Hospital exposure to body fluids and vaccination status of caregivers: a cross-sectional study in public hospitals of Yaoundé-Cameroon

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Abstract

Background: In many Sub-Saharan African countries, structural health system challenges lead to a heavy reliance on informal caregivers to provide basic patient care in hospitals. These caregivers are frequently exposed to blood and body fluids (BBF), placing them at high risk of infections like hepatitis B, COVID-19, and cholera. This study aimed to assess the prevalence and determinants of BBF exposure and vaccination coverage among informal caregivers in public hospitals in Yaoundé, Cameroon.

Methods: A cross-sectional study was conducted between April and July 2025 at two public reference hospitals in Yaoundé. A total of 327 caregivers, aged ≥21 and caring for a hospitalized patient for ≥48 hours, were enrolled using a non-probabilistic convenience sampling technique. Data on sociodemographics, hospital experiences, BBF exposure, and vaccination status were collected via face-to-face interviews using a pre-tested questionnaire. Multivariate binary logistic regression was used to identify factors associated with full vaccination and exposure to BBF.

Results: A high proportion (57.49%) reported exposure to BBF, most commonly to urine (87%), expectoration (38%), and vomit (21%). Vaccination coverage was critically low: only 10.40% were fully vaccinated against hepatitis B, 6.12% against COVID-19, and 3.98% against cholera. Furthermore, 67.59% had not received any of the three vaccines. Multivariate analysis revealed female caregivers were significantly less likely to be fully vaccinated against COVID-19 (aOR=6.27), hepatitis B (aOR=2.98), and cholera (aOR=3.36) compared to males. Higher education level was associated with lower COVID-19 vaccine uptake (aOR=29.7), and unemployed caregivers were less likely to be vaccinated against hepatitis B than public sector workers (aOR=6.43). Caregivers who performed tasks had seventeen-fold increased odds of BBF exposure (aOR=17.1). Those with prior caregiving experience were three times more likely to be exposed (aOR=2.98). Married status and reporting difficulty sleeping were also significantly associated with higher exposure risk to BBF.

Conclusion: Informal caregivers in Cameroonian hospitals face high exposure to blood and body fluids, coupled with low vaccination coverage against key infectious diseases. These results underscore an urgent need for public health policies to recognize and protect them, including integrating them into infection prevention programs and implementing targeted vaccination campaigns within healthcare facilities.

Keywords: Exposure to blood and body fluids, COVID-19, hepatitis B, Cholera, vaccination, vaccine hesitancy, Cameroon

Introduction

Health systems in most Sub-Saharan African countries face major structural challenges, including a shortage of qualified personnel, insufficient budget allocations, and a deficit in leadership and management [1,2]. These constraints directly affect the availability and quality of medical equipment and facilities in hospitals.

As a result of a persistent shortage of qualified healthcare staff to meet the demand for care, a significant portion of basic care is provided by patients' families and close acquaintances within healthcare settings [3,4]. These informal caregivers, who are compelled to actively participate in patient care, take on essential tasks such as bathing, feeding, and administering medication [5].

Consequently, due to their constant presence at the patient's bedside in the hospital setting and the absence of adequate protective measures, informal caregivers are vulnerable to direct exposure to blood and other bodily fluids. They therefore run a high risk of contracting life-threatening infections, such as HIV, hepatitis B, hepatitis C, COVID-19 or other directly transmitted bacterial infections like cholera.

Hospital transmission can occur through splashes to the mucous membranes (eyes, nose, mouth) or broken skin, but also through percutaneous injuries such as needle sticks and cuts [6,7]. Their lack of knowledge about transmission mechanisms significantly exacerbates this risk [8].

This infectious peril exists in a context where Cameroon faces a significant burden of infectious diseases, compounding its public health challenges. In 2023, the national hepatitis B prevalence was 11.9% [9]. Cholera and COVID-19 outbreaks were particularly severe, resulting in 478 and 1,974 deaths, respectively, with high case fatality rates of 2.7% and 1.6% [10,11]. Despite this high burden, vaccine coverage remains inadequate [12–14], with public acceptance especially low for cholera and COVID-19 vaccines [15,16].

In addition to the direct infectious risk, caregivers face precarious living conditions within hospitals, where they often sleep on benches, in corridors, or even outdoors [17]. This overcrowding

doubly increases their vulnerability by exposing them to pathologies such as malaria, the common cold, or flu-like syndromes.

Thus, in their show of solidarity, these caregivers find themselves plunged into an environment that not only jeopardizes their health but also risks making them ill in turn. This problem stems directly from the structural shortcomings of the Cameroonian health system. Indeed, it does not officially recognize the place of the informal caregiver in the hospital, and access to health services is primarily ensured through direct "out-of-pocket" payments by users. This results in multiple barriers to accessing care, translating into incomplete universal health coverage, an extremely low insurance rate, and insufficient household income to procure quality services [18].

