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Public Sentiment and Perceptions of Anti-Aging Treatments: A Comprehensive Twitter Discourse Analysis

PopoolaDamilola Raphael,Akanji A. R
Affiliation: Data Science Department, Cardiff Metropolitan University Institute, Cardiff, UK
Affiliation: Department of Mathematical sciences, Bingham University, Karu, Nasarawa state. Nigeria

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ABSTRACT
This study examines public sentiment and perceptions of Botox and aging through a comprehensive analysis of Twitter discourse from 2011 to 2022. By leveraging the Twitter API, we collected a substantial dataset of tweets mentioning "Botox" and related terms. Sentiment analysis categorized these tweets into positive, negative, and neutral sentiments, allowing us to explore trends and shifts in public opinion over time. Our findings reveal that while overall negative sentiment towards Botox prevails, there was a notable spike in positive sentiment in 2013. Additionally, the influence of celebrity endorsements on public perception was minimal, as only a small percentage of tweets originated from verified users. Geographic analysis showed that most countries with significant tweet volumes had more positive than negative sentiments, with the exception of the Netherlands. The study highlights the importance of proper administration and public awareness to improve the acceptance and perception of Botox treatments.

Keywords:Botox, Twitter, Anti-aging, Sentiment analysis

I. INTRODUCTION

In the age of social media, public discourse on cosmetic treatments and aging has become increasingly prevalent. Examining these conversations can provide valuable insights into how individuals perceive and respond to the growing availability and normalization of procedures like Botox (Kalandar et al., 2018; Vaca et al., 2017). The present study aims to analyze the sentiment and trends surrounding public discussions of Botox and aging on the Twitter platform, spanning the period from 2011 to 2022.

In the medical community, anti-aging research focuses on slowing, preventing, or reversing the aging process, while anti-aging medicine is aimed at the early detection, prevention, and treatment of age-related diseases (Kattimani et al., 2019). This distinction often leads to confusion, as combating age-related diseases through various therapies, such as caloric restriction, can increase lifespan without directly addressing the aging process itself. For example, preventing heart disease or type 2 diabetes can be seen as anti-aging treatments, as they help individuals live longer and healthier lives, even if they do not alter the fundamental causes of aging.

This research emphasizes the use of Twitter as a rich data source for understanding public sentiment on topics related to Botox and aging. By applying sentiment analysis techniques to the vast corpus of Twitter data, the study seeks to uncover the nuances and shifts in public opinion over time, offering a comprehensive perspective on this complex and evolving issue. To collect the data for this analysis, the researchers utilized the Twitter API to gather a comprehensive dataset of tweets mentioning "Botox" and related terms from 2011 to 2022.

Sentiment analysis was employed to categorize the collected tweets into positive, negative, and neutral sentiments(Tripathi& Kumar, 2024). This methodological approach allows for a deeper understanding of how the public has perceived and responded to Botox and its impacts on aging (Conway et al., 2019). The temporal scope of the study, covering over a decade, provides a unique opportunity to identify and explore trends, patterns, and potential shifts in public sentiment over time.

II. LITERATURE REVIEW

Conceptual Framework

The conceptual framework for analyzing public sentiment and perceptions of cosmetic

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treatments, specifically Botox, in relation to aging encompasses several key concepts: societal beauty standards, ageism, self-image, and the role of social media. Societal beauty standards, perpetuated by media and cultural norms, significantly shape individual desires for cosmetic treatments, with studies indicating that societal pressure to maintain a youthful appearance can influence decisions to undergo procedures like Botox(Chrisler et al., 2012). Ageism, or discrimination based on age, drives individuals to seek cosmetic treatments to appear younger, a phenomenon prevalent in Western societies where youth is highly valued(Bradbury, 2012). The impact of self-image on the decision to undergo cosmetic treatments is well-documented, as individuals who perceive themselves as aging or unattractive may turn to procedures like Botox to enhance their appearance and self-esteem (Collier, 2013; Singh et al., 2015). Social media platforms, including Twitter, serve as modern arenas for public discourse and sentiment expression, amplifying both positive and negative perceptions of cosmetic treatments and influencing public opinion and individual choices.

