Scientific Research Publishing

Open Journal of Obstetrics and Gynecology, 2026, 16(2), 270-282
https://www.scirp.org/journal/ojog
ISSN Online: 2160-8806
ISSN Print: 2160-8792

Hemostatic Profile of Women Using Hormonal Contraception Followed in Two Hospitals in Ebolowa, Cameroon

Messakop Moayeth Yannick[1*], Lendem Isabelle[2], Ndoumba Annick[3], Bisay Souhe Ulrich Boris[4], Bilo'o Leslie Lydienne[5], Makemgue Louise Stephanie[2], Fouelefack Tazanou Megane[3], Mboua Ndenga Veronique[4], Atangana Ekobo Huguette[6], Bengono Rody[4], Foumane Pascal[1], Edima Helene Carole[2], Ekono Guy Michel[7]

[1]Department of Gynecology and Human Reproduction, Faculty of Medicine and Pharmaceutical Sciences, University of Ebolowa, Ebolowa, Cameroon
[2]Department of Biomedical Sciences, Faculty of Science, University of Ebolowa, Ebolowa, Cameroon
[3]Department of Biological Sciences, Faculty of Medicine and Pharmaceutical Sciences, University of Ebolowa, Ebolowa, Cameroon
[4]Department of Surgery and Specialties, Faculty of Medicine and Pharmaceutical Sciences, University of Ebolowa, Ebolowa, Cameroon
[5]Department of Paediatrics, Faculty of Medicine and Pharmaceutical Sciences, University of Ebolowa, Ebolowa, Cameroon
[6]Department of Internal Medicines, Faculty of Medicine and Pharmaceutical Sciences, University of Ebolowa, Ebolowa, Cameroon
[7]Department of Gynecology, Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Douala, Cameroon
Email: *yannickmessakop2@gmail.com

How to cite this paper: Yannick, M.M., Isabelle, L., Annick, N., Boris, B.S.U., Lydienne, B.L., Stephanie, M.L., Megane, F.T., Veronique, M.N., Huguette, A.E., Rody, B., Pascal, F., Carole, E.H. and Michel, E.G. (2026) Hemostatic Profile of Women Using Hormonal Contraception Followed in Two Hospitals in Ebolowa, Cameroon. *Open Journal of Obstetrics and Gynecology*, **16**, 270-282.
https://doi.org/10.4236/ojog.2026.162028

Received: January 1, 2026
Accepted: January 31, 2026
Published: February 3, 2026

Abstract

Background: Hormonal contraception plays a pivotal role in modern family planning and reproductive health. Despite its widespread use, concerns persist regarding its potential effects on hematological and hemostatic balance, particularly in low- and middle-income settings where baseline biological profiles and monitoring practices may differ. **Objective:** To evaluate the hemostatic profile of women using hormonal contraception in Ebolowa, Cameroon, and to compare these parameters with those of non-users. **Methods:** A prospective case-control study was conducted among 210 women aged 18 - 45 years, including 75 hormonal contraceptive users and 135 non-users at the Ebolowa Regional Hospital (ERH) and the Ebolowa Regional Hospital Center (ERHC) from January 2025 to June 2025. Hemoglobin level, platelet count, prothrombin time (PT), activated partial thromboplastin time (aPTT), and international normalized ratio (INR) were measured using standardized laboratory procedures on a STAGO automated analyzer. Statistical analyses were performed to assess differences between groups. **Results:** Compared with non-users, women using hormonal contraception exhibited a significantly lower mean hemoglobin level (10.79 ± 1.38 g/dL vs 11.29 ± 1.70 g/dL) and a markedly higher plate-

let count (403.8 ± 162.6 G/L vs 273.2 ± 106.4 G/L; $p < 0.05$). Hemostatic assessment revealed a significant increase in PT, a prolongation of aPTT, and a moderate decrease in INR among contraceptive users. These changes were more pronounced among users of combined oral contraceptives and injectable progestins. **Conclusion:** Hormonal contraceptive use is associated with significant yet subclinical alterations in hematological and hemostatic parameters, suggesting a compensated procoagulant state. These findings underscore the importance of context-specific biological monitoring and support the integration of basic hemostatic evaluation into contraceptive follow-up, particularly for women with additional thromboembolic risk factors.