Faced with this new hospital environment, which must take this population and their health into account, it is necessary to implement sound policies to protect informal caregivers within hospitals. The establishment of such programs requires an assessment of their exposure risks. However, data that describe the experience of this specific population within Cameroon's health facilities are scarce. This cross-sectional study therefore aimed to provide a descriptive assessment and identify determinants of hospital exposure to blood and other body fluids among caregivers, as well as their vaccination status.

Methods

Study design & period

Between April and July 2025, we conducted a cross-sectional study for descriptive and analytical purposes at two public reference hospitals in Yaoundé: the Biyem-Assi District Hospital and the Military Hospital of Region No.1.

Setting

The study was set in Yaoundé, the political capital of Cameroon, a city of 1.5 million people that hosts all the nation's ethnic groups. Its demographic profile is notably young and has a gender imbalance skewed towards men, with the majority (70-80%) [19]. The selected study sites were two public reference hospitals: the Biyem-Assi District Hospital (a first-level referral center in the Yaoundé VI subdivision) and the Military Hospital of Region No. 1 (a third-level referral center in the Yaoundé III subdivision) [20]. In 2024, these two institutions had a combined capacity of 300

beds and managed approximately 73,000 consultations and 9,900 hospitalizations, providing over 35,000 days of inpatient care [21].

Study participants & selection criteria

Eligibility required individuals to be at least 21 years old and a caregiver for a patient hospitalized in one of the selected facilities for ≥48 hours. All eligible caregivers who provided informed consent were included.

Sampling method

The sample size was calculated using the single proportion formula, $n=(Z\alpha/2)2P(1-P)/d2$, at a 95% confidence interval. In this formula, $Z\alpha/2=1.96$, P=50% prevalence (since no similar study had been conducted previously in the study area), and d=5% marginal error. Using the formula, an estimated sample size of n=384 was obtained. The finite population correction was then applied to adjust the initial sample size (n) because the sampling frame was small (N≈1500 caregivers during the 3-month period) [22]. The adjusted sample size was calculated using the formula: Adjusted $n=(n\times N)/(n+(N-1))$, where n is the initial sample size (384) and N is the total number of eligible caregivers in the sampling frame during the study period. The calculation is as follows: Adjusted $n = (384\times1500)/ (384+(1500-1)) = 576{,}000/1883 \approx 306$. Thus, the required sample size was adjusted down to 306. Caregivers were approached in their respective departments and asked to participate. A non-probabilistic convenience sampling technique was used to enroll consenting caregivers.

Data collection tool and procedure

The study tool was a questionnaire designed to collect sociodemographic, hospital stay experience, hospital exposure to body fluids, and vaccination status. The questionnaire was pre-tested and then administered through face-to-face interview method with consenting caregivers.

Variables

The dependent variables included exposure to body fluids during the hospital stay and full vaccination status against hepatitis B, COVID-19, and cholera. The independent variables encompassed sociodemographic characteristics (age, gender, education level, marital status,

occupation, and income) and hospital experience (tasks performed during the hospital stay, experience trouble with a healthcare worker, prior experience as a caregiver, and perceived ease of sleeping during the hospital stay), as well as compliance with full vaccine uptake.

Data processing and analysis

Data were entered, exported, recoded as necessary, and analyzed using R Statistics version 4.4.2 [23]. The respondent characteristics were presented as counts and frequencies. Simple and multiple binary logistic regressions were used to assess the strength of association between variables. The selection of predictors that best fit the model was done stepwise using the Akaike Information Criterion (AIC)[24]. The model with the lowest index was then selected. A *p*-value <0.05 was considered statistically significant.

Ethical approval statement

This protocol was approved by the Human Health Research Ethical Review Committee for the Centre Region (CRERSH - Ce) and the ethical clearance: CE N° 00379/CRERSH/2025 issued. Informed consent was obtained from participants prior to inclusion in the study. All methods were performed in accordance with declaration of Helsinki.

Results

Sociodemographic characteristics of participants

A total of 327 caregivers were recruited. The majority were women (85.0%), with a significant portion aged between 41 and 50 years (29.4%). Most caregivers were married (58.7%) and had attained a secondary education level (47.7%). In terms of employment, the majority were self-employed (45.3%), with a monthly income typically between 50,000 and 100,000 CFA francs (28.1%) (Table 1).