Empirical Evidence

Empirical studies provide a wealth of data on public sentiment and perceptions of Botox and aging, particularly through the analysis of social media content. Research analyzing Twitter discourse from 2011 to 2022 reveals a nuanced landscape of public sentiment towards Botox, with sentiment analysis tools finding a mix of positive, negative, and neutral sentiments. Positive sentiments highlight the perceived benefits of Botox in maintaining a youthful appearance and boosting self-esteem, while negative sentiments focus on the risks, side effects, and ethical concerns associated with altering one's natural appearance(Zarringam et al., 2020). Empirical data indicates that women, particularly those aged 25-45, are the predominant demographic discussing Botox on Twitter, concerned with aging and its impact on personal and professional life (Zarringam et al., 2020). The influence of celebrities and influencers on public perception of Botox is notable, as tweets from high-profile individuals endorsing or criticizing Botox significantly shape public opinion, with celebrity endorsements leading to spikes in positive sentiment and publicized negative experiences generating widespread skepticism and fear (Fan et al., 2019; Pang et al., 2020).

Theoretical Perspectives

Theoretical frameworks provide deeper insights into the underlying dynamics of public sentiment and perceptions regarding cosmetic treatments like Botox. Festinger's Social Comparison Theory posits that individuals evaluate their own appearance by comparing themselves to others, particularly those perceived as more attractive or youthful, explaining why exposure to idealized images on social media can drive individuals to seek cosmetic treatments to align with these ideals (Parsa et al., 2021; Walker et al., 2021). Blumer's Symbolic Interactionism suggests that social interactions and communications, such as tweets, play a critical role in shaping individual self-concepts and behaviors, with Twitter discourse about Botox and aging influencing how individuals perceive themselves and their choices regarding cosmetic treatments (Ayu&Muhendra, 2023; Jin &Phua, 2014; Liu, 2023). Feminist perspectives critique the societal pressures on women to conform to youthful beauty standards, arguing that these pressures reinforce gender inequalities, highlighting the complex interplay between empowerment and subjugation in women's choices to undergo such procedures (Bonell et al., 2021). The Health Belief Model provides a framework for understanding individual decisions regarding health-related behaviors, including cosmetic treatments, considering perceived susceptibility, perceived severity, perceived benefits, and perceived barriers, with individuals weighing the perceived benefits of a youthful appearance against the potential risks and barriers, such as cost and side effects (Clarke et al., 2007; Fink &Prager, 2014; Ramirez et al., 2021; Yeslev et al., 2015).

III. METHODOLOGY

This study involves a comprehensive approach to data collection and sentiment analysis, utilizing Twitter as the primary platform. Over 40,000 tweets were collected between 2011 and 2022 using the Python package Snscrape, which facilitates scraping data from Twitter without the constraints of API limitations. Keywords such as "Botox" and "Aging" were used to gather tweets reflecting public sentiment on these topics. The dataset includes 11 columns, capturing essential details such as tweet content, location, date, and whether the account is verified. Data cleaning followed, involving the removal of duplicates, structural corrections, and handling of outliers and missing data.

Sentiment analysis was conducted using the Vader sentiment analyzer, focusing on

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categorizing tweets as positive, negative, or neutral. This method allows for a nuanced understanding of public perceptions, which is crucial for interpreting the data accurately. Various sentiment analysis types, including graded sentiment analysis and emotion recognition, were utilized to provide deeper insights into the emotional context of the tweets. Finally, data visualization was employed to present the findings clearly, using Python's extensive visualization libraries to illustrate trends and patterns effectively. This approach ensures that the data is accessible and interpretable, supporting informed decision-making and analysis.

IV. RESULT AND DISCUSSION

These section shows the visualizations of result of the sentiment analysis done.

