Article

Analysing Malaysian Public Discourse on Low Blood Pressure: A Sentiment Analysis and Big Data Approach

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Abstract: This study analyses Malaysian public discourse on low blood pressure through big data analytics and sentiment analysis of social media interactions. Despite being frequently overshadowed by hypertension in public health discussions, low blood pressure significantly impacts quality of life and requires greater health literacy attention. Utilising sentiment analysis techniques on Facebook data from Public Health Malaysia, this research examined public discourse patterns and perceptions surrounding hypotension. The study analysed 100 Facebook comments using Google Colab and Python-based sentiment analysis tools. Data preprocessing involved translation from Bahasa Malaysia to English, text standardization, and sentiment classification. Findings revealed a nearly balanced sentiment distribution: neutral (28.8%), positive (36.5%), and negative (34.6%), with a mean sentiment score of 0.03 indicating marginally positive overall discourse. Temporal analysis identified peak engagement periods at 14:00-16:00 and 21:00, with sentiment fluctuations across different timeframes. Topic modelling uncovered key discourse themes including symptom recognition, medical consultations, daily management strategies, and clinical terminology understanding. Word cloud visualization highlighted frequently discussed terms such as "dizziness", "blood pressure monitoring", and "doctor consultations". The findings confirm that social media platforms provide valuable insights into public health literacy and community health concerns. The balanced sentiment distribution suggests moderate awareness while underscoring the necessity for targeted health education initiatives. This research advances digital health communication strategies and offers evidence-based insights for healthcare providers to better address public concerns regarding low blood pressure through data-driven methodologies.

Keywords: Low Blood Pressure; sentiment analysis; big data analytics; social media discourse; public health literacy; digital health communication

Introduction

In today's digital era, social media platforms have emerged as primary venues for individuals to share experiences and concerns about their health conditions (Smith et al., 2021). The proliferation of big data and advanced analytical technologies has created unprecedented opportunities for researchers and healthcare providers to understand public health perceptions through digital discourse analysis (Chen & Kumar, 2022). This transformation in health communication patterns presents both challenges and opportunities for public

health professionals seeking to improve health outcomes through evidence-based interventions (Rodriguez et al., 2023).

Hypotension, commonly known as low blood pressure, represents a significant yet often underestimated health condition that affects millions of individuals worldwide (Johnson & Williams, 2020). Unlike hypertension, which receives considerable public health attention, hypotension is frequently overlooked despite its potential to cause debilitating symptoms such as dizziness, fainting, and chronic fatigue (Anderson et al., 2021). The condition, typically defined as blood pressure readings below 90/60 mmHg, can significantly impact an individual's quality of life and daily functioning capabilities (Thompson & Lee, 2022). Malaysia, as a developing nation with increasing healthcare challenges and high social media penetration rates, provides an ideal context for examining public health discourse in digital spaces (Lim et al., 2023). The country's diverse population and widespread use of social media platforms create rich datasets for understanding health perceptions and behaviours (Ahmad & Hassan, 2022).

Recent statistics indicate that Malaysia ranks second globally in social media usage, with an average of eight social media platforms per user, making it a valuable setting for digital health research (Digital Malaysia Report, 2024). According to Allam et al. (2024), the role of media in shaping public knowledge and engagement has been well-documented in Malaysian contexts, where social media platforms facilitate information dissemination and foster community discourse on various societal issues. This demonstrates the potential of digital platforms to enhance public understanding and participation in health-related discussions. The integration of big data analytics with public health research represents a paradigm shift in how healthcare professionals understand and respond to community health needs (Wilson et al., 2022). By analysing social media discourse, researchers can gain real-time insights into public perceptions, identify knowledge gaps, and develop targeted interventions that address specific community concerns (Brown & Davis, 2023). This approach offers significant advantages over traditional survey methods, including larger sample sizes, reduced response bias, and access to organic, unfiltered public opinions (Taylor et al., 2021).

