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Factors Associated with Refusal of Vaccination among Children Aged 12 to 23 Months in the City of Kisangani, Democratic Republic of the Congo

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Abstract

Introduction: Health systems are facing an alarming increase in cases of hesitation, delay and even refusal of vaccination, despite the availability of quality vaccination services. This study aims to identify the factors associated with vaccination refusal among children aged 12 to 23 months in Kisangani. **Materials and methods**: A cross-sectional analytical study was conducted in 2022 in five health zones in the city of Kisangani. A total of 336 children aged 12 to 23 months and their mothers selected using three-stage cluster sampling. Analyses were performed on STATA 13 using stepwise logistic regression with a threshold of 0.10. **Results**: The prevalence of vaccination refusal was 37.5%. Factors independently associated with refusal included the belief that vaccinating boys is more important than girls (adjusted OR 5.1, 95% CI 1.6 - 15), long waiting times (AOR 3.5, 95% CI 1.7 - 6.9), the mother's lifestyle (AOR 3.1, 95% CI 1.6 - 6.3), existence of a controversial vaccine in the community (AOR 3.0, 95% CI 1.7 - 5.1), lack of trust in vaccine manufacturers (AOR 1.8, 95% CI 1.1 - 3.4), preference for vaccination method, adverse events following immunisation (AOR 2.0, 95% CI 1.1 - 3.6), poor reception by healthcare professionals (AOR 1.9, 95% CI 1.1 - 3.4), and introduction of a new vaccine (AOR 1.8, 95% CI 1.1 - 3.2). **Conclusion**: Targeted interventions addressing these factors are needed to improve adherence to childhood vaccination schedules and reduce preventable morbidity in Kisangani. Communication strategies for social and behavioural change, tailored to mothers and address-

ing identified barriers, could enhance vaccine uptake.

Keywords

Vaccine Hesitancy, Vaccine Refusal, Immunization, Kisangani, Republic Democratic of the Congo

1. Introduction

Health systems worldwide are experiencing a concerning rise in vaccine hesitancy, delays, and outright refusal, despite the availability of high-quality vaccination services. This trend has contributed to outbreaks of vaccine-preventable diseases, undermining decades of progress in public health [1].

According to the World Health Organization (WHO), vaccination prevents 2 to 3 million deaths annually. The benefits of vaccines extend beyond individual protection, reducing the circulation of pathogens within communities. Despite notable achievements—such as the eradication of smallpox and regional elimination of polio, outbreaks of vaccine-preventable diseases persist, even in countries with relatively high coverage rates. These outbreaks are often linked to under-vaccination in specific population subgroups [2] [3].

To promote vaccine acceptance, it is essential to understand and address the determinants of vaccine hesitancy. Monitoring hesitancy and its causes, which can erode herd immunity, is now a critical component of public health strategy, guiding the implementation of targeted interventions [4] [5].

International studies highlight the complexity of vaccine hesitancy. For example, a study in Romania reported a hesitancy rate of 30.3%, with 11.7% of parents refusing vaccination for their children. Contextual influences included media, community leaders, and perceptions of the pharmaceutical industry [1]. In sub-Saharan Africa, the combined frequency of non-use of vaccination is estimated at 21%. A systematic review found that vaccine abandonment rates ranged from 11.1% in Ghana to 33.6% in Nigeria, with higher rates observed in community-based studies compared to institutional settings [6].

In the Democratic Republic of Congo (DRC), under-five mortality has declined from 158 per 1000 live births in 2007 to 70 per 1000 in 2017. However, this remains high compared to global targets, and vaccine-preventable diseases continue to contribute significantly to child mortality [7]. Routine immunisation efforts, including the Mashako Plans, have improved service delivery, cold chain infrastructure, and provider capacity. Nevertheless, recent surveys indicate declining vaccination coverage: the 2023-2024 Demographic and Health Survey reported that only 21% of children aged 12 to 23 months received all basic vaccines, down from 45% in 2014. The proportion of children who had not received any vaccines increased from 6% in 2013-2014 to 23% in 2023-2024 [8].

