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# Association between Malaria, Feeding Habits and Other Socio-Demographic Factors in Children Aged 0 – 2 Years in the Buea, Tiko and Limbe Health Districts in Cameroon

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## ABSTRACT

Feeding practices are associated with childhood malaria and their severity. Most children 0 to 2years experience malaria and feeding practices may play a major role in the occurrence of this disease. The present study aimed to evaluate the association between feeding practice among children below 2 years with malaria in Buea, Tiko and Limbe health districts. A cross-sectional hospital-based survey study was carried out in three Health Districts (Limbe, Buea and Tiko) in the Southwest Region of Cameroon. A total of 1155 mothers attending infant welfare clinics across six hospitals were included. A structured questionnaire was used to collect data on feeding practices as well as socio-demographic factors. The study revealed that the prevalence of malaria was 21.1%. All feeding habits were associated with malaria ($P < 0.001$). Meanwhile, children who were not breastfed reported the highest prevalence of malaria (62.5%). Malaria positive status increased with age. Among the mothers, the age group that reported significantly ($P < 0.001$) higher prevalence of malaria was 32 – 38 years (29.0%) for malaria. Level of education was associated with malaria as well as monthly family income ($P < 0.05$). Exclusive breastfeeding was practiced by 55.5% of the mothers, whereas complementary feeding was practiced by 45.5%. The highest proportion of mothers who exclusively breastfed their children was from Limbe (61.6%), followed by Buea (59.3%) and the least from Tiko (45.6%). The occurrence of malaria and its association with socio-demographic factors cannot be undermined.

***KEYWORDS:*** *Feeding, Socio-demographic, Association, Malaria, Buea, Tiko, Limbe, Cameroon*

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## INTRODUCTION

Infectious diseases are illnesses caused by germs such as bacteria, protozoans, viruses and fungi that enter the body, multiply and can cause an infection. Some infectious diseases are contagious or communicable, meaning they are capable of spreading from one person to another person. Other infectious diseases can be spread by germs carried in air, water, food or soil. They can also be spread by vectors to humans (CDC, 2023) as it is the case with malaria. Malaria is an infectious disease that continues to be a major cause of mortality to a wide population in developing countries especially in Africa (Boutayeb, 2010). Approximately 12 million children younger than 5 years of age die every year of malnutrition with most of these children living in developing countries (WHO, 2013).

Globally, malaria is still a public health concern with approximately 445,000 malaria related deaths occurring in 2016 and Cameroon alone accounted for 3% of this number (WHO, 2018). In 2019, there were 229 million malaria cases globally that led to 409,000 deaths. Of these deaths, 67 percent (274,000) were children under 5 years of age. This translates into a daily toll of nearly 750 children under age 5 (UNICEF, 2012). As seen in many different areas of the globe, the malaria burden and transmission intensity in Cameroon is heterogeneous (Eyong *et al.*, 2016). Although different control measures including

free treatment of uncomplicated malaria in children under five years with artemisinin-based combination therapies (ACTs) and nation-wide distribution of long-lasting insecticidal net (Sumbele *et al*., 2014) have been implemented in Cameroon, the disease burden is still high (Ebai *et al.,* 2016). Most of these deaths occurred in children under the age of 2 years, who have a deficiency in naturally acquired immunity and as a consequence have the highest rates of infection, complications, and mortality. Nutritional status, complementary feeding and immune responses to such infections are closely related. Akiyama *et al*. (2016) reported a close tie between malnutrition particularly stunting, and *Plasmodium falciparum* malaria among children, with the under-two years recording the highest burden.

