

# Twitter Sentiment Analysis on Halal Pharmaceutical

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This study aims to analyze public sentiment towards halal pharmacy and halal pharmaceutical concepts. The data used is primary data sourced from the Twitter social media platform, focusing on the topic of halal pharmacy and halal pharmaceuticals. This data was subsequently processed using the Python Library known as VADER. The research findings indicate that, in the context of halal pharmacy, the public exhibits a positive sentiment tendency of 54.4%, followed by a neutral sentiment at 28.4%, and a negative sentiment of 17.2%. The prominent keywords that frequently appear include pharmacy, halal, pharmacies, best halal, Muslim rage, halal condom, and pharmacy product. Furthermore, it is noted that Auckland, New Zealand, emerges as the location with the highest number of tweets, amounting to 35. In contrast, concerning the concept of halal pharmaceuticals, there is a tendency towards a neutral sentiment at 51.7%, followed by a positive sentiment at 39.2%, and lastly, a negative sentiment at 9.0%. The research results also reveal that the dominant keywords appearing in tweets related to halal pharmaceuticals include halal, halal pharmaceutical, pharmaceutical industry, pharmaceutical company, pharmaceutical product, Malaysia, Brunei pharmaceutical, and global halal. It is noteworthy that the country with the highest number of tweets discussing halal pharmaceuticals is Malaysia, with a total of 127 tweets.

**Keywords: Halal Pharmacy; Halal Pharmaceutical; Sentiment Analysis; VADER**

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## INTRODUCTION

Halal pharmacy refers to the production of pharmaceutical products that are halal and manufactured in accordance with Islamic regulations. In this context, pharmaceutical products must contain halal ingredients and must be produced in compliance with Islamic principles. To obtain halal certification, every ingredient must be traceable, and the product must not contain any substances derived from pork, alcohol, blood, predatory animals, human body parts, or insects. Ingredients sourced from animals must come from animals that are permitted to be slaughtered according to Islamic law (Ali, 2021). With the rapid development of the halal industry, Ali (2021) also explains that halal pharmaceutical products are becoming increasingly popular worldwide, setting new standards for safety and quality. Majority-Muslim countries have adopted regulatory frameworks that guide the halal certification process for pharmaceutical products.

The rapid increase in awareness among Muslims globally has expedited the acknowledgment of halal products as a new benchmark for safety and quality assurance. While the early stages of the halal industry primarily focused on halal food, it has since diversified into other sectors, including pharmaceuticals and healthcare products (Herdiana & Rusdiana, 2022). Nevertheless, despite the proliferation of halal pharmaceuticals, there remains a lack of awareness concerning their ingredients, standards, or manufacturing processes (Alserhan et al., 2020). This leads to the perception that, despite its rapid expansion, the halal pharmaceutical industry still grapples with various challenges and issues.

Norazmi & Lim (2015) elucidate that the necessity to establish an accurate, well-regulated, and aligned accreditation and halal management system is a major challenge for the emerging industry. Moreover, the materials used in the pharmaceutical industry must be halal certified, and doubts persist regarding the halal status of certain ingredients (Herdiana & Rusdiana, 2022). This also relates to the critical points of halal, demanding careful consideration during the preparation, processing, handling, packaging, storage, and distribution of pharmaceuticals. Halal drugs must embody the "WISE" principles, signifying integrity, innovation, sustainability, synergy, and equity, while remaining accessible despite geographical and economic constraints (Mohamed & Shafri, 2021). Furthermore, halal certification for medications and supplements necessitates both theological and technical

expertise due to the unique standards and regulations governing this category (Norazmi & Lim, 2015).

To address these issues, Norazmi & Lim (2015) emphasize the need for continuous and integrated efforts from all stakeholders to ensure the sustainability of the halal pharmaceutical industry. Awareness and the practice of halal drugs should be instilled from an early age through more comprehensive programs involving relevant stakeholders, such as through awareness campaigns, social media expansion, and other means. Zehra & Naqvi (2017) add that the importance of mutual recognition by certifying bodies and the harmonization of halal conformity assessments across various countries can alleviate the challenges faced by suppliers and support industry expansion. Furthermore, large-scale institutional purchases of halal pharmaceuticals and broader halal labeling implementation can boost future demand (The Economist Intelligence Unit Limited, 2020).

