

A Twitter-Based Big-Data Study of Stunting Related to Food Safety Incidents

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Abstract. Stunting, a consequence of chronic malnutrition, is a significant public health issue in Indonesia. Foodborne illnesses such as food poisoning can contribute to poor nutrition, particularly in young children. While the government has implemented policies to ensure food safety, reports on incidents remain limited and fragmented. Twitter offers a potential source of real-time public health data. However, existing studies have focused on short-term datasets and rarely explored food safety incidents in relation to stunting. This research presents Twitter data on food safety incidents related to stunting and provides recommendations. Tweets related to food safety and stunting were collected using Twitter API v2 and analyzed to identify trends, events, and public concerns. Malnutrition was frequently mentioned as a key contributor to stunting. Tweets reported incidents of food poisoning affecting toddlers, especially during public events such as immunization. Some users promoted traditional remedies to treat diarrhea, raising concerns about misinformation. These findings indicate the need for public education and government involvement to promote evidence-based information. A centralized database of foodborne illnesses is suggested to improve prevention efforts. Collaborative efforts involving government and non-governmental organizations are recommended to improve awareness, counter misinformation, and strengthen reporting systems.

1 Introduction

Stunting is a manifestation of malnutrition and a major health problem in Indonesia, with a prevalence of 31% in 2018. Crucially, stunting is a long-term phenomenon closely linked to persistent food insecurity. Unlike acute malnutrition, which often results from short-term food shortages, stunting stems from a sustained lack of access to safe and nutritious food over a prolonged period. This chronic food insecurity forces families to rely on unsafe or nutrient-

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poor diets, creating a cycle of deficiencies and infections that permanently impair a child's linear growth. This condition may result in complications during childbirth, decreased performance and cognitive development, and an increased risk of chronic diseases. Enteric diseases, including diarrhea and decreased appetite due to infection and inflammation, are the most common causes of stunting. Furthermore, infection can promote impaired food absorption and nutrient malabsorption, resulting in growth failure [1].

Food poisoning due to the consumption of toxins, bacteria including *Clostridium botulinum*, *Clostridium perfringens*, *Staphylococcus aureus*, and *Bacillus cereus*, and chemicals comprising of copper, lead, cadmium, insecticides/pesticides, and cleaning products may also result in infection. A study conducted in the agricultural areas of Larangan and Jatibarang, Brebes Regency showed that stunting was prevalent in 20.7% of the population and was significantly associated with pesticide exposure [2]. Twitter is a social media platform used to report food safety incidents. This application is actively used by information media to broadcast the latest news, and by 192 million people, 14 million of whom are in Indonesia. Furthermore, subscribing to the Twitter API enables individuals to obtain, process, and analyze big data on food safety. This API is then used to obtain tweets for food safety, such as poisoning.

Twitter data have been used to analyze important health issues, including food poisoning, Asian restaurant perception, Genetically Modified Organism (GMO) risk perception, nanotechnology, and cancer. Although few studies have used Twitter data to learn different health issues, they mostly used limited time spans, with a maximum of 1 year, except for studies on nanotechnology [3], which used lifetime Twitter from 2006 to 2020. However, the analysis of lifetime Twitter data for food safety-related incidents related to stunting has not yet been studied.

The Indonesian government has implemented various policies to ensure food safety, although data related to this incident are limited and only sectoral. Incidents related to food safety may not necessarily result in diseases, such as food poisoning. However, data on these occurrences are required to provide recommendations. This research aims to provide data on food safety incidents related to stunting on Twitter and thus provide recommendations regarding emerging food safety issues related to stunting.

2 MATERIAL AND METHODS

Data on food safety incidents related to stunting from Twitter were obtained in three steps. The first step was a Focus Group Discussion (FGD) to obtain keywords on food safety incidents related to stunting. The second step was tweet collection followed by data analysis.

2.1 FGD

Four stakeholders from the Indonesian Nutrition Association (Persagi), Health Center (Puskesmas), Southeast Asia Food and Agricultural Science and Technology Center (Seafast Center), Health Office, and National Family Planning Coordinating Agency (BKKBN) participated in the FGD to obtain keywords on food safety incidents related to stunting [1]. Similar keywords were then classified into the stunting, poisoning, and diarrhea groups.

