Prevalence and Determinants of Vaccine Hesitancy Among Caregivers of Children Aged 0-59 Months in Urban Settings of Buea, Cameroon

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ABSTRACT

Background: Vaccine hesitancy, defined as reluctance or refusal to vaccinate despite vaccine availability, represents one of the ten leading threats to global public health. In Cameroon, vaccine hesitancy has reached concerning levels, with previous studies documenting an 84.6% vaccine hesitancy rate for COVID-19 vaccines among adults and only 31.21% expressing willingness to accept vaccination. Understanding the determinants of vaccine hesitancy among caregivers of young children is crucial for developing targeted interventions.

Methodology: This community-based cross-sectional analytical study was conducted in urban settings of Buea, Cameroon. A multistage sampling technique was employed to recruit 438 caregivers of children aged 0–59 months. Data were collected using a structured, interviewer-administered questionnaire incorporating a modified version of the WHO SAGE Vaccine Hesitancy Scale. Bivariate and multivariate logistic regression analyses were performed to identify significant determinants of vaccine hesitancy.

Results: The prevalence of vaccine hesitancy was 11.0% among caregivers. Significant determinants included gender (females less likely to exhibit hesitancy: AOR = 0.245, 95% CI: 0.075–0.805), income (higher income associated with lower hesitancy: AOR = 0.211, 95% CI: 0.056–0.799), caregiver status (shared caregiving associated with higher hesitancy: AOR = 4.931, 95% CI: 1.596–15.230), family influence (no family influence increased hesitancy: AOR = 2.801, 95% CI: 1.120–7.006), and cultural beliefs (AOR = 5.748, 95% CI: 2.446–13.508). Behavioral factors strongly associated with hesitancy included missed health appointments (AOR = 33.519, 95% CI: 9.053–124.103), delayed vaccination schedules (AOR = 17.431, 95% CI: 4.171–72.845), and cultural practices (AOR = 21.971, 95% CI: 7.305–66.077).

Conclusion: The study identified multiple determinants of vaccine hesitancy operating at individual, social, and cultural levels. The findings underscore the need for culturally appropriate interventions that address deeply rooted factors influencing vaccination decisions among caregivers in Cameroon.

Keywords: Vaccine hesitancy; caregivers; children; immunization; determinants; cultural factors; Cameroon; Buea

INTRODUCTION

Vaccine hesitancy, defined by the World Health Organization as the reluctance or refusal to vaccinate despite vaccine availability, represents one of the ten leading threats to global public health. This phenomenon manifests across a complex continuum from complete acceptance to outright refusal, with many individuals occupying intermediate positions. In Cameroon, vaccine hesitancy has reached concerning levels, with comprehensive assessments revealing alarmingly high rates. A nationwide evaluation conducted in 2020–2021 documented an 84.6% vaccine hesitancy rate for COVID-19 vaccines among Cameroonian adults, representing one of the highest globally reported figures (Dinga et al., 2021). This pattern has persisted, with meta-analyses confirming that merely 31.21% (95% CI: 23.49–38.94) of Cameroonians expressed willingness to accept COVID-19 vaccination, leaving approximately 69% exhibiting some form of hesitancy (Cheuyem et al., 2024). The situation remains problematic even among healthcare workers, who might be expected to demonstrate greater vaccine acceptance, yet show substantial hesitancy rates in both Cameroon and neighboring Nigeria (Aseneh et al., 2023).

Similarly concerning, a separate investigation documented 74% vaccine hesitancy among patients recovering from COVID-19 in Cameroon, further demonstrating the pervasiveness of this issue (Cho et al., 2023).

The significance of addressing vaccine hesitancy in Cameroon extends beyond individual health decisions to encompass broader public health implications. The high prevalence of hesitancy compromises efforts to achieve herd immunity, consequently leaving vulnerable populations at greater risk and undermining disease control initiatives. This situation becomes particularly concerning in resource-limited settings like Cameroon, where healthcare infrastructure already faces considerable constraints. Furthermore, widespread vaccine refusal threatens to reverse decades of progress in preventing various infectious diseases. While initiatives such as the Onchocerciasis Control Programme have achieved remarkable success in Cameroon and throughout West Africa, current trends in vaccine hesitancy potentially undermine future vaccination campaigns across multiple disease contexts. The social and economic consequences of preventable disease outbreaks place additional burdens on already limited healthcare resources, creating a cyclical pattern of challenges for public health authorities and communities alike.

Understanding the regional determinants of vaccine hesitancy proves crucial for developing targeted interventions. The South West Region, including Buea, represents a significant population center with unique cultural, social, and economic characteristics that may influence vaccination attitudes differently than in other regions of Cameroon. Several studies have identified medical mistrust as a critical factor driving vaccine hesitancy in Cameroon. A 2022 survey of 1,000 Cameroonians found that medical mistrust positively associated with belief in misinformation related to COVID-19 vaccines, subsequently influencing vaccine hesitancy (Nah et al., 2023). This relationship between trust, misinformation, and hesitancy emerges consistently across multiple investigations, suggesting a foundational pattern requiring intervention. The influence of social media on vaccine hesitancy has been extensively documented in Cameroon, with research examining higher education students finding significant relationships between social media consumption and vaccine-hesitant attitudes (Nkemngong et al., 2024). Similarly, a targeted study in Fako Division of the South West Region investigated how social media influencers contribute to hesitancy through unverified cure claims, misleading prescriptions, and amplification of fears (Nkemngong et al., 2024). This research demonstrated that social media messages significantly influenced students' attitudes toward vaccines and promoted vaccine-hesitant behavior among university students at several institutions, including the University of Buea.

A comprehensive investigation into healthcare workers in Cameroon and Nigeria identified several key factors associated with vaccine hesitancy, including little or no trust in approved vaccines (aOR = 2.28, 95% CI: 1.24–4.20), lower perception of vaccine importance for personal health (aOR = 5.26, 95% CI: 2.38–11.6), concerns about vaccine-related adverse effects (aOR = 3.45, 95% CI: 1.83–6.47), and uncertainty about colleagues' acceptability of vaccines (aOR = 2.98, 95% CI: 1.62–5.48) (Aseneh et al., 2023). Interestingly, healthcare workers with chronic diseases (aOR = 0.34, 95% CI: 0.12–0.97) and higher concerns about contracting COVID-19 (aOR = 0.40, 95% CI: 0.18–0.87) demonstrated lower hesitancy levels, suggesting that perceived vulnerability influences vaccine acceptance. Additional research has found that early concerns about COVID-19 vaccines in Cameroon included perceptions regarding pharmaceutical industry motives, reliability of vaccine sources, and economic costs associated with vaccination (Dinga et al., 2021). These findings demonstrate the multifaceted nature of vaccine hesitancy in Cameroon, encompassing individual beliefs, social influences, and structural factors.