In addition to the challenges faced by the halal pharmaceutical industry, there are several opportunities that can be harnessed to overcome these challenges and, of course, to develop the industry. Norazmi & Lim (2015) and Ali (2021) reveal that the increasing global Muslim population has raised the demand for halal pharmaceuticals, presenting a significant opportunity for stakeholders involved in the halal pharmaceutical industry. This represents a substantial opportunity for halal pharmaceutical products to gain popularity worldwide and establish new standards for safety and quality. This is supported by data indicating that the halal pharmaceutical market is projected to reach \$174.59 billion by 2025 (Ali, 2021). Furthermore, the industry needs to highlight the halal and tayyib aspects of its products through appropriate branding and promotional strategies (Kasri, 2023). Herdiana & Rusdiana (2022) explain that having a halal label on products can increase consumer trust, expand the reach of the global halal food market, and enhance product sales in the market.

However, in some situations, there are differing sentiments and debates within the halal pharmaceutical industry. Sadeeqa et al. (2013) and Kasri et al. (2023) state that there is a positive sentiment towards halal pharmaceutical products among consumers, especially those who are religiously observant. For example, during the COVID-19 pandemic, discussions arose regarding the halal status of vaccines, and some members of the Islamic community expressed concerns about the use of non-halal ingredients in vaccine production (Feizollah et al., 2022). Some Muslim

consumers prefer halal pharmaceuticals because they believe that consuming halal products is a religious obligation. The presence of halal pharmaceuticals provides assurance to Muslim consumers that the products they consume comply with Islamic law.

Another debate or sentiment is related to the definition of halal in the pharmaceutical industry, whether the definition of halal should be limited to the source of raw materials or encompass the entire manufacturing process, including the use of animal-derived ingredients in the pharmaceutical industry. Additionally, some critics argue that the halal certification process is not transparent and is difficult to verify for pharmaceutical product halal status. Moreover, ethical and health-related issues also spark debates within the halal pharmaceutical industry, with discussions on whether the halal pharmaceutical industry should prioritize strict ethical and health aspects in drug production. Some may argue that aspects such as animal welfare or environmental impact should also be taken into account in the production process. Furthermore, the debate extends to regulations and standards in the halal pharmaceutical industry. How governments regulate and oversee this industry, and whether there is international harmonization in halal standards, are important questions.

These debates reflect the diversity of perspectives and needs within the evolving halal pharmaceutical industry, as well as the complexity of ethical, religious, economic, and regulatory issues involved. The ongoing nature of these debates can also influence the future direction of the halal pharmaceutical industry. Therefore, this research seeks to delve deeper into sentiments on the topic of halal pharmacy. Some previous relevant studies in this area include Feizollah et al. (2022), who examined discourse on halal COVID-19 vaccination on Facebook and Twitter using aspect-based sentiment analysis and text emotion analysis; Mohezar et al. (2016), who explored the issues and challenges of the halal pharmaceutical market; Isa et al. (2023), who examined the determinants of consumer adoption of halal cosmetics; Alserhan et al. (2020), who discussed awareness of halal pharmaceuticals; Kabir (2022), who analyzed topics and sentiments in response to clerics' corrections regarding COVID-19 vaccine misinformation; and Kasri et al. (2023), who investigated the intention to consume halal pharmaceutical products.

Based on these findings, there is no specific study that has specifically examined sentiment analysis regarding halal pharmacy. Therefore, this research aims

to assess the extent to which existing research addresses the topic of halal pharmacy, gain a deeper understanding of how the public and stakeholders respond to and interact with the concept of halal pharmaceuticals and the halal pharmacy industry more broadly, and identify aspects that can influence the development of this industry. Sentiment analysis can provide valuable insights to guide the development and marketing of halal pharmaceutical products in the future.

## LITERATURE REVIEW

Halal pharmaceuticals refer to the production and sale of pharmaceutical products that adhere to Islamic laws and regulations (Ali, 2021; Kasri et al., 2023). In the context of pharmaceuticals, "halal" pertains to pharmaceutical products and processes that comply with Sharia principles in Islam. These principles encompass the materials used in the manufacturing of pharmaceutical products, production methods, testing, and product labeling. Pharmaceutical products deemed halal must be free from components prohibited in Islam, such as alcohol, pork, and materials considered impure. Additionally, pharmaceutical production processes must adhere to strict regulations, including the required quality, cleanliness, and fitness for use. Testing is also necessary to ensure that the pharmaceutical products produced meet halal standards (The Economist Intelligence Unit Limited, 2020; Kasri et al., 2023).