2.2 Tweet retrieval

The obtained keywords were then used to harvest tweets written in the Indonesian Language (Bahasa) from March 2006 to September 30, 2021. For tweet collection, Twitter provides an

API that allows us to gather tweets containing specific keywords. A new Twitter API v2 published on January 26, 2021 enable users to harvest lifetime tweets. Tweets were retrieved with R 4.1.1, which was equipped with the *AcademictwitterR* package, equipped with the *academictwitteR* package (version 0.3). One thousand tweets limit was used in each tweet retrieval to adhere to the Academic Twitter Terms and Condition, so a keyword that produces a high-volume tweet was divided into two periods each year.

2.3 Data analysis

The data frame acquired from *academictwitter R* was extracted for the tweet text and its username. To analyze the tweet text, *Corpus(VectorSource(text))* was used to create a simple corpus for processing and cleaning. Data cleaning was required to obtain relevant data for each keyword. pwords were applied using the *tm_map* function in the *Text Mining* package. These stopwords were modified to match the current communication styles.

A document term matrix (DTM) was created from the cleaned data using the *Text Mining* package. DTM was used to create a matrix containing the occurrence frequency for each word. The 50 most frequently occurring words were used to produce word clouds using the *wordcloud2* package. A descriptive analysis and discussion were conducted on the word clouds produced. The 20 top usernames most frequently tweeted usernames were tabulated, and their credentials were identified.

3 Results and Discussion

3.1 Potential key variables

Food safety issues and stunting are generally related to the following keywords and phrases. Stunting in food safety is closely associated with clean food, a pollution-free environment, and safe temperatures. In particular, brebes contain a high level of pesticide contamination due to the use of chemicals by onion farmers; hence, their food safety should be guaranteed before serving. This stunting program addresses only the distribution of food and not its safety during consumption. BKKBN (National Family Planning Coordinating Agency) has a program that provides healthy local food and also plays a role in assisting pregnant women and prospective brides by empowering families to consume local foods. This organization also collaborates with companies to conduct CSR (Corporate Social Responsibility) activities related to stunting. In addition, breastfeeding mothers, infants, and toddlers are at risk of stunting when exposed to food safety problems. The difficulty in improving nutritional status and lack of access to clean water are aspects of food safety issues associated with stunting in pregnant adolescent women. Another factor involving the consumption of beans and corn products contaminated with aflatoxins could trigger stunting, which may be consumed by pregnant women.

There have been no reports on food safety issues related to stunting in infants. However, in Semarang City, the high stunting rates are due to the poor use of family planning (KB) by some couples, resulting in birth intervals of less than 2 years. The presence of more than one toddler in a home also creates a less-than-optimal parenting pattern and nutritional intake. Although food intake plays an important role in fetal growth during early pregnancy, several women consume less food than the required amount. Moreover, not all mothers want their children to receive Supplementary Food Provision (PMT), resulting in stunting. Although not related to infants, data on toddlers who visit public health centers due to diarrhea or other

infectious diseases are available. Probiotics are prescribed to control the composition of the gut microbiota and help reduce the risk of diarrhea in toddlers. In addition, some cases of diarrhea are triggered by introducing formula milk too early or by using contaminated equipment. The occasional consumption of milk after a delayed period also increases contamination, which may induce diarrhea in children. Furthermore, the risk of stunting is increased by inappropriate formula feeding owing to consistency or hygiene.

According to the description above, several variables can be used in the search: nutritional stunting, food poisoning, pregnant stunting, food poisoning in pregnancy, food poisoning in toddlers, aflatoxin poisoning, peanut poisoning, formula milk poisoning, pesticide poisoning, diarrhea in pregnancy, and diarrhea in infants. This study reveals a multifaceted relationship between stunting, food safety, and public discourse in Indonesia, particularly through social media platforms, such as Twitter. Various thematic clusters, ranging from nutritional inadequacy, foodborne illnesses, environmental contaminants, and sociocultural practices, demonstrate that stunting is not solely a result of poor food access but also deeply entangled with food safety risks, public health literacy, and behavioral factors.

