

Understanding vaccine hesitancy: Insights from social media on polio, human papilloma virus, and COVID-19 in Zambia

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Abstract

Objectives: Vaccine hesitancy remains a critical challenge to public health in Zambia and globally, necessitating a deeper understanding of the factors influencing this phenomenon. The study analyzed user-generated Facebook comments from January 2021 to December 2023 to understand the factors influencing vaccine hesitancy in Zambia.

Methods: This study employed a qualitative case study design, focusing on the official Facebook page of the Ministry of Health in Zambia. A purposeful sampling technique was used, collecting comments that discussed vaccine hesitancy related to polio, human papilloma virus (HPV), and coronavirus disease 2019 (COVID-19) vaccines.

Results: The analysis revealed that men contributed 77.5% of comments followed by women with 22.5%. The majority of comments (82.5%) pertained to COVID-19 vaccines, followed by polio (14.1%) and HPV (3.4%). Notably, women expressed greater hesitancy toward polio vaccines (60%) compared to COVID-19 (19.9%) and HPV (12.5%). Thematic analysis highlighted significant hesitancy against vaccines shaped by vaccine safety and efficacy concerns, frequent calls for vaccination particularly against polio, conspiracy theories, distrust in health authorities, and poor communication from health authorities. Other drivers of vaccine hesitancy were reliance on spiritual beliefs, herbal remedies and natural immunity, and the pervasive spread of misinformation.

Conclusion: These findings underscore the barriers to vaccine acceptance, emphasizing the critical need for transparent communication and community engagement. To improve vaccine uptake, public health strategies must address community-specific concerns, foster trust, and enhance the effectiveness of health communication efforts.

Keywords

Vaccine hesitancy, COVID-19 vaccines, polio vaccines, HPV vaccines, social media

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Introduction

Infectious disease outbreaks such as polio, human papilloma virus (HPV) infections, and coronavirus disease 2019 (COVID-19) present an ongoing threat to global health.^{1,2} Polio is a highly infectious disease that may cause paralysis in children under the age of 5 while persistent HPV infections have been linked to increased risk of cervical cancer in women and other cancers in men.^{3,4} Meanwhile, COVID-19 is a recent addition to a list of diseases that have plagued the human race, it is caused by a severe acute respiratory syndrome coronavirus 2

(SARS-CoV-2).⁵ Infectious disease outbreaks such as those involving polio and COVID-19 not only strain health-care systems but also lead to widespread morbidity,

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mortality, and socio-economic disruptions. The global nature of these threats emphasizes the need for comprehensive and effective strategies to prevent further spread. One of the most critical and proven preventive measures in mitigating the impact of these infectious diseases is vaccination.⁶ Since at least 1500AD, biological preparations designed to stimulate immunity against specific pathogens, have played a pivotal role in controlling and, in some cases, eliminating highly pathogenic diseases.^{6–8} Building upon these early advancements, organized global vaccination programs beginning in the early 1970s have successfully reduced the incidence of several diseases.¹ For example, smallpox was declared eradicated by the World Health Organization (WHO) in 1980⁹ while cases of paralytic polio have also seen a decline by 99%.^{1,6,10} Polio vaccines are approved to be administered to children five years and younger while HPV vaccines are given to all girls aged 9–14 years, before they become sexually active.^{3,4} Unlike these two vaccines, COVID-19 vaccines can be administered to people from the age of 6 months.¹¹ The consequences of shunning vaccinations can be dire, as evidenced by recent increases in measles outbreaks in countries which had achieved measles elimination status like the UK and the USA.¹² Similarly, the resurgence of polio in areas with low vaccination rates highlights the critical need for sustained immunization to prevent the re-emergence of diseases once considered under control.¹³

In light of these risks, vaccine hesitancy, defined as a delay in acceptance or refusal of vaccines despite their availability,¹⁴ has been declared as a significant threat to the global health vaccination drive.¹⁵ This phenomenon is not new and can emerge from a complex interplay of factors ranging from deliberate misinformation to unfounded beliefs.^{14,15} The resistance to polio vaccines in Nigeria serves as a pertinent example, where fears regarding vaccine safety and religious misconceptions often lead to low uptake of vaccines.^{16,17} In a new world order driven by social media, those against vaccinations have found a new tool to promote anti-vaccination messages. For example, the spread of misinformation and conspiracy theories on social media can greatly amplify fears surrounding vaccines, often outpacing factual public health information.¹⁸ Social media platforms have changed the landscape of public discourse on several issues including health and vaccination.^{19,20}

In Zambia, social media has become a central platform for disseminating information, with a significant number of people relying on it as a primary source of news and health-related updates.²¹ However, the impact of social media on shaping public perceptions and attitudes toward vaccines in general, not just COVID-19 vaccines, remains poorly studied.²² As seen with the spread of misinformation about antibiotic use in poultry in Zambia, Facebook—a platform where many people socialize—has become a hotbed for false information.²¹ Given the growing

prevalence of misinformation and varying viewpoints shared on social media, understanding how these platforms influence vaccine acceptance or hesitancy is crucial for tackling public health challenges effectively.

