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Research Article

Knowledge and Practice of Doctors on the Biomarker Score in Determining the Risk of Heart Failure in GOMA

Ferdinand Ng'ekieb Mukoso[1-3], Aliocha Natuhoyila Nkodila[4*], Augustin Mpwo Kipela[5], Cedric Mbala Kalala[1], Hippolyte Nani Tuma Situakibanza[6], Daniel Mukadi-Bamuleka[7-9], Richard Bitwe Mihanda[2], Stannislas Okitotsho Wembomyama[2,4], Zacharie Kibendelwa Tsongo[2,11]

[1]Department of Health Sciences, Higher Institute of Medical Techniques of Bandundu, Bandundu, Democratic Republic of Congo.

[2]Faculty of Medecine, University of Goma, Goma, Democratic Republic of Congo

[3]Service of Cardiology, International Clinic for Advanced Medicine in Kivu, Goma, Democratic Republic of Congo

[4]Department of Family Medicine and Primary Health Care, Protestant University of Congo, Kinshasa, Democratic Republic of Congo.

[5]Department of Biology, Higher Pedagogical Institute of Bagata, Bandundu, Democratic Republic of Congo

[6]Faculty of Medicine, University of Kinshasa, Kinshasa, Democratic Republic of Congo.

[7]Rodolphe Mérieux INRB-Goma Laboratory, Goma, North Kivu, Democratic Republic of the Congo

[8]Institut National de Recherche Biomédicale, INRB, Kinshasa, Democratic Republic of the Congo

[9]Service of Microbiology, Department of Medical Biology, Kinshasa Teaching School of Medicine, University of Kinshasa, Kinshasa, Democratic Republic of the Congo

[10]Faculty of Medicine, University of Lubumbashi, Democratic Republic of Congo

[11]Faculty of Medicine and Pharmacy, University of Kisangani, Democratic Republic of Congo

***Corresponding author:** Aliocha Natuhoyila Nkodila, Department of Family Medicine and Primary Health Care, Protestant University of Congo, Kinshasa, Democratic Republic of Congo

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Abstract

Heart failure (HF) is a common condition, long considered a symptomatic disease. Today the burden linked to HF has pushed researchers to implement means of early detection such as the biomarker score. This was a transverse and analytical study that included 135 doctors from the public and private sectors. The snowball method was used to identify doctors. Sociodemographic and knowledge characteristics were studied. A total of 135 Doctors were interviewed, The majority of Doctors had poor knowledge (35.6%). After adjustment in multivariate analysis, provision in the West block (aOR 3.62 95% CI: 1.74-5.93), training in a public university (aOR 2.64 95% CI: 1.27-3.96), the specialty in Internal Medicine (aOR 2.73 95% CI: 1.44-3.91) and service in a tertiary hospital (aOR 3.43 95% CI: 1.52-5.91) had emerged as independent determinants of good knowledge on biomarker score in heart failure determination. Doctors' knowledge of this topic is low; following difficulties in the means of sharing knowledge.

Abbreviations: HF: Heart failure, IQR: Interquartile range; iSGT-2: sodium-glucose co-transporter type 2 inhibitors; aOR: Ajusted Odd Ratio; CI: Confidence interval; DRC: Democratic Repuiblic of the Congo; NT-proBNP: B-type natriuretic peptides such as N-terminal pro Brain natriuretic peptide; hs-CPR: ultrasensitive c-reactive protein ; hs-TnI: ultrasensitive cardiac troponin; aLVH: left ventricular hypertrophy; SPSS: Statistical package for social sciences; SPSS: Statistical Package for social Sciences.

Introduction

A biomarker is a biological characteristic measured objectively (i.e., with precision and reproducibility) and evaluated as an indicator of either normal or pathological biological processes or of pharmacological responses resulting from a therapeutic intervention (a biological indicator depending on the state of the subject, it can be found in a healthy or sick individual, the difference being quantitative) [1,2].

The nature of a biomarker can be cellular or molecular such as DNA, RNA, protein metabolites. They are measured via tissue biopsy or liquid analysis; For example blood, urine, and saliva. Other physiological and morphological biomarkers can be measured by medical imaging. Quantitative biomarkers are used in the detection of a pathogenic process with a threshold effect, whereas qualitative biomarkers are involved in the identification of a pathogenic process in the context of a yes or no analysis [2].

