conducted to assess the internal consistency and reliability of the questionnaire items. A Cronbach's Alpha value of 0.6 to 0.7 was considered acceptable, while values of 0.8 or higher indicated excellent reliability (George et al., 2015). The analysis focused on addressing the research objectives by examining the knowledge and awareness levels of

respondents and identifying patterns or correlations in the data. The results were presented using tables and figures to enhance clarity and facilitate interpretation.

Results

Demographic Profile of Respondents

The demographic characteristics of the 150 respondents who participated in this study are presented in Table 1.

Table 1: Demographic Profile of Respondents

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	76	50.7
	Female	74	49.3
Age	20-25 years	36	24.0
	26-30 years	36	24.0
	31-40 years	41	27.3
	Above 40 years	37	24.7
Academic Level	Secondary School	89	59.3
	Diploma	14	9.3
	Bachelor's Degree	44	29.3
	Master's Degree	3	2.0
Department	Office	34	22.7
	Production	88	58.7
	Warehouse	28	18.7

The gender distribution among respondents was relatively balanced, with slightly more males (50.7%) than females (49.3%). The age distribution showed a fairly even spread across age categories, with the 31-40 years group representing the largest proportion (27.3%). In terms of academic qualifications, the majority of respondents (59.3%) had completed secondary school education, followed by those with bachelor's degrees (29.3%). The department distribution reflected the sampling emphasis on production staff, with 58.7% of respondents coming from the production department, while office and warehouse staff comprised 22.7% and 18.7% of the sample, respectively.

Knowledge of Muslim Consumers Towards Gelatin Existence in Halal Pharmaceutical Products

The first objective of this study was to observe the level of knowledge of Muslim consumers towards gelatin existence in halal pharmaceutical products. Table 2 presents the descriptive statistics for the five items measuring respondents' knowledge.

Table 2: Knowledge of Muslim Consumers Towards Gelatin Existence in Halal Pharmaceutical Products

No.	Item	Mean	Std. Deviation	Level
B1	Do you know what is Gelatin?	4.11	0.772	High
B2	Do you agree that some capsules are made from Gelatin which may be derived from porcine?	3.66	0.939	High
B3	Do you agree bovine animals must be slaughtered according to Islamic law for their Gelatin to be considered halal?	4.10	0.772	High

B4	Have you ever heard the term of “halal pharmaceutical”?	4.16	0.737	High
B5	Do you agree that there is a specific guideline for halal pharmaceutical products that involving Gelatin?	3.78	0.767	High
	Overall Mean	3.96	0.797	High

The results indicate that respondents demonstrated a high level of knowledge regarding gelatin in pharmaceutical products, with an overall mean score of 3.96. The highest knowledge level was observed for awareness of the term “halal pharmaceutical” ($M = 4.16$, $SD = 0.737$), followed by general knowledge about gelatin ($M = 4.11$, $SD = 0.772$) and understanding that bovine animals must be slaughtered according to Islamic law for their gelatin to be considered halal ($M = 4.10$, $SD = 0.772$). Relatively lower, though still high, knowledge levels were reported for awareness of specific guidelines for halal pharmaceutical products involving gelatin ($M = 3.78$, $SD = 0.767$) and understanding that some capsules are made from gelatin potentially derived from porcine sources ($M = 3.66$, $SD = 0.939$). A more detailed analysis of each knowledge item revealed that for the question “Do you know what is Gelatin?” (B1), 82% of respondents either agreed or strongly agreed, indicating widespread basic knowledge about gelatin. Similarly, for the question regarding bovine slaughter requirements (B3), 77.3% of respondents agreed or strongly agreed, demonstrating a good understanding of halal requirements for animal-derived ingredients. The lowest agreement was observed for the question about capsules potentially containing porcine-derived gelatin (B2), where 59.3% agreed or strongly agreed, while 28% were uncertain. This suggests some knowledge gaps regarding the specific sources of gelatin in pharmaceutical formulations.

