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Examining the Factors Related to Vaccine Hesitancy Among Individuals with Disabilities in the Fako and Meme Divisions of Cameroon

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ABSTRACT

Introduction: Vaccines are a cornerstone of public health, effectively combating infectious diseases. However, vaccine hesitancy—defined as delaying or refusing vaccination despite availability—is a significant threat to global health, as recognized by the World Health Organization. This study investigated the knowledge, attitudes, and factors associated with vaccine hesitancy among people with disabilities in the Fako and Meme Divisions of Cameroon.

Methods: A community-based, cross-sectional study design was employed, using a multi-stage probability sampling technique to recruit 116 participants. Data was analyzed using SPSS version 26, with descriptive statistics and Chi-square tests to determine associations between vaccine hesitancy and the categorical variables.

Results: The study population ranged in age from 17 to 75 years (mean age 36.67 ± 15.86 years), with an equal gender distribution (50% female, 50% male). The majority of participants had completed secondary education (50%), followed by primary education (33.6%) and tertiary education (16.4%). Deafness was the most prevalent disability (41.4%). While just over half of the participants (52.6%) recognized the importance of vaccines, only half (50%) perceived them as safe. Despite this, overall knowledge (63%) and attitude (64%) towards vaccination were positive. Statistical analysis revealed significant associations between vaccine hesitancy and both the type of disability (p=0.001) and marital status (p=0.036).

Conclusion: People with disabilities in the study area demonstrated relatively good knowledge and positive attitudes toward vaccines. However, being single was identified as a significant factor influencing vaccine knowledge and uptake. The study recommends targeted vaccine education campaigns for all marital status groups within the disabled community to address potential hesitancy and promote vaccination.

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Introduction

Vaccine hesitancy, the delay or refusal of vaccination despite its availability, is a major global health threat. Recognized by the WHO as a top-ten challenge, it has a long history, predating modern medicine [1]. Despite scientific consensus on vaccine safety and efficacy, hesitancy persists, driven by misinformation, evolving social dynamics, and individual beliefs [2].

Vaccine hesitancy is not new. From skepticism about Edward Jenner's smallpox vaccine to polio vaccine controversies, resistance has been a recurring theme. The internet and social media have amplified misinformation, creating echo chambers for anti-vaccination narratives. High-profile cases, like the debunked MMR-autism link, have eroded public trust. Understanding this history is crucial to addressing current challenges [3].

Disability, as defined by the ICF, encompasses impairments, activity limitations, and participation restrictions, also recognizing the impact of environmental factors. The social model of disability emphasizes healthcare barriers—logistical, communicative, educational—leading to poorer health outcomes [4]. People with disabilities often face unique healthcare access challenges and health disparities, making them particularly vulnerable to vaccine hesitancy due to higher rates of chronic conditions, congregate living, and socioeconomic barriers. Persons with disabilities, therefore, constitute a high-risk group for vaccine hesitancy [5].

Vaccination programs should ensure persons with disabilities are covered which could contribute to the high vaccination coverage needed for herd immunity. If left under-vaccinated, the population of persons with disabilities could threaten public health, hindering herd immunity and increasing outbreak risks [6,7].

Vaccine hesitancy is complex. Concerns about vaccine safety are common. Other factors include lack of awareness about schedules, negative healthcare experiences, and individual health worldviews. Accessibility and convenience are also crucial. In some areas, hesitancy, not access, is the primary barrier [8].

Knowledge about vaccines doesn't always equal acceptance. Some studies suggest parents who vaccinate may have less knowledge than those who refuse, relying on conformity and trust [9,10]. Understanding herd immunity and vaccine combinations is often lacking, as is the ability to decipher misconceptions about ingredients and side effects, both of which contribute to hesitancy.

Past vaccination experiences, positive or negative, influence future decisions. Negative provider encounters, needle fear, and perceived pressure can deter future vaccinations [11]. The perceived importance of vaccination is key. Those prioritizing natural immunity or believing hygiene alone is sufficient may be less likely to vaccinate [11].

Trust in healthcare professionals, institutions, and public health agencies is paramount. Distrust, often fueled by misinformation, contributes to hesitancy. Open communication, transparency, and addressing concerns are crucial for building trust [12].

Several models explain vaccine hesitancy. The 3C model (Complacency, Convenience, Confidence) highlights key factors. The 5C model adds Communication and Community Implications. Complacency is the perception of no longer being at risk of disease. Convenience is easy access. Confidence is trust in vaccines and the system. Communication emphasizes clear information. Community Implications acknowledge social norms and protecting others [13].

The Health Belief Model (HBM) considers perceived susceptibility, severity, benefits, barriers, and cues to action. Studies show the HBM, Theory of Planned Behavior, and 5C model can predict hesitancy [14].