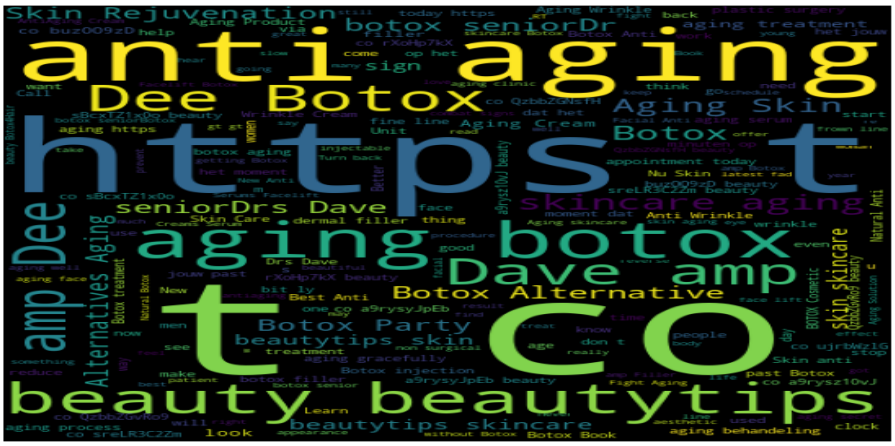

Fig.1

The fig.1 shows the most frequent words in the tweets on Botox as anti-aging treatment. The bigger and bolder letters represent the important keywords in the study.

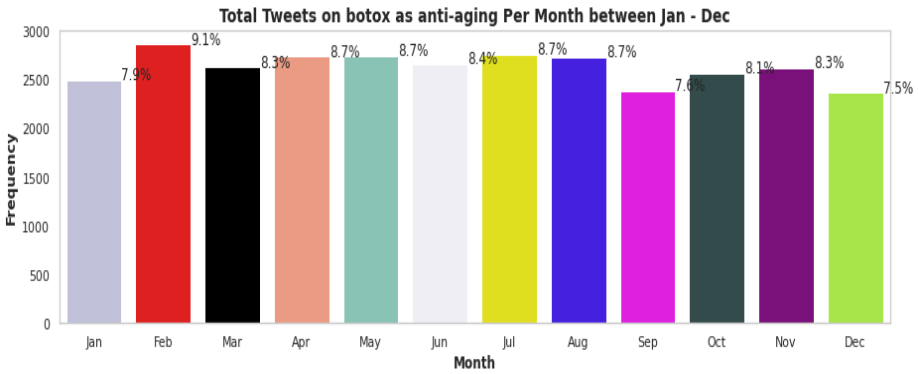

Fig.2

The fig.2 shows the tweets on botox as anti-aging treatment from January to December. It is observed from the chart that the percentage of tweets on Botox are high across each month of the year.

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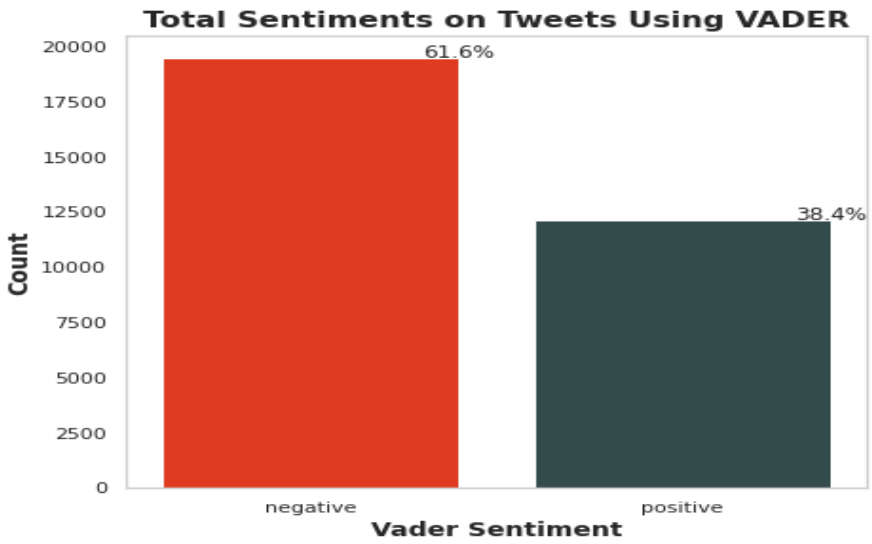

