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The Frequency and Pattern of Haematological Malignancies in A Tertiary Hospital In Abuja, Federal Capital Territory, North-Central Nigeria: A Sixteen Year Review.

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Abstract:

Background*: Report showed that Haematological malignancies (HMs) accounted for 6.66% of all cancer cases in Abuja, Federal Capital Territory (FCT), North-Central, Nigeria. There is lack of accurate information on the frequency and pattern of HMs diagnosed at the University of Abuja Teaching Hospital (UATH), Gwagwalada. Thus, the main objective of this study was to determine the frequency and pattern of HMs at this tertiary hospital in FCT, and compare our findings with similar studies within and outside Nigeria.* ***Methods:*** *A retrospective descriptive study of all haematological malignancies diagnosed at UATH during the study period, from 1st, January, 2005 to 31st, December, 2020. The data abstracted from Abuja Cancer Registry (ABCR), and patients' medical register at the Department of Haematology and Blood Transfusion included type of HMs, sex, age, and date of diagnosis. SPSS version 26 and Microsoft Excel version 16 for data analysis and graphs respectively.* ***Result:*** *Two thousand six hundred and fifty five (2655) cancers cases were diagnosed during the study period, 328 (12.35%) were HMs, 208 (63.4%.) cases these were males while 120 (36.6%) were females, with a M:F Ratio of 1.7 :1. The mean and median age at diagnosis of patients with HMs were 39.7 and 44.5 years respective (range 1 – 83 years). Non-Hodgkin Lymphoma (NHL) which constituted 20.7% of all the HMs, was the commonest, followed respectively by Chronic Myeloid Leukaemia (CML) 16.8%, Chronic Lymphocytic Leukaemia (CLL) 14.0%, Acute Lymphoblastic Leukaemia (ALL) 13.4%, Acute Myeloblastic Leukaemia (AML) 11.9%, while the least frequent were Monoclonal Gammopathy of Undetermined Significance (MGUS) and Waldenstrom Macroglobulinaemia (WM) with 0.3% each. Adults with 257 cases accounted for 78.4% of the HMs, while 21.6% (71 cases) were children.* ***Conclusion:*** *This first comprehensive study on frequency and pattern of HMs at UATH, Gwagwalada, revealed high relative prevalence of HMs among cancer cases diagnosed in our center, 12.35% of overall cancer cases diagnosed at the hospital were HMs. NHL, 20.7% was the commonest HM, while MGUS and WM, 0.3% each, were the least frequent HMs, males were more affected than females, CML and ALL were the most frequent HMs in adults and children respectively. This study generated real-time data on the burden of HMs that is imperative for planning and policy formulation on appropriate diagnostic and management facilities for cost effective HMs service delivery by the Hospital Management.*

Keywords: *Haematological malignancies, Frequency, Pattern, Myeloid, Lymphoid and Abuja*

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I. Introduction:

Haematological malignancies (HMs) are heterogeneous groups of clonal haemopoietic stem cells and lymphoid organs malignancies with the two broad categories, Myeloid HMs and Lymphoid HMs[1,2]. The aetiology of HMs is unknown, however, genetic predisposition and environmental exposure to chemicals such as benzene and carbon tetrachloride (herbicides, pesticide, organic chemicals and solvents), ionizing radiation, infectious agents (viral and bacterial) and smoking are risk factors associated with development of these disorders[2,3,4,5]. Although HMs have increased globally[2], these cancers have emerged as a major cause of morbidity and mortality in Sub-Saharan-Africa (SSA) and accounted for about 10% of overall cancer burden, HMs are projected to overshadow infectious diseases within a few decades if current trend continue unabated [6,7],

WHO estimates that HMs would increase to 48% by 2030 in low-income countries[3], thus, Nigeria being the most populous country in Africa, could likely have greater proportion of HMs burden. Report showed that Non-Hodgkin lymphoma (NHL), Hodgkin lymphoma (HL), Leukaemia and Multiple myeloma (MM) constituted 8.7% of incident cancer diagnoses and 9.9% mortality in SSA[6], GLOBOCAN 2020 report also revealed that these four HMs accounted for 10.9% (13,609) of new cancer incident cases and 11.35% (8900) cancer mortality in 2020 in Nigeria[8]. Recent report on cancer in Nigeria volume II showed that HMs accounted for 6.66% of overall incident cancer cases in Abuja, FCT, Nigeria[9], other studies from various parts of Nigeria reported prevalence of HMs among cancer patients ranging from 4.4% to 18.05% [10, 11, 12, 13, 14].