Although malnutrition is prevalent in developing countries, it is rarely cited as being among the leading causes of death (Bain *et al.,* 2013). About 178 million children globally are stunted and Africa has the highest rates (WHO, 2013). Generally, the risk of malnutrition in the first 2 years of life has been directly linked with poor breastfeeding and complementary feeding practices of mothers alongside high rates of infectious diseases (Arimond and Ruel, 2004). Breastfeeding (BF) has been associated with reduction in morbidity and mortality in children less than 2 years, particularly those exclusively breastfed up to 4 and 6 months of age (WHO, 2008; Kalanda *et al.,* 2006). The World Health Organization (WHO) recommends exclusive breastfeeding of all infants until six months of age (WHO, 2013). In spite of all the sensitization, the prevalence of exclusive breastfeeding remains low (Dhakal *et al.,* 2017). About 44% of infants 0–6 months old are exclusively breastfed. Few children receive nutritionally adequate and safe complementary foods; in many countries less than a fourth of infants 6–23 months of age meet the criteria of dietary diversity and feeding frequency that are appropriate for their age (WHO, 2023; Kunyanga & Kaindi, 2022).

**Statement of the Problem**

Malnutrition is one of the principal underlying causes of death for many of the world's children, contributing to more than a third of under-five deaths globally. In Buea, Tiko and Limbe Health Districts, malnutrition is common among children living in different communities (Nkuo-Akenji *et al*., 2008; Mbuh & Nembo, 2013). Usually, there are contradictory reports on the risk of malnutrition in the first 2 years of life and its association with poor breastfeeding and complementary feeding practices of mothers together with high rates of infectious diseases such as malaria, diarrhea and respiratory diseases (Arimond & Ruel, 2004; Asoba *et al*., 2019). Breastfeeding is said to protect against infectious diseases and provide protection against respiratory tract infections in infants, though the findings are inconsistent and need more scientific backing (Tarrant, 2010). Investigating the influence of feeding practices of mothers on the nutritional status of children up to 2 years and the impact on some infectious diseases may be an important approach toward reducing the burden of child malnutrition and other infectious diseases, thus enhancing population health and socio-economic development.

**Objectives**

**Main objective**

This work aimed at investigating feeding practices and their association to diarrhea, malaria, and respiratory diseases among children 0 to 2 years in Buea, Tiko and Limbe Health Districts.

**Specific objectives**

1. To determine the rate of exclusive breastfeeding and complementary feeding in children 0 – 2 years.
2. To determine the prevalence of malaria in children 0 – 2 years and its association with feeding habits in the Buea, Tiko and Limbe health districts.
3. To investigate the association between malaria and socio-demographic factors in relation to feeding practice in children 0 – 2 years in the Buea, Tiko and Limbe health districts.

**Research Hypotheses**

**Main Research Hypothesis**

There is a relationship between socio-demographic data, feeding practice and the occurrence of malaria in children 0 – 2 years in Fako Division.

**Specific Research Hypotheses**

1. There is a relationship between socio-demographic data and the occurrence of malaria in children 0 – 2 years in Fako Division.
2. There is a relationship between feeding practice and the occurrence of malaria in children 0 – 2 years in Fako Division.

**Rationale**

Nutritional status is closely tied to immune responses to infection, being on the one hand, an important determinant of the risk and prognosis of infectious diseases, and on the other hand, being directly influenced by infection (Caulfeld *et al*., 2004).

To date, findings from studies evaluating associations between various measures of malnutrition and malaria

have been contradictory with some studies reporting association (Sumbele *et al*., 2015) and others no association (Nyaaba *et al*., 2017).

Yet, malnutrition and *Plasmodium falciparum* malaria frequently co-exist in most countries and account for a large part of under-five morbidity and mortality (WHO, 2014).

The availability of data on the proportion and risk factors of ARIs is vital because, achieving the Sustainable Development Goal on improving health and wellbeing will depend on the existing efforts to prevent and control ARIs in all WHO regions (WHO, 2008).

This study will also allow us to bridge the knowledge gap by generating epidemiological information by which to guide proper formulation of prevention and control programs in this area.

**Methodology**

This study was carried out in PMI Tiko, Tiko District hospital, Buea Regional Hospital, PMI Buea, Limbe Regional Hospital and PMI Limbe, located in Fako Division of the Southwest Region of Cameroon.