Table 1 Sociodemographic characteristics of study participants, Yaoundé, 2025, Cameroon (n = 327)

Characteristic	Count (n)	Frequency (%)
Age		

21 – 30	55	16.8
31 – 40	73	22.3
41 – 50	96	29.4
51 – 60	81	24.8
61 – 70	22	6.7
Sex		
Female	278	85.0
Male	49	15.0
Study level		
No formal education	33	10.1
Primary	85	26.0
Secondary	156	47.7
Tertiary	53	16.2
Marital status		
Single	99	30.3
Divorced	6	1.8
Married	192	58.7
Widow(er)	30	9.2
Occupation		
Unemployed	98	30.0
Private sector	54	16.5
Public sector	27	8.3
Self-employed	148	45.3
Income (XAF)	98	30.0
None		
□ 50000	69	21.1
50000-100000	92	28.1
> 100000	68	20.8

XAF: Central Africa CFA Franc

Exposure to body fluids and vaccination coverage

A low proportion of 10.40% of caregivers had received the full hepatitis B vaccine, 6.12% received the full COVID-19 vaccine, and 3.98% received full cholera vaccine (Table 2). In terms of exposure, 188/327 (57%) participants reported having been exposed to blood and biological fluids during their stay at the hospital. They were most frequently exposed to urine (87%), expectoration (38%), and vomiting (21%) (Fig. 1).

Table 2 Vaccination status of caregivers in the hospital setting, Yaoundé, 2025, Cameroon (n = 327)

Parameter		Modality	Count (n)	Frequency (%)	95% CI limits	
Vaccine					Lower	Upper
	Hepatitis B	Fully	34	10.40	7.31	14.23
		Partially	32	9.79	6.79	13.53
		Unvaccinated	261	79.81	75.05	84.03
	COVID-19					

	Fully	20	6.12	3.78	9.29
	Partially	9	2.75	1.27	5.16
	Unvaccinated	298	91.13	87.51	93.98
Cholera					
	Fully	13	3.98	2.13	6.70
	Partially	43	13.14	9.68	17.3
	Unvaccinated	271	82.87	78.34	86.80
None of the three vaccines received		221	67.59	62.22	72.63
Occupational exposure to BBF		188	57.49	51.93	62.91

BBF: Blood and other body fluids

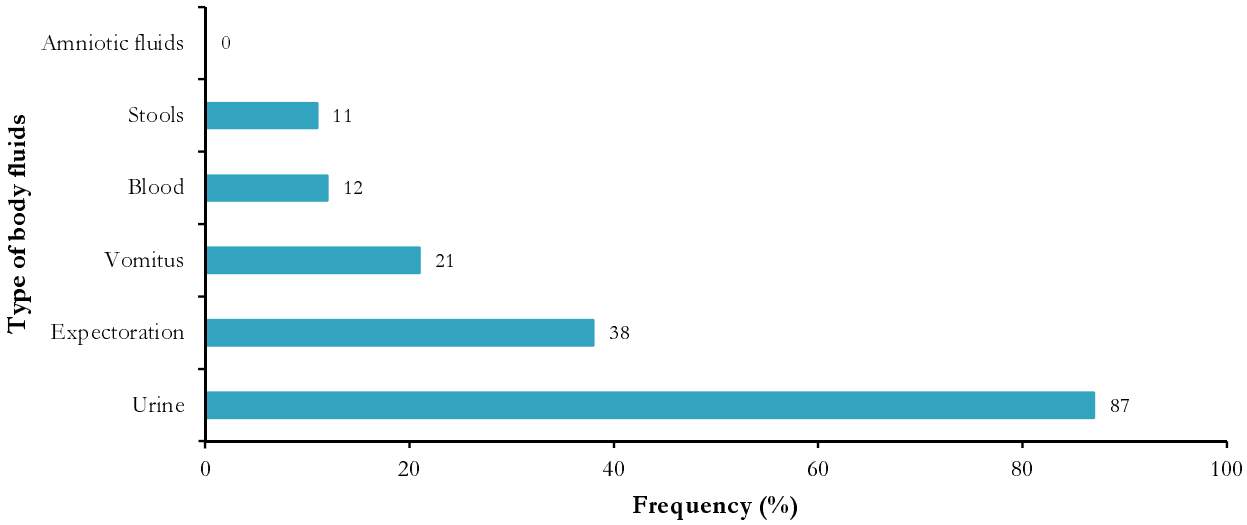

Fig. 1 Reported source of hospital exposure to blood and biological fluids experienced by patients' caregivers in Yaoundé health facilities, 2025, Cameroon

In All, 225/327 (69%) participants reported having previously being caregivers et the hospital. Among them, 88 / 225 (39.11%) stated that they had fallen ill during their experience as caregivers. The most frequently mentioned illnesses were malaria (72%), colds (42%), coughs (36%), and back pain (13%) (Fig. 2).