Awareness Level of Muslim Consumers Towards Gelatin Existence in Halal Pharmaceutical Products

The second objective of this study was to analyze the awareness level of Muslim consumers towards gelatin existence in halal pharmaceutical products. Table 3 presents the descriptive statistics for the five items measuring respondents’ awareness.

Table 3: Awareness Level of Muslim Consumers Towards Gelatin Existence in Halal Pharmaceutical Products

No.	Item	Mean	Std. Deviation	Level
C1	I am aware that Gelatin can be an ingredient in pharmaceutical product	4.19	0.826	High
C2	I am aware Halal Pharmaceuticals do not contain any parts of animals prohibited by the Shariah Law	4.33	0.807	Very High
C3	I am concern about the source of Gelatin used in pharmaceutical products	4.28	0.860	Very High
C4	I will purchase pharmaceutical product if I know the halal status of Gelatin	4.15	1.013	High
C5	Pharmaceutical companies should provide enough information about the presence and source of Gelatin in their products	4.55	0.657	Very High
	Overall Mean	4.30	0.833	Very High

The results indicate that respondents demonstrated a very high level of awareness regarding gelatin in pharmaceutical products, with an overall mean score of 4.30. The highest awareness level was observed for the belief that pharmaceutical companies should provide enough

information about the presence and source of gelatin in their products ($M = 4.55$, $SD = 0.657$), followed by awareness that halal pharmaceuticals should not contain any parts of animals prohibited by Shariah law ($M = 4.33$, $SD = 0.807$) and concern about the source of gelatin used in pharmaceutical products ($M = 4.28$, $SD = 0.860$). Slightly lower, though still high, awareness levels were reported for awareness that gelatin can be an ingredient in pharmaceutical products ($M = 4.19$, $SD = 0.826$) and the intention to purchase pharmaceutical products if the halal status of gelatin is known ($M = 4.15$, $SD = 1.013$). A more detailed analysis of each awareness item revealed that for the statement “Pharmaceutical companies should provide enough information about the presence and source of Gelatin in their products” (C5), 91.3% of respondents either agreed or strongly agreed, indicating a strong desire for transparency from manufacturers. Similarly, for the statement regarding concern about gelatin sources (C3), 83.3% of respondents agreed or strongly agreed, demonstrating high awareness of the potential issues associated with gelatin in pharmaceuticals. The lowest agreement was observed for the statement about purchasing decisions based on known halal status (C4), where 73.4% agreed or strongly agreed, while 17.3% were uncertain and 9.3% disagreed. This suggests that while most respondents were concerned about halal status, some might prioritize other factors (such as medical necessity) in their purchasing decisions.

Discussion

This study aimed to investigate the knowledge and awareness levels of Muslim consumers regarding gelatin in pharmaceutical products, focusing specifically on Muslim employees at Duopharma Bangi, Malaysia. The findings reveal several important insights that contribute to our understanding of consumer perspectives on halal pharmaceuticals.

Knowledge of Muslim Consumers Towards Gelatin Existence in Halal Pharmaceutical Products

The results for objective 1 indicate that respondents generally possessed a high level of knowledge about gelatin and its implications for halal compliance in pharmaceutical products, with an overall mean score of 3.96. This finding supports Baker et al. (2020), who observed increasing knowledge about halal pharmaceuticals among Muslim consumers globally. The relatively high scores may be linked to the respondents’ employment in a pharmaceutical company, which likely exposed them to more information on pharmaceutical ingredients compared to the general population.

Respondents showed the strongest knowledge in recognising the term “halal pharmaceutical” ($M = 4.16$) and understanding the concept of gelatin ($M = 4.11$). This reflects a strong baseline awareness of halal considerations. At the same time, knowledge was weaker regarding porcine-derived gelatin in capsules ($M = 3.66$) and guidelines for halal pharmaceutical products ($M = 3.78$). The uncertainty among 28% of respondents about capsules potentially containing porcine-derived gelatin reflects findings by Hassan et al. (2018), who reported insufficient or unclear labelling of gelatin sources in pharmaceutical products. This highlights the importance of clearer ingredient labelling and consumer education.