Combating hesitancy in persons with disabilities requires a multi-pronged approach. Targeted education addressing concerns is essential. Building trust in providers and institutions is crucial. Improving access and convenience can increase uptake. Community engagement is vital. Utilizing communication channels to disseminate accurate information is important. Addressing the unique challenges of vulnerable populations, like people with disabilities, is essential for equitable coverage. By addressing these complex factors, public health officials can increase vaccine confidence and protect communities [15].

Despite studies on vaccine hesitancy in Cameroon, there is paucity in data on the role of disability-specific concerns, such as accessibility issues, potential side effects, and the effect of cultural beliefs on vaccine decision-making among adults with disabilities. This study aims to inform the relationship between knowledge levels, attitudes towards vaccination, and vaccine hesitancy in persons living with disabilities. The results of this work will inform policy on ways to increase vaccine demand and uptake of persons living with disabilities.

Methods

Study Design and Sites

This study employed a community-based descriptive cross-sectional study design to collect data from adults living with a disability, 18 years and above, who gave their consent to participate in study. The disabilities included visual impairment, blind, physically challenged, hearing impairment and deafness. The study was conducted for a period of nine months, from October 2023 to June 2024. A community-based study design was used because persons living with disability were interviewed at their respective houses (door-to-door) and some organizations that have this group of persons.

Adults with mental health conditions, psychological/neurological disabilities who had difficulties with communication were excluded from the study.

The study was carried out in the Fako and Meme Divisions of Cameroon. Fako Division with a population of 632,645 as of 2020, is located in the South West Region of Cameroon and is situated at the foot of mount Cameroon [16]. It is one of the four divisions and the most thickly populated of the South West Region of Cameroon. It is located between latitude 40 and 40.5" North of the equator and between longitudes 9010" and 9013" East of the Greenwich Meridian. It is bounded to the north and east respectively by Meme and Wouri Divisions and the Atlantic Ocean to the south (Figure 1). The 4100m high Cameroon Mountain, the tallest peak in West Africa is found in this division.

Meme Division with a population of 800,000 as of 2020, is also located in the South West Region of Cameroon lies between latitude 40" and 60" East of the Greenwich Meridian, and between longitude 90" and 100" north of the Equator (Figure 1) [17].

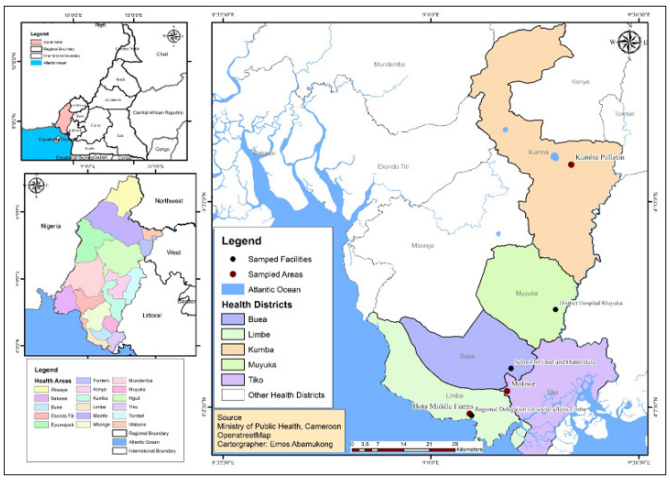

Figure 1: Map of Fako and Meme Health District. Source: Cameroon Ministry of Public Health, 2024

Sample Size Calculation
The sample size for this study was calculated using the Crochan formula [18]:

$$n = (Z^2 \times p \times (1 - p))/E^2,$$

where;
- n: is the required sample size,
- Z^2: is the z-score corresponding to the desired confidence level = 1.96 for 95% confidence,
- p: is the estimated prevalence of VH in Cameroon = 84.6 % [2],
- E^2: is the desired margin of error (level of precision),

n = 200 participants needed.

Sampling Technique
A multistage sampling technique was used for this study.

Stage One: Purposive sampling was used to select towns for the study. They include Buea, Limbe, Kumba, Muyuka. The health area was selected based on some characteristics which the investigator had identified in the health area such as accessibility.

Stage Two: Cluster sampling was used to group the health areas into clusters. Each health area (HA) of the towns were considered as a cluster. Simple random sampling by balloting was used to select health areas. The investigator wrote the names of all Has on small pieces of paper, folded them, and place in a four bowls, representing the four towns. The investigator then asked a neutral party to select four Has randomly from each health district, by drawing four pieces of paper (one after the other, with no replacement and following considerable shuffling) out of each bowl. The investigator then confirmed the names of the Has written on the pieces of paper drawn out of the bowls and wrote them down per health area.

