Childhood diarrhoea in southwestern Nigeria: Predictors of low osmolarity ORS and zinc use among mothers

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Abstract

Objectives: Diarrhoea is a leading cause of mortality among children in resource-limited countries. However, very scarce literature exists regarding the factors influencing the awareness and use of low osmolarity oral rehydration salts (Lo-ORS) and zinc supplementation in the management of childhood diarrhoea among mothers of children under 5 years of age in southwestern Nigeria. This study, performed in Lagos, Nigeria, aimed to address this lack of knowledge.

Methods: Through a cross-sectional survey design, 336 mothers of children under 5 years of age were selected through a multi-stage sampling procedure. Data were collected with a pretested, semi-structured interviewer administered questionnaire and analysed in SPSS version 23. Descriptive and inferential statistical techniques were used for data analysis.

Results: A total of 10.4% of the mothers were aware of Lo-ORS, whereas 6.5% had ever used it; 53.3% were aware of zinc supplementation, whereas 42% had ever used it. Awareness was influenced by educational level (AOR: 2.017; 95% CI: 1.123–3.626) and the age of the child (AOR: 2.257; 95% CI: 1.237–4.117) for Lo-ORS, and by average monthly income (AOR: 1.582; 95% CI: 1.003–2.582) for zinc supplementation.

The authors declare no conflicts of interest.
Introduction

Diarrhoeal disease has been a leading cause of global morbidity and mortality, particularly among children in resource-limited countries. The disease accounts for approximately 18% of child deaths and 13% of disability adjusted life years. Worldwide, approximately 3.5 billion cases of acute diarrhoea and 3.2 episodes per child occur each year in children under 5 years of age. In Africa, variations in childhood diarrhoeal morbidity and mortality have been reported, with the highest case fatality rates in Benin, Lesotho, Mali, Nigeria, and Sierra Leone. In Nigeria, with a prevalence rate of 18.8%, the disease accounts for an estimated 150,000 deaths yearly among children under 5 years of age. Its status as the second leading killer disease of children under 5 years of age provides an alarming reminder of the susceptibility of Nigerian children.

Dehydration and electrolyte imbalance are the crucial reasons for death from diarrhoea. Because water makes up a greater proportion of their body-weight, children are at greater risk of life-threatening dehydration than adults. They also use more water over the course of a day, owing to their higher metabolic rates, and their kidneys are less capable of conserving water than older children and adults. Apart from dehydration and electrolyte imbalance, extended and recurrent episodes of diarrhoea frequently lead to stunting and growth failure in early childhood. Consequently, malnutrition further leads to recurrent diarrhoea, and the cycle continues.

To fight against dehydration due to diarrhoea among children under the age of 5 years, the World Health Organization (WHO) and United Nations Children’s Fund (UNICEF) encouraged the use of oral rehydration salt (ORS) solutions in 1978. Although this measure decreased the mortality rate among children younger than 5 years of age from 4.5 to 1.8 million annually, diarrhoea still remained the second leading cause of death in children under 5 years of age.

Consequently, the WHO introduced low osmolarity ORS and zinc supplementation in 2004, to further lessen the morbidity and mortality associated with diarrhoea. Low osmolarity ORS with diminished concentrations of sodium and glucose is associated with fewer unscheduled intravenous fluid infusions, lower stool volume, and less acetone vomiting than standard ORS, and is recommended for treating adults and children. Zinc significantly decreases the severity and duration of diarrhoea in small children, particularly in developing countries.

With adequate coverage and proper use of zinc supplementation and ORS, more than 75% of all diarrhoea deaths have been estimated to be preventable; thus, many developing countries have complied with including low osmolarity ORS and zinc supplementation in their diarrhoea management policies. However, despite the evidence of its benefit, little progress has been made in the widespread introduction of low osmolarity ORS and zinc for diarrhoea treatment in Nigeria; therefore, Nigeria still has a high prevalence of diarrhoea leading to deaths among children under 5 years of age.

To our knowledge, little literature is available regarding the factors influencing the awareness and use of low osmolarity ORS and zinc supplementation in diarrhoea management among mothers of children under 5 years of age in southwestern Nigeria. This study was performed to address the lack of studies in this area.