The biomarker score includes B-type natriuretic peptides such as N-terminal pro Brain natriuretic peptide (NT-proBNP), ultrasensitive c-reactive protein (hs-CPR) ; ultrasensitive cardiac troponin (hs-TnI) and left ventricular hypertrophy (LVH). The scoring of its markers is: one (1) point for each abnormal biomarker is awarded with a maximum score of four (4). The characteristics and risk of heart failure are assessed in four major groups of biomarkers: a very low score equal to zero (0), a low score equal to One (1), an intermediate score equal to two (2) and a high score between three (3) to four (4) [3]. Ventricular hypertrophy as an element of the biomarker score, its systematic search using the Peguero index is more profitable in the clinic [4].

The biomarker offers clinicians several advantages. For example: diagnosing diseases or predicting the risks of conditions, monitoring asymptomatic people for early clues of disease, targeting specific groups for whom particular treatment may be helpful, and predicting the prognosis of cardiovascular diseases [5-7]. This score is essential in clinical practice in the early detection of cardiovascular diseases, especially the risk of HF, and helps in the preventive strategy of HF in diabetics [3,8].

In developed countries, there is a reduction in the prevalence of heart failure (HF) with reduced and intermediate ejection fraction compared to an increase in heart failure with preserved ejection fraction [5]. This reversal in the prevalence of different types of HF is due to the high proportion of comorbidities such as diabetes mellitus, high blood pressure, obesity, obstructive sleep apnea syndrome and renal failure. Apart from co-morbidities, the use of the biomarker score in the West offers instant detection of HF risk and an effective means of screening for HF with high ejection fraction [5,9].

Indeed, diabetes mellitus is one of the major co-morbidities; which preferentially affects the cardiovascular system although other organs can be affected. In diabetics suffering from HF, the biomarker score improves the early detection of HF and allows early initiation of preventive therapy [3].

In Africa in general and in the Democratic Republic of Congo (DRC) in particular, few studies have evaluated the level of knowledge of doctors on the use of biomarker scores in determining the risk of HF. However, reducing the prevalence and preventing heart failure with reduced ejection fraction requires screening for the risk of heart failure and its treatment using the biomarker score. The overall survival rate after a diagnosis of HF is 24.5% at 10 years and a decrease in this rate of 64.7% in patients aged 45 to 54 years, 4.5% of patients over 80 years old [10].

Assessing physicians' knowledge of biomarker scoring is crucial because lack of knowledge leads to an increase in the prevalence of HF complications. Current projections point to

increasing prevalence of diabetes mellitus in low-income countries [11]. The lack of knowledge on diagnostic strategies for the risk of HF in diabetic patients associated with poverty in the Democratic Republic of Congo constitutes a great threat for said patients through the early onset of cardiovascular diseases, particularly heart failure. Non-use of sodium glucose co-transporter type 2 inhibitors guided by the Biomarker score [12,13]. However, the prevalence of symptomatic heart failure will continue to increase in our hospitals.

This study evaluates the knowledge of doctors on the use of biomarker scores to determine the risk of heart failure in asymptomatic diabetics in hospitals in the Democratic Republic of Congo.

Results

During this study, 135 Doctors were interviewed and their general characteristics are described in (Table 1) The majority of Doctors had an age between 35-44 years (50.4%) with an average age of 37± 5.8 years. Men (80.7%) were more represented than women with a sex ratio of 4M/1F. Their median length of service was 8 years (IQR: 4-11), the majority of them worked in public hospitals (65.2%). 19.3% were specialists of which 8.9% were internists (Table 1).

Variables	Effective (n=135)	%	Mean ±SD Me (IQR)
Age			37.0±5.8
<35 years	50	37.0	
35-44 years	68	50.4	
>44 years	17	12.6	
Gender			
Male	109	80.7	
Female	26	19.3	
Marital status			
Married	102	75.6	
Not married	33	24.4	
Hospital of origin			
State	88	65.2	
Private	24	17.8	
Confessional	23	17.0	
Professional exercise block			
East	41	30.4	
West	86	63.7	
Center	8	5.9	
Training university			
Audience	104	77.0	
Private	31	23.0	
Doctor's grade			
Generalist	71	52.6	
Specialist	26	19.3	
In specialization	38	28.1	
Branch of specialization			
Internal Medicine	12	8.9	
Others	13	9.6	