Fig.3

The fig.3 shows both negative and positive tweets on Botox after the sentiment analysis has been carried out. It is observed that 61.6% of the tweets are negative while 38,4% are positive which implies that their more negative tweets than positive.

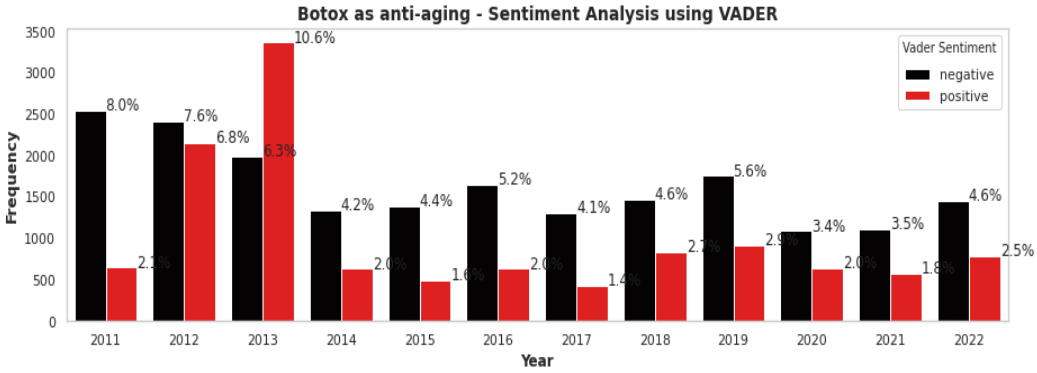

Fig.4

The fig.4 shows the both negative and positive tweets from 2011- 2022. It is observed that in 2011, negative tweets are far more than positive tweets, the negative and positive tweets are almost equal in 2012 while in 2013, the positive tweets are higher than the negative tweets. From year 2014 to 2022, the negative tweets are more than the positive tweets and the tweets about the products are lower.

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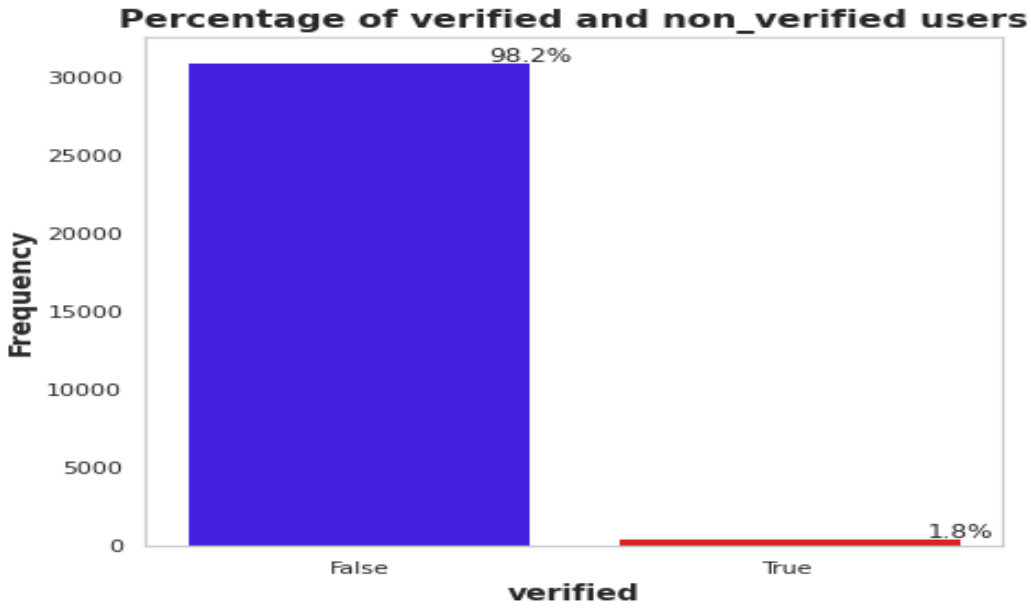

Fig.5

From the fig.5, it is observed that 98.2 % of the tweets are from a non-verified users while 1.8% of the tweets are from verified users. These means that larger percentage of the tweets are not from celebrities.