This study is a cross sectional hospital-based survey that was carried out between the months of February 2021 and July 2022. After obtaining an Ethical clearance from the Faculty of health science institutional review board, an administrative authorization was obtained from the regional delegation of public health of southwest and local authorizations from the various health facilities (Integrated Health Center Buea Town, 7th Days Adventist and District Hospital Bota). A pilot study was carried out by administering 20 questionnaires to 20 mothers who had children within the required age (0 to 2 years) and who volunteered to participate. The pilot study was carried out in order to adjust any lapses and or errors, after which the results were inputted and analyzed, and the necessary corrections made. The updated questionnaire was then reprinted and used for the study proper.

**Sample size determination**

For this work, the estimated population size (N) from the 2021 population statistics for children 0 – 2 years (Limbe = 11957, Buea = 10452 and Tiko = 9119) was obtained from the Regional Delegation of Public Health, SW Region (MINSANTE/CIS, 2021), and the level of significance (e) was 0.05 or 5%. Thus, the estimated sample size was calculated for each Health District and presented as shown in Figure 1.

**Inclusion criteria and exclusion criteria**

This study included children aged 0 to 2 years who leaved in at least one of the study areas. The study excluded children who were born prematurely, HIV positive children and children with disabilities. The study also excluded children whose parents dropped out and were no longer interested in participating in the study.

The sample size for this study was determined based on Yamane's approach for finite population (Yamane, 1967) using the formula;

$$n = \frac{N}{1 + N(e)^2}$$

Where, n = the expected sample size,

N = the finite population out of which the sample was drawn,

e = the level of significance (or limit of tolerable error).