Keywords

Hormonal Contraception, Hemostasis Profile, Women, Ebolowa, Cameroon

1. Introduction

Hormonal contraception is a cornerstone of modern family planning, contributing substantially to the reduction of maternal and infant mortality, fertility control, and improvement of women's health and autonomy. According to the World Health Organization, more than 150 million women worldwide currently use hormonal contraceptive methods, with a steadily increasing prevalence, although usage remains relatively low in sub-Saharan Africa [1].

Hormonal contraceptives—including oral pills, injectables, implants, and hormonal intrauterine devices—exert their contraceptive effects primarily through inhibition of ovulation, alteration of cervical mucus, and endometrial atrophy [2]. Beyond their reproductive effects, estrogenic and progestogenic components induce metabolic and hemostatic changes by modulating hepatic synthesis of plasma proteins, including coagulation factors, natural anticoagulants, and fibrinolytic regulators [3] [4]. These alterations may disturb the delicate balance between procoagulant and anticoagulant mechanisms, leading to measurable biological changes.

In high-income countries, numerous studies have reported an increased risk of venous thromboembolism associated with prolonged use of hormonal contraceptives, although the absolute risk remains low and depends on estrogen dose and type of progestin [5] [6]. In sub-Saharan Africa, however, data remain scarce despite the progressive rise in contraceptive use [7]-[20].

In Cameroon, the Demographic and Health Survey reports a hormonal contraceptive prevalence of approximately 15%, mainly among young, educated, urban women [10] [12] [13]. Despite this growing use, local data evaluating the biological and hemostatic effects of hormonal contraception are limited [21]-[34]. This study therefore aimed to assess the biological hemostasis profile of women using hormonal contraception in Ebolowa, Cameroon, in order to generate local evidence to guide clinical management and contraceptive counseling.

2. Methods

2.1. Study Design and Setting

This prospective analytical case-control study was conducted over a six-month period (January 2025 to June 2025) in Ebolowa, Cameroon, at two major public healthcare facilities: the Ebolowa Regional Hospital (ERH) and the Ebolowa Regional Hospital Center (ERHC). These institutions provide family planning services and possess laboratory infrastructure suitable for hemostatic analysis.

2.2. Study Population

Women aged 18 - 45 years attending these facilities for any reason were eligible. Cases were women who had been using hormonal contraception for at least three months, while controls were women who had never used hormonal contraceptives. Pregnant women, those with known chronic hematological disorders, or those receiving anticoagulants, corticosteroids, or other medications affecting hemostasis were excluded. Non-compliant or pre-analytically compromised samples were also excluded.

2.3. Data Collection

Sociodemographic and clinical data were collected using a structured face-to-face questionnaire, including age, marital status, education level, occupation, lifestyle habits (such as smoking), medical history, body mass index and contraceptive practices.

2.4. Laboratory Procedures

Blood samples were collected and laboratory analysis carried out at the laboratory of the ERHC and the ERH by trained laboratory professionals, working under medical and regulatory oversight. Venous blood (4 - 5 mL) was collected from each participant into EDTA tubes for full blood count (hemoglobin and platelet count) and 3.2% sodium citrate tubes for coagulation tests (PT, aPTT, INR). EDTA samples were analyzed within 30 minutes. Citrated samples were centrifuged, aliquoted, frozen (−20˚C to −70˚C), and later thawed at 37˚C prior to analysis. Frozen plasma samples were transported on dry ice and analyzed within 4 hours, avoiding excessive agitation.

Hemostatic assays were performed using a STAGO automated analyzer with manufacturer-recommended reagents. Reference values were: hemoglobin ≥ 12 g/dL; platelets 150 - 400 G/L; PT 70 - 100%; aPTT ~35 s; INR 0.8 - 1.2.

2.5. Statistical Analysis

Data were analyzed using SPSS version 25. Quantitative variables were expressed as mean ± standard deviation, and qualitative variables as frequencies and percentages. Group comparisons were performed using Student's t-test, chi-square test, or Fisher's exact test as appropriate. Odds ratios were calculated to estimate

the association between hormonal contraceptive use and selected abnormal hemostatic parameters. Statistical significance was set at $p < 0.05$.

2.6. Ethical Considerations

The study received ethical approval from the Regional Ethics Committee for Human Health Research of the South Region. Written informed consent was obtained from all participants, and data confidentiality was strictly maintained.

3. Results

3.1. General Characteristics of the Study Population

A total of 210 women were enrolled in the study, including 75 hormonal contraceptive users (cases) and 135 non-users (controls), corresponding to 36% and 64% of the sample, respectively, yielding a case-to-control ratio of approximately 1:2.