Meanwhile, 77.3% of respondents correctly understood that bovine animals must be slaughtered according to Islamic law for their gelatin to be halal. As emphasised by Tukiran et al. (2023), even gelatin derived from permitted animals may lose its halal status if slaughter is not carried out according to Islamic principles. This awareness demonstrates that respondents possessed a more nuanced understanding of halal requirements beyond simply identifying ingredient types.

From a practical perspective, the findings suggest several implications for Duopharma. Given the relatively strong baseline knowledge among its employees, the company is well-positioned to take a leading role in advancing halal pharmaceutical practices. First, Duopharma can strengthen its halal certification processes by ensuring transparent labelling of gelatin sources, particularly for products where porcine-derived gelatin might be a concern. Second, the company could invest in research and development of alternative capsule materials, such as plant-based or fish-derived gelatin, positioning itself as a pioneer in halal-friendly innovations. Third, internal training programmes could be expanded to address the knowledge gaps identified in this study, especially regarding specific halal guidelines. By doing so, Duopharma not only enhances staff awareness but also builds consumer trust.

Ultimately, Duopharma's proactive approach in addressing these gaps and leading in halal certification innovation would not only benefit its employees and consumers but could also set a benchmark for the wider Malaysian pharmaceutical industry.

Awareness Level of Muslim Consumers Towards Gelatin Existence in Halal Pharmaceutical Products

The results for objective 2 demonstrate that respondents were highly aware of gelatin issues in pharmaceutical products, with an overall mean score of 4.30, which was even higher than their knowledge score ($M = 3.96$). This indicates that although some knowledge gaps remain, there is strong consciousness about the importance of halal compliance in pharmaceutical ingredients.

Respondents' strongest awareness was linked to transparency from pharmaceutical companies, with 91.3% demanding clear disclosure of gelatin sources ($M = 4.55$). This finding supports Eryilmaz et al. (2017), who noted that consumers often struggle due to unclear or missing labelling of gelatin in products. High levels of awareness regarding the prohibition of animal parts under Shariah law ($M = 4.33$) and concern about gelatin sources ($M = 4.28$) align with Mutmainah's (2018) view that halal awareness is closely tied to religious commitment and strongly influences purchase intentions.

The finding that 73.4% would only purchase pharmaceutical products if the halal status of gelatin was known, while 26.6% were uncertain or disagreed, highlights a tension between religious adherence and medical necessity. This reflects Saha et al. (2019), who observed that Muslim consumers often face complex trade-offs when halal alternatives are limited. In practice, this suggests that even with high awareness, purchasing decisions can be shaped by availability and health urgency.

From a practical perspective, the results highlight an opportunity for Duopharma to strengthen consumer trust by leading efforts in halal certification transparency. Clear labelling, consumer education, and the development of halal-certified alternatives would not only address current consumer concerns but also position the company as a leader in halal pharmaceutical standards in Malaysia and beyond.

Comparison of Knowledge and Awareness Levels

A comparative analysis of knowledge and awareness scores reveals that respondents' awareness of gelatin issues ($M = 4.30$) exceeded their knowledge about specific aspects of gelatin in pharmaceuticals ($M = 3.96$). This discrepancy suggests that while consumers are highly

conscious of the importance of halal compliance, they may lack some of the technical knowledge needed to make fully informed decisions.

This pattern is consistent with Kotler and Armstrong's (2001) consumer behavior framework, which distinguishes between awareness (recognition of an issue's importance) and knowledge (detailed understanding of the issue). The higher awareness scores indicate that respondents recognize the significance of gelatin sources for halal compliance, even if they don't possess complete knowledge about all technical aspects.

The gap between knowledge and awareness underscores the need for educational initiatives that not only emphasize the importance of halal ingredients but also provide specific information about identifying and evaluating ingredients in pharmaceutical products. Such initiatives could help bridge the gap between concern about halal compliance and the practical knowledge needed to make informed choices.