This study analyzed the public discourse on social media regarding polio, HPV, and COVID-19 vaccines in Zambia, delving into the factors contributing to vaccine hesitancy within this context. Understanding these dynamics is crucial in fostering a culture of trust and promoting the essential role of vaccines in disease prevention. By identifying the specific barriers to vaccine acceptance, health authorities and advocacy groups can develop targeted strategies to counter misinformation, engage communities, and highlight the vital role that vaccines play in preventing infectious diseases and cancers.

Methods

Study design

This study utilized a qualitative case study design and a purposeful sampling technique. The primary target was the official Facebook page of the Ministry of Health (MoH) in Zambia, where health officials post about vaccine and vaccination campaigns while the public post comments in response to the posts. The MoH Facebook page serves as a vital platform for disseminating health information and facilitating community interaction, boasting a significant following that amplifies its reach and influence. Additionally, Facebook is the biggest and most active social media platform in Zambia.^{21,22} Through analyzing user-generated Facebook comments from January 2021 to December 2023, this research aimed to uncover the theories, traditions, fears, and other complexities surrounding vaccine hesitancy toward polio, HPV, and COVID-19 vaccines in Zambia. The study period was specifically chosen as it coincided with the government's response to the COVID-19 pandemic, which led to increased public discourse around vaccines following the rollout of COVID-19 vaccines. In addition, this period captured the resurgence of attention on other vaccines, such as polio and HPV. Specifically, polio, HPV, and COVID-19 vaccines have been the most publicized vaccines on the MoH Facebook page and attract the most public comments and replies. Overall, the study followed the Consolidated Criteria for reporting qualitative studies (Table S1 in the supplemental materials).

Sample size and justification

The sample size of Facebook comments and replies was determined based on the goal of achieving a comprehensive understanding of vaccine hesitancy across a broad spectrum of public opinions. Since this was a qualitative study using grounded theory, data collection continued until saturation was reached - the point at which no new themes or insights

emerged from the data. After analyzing the first 760 comments, it became apparent that the majority of themes related to vaccine hesitancy were consistently appearing. As the analysis progressed, these themes were refined and further developed, but no significant new categories emerged beyond this initial analysis. Additional comments predominantly served to confirm and elaborate on existing themes rather than to introduce new perspectives. Therefore, the initial 760 comments were sufficient to provide a comprehensive understanding of the key factors influencing vaccine hesitancy within the dataset, justifying the 4716 comments analyzed of which 2124 comments aligned with the identified themes.

Data collection

A checklist was created to systematically gather data from comments and responses to comments on the MoH Facebook page, focusing on user interactions from January 2021 to December 2023. The data was collected by author SMM, a male holding a PhD in Infectious diseases with adequate experience in qualitative and quantitative studies. At the time of the study, he was a lecturer at the University of Zambia with no relationship with participants. The participants had no knowledge of the data collector. Comments and responses made by health officials and professionals were excluded to maintain the focus on public sentiments. To identify relevant discussions, key terms such as vaccine, COVID-19 vaccines, polio, polio vaccines, HPV, HPV vaccines, and cervical cancer were employed in the search function. Gender was primarily inferred based on the names of users, allowing for analysis of demographic trends in attitudes toward vaccines by gender.

Data analysis

An inductive approach was employed, meaning themes were generated directly from Facebook comments and replies to comments rather than being predefined. Thematic analysis was used to explore public comments and responses related to vaccine hesitancy. The process involved thoroughly reviewing all comments from the MoH Facebook page, coding them, and generating themes. Data was coded by SMM. A key step was the cross-referencing of the data with established public health guidelines and scientific literature to validate the information and identify misinformation. Thematic analysis helped in identifying recurring patterns and sentiments that contributed to understanding vaccine hesitancy. Data was imported into NVivo 12.3 (Lumivero, Denver, Colorado, USA) for management, storage, and generation of themes. NVivo is a software tool designed for qualitative and mixed-methods research. It is primarily used to analyze unstructured data. Framework matrices were employed to organize and categorize the data. This structured method facilitated the creation of a visual framework that showed the relationships

between different themes and subthemes. Using matrix coding, each comment was categorized according to established themes, allowing for easier comparison and contrast of sentiments across different vaccines (COVID-19, polio, and HPV). Framework matrices enhanced the analysis by organizing the data, revealing overarching trends, and facilitating a more nuanced understanding of vaccine hesitancy across various demographic groups. This structured approach contributed to a deeper insight into public perceptions surrounding vaccination.

Results

Demographics and distribution of comments

The study analyzed 4716 comments posted by users on the MoH Facebook page, of which 2124 were related to vaccine hesitancy. Among the comments related to vaccine hesitancy, men contributed 77.5% (1647 comments) while women accounted for 22.5% (477 comments). The majority of the comments were about COVID-19 vaccines (82.5%, 1752 comments), followed by polio vaccines (14.1%, 300 comments), and HPV vaccines (3.4%, 72 comments). Notably, women expressed more hesitancy toward polio vaccines (60%, 180/300 comments) compared to COVID-19 vaccines (19.9%, 348/1752 comments) and HPV vaccines (12.5%, 9/72 comments).