Stage Three: Probability proportionate to size was used to obtain the number of households and organizations that were surveyed and consequently participants recruited in each HA (cluster), with respect to the total population of the selected clusters per health area making a sample size of 200 (Table 1).

Table 1: Probability Proportionate to size

SN	Health Area	Approximate PWD (n)	Proportion	Total per Health Area
1	Molyko	21863	0.186	37.2
2	Bota	12198	0.104	20.8
3	Moliwe	67673	0.577	115.4
4	Kumba Pulletin	15604	0.133	26.6
	Total	117338	1	200

PWD: persons with disabilities.

Stage Four: Purposive sampling was used to decide which households or organizations with people living with disabilities were surveyed by the data collectors once on the field.

Data Collection Tool
Data was gotten through face-to-face in-depth interviews using well-structured questionnaires. The English language and Pidgin English was used to administer the questionnaires depending on the level of education of the respondents. The questionnaire contained information on different sections based on the objectives.

Section One: consent form, which was presented to persons with disabilities to be surveyed for consent prior to any questioning.

Section Two: captured socio-demographic information for persons living with disability aged 18 years and above. This included among other information, age, gender, marital status, educational level, level of income, and place of residence.

Section Three: captured the knowledge and attitude of adults living with disabilities.

Section Four: captured the social, religious and health system factors associated with vaccine hesitancy among persons with disability.

Validity and Reliability
The face validity and content validity of the data collection was determined by the research team. The face and content validity of the tool was determined in terms of its relevance to the research objectives, length of the questionnaire, layout, and format. Suggestions and opinions offered by each researcher served as the basis for the final review of the collection tool that was used [19].

Questionnaires were pretested with 20 persons with disabilities. The respondents who were purposefully selected to took part in the main study. The data obtained was analysed to ascertain the internal consistency of the tools and an alpha value of 0.05 was used to determine the instrument reliability. The study used a face-to-face structured interview for the data collection from the households [19].

Data Analysis
Data was analysed using SPSS (Statistical Package for Social Sciences) version 27. The dependent variable for this study was Vaccine Hesitancy (VH), while the independent variables are age, type of disability, income level, Level of education, exposure to communication, religion, and socioeconomic status.

Descriptive statistics were used to summarize data. Categorical variables were summarized using frequency distribution tables, pie charts, bar charts. Continuous variables were summarized using summary statistics like standard deviation and mean. Logistic regression was used to identify factors associated to vaccine hesitancy. Simple logistic regression was used in the bivariate analysis with crude odd ratios to identify factors associated at the bivariate analysis. Significant factors at the bivariate analysis were taken to the multivariate analysis. Multiple logistic regression with adjusted odd ratios were used where confounders are controlled to identify final factors associated to vaccine hesitancy. Significant level was set at 95% ($p<0.05$).

Ethical Considerations
Ethical clearance was obtained from the institutional review board of the Faculty of Health Sciences, University of Buea. Administrative authorization was gotten from the South West Regional Delegation of Public Health. Informed consent was sought from adults with disabilities. The objectives of the study were explained to participants, consent before administering the questionnaire. Participants were also informed that their participation was voluntary and that they could withdraw from the interview at any time without consequences. Participants were assured that their responses would be treated with confidentially

using strict coding measures

Results

Socio-Demographic Characteristics of Study Participants

A total of 116 PWDs were interviewed with age ranging from 17 – 75 with the mean age of 36.67 ±15.860. There was an equal distribution between females 58 (50%) and males 58 (50%). Most of the PWDs identified as Christian 107 (92.2%), with a smaller percentage identifying as Muslim 9 (7.8%). The single PWDs made the majority; 71 (61.2%) of the participants while there were 43 (37.1%) married. Many of the PWDs resided in urban areas 83(71.6%), with a smaller percentage living in rural areas 33 (28.4%) (Table 2).

About 58 (50%) of the 116 participants completed secondary education, followed by 39 (33.6%) with primary education and 19 (16.4%) tertiary education. The PWDs were primarily unemployed/homemakers 54(46.6%), followed by skilled workers 24(20.7%), service workers/technicians 23(19.8%), and professional entrepreneurs 15(12.9%).

Eighty-two (70.7%)] of the 116 PWDs earned less than 50,000 CFA franc (XAF), with smaller percentages earned between 50,000 to 100,000 XAF 27 (23.3%), 100,000 to 150,000 XAF 3 (2.6%), and above 150,000 XAF 4 (3.4%). (Table 2).