$$Limbe\ (n) = \frac{11957}{1+11957(0.05)^2} = 387$$

$$Tiko(n) = \frac{9119}{1 + 9119(0.05)^2} = 383$$

$$Buea(n) = \frac{10452}{1 + 10452(0.05)^2} = 385$$

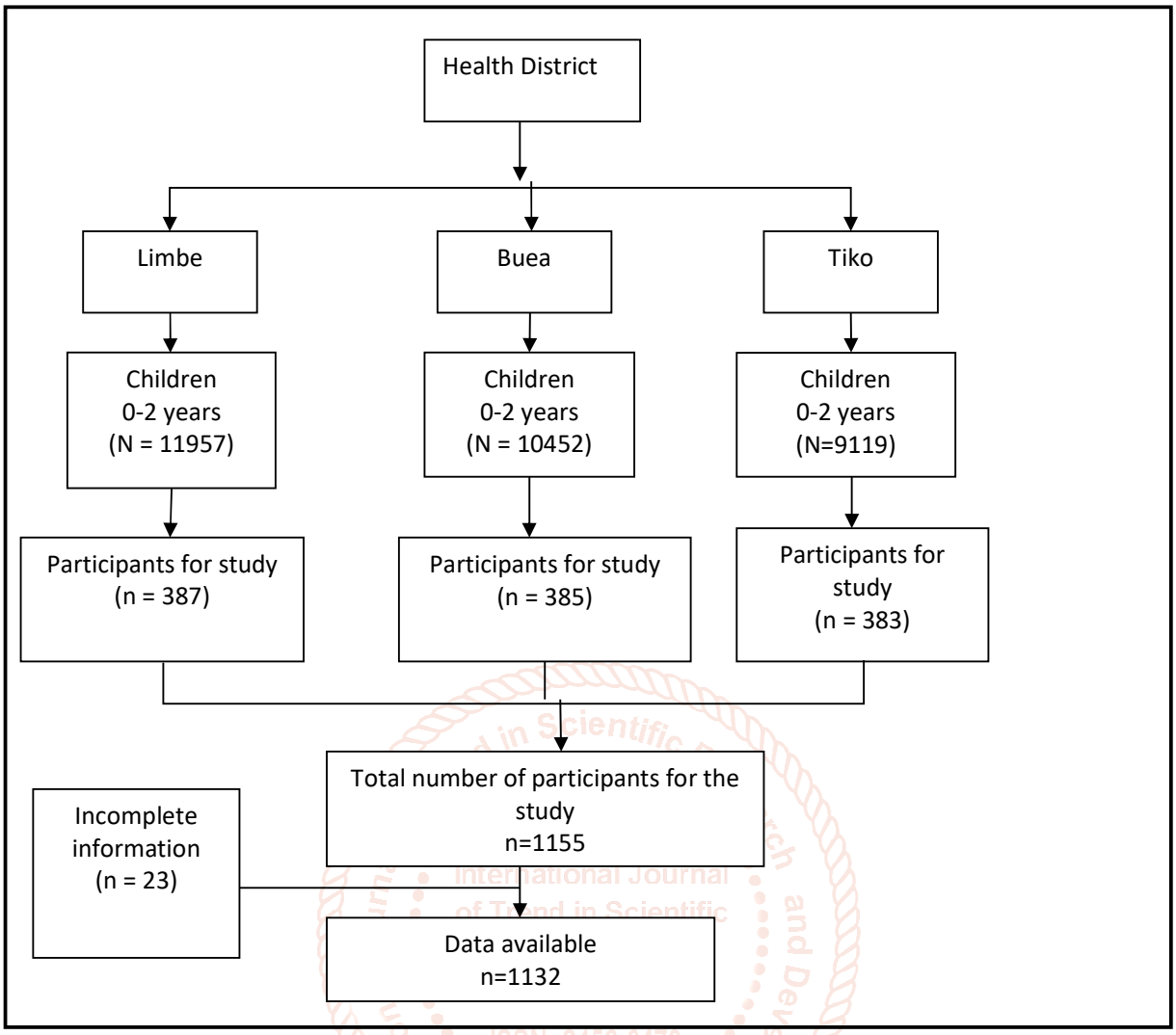


**Figure: Sample flow chart**

At the start of the study in each site, the parents and guardians of the children were educated on the study protocol and the benefits of participation. Upon obtaining the consent from the participants, structured questionnaire was then administered to the participants. The questionnaire was divided into 4 sections, with section A targeting anthropogenic measurements, section B capturing socio-demographic characteristics which helped us to determine the association between malaria and socio demographic characteristics. Section C was made up of questions concerning the different feeding practices. Section dealt with vaccination status. The questionnaire was self-administered to literate participants while it was interviewer administered to participants who could not understand.

## Findings

### Characteristics of study participants

The socio-demographic and socio-economic characteristics of the study participants are shown in table 1. A total of 1154 children within the age 0 – 2 years, residing in Buea 32.8% (378), Limbe 33.6% (388) and Tiko 33.6% (388) were involved in the study. The proportion of males (51.9%) slightly exceeded that of females (48.1%). Participation within age groups was comparable with more of the children in the 0 – 6 months (56.4%) age group. The majority of the women were within the age group 25 – 31 years (51.5%), married (66.0%) and had attended tertiary level of education (35.5%). A greater proportion of the women were employed (58.8%) in the private sector (82.3%). In addition, the monthly family income was above 90000 FCFA.

