level Overall

n 7,783

geo\_zone (%) 1 1368 (17.6)

2 1391 (17.9)

3 1797 (23.1)

4 1207 (15.5)

5 852 (10.9)

6 1168 (15.0)

age\_bands (%) 0 754 ( 9.7)

1 1637 (21.0)

2 1638 (21.0)

3 1752 (22.5)

4 1653 (21.2)

5 349 ( 4.5)

sex (%) 1 3971 (51.0)

2 3812 (49.0)

species (%) PF 1596 (87.7)

PF,PM 109 ( 6.0)

PF,PO 24 ( 1.3)

PM 71 ( 3.9)

PO 19 ( 1.0)

Study population

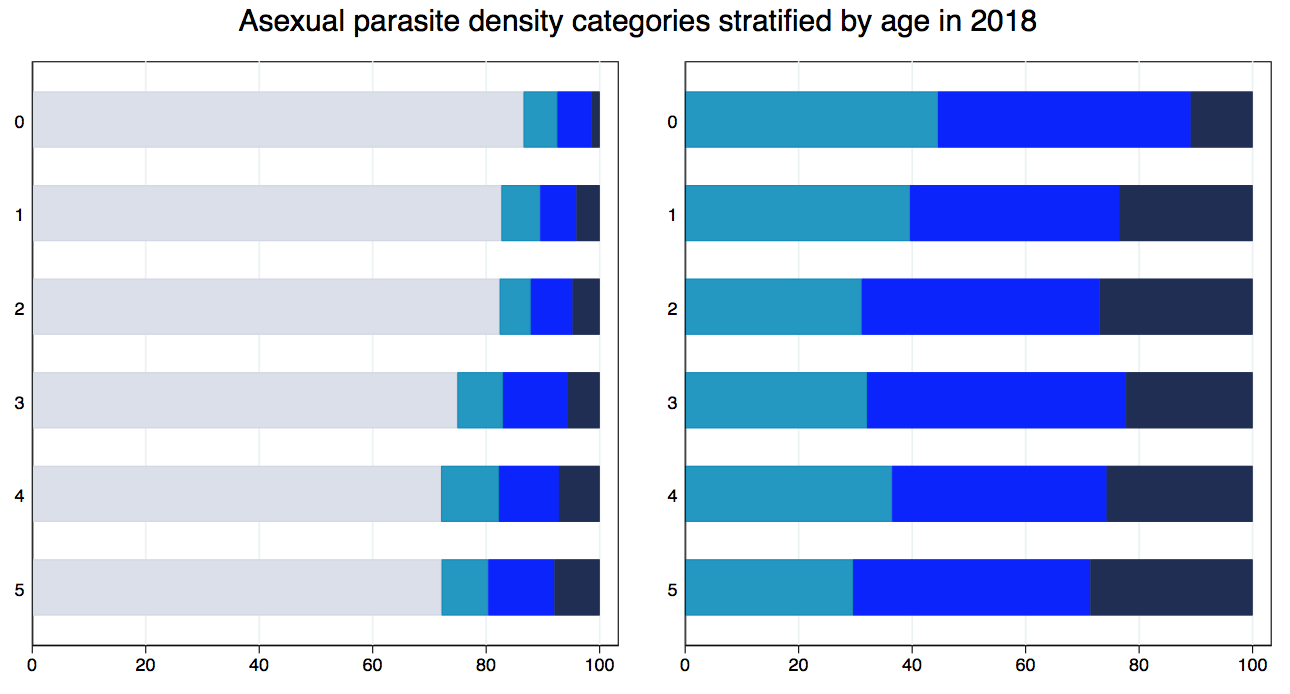
A total of 7783 Nigerian children under 5 years of age participated in the study. Overall, the mean age was 2.4 years (SD = 1.4) and 49.0% were females (3812/7783). Basic study characteristics are presented in Table 1.