Seniority			8.0 (4.0-11.0)
1-5 years	43	31.9	
>5 years	92	68.1	
Sector of practice			
Public	106	78.5	
Private	29	21.5	
Health level of the Hospital			
Primary	22	16.3	
Secondary	56	41.5	
Tertiary	57	42.2	

Table 1: General characteristics of doctors

Level of knowledge on the diagnosis of heart failure in diabetics

Looking at the different elements constituting knowledge on the diagnosis of heart failure in diabetics, we note that the majority of Doctors had low knowledge (35.6%) (Figure 1).

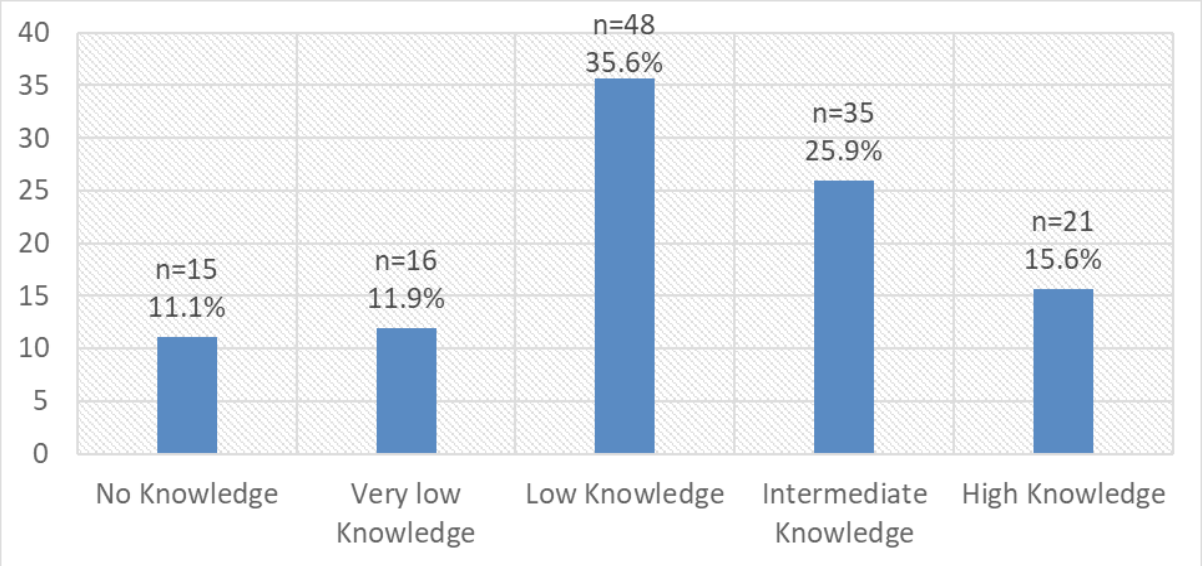

Figure 1: Level of knowledge about the diagnosis and management of heart failure

Table 2 summarizes the characteristics of Doctors' specific knowledge of heart failure; we note that 43.7% of doctors had already heard of the biomarker score, most often during the course and in the medical journal (Table 2).

Knowledge	**Effective (n=135)**	**%**
Biomarker score		
No	76	56.3
Yes	59	43.7
Information sources		
Course	23	17.0
Medical review	21	15.6

Congress	17	12.6
Continuing education	19	14.1
Media	9	6.7
Non-pharmacological means of treating HF		
No	31	23.0
Yes	104	77.0
Pharmacological means of treating the risk of heart failure in diabetics		
No	29	21.5
Yes	106	78.5
Do you think you might be interested in training on the use of biomarkers?		
No	21	15.6
Yes	114	84.4

Table 2: Specific knowledge on the diagnosis of heart failure risk

Knowledge of Doctors on pharmacological treatment (iSGT-2) to prevent heart failure in diabetics.

Of all the doctors surveyed, only 8 (5.9%) had knowledge of sodium-glucose co-transporter type 2 inhibitors (iSGT-2) as a pharmacological means of preventing the risk of heart failure in diabetic (Figure 2).