**Table 1: Socio-demographic and socio-economic characteristics**

| Variable | Category | %(n) |
|---|---|---|
| **Child** | | |
| Study area | Buea | 32.8(378) |
| | Limbe | 33.6(388) |
| | Tiko | 33.6(388) |
| Gender | Male | 51.9(599) |
| | Female | 48.1(555) |
| Age group (months) | 0 – 6 | 56.4(651) |
| | 7 – 12 | 16.9(195) |
| | 13 – 18 | 13.6(157) |
| | >18 | 13.1(151) |
| **Mother** | | |
| Age group (years) | 18 – 24 | 30.2(349) |
| | 25 – 31 | 51.5(594) |
| | 32 – 38 | 13.4(155) |
| | 39 – 45 | 3.3(38) |
| | >45 | 1.6(18) |
| Marital status | Single | 33.4(386) |
| | Married | 66.0(762) |
| | Divorced/Separated/Widow | 0.5(6) |
| Level of education | Primary | 17.5(202) |
| | Secondary | 47.0(542) |
| | University | 35.5(410) |
| Employment status | Employed | 58.8(679) |
| | Unemployed | 41.2(475) |
| Type of employment | Government employee | 17.7(120) |
| | Private employee | 82.3(559) |
| Monthly family income (FCFA)$ | 20.000 – 40.000 | 27.2(308) |
| | 41.000 – 70.000 | 21.3(241) |
| | 71.000 – 90.000 | 18.4(208) |
| | >90.000 | 33.1(375) |
| Religion | Christian | 94.6(1092) |
| | Muslim | 5.4(62) |

$ = Data available for 1132 participants.

**Clinical characteristics**

The prevalence of malaria in children aged 0 – 2 years was 17.9%, as shown in table 2. High parasitemia was reported (96.6%) among malaria cases, and the mean temperature (SD) was 36.7(0.6) (Table 2). The prevalence of anemia was 8.9% and prevalence of anemia was significantly higher ($P < 0.001$) in the age group > 18 months (38.4%) than the other age groups. More so, anemia was highly reported among malaria positive cases 41.9% (85) than malaria negative children and the difference was significant ($\chi^2 = 338.34$; $P < 0.001$). Equally, malaria positive children reported a significantly higher prevalence of fever (25.6%; $\chi^2 = 122.72$; $P < 0.001$) as compared with malaria negative children.

**Table 2: Clinical characteristics of children 0 – 2 years**

| Variable | Category | %(n) |
|---|---|---|
| Malaria prevalence | All children | 17.9 (203) |
| Malaria parasite load | High | 96.6 (196) |
| | Low | 3.4 (7) |
| Anemic status | Anemic | 8.9 (18) |
| | Non-anemic | 91.1 (185) |
| Fever status | Febrile | 25.6 (52) |
| | Afebrile | 74.4 (151) |
| Mean weight (SD) in kg | 7.9 (3.5) | |
| Mean height (SD) in cm | 61.2 (17.0) | |
| Mean temperature (SD) in °C | 36.7 (0.6) | |
| Mean head circumference (SD) in cm | 40.3 (7.1) | |

**Feeding practices in the study population**

The different feeding practices evaluated were exclusive breastfeeding and complimentary feeding. As shown in Table 3, the highest proportion of mothers who exclusively breastfed their children were from Limbe (61.6%), followed by Buea (59.3%) and the least from Tiko (45.6%). Significantly ($P < 0.001$), most mothers in the three study sites practiced complementary feeding with their children from birth. Among the children whose mothers gave information on their age, a statistically significant ($P = 0.020$) proportion in the age group 18 – 24 years exclusively breastfed their children (55.6%) while, those between 39 – 45 years had the highest proportion of children who were given complementary feeding (68.4%).