However, Afifi et al. (2014) explained that despite the large market and religious value of these products, they are still understudied and a contentious area, particularly regarding the materials used and the manufacturing processes. Most pharmaceutical products found in the market do not comply with Halal Islamic rules. Moreover, the concept of Halal in medicine has not been extensively explored and is not taught to medical students or practitioners (Saha et al., 2019). This suggests that Halal pharmaceuticals, including in the rapidly developing industry with significant potential, could benefit from the development of relevant regulatory guidelines (Alserhan et al., 2020).

The growth of Halal pharmaceuticals reflects responses to changes in consumer demand, stricter regulations, and global business opportunities. With more pharmaceutical companies investing in meeting Halal requirements, this industry is expected to continue growing and evolving in the future. This is supported by the development of the Halal industry in

the pharmaceutical sector, which has received increasing attention in recent years. This is in line with the increasing demand for pharmaceutical products that meet Halal standards, particularly in countries with a majority Muslim population. [Ali \(2021\)](#) mentions that the Halal pharmaceutical market is estimated to reach \$174.59 billion by 2025.

Some previous relevant studies to this research topic include [Feizollah et al. \(2022\)](#), who aimed to understand the discourse on halal COVID-19 vaccination on Facebook and Twitter using aspect-based sentiment analysis and text emotion analysis. The COVID-19 pandemic introduced unprecedented challenges to societies and governments. Vaccination is the available solution to address this pandemic. Vaccine recipients come from various age groups, genders, and religions. Muslims follow specific Islamic guidelines that prohibit them from receiving vaccines containing certain ingredients. The research analysis identified four topics in both the Twitter and Facebook datasets. Two common topics, "COVID-19 vaccine" and "halal vaccine," appeared in both datasets. The other two topics in the tweets were "halal certificate" and "must be halal," while the Facebook dataset included "Sinovac vaccine" and "council of ulama." Sentiment analysis revealed that sentiments toward halal vaccines tended to be neutral in the Twitter data but positive in the Facebook data. Emotion analysis showed that trust was the dominant emotion among the top three emotions in both datasets, followed by anticipation and fear.

[Mohezar et al. \(2016\)](#) studied issues and challenges in the halal pharmaceutical market. The increasing economic power and global Muslim population demand a deeper understanding of the halal concept. However, efforts to explain halal issues in pharmaceutical production are still rare. This emphasizes that the halal pharmaceutical industry needs to highlight not only halal values in production but also paint a broader picture of Islamic values—good, clean, and healthy—in the manufacturing process that will attract a wider market segment. Manufacturers not only need to focus on operations and procedures that comply with Sharia law. They need to consider running halal pharmaceutical processes in a sustainable practice regime, where raw materials must be produced sustainably, and business should be conducted with good intentions.

[Isa et al. \(2023\)](#) examined the determinants of consumer adoption of halal cosmetics. This research identified 14 articles, primarily discussing critical points related to religiosity and product factors such as

ingredients, halal logo, and halal certification as the most significant drivers in influencing consumers to purchase halal cosmetics. Other related factors in this study include price, promotion, place, social factors, and consumer characteristics. These factors should be considered as they provide added value and an extra advantage for local or international manufacturers to tap into the global market for halal cosmetics that cater to both Muslim and non-Muslim communities.

[Alserhan et al. \(2020\)](#) explained the awareness of halal pharmaceuticals. Pharmaceuticals remain a less-researched field and a source of controversy, especially regarding the ingredients used and the manufacturing process. The research findings revealed a general lack of awareness at all levels regarding the Halal aspects of pharmaceutical products. This result may be specific to the Arab market rather than the broader Muslim market where Halal is part of Islamic identity, unlike Arab countries where Halal is considered obligatory.

[Kabir \(2022\)](#) analyzed topics and sentiment responses to corrections of misinformation by scholars on the COVID-19 vaccine. Confusion matrix assessment and accuracy scores indicated that the balanced random forest-based model exhibited the best performance. Overall, sentiment analysis found that 74 percent of comments were negative, while 26 percent were positive. An LDA-based topic model also revealed the eight most discussed topics related to ten keywords in the YouTube comments.