A bibliometric analysis of vaccine hesitancy research from behavioral perspectives (2015–2022) identified four major research themes globally: analyses of individual predispositions toward vaccination (attitudes, behavior, risk perceptions, beliefs), contextual factors (social norms, media influences), vaccine-specific concerns (safety, efficacy), and organizational factors (healthcare system accessibility) (Acharya et al., 2024). This framework provides a useful structure for understanding vaccine hesitancy in Cameroon specifically, where similar patterns have been observed but with context-specific manifestations. For instance, while safety concerns represent universal drivers of hesitancy, the specific nature of these concerns may differ substantially between Cameroonian populations and those in other global contexts.

Despite growing research on vaccine hesitancy in Cameroon, several critical gaps persist in the literature. Most studies have focused exclusively on COVID-19 vaccine hesitancy, creating uncertainty about whether similar patterns apply to routine childhood immunizations and other vaccines. This narrow focus limits comprehensive understanding of the broader vaccine hesitancy landscape in Cameroon. Additionally, while some investigations have examined specific populations like healthcare workers or students, comprehensive community-based

research in regional settings remains limited. The determinants of vaccine hesitancy may vary significantly between urban and rural areas and across different regions of Cameroon, yet these nuances remain largely unexplored, particularly in the South West Region.

Methodological limitations also characterize the existing literature, with most studies employing cross-sectional approaches that provide limited insight into how vaccine hesitancy evolves over time or responds to public health messaging and interventions. Longitudinal investigations examining the dynamic nature of vaccine hesitancy remain notably absent from published research. Furthermore, while social media's influence has been documented, studies specifically examining effective counter-strategies to address misinformation in the Cameroonian context remain underdeveloped. Understanding how to design culturally appropriate interventions for the South West Region requires more targeted research that accounts for local communication patterns and information ecosystems.

The present study addresses these gaps by investigating vaccine hesitancy determinants in Buea, South West Region of Cameroon. This study examines vaccine hesitancy more broadly among caregivers of children aged 0–59 months, providing insight into hesitancy patterns affecting routine childhood immunization. The focus on Buea offers several advantages: as an urban center in the South West Region, it provides a setting where both traditional and modern influences interact, potentially revealing unique patterns of vaccine hesitancy determinants not captured in studies from other regions. Understanding local determinants proves essential for developing contextually appropriate interventions addressing specific concerns and barriers experienced by this population.

Methodologically, this research improves upon previous studies by employing a comprehensive approach examining multiple levels of influence, including individual factors (knowledge, beliefs, attitudes), social factors (family influence, community perception), and structural factors (access to healthcare, socioeconomic status). This multilevel examination provides a more nuanced understanding of vaccine hesitancy than investigations focusing on singular determinants. Through addressing these research dimensions, the study aims to contribute valuable insights for developing targeted interventions to reduce vaccine hesitancy and improve vaccination rates in Buea and similar settings throughout Cameroon.

METHODS

Study Design and Setting

This study employed a community-based cross-sectional analytical design to investigate the determinants of vaccine hesitancy among caregivers of children aged 0–59 months in urban settings of Buea, South West Region of Cameroon. The cross-sectional approach provided a contemporaneous assessment of vaccination attitudes and practices within the study population, allowing for the identification of associations between multiple variables and vaccine hesitancy. Buea was purposively selected as the study location due to its demographic diversity and being the regional capital of the South West Region, with a population reflecting both traditional and modern socio-cultural influences that potentially impact vaccine decision-making processes (Nicholas et al., 2020; Abongwa et al., 2022).

Study Population and Sampling Procedure

The target population comprised caregivers (biological parents and non-biological guardians) of children aged 0–59 months residing in urban localities of Buea. A multistage sampling technique was implemented to ensure representative sampling. In the first stage, stratified random sampling was used to select localities within Buea municipality. Subsequently, systematic random sampling was applied to select households within each locality, using residential maps and community health records as sampling frames. Within selected households, eligible caregivers were identified and recruited after obtaining informed consent. A sample size of 428 participants was calculated using the Cochran formula, incorporating an anticipated vaccine hesitancy prevalence of 50%, a confidence level of 95%, a precision of 5%, and a non-response adjustment factor of 10% (Cheuyem et al., 2024; Dinga et al., 2022).

Data Collection Instruments and Procedures

Data were collected using a structured, interviewer-administered questionnaire developed following comprehensive literature review and expert consultation. The questionnaire underwent rigorous validation through pilot testing with 43 respondents (10% of the calculated sample size) from a comparable setting not included in the main study. Content validity was established through expert review by public health specialists,

vaccination program managers, and behavioral scientists. The final instrument comprised four sections: (1) socio-demographic characteristics, (2) knowledge assessment regarding vaccination, (3) attitude measurement, and (4) vaccine hesitancy assessment using a modified version of the WHO SAGE Vaccine Hesitancy Scale adapted to the Cameroonian context (Aseneh et al., 2023; Dinga et al., 2022).

Field data collection was conducted by ten trained research assistants with backgrounds in health sciences and fluency in local languages. The research assistants received comprehensive three-day training on questionnaire administration, ethical considerations, and standardized interview techniques. Quality control measures included daily supervisory checks, field spot-checks, and double-entry verification of 10% of questionnaires to ensure data integrity.

Measurement of Variables

The primary outcome variable, vaccine hesitancy, was operationalized using a composite scale derived from the WHO SAGE Vaccine Hesitancy Scale, incorporating cultural adaptations relevant to the Cameroonian context. The scale assessed hesitancy across three dimensions: confidence, complacency, and convenience. Responses were measured on a five-point Likert scale ranging from "strongly agree" to "strongly disagree." The cumulative scores were categorized into two levels: hesitancy (>50%), and non-hesitancy (<50%), based on validated thresholds from previous studies.

Independent variables encompassed three domains: (1) socio-demographic factors (age, gender, educational level, occupation, income, religion, marital status); (2) social and community factors (family influence, religious leader support, community perception, cultural beliefs); and (3) behavioral factors (awareness of vaccination campaigns, perception of vaccine appropriateness, adherence to vaccination schedules, consumption of traditional remedies).