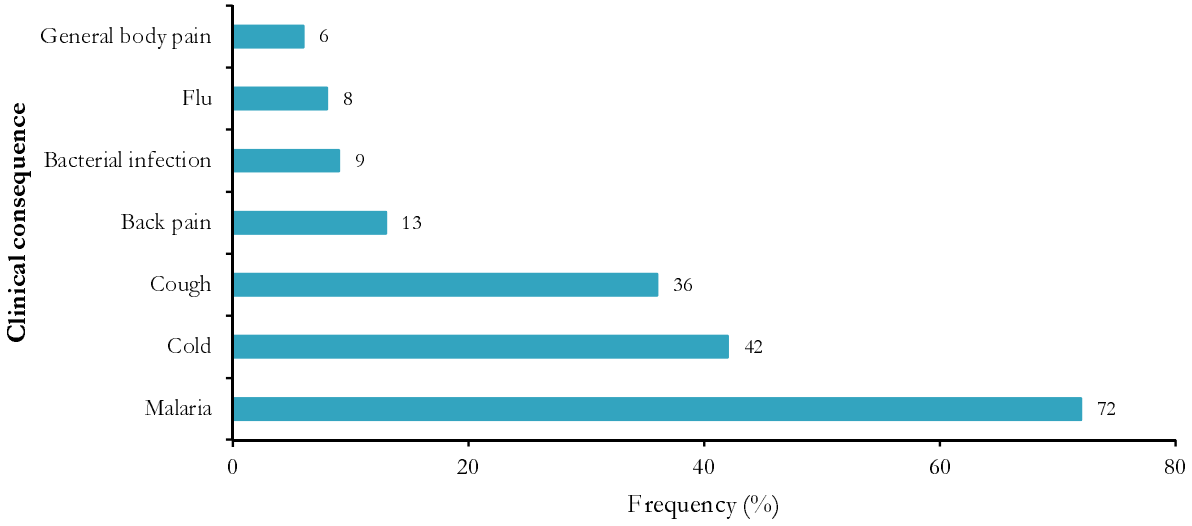

Fig. 2 Reported illness experienced after caregiving their patient in Yaoundé health facilities, 2025, Cameroon

Predictor of preventive vaccination

COVID-19 vaccination

Multivariate analysis showed a significant association between gender, marital status, education level, occupation, and COVID-19 vaccine uptake.

Gender: Female caregivers were significantly six times less likely to be fully vaccinated than their male counterparts (AOR = 6.27; 95% CI: 1.42-27.2; p = 0.013).

Marital Status: Unmarried caregivers were significantly eight times less likely to be fully vaccinated compared to married caregivers (AOR = 7.90; 95% CI: 2.22-36.3; p = 0.003).

Education Level: compared to those with no formal education, caregivers with a higher education level were significantly twenty-nine times less likely to have received a full course of a COVID-19 vaccine (AOR = 29.7; 95% CI: 1.83-65.9; p = 0.021) (Table 3).

Table 3 Simple and multiple binary logistic regression of factors associated with COVID-19 full vaccination among caregivers in hospital settings, Yaoundé, 2025, Cameroon (n = 327)

Predictor	Fully vaccinated against COVID-19		COR	*p*-value	AOR	95% CI		*p*-value
	No n = 307	Yes n = 20				Lower	Upper	
Sex								
Male	44 (89.8)	5 (10.2)	1		1			
Female	263 (94.6)	15 (5.4)	1.99	0.203	6.26	1.42	27.2	0.013
Age group								
21 – 30	51 (92.7)	4 (7.3)	1					
31 – 40	65 (89.0)	8 (11.0)	0.64	0.482				
41 – 50	92 (95.8)	4 (4.2)	1.80	0.418				
51 – 60	77 (95.1)	4 (4.9)	1.51	0.572				
61 – 70	22 (100.0)	0 (0.0)						
Study level								
No formal education	31 (93.9)	2 (6.1)	1		1			
Primary	81 (95.3)	4 (4.7)	1.31	0.764	3.40	0.41	22.7	0.211
Secondary	144 (92.3)	12 (7.7)	0.77	0.746	2.53	0.33	13.3	0.301
Tertiary	51 (96.2)	2 (3.8)	1.65	0.627	29.7	1.83	65.9	0.021
Marital status								
Married	176 (91.7)	16 (8.3)	1		1			
Unmarried	131 (97.0)	4 (3.0)	2.98	0.056	7.90	2.22	36.3	0.003
Occupation								
Public sector	17 (63.0)	10 (37.0)	1		1			
Unemployed	93 (94.9)	5 (5.1)	10.9	<0.001	17.0	4.42	78.0	0.001
Self-employed	144 (97.3)	4 (2.7)	21.2	<0.001	65.5	14.9	36.5	0.001
Private sector	53 (98.1)	1 (1.9)	31.2	0.002	81.9	10.7	18.84	0.001
Income (XAF)								
> 100000	61 (89.7)	7 (10.3)	1					
50000-100000	88 (95.7)	4 (4.3)	2.52	0.153				
□ 50000	65 (94.2)	4 (5.8)	1.86	0.339				
None	93 (94.9)	5 (5.1)	2.13	0.213				
Hepatitis B vaccination								
Fully	28 (82.4)	6 (17.6)	1					
Partially	27 (84.4)	5 (15.6)	1.16	0.826				
Unvaccinated	252 (96.6)	9 (3.4)	6.00	0.001				
Cholera vaccination								
Fully	10 (76.9)	3 (23.1)	1					
Partially	41 (95.3)	2 (4.7)	6.15	0.063				
Unvaccinated	256 (94.5)	15 (5.5)	5.12	0.021				