**Table 3: Association between socio-demographic, socioeconomic factors on different infant feeding methods**

| Parameter | | Number examined | Infant feeding methods %(n) | | $\chi^2$; P value |
|---|---|---|---|---|---|
| | | | Exclusive breastfeeding | Complimentary feeding | |
| Study area | Buea | 378 | 59.3(244) | 40.7(154) | 23.34; **<0.001** |
| | Limbe | 288 | 61.6(239) | 38.4(149) | |
| | Tiko | 388 | 45.6(166) | 54.4(211) | |
| Age group (years) | 18 – 24 | 349 | 55.6(194) | 44.4(155) | 11.72; 0.020 |
| | 25 – 31 | 594 | 57.9(344) | 42.1(250) | |
| | 32 – 38 | 155 | 51.0(79) | 49.0(76) | |
| | 39 – 45 | 38 | 31.6(12) | 68.4(26) | |
| | >45 | 18 | 61.1(11) | 38.9(7) | |
| Marital status | Single | 386 | 61.7(238) | 38.3(148) | 15.73; **<0.001** |
| | Married | 762 | 52.8(402) | 47.2(360) | |
| | Divorced/ Separated/ Widow | 6 | 0.0(0) | 100.0(6) | |
| Level of education | Primary | 202 | 57.9(117) | 42.1(85) | 2.61; 0.271 |
| | Secondary | 542 | 53.0(287) | 47.0(255) | |
| | University | 410 | 57.6(236) | 42.4(174) | |
| Employment status | Employed | 679 | 58.9(400) | 41.1(279) | 7.93; 0.005 |
| | Unemployed | 475 | 50.5(240) | 49.5(235) | |
| Family income | 20.000 – 40.000 | 308 | 57.5(177) | 42.5(131) | 7.57; 0.056 |
| | 41.000 – 70.000 | 241 | 59.3(143) | 40.7(98) | |
| | 71.000 – 90.000 | 208 | 58.7(122) | 41.3(86) | |
| | >90.000 | 375 | 49.9(187) | 50.1(188) | |

**Association between malaria and feeding habits**

All feeding habits were associated with malaria (P < 0.001) as shown in Table 4. The use of Cerelac, Custad, Phosphatine as food was highly (28.3%) associated with malaria as compared to other categories of food formula. More so, children who were not breastfed reported the highest prevalence of malaria (62.5%). The introduction of complementary food at 3 – 6 months was associated with high (25.6%) malaria parasite infection. A higher proportion of malaria (32.9%) was reported among children who were breastfed for a period of 6 months.

**Table 4: Association between malaria and feeding habits**

| Variable | Category | Malaria positive % (n) | $\chi^2$; P value |
|---|---|---|---|
| Formula food | Cerelac, Custad, Phosphatine | 28.3(128) | 62.34; <0.001 |
| | Homemade baby food | 15.6(19) | |
| | Homemade meals for everyone | 20.0(6) | |
| | Water/milk | 17.6(32) | |
| | Breast milk | 0.0(0) | |
| Feeding method | Exclusive breastfeeding | 16.7(107) | 30.31; <0.001 |
| | Formula only | 46.2(6) | |
| | Breast milk/Formula/Homemade | 16.5(80) | |
| | No breastfeeding | 62.5(10) | |
| Introduction of complementary food | <3 months | 22.0(55) | 58.68; <0.001 |
| | 3 – 6 months | 25.6(101) | |
| | After 6 months | 19.7(26) | |
| | Not yet/Never | 5.6(21) | |
| How long the baby was breastfed | <6 months | 8.3(48) | 86.48; <0.001 |
| | 6 months | 32.9(72) | |
| | 7 – 12 months | 22.6(70) | |
| | >12 months | 16.7(6) | |
| | No breastfeeding | 53.8(7) | |

**Association between malaria and socio-demographic factors**

Malaria positive status increases with increase in age. Among mothers, the age groups that reported significantly (P<0.001) higher prevalence of malaria was 32 – 38 years (29.0%). As for the children, it was 18 months and above (41.1%). Marital status was significantly associated with malaria with the divorced/separated/widow having the highest prevalence (50.3%). Level of education was significantly (P<0.001) associated with malaria whereby those that ended at primary level had the highest prevalence (42.1%). Then it was monthly income whereby those within income range 71.000 – 90.000 had significantly (P<0.001) the highest prevalence of malaria (27.4%), as presented in table 5.