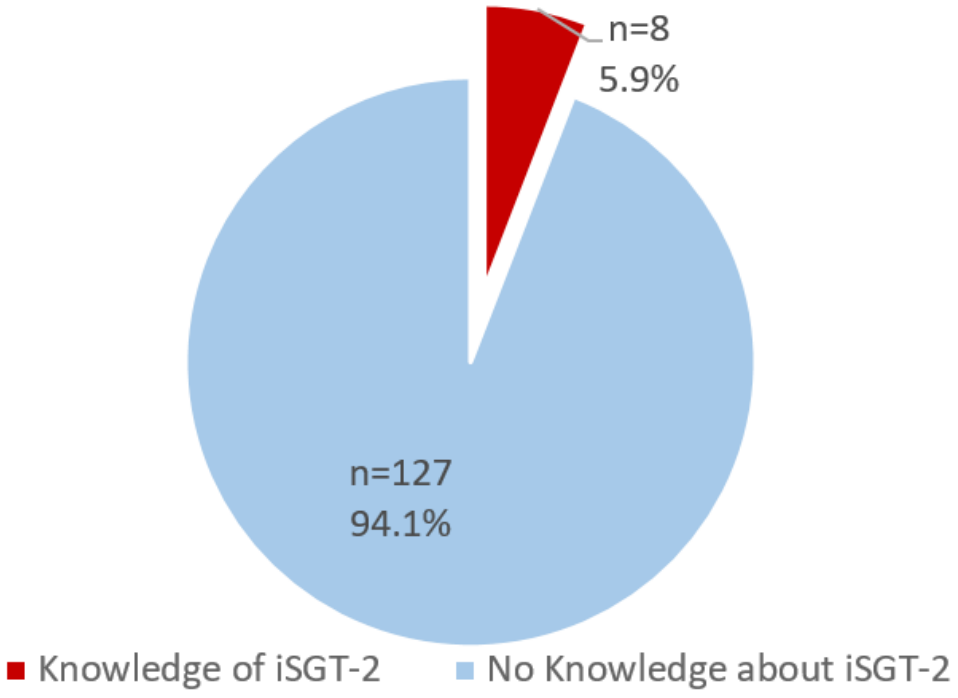

Figure 2: Physicians' knowledge of pharmacological treatment (iSGT-2) to prevent heart failure.

This table indicates that good knowledge on the biomarker score was higher among doctors from the West and East block, particularly those from 1) public universities, 2) public hospitals, 3) tertiary hospitals and 4) those from Internists (Table 3).

Variables	n	Low knowledge	Good knowledge	p	aOR (95%CI)
Age					
<35 years	50	28(56.0)	22(44.0)	0.658	1.44 (0.46-4.51)
35-44 years old	68	40(58.8)	28(41.2)	0.531	1 .28 (0.43-3.89)
>44 years old	17	11(64.7)	6(35.3)		1
Gender					
Male	109	63(57.8)	46(42.2)	0.728	1.17 (0.49-2.81)
Female	26	16(61.5)	10(38.5)		1
Marital status					
Married	102	59(57.8)	43(42.2)	0.780	1.12 (0.50-2.50)
Not married	33	20(60.6)	13(39.4)		1
Exercise block					
East	41	22(53.7)	19(46.3)	**0.001**	4.05 (1.68-6.60)
West	86	50(58.1)	36(41.9)	**0.013**	3.04 (1.59-5.79)
Center	8	7(87.5)	1(12.5)		1
Training university					
Public	104	54(51.9)	50(48.1)	**<0.001**	3.71(2.76-5.83)
Private	31	25(80.6)	6(19.4)		1
Grade of provider					
Generalist	71	39(54.9)	39(45.1)	0.408	1.41 (0.63-3.16)
Specialist	26	16(61.5)	10(38.5)	0.109	1.71 (0.38-3.00)
In specialization	38	24(63.2)	14(36.8)		1
Discipline Specialization					
Internal Medicine	12	6(50.0)	6(50.0)	**<0.001**	3.33 (1.60-5.43)
Others	13	10(76.9)	3(23.1)		1
Seniority					
>5 years	92	53(57.6)	39(42.4)	0.754	1.13 (0.54-2.35)
1-5 years	43	26(60.5)	17(39.5)		1
Sector of practice					
Public	106	59(55.7)	47(44.3)	**0.004**	1.77 (1.38-4.25)
Private	29	20(69.0)	9(31.0)		1
Health level					
Primary	22	21(95.5)	1(4.5)		1
Secondary	56	35(62.5)	21(37.5)	**0.023**	2.54 (1.51-3.69)
Tertiary	57	23(40.4)	34(59.6)	**<0.001**	3.75 (2.38-7.54)

Table 3: Biomarker score knowledge and physician characteristics

In univariate logistic regression analysis, practice in the East or West block, training in a public university, specialty in Internal Medicine, practice in a public and/or tertiary hospital were associated with a good level of knowledge on the biomarker score.