Categorization of vaccine hesitancy

Vaccine hesitancy against COVID-19, polio, and HPV vaccines was categorized into 13 themes and 31 subthemes (Table 1). Concerns against vaccine safety and efficacy were the most pronounced reason for resisting vaccine particularly against COVID-19 (Figure 1 and Table 1).

Vaccine safety and efficacy

Skepticism of vaccine efficacy. Doubts were raised by commenters regarding the effectiveness of vaccines, with questions about why vaccinated individuals still contracted COVID-19. Individuals highlighted their confusion with some stating, "If vaccinated people still get infected, what's the point of being vaccinated?" In the case of polio vaccines, some people expressed doubts about the vaccine's effectiveness as the government often calls for new vaccinations whenever there was an outbreak in a neighboring country. Another person mentioned hearing stories from other areas of how ineffective the vaccine was, noting, "I heard about a village where children still got polio even after being vaccinated, which made me question its efficacy." The concern over repeated frequent vaccines was also echoed over polio by others who claimed by indicating that "our daughters would not take it again as they are tired of daily health issues that are linked to the vaccine."

Table 1. Facebook derived factors contributing to vaccine hesitancy in Zambia.

Theme	Subthemes	Number of Facebook comments (%)	
		Male	Female
Vaccine safety and efficacy	Skepticism of vaccine efficacy	177 (82.7)	37 (17.3)
	Concerns over safety	210 (69.8)	91 (30.2)
	Linking rising health issues to vaccines	61 (67.8)	29 (32.2)
	Skepticism on vaccine development	49 (70)	21 (30)
	Hygiene practices during administration of vaccine	15 (83.3)	3 (16.7)
	Concerns over dosage	3 (100)	0 (0)
	Concerns over independent verification of vaccines	3 (100)	0 (0)
Over-vaccination	Over-vaccination	0 (0)	8 (100)
Religious beliefs and interpretations	Faith in divine protection	49 (76.6)	15 (23.4)
	End-of-life perspectives	49 (86)	8 (14)
Conspiracy theories	Claims of malevolent intent	82 (79.6)	21 (20.4)
	Association with the biblical number 666	23 (71.9)	9 (28.1)
Personal autonomy and choice	Advocacy for personal decision-making	79 (84)	15 (16)
	Resistance to government mandates	64 (78)	18 (22)
	Concerns about consent	41 (63.1)	24 (36.9)
Historical context and comparison	Comparison with past vaccines	38 (76)	12 (24)
Natural immunity advocacy	Confidence in natural immunity advocacy	67 (91.8)	6 (8.2)
Alternative health beliefs	Preference for traditional remedies	64 (91.4)	6 (8.6)
Public perception and stigma	Negative perceptions of the vaccinated	49 (81.7)	11 (18.3)
	Evidence of community division over vaccinations	44 (100)	0 (0)
Influence of misinformation	Spread of false information	58 (86.6)	9 (13.4)
	Impact of social media	32 (100)	0 (0)
Public health communication failures	Lack of clear information from authorities	45 (62.5)	27 (37.5)
	Role of social media	49 (100)	0 (0)
Skepticism toward Western medicine	Historical distrust of Western practices	49 (98)	1 (2)
	Concerns about experimentation	38 (86.4)	6 (13.6)

(continued)

Table 1. Continued.

Theme	Subthemes	Number of Facebook comments (%)	
		Male	Female
	Concerns over donated vaccines	49 (89.1)	6 (10.9)
	Cultural skepticism	50 (100)	0 (0)
Calls for transparency and leadership	Criticism of government decisions	89 (85.6)	15 (14.4)
	Leadership by example	29 (90.6)	3 (9.4)
	Lack of transparency	49 (73.1)	18 (26.9)