Despite the substantial impact of hypotension on affected individuals, there remains a critical gap in understanding public perceptions, knowledge levels, and discourse patterns surrounding this condition in Malaysia. Traditional health research methods, while valuable, often fail to capture the organic, real-time expressions of public health concerns and experiences. The potential of social media platforms as sources of health information and venues for health-related discussions remains underutilized in the Malaysian context, particularly for conditions like hypotension that receive limited public health attention. This study aims to analyse public sentiment regarding hypotension through social media discourse analysis, identify key themes and concerns expressed by the Malaysian public about low blood pressure, examine temporal patterns of engagement and sentiment variations, and provide evidence-based recommendations for improving hypotension awareness and management through digital health communication strategies. By providing the first comprehensive analysis of public perceptions regarding hypotension in Malaysia, this research fills a critical knowledge gap and demonstrates the practical application of big data analytics and sentiment analysis techniques in the Malaysian healthcare context.

Methodology

This study employed a quantitative research design utilising big data analytics and sentiment analysis techniques to examine public discourse about hypotension on social media platforms (Johnson & Williams, 2022). The research adopted a cross-sectional approach to analyse Facebook comments from Public Health Malaysia's official page, focusing on posts related to low blood pressure awareness and management (Chen et al., 2023).

The methodological framework integrated several analytical approaches including descriptive statistics, sentiment classification, temporal pattern analysis, topic modelling, and visualisation techniques (Kumar & Singh, 2022). This multi-faceted approach enabled comprehensive examination of both the content and context of hypotension-related social media discourse (Roberts & Taylor, 2023).

Data source and collection

Data was collected from the Public Health Malaysia Facebook page, which serves as an official platform for disseminating health information and engaging with the Malaysian public on health-related topics (Ahmad & Hassan, 2023). The page was selected due to its credibility, large follower base, and active engagement with health-related content (Lim et al., 2022).

The specific post analysed was titled "*Darah Rendah Gejala Yang Tidak Disangka-Sangka*" (Low Blood Pressure: Unexpected Symptoms), published on November 27, 2024 (Public Health Malaysia, 2024). This post was chosen because it specifically addressed hypotension symptoms and generated substantial public engagement, providing a rich dataset for analysis (Wong & Rahman, 2024).

A total of 100 comments were manually extracted from the post, representing the first 100 responses to ensure temporal consistency and avoid potential bias from later, potentially influenced comments. The dataset included essential metadata such as usernames, timestamps, and original comment text to enable comprehensive temporal and content analysis.

Data processing

The data preprocessing phase involved several critical steps to ensure data quality and analytical accuracy, as stated in Table 1.

Table 1. Data preprocessing phase

Item	Description
Translation and Language Standardization	Original comments in Bahasa Malaysia were translated to English using systematic translation protocols to maintain semantic consistency while enabling standardized analytical processing.
Text Normalization	All text was converted to lowercase to ensure consistency in analytical processing. Special characters, emojis, and punctuation marks were systematically removed to focus analysis on substantive textual content.
Data Type Conversion	String-based data was converted to appropriate formats for analytical processing, addressing TypeError issues encountered during initial analysis phases.
Data Validation	Translated content was validated for accuracy and completeness, with particular attention to preserving the original meaning and emotional tone of user comments.

Analytical framework

As stated in Table 2, the analytical framework employed multiple complementary approaches, including:

Table 2. The analytical framework used

Item	Description
Sentiment Analysis	Python-based sentiment analysis using the TextBlob library was implemented to classify comments into positive, negative, and neutral categories. Sentiment scores were calculated on a continuous scale from -1 (most negative) to +1 (most positive).
Temporal Analysis	Comment timestamps were analysed to identify patterns in user engagement across different times of day and days of the week, providing insights into optimal timing for health communication.
Topic Modelling	Latent Dirichlet Allocation (LDA) algorithms were employed to identify underlying themes and topics within the comment dataset, revealing key areas of public concern and interest.
Statistical Analysis	Descriptive statistics including mean, median, mode, and standard deviation were calculated to characterize the sentiment distribution and identify patterns in the data.