3.2 Stunting

3.2.1 Stunting and nutrition

The keywords "stunting" and "nutrition" are generally used to determine baseline tweets related to stunting and nutrition. Consequently, 38,594 tweets were obtained using these keywords. Malnutrition was identified as a cause of stunting. Figure 1 shows the 50 most-appearing words with those accompanying these keywords. The population that surfaced during the search included infants, toddlers, children, and pregnant women. The emergence of this word is understandable because stunting can be directly identified in the population of infants, toddlers, and children. In addition, pregnancy is known as one of an important period that is strongly associated with stunting.



Figure 1. Word cloud related to stunting and nutrition. More words appear as the size of the letter increases (n= 140,102)

@jokowi and @wowfakta were the two Twitter accounts with the most mentions. The first account was President Jokowi's, while the second was a news portal. In addition, the information in news portals is accurate, although the source is unknown. Figure 1 also shows the word coffee, which was once mentioned as a trigger for stunting. However, recent literature suggests that coffee farmers in Africa have children who face a significant risk of food safety, which triggers malnutrition and stunting.

Notably, coffee, a culturally embedded beverage, has also been discussed in relation to diarrhea and stunting. This is supported by many studies that have shown a dose–response relationship between caffeine consumption and pregnancy risks. Therefore, caffeine intake during pregnancy should be limited as no safe threshold for caffeine consumption has been identified.

Table 1. The top 20 usernames and the number of tweets with keywords stunting and nutrition

No	Username	Frequency	No	Username	Frequency
1	MCA_Indonesia	90	11	Andracadabra1	51
2	KemenkesRI	88	12	Yappika	47
3	gmb_indonesia	87	13	mudha_satriya	44
4	Desty007	82	14	Yusveryy	44
5	Nutrisi_Bangsa	67	15	Hmmurahmurahhm2	43
6	GerakanEmas2030	66	16	yuwarlis	43
7	republikaonline	63	17	awanmalangit	42
8	kompascom	63	18	ditjenkesmas	42
9	SahabatYAICI_ID	57	19	sun_indonesia	42
10	RadioGloriaFM	52	20	InfokomPMK	41

MCA_Indonesia or Millennium Challenge Account - Indonesia is a U.S. non-governmental organization (NGO) with the vision of reducing poverty through economic growth. However, this NGO stopped operating in Indonesia in 2018. The Movement to Build the Nation and *gmb_indonesia* claims to be an NGO, although no such record was discovered in 2018. Furthermore, the account *Desty007* belonged to a free blogger, while *Nutrition_Nation* was owned by Danone Specialized Nutrition (SN) Indonesia and used for public education on nutrition and health issues. The *GerakanEmas2030* account campaigned for stunting during the 2019 Indonesian Presidential Election, although it has been inactive since that year. *SahabatYAICI_ID* is also an account of the Abhipraya Insan Cendekia Foundation, which includes various activities related to health and nutrition. However, the website could not be accessed at this time. The *KemenkesRI* accounts for the Indonesian Health Ministry. Meanwhile, trusted online news portal accounts include *Republikaonline*, *Kompascom*, and *RadioGloriaFM*.

Despite its relevance, the intersection between stunting and food safety appears to be underrepresented in public conversations. Although malnutrition is frequently highlighted as a cause of stunting, only a minimal number of tweets (n=8) have directly linked food poisoning to stunting, suggesting a general lack of awareness or attention to the food safety aspect in stunting prevention narratives. This represents a gap between critical knowledge and advocacy. Issues such as unsafe food preparation, contamination by pesticides or aflatoxins, and improper feeding practices are all potent contributors to both acute illness and chronic malnutrition, factors that, in vulnerable populations, can culminate in stunting.

3.2.2 Stunting and poisoning

Due to the occurrence of only eight tweets, which directly linked stunting and poisoning, the analysis was less extensive. Figure 2 demonstrates that some of the keywords obtained were related to soap-based handwashing education, which is very useful in reducing diarrhea and

stunting risk. This phenomenon shows a lack of concern regarding the risks of food poisoning and stunting.

The nutritional status of pregnant women and young children has emerged as a primary theme in both the social media discourse and the existing public health literature. Particularly in rural agricultural areas, such as Brebes, where the use of pesticides is rampant, the risk of chronic exposure to environmental toxins is high. The consumption of vegetables or grains contaminated with aflatoxins or pesticide residues can severely impair fetal development and infant growth. However, such issues are rarely foregrounded in stunting prevention programs, which still focus heavily on caloric supplementation and food distribution, without ensuring hygienic preparation or chemical safety.