In Kisangani, vaccination coverage remains suboptimal. The 2021 survey found

high dropout rates for key vaccines and a substantial proportion of children who had not received any doses, particularly in certain health zones. This situation has led to recurrent epidemics, such as measles, with rising case numbers and mortality [9] [10].

Identifying the factors that hinder adherence to vaccination schedules is fundamental for guiding and evaluating immunisation programmes. These factors may include individual and family characteristics, living conditions, and the organisation of vaccination services [11].

In Kisangani, few studies have explored the causes and impact of vaccine refusal. This study was therefore conducted to identify factors associated with vaccine refusal among children aged 12 to 23 months in Kisangani, with the aim of informing strategies to reduce vaccine-preventable morbidity and mortality.

2. Materials and Methods

2.1. Study Design and Setting

This cross-sectional analytical study was conducted between 25 October 2022 and 18 February 2023 in Kisangani, a city in north-eastern Democratic Republic of Congo (DRC). Kisangani comprises five health zones: two urban (Makiso-Kisangani and Mangobo) and three urban-rural (Tshopo, Kabondo, and Lubunga), with a total of 88 health areas, four general referral hospitals, one provincial hospital, and 88 integrated health centres. All these facilities are covered by the Expanded Programme on Immunisation (EPI).

2.2. Study Population

The study population consisted of households with children aged 12 to 23 months who had resided in Kisangani for at least six months. Only mothers who consented to participate were included. Households were excluded if the mother interrupted the interview for personal reasons.

2.3. Sample Size and Sampling

The minimum sample size was calculated using Daniel Schwartz's formula, based on an average vaccination dropout rate of 17.5% from the 2021 Kisangani coverage survey [9]. With a 95% confidence level, 5% precision, and a cluster effect of 1.5, the sample size was increased by 10% to account for non-responses, resulting in a target of 370 children aged 12 to 23 months.

A three-stage probability cluster sampling proportional to population size was used:

1) First stage: In each health zone, two clusters were randomly selected from the list of health areas.

2) Second stage: In each selected health area, two neighbourhoods were randomly chosen.

3) Third stage: Within each neighbourhood, households were systematically selected proportional to the number of eligible children.

2.4. Data Collection

Data were collected using a pre-tested questionnaire adapted from the WHO Strategic Advisory Group of Experts on Immunisation (SAGE) model [12]. The questionnaire was reviewed by local EPI experts and piloted in a comparable health area. Ten trained surveyors, all epidemiology graduates, conducted face-to-face interviews with mothers. Data completeness and quality were checked daily by the principal investigator, with follow-up visits as needed.

2.5. Variable

The primary outcome was refusal of vaccination, defined as a mother reporting that she had refused at least an entire vaccine type for her child, either during routine immunisation or mass campaigns.

Potential explanatory variables were grouped as follows:

- Individual and collective factors: Health zone, mother's age, marital status, education, occupation, religion, child's birth order, previous vaccination experience, opinions and knowledge about vaccines, perceived risks and benefits, and social norms.
- Contextual factors: Trusted sources of information, influence of community leaders, historical vaccine refusals, sociocultural beliefs (e.g., gender preference), political factors, barriers such as waiting time and lifestyle, and trust in vaccine manufacturers.
- Vaccine-specific factors: Perceptions of vaccine safety, introduction of new vaccines, preferred method and site of administration, willingness to vaccinate future children, cost, and experiences with healthcare professionals.

2.6. Data Analysis

Data were entered into Excel and analysed using STATA version 13. Descriptive statistics (means, standard deviations, medians, interquartile ranges, and proportions) were used to summarise the sample. Associations between the dependent and independent variables were assessed using contingency tables, Pearson's chi-square or Fisher's exact test, and odds ratios (ORs) with 95% confidence intervals (CIs). Variables with $p < 0.10$ in bivariate analysis were included in a stepwise logistic regression model to adjust for confounders. Model fit was assessed using the Hosmer-Lemeshow test. Statistical significance was set at $p < 0.05$. This stepwise logistic regression model was chosen because of its ability to effectively identify explanatory variables that are significantly associated with a binary event, while eliminating irrelevant variables. It also optimises the model for predicting the probability of vaccine refusal by retaining only those factors that significantly improve the prediction according to the significance threshold.