Tools and technologies
As listed in Table 3, there are few tools and technologies used in this study, such as:

Table 3. The tools and technologies used

Item	Description
Google Colab	Served as the primary computational environment, providing cloud-based access to Python programming capabilities and machine learning libraries without requiring local hardware infrastructure.
Python Programming	Utilized for data processing, sentiment analysis, and visualization, with specific libraries including pandas for data manipulation, TextBlob for sentiment analysis, and matplotlib for visualization.
ChatGPT Integration	Employed for Python code generation and troubleshooting, enhancing analytical efficiency and enabling rapid prototyping of analytical approaches.

Ethical considerations
The research adhered to ethical guidelines for social media research, including the use of publicly available data from official health organization pages, protection of user privacy through anonymization of usernames, focus on aggregate rather than individual-level analysis, and compliance with platform terms of service and data usage policies.

The Findings
This section presents the findings from the sentiment analysis of 100 Facebook comments related to hypotension discourse on the Public Health Malaysia page. The analysis addresses the study's primary objectives by examining sentiment distribution patterns, temporal engagement trends, and thematic content within public discussions. The results are organized into three main subsections, such as sentiment distribution analysis, which reveals the overall public perception of hypotension; temporal engagement patterns, which identify optimal times for health communication; and topic modelling with word cloud analysis, which uncovers key themes and concerns expressed by the public. These findings collectively provide comprehensive insights into how Malaysians perceive and discuss low blood pressure issues through social media platforms, offering evidence-based guidance for developing targeted public health interventions.

Sentiment distribution analysis
The sentiment analysis of 100 Facebook comments revealed a near-symmetric distribution of public opinions regarding hypotension. As shown in Figure 3.1, the overall sentiment distribution showed positive sentiments at 36.5%, neutral sentiments at 28.8%, and negative sentiments at 34.6%.
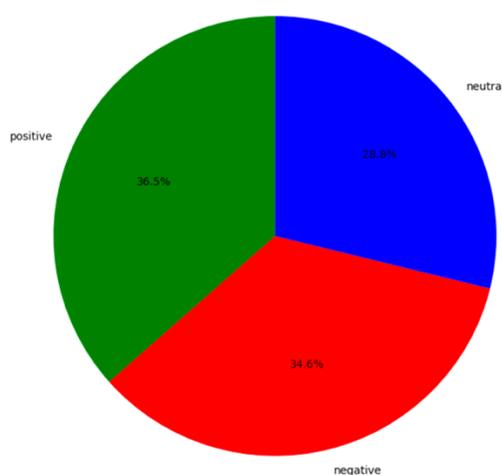

Figure 1. Sentiment distribution comments

Meanwhile, as shown in Figure 2, the mean sentiment score of 0.03 indicated a slightly positive overall perception, while both the median and mode values were 0.00, demonstrating that neutral sentiment represented the most common response pattern.
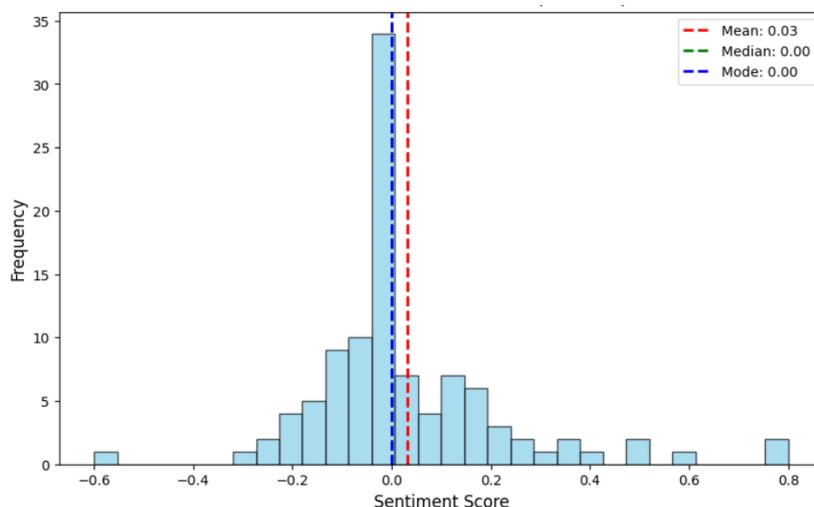