The pattern of HMs differ in developed and developing countries as well as within different regions of a country, ethnicity, age and sex[15,16]. NHL have been reported to be the most common HM in studies from Nigeria[8,9,11,13,14]; United State of America[17], Latin America[18], Aden, Yemen[19], Northern Tanzania[7], Eastern Morocco[15], Erica, Chile[20]and United Kingdom[21], while other studies from Nigeria by Kingsley et al and Korubo et al, found CLL and CML to be the commonest HM respectivly[12,22]. AML have also been reported as the commonest HM in Bangladesh and Pakistan[3,23] respectively. Recent report showed increase in frequency of CLL in the elderly population more than the other types of HM in the United States of America[17].

Real-time data on HM prevalence and pattern in a region provides information on the health care needs of patients with HMs. Detailed information on the frequency and pattern of HMs in patients seen at the University of Abuja Teaching Hospital (UATH), Gwagwalada is lacking, thus, the main objective of this study was to determine the frequency and pattern of HMs at this tertiary hospital in the Federal Capital Territory, North Central Nigeria and also compare our findings with similar studies within and outside Nigeria.

II. Material And Methods:

A Sixteen years retrospective descriptive study of all diagnosed haematological malignancies at University of Abuja Teaching Hospital, Gwagwalada, during the study period, from 1st, January, 2005 to 31st, December, 2020. The hospital is a public tertiary health care facility and serves as referral center for patients in FCT and states in the north central region of Nigeria. Data on HMs were abstracted from patients' medical register at the Department of Haematology and Blood Transfusion, UATH and Abuja Cancer Registry (ABCR), Gwagwalada. The ABCR is a population-based cancer registry responsible for registration of all cancer cases diagnosed from both public and private Health care institutions (including UATH) in the three Area Councils (Gwagwalada, Kwali and Abaji) of the FCT. This Cancer registry uses the third edition of the International Classification of Disease for Oncology (ICD-03) for coding and classification of malignancies, and CanReg5 software for processing and storage of cancer data.

The data abstracted included type of HMs, sex, age, and date of diagnosis. The total number of all cancers diagnosed at the University of Abuja Teaching Hospital, Gwagwalada during the study period, was obtained from ABCR as well. Data was analysed using SPSS version 26 and Microsoft Excel version 16. The descriptive statistics was presented by graphic charts, Chi-square test was used for comparison of frequency, a P-value of < 0.05 and 95% confidence interval Cl) considered statistically significant. Ethical approval for this study was obtained from the UATH Health Research Ethics Committee.

III. Results:

A total of 2655 patients were diagnosed with malignancies at UATH, Gwagwalada during the study period, 12.35% (328) of these were haematological malignancies (HMs), 63.4% (208) were males while 36.6% (120) were females with a male to female ratio of 1.7:1. The mean and median ages of HMs at diagnosis were 39.7 and 44.5 years respectively (age range 1- 83 years) (table 1). Adult accounted for 78.4% (257), of all the HMs, with mean and median age at diagnosis of 48.1 and 49 years; males, 64.4% (166) and females, 35.6% (91); M:F ratio – 1.8:1; while children accounted for 21.6% (71); mean and median age at diagnosis of 8.1 and 7; males, 59.2% (42) and females 40.8% (29); M:F ratio – 1.5:1 respectively (as presented in tables 1 and 2).

The non-haematological malignancies (NHMs) were 2327 (87.65%), males constituted 39.9% (929) and female 60.1% (1318) with a male to female ratio of 1:1.5; mean and median age at diagnosis 50.7 and 55.4 years respectively (age range 1 – 85 years). Females accounted for 57.2% (1518) and males 42.8% (1137) of the overall cancer cases, with a male to female ratio of 1:1.3, mean and median age at diagnosis of 49.7 years and 51.5 respectively (age range 1 – 85) (table 1).

Table 1: Frequency, Gender, Mean and Median Age of all HMs, Adult HMs, Childhood HMs, NHMs and Overall Malignancies Diagnosed at UATH, Gwagwalada, Nigeria: 2005 - 2020.