Table 2: Socio – Demographic Characteristics of the Study Participants

Variable	Categories	Frequency	Percentage
Gender	Female	58	50
	Male	58	50
	Total	116	100
Religion	Christian	107	92.2
	Muslim	9	7.8
	Total	116	100
Marital Status	Divorced separated	2	1.7
	Married	43	37.1
	Single	71	61.2
	Total	116	100
Residential Area	Rural	33	28.4
	Urban	83	71.6
	Total	116	100
Level of Education	Primary	39	33.6
	Secondary	58	50
	Tertiary	19	16.4
	Total	116	100
Occupation	Professional entrepreneur	15	12.9
	Service worker	23	19.8
	Skilled worker/ technician	24	20.7
	Unemployed/ homemaker	54	46.6
	Total	116	100
Monthly Income (XAF)	Above 150,000	4	3.4
	100,000 – 150,000	3	2.6
	50,000 – 100,000	27	23.3
	Less than 50,000	82	70.7
	Total	116	100

Types Of Disabilities in the Study Population

The types of disabilities among participants revealed a diverse range within the sample. The most prevalent disability among the participants was deafness, 48 (41.4%), followed by hearing impairment 18 (15.5%). Physically challenged were 17 (14.7%), while 13 (11.2%) reported blindness. Eight of the participants were amputees 8 (6.9%), physical disabilities were 6 (5.2%) and visual impairments were 5 (4.3%). A small percentage of participants reported a combination of walking disability and hearing impairment, making up 1 (0.9%) of the total sample (Figure 2).

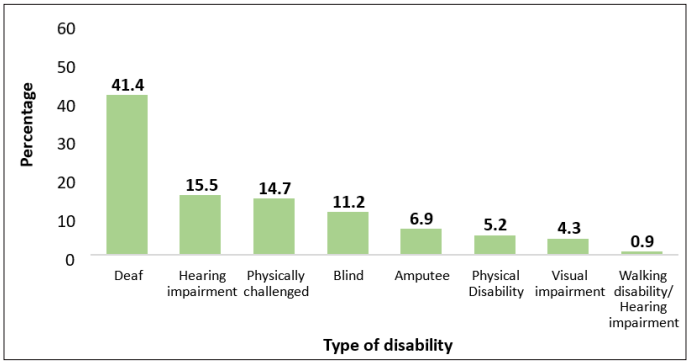

Figure 2: Types of disabilities among the 116 participants in the study area

Knowledge on Vaccines

The study assessed the knowledge on vaccines among the participants, and the responses were categorized into different variables (Table 3).

Firstly, when asked about the importance of vaccines for their health, 61(52.6%) participants considered it very important, while 21(18.1%) said it was not at all important. This indicates that a majority of the participants recognize the significance of vaccines for their well-being.

In terms of the perceived safety of vaccines, 58 (50%) of the participants believed that vaccines are very safe, while 14 (12.1%) thought they were not at all safe. This suggests that a half of the participants have confidence in the safety of vaccines. When asked if other persons with disabilities will get vaccinated, 85 (73.3%) responded affirmatively, indicating that a majority of the participants believe that individuals with disabilities should receive vaccines (Table 3).

Regarding awareness of where to go to get vaccinated, 82 (70.7%) participants answered positively, while 34 (29.3%) said no. This suggests that a majority of the participants are aware of vaccination centers. In terms of whether vaccines should be compulsory, 69 (59.5%) believed that they should be compulsory, while 47 (40.5%) disagreed. This indicates a slightly higher percentage in favor of compulsory vaccination. Asking if they remembered any past events that would discourage them from getting vaccinated, 29

(25%) said yes, while 87 (75%) responded negatively. This suggests that most of the participants do not have any negative experiences that would discourage them from getting vaccinated.

With vaccination services, 44 (37.9%) mentioned being satisfied with everything, while other factors such as long waiting times and vaccine availability were also mentioned as areas for improvement (Table 3).

Table 3: Knowledge on Vaccines among Persons with Disability

Variable	Category	Frequency	Percentage
Importance of vaccines for your health	A little important Moderately important Not at all important Very important	16 18 21 61	13.8 15.5 18.1 52.6
Perception of vaccine safety	A little safe Moderately safe Not at all safe Very safe	18 26 14 58	15.5 22.4 12.1 50
Other persons with disabilities getting vaccinated	 No Yes	 31 85	 26.7 73.3
Knowledge of vaccination centers	No Yes	34 82	29.3 70.7
Compulsory of vaccines	No Yes	47 69	40.5 59.5
Past event that could discourage vaccination	No Yes	87 29	75 25
Factors that affect the satisfaction of vaccination services	Nothing you are satisfied	44	37.9
	Staff are poorly trained	15	12.9
	Staff do not spend enough time with people	11	9.5
	The clinic does not open on time	10	8.6
	The clinic is not clean	15	12.9
	The waiting times are long	5	4.4
	Vaccine is not always available	16	13.8

