The Prevalence and the Predictors of Complementary and Alternative Medicine among Children on Highly Active Antiretroviral Therapy in Makurdi, Nigeria

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Authors’ contributions

This work was carried out in collaboration between all authors. Author EAA designed the study, wrote the protocol and collated the data, performed and reviewed the statistical analysis, did literature searches, wrote the first draft of the manuscript and also critically reviewed it for intellectual content. Author AO was also involved in the design of the study, reviewed the statistical analyses, provided literature reviews and also critically reviewed the article for intellectual content. Author TTB reviewed the statistical analyses and critically reviewed the manuscript for intellectual content. Authors OJD, UMA and AAA managed the literature searches and also reviewed the article for intellectual content. All authors read and approved the final manuscript.

ABSTRACT

**Aims:** To determine the prevalence, the pattern of usage and the predictors of complementary and alternative medicine (CAM) among children on highly active antiretroviral therapy (HAART).
Study Design: Prospective, Cross-sectional and quantitative.
Place and Duration of Study: Paediatric antiretroviral clinic of the Federal Medical Centre, Makurdi, Benue State, Nigeria, February 2012 to December 2012.
Methodology: Researchers administered structured questionnaire to 409 (102 men and 307 women) consecutively consented caregivers (CGs) whose children had been on HAART for not less than 6 months in order to fulfill the objectives of the study.
Results: 79.2% (324/409) of children used CAM as reported by their CGs. The three most commonly used CAM products were herbal concoctions containing majorly Bitter leaves (317/324, 97.8%), Ugu leaves/roots (282, 87.0%) and Neem tree leaves/bark (270, 83.3%). CGs also largely administered CAM whose contents were unknown (250, 77.2%). The use of Anointed water (255, 78.7%) and Anointed Oil (245, 75.6%) were also common. Animal products including Elephant skin (12, 3.7%), Elephant bone (10, 3.1%) and Snake bone (8, 2.5%) were also acknowledged. Spiritual healing was the most sought-for practice, seen among 252 (77.8%) CGs. 3.7% (12/324) of the CGs had disclosed the use of CAM to their primary physicians. Multivariate logistic regression analyses showed that: the use of CAM by CGs (AOR; 33.79, 95% CI; 8.049-141.856, \( P = .000 \)); when the child on HAART is of a male gender (AOR; 2.142, 95% CI; 1.230-3.730, \( P = .007 \)); fathers as CGs compared to mothers (AOR; 1.698, 95% CI; 1.180-2.443, \( P = .004 \)); CGs with no formal education compared to when CG attained a post-secondary level of education (AOR; 1.498, 95% CI; 1.127-1.990, \( P = .005 \)), remained independently associated with the use of CAM in children.
Conclusions: CAM use is common in Nigerian children on HAART. Concerted efforts should be put in place to encourage disclosure among CGs. Identified harmful CAMs should be discouraged.

Keywords: Complementary and alternative medicine; HIV infected children; antiretroviral therapy; Makurdi; Nigeria.

ABBREVIATIONS

CAM; Complimentary and alternative medicine; CGs; Caregivers; CG; Caregiver; HAART; Highly active antiretroviral therapy; ART; Antiretroviral therapy; FMC; Federal Medical Centre.

1. INTRODUCTION

Complementary and Alternative medicine (CAM) is defined simply as ‘preparations and practices that are not regarded as a part of conventional medicine and which may be used as a complement or as an alternative to conventional medicine’ [1]. It is broadly divided into 5 main groups: biological based products including the use of vitamins, minerals and local concoctions made from animal and/or plant products; manipulative/body based approaches including massage therapy and chiropractic medicine; mind-body medicine which include spiritual, meditative and relaxation techniques; energy medicine including bio-field and bio-electromagnetic techniques and lastly; alternative medical systems including acupuncture, traditional Chinese medicine, homeopathic medicine and Ayurveda [2]. The commonly used CAM in Nigeria includes vitamins and minerals, various concoctions of herbal and animal products, spiritual healing and many traditional Chinese herbal products [3-5]. In addition, massage therapy and chiropractic medicine are also scantly seen in the metropolitan towns of Abuja and Lagos. In Nigeria [6], like elsewhere [7], people patronize CAM because of its
cheapness, convenience, and the confidence in its use. According to the World Health Organization (WHO), about 80% of Africans use CAM for primary health care [8]. However, admittance of the use of CAM to health care workers is scarce and often not forthcoming [8]. Possible reasons for non-disclosure of CAM include concerns about a negative response by the physician, belief that the physician did not need to know about the CAM use, and that the physician did not ask [9-11].