Type of Malignancy	Frequency	Sex: M ale. Female	Mean Age at Diagnosis	Median Age at Diagnosis	Std. Deviation
HMs	N=328 (12.35%)	N=208(63.4%). N=120 (36.6%)	39.7	44.5	21. 304

NHMs	N=2327 (87.65%)	N=929(39.9%).N=1398(60.1%)	50.7	55.3	22.578
Adult HMs (Age 18 - 83 Years)	N=257 (78.4%)	N=166 (64.6%). N=91 (35.4%)	48.1	49	15.161
Childhood HMs (Age 17 years)	N=71 (21.6%)	N=42 (59.2%). N = 29 (40.8%)	8.1	7	4.338
NHMs	N=2327 (87.6%)	N=929(39.9%). N=1398(60.1%)	50.7	55.3	22.578
All Malignancies	N=2655 (100.0%)	N=1137(42.82%).N=1518 (57.18%)	49.7	51.5	22.358

The frequency distribution of the different HMs is shown in table 2, NHL accounted for 20.7% of all the HMs, followed by CML 16.8%, CLL 14.0%, ALL 13.4%, AML 11.9%, MM 9.1%, HL 6.1%, PV 2.4%, MDS 1.8%, PMF and ET 1.5% each, the least were MGUS and WM with 0.3% each. The demographic distribution of the various HMs depicted in table 3, HMs were found to be more frequent in males than females except for Chronic lymphocytic leukaemia where females were the predominantly affected and accounted for 54.3% the CLL cases while males accounted for 45.7%, and Myelodysplastic syndrome, where both sexes were equally affected with 50.0% each as shown in table 3. The yearly prevalence of HMs is shown in figure 1, the frequency of HMs increased form 4,9% in 2005 – 2006 to 7.7.0% in 2011, declined to 5,8% in 2012 through 2015 and peaked in 2016 8.5% and 9.1% in2019 with sharp drop 3.0% in 2020.

IV. Discussion:

HMs have increased globally[2,24], these cancers have emerged as a major cause of morbidity and mortality in Sub-Saharan-Africa (SSA) and accounted for about 10% of overall cancer burden, and are projected to overshadow infectious diseases within a few decades if current trend continue unabated [6,7]. This study showed that HMs accounted for 12.35% (328) of all the malignancies (2655) diagnosed at UATH, Gwagwalada during the sixteen years study period (table1). It is in agreement with results from similar studies conducted in the country that reported high prevalence of HMs, 10.5%, Kingsley A et al[12], 11.8%, Nwagu MU et al[25], similar results were also reported from some African countries 10.0% by Leak SA et al (Norther Tanzania)[7], 10.9 Errahhali ME (Eastern Morocco)[15] and 12.45% Refeno V et al (Madagascar)[26]. However, other studies within and outside Nigeria found much higher prevalence of HMs, that ranged from 17.4%, IA N et al (Benin, Nigeria)[13] 18.05%,Babatunde et al (Ilorin, Nigeria)[14] and 18.9% W. Al-Kahiry (Eden Yemen)[3]. In contrast, our finding is higher than the reported 6.66% of overall incident cancer cases in Abuja, FCT, Nigeria[9]. The observed disparity could be attributed to the wider cancer registration coverage by the ABCR while clinically suspicious or queried HM cases from other hospitals in the Federal Capital Territory and neighbouring states were referred to UATH being one of the two referral public

Table 2: Frequency and Sex Distribution of Adult and Childhood Haematological Malignancies at UATH, Gwagwalada: 2005 -2020

Type of Malignancy	**Frequency**	**Sex: Frequency (N) Percent (%). Male Female**
Adult HMs (Age 18 - 83 Years)	N = 257 (78.40%)	N = 166 (64.4%). N = 91 (35.4%) M:F ratio – 1.8:1
Childhood HMs (Age 1 - 17 years)	N = 71 (21.60%	N = 42 (59.2%). N = 29 (40.8%) M:F ratio – 1.5:1
All Ages (1 - 83 Years)	N = 328 (100.0%)	N = 208 (63.4%). N = 120 (36.6%) M:F ratio – 1.7:1

Table 3: Demographic Characteristics of Haematological Malignancies Seen at UATH, Gwagwalada: 2005 - 2020