Attitude Towards Vaccination among Persons with Disabilities

Of the 116 study participants, 72(62.1%) responded positively when asked how vaccines work, while 44(37.9%) said no. This indicates that most of the participants have basic understanding of vaccine mechanisms. Next, when asked if they knew which vaccines they should get for themselves, 48 (41.4%) responded affirmatively, while 68 (58.6%) were unsure. This suggests that there is a lack of awareness among a significant portion of the participants regarding the vaccines they should receive. In terms of the importance of getting a COVID-19 vaccine for their health, 48 (41.4%) considered it very important, 30 (25.9%) thought it was not at all important, and the rest had varying degrees of importance. This shows that a substantial number of participants recognize the significance of COVID-19 vaccination for their well-being. Asked if they wanted to get a COVID-19 vaccine, 41(35.3%) expressed their desire to receive it, while 33 (28.4%) stated that they did not want to get vaccinated. Additionally, 25 (21.6%) were unsure, and 17 (14.7%) mentioned already being vaccinated. These findings indicate a mixed response towards COVID-19 vaccination. About perception of close family and friends towards COVID-19 vaccination, 47 (40.5%) believed that most of them want them to get vaccinated, whereas 69 (59.5%) thought otherwise. This suggests a lack of consensus among participants' social circles regarding vaccination. Fifty-one (44%) agreed that there are better ways to prevent vaccine-preventable diseases than with a vaccine, while 65(56%) disagreed. This shows that a significant portion of participants believe there more ways to avoid a vaccine-preventable disease than using a vaccine. In terms of whether vaccines strengthen the immune system, 76 (65.5%) responded positively and 40 (34.5%) said no. This indicates that most participants recognize the role of vaccines in stimulating the immune system. Only 42 (36.2%) of the participants said they would like to be the first to receive a new vaccine, while 74 (63.8%) said no. This is an indication that most of participants prefer to wait and observe before getting a newly introduced vaccine. Safety and side effects of a vaccine where the major concern of 54 (46.6%) of the participants, while 27 (23.3%) laid emphasis on vaccine efficacy and effectiveness, indicating participants prioritize information related to safety and side effects when considering a new vaccine.

Table 4: Attitude Towards Vaccination among Persons with Disability

Variables	Categories	Frequency	Percentage
Understanding how vaccines work	No	44	37.9
	Yes	72	62.1
	Total	116	100
Knowing the types of vaccines to take	No	68	58.6
	Yes	48	41.4
	Total	116	100
	All of the above	30	25.9
	A little important	18	15.5 17.2
Importance of getting Covid-19 vaccine	Moderately important	20	25.9
	Not at all important	30	
	Very important	48	41.4
	Total	116	100
Need a Covid-19 vaccine	I am already vaccinated	17	14.7 21.6
	I am not sure	25	28.4
	I do not want to	33	
	I want to	41	35.3
	Total	116	100
Perception of close family and friends towards Covid19 vaccination	No	69	59.5
	Yes	47	40.5
	Total	116	100
Importance of the Polio vaccine	No	48	41.4
	Yes	68	58.6
	Total	116	100
	No	65	56
	Yes	51	44
	Total	116	100
	No	40	34.5
	Yes	76	65.5
	Total	116	100
First to get vaccinated with new vaccine	No	74	63.8
	Yes	42	36.2
	Total	116	100
Thing you want to know when a new vaccine is introduced	Availability and access	17	14.7 12.1
	Cost and affordability	14	46.6
	The side effects	54	0.9
	Cost and affordability	1	2.6
	Vaccine efficacy and effectiveness	3	
	Vaccine efficacy and effectiveness	27	23.3
	Total	116	100
Newer vaccines are safer than older ones	No	71	61.2
	Yes	45	38.8
	Total	116	100

Association Between Vaccine Knowledge and Socio-Demographic Characteristics

Vaccine knowledge was a binary (yes/no) outcome variable and socio-demographic characteristics were used as independent variables (Table 5). A p-value of <0.05 was considered as the cutoff point for a variable to be suspected as having association with knowledge about vaccine. After running a bivariate analysis, the factor that appeared to be associated with vaccine knowledge included the type of disability. There was a significant association between type of disability and vaccine knowledge for persons living with disabilities ($P < 0.001$) (Table 5).

Table 5: Association Between Vaccine Knowledge and Socio-Demographic Characteristics using Bivariate Analysis Model