The mean age of participants ranged from 18 to 45 years.

Age distribution differed significantly between the two groups ($p = 0.0001$). Women aged 25 - 34 years constituted the largest proportion of hormonal contraceptive users (46.5%), whereas non-users were predominantly younger, with 80% aged between 18 and 24 years. This finding indicates that hormonal contraception was more frequently used by women in the mid-reproductive age group.

Table 1. Matching of cases and controls by socio-demographic data in a study on the hemostatic profile of women using hormonal contraception carried out in two hospitals in Ebolowa-Cameroon, 2025.

Variable	Cases n (%)	Controls n (%)	p-value (statistic)
Total	75 (36%)	135 (64)	-
Marital status			0.5826
Single	53 (37.3%)	89 (62.7)	
Married	22 (32.4%)	46 (67.6)	
Age (years) (Cramer's V = 0.362)			**0.0001**
18 - 24	21 (20%)	84 (80)	
25 - 34	40 (46.5%)	46 (53.5)	
35 - 44	14 (73.7%)	5 (26.3)	
Religion			0.6515
Catholic	45 (38.1%)	73 (61.9)	
Protestant	20 (31.3%)	44 (68.8)	
Other	10 (35.7%)	18 (64.3)	
Occupation (Cramer's V = 0.207)			**0.0109***
Student	30 (26.5%)	83 (73.5)	
Self-employed	23 (45.1%)	28 (54.9)	
Salaried	22 (47.8%)	24 (52.2)	

Marital status did not differ significantly between users and non-users (p = 0.5826). Single women represented 37.3% of contraceptive users and 62.7% of non-users, while married women accounted for 32.4% of users and 67.6% of controls. Similarly, religious affiliation showed no statistically significant association with contraceptive use (p = 0.6515), with Catholics being the predominant group in both populations.

In contrast, occupation was significantly associated with hormonal contraceptive use (p = 0.0109; Cramer's V = 0.207). Students were underrepresented among users (26.5%) compared with controls (73.5%), whereas self-employed and salaried women exhibited higher proportions of contraceptive use. This suggests that socio-economic autonomy may influence access to and acceptance of hormonal contraception (see Table 1).

3.2. Types of Contraceptives

Combined estrogen-progestin oral contraceptives (COCs) were the most frequently used method, accounting for 26 women (34.7%). Among progestin-only methods, injectable contraceptives were predominant, with Sayana Press used by 21 participants (28.0%) and Depot Provera by 12 participants (16.0%), together representing 44.0% of the study population. Progestin implants were less commonly used, with Jadelle and Implanon NXT accounting for 12.0% and 8.0%, respectively. In contrast, use of the hormonal intrauterine device was rare, reported in only 1 participant (1.3%). Overall, the distribution indicates a predominance of systemic hormonal contraceptive methods, particularly injectables and combined oral contraceptives, among our studied population (see Table 2).

Table 2. Frequencies by type of contraceptive in a study on the hemostatic profile of women using hormonal contraception carried out in two hospitals in Ebolowa-Cameroon, 2025.

Contraceptive Type	Contraceptive Name	N	%
Injectable progestin (DMPA)	Sayana Press	21	28.0
	Depot Provera	12	16.0
Implant progestin	Jadelle implant	9	12.0
	Implanon NXT	6	8.0
Combined estrogen-progestin	(COC)	26	34.7
Hormonal intrauterine device	Hormonal IUD	1	1.3

3.3. Comparison of Biological and Hemostatic Parameters

The comparative analysis of biological parameters revealed significant differences between hormonal contraceptive users and non-users.

3.3.1. Hemoglobin Level

The mean hemoglobin concentration was significantly lower among hormonal contraceptive users compared with controls (10.8 ± 1.39 g/dL vs 11.3 ± 1.70 g/dL;

p = 0.0159). Although both values indicate a generally mild reduction, this finding suggests a higher prevalence of anemia among contraceptive users (see Table 3).

Table 3. Effect of Hormonal Contraception on Hemostatic Parameters in a study on the hemostatic profile of women using hormonal contraception carried out in two hospitals in Ebolowa-Cameroon, 2025.