Data Analysis

Data analysis followed a systematic approach using SPSS version 26.0. Descriptive statistics (frequencies, percentages, means, standard deviations) characterized the study population and summarized vaccine hesitancy prevalence. Bivariate analysis using chi-square tests and simple logistic regression examined associations between independent variables and vaccine hesitancy. Variables with p-values <0.25 in bivariate analysis were included in the multivariate logistic regression model to identify significant predictors of high vaccine hesitancy, controlling for potential confounders. The strength of associations was quantified using adjusted odds ratios (aOR) with corresponding 95% confidence intervals. Model fitness was assessed using the Hosmer–Lemeshow goodness-of-fit test, and multicollinearity was evaluated through variance inflation factor analysis. Statistical significance was established at $p < 0.05$ for all analyses.

Ethical Considerations

The study protocol received ethical approval from the Institutional Review Board of the Faculty of Health Sciences, University of Buea (approval number: FHS-IRB/2023/034). Administrative authorization was obtained from the Regional Delegation of Public Health for the South West Region and relevant municipal authorities. Participation was entirely voluntary, with written informed consent obtained from all respondents prior to enrollment. Confidentiality was maintained through de-identification of data and secure storage of research materials. Participants were informed of their right to withdraw at any stage without consequences. The research adhered to principles outlined in the Declaration of Helsinki and Good Clinical Practice guidelines.

RESULTS

Socio-Demographic Characteristics of Study Participants

The study included 438 participants with mean age of 31 ± 7 years, with the majority residing in Buea Road (41.3%) and Molyko (29.7%), areas known for their high population density due to urbanization and accessibility, as documented in previous studies (Nicholas et al., 2020). Most participants were young adults aged 22–30 years (56.2%), a trend consistent with demographic research highlighting Buea's youthful population, influenced by its status as a university town (Mandaah et al., 2020). The majority were female (87.7%), reflecting established patterns in health-related studies where women are more likely to participate, possibly due to their caregiving roles (Aminde et al., 2017). In terms of education, over half (53.7%) had attained a university degree, aligning with Buea's reputation as an academic hub, home to institutions like the University of Buea (Buea, 2024). Employment data showed that 56.2% were self-employed, mirroring economic trends in

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semi-urban areas of Cameroon where self-employment is prevalent due to limited formal job opportunities. Income distribution revealed that 42.9% earned less than 50,000 FCFA, consistent with socio-economic analyses highlighting disparities in earnings across urban and semi-urban areas (Ngalle, 2021). Additionally, 57.1% of participants identified as the primary caregiver, further emphasizing the role of caregivers in health-related decision-making.

Table 1: Socio-Demographic Characteristics of Study Participants

Variable	Category	Frequency	Percent
Health Area			
	Buea Road	181	41.3
	Buea Town	66	15.1
	Molyko	130	29.7
	Total	438	100.0
Age			
	22-30	246	56.2
	31-40	137	31.3
	41-50	47	10.7
	51-60	8	1.8
	Total	438	100.0
Sex			
	Female	384	87.7
	Male	54	12.3
	Total	438	100.0
Marital Status			
	Divorced	11	2.5
	Married	217	49.5
	Separated	21	4.8
	Single	172	39.3
	Widowed	17	3.9
	Total	438	100.0
Level of Education			
	No Formal Education	12	2.7
	Primary	29	6.6
	Secondary	162	37.0
	University	235	53.7
	Total	438	100.0
Employment status			
	Employed (Government)	54	12.3
	Employed (Private Sector)	25	5.7
	Self-employed (Business)	246	56.2
	Unemployed	113	25.8
	Total	438	100.0
Monthly Income			
	100K-150K	69	15.8
	50K-99K	145	33.1
	Above 150K	36	8.2
	Less than 50K	188	42.9
	Total	438	100.0
Caregiver Status			
	No, another family member is the primary caregiver	54	12.3
	Shared care giving responsibility	134	30.6
	Yes, I am the primary caregiver	250	57.1
	Total	438	100.0

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Societal and Social Characteristics of Study Participants

The study revealed that 94.3% of participants identified as Christian, aligning with Buea's religious demographics, where Christianity is predominant (Wormald, 2015). This finding is consistent with studies showing the influence of religious beliefs on health behaviors in sub-Saharan Africa (Wormald, 2015). Family influence played a significant role in vaccination decisions for 52.3% of participants, reflecting research on the importance of familial and social networks in health decision-making (Ashiru-Oredope et al., 2023). Additionally, 67.1% acknowledged support from religious leaders, reinforcing their well-documented role in promoting public health initiatives, including vaccination campaigns (Ngwa et al., 2018). Community support for vaccination was high (81.7%), consistent with studies highlighting the role of community engagement in increasing vaccine uptake. Societal stigma related to vaccination was reported by only 28.3% of participants, suggesting that public awareness efforts have contributed to reducing vaccine-related stigma (Evans et al., 2023). Cultural beliefs influenced vaccination decisions for 21.2% of participants, a relatively low percentage that aligns with research indicating that education and awareness mitigate cultural hesitancy (Lazarus et al., 2021). Confidence in vaccine safety was high (93.2%), mirroring global trends of increasing trust in immunization programs, while 92.5% believed in the importance of vaccination, reinforcing the success of public health campaigns in fostering positive vaccine perceptions (Lazarus et al., 2021).

Table 2: Societal and Social Characteristics of Study Participants

Variable	Category	Frequency	Percent
Religion			
	Christian	413	94.3
	Muslim	11	2.5
	Others	14	3.2
	Total	438	100.0
Influence of Family			
	No	209	47.7
	Yes	229	52.3
	Total	438	100.0
Support From Religious Leaders			
	No	144	32.9
	Yes	294	67.1
	Total	438	100.0
Support From Community			
	No	80	18.3
	Yes	358	81.7
	Total	438	100.0
Societal Stigma			
	No	314	71.7
	Yes	124	28.3
	Total	438	100.0
Access to Childcare Support			
	No	195	44.5
	Yes	243	55.5
	Total	438	100.0
Received Unsolicited Advice			
	No	292	66.7
	Yes	146	33.3
	Total	438	100.0
Cultural Beliefs			
	No	345	78.8
	Yes	93	21.2
	Total	438	100.0

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Beliefs about Safety and Effectiveness			
	No	30	6.8
	Yes	408	93.2
	Total	438	100.0
Beliefs about Importance of Vaccination			
	No	33	7.5
	Yes	405	92.5
	Total	438	100.0

Information Access and Behavioral Patterns

The study revealed that 68.9% of participants were aware of local vaccination campaigns, highlighting persistent gaps in communication strategies, as documented in previous research (Saidu et al., 2024). Engagement with healthcare workers was also notable, with 59.4% of caregivers discussing vaccination concerns, reinforcing the critical role of health professionals in improving vaccine uptake (Ames et al., 2015). Confidence in vaccine appropriateness was high (91.1%), aligning with global trends of increasing trust in immunization programs (Lazarus et al., 2021). While most caregivers (73.5%) sought medical advice before vaccination, only 33.3% frequently engaged in vaccine-related discussions, indicating potential areas for increased awareness efforts. Delayed vaccinations were reported by 41.6% of participants, reflecting common barriers such as long waiting times and unproductive health facility visits. Language barriers affected 26.3% of participants, consistent with findings on Cameroon's linguistic diversity as a challenge to healthcare access (Challenges of Language Barrier, 2024). Cultural influences on vaccination decisions were relatively low (17.6%), suggesting that public education efforts may be mitigating traditional beliefs that hinder vaccine compliance (Kamtchueng, 2024).