2.7. Ethical Considerations

The study protocol and questionnaire were approved by the ethics committee of

the Faculty of Medicine and Pharmacy, University of Kisangani. Participation was voluntary, with verbal informed consent obtained from all respondents. Data were collected anonymously and confidentiality was maintained throughout.

3. Results

A total of 336 households with children aged 12 to 23 months were surveyed. Table 1 presents the characteristics of these households.

3.1. Prevalence of Vaccination Refusal

The prevalence of vaccination refusal among children aged 12 to 23 months in Kisangani was 37.5% (Figure 1).

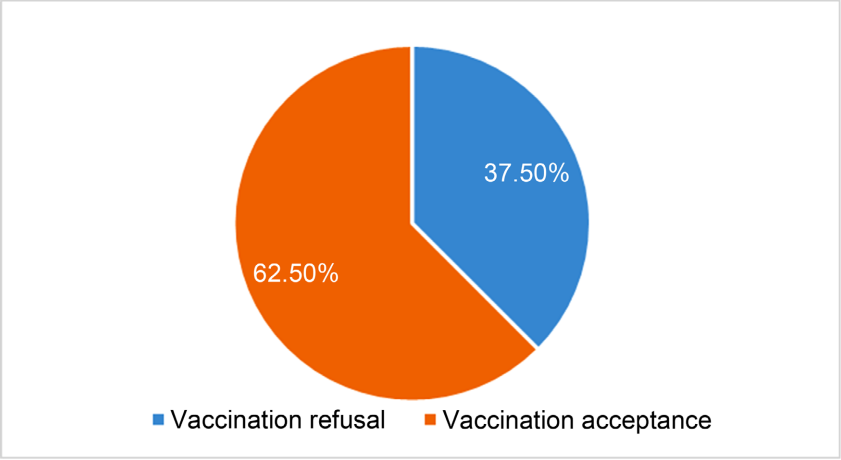

Figure 1. Prevalence of vaccination refusal among children aged 12 to 23 months in Kisangani.

3.2. Individual and Collective Factors

Table 1 presents the results of bivariate and multivariate analyses examining individual and collective factors linked to vaccination refusal.

Table 1. Individual and collective factors associated with refusal of vaccination among children aged 12 to 23 months in Kisangani.

Variables	Frequencies N (%)	Vaccine refusal n (%)	OR [IC95%]	p-val	AOR [IC95%]	p-val
Health zone of residence						
Urban	177 (52.7)	65 (36.7)	1	0.756	-	-
Urban-rural	159 (47.3)	61 (38.4)	1.0 [0.7 - 1.7]			
Mother's age (years)						
≤24	109 (32.4)	28 (25.7)	1	0.002	1	<0.001
>24	227 (67.6)	98 (43.2)	2.1 [1.3 - 3.8]		2.1 [1.3 - 3.8]	