Variable	Category	n	Vaccine Knowledge				chi-square	p-value
			Good	%	Poor	%		
Level of education	Primary	39	25	21.55	14	12.07	0.248	0.883
	Secondary	58	37	31.90	21	18.10		
	Tertiary	19	11	9.48	8	6.90		
Occupation	Professional/entrepreneur	15	13	11.21	2	1.72	5.83	0.120
	Service worker	23	13	11.21	10	8.62		
	Skilled worker/technician	24	12	10.34	12	10.34		
	Unemployed/homemaker	54	35	30.17	19	16.38		
Monthly income (XAF)	> 150,000	4	3	2.59	1	0.86	1.157	0.840
	100,000 – 150,000	3	2	1.72	1	0.86		
	50,000 – 100,000	27	15	12.93	12	10.34		
	< 50,000	82	53	45.69	29	25.00		
Gender	Female							
	Male							
Religion	Christian	106	68	58.62	38	32.76		
	Muslim	9	5	4.31	4	3.45		
	Others	1	0	0.00	1	0.86	1.975	0.372
Marital status	Divorced separated							
	Married							
	Single							
	Widowed							
Type of disability	Hearing impairment	18	11	9.48	7	6.03		
	Physical disability	24	20	17.24	4	3.45		
	Visual impairment	5	5	4.31	0	0.00	23.726	<0.001

Association Between Attitude and Socio-Demographic Characteristics

Attitude towards vaccination was a binary (yes/no) outcome variable and socio-demographic characteristics were used as independent variables. A p-value of < 0.05 was considered as the cutoff point for a variable to be suspected as having significant association with attitude towards vaccination. After running a bivariate analysis, the factor that appeared to be associated with attitude towards vaccination was marital status (Table 6). There was a significant association between marital status and attitude towards vaccination for persons living with disabilities (p = 0.036) (Table 6).

Table 6: Determining the Association Between Attitude and Socio-Demographic Characteristics of The Participants using a Bivariate Analysis Model

Variable	Category	n	Vaccine Knowledge				chi-square	p-value
			Good	%	Poor	%		
Gender	Female	58	38	32.76	20	17.24	0.149	0.699
	Male	58	36	31.03	22	18.97		
	Total	116	74	63.79	42	36.21		
Religion	Christian	107 9	69 5	59.48	38 4	32.76	0.287	0.592
	Muslim			4.31		3.45		
	Total	116	74	63.79	42	36.21		
Marital status	Divorced/separated	2	2	1.72	0	0.00		
	Married	43	33	28.45	10	8.62		
	Single	71	39	33.62	32	27.59	6.673	0.036
	Total	116	74	63.79	42	36.21		
Level of education	Primary	39	26	22.41	13	11.21	1.239	0.538
	Secondary	58	38	32.76	20	17.24		
	Tertiary	19	10	8.62	9	7.76		
	Total	**116**	**74**	**63.79**	**42**	**36.21**		

Occupation	Professional/ entrepreneur	15	11	9.48	4	3.45	0.71	0.871
	Service worker	23	14	12.07	9	7.76		
	Skilled worker/ technician	24	15	12.93	9	7.76		
	Unemployed/ homemaker	54	34	29.31	20	17.24		
	Total	**116**	**74**	**63.79**	**42**	**36.21**		
Monthly income (XAF)	<50000	82	52	44.83	30	25.86		
	>150000	4	4	3.45	0	0.00		
	100000 – 150000	3	3	2.59	0	0.00	3.933	0.228
	50000 – 100000	27	15	12.93	12	10.34		
	Total	116	74	63.79	42	36.21		
Type of disability	Amputee	8	7	6.03	1	0.86		
	Blind	13	5	4.31	8	6.90		
	Deaf	48	29	25.00	19	16.38		
	Hearing impairment	18	12	10.34	6	5.17		
	Physical disability	24	17	14.66	7	6.03		
	Visual impairment	5	4	3.45	1	0.86	6.415	0.262
	Total	**116**	**74**	**63.79**	**42**	**36.21**		

Relation Between Vaccine Knowledge and Attitude Towards Vaccines

After controlling for all possible confounding variables by each of the socio-demographic variables, gender, religion, marital status, level of education, occupation, monthly income and type of disability, and upon bivariate analysis of the relationship between Knowledge of vaccines and attitude towards vaccination among PWDs, the relationship was found to be significant (Table 7). PWDs with good attitude towards vaccination were 6.525 time more likely to have good knowledge compared to other PWDs who had poor knowledge. In fact, the odd of a PWD with good attitude towards vaccination was 6.525 (95%CI: 2.82-15.11, P=0.001) times more likely to have good knowledge about vaccination (Table 7).

Table 7: Relationship between Vaccine Knowledge and Attitude of PWDs towards Vaccination

Variable	Category	Odds Ratio	Lower	Upper	*p*-value
Attitude	Good Poor	6.525 1	2.82	15.11	<0.001

Social, Health system, and religious factors of vaccine hesitancy among persons with disability When it comes to social factors, the participants' trust in healthcare workers who administer vaccines was moderately high, with 42(36.2%) expressing moderate trust and 18(15.5%) indicating very high trust. However, a significant proportion 34 (29.3%) reported having only a little trust in healthcare workers. Additionally, the study found that a most of the participants believe that religious leaders 60 (51.7%) and community leaders 70 (60.3%) support vaccination (Table 8).