Table 3: Information Access and Behavioral Patterns of Caregivers

Variable	Category	Frequency	Percent
Awareness of Local Campaigns			
	No	136	31.1
	Yes	302	68.9
	Total	438	100.0
Discussed Vaccination Concerns With Healthcare workers			
	No	178	40.6
	Yes	260	59.4
	Total	438	100.0
Appropriateness of Vaccine			
	No	39	8.9
	Yes	399	91.1
	Total	438	100.0
Missed Health_Appointments			
	No	309	70.5
	Yes	129	29.5
	Total	438	100.0
Participation in Discussions and workshop			
	No	229	52.3
	Yes	209	47.7
	Total	438	100.0
Delayed Vaccination Schedule			
		Frequency	Percent
	No	256	58.4
	Yes	182	41.6
	Total	438	100.0
Active Search for new Vaccines			
	No	203	46.3

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	Yes	235	53.7
	Total	438	100.0
Frequency of Vaccine Discussions			
	Frequently	146	33.3
	Rarely	292	66.7
	Total	438	100.0
Language Barrier			
	No	323	73.7
	Yes	115	26.3
	Total	438	100.0
Seeking Medical advice before Vaccination			
	No	116	26.5
	Yes	322	73.5
	Total	438	100.0
Cultural Practices			
	No	361	82.4
	Yes	77	17.6
	Total	438	100.0

Prevalence of Vaccine Hesitancy

The overall prevalence of vaccine hesitancy among the sampled caregivers was 11.0%. Of the 438 caregivers who participated in the study, 48 demonstrated vaccine hesitancy while 390 did not exhibit hesitancy toward vaccination. These findings indicate that approximately one in nine caregivers expressed some form of vaccine hesitancy.

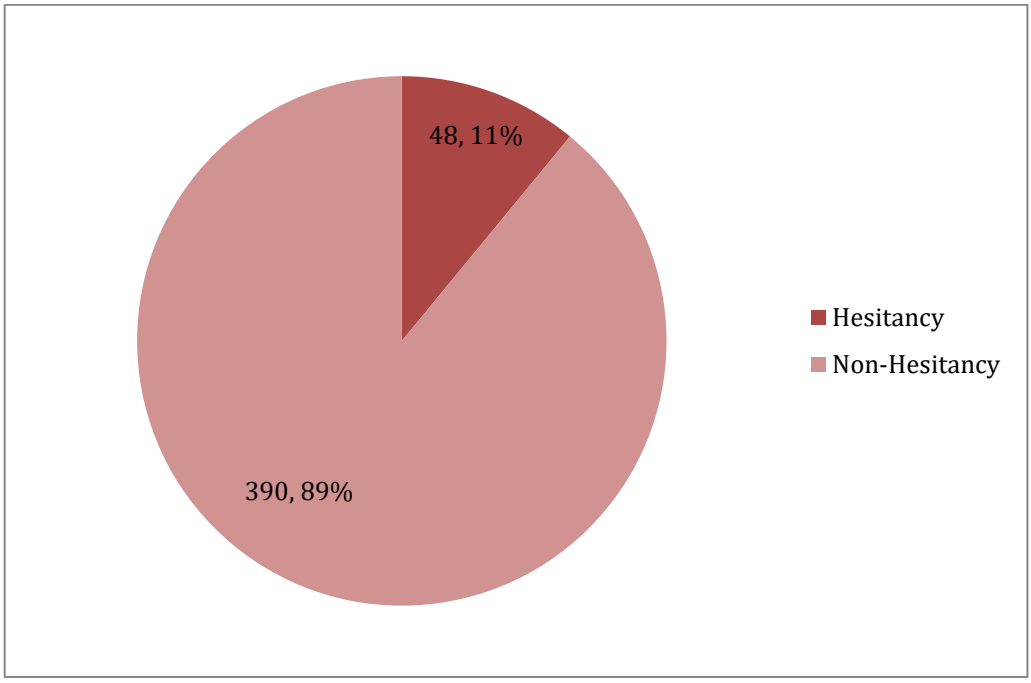

Figure 1: Prevalence of Vaccine Hesitancy

Association between Socio-Demographics and Vaccine Hesitancy (Bivariate Analysis)

The bivariate analysis revealed several significant associations with vaccine hesitancy. Marital status was significantly associated with vaccine hesitancy, as married participants were more likely to be hesitant compared to widowed individuals (OR = 4.104, 95% CI: 1.312–12.835, p = 0.015). Similarly, single participants had higher odds of vaccine hesitancy compared to widowed individuals (OR = 5.096, 95% CI: 1.556–16.695, p = 0.007).

Level of education also showed a significant relationship, with participants who had attained secondary education being more likely to exhibit vaccine hesitancy compared to those with a university education (OR = 2.042, 95% CI: 1.021–4.086, p = 0.044).

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Regarding employment status, government-employed individuals had significantly lower odds of vaccine hesitancy compared to the unemployed (OR = 0.231, 95% CI: 0.085–0.627, p = 0.004).

Monthly income was another significant factor, as participants earning between 100,000–150,000 FCFA had reduced odds of vaccine hesitancy compared to those earning less than 50,000 FCFA (OR = 0.267, 95% CI: 0.110–0.650, p = 0.004). Likewise, those earning 50,000–99,000 FCFA were also less likely to be hesitant (OR = 0.373, 95% CI: 0.168–0.828, p = 0.015), and participants earning above 150,000 FCFA had even lower odds (OR = 0.233, 95% CI: 0.082–0.660, p = 0.006).

Finally, caregiver status was significantly associated with vaccine hesitancy, as participants who shared caregiving responsibilities were at higher odds of hesitancy compared to primary caregivers (OR = 5.116, 95% CI: 1.775–14.746, p = 0.003).