Continued

Marital status						
Lives with spouse	162 (48.2)	55 (34.0)	1	0.195	-	-
Lives alone	174 (51.8)	71 (40.8)	1.3 [0.8 - 2.1]			
Mother's level of education						
No schooling	32 (9.5)	17 (53.1)	1	0.055	-	-
Schooled	304 (90.5)	109 (35.9)	0.4 [0.2 - 1.1]			
Religion						
Christian	257 (76.5)	91 (35.4)	1	0.153	-	-
Non-Christian	79 (23.5)	35 (44.3)	1.4 [0.8 - 2.5]			
Main activity						
Housewife	124 (36.9	47 (37.9)	1	0.907	-	-
Working	212 (63.1	79 (37.3)	0.9 [0.6 - 1.6]			
Birth order of child						
1 - 3	232 (69.1)	76 (32.8)	0.5 [0.3 - 0.9]	0.007	1.9 [1.2 - 3.1]	<0.001
4 - 6	104 (30.9)	50 (48.1)	1		1	
Has your child ever had an adverse reaction, or do you know anyone whose child has had one?						
Yes	151 (44.9)	77 (51.0)	2.8 [1.8 - 4.7]	<0.001	-	-
No	185 (55.1)	49 (26.5)	1			
Is the pain experienced during vaccination the reason behind your decision not to vaccinate your child?						
Yes	128 (38.1)	74 (57.8)	4.1 [2.5 - 6.8]	0.001	2.7 [1.5 - 4.7]	<0.001
No	208 (61.9)	52 (25.0)	1		1	
Do you think it is possible to receive a large number of vaccines at once?						
Yes	205 (61.0)	57 (27.8)	1	<0.001	-	-
No	131 (39.0)	69 (52.7)	2.8 [1.8 - 4.7]			
Do you think it is better to vaccinate children after the age of one?						
Yes	56 (16.7)	22 (39.3)	1.0 [0.5 - 2.0]	0.762	-	-
No	280 (83.3)	104 (37.1)	1			
Do you think you are aware of the EPI vaccines?						
Yes	243 (72.3)	85 (35.0)	1	0.123	-	-
No	93 (27.7)	41 (44.1)	1.4 [0.9 - 2.5]			
Have you been informed by vaccinators to allay your fears about vaccination?						
Yes	227 (67.6)	61 (26.9)	1	0.001	1	<0.001

Continued

No	109 (32.4)	65 (59.6)	4.0 [2.4 - 6.7]		2.3 [1.3 - 4.0]	
Do you think that some vaccines are more important than others?						
Yes	88 (26.2)	57 (64.8)	4.7 [2.8 - 8.3]	0.001	3 [1.7 - 5.4]	<0.001
No	248 (73.8)	69 (27.8)	1		1	
Do you think vaccines are still necessary if the disease no longer affects many children?						
Yes	207 (61.6)	54 (26.1)	1	0.001	1	0.003
No	129 (38.4)	72 (55.8)	3.5 [2.2 - 5.9]		1.8 [1.1 - 3.2]	
Do the mothers in your circle have their children vaccinated?						
Yes	249 (74.1)	89 (35.7)	1	0.260	-	-
No	87 (25.9)	37 (42.5)	1.3 [0.9 - 2.3]			
Do you believe that if you vaccinate your child, others will also be protected?						
Yes	133 (39.6)	36 (27.1)	1	0.001	-	-
No	203 (60.4)	90 (44.3)	2.1 [1.3 - 3.6]			

Significant factors included the mother's age, child's birth order, pain experienced during vaccination, lack of information from vaccinators, and the belief that some vaccines are more important than others. These findings highlight the importance of maternal perceptions and experiences in vaccine decision-making.

3.3. Contextual Factors

Table 2 details contextual influences on vaccination refusal, including community beliefs, waiting time, lifestyle barriers, and trust in vaccine manufacturers.

Table 2. Contextual factors associated with refusal of vaccination among children aged 12 to 23 months in Kisangani.

Variables	Frequencies N (%)	Vaccine refusal n (%)	OR [IC95%]	p-val	AOR [IC95%]	p-val
Who do you trust most for information about vaccines?						
HCI*	181 (53.9)	63 (34.8)	1	0.270	-	-
Others**	185 (46.1)	63 (40.7)	1.2 [0.8 - 2.0]			
Who do you trust the least for information about vaccines?						
HCI*	113 (33.6)	45 (39.8)	1.1 [0.8 - 1.9]	0.531	-	-
Others**	223 (66.4)	81 (36.3)	1			
Do you recall a vaccine that was controversial?						
Yes	128 (38.1)	75 (58.6)	4.3 [2.6 - 7.2]	<0.001	3 [1.7 - 5.1]	<0.001
No	208 (61.9)	51 (24.5)	1		1	