After adjustment in multivariate analysis, provision in the West block (aOR : 3.62 95% CI: 1.74-5.93), training in a public university (aOR : 2.64 95% CI: 1.27-3, 96), the specialty in Internal Medicine (aOR: 2.73 95% CI: 1.44-3.91) and service in a tertiary hospital (aOR: 3.43 95% CI: 1.52-5.91) had emerged as independent determinants of good knowledge on biomarker score in determining heart failure (Table 4).

Variables	Univariéate analysis		Multivariate analysis	
	p	OR (IC95%)	p	aOR (95%CI)
Exercise block				
East	**0.001**	2.05 (1.68-4.60)	0.120	1.52 (0.62-4.74)
West	**0.013**	3.04 (1.59-5.79)	**0.010**	3.62 (1.74-5.93)
Center		1		1
Training university				
Public	**<0.001**	3.71(2.76-5.83)	**0.001**	2.64 (1.27-3.96)
Private		1		1
Discipline Specialization				
Internal Medicine	**<0.001**	3.33 (1.60-5.43)	**0.002**	2.73 (1.44-3.91)
Others		1		1
Sector of practice				
Public	**0.004**	1.77 (1.38-4.25)	0.706	1.38 (0.13-2.19)
Private		1		1
Health level				
Tertiary	**<0.001**	3.75 (2.38-7.54)	**0.014**	3.43 (1.52-5.91)
Secondary	**0.023**	2.54 (1.51-3.69)	0.526	1.36 (0.36-1.68)
Primary		1		1

Table 4: Independent determinants of good knowledge on the determination of insufficiency among Doctors

Discussion

Very few studies have been carried out in the DRC and Africa on the evaluation of doctors' knowledge on the use of the biomarker score in diabetics.

This first survey aimed to evaluate physicians' knowledge of the biomarker score, which is an important tool for diagnosing and guiding preventive therapy of HF in diabetics.

We surveyed 135 doctors. Our study clearly shows that new knowledge arrives late in our environment; As illustrated by the low knowledge of doctors on the biomarker score (36.6%). The better knowledge of the use of the biomarker score makes it possible to diagnose and treat the risk of heart failure in diabetics [3,8].

The low proportion of doctors knowing the preventive treatment of heart failure in diabetics guided by the biomarker score (5.9%). Pandy showed that the biomarker score allows the timely use of sodium glucose co-transporter type 2 inhibitors to reduce the incidence of HF [3,13-15].

The scarcity of studies in sub-Saharan Africa, especially the almost non-existent in the Democratic Republic of Congo, on the evaluation of the biomarker score among Doctors led us to a free discussion. Out of 135 doctors, 112 had requested training on the Biomarker score (84.4%) ; This is explained by the opinion of Congolese doctors to improve their knowledge on this very important topic. Doctors from public universities had higher knowledge than those from private universities. This difference can be explained by the youth of our private university institutions. Tertiary health level doctors had a higher level of knowledge than secondary and primary health level doctors. This is explained by the health system of our country where we find specialist doctors more concentrated in tertiary levels than in primary and secondary health structures. Doctors from the West and East blocks had higher knowledge linked to the presence of the large universities of the Democratic Republic of Congo located in these blocks. Doctors recognized the Peguero index in the search for left ventricular hypertrophy at 23.7%. This poor knowledge can be explained by the late introduction of the Internet in our universities, this index

being newly discovered and integrated into the research of left ventricular hypertrophy in the Democratic Republic of Congo [4].

Methods

This was an analytical cross-sectional study carried out online in the Democratic Republic of Congo during the period from September 29, 2022 to March 30, 2023. The study population was made up of all Congolese doctors living in the Democratic Republic of the Congo. All Congolese doctors practicing in a hospital or in program and having freely agreed in writing or orally to participate in the study were included. Foreign and Congolese doctors living abroad were not affected by this study. Doctors who did not answer two thirds of the questions in the questionnaire during the survey were excluded from the study.