Table 4: Bivariate Analysis of Socio-Demographic Factors Associated with Vaccine Hesitancy

		Hesitancy						
		No	Yes	Total	COR	Lower	Upper	p value
Health Area	Bokwango	54	7	61	1.006	0.388	2.611	0.990
	Buea Road	158	23	181	0.896	0.448	1.793	0.756
	Buea Town	63	3	66	2.739	0.764	9.823	0.122
	Molyko	115	15	130	1			
Total		390	48	438				
Age	22-30	226	20	246	1.614	0.189	13.784	0.662
	31-40	118	19	137	0.887	0.103	7.621	0.913
	41-50	39	8	47	0.696	0.075	6.471	0.750
	51-60	7	1	8	1			
Total		390	48	438				
Sex	Female	340	44	384	0.618	0.213	1.795	0.376
	Male	50	4	54	1			
Total		390	48	438				
Marital Status	Divorced	7	4	11	0.729	0.146	3.654	0.701
	Married	197	20	217	4.104	1.312	12.835	0.015
	Separated	15	6	21	1.042	0.255	4.262	0.955
	Single	159	13	172	5.096	1.556	16.695	0.007
	Widowed	12	5	17	1			
Total		390	48	438				
Level of Education	No Formal Education	10	2	12	0.817	0.171	3.896	0.800
	Primary	28	1	29	4.574	0.602	34.770	0.142
	Secondary	150	12	162	2.042	1.021	4.086	0.044
	University	202	33	235	1			
Total		390	48	438				
Employment Status	Employed (Government)	42	12	54	0.231	0.085	0.627	0.004
	Employed (Private Sector)	21	4	25	0.347	0.093	1.291	0.114
	Self-employed (Business)	221	25	246	0.584	0.245	1.393	0.225
	Unemployed	106	7	113				
Total		390	48	438				
Monthly Income	100K-150K	57	12	69	0.267	0.110	0.650	0.004
	50K-99K	126	19	145	0.373	0.168	0.828	0.015
	Above 150K	29	7	36	0.233	0.082	0.660	0.006
	Less than 50K	178	10	188	1			
Total		390	48	438				

Caregiver Status	No, another family member is the primary caregiver	44	10	54	0.693	0.319	1.505	0.354
	Shared caregiving responsibility	130	4	134	5.116	1.775	14.746	0.003
	Yes, I am the primary caregiver	216	34	250	1			
Total		390	48	438				

Socio-Demographic Factors Associated with Vaccine Hesitancy (Multivariate Analysis)

The multivariate analysis identified several significant factors associated with vaccine hesitancy. Sex was a significant predictor, with female participants being less likely to exhibit vaccine hesitancy compared to males (AOR = 0.245, 95% CI: 0.075–0.805, p = 0.020).

Monthly income also showed a significant association, as participants earning above 150,000 FCFA had significantly lower odds of vaccine hesitancy compared to those earning less than 50,000 FCFA (AOR = 0.211, 95% CI: 0.056–0.799, p = 0.022).

Caregiver status was another significant determinant, with individuals who shared caregiving responsibilities having higher odds of vaccine hesitancy compared to primary caregivers (AOR = 4.931, 95% CI: 1.596–15.230, p = 0.006).

Table 5: Multivariate Analysis of Socio-Demographic Factors Associated with Vaccine Hesitancy

			95% CI for AOR		
Variable	**Category**	**AOR**	**Lower**	**Upper**	**p value**
	Threshold	0.069	0.009	0.535	0.011
Health Area	Bokwango	1.242	0.435	3.542	0.686
	Buea Road	1.099	0.510	2.368	0.809
	Buea Town	2.420	0.604	9.691	0.212
	Molyko	1			
Sex	Female	0.245	0.075	0.805	0.020
	Male	1			
Marital Status	Divorced	0.753	0.129	4.415	0.753
	Married	2.715	0.723	10.189	0.139
	Separated	0.736	0.147	3.696	0.710
	Single	3.629	0.916	14.372	0.066
	Widowed	1			
Level of Education	No Formal Education	1.153	0.175	7.612	0.883
	Primary	1.679	0.201	14.006	0.632
	Secondary	1.607	0.709	3.640	0.256
	University	1			
Employment Status	Employed (Government)	0.580	0.141	2.388	0.451
	Employed (Private Sector)	0.830	0.166	4.140	0.820
	Self-employed (Business)	0.851	0.291	2.487	0.768
	Unemployed	1			
Monthly Income	100K-150K	0.469	0.141	1.560	0.217
	50K-99K	0.489	0.183	1.309	0.154
	Above 150K	0.211	0.056	0.799	0.022
	Less than 50K	1			
Caregiver Status	No, another family member is the primary caregiver	0.659	0.277	1.566	0.345
	Shared care giving responsibility	4.931	1.596	15.230	0.006
	Yes, I am the primary caregiver	1			

Association between Societal and Social Characteristics with Vaccine Hesitancy

The bivariate analysis revealed significant associations between societal and social characteristics and vaccine hesitancy. Support from religious leaders was significantly associated with vaccine hesitancy, as participants who did not receive support from religious leaders were more likely to be hesitant compared to those who did (OR = 0.367, 95% CI: 0.200–0.674, p = 0.001).

Community support also played a crucial role, with participants who lacked support from their community exhibiting higher odds of vaccine hesitancy compared to those who had community support (OR = 0.315, 95% CI: 0.165–0.600, p < 0.001).

Societal stigma was another significant factor, as participants who did not experience societal stigma had significantly lower odds of vaccine hesitancy compared to those who did (OR = 3.521, 95% CI: 1.909–6.495, p < 0.001).

Access to childcare support showed a significant association, with participants who lacked access to childcare support being more likely to be vaccine-hesitant compared to those who had access (OR = 0.535, 95% CI: 0.291–0.982, p = 0.044).

Receiving unsolicited advice was also significantly associated with vaccine hesitancy, as participants who did not receive unsolicited advice had higher odds of vaccine hesitancy compared to those who did (OR = 3.937, 95% CI: 2.111–7.343, p < 0.001).

Cultural beliefs were a strong predictor of vaccine hesitancy, with participants who reported no cultural influence being significantly less likely to be hesitant compared to those who reported cultural beliefs affecting their vaccination decisions (OR = 8.651, 95% CI: 4.545–16.465, p < 0.001).

Beliefs about vaccine safety and effectiveness were significantly associated with hesitancy, as participants who doubted vaccine safety had much higher odds of hesitancy compared to those who believed in its safety (OR = 0.053, 95% CI: 0.023–0.120, p < 0.001).

Beliefs about the importance of vaccination also showed a significant relationship, with participants who did not consider vaccines important being more likely to be hesitant compared to those who did (OR = 0.041, 95% CI: 0.018–0.092, p < 0.001).