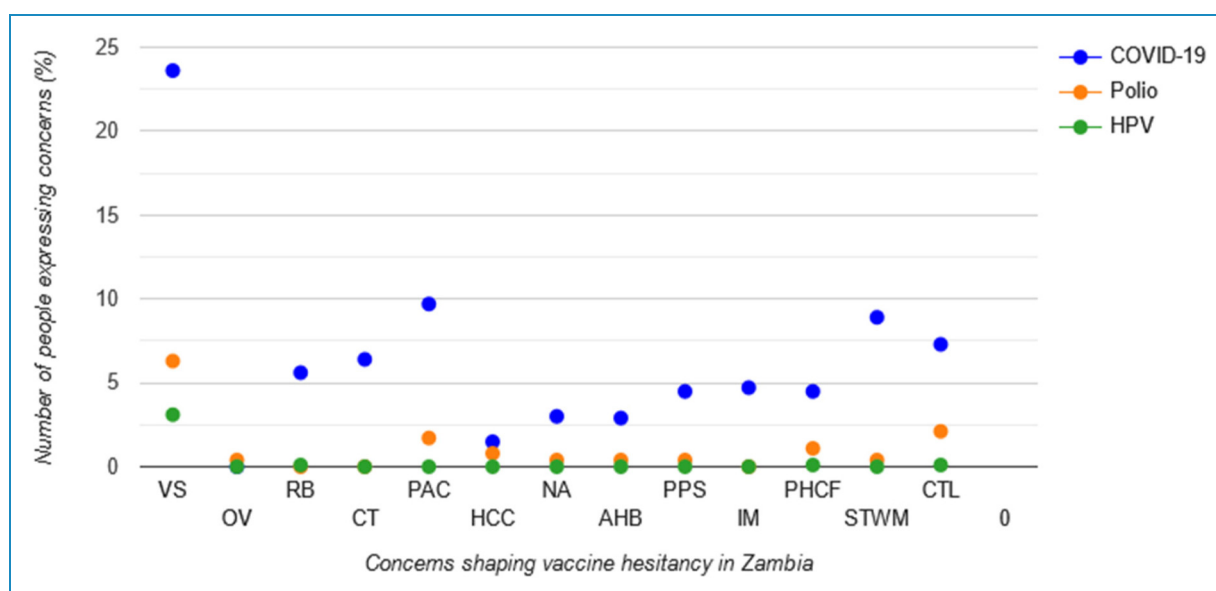


Figure 1. Facebook concerns shaping vaccine hesitancy against COVID-19 (blue), polio (orange), and HPV (green) vaccines on Facebook in Zambia. AHB: alternative health beliefs; CT: conspiracy theories; CTL: calls for transparency and leadership; HCC: historical context and comparison; IM: influence of misinformation; NA: natural immunity advocacy; OV: over-vaccination; PAC: personal autonomy and choice; PHCF: public health communication failures; PPS: public perception and stigma; RB: religious beliefs and interpretations; STWM: skepticism toward Western medicine; VS: vaccine safety and efficacy.

Concerns over safety. Concerns about the potential long-term effects of vaccines were prevalent. One commenter expressed concerns, writing, “People are scared; they are saying when you get a COVID-19 vaccine, you become magnetic,” reflecting fears about side effects and the unknown consequences of vaccination. Other comments expanded this fear, saying, “People will die with this vaccine.” Concerning HPV vaccines, some parents questioned their safety and someone went on to state, “I hope the country where the vaccine was made has already vaccinated their girls before introducing it in Zambia.”

Concerns over dosage. Dosage was also of concern to Facebook users. Some individuals questioned whether MoH officials even knew the dosage for the polio vaccine and threatened never to take their children for vaccinations again. One individual said, “If you are not certain of the dosage, I will never vaccinate my children,” highlighting a potential lack of confidence in the health authorities.

Linking rising health issues to vaccines. Beliefs that frequent vaccinations correlated with rising health problems were common in some of the Facebook comments. One individual stated, “I have come to realise that the more the

vaccinations were done, the more cases of polio seemed to rise among our populations,” indicating serious doubts about the efficacy of the vaccines. Over HPV vaccines, one commenter expressed skepticism about the origins of cervical cancer: “Where were all these cancers all along in the past? It makes me wonder about the introduction of attenuated cancer strains in people’s bodies through vaccines.” This comment suggested unverified links between vaccines and cancers.

Skepticism on vaccine development. Doubts were voiced regarding the speed of the vaccine development process in the case of COVID-19 vaccines. For instance, a commenter asked, “When did you carry out trials for vaccines against Omicron?” suggesting a lack of trust in the thoroughness of vaccine testing.

Concerns over independent verification of vaccines. On polio and HPV vaccines, concerns were expressed over the ability of the government to independently verify the safety of vaccines. A concerned parent asked “Did MoH independently verify the safety of the vaccine” indicating frustrations about the government’s failures to locally test foreign products. Others suggested the need to allow local researchers to consult with others across the African continent to get an unbiased view concerning polio and HPV vaccines.

Hygiene practices during administration of vaccines. Some people raised concerns about hygiene practices when administering vaccines because MoH officials usually wore no gloves when administering polio and HPV vaccines. One noted, “I am worried about hygiene by the people helping to administer these vaccines.” It seems the fears were not just about vaccines and hygiene too.

Over-vaccination

Facebook comments, particularly from women expressed confusion and frustration about the frequency of vaccinations of polio. They labeled the vaccinations, too much. They questioned how many times a child should be vaccinated against polio considering the number of times MoH was calling for vaccine boosters. One comment noted the following, “This year alone, my child has received about three vaccinations.” Another commenter stated, “Be specific on how many times a child should be vaccinated; ‘several times’ isn’t specific,” emphasizing a desire for clearer guidance from health authorities.

Religious beliefs and interpretations

Faith in divine protection. Religious beliefs played a central role in shaping attitudes toward vaccines. Some users suggested heavy reliance on their faith as a primary source of protection against COVID-19. One user stated,

“Protection comes from God,” indicating that they preferred spiritual guidance over vaccination. Some used biblical scripture to bolster their resistance, with one comment citing Psalms to argue that, “God will protect us and heal our land,” positioning vaccination as unnecessary in light of divine intervention. Others claimed, “Jesus is my vaccine.” This reliance on spiritual belief over medical intervention illustrated a strong connection between faith and health choices in some communities.