Biological Parameters	Cases (mean ± SD)	Controls (mean ± SD)	p-value (statistic)
Hemoglobin (g/dL)	10.8 ± 1.39	11.3 ± 1.7	**0.0159**
Platelets (G/L)	402 ± 160	271 ± 106	**<0.0001**
Prothrombin Time (%)	97.9 ± 12.9	81.1 ± 18.8	**<0.0001**
Activated Partial Thromboplastin Time (s)	37.5 ± 6.98	32.9 ± 21.5	**0.0223***
INR	1.03 ± 0.09	1.19 ± 0.21	**<0.0001**

3.3.2. Platelet Count

Platelet counts were significantly elevated in hormonal contraceptive users (402 ± 160 G/L) compared with non-users (271 ± 106 G/L; p < 0.0001). A substantial proportion of users exhibited platelet values near or above the upper limit of normal, indicating a relative thrombocytosis associated with hormonal exposure (see Table 3).

3.3.3. Coagulation Parameters

Prothrombin time (PT) was significantly increased among users (97.9 ± 12.9%) compared with controls (81.1 ± 18.8%; p < 0.0001).

The international normalized ratio (INR) was significantly higher in hormonal contraceptive users (1.19 ± 0.21) than in non-users (1.03 ± 0.09; p < 0.0001), reflecting alterations in coagulation balance.

Activated partial thromboplastin time (aPTT) was also significantly prolonged in users (37.5 ± 6.98 seconds) compared with controls (32.9 ± 2.15 seconds; p = 0.0223). The overall mean aPTT was 34.5 ± 17.8 seconds, with an average prolongation of approximately 5 seconds among users. The odds ratio for prolonged aPTT among users was estimated at 8.38 (95% CI: 4.39 - 16.0) (see Table 3).

Collectively, these findings indicate significant modifications of both intrinsic and extrinsic coagulation pathways associated with hormonal contraceptive use.

3.4. Biological Parameters According to Type of Hormonal Contraceptive

Analysis by contraceptive method revealed variability in hematological and hemostatic profiles.

Hemoglobin levels were lowest among users of combined oral contraceptives (9.49 ± 1.30 g/dL), suggesting a higher frequency of anemia in this group. Conversely, the highest hemoglobin values were observed among Sayana Press users (11.04 ± 1.31 g/dL).

Platelet counts were markedly elevated among users of Depot Medroxyprogesterone Acetate (447.62 ± 146.25 G/L) and combined oral contraceptives (438.50 ± 184.46 G/L), indicating a stronger platelet response associated with these methods. The lowest platelet counts were observed among hormonal intrauterine device users, although interpretation is limited by the very small sample size.

Prothrombin time was lowest among combined oral contraceptive users (69.83 ± 16.01%), whereas the highest PT values were recorded among hormonal IUD users.

INR values were highest among users of combined oral contraceptives (1.30 ± 0.19) and Implanon NXT (1.27 ± 0.22), indicating a relative imbalance in coagulation homeostasis. aPTT was most prolonged among users of combined oral contraceptives and Depot Provera, while shorter aPTT values were observed among Implanon NXT users.

These results highlight method-dependent effects of hormonal contraception on hemostatic parameters (see Table 4).

Table 4. Biological parameters by type of Contraceptive in a study on the hemostatic profile of women using hormonal contraception carried out in two hospitals in Ebolowa-Cameroon, 2025.

Contraceptive Method	Hemoglobin (g/dL)	Platelets (G/L)	PT (%)	INR	aPTT (s)
Depot Provera	10.88 ± 1.87	447.62 ± 146.25	93.62 ± 25.98	1.02 ± 0.18	37.23 ± 5.08
Combined oral pill (COC)	9.49 ± 1.30	438.50 ± 184.46	69.83 ± 16.01	1.30 ± 0.19	37.98 ± 6.52
Jadelle implant	10.61 ± 1.51	404.67 ± 130.20	82.11 ± 15.66	1.20 ± 0.23	31.25 ± 7.09
Implanon NXT	10.92 ± 1.24	394.62 ± 176.83	73.68 ± 16.29	1.27 ± 0.22	30.15 ± 7.24
Sayana Press	11.04 ± 1.31	375.79 ± 151.62	88.00 ± 13.85	1.10 ± 0.12	36.47 ± 5.59

4. Discussion

The present study investigated the effects of hormonal contraception on selected biological parameters, with a particular focus on hemostatic markers, among women followed in two referral hospitals in Ebolowa. The findings provide locally relevant evidence on hematological and coagulation changes associated with hormonal contraceptive use, while remaining consistent with observations reported in African and international studies.