CAM is often used in chronic or incurable medical condition like HIV/AIDS and some studies in adult populations suggested that the use of CAM among HIV/AIDS patients on ART is high, at between 15%-79% [12-15]. A review of the literature indicates that the most common reasons for the use of CAM among people with HIV/AIDS are: to take active control over their own health care; to boost their immune function; to lower viral load and prevent, delay, or treat symptoms of HIV disease progression or opportunistic infections; to help with side effects of conventional therapy (antiretroviral drugs and treatments for opportunistic infections); to help relieve stress, depression and fatigue, and to improve general well-being [16].

The use of CAM had been reported in acutely ill Nigerian children with febrile convulsion [17-19] and those with chronic illnesses including epilepsy, asthma and sickle cell anaemia [5,20]. Regrettably, there is a dearth of paediatric data on the use of CAM in HIV/AIDS [21], with none known to the Authors in Nigeria.

However, it is very important to document CAM use among paediatrics population because some CAM products may be forcibly administered to the child by the parents, with or without the assent of the child [17]. Furthermore, as related to HIV/AIDS, evidences have pointed to harmful interfaces on concurrent administration of CAM products and antiretroviral medications in adult population. This includes complex interactions between CAM products and antiretroviral medications resulting in sub-therapeutic serum levels and/or potentiating the side effects and toxicities of the antiretroviral (ARV) medications [12-24].

In the present study, data collection was based on structured questionnaire administered to the caregivers (CGs) of the children receiving Highly Active Antiretroviral Therapy (HAART) at the Paediatric antiretroviral therapy (ART) clinic of the Federal Medical Centre (FMC), Makurdi. The study aims at determining the prevalence and predictors of the use of CAM among HIV-infected children who had been on HAART for at least 6 months.

2. METHODS

2.1 Study Area and Setting

It was a cross-sectional study that took place between February 2012 and December 2012 at the Paediatric ART Clinic of the Riverside Specialist Clinics of the FMC, Makurdi. The centre is the only tertiary health hospital providing care and treatment for children exposed to or infected with HIV in Benue State of Nigeria. It is also a referral centre for primary and secondary health facilities in Benue State and the surrounding States of Taraba, Nasarawa and Kogi. The facility is supported by the AIDS Prevention Initiative in Nigeria (APIN)/Harvard PEPFAR (The USA President’s Emergency Plan for AIDS Relief) programme. By December 2012, the programme had cumulatively recruited 1,101 children, out of which 749 had been initiated on highly active antiretroviral therapy (HAART). However, only 746 children (410 males, 336 females) were still on care and lower 588
children were still on HAART (328 males, 260 females) in the same period. The clinic holds twice in a week, on Tuesdays and Fridays, with an average attendance of 100 children per visit. The clinic provides HIV care and treatment in accordance with the Nigerian National Guidelines on Paediatric HIV/AIDS Treatment and Care [25,26].

2.2 Sample Size Determination, Recruitment, Inclusion Criteria and Data Collection

A minimum sample size of 384 was calculated using the Leslie Kish’s method [27] at a standard normal deviate of 1.96, assuming 50% target population and tolerating 5% sampling error. From our experience in the pre-testing of the study questionnaire, we limited non-response rate to just 5%, giving a rounded figure of 409 for the sample size. Consecutive consenting caregivers of HIV-infected children (15 years and below) who had been on HAART for at least 6 months satisfied the inclusion criteria and were thus recruited till the sample size was attained. Adolescent children, >15 years were excluded as they were often seen in the adult ART clinic of the FMC, Makurdi. The research instrument was a structured questionnaire. It consisted of five broad parts including; socio-demographic characteristics of caregiver and the child; section on whether or not CAM has been used for the child; section on the types of CAM used; section on the reasons for or not using CAM and lastly information on HAART, its regimen and its duration. Vitamins syrup/capsules were excluded from the list of possible CAMs as all the HIV-infected children on HAART were on the routine prescription in our program. The questions in the questionnaire had been summarized in Tables under the Results section. Previous studies [3-5] in Nigeria as well as CAM practitioners in Makurdi informed the list of CAM. Generally, CAM was divided into products and practices. Allowance was also made for any CAM not included in the questionnaire. As previously done by Oshikoya et al. [10], samples of the CAM products and the photographs of the different alternative medical practices (i.e. body scarification, charm wearing, ritual sacrifice, Chinese medicine, homeopathy and Ayurveda) were shown to the caregivers to aid and confirm a particular CAM that may have been used. The mind body system practices (spiritual healing/prayer, visualization, meditation, hypnosis and divination/incantation) were also explained to the caregivers. Spiritual healing/prayer and ritual sacrifice were included as CAM, only when the purpose was for the cure of HIV/AIDS. The questionnaire was pre-tested among 25 other respondents who did not participate in the survey. The pre-tested questionnaire was then analysed and the necessary corrections made. In order to encourage the free and unhindered admittance in the use of CAM by the respondents (caregivers), the survey team consisted of 4 medical doctors who were not part of the routine doctors that provide care and treatment to the HIV-infected children. These doctors were fluent in Tiv and Idoma indigenous languages and were also familiar with the culture of the respondents. They were trained in the administration of the questionnaires adapted in the indigenous languages and their proficiency was verified through role-play and pre-testing. Administration of the questionnaire to the respondents took place in adjoining consulting offices to the waiting space of the clinic. Since the survey was anonymous, duplication of respondents was avoided by asking if a respondent had been surveyed previously.