Furthermore, access to clean water and sanitation are indispensable components of food safety, especially for pregnant and breastfeeding mothers. Diarrhea, often caused by contaminated food or water, exacerbates nutrient loss and weakens immune responses, particularly in infants and toddlers. This explains the frequent prescription of probiotics to control gut microbiota composition as a preventive or mitigating measure against diarrhea-induced stunting.



Figure 2. Word cloud of stunting and poisoning. The frequency of words increased with the size of the letter (n= 36)

3.2.3 Stunting and pregnancy

The tweets involving President Jokowi and the World Bank president, Jim Yong Kim, during his visit to Caringin Village, Bogor, where he viewed *Posyandu* (Integrated Service Posts) activities in providing additional food, counseling for pregnant women, and early childhood education, contributed to 7,918 tweets related to stunting and pregnancy. This visit from the World Bank's presidential involvement was important because he had experience in handling stunting cases from other countries.

Another tweet emphasized the importance of monitoring the health of pregnant women to protect them from anemia and death. This group also highlights the significance of *Posyandu* (Integrated Healthcare Center) participation and Family Welfare Empowerment (PKK) in supporting stunting prevention.



Figure 3. Word cloud on stunting and pregnancy. The frequency of the word increases with the size of the letter (n= 32,033)

Table 2 illustrates that the usernames dominating the stunting and pregnancy keyword groups include individuals and unclear accounts, except for *InfokomPMK* (Directorate of Information and Communication for Human Development and Culture, Directorate General of IKP, and Ministry of Communication and Information). According to this data, the government should improve stunting education through the Twitter account of a competent institution.

Table 2. The top 20 usernames and the number of tweets with the keywords stunting and pregnancy

No	Username	Frequency	No	Username	Frequency
1	Andracadabral	69	11	mudha_satriya	26
2	delArdian	63	12	AryatamaAditya	25
3	Yumma_11	61	13	genbestid	23
4	MamaMudah	46	14	antares29	23
5	HanifahAndini96	42	15	ByruBima	22
6	iman4WD	40	16	MistikPolitik	21
7	selfmirror	34	17	S4fitr1HS	20
8	_riverheaven	31	18	shae_ll	20
9	GerakanEmas2030	28	19	vini_vidi_veci	19
10	najwa_fais	28	20	InfokomPMK	17

3.3 Poisoning

3.3.1 Poisoning and pregnancy

Poisoning and pregnancy were mentioned in 6,436 tweets. Figure 4 shows that these tweets were dominated by news on an artist named Ashanty, who suffered from food poisoning while pregnant. This incident also makes it difficult to obtain important information about poisoning during pregnancy.

However, several interesting facts exist, including Sweden’s recommendation to remove PIP (Poly Implant Prothese) breast implants to prevent poisoning in breastfed children. This incident remains a matter of debate even after additional investigations have been conducted. European Union health authorities have concluded that there are no convincing medical, toxicological, or other data justifying the mass removal of PIP breast implants. However, the decision to perform this procedure depends on the condition of the respective women after consultation with a doctor.

There was a poisoning incident of 142 elementary school students and one pregnant woman during a campaign to increase fish consumption in the Malaka Regency, NTT (East Nusa Tenggara) [4]. Keywords, including the risk of *Listeria* bacterial infection due to food poisoning, were also identified. Therefore, sensitive individuals, such as pregnant women, are recommended to avoid unclean vegetables, lettuce, or raw vegetables. Clinical data indicate that this infection poses a severe threat, with significant mortality rates even among healthy individuals. Moreover, even minimal bacterial exposure can induce sepsis, meningitis, and fetal infections, resulting in miscarriage.



Figure 4. Word cloud related to poisoning and pregnancy. The size of the letter increases with the frequency of the words that appear (n= 9,483)

Table 3 shows the usernames involved in the tweets with the keywords poisoning and pregnancy. *Parenting INA* (Femina Group account), *Nakita ID* (Kompas Gramedia Group account), *kompascom*, and *TabloidBintang* were the only legitimate accounts. Other accounts are obscure accounts due to the high number of news articles related to artists that these accounts like. Subsequently, the frequency distribution of usernames tweeting these keywords compared with the total number of tweets indicates that this topic is popular across users, and no particular username has a high frequency.