COR: Crude odds ratio; AOR: Adjusted odds ratio; CI: Confidence interval; XAF: Central Africa CFA Franc

Hepatitis B vaccination

Multivariate analysis revealed a significant association between gender, occupation, and cholera vaccination status with full vaccination against hepatitis B.

Gender: Female caregivers were significantly three times less likely to be fully vaccinated against hepatitis B than male counterparts (AOR = 2.98; 95% CI: 1.16-7.64; $p = 0.022$).

Occupation: Unemployed caregivers were significantly six times less likely to be fully vaccinated for hepatitis B than public sector workers (AOR = 6.43; 95% CI: 1.67-26.1; $p = 0.007$).

Cholera vaccination status: Caregivers who had not received any cholera vaccine were significantly eight times less likely to be fully vaccinated for hepatitis B (AOR = 8.20; 95% CI: 1.76-34.7; $p = 0.005$) (Table 4).

Table 4 Simple and multiple binary logistic regression of factors associated with hepatitis B full vaccination among caregivers in hospital sittings, Yaoundé, 2025, Cameroon (n = 327)

Predictor	Fully vaccinated against hepatis B		COR	*p*-value	AOR	95% CI		*p*-value
	No n = 283	Yes n = 34				Lower	Upper	
Sex								
Male	38 (77.6)	11 (22.4)	1		1			
Female	255 (91.7)	23 (8.3)	3.21	0.004	2.98	1.16	7.64	0.022
Age group								
21 – 30	50 (90.9)	5 (9.1)	1		1			
31 – 40	58 (79.5)	15 (20.5)	0.39	0.085	0.36	0.09	1.24	0.122
41 – 50	89 (92.7)	7 (7.3)	1.27	0.695	0.93	0.21	3.80	0.926
51 – 60	79 (97.5)	2 (2.5)	3.95	0.109	2.51	0.40	21.0	0.343
61 – 70	17 (77.3)	5 (22.7)	0.34	0.119	0.27	0.05	1.37	0.110
Study level								
Tertiary	42 (79.2)	11 (20.8)	1					
Secondary	141 (90.4)	15 (9.6)	2.62	0.038				
Primary	80 (94.1)	5 (5.9)	4.19	0.012				
No formal education	30 (90.9)	3 (9.1)	2.62	0.165				
Marital status								
Married	118 (87.4)	17 (12.6)	1					
Unmarried	175 (91.1)	17 (8.9)	1.48	0.278				
Occupation								
Public sector	20 (74.1)	7 (25.9)	1		1			
Private sector	44 (81.5)	10 (18.5)	1.54	0.442	2.05	0.59	7.06	0.252
Self-employed	137 (92.6)	11 (7.4)	4.36	0.006	3.93	1.18	12.6	0.022
Unemployed	92 (93.9)	6 (6.1)	5.37	0.006	6.43	1.67	26.1	0.007
Income (in XAF)								
> 100000	54 (79.4)	14 (20.6)	1					
50000-100000	85 (92.4)	7 (7.6)	3.15	0.020				
□ 50000	62 (89.9)	7 (10.1)	2.30	0.096				
None	92 (93.9)	6 (6.1)	3.98	0.008				
Cholera vaccination								
Fully	9 (69.2)	4 (30.8)	1		1			
Partially	35 (81.4)	8 (18.6)	1.94	0.354	3.13	0.59	16.1	0.170
Unvaccinated	249 (91.9)	22 (8.1)	5.03	0.012	8.20	1.76	34.7	0.005

COR: Crude odds ratio; AOR: Adjusted odds ratio; CI: Confidence interval; XAF: Central Africa CFA Franc

Cholera vaccination

The female gender was significantly three times less likely to be fully vaccinated against cholera than male (Table 5).