End-of-life perspectives. Besides faith in divine protection, expressions to die rather than take the vaccines were also noticeable from the comments. Some individuals expressed a belief that physical health was secondary to spiritual well-being, one individual stated, “It is better to die in the Lord than in sin.” This viewpoint positioned faith as a primary concern, leading many to reject vaccinations in favor of spiritual readiness.

Conspiracy theories

Claims of malevolent intent. Conspiracy theories proliferated in some posts and replies, with one asserting that a certain philanthropist was part of a plot to reduce the world’s population, claiming, “Bill Gates’ plan is now working.” Others suggested that vaccines were part of a larger plot against African populations, noting “You will die like flies” while others said, “The growing population of Africa is a concern to some so-called developed nations, which makes me wary of their intentions with vaccines.” Such comments revealed a pervasive belief in hidden agendas behind public health initiatives. The sentiments reflected a widespread belief in sinister motives behind the vaccine push. When it came to HPV vaccines, some individuals referenced past unverified incidents to justify their concerns. One remarked, “Years ago, philanthropist Bill Gates went to India and promoted similar vaccines, and many deaths occurred; he never went back there after that,” reflecting a deep mistrust of vaccine advocates and potential concerns about vaccine safety. There were also false mentions of global trends regarding polio vaccination, with comments like, “Most of the world has banned the use of the oral polio vaccine because it’s known to spread polio.”

Association with the biblical number 666. The 666 conspiracy came up a number of times where vaccines were said to represent a religious number from the Bible. A particularly striking comment connected COVID-19 to apocalyptic fears, stating, “COVID-19 stands for 666,” which showcased a belief that the vaccine was part of a larger, nefarious agenda. Several individuals connected vaccine discussions to religious prophecies. They believed that the vaccines were part of a biblical prophecy about the mark of the beast.

Personal autonomy and choice

Advocacy for personal decision-making. A strong theme of personal choice emerged particularly from vaccine skeptics with one user stating, “If it’s by force, I will be the last one to be vaccinated in Zambia” while another said, “Let those who want it take it at their own risk.” These sentiments highlighted a desire for autonomy in health-related decisions even at the expense of a national crisis due to a highly infectious pathogen.

Resistance to government mandates. Some users voiced opposition to government coercion, expressing sentiments such as, “Don’t force people to do the so-called vaccination,” while another said, “It’s not a forcing matter; those who want it will get it, you leave it or you get it.” This reflected a broader desire for autonomy in health choices.

Concerns about consent. Issues regarding parental consent were highlighted, with one user expressing concern that her child was vaccinated without her consent. She said, “My child was vaccinated in my absence.” The comments emphasized the importance of parental involvement in health decisions.

Historical context and comparison

Comparison with past vaccines. Posts from some people drew parallels between the COVID-19 vaccine and historical vaccinations such as polio, questioning why COVID-19 was treated differently. One user noted, “Polio vaccine was not a forcing matter, but why the COVID-19 vaccine is different,” highlighting concerns about perceived inconsistencies in vaccine mandates and raising doubts about the necessity of the COVID-19 vaccine. Some individuals also referenced their experiences growing up without frequent vaccinations against polio and HPV. One stated, “When we were growing, we never had so many vaccines; what’s going on now,” reflecting concerns about the increasing number of vaccines and questioning the changes in vaccination practices over time.

Natural immunity advocacy

Some expressed confidence in their natural immunity. One user proclaimed, “We are safe; our immune system is very strong,” underscoring a preference for natural defenses over medical interventions.

Alternative health beliefs

Preference for traditional remedies. Some users expressed a strong belief in traditional medicine over vaccines, with one stating, “Me, I believe in Zambian herbs.” This

indicated a preference for natural remedies, rooted in cultural practices, over modern medical interventions. This preference was also evident in some comments that advised relying on “traditional herbs like lemons” instead of vaccines, because “vaccines don’t help people at all”, another person claimed expressing skepticism about the effectiveness of vaccines and reflecting a broader doubt about their benefits. Over polio outbreaks, some parents expressed a desire for alternative solutions, with one stating, “I’m going to use natural medicine should there be a polio outbreak,” indicating a reluctance to continue with conventional vaccinations.

Public perception and stigma

Perceptions of the vaccinated. Negative views toward those who chose COVID-19 vaccination were common, with some asserting stating, “Only fools will get unverified vaccines,” illustrating a stigma against vaccinated individuals.

Community division. Some comments and replies reflected a polarized community, with one user expressing a strong resolve against vaccination, saying, “I will never get this thing in my body,” indicating deep divisions in beliefs around health and safety.

Influence of misinformation

Spread of false information. Misinformation played a significant role, as seen in comments regarding bizarre myths, such as those that posted saying, “They are saying when you get a COVID-19 vaccine, you become magnetic,” which probably spread fear and distrust.