|  |  |  |  |
| --- | --- | --- | --- |
| Table 2: Study population characteristics | | | |
|  | **2018**  (N=7,783) \* |  |  |
| **Age (years), % (n)** |  |  |  |
| 0 | 9.7 (754) |  |  |
| 1 | 21.0 (1,637) |  |  |
| 2 | 21.0 (1,638) |  |  |
| 3 | 22.5 (1,752) |  |  |
| 4 | 21.2 (1,653) |  |  |
| 5 | 4.5 (349) |  |  |
| **Gender, % (n)** |  |  |  |
| Female | 49.0 (3,812) |  |  |
| **Geopolitical zone, % (n)** |  |  |  |
| North-Central | 17.6 (1,368) |  |  |
| North-East | 17.9 (1,391) |  |  |
| North-West | 23.1 (1,797) |  |  |
| South-East | 15.5 (1,207) |  |  |
| South-South | 10.9 (852) |  |  |
| South-West | 15.0 (1,168) |  |  |
| \* N = denominator | | | |

Asexual parasite prevalence was 21.5% (1675/7783) and the asexual parasite densities ranged from 15 to 485,609 parasites/μL, with the geometric mean being 2242 parasites/μL (95% CI = 2032-2473 parasites/μL). Asexual parasite densities did not differ in relation to sex (geometric mean: 2187 parasites/μL, 95% CI: 1909-2505 parasites/μL for males and 2304 parasites/μL, 95% CI: 1998-2657 parasites/μL for females, p-value=0.5).

When including all children in the analysis (those positive or negative for parasites), the proportion with ≥ 10,000 parasites/μL increased with increasing age, with 1.6% in children under 1 years, 4.2% in 1-year olds, 4.8% in 2-year olds, 5.8% in 3-year olds, 7.3% in 4-year olds and 8.0% in 5-year olds (**Figure 4a**). Conversely, the proportion with no infection detected by microscopy decreased with increasing age, with 86.7% in 0-year olds, 82.6% in 1-year olds, 82.3% in 2-year olds, 74.8% in 3-year olds, 72.1% in 4-year olds, 71.9% in 5-year olds (**Figure 4a**). There was strong evidence for a difference between asexual category and age (p<0.001).

When only infected children were included in the analysis, a different pattern emerged (**Figure 4b**). The percentage with ≥ 10,000 parasites/μL was similar in all age groups (between 23.1-28.6%) apart from the in the youngest age group (12.0%). A significant difference between asexual category and age was found (p=0.02), however, this was less significant than when all individuals were included in the analysis.



**Percent (%)**

**Age (years)**

**A**

**B**

Chart

Description automatically generated

**Figure 4: Asexual parasite density categories stratified by age in 2018,** highlighting that different information can be understood from analysis based on only positive individuals (B) as compared to when all individuals are included in the analysis (A).

When analysing the geometric mean density by age, a consistent finding to the categorical analysis above was observed, where the youngest age group had the lowest geometric mean (1414 parasites/μL, 95% CI: 985-2030 parasites/μL)(Figure 5). It then increased to a maximum of 2750 parasites/μL (95%CI: 2161-3499) at 2 years of age. After 2 years of age, the asexual parasite density decreased and then increased slightly. There was evidence for a difference between asexual parasite density between age groups (p=0.04). Through conducting pairwise comparisons, this difference was shown to be driven through the 0-year age group being significantly different to the rest (Appendix 1).

Chart, box and whisker chart

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Further geopolitical zone asexual density differences were investigated on the premise of the zones containing differences in the prevalence of malaria, with the north generally being higher than the south (21). Regarding the distribution of parasitaemia by geopolitical zone in 2018, the highest density was recorded in the North-Central (geometric mean 2535 parasites/μL; 95% CI: 1977-3251 parasites/μL) and the lowest in the South-West (geometric mean 1583 parasites/μL; 95% CI: 1237-2926 parasites/μL)(Figure 6). In general, the North had a higher geometric mean asexual parasite density than the South. The 95% CIs for all regions overlapped, however, there was strong evidence for a difference between the asexual parasite density between geopolitical zones (p=0.01). Pairwise comparisons showed that this difference was mainly driven by the North-West and North-Central being significantly different to all Southern geopolitical zones (Appendix 1). Therefore, as a whole the parasite density follows a similar pattern to the parasite prevalence.