Table 5 Simple and multiple binary logistic regression of factors associated with cholera vaccination among caregivers in hospital settings, Yaoundé, 2025, Cameroon (n = 327).

Predictor	Fully vaccinated against Cholera		COR	*p*-value	AOR	95% CI		*p*-value
	No n = 314	Yes n = 12				Lower	Upper	
Sex								
Male	47 (95.9)	2 (4.1)						
Female	267 (96.0)	11 (4.0)	1.03	0.967	3.36	1.07	12.6	0.048
Age group								
21 – 30	50 (90.9)	5 (9.1)						
31 – 40	72 (98.6)	1 (1.4)	7.20	0.076				
41 – 50	92 (95.8)	4 (4.2)	2.30	0.230				
51 – 60	79 (97.5)	2 (2.5)	3.95	0.109				
61 – 70	21 (95.5)	1 (4.5)	2.10	0.510				
Study level								
Tertiary	50 (94.3)	3 (5.7)						
Secondary	150 (96.2)	6 (3.8)	1.50	0.576				
Primary	82 (96.5)	3 (3.5)	1.64	0.554				
No formal education	32 (97.0)	1 (3.0)	1.92	0.579				
Marital status								
Married	126 (93.3)	9 (6.7)						
Unmarried	188 (97.9)	4 (2.1)	3.36	0.048				
Occupation								
Unemployed	92 (93.9)	6 (6.1)						
Self-employed	144 (97.3)	4 (2.7)	2.35	0.195				
Private sector	52 (96.3)	2 (3.7)	1.70	0.527				
Public sector	26 (96.3)	1 (3.7)	1.70	0.632				
Income (in XAF)								
> 100000	65 (95.6)	3 (4.4)						
50000-100000	91 (98.9)	1 (1.1)	4.20	0.218				
□ 50000	66 (95.7)	3 (4.3)	1.02	0.985				
None	92 (93.9)	6 (6.1)	0.71	0.634				

COR: Crude odds ratio; AOR: Adjusted odds ratio; CI: Confidence interval; XAF: Central Africa CFA Franc

Risk of exposure to blood and biological fluids among caregivers

More than half of the respondents who reported exposure to body fluids have not received any vaccine course of against hepatitis B (n = 168/327; 51,4%), cholera (n = 178/327; 54.4%) or COVID-19 (n = 173/327; 54.1%).

Multivariate analysis showed a significant association between hospital exposure to blood and biological fluids and several caregiver characteristics:

Prior hospital tasks: Caregivers who had previously performed tasks in the hospital were 17 times more likely to be exposed to blood and biological fluids (AOR = 17.1; 95% CI: 8.36–38.3; $p < 0.001$).

Past caregiving experience: Those with prior caregiving experience were 3 times more likely to be exposed (AOR = 2.98; 95% CI: 1.60–5.57; $p = 0.001$).

Marital status: Married caregivers (AOR = 2.28; 95% CI: 1.24-4.21; $p = 0.008$) were more likely to be exposed to biological fluids during caregiving.

Sleeping condition: caregivers who reported difficulty of sleeping were two to three times more likely to get exposed to biological fluids (AOR = 2.80; 95% CI:1.01-7.81; $p = 0.047$ and AOR = 3.28; 95% CI: 1.21-8.97; $p = 0.019$). (Table 6)

Table 6 Simple and multivariate regression of caregivers' exposure risk to blood and biological fluids in Yaoundé hospital settings, 2025, Cameroon (n = 327)

Risk factor	Exposed to BBF		COR	*p*-value	AOR	95% CI		*p*-value
	Yes n = 188	No n = 139				Lower	Upper	
Sex								
Male	20 (40.8)	29 (59.2)	1					
Female	168 (60.4)	110 (39.6)	2.21	0.012				
Age group								
21 – 30	18 (32.7)	37 (67.3)	1					
31 – 40	35 (47.9)	38 (52.1)	1.89	0.085				
41 – 50	58 (60.4)	38 (39.6)	3.14	0.001				
51 – 60	59 (72.8)	22 (27.2)	5.51	<0.001				
61 – 70	18 (81.8)	4 (18.2)	9.25	<0.001				
Study level								
Tertiary	22 (41.5)	31 (58.5)	1					
Secondary	91 (58.3)	65 (41.7)	1.97	0.035				
Primary	52 (61.2)	33 (38.8)	2.22	0.025				
No formal education	23 (69.7)	10 (30.3)	3.24	0.012				
Marital status								
Single	40 (40.4)	59 (59.6)	1		1			
Divorced	2 (33.3)	4 (66.7)	0.74	0.732	0.28	0.04	1.83	0.188
Married	119 (62.0)	73 (38.0)	2.40	0.001	2.28	1.24	4.21	0.008
Widow(er)	27 (90.0)	3 (10.0)	13.3	0.001	14.0	3.51	75.3	<0.001
Occupation								
Public sector	7 (25.9)	20 (74.1)	1					
Private sector	29 (53.7)	25 (46.3)	3.31	0.020				
Self-employed	97 (65.5)	51 (34.5)	5.43	<0.001				
Unemployed	55 (56.1)	43 (43.9)	3.65	0.007				
Income (In XAF)								
None	55 (56.1)	43 (43.9)	1					