Impact of social media. The influence of social media was evident, with one commenter noting, “read articles on CDC and other social media blogs” and be cautious about the vaccine, reflecting how online narratives shaped opinions and fuelled skepticism.

Public health communication failures

Lack of clear information from authorities. Several comments highlighted a perceived lack of effective communication about vaccines, with one user stating, “There’s very little sensitization on the importance of getting vaccinated.” Other users also criticized MoH for not providing adequate information. One user remarked, “Please give us proper details so that we don’t expose our ignorance,” indicating a need for better communication. There were frustrations about contradictory information regarding polio vaccination schedules. A commenter pointed out, “This is now confusing; how many vaccines should these little ones be given? It was just last month that they took the same

polio,” highlighting confusion and frustration over the frequency of vaccinations for children.

Role of social media. A selected number of posts pointed out that misinformation propagated by unqualified individuals contributed to vaccine hesitancy, with one commenter lamenting, “They think you’re taking some years off their lifespan with the jabs.” This shows how false narratives spread through social media influenced public opinion.

Skepticism toward Western medicine

Historical distrust of Western practices. Some comments reflected a broader skepticism of Western medical practices, with one commenter stating, “Is this not rejected in the USA?” This skepticism was often tied to historical grievances and the perception that Western nations do not prioritize African health.

Concerns about experimentation. Some people expressed fears of being used as “guinea pigs” for vaccines that had been rejected elsewhere, with a user remarking, “They want to use us as guinea pigs.” This highlighted a deep-seated fear of exploitation in medical research.

Concerns over donated vaccines. A recurring theme involved suspicion about why vaccines were donated to countries like Zambia. A commenter questioned, “Why are they donating here in Zambia when we are all facing the same problem?” This raised doubts about the intentions behind the donation, implying that the vaccines might be less effective or even dangerous. Some shared observations about vaccine administration in other nations, questioning why Zambia would accept vaccines that were deemed unsafe elsewhere. One individual stated, “Why Zambia is taking vaccines that people in the United States of America (USA) and some European countries have refused.”

Cultural skepticism. Reflections on cultural attitudes toward vaccines emerged, with users stating, “Vaccines only work in Europe,” suggesting a belief that Western practices were not applicable or trustworthy in their context.

Calls for transparency and leadership

Criticism of government decisions. Certain users often criticized governmental decisions regarding vaccine procurement, such as, “MOH made a huge mistake to procure the AST vaccine.” This suggested a lack of trust in public health authorities to make decisions in the best interest of the population.

Leadership by example. In some cases, people demanded that government leaders receive vaccinations first. They said, “Leaders should be the first to show the vaccine’s

safety.” Many others proposed monitoring leaders post-vaccination, stating, “Seeing leaders vaccinated would build public trust,” emphasizing the importance of visible leadership in encouraging vaccine acceptance and fostering trust in health initiatives.

Lack of transparency. Individuals criticized the government for not being forthcoming about vaccine risks. A user wrote, “The government is pushing vaccines without proper investigation,” expressing concerns about the adequacy of research and transparency behind vaccination campaigns. Other posts and replies expressed a similar lack of trust in even in international health authorities and organizations such as the WHO. One noted, “I would never trust WHO after hearing about their past actions in other countries.” Others urged the government of Zambia through MoH to always be careful and never rush to introduce vaccines without thorough investigation.

Discussion

The analysis of Facebook comments and replies regarding vaccine hesitancy in Zambia revealed a complex interplay of concerns related to vaccine safety, efficacy, and the communication strategies employed by health authorities. These findings resonate with similar studies in other contexts, highlighting a global phenomenon where mistrust in vaccines persists.^{23–26} A deeper analysis of the factors driving vaccine hesitancy uncovered a strong link between women and their children and gender differences, with women (60%) expressing greater reluctance toward polio vaccines than any other vaccine compared to men (40%). In this study unlike others before, men were more hesitant toward all vaccines combined than women.²⁷ Several of the concerns toward vaccines were largely due to skepticism in the absence of correct information as observed elsewhere.¹⁸

Skepticism about vaccine effectiveness stemmed from the Zambian government’s frequent calls for new vaccinations during polio outbreaks in neighboring countries, as well as reports of COVID-19 cases among vaccinated individuals. In fact, what some described as the dosage was simply the frequency of vaccinations. Women expressed greater frustration than men about their children receiving additional vaccine boosters beyond what was taught at under-five clinics and recommended by WHO standards. They saw the efforts as per incuriam. Nonetheless, the skeptic sentiments align with findings from similar studies in the USA, Europe, and some African countries where doubts about vaccine efficacy were fuelled by media narratives highlighting breakthrough infections.^{28–30} To some extent, the skepticism may be justified especially in the context of polio vaccines where vaccine-derived outbreaks are on the rise globally.^{13,31} If this phenomenon does not change in the short term, the skepticism observed in this

study may hinder public health efforts as observed in Nigeria where similar concerns contributed to lower vaccination rates against polio.^{16,32}