Materials and Methods

Study location

The Oshodi-Isolo local government area (LGA), an urban local government, is one of the 20 LGAs in Lagos State, southwestern Nigeria. Located in the Lagos West senatorial district, it is made up of 11 wards and covers a land area of 45.0 km². It is bounded by Ikeja (LGA) to the north, Surauluere (LGA) to the south, Mushin (LGA) to the northeast, and Alimosho (LGA) to the west. Its population was estimated to be 629,061 in the national census in 2006. The people are predominantly Yoruba, but other ethnic groups also reside in the LGA. The LGA has at least one primary health centre located in each ward.

Study design

This was a cross-sectional survey conducted among mothers 21–45 years of age with children under 5 years of age.

Sample size determination

On the basis of the assumption of a 95% level of confidence, and 28.8% of mothers having good knowledge of ORS in diarrhoeal management according to a previous study, we used Cochran’s formula for calculating single proportions to determine a minimum sample size of 315. To compensate for improperly filled questionnaires, we
increased the calculated sample size by 5%, but a total of 336 respondents were eventually interviewed.

**Sampling technique**

The multistage sampling technique was used to recruit participants. Four of eleven wards were chosen through simple random sampling in the first phase. Ten streets were selected from each of the selected wards by balloting in phase two. In the third phase, eight or nine houses were selected from each of the selected streets through systematic sampling. From each selected house, an eligible respondent who gave consent to participate was interviewed.

**Data collection tool/psychometric properties**

We used a semi-structured pre-tested questionnaire adapted from the USAID toolkit for the collection of survey data on the correct use of paediatric zinc as a treatment for diarrhoea. The questionnaire was pre-tested in Mushin LGA, Lagos state. The face and content validity was ensured by an epidemiologist, a statistician, and experts in the field of study. The reliability of the instrument was tested, and a Cronbach alpha value of 0.73 was obtained.

**Study variables**

The independent variables were the respondents’ socio-demographic characteristics, and the dependent variables were the use of low osmolarity ORS and zinc supplementation. Awareness of low osmolarity ORS and of zinc supplementation served as independent variables and dependent variables.

**Data analysis**

The data collected for the study were analysed in Statistical Package for Social Sciences (SPSS) version 23.0 for Windows, (IBM Corp., Armonk, N.Y., USA). Descriptive statistics based on frequencies and percentage distributions was calculated for categorical variables. The chi-square test and logistic regression were used for bivariate and multivariate analyses, respectively. A p-value <0.05 was considered statistically significant. Before the test for significance, the dataset was examined for multi-collinearity with the variance inflation factor diagnostic check. Multi-collinearity was absent with a variance inflation factor ranging from 1.0 to 1.1 for all independent variables and 3.1 for respondents’ age, thus qualifying the variables for significance testing.

**Results**

A total of 336 questionnaires were administered, and all were properly filled and returned, thus resulting in a response rate of 100%. The socio-demographic characteristics of the respondents are shown in Table 1. Most (36.3%) respondents were 26–30 years old, with an average age of 31.9 ± 5.11 years. Most were married (95.2%), unskilled (58.3%), earned an average monthly income of 20,000–50,000 Naira (61.9%), and had two or three children (69.3%). A substantial proportion of respondents were members of the Yoruba tribe (44%) and had tertiary education (45.8%). Most of the children were girls (52.4%) 2–3 years of age (58%), with a mean age of 2.6 ± 1.13 years.

Table 2 displays the awareness and use of low osmolarity ORS/zinc supplementation among the mothers. Very few (10.4%) mothers were aware of low osmolarity ORS, whereas a high proportion (53.3%) were aware of zinc supplementation. In addition, only 6.5% and 42% of the mothers had ever used low osmolarity ORS and zinc supplementation, respectively.

The association between socio-demographic characteristics and awareness of low osmolarity ORS/zinc
supplementation among the mothers is presented in Table 3. Within the Yoruba ethnicity, only 11.5% of respondents were aware of low osmolarity ORS. In addition, a minority (16.9%) of mothers with tertiary education were aware of low osmolarity ORS. Most (93.8%) mothers with children 1–2 years of age were unaware of low osmolarity ORS. A high proportion (91.7%) of mothers who had never been married were unaware of zinc supplementation. In addition, 67.5% of the mothers with income below 20,000 Naira were not aware of zinc supplementation for the management of diarrhea.