2.3 Operational Definitions

Caregiver (CG) is a person who has consistently assumed responsibility for the housing, health, or safety of the child (individuals who administered the child medication daily and
bringing the child for clinic appointments). This may be the parents of the child or a biological or a non-biological relation if the child happens to be an orphan.

Optimal adherence is defined as achieving 95% or more, when a child misses 3 doses or less in a twice daily regimen over 30 days.

Adherence was assessed by a monthly recall from the caregivers.

2.4 Statistical Analysis

Descriptive statistics were tabulated as means (standard deviation) for continuous variables and numbers and percentages for categorical variables. The main outcome variable in the analysis was CAM use versus no CAM use. The prevalence of CAM used was calculated. Potential predictors for CAM use were tested for significance in a bivariate logistic regression. These predictive variables included some socio-demographic factors, some reasons for using CAM and the duration of children on HAART. Predictive factors that achieved a significance level of 0.1 were considered eligible for multivariate logistic regression analysis. For all analyses, p-values less than 0.05 were considered statistically significant. Statistical analysis was done using SPSS version 16.

3. RESULTS

Table 1 shows some socio-demographic characteristics of the CGs and children on antiretroviral therapy stratified by CAM usage. A total of 409 CGs were surveyed. The mean age of the CGs and the children was 34.90±11.29 years and 6.71±2.32 years respectively. Majority were mothers (256, 62.6%) and of female gender (307, 75.1%) including when biological relations were caregivers. Most (146, 35.7%) of the CGs were ≤29 years and almost an equal number (145, 35.4%) were also between 30-39 years. Almost two thirds of the CGs lived in with a form of partner (270, 66%) and a vast majority (345, 84.4%) was of Tivs tribe. Most (159, 38.9%) of the CG had no formal education and a little lower (156, 38.1%) attained secondary level education. Majority (275, 67.3%) of the CGs received less than the Country’s monthly minimum wage of 10,000 Naira. Almost all of the CGs (406, 99.3%) was of the Christian faith. A little above half (220, 53.8%) of the CG were rural dwellers. A third (140, 34.2%) of the CGs had also used CAM and almost a 2/3rd (277, 67.7%) were also on HAART. Among the CGs on HAART, a vast majority (365, 89.2%) had also received counselling on HAART.

For the children: most of them were of female gender (216, 52.8%); less than or equal to 9 years (387, 94.6%); on optimal adherence on HAART (366, 89.5%). One hundred and forty (140, 34.2%) children were on HAART for ≤12 months and 148 (36.2%) children had been on HAART for >36 months.

Table 2 shows the prevalence and profile of CAM administered to the child by the CGs. The three most commonly used CAM products identified by the CGs were herbal concoction containing majorly Bitter leaves (317/324, 97.8%), Ugu leaves/roots (282, 87.0%) and Neem tree leaves/bark (270, 83.3%). The least used CAMs known to CGs were Lemon grass (69, 21.3%), Moringa leaves (35, 10.8%) and Indian hemp (29, 8.9%). CGs also largely used CAM whose contents were unknown (250, 77.2%). For branded herbal product, Jobelyn® (36, 11.1%), Yem-kem® (25, 7.7%) and Tianshi® (9, 2.8%) were acknowledged among the CGs. Anointed water (255, 78.7%) and Anointed Oil (245, 75.6%) were also common among
the CGs. As regards the use of animal products as CAM, Elephant skin (12, 3.7%), Elephant bone (10, 3.1%) and Snake bone (8, 2.5%) were acknowledged. Although, a higher number (29, 8.9%) whose animal origin was unknown had been used by the CGs. Concoctions containing a mix of herbal and animal products were used by 39 (12.0%) CGs.