**Table 5: Association between malaria and socio-demographic factors in children 0-2 years in the Fako Division**

| Variable | Category | Malaria positive status %(n) |
|---|---|---|
| Study area | Buea | 17.5(66) |
| | Limbe | 14.9(58) |
| | Tiko | 20.4(79) |
| **$\chi^2$; P value** | | **3.93; 0.140** |
| Gender | Male | 18.5(111) |
| | Female | 16.6(92) |

| | | |
|---|---|---|
| **$\chi^2$; P value** | | **0.76; 0.384** |
| Age group (months) | 0 – 6 | 4.1(40) |
| | 7 – 12 | 28.7(56) |
| | 13 – 18 | 28.7(45) |
| | >18 | 41.1(62) |
| **$\chi^2$; P value** | | **146.14; <0.001** |
| Age group (years) | 18 – 24 | 7.4(26) |
| | 25 – 31 | 20.4(121) |
| | 32 – 38 | 29.0(45) |
| | 39 – 45 | 28.9(11) |
| | >45 | 0.0(0) |
| **$\chi^2$; P value** | | **49.14; <0.001** |
| Marital status | Single | 27.5(106) |
| | Married | 12.3(94) |
| | Divorced/Separated/Widow | 50.0(3) |
| **$\chi^2$; P value** | | **44.8; <0.001** |
| Level of education | Primary | 42.1(85) |
| | Secondary | 12.4(67) |
| | University | 12.4(51) |
| **$\chi^2$; P value** | | **101.29; <0.001** |
| Employment status | Employed | 18.6(126) |
| | Unemployed | 16.2(77) |
| **$\chi^2$; P value** | | **1.06; 0.303** |
| Monthly family income (FCFA)[$] | 20.000 – 40.000 | 18.5(57) |
| | 41.000 – 70.000 | 16.6(40) |
| | 71.000 – 90.000 | 27.4(57) |
| | >90.000 | 13.1(49) |
| **$\chi^2$; P value** | | **19.07; <0.001** |

## Discussion

This study reported on the prevalence of malaria among children 0 – 2 years as well as its association with socio-demographic and different feeding practices. As compared to previous studies on malaria in children in the Mount Cameroon area, we reported a low prevalence of malaria (17.9%) which is lower than the most recently reported 36.4% by Sumbele *et al*., 2021). Although, the Mount Cameroon area has an equatorial climate characterized by abundant rainfall and constant humidity which are factors favoring intense and perennial transmission of the malaria parasite (Achidi *et al*., 2012), considerable progress has been made in the past years in reducing malaria morbidity and mortality in Cameroon, largely due to interventions such as LLIN and use of artemisinin-based combination therapy (Bhatt *et al*., 2015). Findings from the study revealed a significant association between infant feeding practice and the prevalence of malaria parasite, with a significantly lower prevalence in children who were exclusively breastfed. This is similar to a study carried in the Mount Cameroon area (Asoba *et al*., 2019) and also in Kinshasa, Democratic Republic of the Congo (Kassim *et al*., 2015). The lower prevalence of malaria parasite infection among infants who were exclusively breastfed (EBF) may be the result of early development of anti-parasite immunity unlike their counterparts who were not breastfed but rather introduced to other food stuffs. This is probably due to the transfer of maternal IgG antibodies against *P. falciparum* present in breast milk which is systemically absorbed into blood circulation where malaria parasites reside as well (Ballard & Morrow, 2013; Van de Perre, 2013). It should be noted that at six months, breastfeeding did not adequately protect