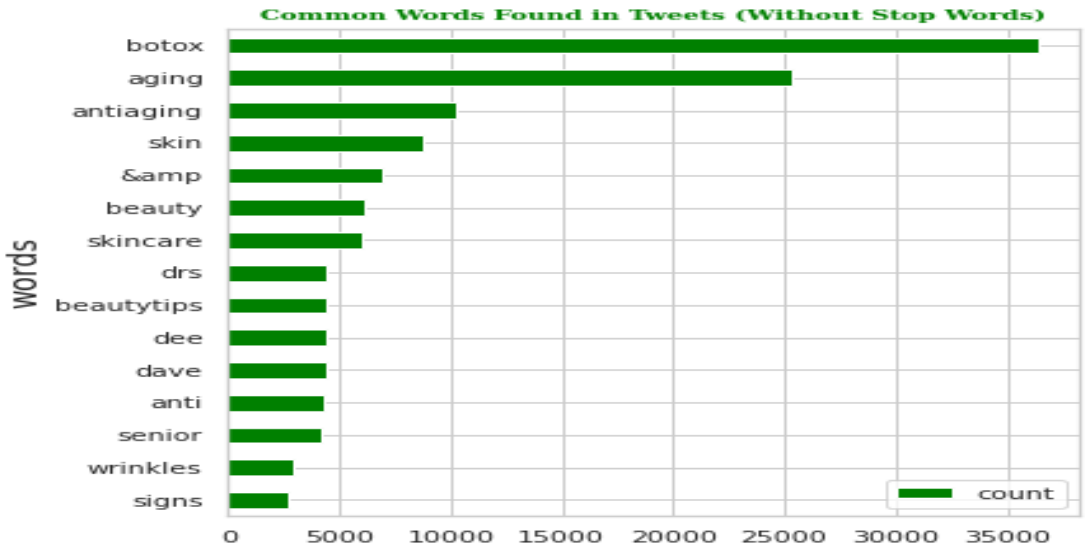

Fig.6

The fig.6 indicate that the common words found in the tweets which include Botox, aging, antiaging, skin, beauty skincare and so on. It is indicated in the chart that Botox has the highest word count followed by aging and antiaging respectively.

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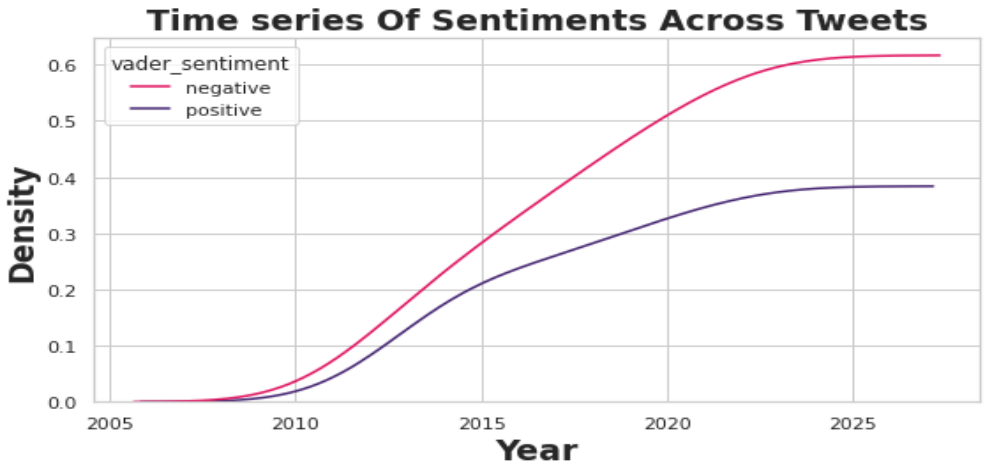