Doubts about vaccine effectiveness extended to concerns about safety and quality assurance. Many commenters feared side effects, such as magnetization and death from COVID-19 vaccines, reflecting global concerns about long-term effects.^{33,34} These fears were largely fuelled by misleading foreign social media posts. Some commenters also questioned the government's ability to independently verify vaccine safety, particularly for HPV and COVID-19 vaccines, suggesting a broader mistrust of government programs.^{29,35–37} The rapid development of COVID-19 vaccines was similarly questioned, consistent with trends observed globally.^{38,39} This highlights the need for local researchers to conduct independent safety assessments and for the government to invest in research infrastructure; ensuring scientific efforts are locally proven and results communicated effectively to the public to build confidence in the health and scientific systems.^{40,41}

Linked to vaccine safety and skepticism was the perception that increased vaccination rates correlate with rising health problems. This was reminiscent of findings from studies in South Africa, where communities linked vaccination campaigns to rising disease prevalence.²⁴ This perspective highlights the necessity for health authorities to convey data on vaccination outcomes transparently to mitigate misconceptions.⁴²

Aspects of vaccine hesitancy in Zambia also appear to be shaped by religious beliefs, where faith is often prioritized over medical interventions, beyond safety issues. This may not be a surprise finding as Zambia was declared a Christian nation in 1996 and people are highly religious.⁴³ Several individuals expressed a preference for divine protection, viewing spiritual guidance as sufficient for safeguarding against diseases like COVID-19, rather than relying on vaccines. This perspective was reinforced by interpretations of religious texts that frame health as a matter of spiritual readiness, positioning vaccination as unnecessary or even contrary to divine will. The deep connection between faith and health decisions may reflect a broader cultural context in which religious beliefs strongly influence public health choices. Unfortunately, This reliance on spiritual beliefs is a recurring theme in vaccine hesitancy studies worldwide, where faith communities often resist medical interventions.^{32,44,45} Therefore, understanding this dynamic is crucial for addressing vaccine hesitancy, as it highlights the need for culturally relevant strategies that respect religious perspectives while promoting the benefits of vaccination. Such approaches can help bridge the gap between faith-based resistance and public health goals, ultimately fostering greater acceptance of vaccines in religious communities.

Similar to religious beliefs, the findings of this study suggest that conspiracy theories may be drivers of vaccine

hesitancy in Zambia, with many individuals believing that vaccines are part of a larger, sinister agenda. These theories often involved suspicions about global elites or external forces seeking to harm or control populations, particularly in Africa. It appears that phenomenon is not unique to Zambia but a worldwide problem where rumors and theories are rife on social media.⁴⁶ Additionally, conspiracy theories often linked vaccines to apocalyptic or religious fears, further deepening mistrust. These beliefs are reinforced by misinformation, such as unverified incidents or false claims about vaccines.⁴⁷ Addressing these conspiracy theories is critical for improving vaccine acceptance, as they create significant barriers to public health efforts. Effective strategies will need to focus on debunking misinformation, providing transparent information, and fostering trust in both local and global health initiatives.

Conspiracy theories and desire for personal autonomy often appeared together. Many individuals expressed strong preferences for personal choice in vaccination, viewing it as a fundamental right similar to other findings.⁴⁸ This desire for autonomy was often coupled with resistance to government mandates, as individuals rejected the idea of being coerced into vaccination, even in the face of a public health crisis. However, as observed elsewhere, the call for personal autonomy was supported by questionable scientific data and conspiracy theories regarding vaccines.⁴⁸ Additionally, calls for vaccinations are not inherently incompatible with human rights laws across the world.⁴⁹ These concerns may reflect a broader societal value placed on personal freedom and control over health choices, which can present challenges for public health initiatives aiming to increase vaccine acceptance.

In line with personal autonomy, a complex interplay of historical perceptions, natural immunity beliefs, and a preference for traditional remedies could also explain vaccine hesitancy. Historical comparisons to past vaccination campaigns, such as polio, often fuelled skepticism toward newer vaccines like COVID-19. These comparisons suggest a perceived inconsistency in vaccination practices, which can undermine trust in health authorities and their recommendations. Furthermore, the belief in natural immunity indicates a broader cultural preference for self-reliance and a mistrust of external medical interventions, especially when people feel their bodies are naturally equipped to resist illness.⁵⁰ Alongside this, traditional health practices, including the use of herbal remedies, seem to hold significant cultural value in Zambia, leading some to reject modern medicine in favor of alternative approaches. These views challenge public health efforts and necessitate strategies that integrate respect for local practices with evidence-based health education to foster greater vaccine acceptance.⁵¹