In respect to CAM practices, spiritual healing was the most sought-for practice, seen among 252 CG (77.8%). In addition, bodily scarifications (158, 48.8%), wearing of charms/bracelets (38, 11.7%) and ritual sacrifices (29, 8.9%) were other identified CAM. Other form of CAM practices was not found among the surveyed CG.

Table 1. Some socio-demographic characteristics of the caregivers and children on antiretroviral therapy stratified by CAM usage

| Characteristics                        | CAM-users (N, %) | Non-CAM users (N, %) | N=409 (%) |
|----------------------------------------|------------------|----------------------|-----------|
| **Care giver (CG)**                    |                  |                      |           |
| Mother                                 | 198(77.3)        | 58(22.7)             | 256(62.6) |
| Father                                 | 71(86.6)         | 11(13.4)             | 82(20.0)  |
| Biological relation                    | 55(77.5)         | 16(22.5)             | 71(17.4)  |
| Non-biological relation                | -                | -                    | -         |
| **Age of CG (years)**                  |                  |                      |           |
| ≤29                                    | 109(74.7)        | 37(25.3)             | 146(35.7) |
| 30-39                                  | 114 (78.6)       | 31(21.4)             | 145(35.4) |
| 40-49                                  | 61(82.4)         | 13(17.6)             | 74(18.1)  |
| ≥50                                    | 40(90.9)         | 4(9.1)               | 44(10.8)  |
| **Gender of CG**                       |                  |                      |           |
| Male                                   | 83(81.4)         | 19(18.6)             | 102(24.9) |
| Female                                 | 241(78.5)        | 66(21.5)             | 307(75.1) |
| **Marital status of CG**               |                  |                      |           |
| With a partner                         | 209(77.4)        | 61(22.6)             | 270(66.0) |
| Without a partner                      | 115(82.7)        | 24(17.3)             | 139(34.0) |
| **Ethnic group of CG**                 |                  |                      |           |
| Tiv                                    | 275(79.7)        | 70(20.3)             | 345(84.4) |
| Idoma                                  | 49(76.6)         | 15(23.4)             | 64(15.6)  |
| **Education of CG**                    |                  |                      |           |
| Non-formal                             | 138(86.8)        | 21(13.2)             | 159(38.9) |
| Primary                                | 56(77.8)         | 16(22.2)             | 72(17.6)  |
| Secondary                              | 117(75.0)        | 39(25.0)             | 156(38.1) |
| Post-secondary                         | 13(59.1)         | 9(40.9)              | 22(5.4)   |
| **Monthly income of CG (Naira)**       |                  |                      |           |
| <5,000                                 | 116(78.4)        | 32(21.6)             | 148(36.2) |
| 5,000-<11,000                          | 98(77.2)         | 29(22.8)             | 127(31.1) |
| 11,000-<20,000                         | 33(76.7)         | 10(23.3)             | 43(10.5)  |
| ≥20,000                                | 77(84.6)         | 14(15.4)             | 91(22.2)  |
| **Religion of CG**                     |                  |                      |           |
| Christianity                           | 322(79.3)        | 84(20.7)             | 406(99.3) |
| Islam                                  | 2(66.7)          | 1(33.3)              | 3(0.7)    |
| **Residence of CG**                    |                  |                      |           |
| Rural                                  | 184(83.6)        | 36(16.4)             | 220(53.8) |
| Urban                                  | 140(74.1)        | 49(25.9)             | 189(46.2) |
Table 1 continued