Table 3. The top 20 usernames and the number of tweets with the keywords poisoning and pregnancy (n=5.413)

No	Username	Frequency	No	Username	Frequency
1	GEMAWAHYUH	11	11	KoalaSuntuk	6
2	parentingINA	10	12	TabloidBintang	6
3	Nakita ID	9	13	selamatkanibu	5
4	dahlandahi	9	14	think smartz	5
5	kompascom	8	15	VionaRachellia	5
6	Arisfivedragon	8	16	RatnoWistu	5

No	Username	Frequency	No	Username	Frequency
7	Daafiiii27	8	17	StfuCok	5
8	muhfeeb	7	18	mahirdesain	5
9	jonanyaman	7	19	kontendewasa	5
10	kaixongin	6	20	Official48Indo	5

3.3.2 Poisoning and toddlers

Dozens of poisoned toddlers were observed from multiple documented incidents in 4,847 tweets, including 1) dozens of toddlers poisoned by green bean porridge PMT at *Posyandu* in Madiun [5]; 2) dozens of toddlers poisoned during immunization at the Community Health Center (*Pustu*) in Bener Meriah Regency, Aceh. This poisoning in Aceh could be caused by PMT green bean porridge, vaccines, or vitamins [6]. 3) Dozens of toddlers poisoned after consuming meat from a friend's birthday party in Singojuruh Village, Banyuwangi, East Java [7]. 4) Dozens of toddlers were alleged to have experienced additional food poisoning from *Posyandu* in Gilingan, Surakarta, Central Java [8]. 5) Toddlers in Makassar were suspected of being poisoned by pallubasa [9]. Moreover, similar incidents have occurred in the past, including the recent PMT poisoning of dozens of toddlers at the Guntur Health Center, Garut Regency [10].

The prevalence of food poisoning in toddlers may be caused by several factors, including *Bacillus cereus* contamination in rice resulting from improper storage and processing temperatures. To ensure safety, exposure to hazardous temperatures (5–57 °C) should be strictly limited to a maximum of 2 hours, particularly for leftover food intended for later consumption. Therefore, not leaving cooked or perishable food at room temperature, reheating food before consumption, and using a thermometer to ensure that the food is cooked properly are recommended.



Figure 5. Word cloud related to poisoning and toddlers. The size of the letter increases with the incidence of the word (n= 15,468)

Several incidents originated from food processed unprofessionally by neighbors. These reports reflect a lack of food safety awareness in domestic settings, highlighting the urgent need to improve food safety knowledge and practices at the household level.

Obscure accounts dominated the username data for this tweet; for example, *Brother Jst*, which has been inactive since 2014. However, Table 4 also shows that several mainstream news portal accounts, such as *kompascom* and *beritasatu*, remained in the top 20. It is also necessary to remain aware of fake news accounts, such as *kabardetiknews*, which are suspected to imitate *the detikcom* news portal.

Table 4. The top 20 usernames and the number of tweets with keywords poisoning and toddlers

No	Username	Frequency	No	Username	Frequency
1	Brother_Jst	18	11	IClub_Madiun	8
2	inBANDAACEHcity	16	12	AncamanKristen	8
3	kompascom	12	13	parentingINA	8
4	Ayahbunda	10	14	kabardetiknews	7
5	Arisfivedragon	10	15	jogiacoret	7
6	GEMAWAHYUH	9	16	CeritaMedan2	7
7	RatnoWistu	9	17	Martiens	7
8	kebenaran_21	9	18	tribunnews	6
9	Beritasatu	8	19	Berita9TV	6
10	republikaonline	8	20	SINDOnews	6

3.3.3 Aflatoxin poisoning

Extremely low aflatoxin poisoning data were available on Twitter (n=54) because people were not familiar with these terms. However, Figure 6 illustrates that the incidence of aflatoxin poisoning was mostly associated with peanut sauce.