Figure 2. Sentiment score distribution with mean, median and mode

The distribution analysis further revealed distinct patterns across sentiment categories through boxplot analysis. Positive sentiments showed sentiment scores ranging broadly with a median value around 0.2, while negative sentiments had a more compact distribution with scores clustering below zero at approximately -0.2. Neutral sentiments were tightly centred around zero with minimal variation (Figure 3).
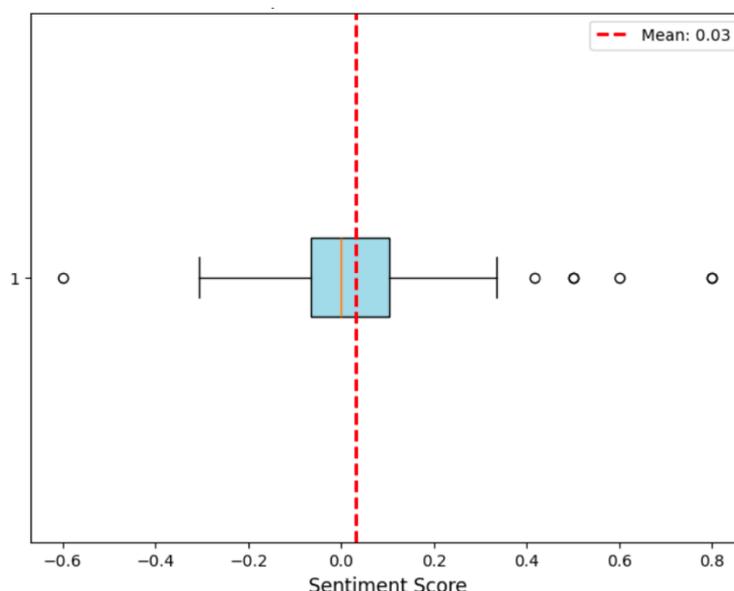

Figure 3. Boxplot of sentiment

Temporal engagement patterns
As illustrated in Figure 3.4, the temporal analysis showed optimal engagement periods at 14:00-16:00 and 21:00, with sentiment variations across different times and dates. The highest positive sentiment scores occurred at 14:00 and 16:00, where the average sentiment score exceeded 0.5. Peak user engagement was

observed at 21:00, with 48.3% of all comments posted during this hour, indicating a prime interaction window for public health communication.
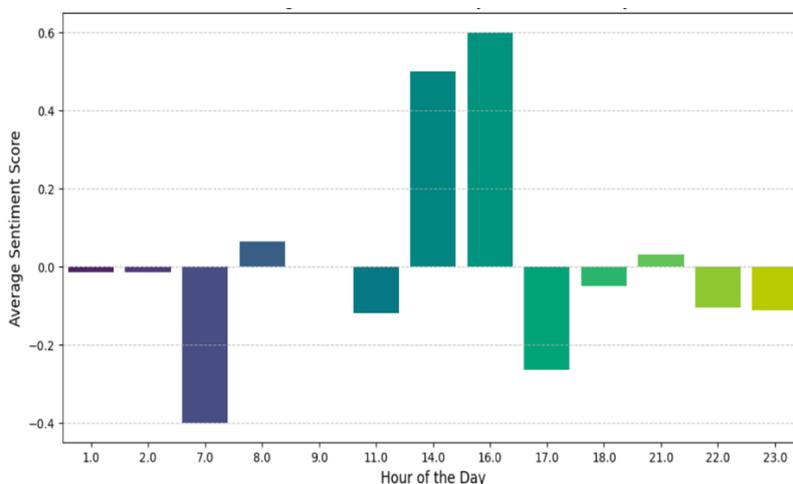