Table 4 shows the association between socio-demographic characteristics and the use of low osmolarity ORS/zinc supplementation among the mothers. Educational level (p = 0.039) and marital status (p = 0.018) were significantly associated with the use of low osmolarity ORS and zinc supplementation. Most (91.7%) of the unmarried mothers had never used zinc supplementation, whereas 89.6% of mothers with tertiary education had never used low osmolarity ORS for diarrhoea management in their children.

The association between the awareness of and the use of low osmolarity ORS/zinc among the mothers is shown in Table 2: Awareness and use of low osmolarity ORS and zinc supplementation in the management of diarrhoea among respondents.

| Frequency | Percentage |
|-----------|------------|
| **Awareness** |  |
| **Low osmolarity ORS** |  |
| Aware | 35 | 10.4 |
| Not aware | 301 | 89.6 |
| Total | 336 | 100.0 |
| **Zinc supplementation** |  |
| Aware | 179 | 53.3 |
| Not aware | 157 | 46.7 |
| Total | 336 | 100.0 |
| **Use** |  |
| **Low osmolarity ORS** |  |
| Ever used | 22 | 6.5 |
| Never used | 314 | 93.5 |
| Total | 336 | 100.0 |
| **Zinc supplementation** |  |
| Has ever used | 141 | 42.0 |
| Has never used | 195 | 58.0 |
| Total | 336 | 100.0 |

Table 3: Association between socio-demographic factors and awareness of low osmolarity ORS in the management of diarrhoea among respondents.

| Variable | Low osmolarity ORS |  | Zinc |  |
|----------|-------------------|---|------|---|
|          | Aware | Not aware | p-value | Aware | Not aware | p-value |
| **Age (years)** |  |  |  |  |  |  |
| ≤30      | 13 (8.5) | 140 (91.5) | 0.37a | 77 (50.3) | 76 (49.7) | 0.379a |
| >30      | 22 (12.0) | 161 (88.0) |  | 102 (55.7) | 81 (44.3) |  |
| **Marital status** |  |  |  |  |  |  |
| Ever married | 33 (10.2) | 291 (89.8) | 0.36a | 178 (54.9) | 146 (45.1) | 0.004a–* |
| Never married | 2 (16.7) | 10 (83.3) | 1 (8.3) | 11 (91.7) |  |  |
| **Ethnic group** |  |  |  |  |  |  |
| Yoruba | 17 (11.5) | 131 (88.5) | 0.004* | 78 (52.7) | 70 (47.3) | 0.953 |
| Igbo | 5 (5.6) | 84 (94.4) |  | 46 (51.7) | 43 (48.3) |  |
| Hausa | 5 (38.5) | 8 (61.5) |  | 7 (53.8) | 6 (46.2) |  |
| Other | 8 (9.3) | 78 (90.7) |  | 48 (55.8) | 38 (44.2) |  |
| **Educational level** |  |  |  |  |  |  |
| No formal | 1 (12.5) | 7 (87.5) | 0.003* | 3 (37.5) | 5 (62.5) | 0.839 |
| Primary | 3 (7.3) | 38 (92.7) |  | 22 (53.7) | 19 (46.3) |  |
| Secondary | 5 (3.8) | 128 (96.2) |  | 72 (54.1) | 61 (45.9) |  |
| Tertiary | 26 (16.9) | 128 (83.1) |  | 82 (53.2) | 72 (46.8) |  |
| **Occupation** |  |  |  |  |  |  |
| Unskilled | 19 (0.7) | 177 (90.3) | 0.17 | 108 (55.1) | 88 (44.9) | 0.161 |
| Manually skilled | 2 (4.5) | 42 (95.5) |  | 23 (52.3) | 21 (47.7) |  |
| Skilled | 7 (11.7) | 53 (88.3) |  | 25 (41.7) | 35 (58.3) |  |
| Professional | 7 (11.7) | 29 (80.6) |  | 23 (63.9) | 13 (36.1) |  |
| **Average monthly income (in Naira)** |  |  |  |  |  |  |
| <20,000 | 4 (10.0) | 36 (90.0) | 0.055 | 13 (32.5) | 27 (67.5) | 0.007* |
| 20,000–<50,000 | 16 (7.7) | 192 (92.3) |  | 111 (53.4) | 97 (46.6) |  |
| 50,000 or above | 15 (17) | 73 (83) |  | 55 (62.5) | 33 (37.5) |  |
| **Number of children** |  |  |  |  |  |  |
| 0–4 | 33 (10.5) | 281 (89.5) | 0.833 | 168 (53.5) | 146 (46.5) | 0.922 |
| 5–6 | 2 (9.1) | 20 (90.9) | 11 (50.0) | 11 (50.0) |  |  |
| **Age of child** |  |  |  |  |  |  |
| 1–2 | 11 (6.2) | 167 (93.8) | 0.016a | 92 (51.7) | 86 (48.3) | 0.659 |
| 3–4 | 21 (14.5) | 124 (85.5) | 81 (55.9) | 64 (44.1) |  |  |
| 5–6 | 3 (23.1) | 10 (76.9) | 6 (46.2) | 7 (53.8) |  |  |