Figure 6. Wordcloud-related poisoning and aflatoxins. The size of the letter increases with the frequency of the word (n= 390)

3.3.4 Peanut poisoning

"A large amount of data was available on peanut poisoning (n=2,215). The incidence of this condition also coincides with the high number of cases of mung bean porridge poisoning in toddlers (Figure 7). Kidney beans and koro beans are two other varieties of legumes that contribute to bean poisoning. Furthermore, it is well established that uncooked red beans contain phytohemagglutinin (PHA), a toxin that can disrupt cellular metabolism. To eliminate these anti-nutritional factors, proper thermal processing, particularly thorough boiling or frying, is mandatory to inactivate the toxin before consumption.



Figure 7. Word cloud of poisoning and peanuts. The occurrence of the word increases with the size of the letter (n= 4,825)

Koro also appears because of the toxic variety of this legume which contains cyanide. However, this chemical is removed by immersion for more than 72 h or during the germination process.

3.3.5 Formula milk poisoning

Figure 8 displays the distribution of the keyword formula milk poisoning, which was observed in 721 tweets. These tweets were obtained because a poisoning incident occurred in a 34-day-old newborn from the consumption of goat milk and honeycomb in Tambun, Bekasi, West Java [11]. Honey should not be administered to infants to prevent botulinum toxicity.

Formula milk poisoning in four toddlers, which resulted in the death of one, was a more relevant incident [12]. This poisoning is associated with the contamination of several microbes, including *Enterobacter sakazakii* and *Staphylococcus aureus*. In Indonesia, tracing these events is quite difficult, except for several studies, such as the Extraordinary Event (KLB) of Food Poisoning in Sirnamekar Village, Sukabumi Regency, 2019 [13] and in Wonosari District, Gunungkidul Regency, Special Region Yogyakarta (DIY) [14].



Figure 8. Word cloud related to formula poisoning. Letters increase with the frequency of words (n=2,399).

he early introduction of formula milk and improper handling of feeding equipment are widely recognized as significant contributors to diarrheal illnesses among infants. Social media reports of formula milk poisoning (n=721 tweets) and a newborn's death from honey and goat's milk underscored the need for better maternal education around infant feeding. Although breastfeeding is highly recommended, this practice is often hindered by social pressure, misinformation, and practical constraints, which can lead to high levels of stress among breastfeeding mothers.

Inappropriate feeding techniques, notably the use of unclean bottles, expired milk, or incorrect reconstitution temperatures, increase the risk of contamination with pathogens such as *Staphylococcus aureus*. These microbial contaminants are known to cause life-threatening conditions, such as infant sepsis, which can permanently disrupt a child's long-term growth and development.

3.3.6 Pesticide poisoning

This pesticide poisoning group (n=3,716) is quite interesting because it was mentioned in a romantic tweet that reads "Love is like a pesticide, hence continues watering of plants with pesticides may poison and destroy them, and the same is true for love." Despite the romantic tweet, the relevant tweets show that 51 Cikarang residents, including children, were poisoned by pesticide factory fumes [15]. Meanwhile, 18 people were poisoned after consuming coffee during the condolence visit to the Malang Regency. This may have occurred because of the preparation of coffee drinks with pesticide-contaminated water from a well close to rice fields.

Owing to careless pesticide use, agricultural lands often contaminate wells or fishing grounds. This pollution is dangerous to health and triggers a variety of symptoms including dizziness, nausea, diarrhea, cramps, fainting, seizures, and death. Therefore, education regarding the safe use of pesticides is essential.

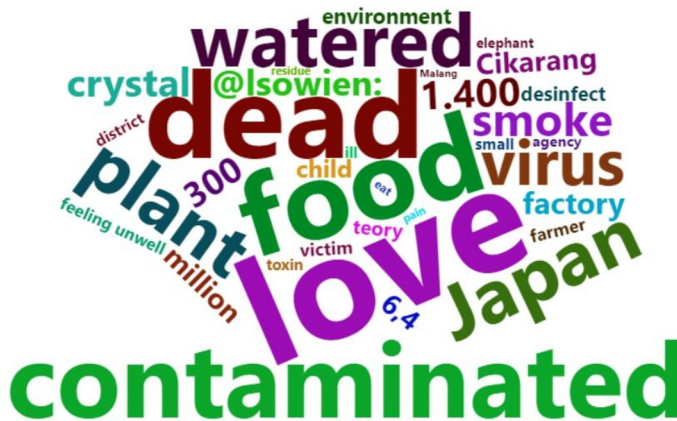


Figure 9. Word clouds related to milk formula. The size of the letter increases with the prevalence of the word (n=11,642)

An important but underdiscussed theme is chronic exposure to environmental toxins, particularly pesticides and aflatoxins, which are found in corn, peanuts, and grains. While only 54 tweets explicitly mentioned aflatoxin poisoning, existing studies and poisoning incidents have revealed the presence of biologically hazardous compounds in commonly

consumed foods. For instance, aflatoxin-contaminated peanuts used in satay sauce and the Supplementary Feeding Program (PMT) green bean porridge served at Posyandu (Integrated Health Services Posts) have repeatedly led to toddler poisoning.