Continued

Are the leaders in your community supportive of infant immunisation?						
Yes	162 (48.2)	46 (28.4)	1	0.001	-	-
No	174 (51.8)	80 (46.0)	2.1 [1.3 - 3.5]			
Has your community refused certain vaccines in the past?						
Yes	141 (42.0)	78 (55.3)	3.7 [2.3 - 6.2]	<0.001	-	-
No	195 (58.0)	48 (24.6)	1			
In your opinion, is vaccinating girls more important than vaccinating boys?						
Yes	318 (94.6)	117 (36.8)	1.7 [0.6 - 5.0]	0.260	-	-
No	18 (5.4)	9 (50.0)	1			
In your opinion, is vaccinating boys more important than vaccinating girls?						
Yes	313 (93.2)	109 (34.8)	5.3 [1.9 - 16]	<0.001	5.1 [1.6 - 15]	<0.001
No	23 (6.8)	17 (73.9)	1		1	
Would you refuse a vaccine for your child because of the tribe, religion or gender of the vaccinator?						
Yes	86 (25.6)	44 (51.2)	2.1 [1.3 - 3.6]	0.002	-	-
No	250 (74.4)	82 (32.8)	1			
Have you ever refused a vaccine recommended by the government of the DR Congo?						
Yes	109 (32.4)	48 (44.0)	1.5 [0.9 - 2.5]	0.086	-	-
No	227 (67.6)	78 (34.4)	1			
Has the waiting time already prevented you from vaccinating your child?						
Yes	178 (53.0)	102 (57.3)	7.4 [4.3 - 13]	<0.001	3.5 [1.7 - 6.9]	<0.001
No	158 (47.0)	24 (15.2)	1		1	
Has your occupation ever prevented you from getting a vaccine for your child?						
Yes	178 (53.0)	103 (57.9)	8.1 [4.6 - 14]	<0.001	3.1 [1.6 - 6.3]	<0.001
No	158 (47.0)	23 (14.6)	1		1	
Do you trust the pharmaceutical companies that supply vaccines?						
Yes	238 (70.8)	68 (28.6)	1	<0.001	1	0.004
No	98 (29.2)	58 (59.2)	3.6 [2.2 - 6.1]		1.8 [1.1 - 3.4]	

*HCI: health care institution; **Others: media, church, internet, social networks.

It appears that, the belief that vaccinating boys is more important than girls, long waiting times, and the existence of controversial vaccines in the community were strongly associated with refusal. These results underscore the role of social and systemic factors in shaping vaccination behaviours.

3.4. Vaccine-Specific Aspects

Table 3 shows vaccine-specific factors associated with refusal, such as disapproval of the vaccination method, adverse events following immunisation, poor reception by healthcare professionals, and the introduction of new vaccines. These aspects reflect concerns about vaccine safety, administration, and the quality of healthcare interactions.

Table 3. Vaccine-specific aspects associated with refusal of vaccination among children aged 12 to 23 months in Kisangani.