The sampling was non-probability. The sample size was convenient. The sampling method used led us to collect 135 participants. The data was collected from a questionnaire designed using a Gmail link which should be sent to a Doctor by WhatsApp whose telephone number we had. Whoever received it should send it to other Doctors he knew and so on. The questionnaire was put online and could be completed by any Doctor in the DRC, the links and the QR code allowing access to the study were distributed to the correspondents by WhatsApp and the participants who expressed their interest in the study The study carried out directly addressed the questions. The recruitment of participants was therefore mainly based on the "snowball" effect. After validation of consent, access to the questionnaire did not require identification and the responses were completely anonymous. The principal investigator was responsible for the data collected via a confidentiality email.

The variables of interest consisted of the sociodemographic characteristics of the Doctors (age, sex, marital status, hospital of origin, province of practice of the profession, university of training, grade of the doctor, seniority in the practice of origin, sector of professional practice and level of the hospital pyramid), knowledge on insufficiency, biomarker score and Péguoro index.

A study carried out in the DRC divided into three blocks according to the provinces below: West block (province of Kinshasa, Mai Ndombe, Kwilu, Kwango, Kongo Central, Equateur, Mongala, Tshuapa, South Ubangi, North Ubangi), East block (North Kivu, South Kivu, Maniema, Tshopo, Haut Uele, Bas Uele, Ituri, Tanganika, Haut-Katanga, Lualaba) and Center block (Kasai, Kasai Central, Kasai Oriental, Lomami, Sankuru and Haut Lomami),

Knowledge on the diagnosis and management of heart failure was determined by elements of the questionnaire including knowledge of biomarkers as test for predicting heart failure, knowledge of non-pharmacological and pharmacological management measures. Of heart failure. The score obtained had a minimum of 0 and a maximum of 4. The level of knowledge was categorized into 4 stages : very low, low, intermediate, and high corresponding to scores 0, 1, 2, 3 to 4. High knowledge was defined for any Doctor with a score between 3 and 4, followed by intermediate knowledge for a score of 2, low knowledge for a score equal to 1 and very low knowledge for a score equal to 0. The health level classification of Ministry of Health hospitals was applied in this study to classify the practicing hospitals of the Doctors included in the study. This is the primary level (community care site, health post, health center, referral health center), secondary level (hospitals, general referral hospital) and tertiary level (university clinics, scientific research hospitals, Scientific Research Laboratories).

Statistical analyses

Data were collected using Excel 2010 software, then exported to SPSS for Windows version 26 for analyses. Categorical variables were presented in the form of absolute and relative frequency, quantitative variables with Gaussian distribution were summarized in the form of mean plus or minus standard deviation, on the other hand those with non-Gaussian distribution were described in the form of median and interquartile range (IQR). Comparison of proportions was carried out using Pearson's Chi square or Fischer's exact test. The determining factors of good knowledge on the biomarker score were examined in a univariate model and were included in the logistic regression model when they were associated with the dependent variable in multivariate analysis. Variables not contributing significantly ($P \geq 0.05$) were progressively excluded to obtain the final models. The calculated adjusted odds ratios made it possible to estimate the degree of association between the dependent variable and the independent variables. The value of $p<0.05$ was considered as the threshold for statistical significance.

Data availability

The data that support the findings of this study is available in manuscript tracking system

Code availability: No custom code was used.

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Authors' Contributions

FNM and ANN conceptualized the research topic, SOW, RBM and ZKT drafted the protocol with input from FNM and ANN for the methods, prepared the submission for institutional review board approval, supervised the data collection and drafted the manuscript. ANN provided guidance for the statistical analysis.

AMK, CMK, HNS and DMB provided content oversight for the manuscript. All authors read and approved the final manuscript.

Competing interests: The authors declare no known conflict of interest.

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Ethics approval and consent to participate

This study was conducted in accordance to relevant guidelines and regulations. The study was reviewed and approved by the Medical Ethics Committee of the University of Goma at No. UNIGOM / CEM / 09/ 2022. Written informed consent was obtained from all the participants and/or their legally acceptable representatives.

Consent for publication: Not Applicable.

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