It appears that the preference for traditional remedies was driven by skepticism toward Western medicine in Zambia. This skepticism was probably rooted in both

historical grievances and cultural perceptions of exploitation like other countries previously colonized by Western nations.⁵² This mistrust was often amplified by concerns over the motivations behind the introduction of vaccines, particularly when these are perceived as having been rejected or poorly received in Western countries. The fear of being used as “guinea pigs” for medical experimentation possibly reflects a deep-seated anxiety about exploitation, particularly in the context of medical research that has historically overlooked African populations.⁵³ Such attitudes present significant challenges for public health initiatives, requiring efforts to rebuild trust through transparency, cultural sensitivity, and engagement with local communities to address historical concerns and perceptions of exploitation.⁵⁴

The perceived inadequacy of health authorities in providing clear and consistent information also emerged as a major barrier to vaccine acceptance. This was particularly highlighted with regard to lack of information or information not reaching certain regions early enough for parents to prepare. Some expressed frustration with contradictory messages regarding vaccination schedules, echoing research that suggests misinformation and poor communication from health officials can exacerbate vaccine hesitancy.^{55–57} Therefore, the call for more detailed and accessible information reflects a critical need for health agencies to prioritize effective communication strategies that build public trust.^{55,58} The demands for better communication were coupled with calls for transparency and accountability in the procurement and safety of vaccines, mirroring calls from other countries.⁵⁹ These demands underscored a deep-seated need for transparent dialogue between public health officials and the public.

This study highlights the complex and deeply rooted factors driving vaccine hesitancy in Zambia, where factors converge to create significant barriers to vaccination. Addressing these challenges demands a radical shift toward culturally relevant, transparent communication and a concerted effort to rebuild trust in health authorities. This can be achieved through consistent and clear messaging, community engagement, addressing misinformation, and fostering partnerships with local leaders to ensure that vaccination efforts resonate with the cultural and social values of the population. Additionally, MoH officials should consider responding to individual comments on their Facebook page, addressing recurring concerns about vaccines directly. This proactive approach would help tackle misinformation, clarify doubts, and demonstrate responsiveness, further strengthening public trust in health authorities.

Limitations and strengths of the study

While the study provided valuable insights into vaccine hesitancy through the analysis of Facebook comments,

some limitations were noted. One key limitation was that the analysis was based solely on comments from one platform - Facebook - which may not have fully captured the perspectives of individuals who engaged with other social media platforms or those without internet access. Currently, only 4.3 million out of 20 million Zambians have access to internet.⁶⁰ This resulted in a non-representative sample, as the opinions included in the analysis came primarily from internet users who commented on the Ministry’s page, likely skewing the sample toward a specific demographic group. Additionally, the study found a significant gender disparity in the comments, with 77.5% of comments coming from men and only 22.5% from women. This limited the generalization of the findings and may have reflected broader gender differences in social media engagement and vaccine-related concerns. The predominance of male commenters may have also influenced the themes and perspectives identified in the analysis.

Although the study could also have benefited from participant interviews to supplement the content analysis of Facebook comments, the study’s approach allowed for a deeper understanding of the motivations behind specific opinions. This is because freely shared information, such as Facebook posts and replies, is often rich in context and reflects diverse public opinions and attitudes. Unlike formal interviews, where participants may alter their responses to please the interviewer, comments on social media provide a more authentic glimpse into people’s genuine thoughts and concerns. This contextual richness allowed for a more natural exploration of vaccine hesitancy as the comments often revealed personal concerns, cultural beliefs, and social influences that may not have been captured in more formal research settings. Overall, the study’s approach enabled the exploration of vaccine hesitancy from a broad, contextualized, and more naturalistic perspective making it a strong contribution to understanding vaccine hesitancy in Zambia.

Conclusion

The findings of this study underscore the complexity of vaccine hesitancy in Zambia, highlighting key factors that contribute to reluctance toward vaccination, particularly concerning the COVID-19, polio, and HPV vaccines. The analysis revealed significant gender disparities, with men contributing 77.5% of comments compared to 22.5% from women, and notably, women showed greater hesitancy toward the polio vaccine (60%) compared to COVID-19 (19.9%) and HPV (12.5%). Thematic analysis identified a range of hesitancy drivers, including concerns over vaccine safety and efficacy, distrust in health authorities, conspiracy theories, and poor communication. Other contributing factors included reliance on spiritual beliefs, herbal remedies, natural immunity, and the widespread spread of misinformation. Based on these findings, it is

clear that addressing vaccine hesitancy in Zambia—and globally—requires a multifaceted approach that prioritizes transparent communication, community engagement, and respect for cultural beliefs. By fostering trust through consistent messaging, teaching, and visible leadership, health authorities can effectively combat skepticism, enhance vaccine acceptance, and ultimately protect public health. Building this trust is not just a necessity; it is the foundation for a healthier future.


Data availability: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Ethical approval: To ensure ethical compliance, the privacy and confidentiality of Facebook users were maintained. Identifiable information was anonymized. Identities of companies that manufactured the vaccines were withheld. To protect participant anonymity, all individuals' names were kept confidential, with only basic demographic data, such as gender, recorded alongside each comment. Data were securely backed up on an external hard drive, and access to the laptop used for data management was restricted to the research team. Ethical approval was waived by the University of Zambia Health Sciences Research Ethics Committee (protocol ID: #2023270294).

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