Variables	Frequencies N (%)	Vaccine refusal n (%)	OR [IC95%]	p-val	AOR [IC95%]	p-val
Do you think vaccines are safe for your child?						
Yes	283 (84.2)	91 (32.2)	1			
No	53 (15.8)	35 (66.0)	4.1 [2.1 - 8.1]	<0.001	-	-
Have you ever delayed vaccinating your child with a new vaccine that had just been introduced?						
Yes	105 (31.3)	59 (56.2)	3.1 [1.9 - 5.2]		1.8 [1.1 - 3.2]	
No	231 (68.7)	67 (29.0)	1	<0.001	1	0.003
Is there any type of vaccination that you would refuse for your child?						
Yes	148 (44.1)	91 (61.5)	6.9 [4.1 - 11]		4.1 [2.2 - 7.7]	
No	188 (55.9)	35 (18.6)	1	<0.001	1	<0.001
Are you afraid of the pain or the needle when vaccinating your child?						
Yes	164 (48.8)	71 (43.3)	1.6 [1.0 - 2.6]			
No	172 (51.2)	55 (32.0)	1	0.032	-	-
Which vaccination site would you prefer for your child?						
HCI*	246 (73.2)	78 (31.7)	1			
Others**	90 (26.8)	48 (53.3)	2.4 [1.5 - 4.2]	<0.001	1	-
If you had another child today, would you want them to be vaccinated?						
Yes	283 (84.2)	91 (32.2)	1			
No	53 (15.8)	35 (66.0)	4.1 [2.1 - 8.1]	<0.001	-	-
Would you mind taking time off work to vaccinate your child?						
Yes	138 (41.1)	71 (35.9)	1.1 [0.7 - 1.9]			
No	198 (58.9)	55 (39.9)	1	0.457	-	-
Have healthcare professionals ever been disrespectful to you?						
Yes	148 (44.1)	82 (55.4)	4.0 [2.5 - 6.7]		1.9 [1.1 - 3.4]	
No	188 (55.9)	44 (23.4)	1	<0.001	1	0.003

Continued

Do you trust vaccinators who go door to door?						
Yes	250 (74.4)	76 (30.4)	1			
No	86 (25.6)	50 (58.1)	3.1 [1.8 - 5.4]	<0.001	-	-
Have you experienced any adverse reactions following immunisation for your child?						
Yes	151 (44.9)	86 (57.0)	4.7 [2.9 - 7.9]		2.0 [1.1 - 3.6]	
No	185 (55.1)	40 (21.6)	1	<0.001	1	0.001

*HCI: health care institution; **Others: media, church, internet, social networks.

4. Discussion

In this study, the prevalence of vaccine refusal among children aged 12 to 23 months in Kisangani was 37.5% (Figure 1), which is considerably higher than the national estimate of 12.7% for children who have not received any vaccines in the Democratic Republic of Congo (DRC) [9]. Recent national data also indicate a decline in full vaccination coverage, with only 21% of children aged 12 to 23 months receiving all recommended vaccines in 2023-2024, compared to 45% in 2013-2014. The proportion of children who have not received any vaccines has increased from 6% to 23% over the same period (8). These findings underscore a growing challenge for immunisation programmes in the region.

4.1. Interpretation of Key Findings

Several individual, contextual, and vaccine-specific factors were independently associated with vaccine refusal. Notably, mothers older than 24 years were more likely to refuse vaccination for their children (AOR 1.7) (Table 1), a finding that contrasts with some previous studies where younger maternal age was associated with higher hesitancy [13]. This discrepancy may reflect differences in education, exposure to information, and trust in healthcare systems across settings. Birth order was also significant, with first- to third-born children more likely to experience vaccine refusal (AOR 1.9) (Table 1). This result aligns with findings from Cameroon, where birth order influenced vaccination status, but contrasts with studies reporting higher coverage among firstborns. Strong mistrust of vaccine safety, often fuelled by fears of side effects or negative information received through the media or friends and family, is more pronounced among young parents (under 30), who are statistically more likely to hesitate to vaccinate. The influence of cultural beliefs and traditional references, which may be more common among parents with their first children, before experience changes their perceptions for subsequent children. These reasons may be specific to the socio-cultural context and young parents' perception of vaccination risk [13]-[16]. The reasons for these differences may include parental experience, resource allocation, and cultural factors.

Pain experienced during vaccination (AOR 2.7) and lack of information from vaccinators (AOR 2.3) were important barriers (**Table 1**). Fear of needles and pain is a well-documented obstacle to vaccination uptake, affecting both children and parents [17] [18]. Insufficient communication from healthcare providers can exacerbate these concerns, highlighting the need for improved counselling and support for parents [19].

The belief that some vaccines are more important than others (AOR 3.0) and the perception that vaccination is unnecessary if a disease is rare (AOR 1.8) were also associated with refusal (**Table 1**). These findings reflect gaps in knowledge and risk perception, which can undermine confidence in the full immunisation schedule [18] [20].