|                          | Yes       | No       | Total     |
|--------------------------|-----------|----------|-----------|
| CG also use CAM          | 138(98.6)| 2(1.4)   | 140(34.2) |
| CG also use HAART        | 220(79.4)| 57(20.6) | 277(67.7) |
| CG has received counselling on HAART | 287(78.6)| 78(21.4) | 365(89.2) |
| Gender of the child      |           |          |           |
| Male                     | 160(82.9)| 33(17.1) | 193(47.2) |
| Female                   | 164(75.9)| 52(24.1) | 216(52.8) |
| Age of the child (years) |           |          |           |
| ≤9                       | 324(83.7)| 63(16.3) | 387(94.6) |
| 10-15                    | 0(0.0)   | 22(100.0)| 22(5.4)   |
| Optimal adherence of the child on HAART | 291(79.5)| 75(20.5) | 366(89.5) |
| Types of HAART child is on |          |          |           |
| AZT/3TC/NVP              | 203(78.7)| 55(21.3) | 258(63.1) |
| d4T/3TC/NVP              | 85(76.6)| 26(23.4) | 111(27.1) |
| ABC/3TC/LPV              | 36(90.0)| 4(10.0)  | 40(9.8)   |
| Duration on HAART by the child |          |          |           |
| ≤12 months               | 116(82.9)| 24(17.1) | 140(34.2) |
| >12–24 months            | 48(80.0)| 12(20.0) | 60(14.7)  |
| >24–36 months            | 44(72.1)| 17(27.9) | 61(14.9)  |
| >36 months               | 116(78.4)| 32       | 148(36.2) |
| Number of Siblings of the child |          |          |           |
| ≤4                       | 305(79.6)| 78(20.4) | 383(93.6) |
| >4                       | 19(73.1)| 7(26.9)  | 26(6.4)   |
| History of death of a sibling on HAART |          |          |           |
| Yes                      | 20(80.0)| 5(20.0)  | 25(6.1)   |
| No                       | 304(79.2)| 80(20.8) | 384(93.9) |

N=Total number of caregivers, Mean age of CG=34.90±11.29 years; Mean age of the children=6.71±2.32 years; HAART=highly active antiretroviral therapy

With specific regards to the reasons for using the CAM products and practices, the trend was such that CAM containing animal products and CAM practices were majorly used as a cure for HIV/AIDS.

Pertaining to the frequency of use of CAM among the respondents, majority (189, 58.3%) administered CAM more than once weekly and at least 77 CGs administered CAM once a week.

Among the CGs that attested to the use of CAM for their children, the source of recommendation was from other CGs of similarly HIV-infected children. Spiritual leaders (i.e. Prophets) were sources of recommendation in 42 (12.9%) and Biological Relations in 32
(9.9%) respondents. Curiously, Health workers (Community health extension workers) were identified as a referral source in 12 respondents (3.7%). Print media (Newspapers, 6, 1.9%) was not a common source of recommendation.

Table 2. Prevalence and profile of CAM administered to the child by the care givers

| Types of CAM administered to children | N# (N/324=%) | Reason (s) for the use of CAM |
|--------------------------------------|-------------|------------------------------|
| **1. Herbal products**               |             |                              |
| A. Concoctions with known herbs      |             |                              |
| bitter leaves (Vernonia amygdalina)   | 317 (97.8)  | 1—6,8                       |
| Ugu leaves/roots (Telfairia occidentalis) | 282 (87.0)  | 1-6,8                       |
| Team tree leaves/bark (Azadirachta indica) | 270 (83.3)  | 2-4                         |
| Banana gruel (Musa sapientum)        | 185 (57.1)  | 2-4                         |
| Coconut milk (Cocos nucifera)        | 150 (46.3)  | 2-6,8                       |
| Aloe vera (Aloe barbadensis)         | 90 (27.8)   | 2-5                         |
| Ginger (Zingiber officinale)         | 81 (25.0)   | 2-5,8                       |
| Lemon grass (Cymbopogon citratus)    | 69 (21.3)   | 2-5,8                       |
| Moringa (Moringa oleifera)           | 35 (10.8)   | 2,3,6                       |
| Indian hemp (Apocynum cannabinum)    | 29 (8.9)    | 2,3,6                       |
| B. Concoctions with unknown herbs    | 250 (77.2)  | 2,3,5                       |
| C. Branded herbal products          | 36 (11.1)   | 2,3,5,6                     |
| Jobelyn®                             |             |                              |
| Yem-kem®                             | 25 (7.7)    | 2,3,5,6                     |
| Tianshi®                             | 9 (2.8)     | 2,3,5,6                     |
| D. Anointed water                    | 255 (78.7)  | 7                           |
| E. Anointed oil                      | 245 (75.6)  | 7                           |
| **2. Animal products**               |             |                              |
| Elephant skin                        | 12 (3.7)    | 7                           |
| Elephant bone                        | 10 (3.1)    | 7                           |
| Snake bone                           | 8 (2.5)     | 7                           |
| Unknown                              | 29 (8.9)    | 7                           |
| **3. Mix of herbal and animal products** |         |                              |
| Mangoes leaves+Elephant skin         | 4 (1.2)     | 7                           |
| Unknown                              | 35 (10.8)   | 7                           |
| **4. CAM Practices**                 |             |                              |
| Spiritual healing                    | 252 (77.8)  | 7                           |
| Scarification                         | 158 (48.8)  | 2,3                         |
| Wearing of charms/bracelets          | 38 (11.7)   | 2,3                         |
| Ritual sacrifice with animals        | 29 (8.9)    | 7                           |
| Meditation                           | -            | -                           |
| Hypnosis                             | -            | -                           |
| Massage                              | -            | -                           |
| Chiropractic                         | -            | -                           |
| Bio-field                            | -            | -                           |
| Bio-electromagnetic                  | -            | -                           |
Table 2 continued