Table 6: **Bivariate Analysis of Societal and Social Factors Associated with Vaccine Hesitancy**

		Hesitancy						
		No	Yes	Total	COR	Lower	Upper	p value
Religion	Christian	369	44	413	0.645	0.082	5.051	0.676
	Muslim	8	3	11	0.205	0.018	2.327	0.201
	Others	13	1	14	1			
Total		390	48	438				
Influence of Family	No	190	19	209	1.450	0.787	2.673	0.234
	Yes	200	29	229	1			
Total		390	48	438				
Support From Religious Leaders	No	118	26	144	0.367	0.200	0.674	0.001
	Yes	272	22	294	1			
Total		390	48	438				
Support From Community	No	62	18	80	0.315	0.165	0.600	0.001
	Yes	328	30	358	1			
Total		390	48	438				
Societal Stigma	No	292	22	314	3.521	1.909	6.495	0.001
	Yes	98	26	124	1			
Total		390	48	438				
Access to Childcare Support	No	167	28	195	0.535	0.291	0.982	0.044
	Yes	223	20	243	1			
Total		390	48	438				
Received Unsolicited Advice	No	274	18	292	3.937	2.111	7.343	0.001

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	Yes	116	30	146	1			
Total		390	48	438				
Cultural Beliefs	No	327	18	345	8.651	4.545	16.465	0.001
	Yes	63	30	93	1			
Total		390	48	438				
Beliefs about Safety and Effectiveness	No	12	18	30	0.053	0.023	0.120	0.001
	Yes	378	30	408	1			
Total		390	48	438				
Beliefs about Importance of Vaccination	No	12	21	33	0.041	0.018	0.092	0.001
	Yes	378	27	405	1			
Total		390	48	438				

Societal and Social Factors Associated with Vaccine Hesitancy (Multivariate Analysis)

The multivariate analysis identified several significant associations between societal and social characteristics and vaccine hesitancy. Influence of family was a significant factor, with participants who reported no family influence being more likely to exhibit vaccine hesitancy compared to those who experienced family influence (AOR = 2.801, 95% CI: 1.120–7.006, p = 0.028).

Societal stigma was also significantly associated with vaccine hesitancy, as participants who did not experience societal stigma had lower odds of hesitancy compared to those who did (AOR = 3.695, 95% CI: 1.489–9.169, p = 0.005).

Cultural beliefs played a strong role in vaccine hesitancy, with participants who reported no cultural influence being significantly less likely to be hesitant compared to those who cited cultural beliefs as influencing their vaccination decisions (AOR = 5.748, 95% CI: 2.446–13.508, p < 0.001).

Beliefs about vaccine safety and effectiveness were also significantly associated with hesitancy, as participants who expressed concerns about vaccine safety had much higher odds of hesitancy compared to those who believed in vaccine safety (AOR = 0.059, 95% CI: 0.018–0.199, p < 0.001).

Beliefs about the importance of vaccination further influenced hesitancy, with participants who did not perceive vaccines as important being more likely to exhibit hesitancy compared to those who believed in their importance (AOR = 0.062, 95% CI: 0.021–0.182, p < 0.001).

Table 7: Multivariate Analysis of Societal and Social Factors Associated with Vaccine Hesitancy

			95% CI for AOR		
Variable	**Category**	**AOR**	**Lower**	**Upper**	**p value**
	Threshold	0.064	0.001	2.940	0.159
Religion	Christian	0.145	0.003	6.111	0.311
	Muslim	0.022	0.000	1.462	0.075
	Others	1			
Influence of Family	No	2.801	1.120	7.006	0.028
	Yes	1			
Support from Religious Leaders	No	0.448	0.184	1.089	0.076
	Yes	1			
	No	0.961	0.332	2.784	0.942
	Yes	1			
Societal stigma	No	3.695	1.489	9.169	0.005
	Yes	1			
Access to Childcare support	No	0.749	0.314	1.787	0.515
	Yes	1			
Received Unsolicited Advice	No	2.130	0.889	5.107	0.090
	Yes	1			
Cultural Beliefs	No	5.748	2.446	13.508	0.001

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	Yes	1			
Beliefs about Vaccine safety and effectiveness	No	0.059	0.018	0.199	0.001
	Yes	1			
beliefs about importance of Vaccination	No	0.062	0.021	0.182	0.001
	Yes	1			

Information Access and Behavioral Patterns Associated with Vaccine Hesitancy

The bivariate analysis identified significant associations between information access, behavioral patterns, and vaccine hesitancy. Awareness of local campaigns was significantly associated with vaccine hesitancy, as participants who were unaware of local vaccination campaigns had higher odds of hesitancy compared to those who were aware (OR = 0.403, 95% CI: 0.220–0.739, p = 0.003).

Perception of vaccine appropriateness was another significant factor, with participants who believed vaccines were inappropriate being more likely to exhibit hesitancy compared to those who considered vaccines appropriate (OR = 0.144, 95% CI: 0.069–0.301, p < 0.001).

Missed health appointments showed a strong association with vaccine hesitancy, as participants who did not miss health appointments had significantly lower odds of hesitancy compared to those who had missed appointments (OR = 39.471, 95% CI: 13.793–112.952, p < 0.001).

Delayed vaccination schedules were significantly linked to hesitancy, with participants who did not delay vaccinations being much less likely to exhibit hesitancy compared to those who had delayed schedules (OR = 15.529, 95% CI: 6.012–40.114, p < 0.001).

Language barriers were also a significant factor, as participants who did not experience language difficulties had lower odds of hesitancy compared to those who reported language barriers (OR = 2.702, 95% CI: 1.463–4.992, p = 0.001).

Seeking medical advice before vaccination was significantly associated with hesitancy, as participants who did not seek medical advice had higher odds of vaccine hesitancy compared to those who did (OR = 0.505, 95% CI: 0.271–0.942, p = 0.032).

Cultural practices were a strong predictor of hesitancy, with participants who reported no cultural influence being significantly less likely to be hesitant compared to those whose cultural beliefs affected their vaccination decisions (OR = 13.637, 95% CI: 7.001–26.563, p < 0.001).