Types of HMs	**Frequency**	**Percent (%)**	**Mean Age**	**Median Age**	**Std. deviation**	**Sex: M % F %**	
ALL	44	13.4%	13.27	8	11.609	63.6% (N=28)	36.4% (N=16)
AML	39	11.9%	25.05	25	16.095	53.8% (N=21)	46.2% (N=18)
CLL	46	14.0%	55.28	53.5	11.159	45,7% (N21)	54.3% (N=25)
CML	55	16.8%	40.56	38	12.958	69.1% (N=38)	30.9% (N=17)
HL	20	6.1%	29.9	22	22.967	70.0% (N=14)	30.0% (N=6)
NHL	68	20.7%	45	47	22.179	66.2% (N=45)	33.8% (N-23)
MM	30	9.1%	59.2	57.5	498	60.0% (N=18	40.0% (N=12)
MGUS	1	0.3%	69.	-	-	100.0% (N=1)	0.0%

WM	1	0.3%	52	-	-	100.0% (N=1)	0.0%
MDS	6	1.8%	54	55	10.354	50.0% (N=3)	50.0% (N=3)
PMF	5	1.5%	56.4	52	11.971	80.0% (N=4)	20.0% (N=1)
PV	8	2.4%	61	62	6.740	87.5% (N=7)	12.5% (N=1)
ET	5	1.5%	57.6	56	9.555	80.0% (N=4)	20.0% (N=1)
Total	328	100%	39.7	44.5	21.304	63.4%(N=208)	36.6% (N=120)

ALL = Acute Lymphoblastic Leukaemia, AML = Acute myeloblastic Leukaemia, CLL = Chronic lymphocytic Leukaemia, CML = Chronic Myeloid Leukaemia, HL = Hodgkin's Lymphoma, NHL = Non-Hodgkin's Lymphoma, MM = Multiple Myeloma, MGUS = Monoclonal Gammopathy of Undetermined, WM = Waldenstrom Macroglobulineania, MDS = Myelodysplastic Syndrome, PMF = Primary Myelofibrosis, PV = Polycythaemia Vera, ET = Essential Thrombocythaemia.

tertiary health care institution with available expertise for diagnosis and management. Our finding is also higher than the 4.4% reported by Egesie OJ et al (North-Central Nigeria)[12] and 6.05% by Kugu MB et al (North Eastern Nigeria)[13].

Literature review showed that Non-Hodgkin's lymphoma is the nineth most common malignancy and the commonest HM globally[27,5,16,28] it is the sixth common cancer in Sub-Saharan Africa[6]. This study also showed NHL was the most common among all the MHs diagnosed at UATH during the study period, it accounted for 20.7% (68) of the HMs cases. Our finding was in concordance with reports from most local studies within Nigeria[9,10,11,12,14,15] and abroad[2,3,8,16,18,19,20]. However, contrary to this finding, Korubo et al[22] and Kingsley et al[13] reported CML and CLL as the most common HM in their studies respectively. Nonetheless, CML and CLL were the second and third commonest HMs diagnosed in our center, they constituted 16.8% (55) and 14.0% (46) of all the HMs cases. In addition to these three types HMs, ALL, 13.4%, (44); AML, 11.9% (39); MM, 9.1% (30) and HL 6.1% (20) were also frequently seen while the less frequently diagnosed HMs were PV, 2.4% (8); MDS,

Table 4: Distribution of Adult and Childhood HMs At UATH, Gwagwalada, Nigeria: 2005 - 2020

	Adult HMs		CHHMs	
Type of HMs	**Frequency**	**Percent (%)**	**Frequency**	**Percent (%)**
ALL	11	4.3	33	46.5
AML	25	9.7	14	19.7
CLL	46	17.9	0	0
CML	54	21	1	1.4
HL	12	4.7	8	11.3
NHL	53	20.6	15	21.1
MM	30	11.7	0	0
MGUS	1	0.4	0	0
WM	1	0.4	0	0
MDS	6	2.3	0	0
PMF	5	1.9	0	0
PV	8	3.1	0	0
ET	5	1.9	0	0
Total	257	100	71	100