Conclusion

This study investigated the knowledge and awareness levels of Muslim consumers regarding gelatin in pharmaceutical products, focusing on employees at Duopharma Bangi, Malaysia. The findings revealed that respondents generally possessed high levels of knowledge about gelatin and very high levels of awareness regarding its implications for halal compliance.

The results highlight several key insights:

- Muslim consumers working in the pharmaceutical industry demonstrate good general knowledge about gelatin and halal pharmaceuticals, though some knowledge gaps exist regarding specific sources and guidelines.
- Awareness levels exceed knowledge levels, indicating high consciousness of the importance of halal compliance even when detailed technical knowledge may be limited.
- There is a strong demand for transparency from pharmaceutical companies regarding gelatin sources, with 91.3% of respondents agreeing that companies should provide adequate information.
- While most respondents (73.4%) indicated they would purchase pharmaceutical products if they knew the halal status of gelatin, some uncertainty exists, suggesting potential conflicts between religious considerations and health necessities.

These findings have important implications for various stakeholders. For pharmaceutical manufacturers, the results underscore the importance of transparent labeling and clear communication about ingredient sources to meet consumer expectations. For regulatory bodies, the findings highlight the need for comprehensive guidelines and enforcement mechanisms to ensure adherence to halal standards. For Muslim consumers, the study emphasizes the importance of continued education about pharmaceutical ingredients to make informed choices aligned with religious requirements. The study's focus on pharmaceutical industry employees provides a unique perspective that bridges industry knowledge and consumer concerns. However, it also suggests that knowledge levels among the general public might be lower than those observed in this specialized sample, further emphasizing the need for broader consumer education initiatives. In conclusion, while progress has been made in raising awareness about gelatin in pharmaceuticals among Muslim consumers, continued efforts are needed to enhance knowledge, improve transparency, and ensure the availability of halal alternatives. By addressing these areas, stakeholders can contribute to a pharmaceutical market that better serves the needs of Muslim consumers while respecting their religious obligations.

Recommendations

Based on the findings of this study, several recommendations can be made for different stakeholders:

For Muslim Consumers

- Actively seek information about pharmaceutical ingredients, particularly gelatin sources, to make informed choices aligned with religious requirements.
- Check product labels for halal certification symbols from reputable certification bodies, such as JAKIM in Malaysia.
- Consult knowledgeable sources, such as Islamic scholars or halal certification bodies, for guidance on the halal status of specific pharmaceutical products.
- Advocate for greater transparency from pharmaceutical companies regarding ingredient information.

For Pharmaceutical Manufacturers

- Enhance labeling practices to clearly indicate the source of gelatin used in pharmaceutical products.
- Consider developing halal alternatives to common pharmaceutical formulations that typically contain non-halal gelatin.
- Seek halal certification for products to provide assurance to Muslim consumers.
- Engage with Muslim consumers and religious authorities to better understand concerns and expectations regarding halal compliance.

For Regulatory Bodies

- Strengthen and standardize halal certification processes for pharmaceutical products.
- Develop specific guidelines for gelatin-containing pharmaceuticals, addressing both source verification and manufacturing processes.
- Implement consumer education campaigns to raise awareness about halal pharmaceutical considerations.
- Enhance regulatory oversight to ensure compliance with halal standards and accuracy in ingredient labeling.

For Future Research

- Extend the study to include a broader sample of Muslim consumers beyond those working in the pharmaceutical industry.
- Investigate the availability and accessibility of halal pharmaceutical alternatives in different regions.
- Examine the economic implications of transitioning to halal-certified pharmaceutical production.
- Explore the development and efficacy of plant-based or synthetic alternatives to animal-derived gelatin in pharmaceutical applications.

By implementing these recommendations, stakeholders can contribute to a more transparent, inclusive, and religiously compliant pharmaceutical market that better serves the needs of Muslim consumers worldwide.

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