4.1. Sociodemographic Characteristics of the Study Population

The study population was predominantly composed of young women aged between 18 and 35 years. This age distribution is in line with data from the 2018 Cameroon Demographic and Health Survey, which indicates that modern contraceptive methods are mainly used by women of reproductive age living in urban areas [2]. Women aged 25 - 34 years constituted the largest proportion of hormonal contraceptive users (46.5%), whereas non-users were predominantly younger, with 80% aged between 18 and 24 years, as this age could be a major confounding factor in this study for age has a significant and well-documented influence on

hemostatic parameters (coagulation, anticoagulation, and fibrinolysis). Overall, aging is associated with a prothrombotic shift—often described as a state of "*hemostatic imbalance toward hypercoagulability*." [5]. The relatively high proportion of students and salaried women further reflects the influence of educational attainment and socioeconomic status on contraceptive uptake, as previously documented in Cameroon and other sub-Saharan African countries [10] [13].

In terms of marital status, the predominance of unmarried women among contraceptive users supports the growing trend of contraceptive use outside marriage. This pattern has been widely reported in Cameroon and reflects increasing reproductive autonomy among women, particularly those with higher levels of education and access to reproductive health information [9] [11] [16] [23].

4.2. Contraceptive Type

The predominance of combined oral contraceptives and injectable methods observed in this study reflects national trends reported by the Demographic and Health Survey, which identified injectable contraceptives as the most commonly used modern method in Cameroon [2]. Although implants were less frequently used, their uptake is gradually increasing through reproductive health initiatives supported by international organizations.

Previous studies in Cameroon have shown a preference for injectable contraceptives in urban areas, while oral contraceptives remain more common in rural settings [31]. The present findings align with these observations and highlight the importance of accessibility, counseling, and health system capacity in shaping contraceptive choices.

4.3. Hematological Changes Associated with Hormonal Contraception

4.3.1. Hemoglobin Levels

Hormonal contraceptive users exhibited a modest but statistically significant reduction in hemoglobin concentration compared with non-users. Similar findings have been reported in studies conducted in Nigeria, Ethiopia, and Cameroon, suggesting that hormonal contraception may be associated with mild alterations in erythropoietic balance [25] [27] [31].

This reduction may be related to the systemic effects of certain hormonal components, particularly progestins, which have been implicated in subtle changes in erythropoiesis or iron metabolism [20] [21]. Importantly, the magnitude of the decrease observed in the present study remained within a subclinical range and did not indicate a high risk of clinically significant anemia, consistent with observations reported in the Democratic Republic of Congo [32].

4.3.2. Platelet Count

A significant increase in platelet count was observed among hormonal contraceptive users. This finding is consistent with several studies conducted in West and Southern Africa, which reported higher platelet counts among women using hor-

monal contraceptives [25] [28]-[30].

This absolute thrombocytosis may reflect a compensated biological response to estrogen-induced changes in coagulation pathways. Estrogens are known to enhance hepatic synthesis of procoagulant proteins and may contribute to increased platelet production or turnover [14] [18]. Previous studies have demonstrated that combined hormonal contraceptives influence multiple components of the hemostatic system, including fibrinogen and coagulation factors VII and VIII [14] [18].

4.4. Effects on Coagulation Parameters

4.4.1. Prothrombin Time and International Normalized Ratio

In the present study, hormonal contraceptive use was associated with an increase in prothrombin time and a concomitant decrease in INR values. These findings are consistent with reports from Nigerian cohorts, where similar coagulation profiles were observed among users of combined oral contraceptives [24].

Such changes likely reflect the procoagulant effects of estrogenic components, which promote increased synthesis of fibrinogen and vitamin K-dependent coagulation factors, particularly factors VII and X [15] [17]. The observed pattern suggests a shift in coagulation balance rather than overt pathological disruption, indicating physiological adaptation of the extrinsic pathway.

4.4.2. Activated Partial Thromboplastin Time

Unlike prothrombin time, activated partial thromboplastin time (aPTT) was significantly prolonged among hormonal contraceptive users. Prolongation of aPTT may indicate adaptive modulation of the intrinsic coagulation pathway, potentially related to relative factor consumption or mild alterations in endogenous anticoagulant systems such as protein C or antithrombin [17] [32] [33].