[Kasri et al. \(2023\)](#) conducted an analysis of the intention to consume halal pharmaceutical products. Although pharmaceutical products are crucial in daily life, especially after the outbreak of the coronavirus in early 2020, there is limited research that attempts to analyze consumer behavior regarding halal pharmaceutical products. Therefore, this research specifically aimed to understand the factors influencing the intention to purchase halal pharmaceutical products among the Muslim population in Indonesia. The research findings revealed that the intention to purchase halal pharmaceutical products is positively influenced by attitudes, religiosity, knowledge of halal products, and perceived behavioral control. However, the impact of the subjective norm variable was found to be non-significant in this study.

## METHOD

This research is a qualitative study that utilizes a sentiment analysis approach. The data used in this research is sourced from tweets available on the social media platform Twitter. The choice of Twitter as a

platform for social media research is based on the relatively easy accessibility of Twitter data. Twitter has distinctive features in the world of social media, with two main characteristics: its messages are open to the public, and it has a short message length limit. This limitation in message length allows for faster analysis compared to other social media platforms. Additionally, Twitter enables research that includes the analysis of both individuals and media within a single analytical framework (Vargo et al., 2014).

The data collected from Twitter is then processed with the assistance of a Python library known as VADER (Valence Aware Dictionary and sEntiment Reasoner). VADER is a lexicon and rule-based sentiment analysis tool that is specifically designed to identify sentiments expressed in social

media and works well on text from various domains. VADER facilitates sentiment analysis by calculating a composite score, which is used to classify tweets into three categories: positive, negative, and neutral (Liu, 2012). The sampling technique employed in this research is purposive non-probability sampling, which aims to obtain information that aligns with the research objectives.

Some relevant studies using sentiment analysis methodology in the field of Islamic economics and finance include: Haidar et al., (2022), As-Salafiyah (2021), Nuraini (2022), Izza (2021), Maulida & Hakim (2022), (Hassan et al., 2022), (Rusydiana, 2022), (Maulida, 2022), (Hakim et al., 2022), (Maulida et al., 2023), and also (Assalafiyah & Rusydiana, 2023).

## RESULT AND DISCUSSION

### Halal Pharmacy

Sentiment Polarity on Tweets Data

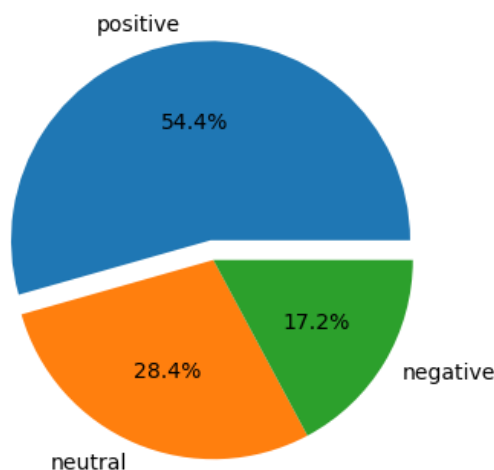


Figure 1: Sentiment Polarity of Halal Pharmacy in Tweet Data

The pie chart above illustrates the sentiment polarity expressed by the public through Twitter tweets related to halal pharmacy. Based on the data analysis using VADER, the sentiment polarity in the tweet data shows that the public has a tendency towards positive sentiment, accounting for 54.4% regarding halal pharmacy. Furthermore, there is a neutral sentiment at 28.4%, and a negative sentiment at 17.2%. Positive sentiment reflects a supportive and approving view of the existence of halal pharmacy. On the other hand, neutral sentiment includes responses that do not

express a particular view or emotion regarding the presence of halal pharmacy. Meanwhile, negative sentiment involves negative responses that encompass perceptions of rejection and criticism of halal pharmacy.

With the dominance of positive sentiment in these results, it indicates that the public's awareness of the use of halal products is increasing. This also suggests that halal pharmacy is performing optimally, and its presence is accepted by the public.



**Table 1:** Location Distribution of Halal Pharmacy-Related Tweets

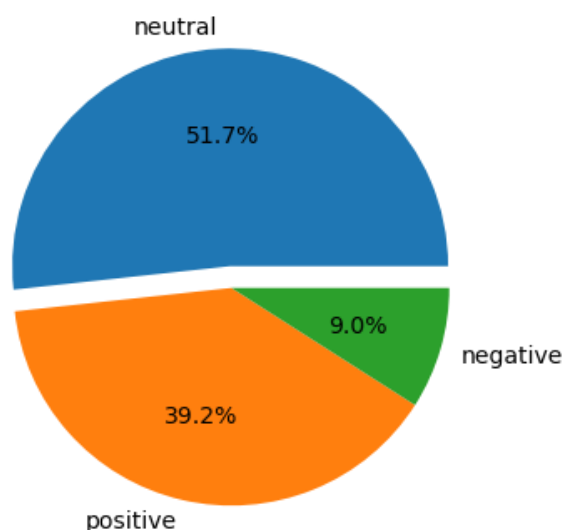
No	Location	Number
1	Auckland, New Zealand	35
2	Los Angeles	30
3	Jakarta	17
4	Malaysia	11
5	Australia	7
6	Finsbury Park, London, UK	7
7	Manhattan, NY	7