□ 50000	39 (56.5)	30 (43.5)	1.02	0.959				
50000-100000	54 (58.7)	38 (41.3)	1.11	0.720				
> 100000	40 (58.8)	28 (41.2)	1.12	0.729				
Caregiving period (in days)								
2-3	33 (37.9)	54 (62.1)	1					
4-7	98 (58.7)	69 (41.3)	2.32	0.002				
8+	57 (78.1)	16 (21.9)	5.83	<0.001				
Had trouble with a HCW								
No	126 (54.5)	105 (45.5)	1					
Yes	62 (64.6)	34 (35.4)	1.52					
Hepatitis B vaccination								
Fully	20 (58.8)	14 (41.2)	1					
Partially	17 (53.1)	15 (46.9)	0.79	0.641				
Unvaccinated	151 (57.9)	110 (42.1)	0.96	0.914				
COVID-19 vaccination								
Fully	11 (55.0)	9 (45.0)	1					
Partially	3 (33.3)	6 (66.7)	0.41	0.286				
Unvaccinated	174 (58.4)	124 (41.6)	1.15	0.766				
Cholera vaccination								
Fully	10 (76.9)	3 (23.1)	1					
Partially	26 (60.5)	17 (39.5)	0.46	0.285				
Unvaccinated	152 (56.1)	119 (43.9)	0.38	0.152				
Performed task during the hospital stay								
No	12 (14.0)	74 (86.0)	1		1			
Yes	176 (73.0)	65 (27.0)	16.7	<0.001	17.1	8.36	38.3	<0.001
Have been caregiver before								
No	33 (32.4)	69 (67.6)	1		1			
Yes	155 (68.9)	70 (31.1)	4.63	<0.001	2.98	1.60	5.57	0.001
Feel easy to sleep during hospital stay								
Yes	11 (40.7)	16 (59.3)	1		1			
Sometime	78 (59.5)	53 (40.5)	2.14	0.077	2.80	1.01	7.81	0.047
Never	99 (58.6)	70 (41.4)	2.06	0.087	3.28	1.21	8.97	0.019

BBF: Blood and other body fluids; COR: Crude odds ratio; AOR: Adjusted odds ratio; CI: Confidence interval; XAF: Central Africa CFA Franc; HCW: Healthcare worker

Discussion

This study aimed to provide a descriptive overview and identify the determinants of exposure to blood and body fluids (BBF) among caregivers, as well as to assess their vaccination status. The results reveal that caregivers are highly exposed to these fluids in the hospital setting, despite very low vaccination coverage.

The majority of participants were female and over 41 years old. Similar results were found in a study conducted in Iran, which could be explained by the fact that as women get older, they are more likely to care for their relatives without necessarily considering the risks of exposure [25]. Half of the participants were either unemployed or self-employed and had a monthly income of less than

50,000 CFA francs. Indeed, due to the long hospital stays required, families tend to assign the most available person to stay by the patient's side [17].

Among participants who had previously been patient attendants, over 25% had contracted an illness during their hospital stay. This concerning figure corroborates the findings of a Cameroonian study documenting the precarious living conditions of these caregivers [17,26]. Due to a lack of suitable accommodation, they are often compelled to sleep on benches, in corridors, or in the open air, which significantly increases their risk of exposure to pathogens. This situation calls for urgent action from policymakers to guarantee the health and well-being of this vulnerable population by creating safe and suitable reception areas within healthcare facilities.

Just under a quarter of the caregivers surveyed had received a complete COVID-19 vaccination schedule, a finding similar to that observed in Congo [27]. This low coverage is mainly explained by vaccine hesitancy, fueled by doubts about the vaccines' efficacy and safety, a lack of information, and widespread mistrust [28,29]. To promote uptake, vaccination strategies must therefore imperatively target the specific factors underlying this hesitancy within the population [30].