Comparable findings have been reported in studies from Ethiopia, South Africa, and Nigeria, which documented stable prolongation of aPTT among women using hormonal contraceptive methods [26]-[28].

4.4.3. Integrated Interpretation of the Hemostatic Profile

Overall, the findings suggest a trend toward a **compensated procoagulant state**, characterized by elevated platelet counts, shortened prothrombin time, increased INR, and prolonged aPTT. This profile is consistent with international evidence describing hormonal contraceptive-induced changes in hemostasis mediated by increased fibrinogen levels, elevated coagulation factors VII, VIII, and X, and reduced functional activity of protein S [14] [15] [17].

Importantly, the observed alterations were moderate and did not reach pathological thresholds. This supports findings from African studies indicating that, despite measurable biological changes, the absolute risk of thromboembolic events among African women using hormonal contraception remains relatively low compared with that reported in European populations [26] [28] [30].

Consistent with existing literature, the biological effects observed in this study appear to vary according to contraceptive formulation. Estrogen-containing meth-

ods tend to induce more pronounced hemostatic changes than progestin-only methods [19] [29] [33] [34]. The increased platelet counts and prolonged aPTT observed among long-term users support this hypothesis.

4.5. Clinical Implications

Although hormonal contraception remains a safe and effective family planning strategy in Cameroon, the findings of this study support the need for targeted clinical vigilance. Minimal hemostatic monitoring may be beneficial for women with additional thrombotic risk factors, while progestin-only methods should be preferentially considered for women with a history of thromboembolic disease, obesity, or smoking habits [22] [23].

5. Study Limitations

Despite the relevance of the findings, this study has several limitations that should be acknowledged.

Firstly, the relatively small sample size—particularly when stratified by type of contraceptive method—limits the statistical power of subgroup analyses. This constraint is especially evident for hormonal intrauterine device users, whose very low representation precludes robust conclusions regarding this method.

Secondly, potential confounding factors such as nutritional status, iron deficiency, inflammatory conditions, and genetic thrombophilia were not systematically assessed. These factors may independently influence hematological and coagulation parameters and could partially contribute to the observed variations.

Finally, this study was conducted in two hospitals within a single urban setting, which may limit the generalizability of the findings to rural populations or other regions of Cameroon with different sociodemographic and healthcare characteristics.

Despite these limitations, the study provides valuable local data on the biological effects of hormonal contraception and constitutes an important foundation for larger, multicenter studies in sub-Saharan Africa.

6. Conclusions

This study demonstrates that the use of hormonal contraception among women in Ebolowa is associated with significant modifications of hematological and hemostatic parameters, including reduced hemoglobin levels, increased platelet counts, shortened prothrombin time, elevated INR, and prolonged activated partial thromboplastin time. Collectively, these changes reflect a compensated procoagulant state rather than overt pathology.

Although these biological alterations remain largely subclinical, they highlight the measurable impact of hormonal contraceptives on hemostatic balance, particularly among users of combined oral contraceptives and injectable progestins. These findings reinforce the need for individualized contraceptive counseling and careful method selection, especially in women presenting additional thromboem-

bolic risk factors.

Integrating basic hemostatic assessment could be considered as part of routine follow-up for women using hormonal contraception—particularly platelet count and aPTT—could enhance early detection of unfavorable biological trends and contribute to safer contraceptive practice. Further large-scale, longitudinal, and multicenter studies are warranted to confirm these findings, explore long-term clinical outcomes, and inform evidence-based guidelines adapted to African populations.

Acknowledgements

This work was supported by the Ebolowa Regional Hospital Center, Ebolowa Regional hospital and the Faculty of Medicine and Pharmaceutical Sciences of Sangmelima.

Ethical Approval

This study was approved by the ERHC ethics committee Informed consent was obtained from all participants prior to data collection. All procedures involving human participants were conducted in accordance with the Declaration of Helsinki.

Authors' Contribution

- **Data design and acquisition:** Messakop M.Y., Ndoumba A., Bilo'o L.
- **Data analysis and interpretation:** Messakop M.Y., Keyme M., Mboua N.V., Bisay S.U., Bilo'o L., Atangana E.H., Ndoumba A., Aboui F.
- **Editing of the article:** Messakop M.Y., Ndoumba A., Lendem I.
- **Critical review of intellectual content:** Ndoumba A., Bengono R., Foumane P., Ekono G.M.

Conflicts of Interest

The authors declare no conflict of interest.

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