Fig.7

The fig.7 indicates the time series analysis of the trend of tweets which predict the future tweets about Botox. It shows that the negative tweets will be far more than the positive tweets as the year progresses.

```
United States                    11863
Canada                             888
United Kingdom                     838
Netherland                         498
No Known Location                  342
Indonesia                          179
Singapore                          147
Venezuela - Panama - Trinidad      104
Name: Location, dtype: int64
```

Fig.8

The fig.8 shows the countries with over 100 tweets about Botox. It is indicated that United States has the highest tweets about Botox while Venezuela, Panama and Trinida has only 104 tweets about Botox

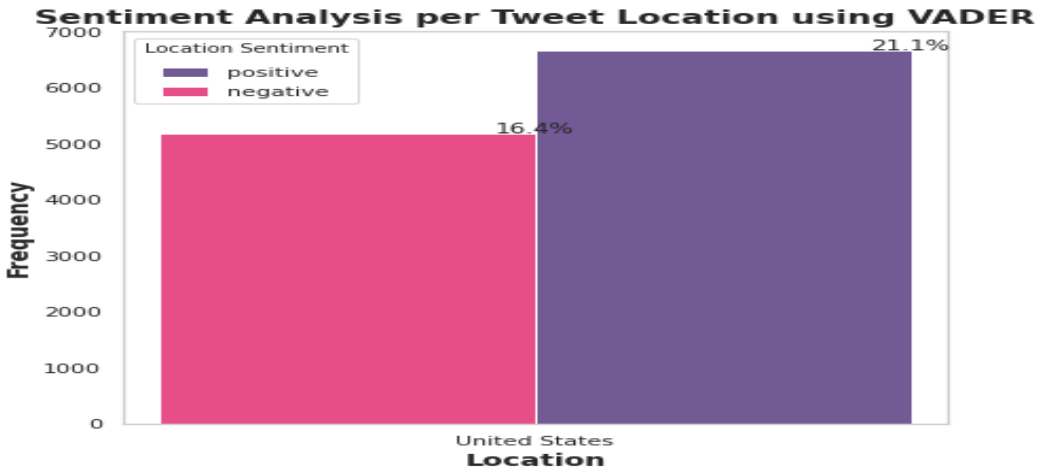

Fig. 9

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It is shown from fig.9 that united state that has the highest tweets about botox, has more of positive tweets than the negative tweets.

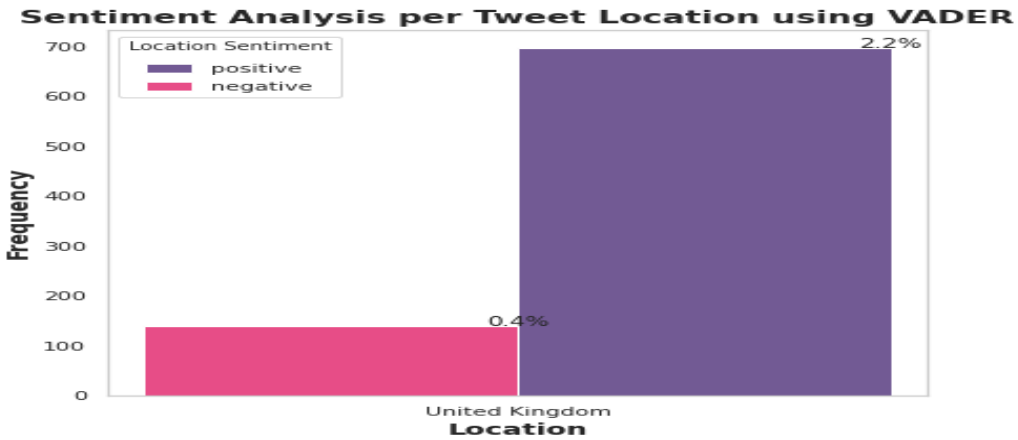

Fig.10

The fig. 10 shows that United Kingdom which has the second largest tweets about the anti-aging product also has more positive tweets than the negative tweets.