A higher level of education was significantly associated with COVID-19 vaccination. This trend was also observed in a study conducted in the United States [31]. Caregivers with a higher level of education are indeed more likely to adopt health-promoting behaviors, including preventive measures against infectious diseases like COVID-19. Furthermore, they generally benefit from better access to health resources, particularly information on disease prevention [32]. These results underscore the need to strengthen vaccination awareness, specifically targeting less educated populations. To effectively reach these groups, including in the most remote areas, it is essential to use widely accessible communication channels, such as media (television, radio), social networks, and health facilities.

Regarding hepatitis B, only 10.40% of caregivers had received a complete vaccination. This insufficient vaccination coverage worsens the burden of this preventable disease [33]. This result is lower than that observed in another Cameroonian study, a discrepancy that could be explained by differences in the study populations [7].

Studies have identified several barriers that could explain this low vaccination coverage, including the high cost of the vaccine, lack of time to get vaccinated, neglect, and vaccine unavailability [7,34]. To reduce the incidence of infection, the policy of free vaccination for

newborns of infected mothers must be reinforced by intensive behavior change campaigns aimed at promoting preventive behaviors within the population [35].

Unemployed caregivers and those not vaccinated against cholera were respectively six and eight times more likely to be vaccinated against hepatitis B. This trend, which contrasts with data from an Ethiopian study, could reveal a unique opportunity to target these groups in future awareness and vaccination strategies [36].

Less than 5% of caregivers were fully vaccinated against cholera, with a lack of awareness of the vaccine's existence identified as a major barrier [14]. Consequently, it is crucial to intensify awareness campaigns focused on communities and to adjust public health strategies to better meet the specific needs of this population [37].

Over 50% of caregivers were exposed to body fluids, a result similar to that observed in Bangladesh [8]. Most of the exposed caregivers were not fully vaccinated against hepatitis B, Cholera, and COVID-19. This makes them more vulnerable to infectious diseases, especially if an outbreak appears in the study area [38,39].

These findings corroborate results among healthcare workers in both a district and a referral hospital in Yaoundé. Workers responsible for providing primary care were not fully protected against these diseases, a situation worsened by recurrent shortages of personal protective equipment, poor compliance with standard precautions, and inadequate management of exposure cases in most hospital settings [39–43].

Multivariate analysis revealed that caregivers performing hospital tasks had a 17-fold higher risk of exposure to blood and body fluids, while those with prior caregiving experience had a three-fold higher risk. Paradoxically, these essential care actors receive no training in basic precautions, leaving them defenseless against the growing threat of nosocomial infections [5,44].

Limitations

The main limitation of this study is the risk of recall bias regarding previous exposure, or the difficulty in proving that exposure to the risk was prior to the outcome. The study was also subject to social desirability bias but this was mitigated by asking multiple question to establish the vaccination status of the respondent (type of vaccine, number of doses received and the approximate date of the last dose). In addition, a qualitative research design might be helpful in understanding why help

understanding the deep reason behind poor compliance with vaccination and other issues raised in this study.

Conclusions

Caregivers play an indispensable role in the Cameroonian healthcare system. They perform their tasks without protective measures and are at a significant risk of exposure to blood and other body fluids. Vaccination coverage among these caregivers is very low for diseases such as hepatitis B, COVID-19, and cholera, with less than a quarter being fully vaccinated. Furthermore, their precarious living conditions are so dire that a significant proportion have already contracted illnesses during their hospital stays, primarily malaria, respiratory infections (colds, coughs), and back pain. Given this critical situation, it is urgent for policymakers to integrate informal caregivers as key players in the health system. This requires implementing appropriate policies and providing them with the necessary tools to reduce their exposure to infectious risks. These actions should include creating safe reception areas, providing training on risk protection within hospitals, and intensifying targeted awareness campaigns to improve prevention and vaccination.

Abbreviations

aOR: Adjusted Odds Ration

CI: Confidence Interval

cOR: Crude Odds Ratio

COVID-19: New Coronavirus Disease

Declaration

Authors' contribution: Conception, drafting of the study protocol, data collection, analysis, and interpretation: R.T.; Drafting and editing of manuscript: R.T. and F.Z.L.C.; Critical revision of the manuscript: R.T., A.E.M., G.A.M., G.R.E. and F.Z.L.C.; Conception, design and supervision of

research protocol and implementation, data analysis plan, data analysis, interpretation, revision, and editing: F.Z.L.C.; Final validation of the manuscript: All authors.

Ethical approval statement: This protocol was approved by the Human Health Research Ethical Review Committee for the Centre Region (CRERSH - Ce) and the ethical clearance: CE Nº 00379/CRERSH/2025 issued. Informed consent was obtained from participants prior to inclusion in the study. All methods were performed in accordance with declaration of Helsinki.

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