Table 8: Bivariate Analysis of Information Access and Behavioral Factors Associated with Vaccine Hesitancy

		Hesitancy						
		No	Yes	Total	COR	Lower	Upper	p value
Awareness of Local Campaigns	No	112	24	136	0.403	0.220	0.739	0.003
	Yes	278	24	302	1			
Total		390	48	438				
Discussed Vaccination Concerns With Healthcare workers	No	153	25	178	0.594	0.325	1.084	0.090
	Yes	237	23	260	1			
Total		390	48	438				
Appropriateness of Vaccine	No	24	15	39	0.144	0.069	0.301	0.001
	Yes	366	33	399	1			
Total		390	48	438				
Missed Health Appointments	No	305	4	309	39.471	13.793	112.952	0.001
	Yes	85	44	129	1			
Total		390	48	438				
Delayed Vaccination Schedule	No	251	5	256	15.529	6.012	40.114	0.001
	Yes	139	43	182	1			
Total		390	48	438				

Active Search for new Vaccines	No	176	27	203	0.640	0.350	1.170	0.147
	Yes	214	21	235	1			
Total		390	48	438				
Frequency of Vaccine Discussions	Frequently	128	18	146	0.814	0.437	1.516	0.517
	Rarely	262	30	292	1			
Total		390	48	438				
Language Barrier	No	297	26	323	2.702	1.463	4.992	0.001
	Yes	93	22	115	1			
Total		390	48	438				
Seeking Medical advice before Vaccination	No	97	19	116	0.505	0.271	0.942	0.032
	Yes	293	29	322	1			
Total		390	48	438				
Participation in Discussions and workshop	No	201	28	229	0.760	0.414	1.394	0.375
	Yes	189	20	209	1			
Total		390	48	438				
Cultural Practices	No	344	17	361	13.637	7.001	26.563	0.001
	Yes	46	31	77	1			
Total		390	48	438				

Information Access and Behavioral Factors Associated with Vaccine Hesitancy (Multivariate Analysis)

The multivariate analysis identified several significant associations between information access, behavioral patterns, and vaccine hesitancy. Perception of vaccine appropriateness was a significant determinant, as participants who believed vaccines were inappropriate had significantly higher odds of vaccine hesitancy compared to those who considered them appropriate (AOR = 0.131, 95% CI: 0.036–0.474, p = 0.002).

Missed health appointments showed a strong association with vaccine hesitancy, with participants who had not missed appointments being significantly less likely to be hesitant compared to those who had missed appointments (AOR = 33.519, 95% CI: 9.053–124.103, p < 0.001).

Delayed vaccination schedules were also significantly linked to hesitancy, as participants who did not delay vaccinations had lower odds of hesitancy compared to those who delayed vaccination schedules (AOR = 17.431, 95% CI: 4.171–72.845, p < 0.001).

Cultural practices played a strong role, as participants who reported no cultural influence were significantly less likely to exhibit vaccine hesitancy compared to those who cited cultural beliefs as a factor (AOR = 21.971, 95% CI: 7.305–66.077, p < 0.001).

Table 9: Multivariate Analysis of Information Access and Behavioral Factors Associated with Vaccine Hesitancy

			95% CI for AOR		
Variable	**Category**	**AOR**	**Lower**	**Upper**	**p value**
	Threshold	3.094	0.875	10.942	0.080
Awareness of Local Campaigns	No	0.456	0.168	1.237	0.123
	Yes	1			
Discussed Vaccination Concerns With Healthcare workers	No	0.681	0.261	1.779	0.433
	Yes	1			
Appropriateness of Vaccine	No	0.131	0.036	0.474	0.002
	Yes	1			
Missed Health Appointments	No	33.519	9.053	124.103	0.001

	Yes	1			
Participation in Discussions and workshop	No	0.735	0.268	2.015	0.550
	Yes	1			
Delayed Vaccination Schedule	No	17.431	4.171	72.845	0.000
	Yes	1			
Active Search for new Vaccines	No	2.102	0.744	5.937	0.161
	Yes	1			
Seeking Medical advice before Vaccination	No	0.640	0.216	1.894	0.420
	Yes	1			
Cultural Practices	No	21.971	7.305	66.077	0.001
	Yes	1			
Language Barrier	No	0.829	0.296	2.316	0.720
	Yes	1			

DISCUSSION

This study found a vaccine hesitancy prevalence of 11.0% among caregivers in urban Buea, Cameroon, which is notably lower than rates reported in other African studies. A systematic review and meta-analysis by Maamor et al. (2024) found that the overall prevalence of COVID-19 vaccine hesitancy among caregivers in Africa was 41% (95% CI: 0.13, 0.69). This is significantly higher than the 11.0% prevalence found in our study. The difference could be attributed to the fact that our study focused specifically on urban Buea, whereas a study by Aseneh et al. (2023) on COVID-19 vaccine hesitancy among healthcare workers in Cameroon found a higher prevalence of 56.9% (95% CI: 51.6–62.1%). The higher hesitancy rate among healthcare workers compared to our study population of general caregivers is noteworthy and somewhat counterintuitive, given that healthcare workers are expected to have better access to medical information.

Socio-Demographic Determinants

Gender emerged as a significant predictor of vaccine hesitancy, with female participants demonstrating lower likelihood of vaccine hesitancy compared to males (AOR = 0.245, 95% CI: 0.075–0.805, p = 0.020). This finding contrasts with some regional studies, including research in Ghana where being female was associated with increased COVID-19 vaccine hesitancy (Madzorera et al., 2025). The disparity likely stems from different sociocultural contexts and the fact that females often constitute the primary caregivers for children in Cameroonian households, potentially increasing their exposure to vaccine education during maternal and child health visits.

Monthly income showed significant association with vaccine hesitancy, as participants earning above 150,000 FCFA had substantially lower odds of vaccine hesitancy compared to those earning less than 50,000 FCFA (AOR = 0.211, 95% CI: 0.056–0.799, p = 0.022). This aligns with findings from a study in Yaoundé which demonstrated that although vaccine hesitancy prevalence did not significantly vary across household wealth levels overall, wealthier households (14%) showed less vaccine refusal than poorer households (20%) (Wang et al., 2022). Higher income likely correlates with better education and healthcare access, both protective factors against vaccine hesitancy.

Caregiver status emerged as another significant determinant, with individuals who shared caregiving responsibilities exhibiting significantly higher odds of vaccine hesitancy compared to primary caregivers (AOR = 4.931, 95% CI: 1.596–15.230, p = 0.006). This finding suggests that primary caregivers may develop stronger relationships with healthcare providers through regular visits, enhancing trust in medical recommendations including vaccination.

Societal and Social Factors

Family influence proved to be a significant protective factor against vaccine hesitancy, as participants reporting no family influence demonstrated higher likelihood of hesitancy compared to those who experienced family influence (AOR = 2.801, 95% CI: 1.120–7.006, p = 0.028). This highlights the critical role of family dynamics in vaccination decisions in the Cameroonian context, where extended family opinions often influence health decisions. Studies across sub-Saharan Africa have similarly identified family members as having substantial impact on vaccine acceptance, particularly among younger populations (Wang et al., 2022).