the child against malaria (32.9%). At 6 months, it is a vulnerable period of growth as nutritional intake, health status, the environment and care the child receives all affect its wellbeing (Michaelsen *et al.*, 2017). This finding is in line with the observations by Food and Nutrition Technical Assistance (FANTA) which also observed that vulnerability to infection is very high between ages 6-24 months of a child's life (FANTA, 2001). In addition, a study by Uyoga *et al.* (2017) among children showed that children who were breastfed for 6-10 months were more prone to illnesses due to decrease in iron stores and immunity gotten from the mother after delivery. It is true that breastfeeding keeps the infant away from contamination, but after 3-4 months of age, breast milk alone is not sufficient to satisfy the nutritional requirement. Other food items are being introduced even though breast feeding should be continued at least up to second year of life. Previous research has indicated that breastfed infants have fewer infections and hospitalizations rate (Ogbo *et al*., 2016). The current study showed that children who were only breastfed experienced lower respiratory diseases as compared to children who received other formula food. Past studies have shown that infants who receive other food substances had lower opportunities for receiving antibodies and other immune complexes from their mothers (Palmeira and Carneiro-Sampaio, 1992; Hosea *et al*., 2008). It is also possible that the relationship between bottle feeding and respiratory diseases is evident because bottle feeding may promote a higher rate of swallowing and more frequent interruption of breathing, which may increase the risk for micro-aspiration, and can lead to chest infection (Kim *et al*., 2011). Findings from the study showed that children Marital status influenced malaria infection and mothers who were divorced/separated reported having the highest prevalence of malaria among their children. Studies have shown that marriage has advantages on the health outcomes of individuals and children (Wood *et al*., 2007). A spouse may improve economic well-being (Lerman, 2002) as well as play an important role in monitoring and encouraging healthy behaviors (Umberson, 1987). This could be attributed to the challenges faced by single parents in raising a family especially the farmers who are of low socio-economic status. The parental care given to the children is minimal as the mother spends more time sourcing for income to cater for the needs of the family as a whole. Different socio-demographic characters of the participants including study area, age group, marital status and employment status were all associated with infant feeding methods. On average, 55.5% of the babies were on EBF meanwhile, 45.5% were on complementary feeding. The rate was much lower than that reported in Port Harcourt Southern Nigeria (Otaigbe *et al*., 2005) but higher than that reported by Asoba *et al*. (2019) (22.6%) in the Mount Cameroon area. Differences in study design might have accounted for this wide variation in rates. The study in Port Harcourt was a longitudinal and interventional study and since active mobilization and monitoring have been documented to positively impact EBF practices, the reported higher rates in these locations could be attributed to these interventions. This study being a cross-sectional design would have been devoid of such influence. Complementary breastfeeding which involves the use of both breast milk, infant formula and other non-milk feeds was practiced by significantly more (68.4%) by older women (39 – 45 years). This is probably due to the fact that older mothers usually start introducing other types of feeds as child gets older and able to tolerate these feeds in order to give them (mothers) time to attend to other activities. Although not significant, mothers who have attended university level of education practiced EBF (57.9%). Mothers with higher education will more likely understand and be better informed of the benefits of EBF thus delay introduction of other feeds compared to mothers with lower educational attainment. This is similar to a significant finding by Lawoyin *et al*. (2001) in a study at Ibadan, Southwest Nigeria. This study also revealed that both employed and non-employed mothers' practice significantly higher EBF than complementary feeding. They may be due to high level of awareness and correct knowledge of EBF and its practice. It was evident from this study that awareness and knowledge do equate to practice. However, some studies have reported a mismatch between knowledge and practice of EBF (Uchendu *et al*., 2009). Also, this high level of awareness and practice of EBF may be due to the dissemination of information on EBF which has helped resolve potential challenges previously faced by mothers.

## Conclusions

The overall prevalence of malaria was 17.9%. Malaria was highly associated with children who were not breastfed (62.5%) while children who used breast milk only had no malaria. Children from Tiko reported the highest cases of malaria. Malaria positive status increases with increase in age. Among mothers, child's age, mother's age, level of education, marital status and family monthly income was associated with malaria. On average 55.5% of the babies were on EBF meanwhile, 45.5% were on complementary feeding. Exclusively breast feeding was practiced more by mothers in Limbe (61.6%) than in Buea (59.3%) and Tiko (45.6%). Mothers in the age group 18 – 24 years exclusively breastfed their children (55.6%) while,

mothers between 39 – 45 years had the highest proportion of children who were given complementary feeding (68.4%).

**Recommendations**

- Primary health care sectors should be strengthened to improve access to preventive health care information and services. This will help the country meet up with sustainable development goal to end preventable child deaths (RDPH-SW).
- More comprehensive studies on Nutrition and infectious diseases should be conducted to identify more effective interventional strategies to prevent and treat these conditions that impose a significant public health and socio-economic burden in this region.

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