Within the health system, the study identified several challenges that individuals with disabilities face in accessing vaccination services. While a significant portion of 62 (53.4%) reported being contacted about getting vaccines for vaccine-preventable diseases, a concerning finding was that 26 (22.4%) of the participants had been turned away when attempting to get vaccinated (Table 8). This suggests potential barriers within the health system that need to be addressed to ensure equitable access to vaccination for individuals with disabilities. Furthermore, factors such as inconvenient clinic opening times and long waiting times were reported as barriers to getting vaccinated, indicating the need for improvements in service accessibility and efficiency.

In terms of religious factors, a slight majority of the participants 60 (51.7%) believe that religious leaders support vaccination (Table 8).

Table 8: Social, Health System and Religious Factors Towards Vaccine Hesitancy

Variable	Category	Frequency	Percent
Trust in healthcare workers	A little	34	29.3
	Moderately	42	36.2 19
	Not at all	22	15.5
	Very much	18	
Religious leaders support vaccination	No	56	48.3
	Yes	60	51.7
Community leaders support vaccination	No	46	39.7
	Yes	70	60.3
Vaccine recommended by healthcare provider	No	54	46.6
	Yes	62	53.4
Vaccination refusal by healthcare provider	No	80	69
	Yes	36	31
Challenges in getting vaccinated	Getting to the clinic is hard	26	22.4
	Nothing, it's not hard	1	0.9
	The clinic opening times are inconvenient	34	29.3
	The clinic sometimes turns people away without vaccinating	36	31
	Opening times are inconvenient	1	0.9
	long waiting time	1	0.9
	The waiting time in the clinic takes too long	17	14.6
Payment for vaccination services	A little easy	29	25
	Moderately easy	29	25
	Not at all easy	49 9	42.2
	Very easy		7.8

Discussion

In 2019, vaccine hesitancy (VH) was named as one of the top 10 threats to global health by the World Health Organization (WHO) [1]. People with disabilities are vulnerable to complications from vaccine-preventable diseases, and every effort should be made to ensure equitable access to immunization for this population. This study assessed the knowledge of vaccine hesitancy among persons with disability, the attitude of persons with disability towards vaccine hesitancy and the factors associated to vaccine hesitancy among persons living with disability.

Regarding knowledge the was a significant association between type of disability and knowledge for persons living with disability. Up to (16.38%) of PLWD who were deaf did not have good knowledge of vaccines. This could be due to the fact that since they cannot hear it limits them from getting information concerning vaccines. This is in line with a study carried out in Ghana by Atta-Osei et al which revealed that the type of disability influenced respondents knowledge towards covid-19 [20]. Regarding knowledge of vaccines among persons living with disability, it was documented that more than half of the people living with disability 52.6% considered vaccines to be very important. This positive outlook on the importance of vaccines can be considered responsible for increase in vaccine uptake as studies have shown that persons with high knowledge about vaccines are more likely to have a positive attitude towards the vaccine, which in turn increases their likelihood of getting vaccinated, although some studies argue that the association between level of knowledge about vaccination and vaccine acceptance is not straightforward [21,22]. The proportion of participants with good knowledge of vaccines in our study was similar to the 74.0% who had good knowledge on Covid-19 in a study carried out in Ghana among persons with disability [20].

In terms of perceived safety of vaccines, half of the participants 50% believed that vaccines are very safe. This suggests that a significant portion of the participants were confident in the vaccines. People with disabilities may be more concerned about potential side effects and adverse reactions to vaccines, thus this level of confidence in vaccines as documented in our study could be as a result of good knowledge on the importance of vaccines as demonstrated in the study and the fact that a reasonable population has already been vaccinated, without any noticeable major adverse reaction [23]. The proportion of individuals with disabilities in our study who believed that vaccines are very safe is comparable to the findings of Umucu and colleagues, which reported that 51.1% of college students with disabilities were confident in COVID-19 vaccines [24].

Regarding the perceptions of individuals with disability on whether other persons with disabilities will get vaccinated, it was documented that majority of them 73.3% responded affirmatively [25]. This suggests that there is a significant level of confidence among individuals with disabilities that their peers will participate in the vaccination process. This result is consistent with other studies that have shown that persons with disabilities are more likely to be influenced by the actions and attitudes of their peers when it comes to health-related behaviors, including vaccinations [25].