The next important piece of information is the location of Twitter users who posted tweets related to Halal Pharmacy. This analysis does not represent the entire dataset since not all users display their location on their Twitter profiles or use non-specific locations like Global, Earth, or other text. The table above (Table 1.) shows that Auckland, New Zealand, had the

highest number of tweets, totaling 35 tweets. The second most common location is Los Angeles with 30 tweets. Jakarta, the capital of Indonesia, follows closely. We can conclude that Halal Pharmacy generates both support and opposition in regions with a predominantly Muslim population as well as in areas with a majority of non-Muslim residents.

**Halal Pharmaceutical**

**Sentiment Polarity on Tweets Data**



**Figure 4:** Sentiment Polarity of Halal Pharmaceutical in Tweet Data

In contrast to the concept of Halal Pharmacy, which received the highest proportion of positive sentiments, as indicated by the pie chart above, it is evident that Halal Pharmaceutical tends to have a neutral sentiment of 51.7%. This is followed by a positive sentiment of 39.2%, with negative sentiment at 9.0%. A significant portion of the public expresses a neutral sentiment towards Halal Pharmaceutical. This neutral sentiment suggests that most people do not have strong positive or negative views on Halal

Pharmaceutical. They may hold a neutral attitude or simply lack a strong opinion on the matter.

Neutral sentiment can reflect various factors, including people's unfamiliarity with the concept of Halal Pharmaceutical, inadequate information, or even a lack of interest in the topic. It's important to note that neutral sentiment can change as public awareness and understanding of Halal Pharmaceutical increase or as new developments and events in the industry unfold.



frequently appearing keywords include "halal pharmaceutical," "pharmaceutical industry," "destroy Indonesia," "bio Farma," "halal law," and "industry bio." These wordclouds provide an overview of the dominating keywords in conversations on Twitter related to the topic of Halal Pharmaceutical,

encompassing both positive and negative aspects. It's worth noting that the keyword "Halal pharmaceutical" appears in both wordclouds, indicating it may be a controversial or frequently discussed keyword in various contexts within these conversations.

**Table 2:** Location Distribution of Halal Pharmaceutical-Related Tweets

No	Location	Number
1	Malaysia	81
2	Kuala Lumpur, Malaysia	46
3	London, England	20
4	Dubai, UAE	13
5	Brunei	10

As for the locations of Twitter users discussing halal pharmaceuticals, Malaysia had the highest number of tweets with 81 tweets and 46 tweets. It was followed by England with 20 tweets, and the countries of Dubai and Brunei with 13 and 10 tweets, respectively. The diversity of opinions and sentiments expressed through Twitter tweets indicates that in these countries, halal pharmaceuticals still receive mixed reactions.

## DISCUSSION

The research results indicate differences in public sentiment towards Halal Pharmacy and Halal Pharmaceutical. The predominant positive sentiment towards Halal Pharmacy suggests that the general public generally feels positive about this concept, while the dominant neutral sentiment towards Halal Pharmaceutical indicates that this concept may not have elicited a strong response from the public. This difference suggests that there is still growing enthusiasm and awareness among the public regarding the halal pharmaceutical industry, which is still relatively new. The importance of the halal status of products, such as food, pharmaceuticals, cosmetics, fashion, and other consumer goods, for Muslim consumers is evident. (Cahyawati et al., 2021) highlighting the importance of the development and understanding of the concepts of Halal Pharmacy and Halal Pharmaceutical.

The fact that halal pharmaceuticals have contributed to nearly one-third of the total revenue of the global halal market underscores the high demand for these products among individuals who are mindful of halal principles in their lives. There is a significant opportunity for players in the halal pharmaceutical industry to continue developing products that cater to

the growing consumer demand. Demand surpassing supply with a significant margin creates opportunities to enhance the economic value in this industry (Hasanah, 2021). Furthermore, health and pharmaceutical products within the framework of the halal industry have shown impressive growth. This indicates that consumers are becoming increasingly aware of the halal status of the products they consume, including pharmaceuticals, and it opens the doors for further innovation and growth in the halal pharmaceutical industry. Therefore, industry players need to continue to focus on quality, compliance, and understanding consumer needs to fully leverage the growth opportunities at hand (Azam & Abdullah, 2020).