HMs =Haematological malignancies; CHHMs = Childhood haematological malignancies

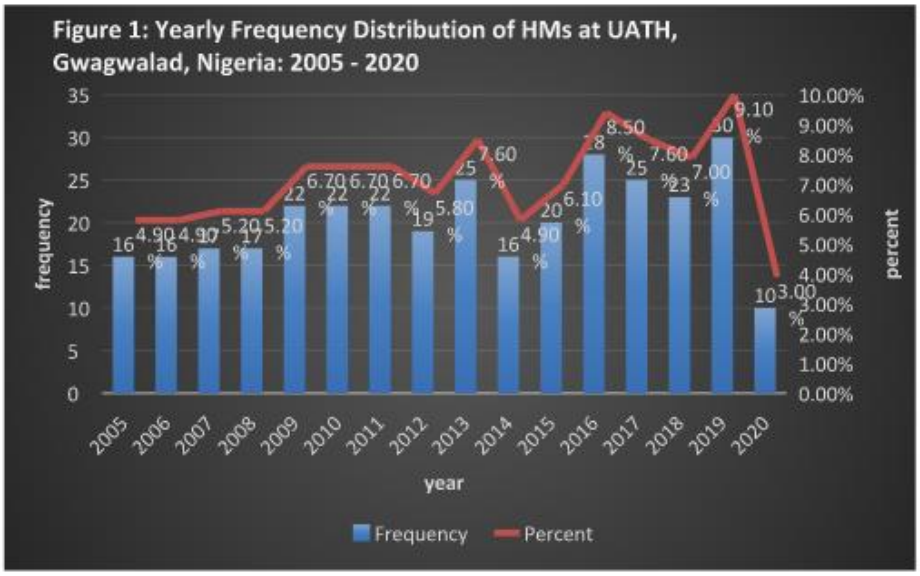
1.8%; ET and PMF, 1.5% each; and MGUS and WM, 0.3% each; as shown in table. These most common HMs observed in this study were also the most prevalent HMs reported by most researchers in Nigeria, and the countries cited above, however, the pattern of distribution of the various types of HMs vary significantly, each study reported different prevalence pattern for the most common and uncommon HMs prevalent in their localities[6,11,13,14,15,16,18,19,20,24].

Tables 2 and 4 showed the frequency and pattern of adult and childhood HMs seen at UATH, adults HMs were more prevalent 78.4% than childhood 21.6% HNs, similar finding was reported by IA N, OO A et al

(Benin, South-South Nigeria)[14], where adults and children constituted 83.3% and 16.7% of total HMs respectively, in contrast, W. Al-Kahiry (Eden, Yemen)[3] found much lower prevalence of childhood HMs than ours, CHHMs constituted 3.1% while adult HMs accounted for 96.9% of the overall HMs. The acute leukaemias (ALL and AML) were significantly more frequent in children than adults, ALL and AML accounted for 46.5% and 19.7% of childhood HMs while in adults they constituted 4.3% and 9.7% of adult HMs respectively. NHL was noted as the second most common childhood HMs, (21.1%) as well as adult HMs, (20.7%); no statistically significant difference was observed in the frequency of NHL between these groups. CML was the most common adult HMs in this study, our finding is consistent with that of Korubo et al[12], CML is reported to be rare in children[29], it accounted for 1.4% of childhood HMs seen here. HL was also found to be significantly more common in children than adult, 11.3% of diagnosed childhood HMs were HL, while it accounted for only 4.7% of the adult HMs in this study. The association between ALL, AML, HL and CML and patient's age were statistically significant ($P < 0.0001$). CLL is the third most common leukaemia in adults, accounted for 17.9% of adult HMs seen at this hospital contrary to our observation, CLL was the most common HMs in Calabar, Kingsley et al[12], MM, constituted 11.7% of the adult HMs in our study, this is consistent with studies from within and outside Nigeria[3,12], higher prevalence have been reported by some studies[7], [22] while other found lower prevalence of MM[10],[11],[13],[14]. We noted that PV, 3.1%; MDS, 2.3%; ET and PMF, 1.9% each were the less frequently diagnosed HMs, while WM and MGUS constituted 0.4% each were the least frequent HMs seen at UATH, this finding is similar to reported from Nigeria and other developing countries[3],[12],[13],[15],[22],[26].