* p < 0.05.
* Yates’ correction.
Table 4: Association between socio-demographic factors and use of low osmolarity ORS/zinc in the management of diarrhoea among respondents.

| Variable                        | Low osmolarity ORS | Zinc |
|---------------------------------|--------------------|------|
|                                 | Ever used          | Never used | p-value | Ever used          | Never used | p-value |
| **Age (years)**                 |                    |       |        |                    |            |        |
| ≤30                             | 12 (7.8)           | 141 (92.2) | 0.512* | 59 (38.6)          | 94 (61.4)  | 0.296* |
| >30                             | 10 (5.5)           | 173 (94.5) |       | 82 (44.8)          | 101 (55.2) |        |
| **Marital status**              |                    |       |        |                    |            |        |
| Ever married                    | 21 (6.5)           | 303 (93.5) | 1.000* | 140 (43.2)         | 184 (56.8) | 0.035** |
| Never married                   | 1 (8.3)            | 11 (91.7)  |       | 1 (8.3)            | 11 (91.7)  |        |
| **Ethnic group**                |                    |       |        |                    |            |        |
| Yoruba                          | 10 (6.8)           | 138 (93.2) | 0.462  | 61 (41.2)          | 87 (58.8)  | 0.635  |
| Igbo                            | 3 (3.4)            | 86 (96.6)   |       | 34 (38.2)          | 55 (61.8)  |        |
| Hausa                           | 1 (7.7)            | 12 (92.3)   |       | 7 (53.8)           | 6 (46.2)   |        |
| Other                           | 8 (9.3)            | 78 (90.7)   |       | 39 (45.3)          | 47 (54.7)  |        |
| **Educational level**           |                    |       |        |                    |            |        |
| No formal                       | 1 (12.5)           | 7 (87.5)    | 0.039* | 3 (37.5)           | 5 (62.5)   | 0.49   |
| Primary                         | 2 (4.9)            | 39 (95.1)    |       | 14 (34.1)          | 27 (65.9)  |        |
| Secondary                       | 3 (2.9)            | 130 (97.7)  |       | 53 (39.8)          | 80 (60.2)  |        |
| Tertiary                        | 16 (10.4)          | 138 (89.6)  |       | 71 (46.1)          | 83 (53.9)  |        |
| **Occupation**                  |                    |       |        |                    |            |        |
| Unskilled                       | 13 (6.6)           | 183 (93.4)  | 0.193  | 86 (43.9)          | 110 (56.1) | 0.275  |
| Manually skilled                | 1 (2.3)            | 43 (97.7)   |       | 18 (40.9)          | 26 (59.1)  |        |
| Skilled                         | 3 (5.0)            | 57 (95.0)   |       | 19 (31.7)          | 41 (68.3)  |        |
| Professional                    | 5 (13.9)           | 31 (86.1)   |       | 18 (50.0)          | 18 (50.0)  |        |
| **Average monthly income (in Naira)** |                |       |        |                    |            |        |
| <20,000                         | 2 (5.0)            | 38 (95.0)    | 0.104  | 11 (27.5)          | 39 (72.5)  | 0.098  |
| 20,000—<50,000                  | 10 (4.8)           | 198 (95.2)  |       | 88 (42.3)          | 120 (57.7) |        |
| 50,000 or above                 | 10 (11.4)          | 78 (88.6)   |       | 42 (47.7)          | 46 (52.3)  |        |
| **Number of children**          |                    |       |        |                    |            |        |
| 0—4                            | 20 (6.4)           | 294 (93.6)  | 0.958* | 136 (43.3)         | 178 (56.7) | 0.095* |
| 5—6                            | 2 (9.1)            | 20 (90.9)   |       | 5 (22.7)           | 17 (77.3)  |        |
| **Age of child**                |                    |       |        |                    |            |        |
| 1—2                            | 8 (4.5)            | 170 (95.5)  | 0.267  | 71 (39.9)          | 107 (60.1) | 0.42   |
| 3—4                            | 13 (9.0)           | 132 (91.0)  |       | 66 (45.5)          | 79 (54.5)  |        |
| 5—6                            | 1 (7.7)            | 12 (92.3)   |       | 4 (30.8)           | 9 (69.2)   |        |

*p < 0.05.