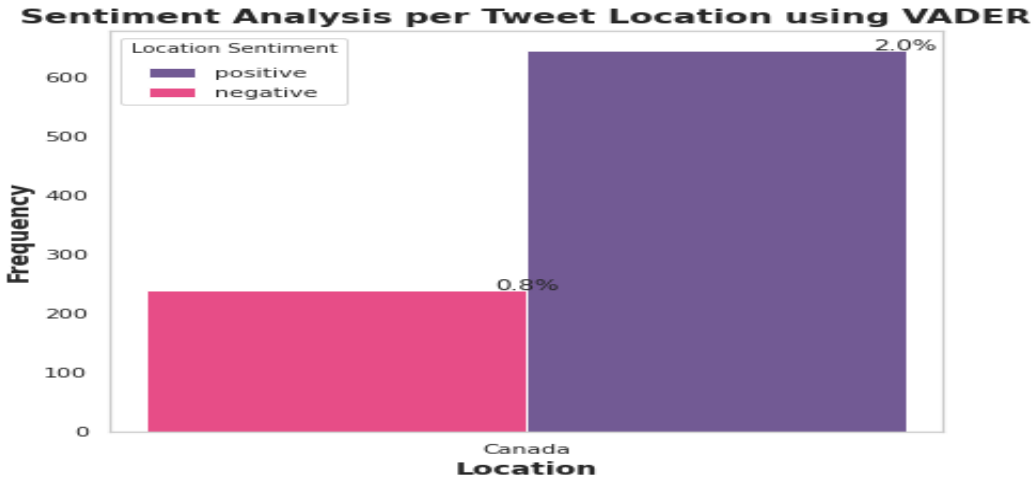

Fig.11

Canada is also one of the countries with high tweets and the location has more positive tweets than negative tweets from fig. 11.

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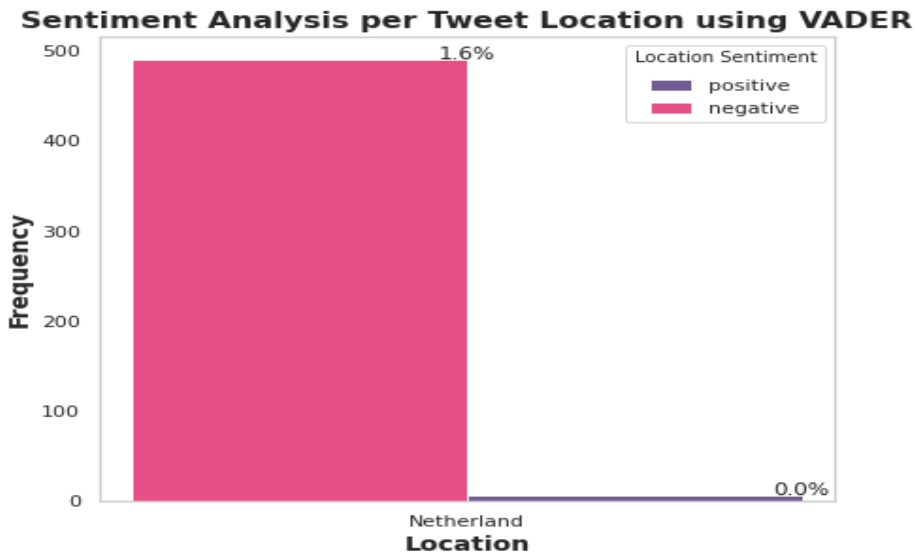

Fig.12

It is observed from fig.12 that Netherland has only negative tweets. This implies that the product has no acceptance in the country.