Cultural beliefs emerged as powerful determinants of vaccine hesitancy. Participants reporting no cultural influence were significantly less likely to exhibit hesitancy compared to those who cited cultural beliefs as influencing their vaccination decisions (AOR = 5.748, 95% CI: 2.446–13.508, $p < 0.001$). This finding resonates with broader regional patterns where cultural beliefs frequently intersect with health decisions. A study of COVID-19 vaccine hesitancy among healthcare workers in Cameroon and Nigeria identified various cultural and belief factors associated with hesitancy, demonstrating the pervasive influence of cultural contexts on vaccine acceptance (Aseneh et al., 2023).

Perceptions regarding vaccine safety and effectiveness showed some of the strongest associations with hesitancy. Participants expressing concerns about vaccine safety had substantially higher odds of hesitancy compared to those believing in vaccine safety (AOR = 0.059, 95% CI: 0.018–0.199, $p < 0.001$). Similarly, beliefs about vaccination importance strongly predicted hesitancy, with participants who did not perceive vaccines as important being more likely to exhibit hesitancy (AOR = 0.062, 95% CI: 0.021–0.182, $p < 0.001$). These findings align with research across Africa that consistently identifies safety concerns as primary drivers of hesitancy. In a study evaluating COVID-19 vaccine hesitancy among healthcare professionals in five African countries, concerns about vaccine effectiveness and side effects were leading reasons for hesitancy (Madzorera et al., 2025).

Societal stigma showed a counter-intuitive relationship with vaccine hesitancy, as participants who did not experience societal stigma had higher odds of hesitancy compared to those who did (AOR = 3.695, 95% CI: 1.489–9.169, $p = 0.005$). This might reflect that those experiencing stigma may feel greater social pressure to vaccinate despite personal reservations, whereas those free from stigma might more readily express hesitancy.

Behavioral Patterns and Information Access

Perception of vaccine appropriateness significantly predicted hesitancy, with participants believing vaccines were inappropriate demonstrating higher odds of hesitancy (AOR = 0.131, 95% CI: 0.036–0.474, $p = 0.002$). This finding parallels research in Yaoundé that found many hesitant individuals "did not think that the vaccine was needed," highlighting how perceptions of necessity directly impact vaccine acceptance (Yakum et al., 2022).

Prior healthcare behavior strongly predicted vaccine hesitancy. Participants who had not missed health appointments were substantially less likely to exhibit hesitancy compared to those who had missed appointments (AOR = 33.519, 95% CI: 9.053–124.103, $p < 0.001$). Similarly, those without delayed vaccination schedules showed lower hesitancy odds compared to those with delayed schedules (AOR = 17.431, 95% CI: 4.171–72.845, $p < 0.001$). These strikingly high adjusted odds ratios suggest that general healthcare engagement patterns may be the strongest predictors of vaccine acceptance, consistent with findings from other African countries that link complacency about healthcare with vaccine hesitancy (Njoga et al., 2022).

Cultural practices maintained strong associations with hesitancy when examined from a behavioral perspective. Participants reporting no cultural influence were significantly less likely to exhibit vaccine hesitancy compared to those citing cultural beliefs as factors (AOR = 21.971, 95% CI: 7.305–66.077, $p < 0.001$). This reaffirms the profound impact of cultural contexts on vaccination decisions across Cameroon and Africa more broadly, as documented in studies examining various populations including healthcare workers in Yaoundé.

CONCLUSION

This study provides valuable insights into the determinants of vaccine hesitancy among caregivers of children aged 0–59 months in urban Buea, Cameroon. The prevalence of vaccine hesitancy was found to be 11.0%, which is lower than rates reported in other African studies. Significant determinants included gender (females less likely to exhibit hesitancy), income (higher income associated with lower hesitancy), caregiver status (shared caregiving associated with higher hesitancy), family influence (no family influence increased hesitancy), and cultural beliefs. Behavioral factors strongly associated with hesitancy included missed health appointments, delayed vaccination schedules, and cultural practices. These findings underscore the complex interplay of socio-demographic, cultural, and behavioral factors influencing vaccine hesitancy in this population. The study highlights the need for targeted, culturally sensitive interventions that address deeply rooted determinants of vaccine hesitancy, particularly focusing on improving healthcare engagement, addressing cultural beliefs, and leveraging family and community support systems to promote vaccine acceptance. Future research should explore the protective effect of female gender, the relationship between societal stigma and vaccine decisions, and develop evidence-based strategies to mitigate vaccine hesitancy in Cameroonian communities.

Limitations

The cross-sectional design precluded establishing causal relationships between identified factors and vaccine hesitancy, instead only capturing associations at a single point in time. The study's focus on urban settings in Buea limits generalizability to rural areas or other regions in Cameroon where determinants of vaccine hesitancy might differ substantially.

RECOMMENDATIONS

Future research should explore the apparent protective effect of female gender against vaccine hesitancy in this population, the complex relationship between societal stigma and vaccine decisions, and develop culturally appropriate interventions that address the deeply rooted cultural factors influencing vaccine hesitancy in Cameroonian communities.

Author Contributions

Ngwa Fred Ngunjoh (NFN) and Randolf Funagene Wefuan (RFW) conceived and designed the study; NFN, RFW, Ngende Rosine Nyake (NRN), and Ngopekba Marie-Noel Matemb (NMM) developed the methodology; NFN, NRN, NMM, Ngabami Laura Dzem-Kfemfon (NLDK), Nsam-Akum Antoinette Tendoh (NAAT), collected the data; NFN, RFW, NMM, NLDK, and NAAT performed the formal analysis; NFN, Tabe Stephany Tabot (TST), and Zyh Akumawah Berinyuy (ZAB) prepared the original draft; NFN, RFW, NRN, TST, ZAB, NLDK, and NAAT, reviewed and edited the manuscript; NFN and ZAB supervised the research. All authors have read and agreed to the published version of the manuscript.

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Ethical Approval

This study was conducted in compliance with the Declaration of Helsinki and all applicable national laws and institutional rules and has been approved by the author's institutional review board. Ethical approval was granted by the Institutional Review Board, Faculty of Health Sciences, University of Buea (Application No: FHS-IRB/2023/034). Informed consent was obtained from all subjects involved in the study.

Data Availability

Data used for this research are available from the Corresponding author upon reasonable request.

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assistants involved in this study.

Conflicts of Interest

The authors declare no conflict of interest.

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