Concerning attitudes towards vaccine among persons with disability, the overall attitude was good 64%. This is lower than 44% positive attitude towards HBV reported in Bamenda Health District by Akazong and colleagues [26]. Regarding attitudes of persons living with disabilities towards vaccination, 35.3% of the participants indicated interest in taking the COVID 19 vaccine while 14.7% of the participants as documented in the study indicated that they were already vaccinated. This suggests that many persons living with disabilities have a positive attitude towards vaccines, which can be attributed to their high knowledge on the importance of vaccines as equally documented in our study. This findings is in agreement with the observation made by Lazarus et al in Nigeria where the level of knowledge, attitude and practice during covid-19 outbreak was high, positive and appropriate respectively [27]. Furthermore, when asked if the polio vaccine is still needed, a significant number of persons with disabilities (58.6%) as documented in the present study responded affirmatively. This implies that they have a positive attitude towards the polio vaccine.

Still in the aspect of attitude towards vaccination, the present study showed that majority of the persons living with disabilities (63.8%) expressed their refusal to be the first to receive a new vaccine, implying that they prefer to wait and observe before getting a newly introduced vaccine. These findings correlate to that suggested by Paul et al which suggest that the largest behavioural and attitudinal barriers to receiving a COVID-19 vaccine are a general mistrust in the benefits and safety of vaccines and concerns about their unforeseen effects [28]. This can be attributed to the fact that the present study showed 46.6% wanted to first know about the side effects of a new vaccine once it is introduced, while 23.3% prioritized finding out the vaccine's efficacy and effectiveness. Thus, the vaccine uptake among persons living with disabilities can increase if they can confirm that there are no side effects, and that these vaccines are also effective.

The study provides valuable insights into the social, health system, and religious factors influencing vaccination among individuals with disabilities. In terms of social factors, the participants' trust in healthcare workers who administer vaccines is moderately high, with (36.2%) expressing moderate trust and (15.5%) indicating very high trust. However, a significant proportion (29.3%) reported having only a little trust in healthcare workers, indicating a potential area for improvement in building trust and confidence in vaccination services. This could explain the literature by O'Neill which indicates the importance of health-care provider's recommendation regarding interventions to improve confidence and uptake in immunizations in the general population [29]. Additionally, the study found that a majority of the participants believe that religious leaders (51.7%) and community leaders (60.3%) support vaccination, highlighting the potential influence of religious and community leaders in promoting vaccination within the community. This high percentage can relate to the study by Syed et al in the USA where Faith-Based organizations and religious leaders influenced vaccine uptake and encouraged their members to get vaccinated with the COVID-19 vaccines. Within the health system, the study identified several challenges that individuals with disabilities face in accessing vaccination services. While a significant portion (53.4%) reported being contacted about getting vaccines for vaccine-preventable diseases, a concerning finding was that (31%) of the participants had been turned away when attempting to get vaccinated. This suggests potential barriers within the health system that need to be addressed to ensure equitable access to vaccination for individuals with disabilities. Furthermore, factors such as inconvenient clinic opening times and long waiting times were reported as barriers to getting vaccinated, indicating the need for improvements in service accessibility and efficiency.

Conclusion

The knowledge of vaccine among persons with disabilities was good. Their good attitudes toward vaccine were good. There was a statistically significant association between Knowledge and type of disability, marital status (being single) was significant with vaccine uptake. Health authorities could implement the following actions; Tailored communication strategies to address concerns specific to PWDs; improve access to vaccines by addressing barriers such as financial costs and lack of recommendation from healthcare providers; enhance accessibility and availability of healthcare services to PWDs in order to improve vaccine uptake; implement targeted educational campaigns to address misinformation and increase trust in vaccines among PWDs; collaborate with community leaders, healthcare providers, and disability organizations to develop culturally appropriate and accessible vaccine education materials; and investigate the specific factors that contribute to vaccine hesitancy among individuals with different types of disabilities and tailored interventions accordingly.

Limitation of the Study

Recall bias of respondents may have posed a serious limitation to the study. Some respondents must have forgotten the name of the vaccine they took making it difficult to know the different vaccines that persons living with disability have taken. The short time of the study might have caused some participants that would have given us vital information to be left out.

Most of the persons living with disability that were sampled had lower level of education, making it difficult for them to fill in the questionnaire. Also, communication to some of the persons living with disability was a limitation to the study since some of the disabilities like the hearing impaired needed an interpreter. We found just few articles on vaccine hesitancy with the disabled which made our discussion to be limited. We were not able to meet our sample size because it was difficult to reach out to most persons with disabilities, some of which are located in the crisis zones.

Strength of the Study

The larger the sample size increases the accuracy of the results documented from this study.

Also, probability sampling was used to recruit participants for the study. This gave all persons with disability equal chances of being recruited for the study thereby avoiding bias in the study

Authors' Contribution

Conceptualization, JND.; methodology, SE, BP, AAN, AS, and SGD; data analysis, SE, AAN, AS, and SGD; original draft preparation, JND, SE, SGD, and JMEA; writing—review and editing, JND, SE, BP, AAN, AS, SGD, and JMEA. All authors have read and agreed to the published version of the manuscript.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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