Data on the countries where Twitter users extensively discuss halal pharmacy indicates that this topic indeed triggers significant discussions, both in countries with a majority Muslim population and in those with a minority Muslim population. For example, Malaysia, with a total of 127 tweets, leads the discussions on Twitter related to the halal pharmaceutical industry. This fact reflects the importance of this topic in Malaysia.

Malaysia has a majority Muslim population and has also been leading the global Islamic economy ranking, being the second-ranked country in the world after Singapore in the halal pharmaceutical industry (DinarStandard, 2022). The guidelines established by the Malaysian government for the production, preparation, handling, and storage of halal products are significant steps in ensuring compliance with halal principles in the pharmaceutical industry (Afifi et al., 2014). Malaysia's success in this industry reflects not only the interest in the topic of halal pharmaceuticals

but also the strong economic potential associated with it. Malaysia's presence in Twitter discussions highlights the significant role of this country in the halal pharmaceutical industry and the ongoing growth potential in this field. It also underscores the importance of understanding and awareness of halal principles among people in Muslim-majority countries and worldwide, leading to increasing discussions about halal pharmacy on social media.

## CONCLUSION

Halal Pharmacy and Halal Pharmaceutical are two concepts related to pharmacy and pharmaceuticals that adhere to Islamic halal principles. This study aimed to understand public sentiment towards both concepts using data from tweets shared on the social media platform Twitter. The research, with the assistance of the VADER programming, revealed that for the concept of Halal Pharmacy, the public tends to have a positive sentiment of 54.4%, followed by a neutral sentiment of 28.4%, and a negative sentiment of 17.2%. Common keywords in these discussions included pharmacy, halal, pharmacies, best halal, Muslim rage, halal condom, and pharmacy product. Additionally, it was found that Auckland, New Zealand, had the highest number of tweets, totaling 35.

On the other hand, the concept of Halal Pharmaceutical tended to receive a neutral sentiment of 51.7%, followed by a positive sentiment of 39.2%, and a negative sentiment of 9.0%. The research also highlighted dominant keywords in Twitter discussions related to Halal Pharmaceutical, including halal, halal pharmaceutical, pharmaceutical industry, pharmaceutical company, pharmaceutical product, Malaysia, Brunei pharmaceutical, and global halal. Concerning the location of Twitter users discussing Halal Pharmaceutical, Malaysia was the most active with 127 tweets.

This study provides insights into how the public responds to both concepts on the Twitter platform. The predominance of positive sentiment towards Halal Pharmacy and the dominance of neutral sentiment towards Halal Pharmaceutical reflect differences in public perceptions of these two concepts. The research also lists frequently mentioned keywords in discussions about each concept and the locations of Twitter users most active in discussing these topics.

Based on the findings of this research, the author provides recommendations for stakeholders, including **Halal Pharmaceutical Industry**: The Halal pharmaceutical industry can enhance consumer

understanding of Halal pharmaceutical products and their benefits. They should maintain product quality and compliance with Halal standards. Active communication through social media and websites to provide transparent information to the public is essential. Additionally, practitioners and researchers in the field of Halal pharmaceuticals should focus on research and development in this sector.

### Government and Regulatory Bodies:

Government and regulatory bodies should implement and monitor regulations related to Halal pharmaceutical products to ensure quality and compliance with Halal principles. Governments can provide incentives and support to pharmaceutical companies investing in Halal products. Moreover, they can offer training and education to the pharmaceutical workforce regarding Halal principles.

**General Public:** The general public can increase awareness of Halal pharmaceutical products and their benefits. They can use social media and online platforms for discussions and information sharing on this topic. Public feedback to Halal pharmaceutical manufacturers regarding consumer preferences and needs can help the industry provide the best services.

**Researchers and Academics:** Researchers and academics can build upon the findings of this research and further develop studies on the evolution of Halal pharmaceuticals and their impact on society. They can publish their findings in scientific journals to share knowledge with the scientific community and practitioners.

These recommendations aim to promote a better understanding of the concepts of Halal Pharmacy and Halal Pharmaceutical, ensuring that pharmaceutical products that adhere to Halal principles are available and consumed safely by the public.

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