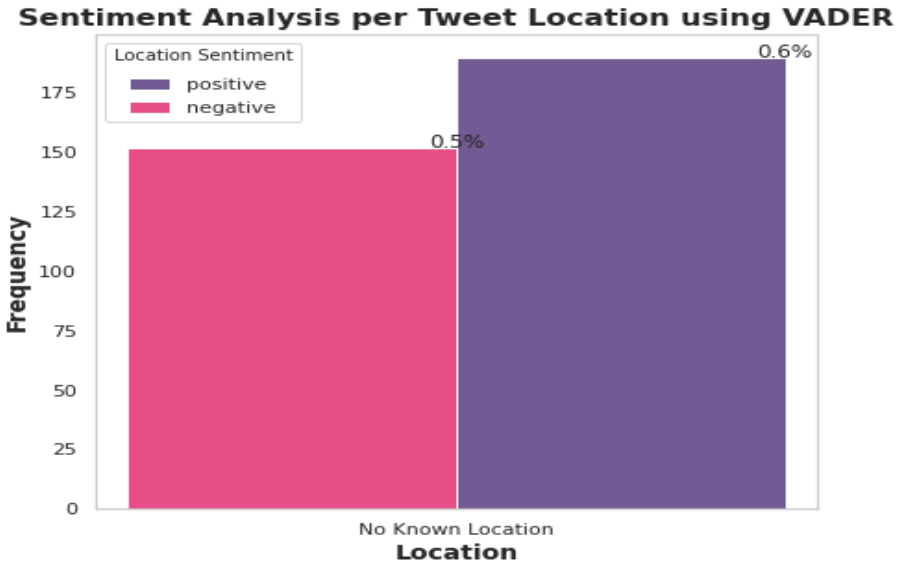

Fig.13

It is indicated from fig.13 that tweets with unknown location shown in the chart above has more positive tweets than the negative.

DISCUSSION

Botox is a widely acknowledged anti-aging procedure.The objective of this study was to ascertain the products' acceptance while also taking into account the countries where the product has prevailed. Fig. 4 shows that there are more negative tweets than positive tweets, but in 2013, the positive tweets far outweighed the negative tweets. This means that the products were better received in 2013 than in previous years. The company should try to find out what influenced the adoption rate to maintain this pace

The study wants to find out if celebrity tweets affect the adoption rate, but in Fig. 5 to see that only a very small percentage of tweets are from verified users. The word count was also performed. It shows that a larger percentage of the

scraped words were Botox, and this means that the scrapping technique is very effective.

The trend of the product was also predicted in Fig. 7, and it shows that the acceptance of the products in the future is low because the negative tweets were predicted much higher than the positive tweets. The company should try to improve its performance to gain wide acceptance.

Fig. 9 to Fig. 13 show the sentiment analysis of tweets from countries with more than 100 tweets. It can be observed that the three major countries except the Netherlands have more positive tweets than negative tweets. The Netherlands has no positive tweets. This means that the countries that know or have adopted the products had something good to say about the products. However, the company should check if the product is also accepted in the Netherlands.

V. CONCLUSION AND RECOMENDATION

According to this study, Botox is widely accepted as an effective anti-aging treatment in developed nations. It demonstrates that Botox is popular in nations where the product has received more than one hundred (100) tweets with the exception of the Netherlands. Despite the fact that Botox treatments are so popular, it's vital to remember that they are still medical procedures with potential side effects. Consequently, it would be dangerous to try the treatment at just any facility(Thakur, 2023). An inexperienced hand might accidentally inject Botox into the wrong muscle, paralyzing it and causing harm to the facial tissues. Therefore, it is advised that the firm that manufactures Botox should raise awareness of the issue and help the general public understand that the negative perception of their product is a result of the fact that it was handled by facilities without enough knowledge of its intended use. There is substantial variation in the number of tweets throughout a particular season. Therefore, the product is not seasonally restricted, and can be used at any time of the year.

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