HMs were found to be more frequent in males 208 (63.4%0 than females 120 (36.6%) in our study, with a male : female ratio of 1.7:1, the association between patient's gender and HMs was statistically significant ($P < 0.05$). We also found statistically significant association ($P < 0.05$) between patient's gender and HMs in comparison with Non-Haematological Malignancies (M:F ratio – 1:1.5) and overall malignancies (M:F ratio – 1:1.3) (table 1); Adult HMs (M:F ratio 1.8:1), and Childhood HMs (M:F ratio – 1.5:1) (table 3). The predominance of males was noted in all the HMs types except for chronic lymphocytic leukaemia where females were the most affected, they constituted 54.3% (25/46) the CLL cases, as shown in table 2. This finding is consistent with the reported male preponderance in prevalence of HMs than female in studies by KI Korubo et al (Port Harcourt, Nigeria)[22], Kagu MB et al (North-East, Nigeria)[11], Shahtja Khan et al (Pakistan)[23], and Li J, Smith A et al (United Kingdom)[30] that showed males 57.4%, females 42.6%, males 66.5%, females 33.5%, males 71.8%, females 28.2%, and males 55.7% and females 45.3% respectively.

Studies have shown that the mean and median ages at diagnosis of HMs in developing countries were generally lower than that of the Western countries[4]. The mean and median ages at diagnosis for HMs; adult HMs; CHHM; overall cancer cases and NHMs patients were, 39.7 years and 44.5 years; 48.1years and 49 years; 8.1 years and 7; 49.7 years and 51.5 years; and 50.7 years and 55.3 years respectively as depicted in tables 1 and 2. Statistically significant lower mean and median age at diagnosis were noted in overall HMs compared with overall cancers cases and non-haematological malignancies as well between CHHMs and overall cancers and NHMs ($P < 0.05$). This observation concord with findings from similar studies in various regions of Nigeria[11],[12],[13],[14]; and within and outside SSA countries[3],[16],[21],[25]. On the contrary, this finding was lower than the high mean and median ages at presentation of patients with HMs in North America and the UK[8].



The yearly frequency distribution of the HMs diagnosed at UATH, during the study period as shown in figure 1, revealed a nonsignificant increased in frequency of HMs form 4,9% in 2005/2006 to 5.2% in 2018/2019, however, a statistically significant ($P < 0.05$) increase from 5.2% to 7.0% was noted in 2011, which declined to 5,8% in 2012 through 2015 and peaked in 2016 8.5% and 9.1% in2019 with sharp drop 3.0% in 2020. The statistically significant drop in prevalence was attributed to lockdown and suspension of most regular clinical activities in many health care facilities in the FCT and the country at large due to the COVID-19 pandemic in 2020.

V. Conclusion:

This study has provided the first comprehensive information on the frequency and pattern of HMs at the University of Abuja Teaching Hospital, Gwagwalada. We found high prevalence of HMs in this study, 12.35% of all cancers diagnosed in our hospital during the study period were HMs. The six most frequently seen HMs were NHL, CML, CLL, ALL, AML and MM, while the most common HM in adult and children were CML and ALL respectively, the mean and median age at diagnosis in these patients were lower than that of NHMs. The study showed that HMs were significantly more prevalent in males than in females, this is in agreement with similar studies conducted within and outside Nigeria. Statistically significant progressive increase in the frequency of HMs from 2016 – 2019 was noted. Findings from this study have highlighted the burden of HMs in this center, provided information on the health care needs of patients with HMs and the need for further studies on the various aspects of HMs.

LIMITATIONS: Critical ancillary diagnostic tests facilities such as cytochemical, immunophenotype, cytogenetic, molecular and advance imaging that are imperative for current standard diagnosis of HMs are lacking. Thus, diagnosis of HMs in this center is based on clinical evaluation and primary tests: Full blood count, peripheral blood and bone marrow smear cytology, involved tissue/organ biopsy histology, and basic biochemical and imaging tests.

RECOMMENDATION:

Our study has raised the awareness on the burden of HMs in this center of healthcare excellence, we thus, recommend that resources should be harnessed to provide essential ancillary laboratory investigation equipment for effective and efficient oncology service delivery aimed at reducing the high morbidity and mortality that is associated with HMs in SSA countries.

AUTHORS' CONTRIBUTION:

All the authors participated in the research. T. I. OTU conceptualised and designed the study, involved in data extraction, data curation and analysis; and wrote the manuscript. U. G. EJIKEME contributed in data extraction and manuscript writhing. Both authors read and approved the final manuscript.

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CONFLICT OF INTEREST:

Author declare no conflict of interest.

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