Yates’ correction.

Table 5: Association between awareness and use of low osmolarity ORS and zinc among respondents.

| Variable                        | Low osmolarity ORS | Zinc |
|---------------------------------|--------------------|------|
|                                 | Ever used          | Never used | p-value | Ever used          | Never used | p-value |
| **Low osmolarity ORS awareness**|                    |       |        |                    |            |        |
| Unaware                         | 301 (100)          | 0 (0) | 192.31 | <0.001*           |            |        |
| Aware                           | 13 (37.1)          | 22 (62.9) |       |                    |            |        |
| **Zinc awareness**              |                    |       |        |                    |            |        |
| Unaware                         | 157 (100)          | 0 (0) | 209.87 | <0.001*           |            |        |
| Aware                           | 38 (21.2)          | 141 (78.8) |       |                    |            |        |

χ²: chi-square; *p < 0.05.

Yates’ correction.

Table 6: Predictors of the awareness and use of low osmolarity ORS/zinc among respondents.

|                      | B       | p-value | AOR    | 95% CI   | Lower | Upper |
|----------------------|---------|---------|--------|----------|-------|-------|
| **Low osmolarity ORS awareness** |         |         |        |          |       |       |
| Ethnic group         | 0.010   | 0.944   | 1.010  | 0.755    | 1.352 |
| Educational level    | 0.702   | 0.019*  | 2.017  | 1.123    | 3.626 |
| Age of child         | 0.814   | 0.006*  | 2.257  | 1.237    | 4.117 |
| **Zinc awareness**   |         |         |        |          |       |       |
| Marital status       | −2.558  | 0.015*  | 0.077  | 0.01     | 0.612 |
| Average monthly income | 0.459   | 0.006*  | 1.582  | 1.144    | 2.187 |
| **Low osmolarity ORS use** |        |         |        |          |       |       |
| ORS awareness         | 21.846  | 0.992   | 3.07E+09 | 0        | —     | —     |
| Educational level     | −0.269  | 0.586   | 0.764  | 0.29     | 2.013 |
| **Zinc use**          |         |         |        |          |       |       |
| Zinc awareness        | 34.091  | 0.993   | 6.39E+14 | 0        | —     | —     |
| Marital status        | 14.555  | 0.996   | 2.095692 | 0        | —     | —     |

*p-value < 0.05; B: coefficient of regression; AOR: adjusted odds ratio; 95% CI: 95% confidence interval.
osmolarity ORS and zinc supplementation among respondents (Table 6). The factors that were significant in the bi-variate (chi-square) analysis were incorporated into the various models. The awareness of low osmolarity ORS among the mothers was significantly influenced by educational level (AOR: 2.017; 95% CI: 1.123–3.626) and the age of the child (AOR: 2.257; 95% CI: 1.237–4.177). Whereas average monthly income was a more likely predictor (AOR: 1.582; 95% CI: 1.144–2.187) of the awareness of zinc supplementation, marital status was a less likely predictor (AOR: 0.077; 95% CI: 0.01–0.612). In addition, no factor predicted the use of both treatments among the mothers in this study.