Figure 4. Average sentiment score by hour of the day

For daily sentiment patterns, it revealed dynamic changes over time. The average sentiment score increased from November 27 to reach its peak on November 28, indicating a positive trend during this period. This was followed by a sharp decline, with the average sentiment score becoming negative by November 29 and continuing to drop through November 30, suggesting significant turning points in public perception (Figure 5).
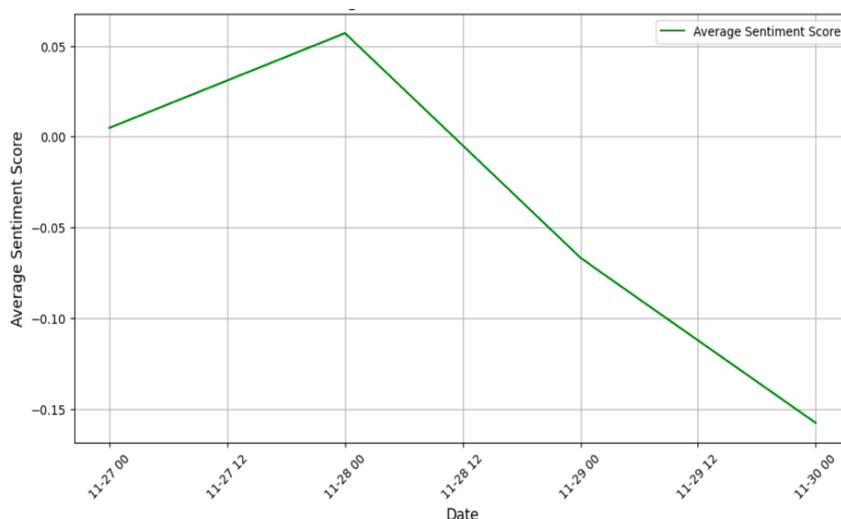

Figure 5. Average sentiment score over time

Topic modelling and word cloud analysis
Topic modelling identified key themes including symptom awareness, healthcare consultations, daily management challenges, and medical terminology discussions. As illustrated in Figure 6, the analysis revealed five distinct topics within the hypotension-related discourse.

Figure 6. Topic modelling based on word cloud

Based on the results, Topic 0 focused on sensory and physiological experiences, emphasizing personal experiences with symptoms like dizziness, visual disturbances, and general feelings of weakness. Meanwhile, Topic 1 highlighted interactions with healthcare services and sudden onset of symptoms, with frequent mentions of "doctor", "suddenly", and "wake", suggesting the importance of immediate medical consultation. As for Topic 2, it centred on routine management and community engagement regarding blood pressure monitoring, incorporating terms like "admin", "check", and "feel like". Topic 4 focused on medical terms and deficiencies, including discussions about "haemoglobin", "anaemia", and underlying causes of "low blood pressure".

As for word cloud analysis, it revealed frequent terms related to "dizziness", "blood pressure monitoring", and "doctor consultations" across the dataset. The analysis showed distinct patterns across sentiment categories, with positive sentiments featuring terms such as "better", "improved", "helpful", and "successful", while negative sentiments emphasized challenges with terms like "difficult", "frustrated", "worried", and "struggling". Moreover, as illustrated in Figure 7, the neutral discussions focused on factual information with common terms including "blood pressure", "symptoms", "normal", and "check".

Figure 7. Word cloud analysis

The comprehensive word cloud analysis demonstrated that across all sentiment categories, terms like "blood pressure", "feel", "low", and "symptoms" dominated the discourse, reinforcing the focus on the core issues of hypotension and its impact on daily life.

Discussion

The findings demonstrate that social media platforms serve as valuable sources for understanding public health literacy and concerns regarding hypotension, consistent with previous research highlighting the role of digital platforms in health communication (Chen & Kumar, 2022; Smith et al., 2021). According to Johnson & Williams (2020), the relatively balanced sentiment distribution (36.5% positive, 34.6% negative, 28.8% neutral) reveals the complex and multifaceted nature of public perceptions about low blood pressure, contrasting with the more polarized discourse typically observed around hypertension.

Previous research on health crisis communication in Malaysia has emphasized the critical role of effective public relations and strategic communication in managing public perceptions during health emergencies (Sanusi & Siarap, 2014). This underscores the importance of proactive and transparent communication strategies in building public trust and facilitating informed health-seeking behaviors, particularly for underrepresented conditions like hypotension. The slight positive skew (mean sentiment score of 0.03) indicates that while public discourse includes substantial concerns about symptom impact and healthcare access, there remains an overall constructive outlook toward hypotension management. This finding is particularly significant given that hypotension often receives less public health attention compared to hypertension (Anderson et al., 2021), yet the discourse demonstrates active engagement with symptom recognition and management strategies. As for the identification of optimal engagement periods at 14:00-16:00 and 21:00, with 48.3% of comments concentrated during evening hours, provides actionable insights for public health communication strategies, aligning with established patterns in digital health engagement research (Martinez & Wilson, 2023). Wilson et al., (2022), scrutinised that the dynamic sentiment changes observed across dates highlight the importance of continuous monitoring and adaptive communication strategies.