Aflatoxins are hepatotoxic and immunosuppressive, leading not only to acute illnesses, but also to inhibition of nutrient absorption and growth retardation in children. Moreover, the low thermal stability of these toxins indicates that standard cooking processes are often inadequate for neutralization. The lack of public awareness about aflatoxins and, more broadly, about mycotoxins in food reflects a major information gap in food safety education campaigns.

3.4 Diarrhea

3.4.1 Diarrhea in the pregnancy

The number of tweets obtained for diarrhea in the pregnancy group was 8,547, with the majority containing the benefits of drinking coffee to stop diarrhea. This recommendation contrasts with general medical understanding, as caffeine is typically recognized to stimulate colonic muscle activity rather than acting as an anti-diarrheal agent. This discrepancy highlights the spread of potential health misinformation on the platform.



Figure 10. Word cloud related to diarrhea during pregnancy. The size of the letter increases the frequency of the word (n= 23,285)

The benefits of guava leaf consumption were also tweeted to stop diarrhea in pregnant women. This popularity is likely due to the plant's well-known content of flavonoids and quercetin, which possess antimicrobial and antispasmodic properties helpful in relieving diarrhea-related cramping. The use of natural ingredients is also preferred for drugs because of concerns regarding fetal side effects. However, it is necessary to consider the correct use of these natural ingredients.

3.4.2 Diarrhea in Infants

Figure 11 illustrates that soursop had the highest number of diarrhea-in-infant-related tweets (24, 190 tweets). This fruit is frequently mentioned as a natural remedy, likely due to its rich content of bioactive compounds. It is widely known that compounds such as flavonoids and phenols possess antimicrobial properties that can help control bacterial infections.

The next tweet emphasized that breastfeeding should not be stopped if the infant has diarrhea. This aligns with standard health recommendations, as breast milk provides essential nutrients and immunological factors including antibodies and prebiotics, that are critical for protecting the infant against enteropathogens.



Figure 11. Word clouds related to diarrhea in infants. The word appears more when the letter is bigger (n= 56,915)

Diarrhea, often trivialized in everyday conversation, has surfaced as a recurring mediator linking unsafe food, poor hygiene, and stunting. Data from Twitter (n=56,915 tweets) emphasize the public's engagement with natural remedies, such as guava leaves, which are believed to alleviate diarrheal symptoms. Although such remedies have scientific merit, the lack of guidance on dosage and safe use can be risky, especially in pregnant women or infants.

The data reveals that malnutrition and diarrheal disease are the two most prominent factors identified in this study. Malnutrition is explicitly recognized as a fundamental cause, evidenced by the high volume of tweets (n=38,594) connecting nutrient deficiency to growth failure. Additionally, the dataset indicates that diarrhea serves as a critical and high-frequency driver. Since the volume of tweets regarding infant diarrhea (n=56,915) exceeds other categories, it suggests that enteric infections resulting from poor food safety act as a dominant determinant associated with the stunting burden.

4 Conclusion

This research aims to provide data on food safety incidents related to stunting on Twitter and thus provide recommendations regarding emerging food safety issues related to stunting. Malnutrition was identified as a cause of stunting. Toddlers are prone to food poisoning at public events, such as immunization. Diarrhea in infants can be cured by soursop ingestion. It is recommended that government agencies actively participate in the provision of education and news related to stunting. The basis for overcoming food poisoning issues, which include a comprehensive food poisoning database and an analysis of its causes, is also required. Public education is also necessary to identify important, scientifically valid information. Therefore, synergistic collaboration should be formed with non-governmental institutions concerned about stunting. Furthermore, food safety education regarding the cautious use of pesticides is required at the household level.

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