Discussion

Despite being in an urban location, only approximately one-tenth (10.4%) of the respondents in this study were aware of low osmolarity ORS. Better awareness levels have been documented in recent studies in southwestern Nigeria, northern Nigeria, and India.15–20 In addition, awareness of low osmolarity ORS was influenced by the mothers’ educational level and the age of the child. In contrast to traditional ORS, for low osmolarity ORS, there is a paucity of literature supporting this finding. Nonetheless, this result is consistent with findings from a study in Port Harcourt, southern Nigeria, where the level of education has been found to be a factor associated with awareness of low osmolarity ORS.21

Zinc supplementation lessens the severity, extent, and occurrence of diarrhoea in children. However, only approximately half (53.3%) of the mothers in this study were aware of zinc supplementation in the management of diarrhoea, and this awareness was influenced by average monthly income. Higher levels of awareness have been documented in studies conducted in southeast Nigeria (62.2%) and Ghana (70%),22,23 and lower levels of awareness have been observed in surveys in southwestern Nigeria, northwest Nigeria, and Bangladesh.18,24,25 In contrast to the findings in this study, educational level was associated with the awareness of zinc supplementation in the management of diarrhoea in a study in Enugu, Nigeria.22

The use of low osmolarity ORS among mothers of children under 5 years of age in this study was very low. Only approximately 6.5% had ever used low osmolarity ORS, whereas approximately nine in ten mothers had used regular ORS before. This low use was unsurprising, given that only approximately one in every ten mothers was even aware of this treatment. Awareness and educational level were associated with the use of low osmolarity ORS in this study. Similar findings have been observed in Abeokuta, southwestern Nigeria, where the awareness, knowledge, and availability of ORS have been found to influence its use. A preference for traditional treatment options is a suggested but unverified factor across four states in northwest Nigeria.19 The availability of different compositions of ORS and brands on the market has been found to be responsible for use in India.20 In this study, approximately four in ten mothers had actually used zinc in the management of diarrhoea. This result is consistent with findings among Ghanaian mothers but dissimilar to those from previous studies in Mali and Ethiopia, where higher levels of use have been reported.26,27 In addition, lower levels of use have been observed in other studies in the southwest and south of Nigeria and East Africa.18,28,29 Awareness and marital status were associated with the use of zinc supplementation in this study, and its use was higher among the mothers who were married and those who were aware of this treatment. Relatedly, knowledge regarding zinc for diarrhoea management has been found to determine its use in Abeokuta, Nigeria.18 Media exposure has also been found to predict its use in Ghana and India,30,31 whereas the mother’s educational level has been reported to influence its use in a previous study in Ethiopia.32

Awareness was a common factor associated with the poor use of low osmolarity ORS and zinc supplementation in this study. Healthcare workers in health centres are usually responsible for disseminating such information to mothers or caregivers whenever they come to access care. A recent survey in Imo state, southeast Nigeria, has identified knowledge gaps as key factors underlying the use of low osmolarity ORS and zinc supplementation among health care providers.33 These findings might not indicate a complete lack of health education activities in the area surveyed, but they do suggest that the message content, delivery approaches, and tools could have played important roles in creating the observed lack of knowledge.

Further research is necessary to reveal why zinc supplementation appears to be more commonly and better used than low osmolarity ORS among mothers, even though the two treatments were introduced at the same time.

Conclusion

We concluded that mothers of children under 5 years of age in Oshodi-Isolo LGA, Lagos, were largely unaware of low osmolarity ORS, and most of them had never used it. However, approximately half the mothers were aware of zinc supplementation, and two-fifths had actually used it in the management of childhood diarrhoea. Although awareness of low osmolarity ORS was significantly influenced by the mothers’ educational status and the age of child, the average monthly income determined the awareness of zinc supplementation. In addition, awareness was the only common factor associated with the use of both treatments.

Urgent action must be taken to promote awareness and education of mothers of children under 5 years of age and of community health workers regarding the importance of low osmolarity ORS and zinc supplementation in the management of diarrhoea. Such measures would greatly increase their awareness and use, thereby decreasing the morbidity and mortality from diarrhoeal diseases among children. The findings of this study should also help health system decision-makers bridge the gap between policymaking and implementation.

Limitations of the study

This study has several limitations. First, the setting of this study does not allow for generalisation of our findings to all other mothers of children under 5 years of age in southwest
Nigeria, given that only one local government area was studied, which was in an urban location. Second, the measure of use was based on respondents’ recall, thus potentially leading to recall bias. Nonetheless, the study outcomes add additional knowledge to the small corpus of research in this field.

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Conflict of interest

The authors have no conflict of interest to declare.

Ethical approval

All procedures performed were in accordance with the ethical standards of the Lagos University Teaching Hospital Ethics and Research Committee, and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Authors contributions

EOA, FAO, and BOA designed the study. OEA performed the data analysis, to which EOA contributed. All authors were involved in the literature searches. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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