Contextual factors such as the belief that vaccinating boys is more important than girls (AOR 5.1), long waiting times (AOR 3.5), and the mother's lifestyle (AOR 3.1) were strongly associated with refusal (**Table 2**). Cultural beliefs about gender, logistical barriers, and competing priorities can all influence vaccination decisions. However, the variable 'mother's lifestyle' measured aspects related to the socio-economic conditions of the child's mother. Bokoko *et al.* showed that, among Congolese children, the mother's lifestyle significantly influences her refusal to vaccinate her child through several mechanisms related in particular to her socio-economic conditions and access to services. Many mothers, especially those living in precarious conditions or in single-parent households, prioritise daily survival (finding food, providing for basic needs) over vaccination, which is perceived as less urgent. Even though vaccination is free, transport costs, the need to take time off work, and the loss of a day's income are major obstacles. The existence of controversial vaccines in the community (AOR 3.0) and lack of trust in vaccine manufacturers (AOR 1.8) (**Table 2**) further highlight the impact of misinformation, rumours, and distrust in institutions [21]-[24].

Vaccine-specific aspects, including disapproval of the vaccination method (AOR 4.1), adverse events following immunisation (AOR 2.0), poor reception by healthcare professionals (AOR 1.9), and the introduction of new vaccines (AOR 1.8), were also significant (**Table 3**). These findings are consistent with previous research showing that concerns about vaccine safety, administration, and healthcare interactions can deter parents from vaccinating their children [23]-[29].

4.2. Implications for Practice and Policy

The high prevalence of vaccine refusal and the range of associated factors identified in this study suggest that multifaceted interventions are needed. Strategies should include targeted communication to address misconceptions, improved training for healthcare providers in patient-centred communication, and efforts to reduce logistical barriers such as waiting times. Community engagement to address cultural beliefs and build trust in vaccines and healthcare systems is also essential. To combat misconceptions about the supposed prioritization of one gender over another in childhood vaccination, it is essential to develop targeted

communication messages that emphasize equality, fairness and the importance of vaccinating all children without discrimination. Finally, messages designed to address parents' concerns about new vaccines should show that new vaccines are rigorously tested to ensure their safety and efficacy before being offered to children.

4.3. Limitations

This study has several limitations. First, the cross-sectional design precludes causal inference. Second, qualitative analysis was not included, which may have limited the depth of understanding of underlying attitudes and beliefs. Third, the study was conducted during the COVID-19 pandemic, which may have influenced perceptions of vaccines and healthcare. Despite these limitations, the use of a standardised WHO questionnaire and robust sampling methods strengthens the validity of the findings.

5. Conclusions

This study identified a high prevalence of vaccine refusal among children aged 12 to 23 months in Kisangani, Democratic Republic of Congo. Refusal was associated with a range of individual, contextual, and vaccine-specific factors, including maternal beliefs, pain during vaccination, lack of information from vaccinators, birth order, maternal age, perceptions of disease risk, waiting time, lifestyle barriers, community controversies, and distrust in vaccine manufacturers. Additionally, concerns about new vaccines, adverse events, and negative experiences with healthcare professionals contributed to refusal.

These findings highlight the urgent need for targeted interventions to address the identified barriers. Strategies should focus on improving communication and education for mothers, enhancing the quality of interactions with healthcare providers, and addressing logistical and sociocultural obstacles. Strengthening trust in vaccines and the health system is essential to increase adherence to vaccination schedules and reduce preventable childhood morbidity and mortality in Kisangani.

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Contributions and Responsibilities of the Authors

All authors contributed to the conduct of this research and the writing of the manuscript. All authors have read and approved the final version. ETA: conceptualization, methodology and original writing; BAP: data collection; IBR: data analysis using STATA; BLZ: data collection; KBG: contribution to the original draft; PLKJ: manuscript revision; LLJ: supervision, writing and editing.

Conflicts of Interest

The authors declare that they have no competing interests.

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