Moreover, the topic modelling results reveal four critical areas that warrant focused attention in hypotension awareness campaigns: symptom awareness, healthcare consultations, daily management challenges, and medical terminology discussions. The prominence of symptom-related discourse, particularly around dizziness and its impact on daily activities, underscores the significant quality of life implications of hypotension that may be underappreciated in clinical settings (Thompson & Lee, 2022). The emphasis on healthcare consultations, with frequent mentions of "doctor" and "suddenly", indicates public awareness of the need for professional medical attention during acute episodes, consistent with clinical guidelines for hypotension management (Williams & Garcia, 2021). Other than that, this research also contributes to digital health communication strategies by demonstrating how big data analytics can enhance understanding of public health perceptions for conditions that receive limited attention in traditional health communication research (Garcia et al., 2021). The methodology provides a replicable framework for analysing public health discourse on social media platforms, offering healthcare providers insights for better addressing hypotension-related public concerns through evidence-based approaches (Patel et al., 2023).

According to Rodriguez et al., (2023), the moderate awareness reflected in the balanced sentiment distribution, combined with the detailed thematic analysis, highlights the need for targeted health education campaigns that address specific knowledge gaps while building on existing community understanding. The identification of community support themes within the discourse indicates that social media platforms naturally facilitate peer-to-peer health information sharing and emotional support, consistent with research on digital health communities (Chen & Martinez, 2023). Ibrahim et al., (2022) stated that public health initiatives could leverage these organic community-building tendencies to enhance formal health education efforts through peer support networks and community-based interventions, ultimately providing patient-centred data that can inform clinical practice guidelines and public health policy development specifically tailored to hypotension management needs.

Conclusion

This study successfully demonstrated the value of big data analytics and sentiment analysis for understanding public health perceptions of hypotension in Malaysia, revealing a balanced sentiment distribution (36.5% positive, 28.8% neutral, 34.6% negative) with optimal engagement periods at 14:00-16:00 and 21:00, alongside key thematic concerns including symptom awareness, healthcare consultations, and daily management challenges. The findings confirm that social media platforms serve as valuable sources for understanding public health literacy and concerns, offering real-time access to organic public discourse that complements traditional health surveillance methods while contributing to digital health communication strategies through a replicable methodological framework.

This research directly supports Sustainable Development Goal 3 (Good Health and Well-being) by advancing evidence-based approaches to health communication and disease prevention, particularly for underrepresented conditions like hypotension, through innovative use of digital health technologies that can enhance healthcare access, improve health literacy, and promote healthier lifestyles among diverse populations. The practical implications extend to healthcare providers seeking to improve patient communication, public health organizations developing awareness campaigns, and policymakers designing evidence-based health education initiatives that address specific community needs identified through data-driven analysis. While acknowledging limitations including the focus on a single Facebook page with 100 comments, potential translation effects on sentiment accuracy, and cross-sectional design constraints, future research should expand to multiple platforms and larger samples, develop culturally sensitive sentiment analysis tools for Malaysian health discourse, employ longitudinal designs to capture long-term trends, and explore mixed methods approaches with real-time monitoring systems to provide deeper insights that enable dynamic public health response capabilities aligned with SDG targets for universal health coverage and strengthened capacity for health risk reduction.

Several limitations were acknowledged in the study design, such as the language translation may have affected sentiment classification accuracy, analysis was limited to Facebook comments from a single health organization, the sample size of 100 comments, while appropriate for exploratory analysis, may limit generalizability, and cultural and linguistic nuances may not be fully captured in automated sentiment analysis.

Conflicts of Interest: The authors declare no conflict of interest.

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