| 5. Frequency of use of CAM | Number (N/324=%) |
|---------------------------|------------------|
| >Once weekly              | 189(58.3)        |
| Weekly                    | 77(23.8)         |
| ≤Monthly                  | 33(10.2)         |
| Very infrequent           | 25(7.7)          |

6. Source of recommendation for CAM usage

| Number (N/324=%) |
|------------------|
| Other CG of HIV infected child | 182(56.2) |
| Spiritual leader  | 42(12.9)    |
| Relation          | 32(9.9)     |
| Friends           | 27(8.3)     |
| Health worker(CHEW) | 12(3.7) |
| Self              | 23(7.1)     |
| Newspaper         | 6(1.9)      |

7. Is your doctor aware of CAM use?

| Yes | 12(3.7) |
| No  | 312(96.3) |

A vast majority (312/324, 96.3%) of the CAM users did not disclose to their primary health caregivers about the use of CAM in their children.

Table 3 shows the reasons for the use of CAM among the caregivers. The most common reasons for the use of various forms of CAM among the respondents were “To relieve the side effects of ARV medicines” in 307 (75.1%). “To boost the child’s immunity” in 280 (68.5%) and “To prevent Opportunistic infections” in 278 (68.0%). The less common reasons were; “To provide cure for HIV/AIDS” in 69 (16.9%) and “To reduce viral load” in 27 (6.6%) respondents.

Table 4 is the bivariate and multivariate regression analyses for predictive factors for CAM usage.
### Table 3. Reasons for the use of CAM

| Reason(s)                                      | N=409 (%) |
|------------------------------------------------|-----------|
| **1. CAM relieves side effects of HAART**     |           |
| Yes                                           | 307 (75.1)|
| No                                            | 17 (4.2) |
| Not applicable                                | 85 (20.8)|
| **2. CAM boosts child’s immunity**             |           |
| Yes                                           | 280 (68.5)|
| No                                            | 44 (10.8) |
| Not applicable                                | 85 (20.8)|
| **3. CAM prevents Opportunistic infections**   |           |
| Yes                                           | 277 (67.7)|
| No                                            | 47 (11.5) |
| Not applicable                                | 85 (20.8)|
| **4. CAM causes no harm**                      |           |
| Yes                                           | 263 (64.3)|
| No                                            | 61 (14.9) |
| Not applicable                                | 85 (20.8)|
| **5. CAM helps ART in its functions**          |           |
| Yes                                           | 124 (30.3)|
| No                                            | 200 (49.6)|
| Not negotiable                                | 85 (20.8)|
| **6. CAM relieves some symptoms of HIV/AIDS** |           |
| Yes                                           | 121 (29.6)|
| No                                            | 203 (49.6)|
| Not applicable                                | 85 (20.8)|
| **7. CAM with HAART provides cure for HIV/AIDS** |       |
| Yes                                           | 69 (16.9) |
| No                                            | 255 (62.3)|
| Not applicable                                | 85 (20.8)|
| **8. CAM reduces Child’s viral load**          |           |
| Yes                                           | 27 (6.6)  |
| No                                            | 297 (72.6)|
| Not applicable                                | 85 (20.8)|

N=Total number of caregivers
Table 4. Bivariate and multivariate regression analyses for predictive factors for CAM usage

| Predictive factor                  | CAM user N (%) | Non-CAM user N (%) | Bivariate analysis | Multivariate analysis |
|-----------------------------------|----------------|-------------------|--------------------|-----------------------|
|                                   | N (%)          | N (%)             | 95 % CI            | OR   | P-value | 95 % CI | AOR  | P-value |
| **Primary care giver (PCG)**      |                |                   |                    |      |         |        |      |         |
| Mother (Ref)                      | 198(77.3)      | 58(22.7)          | 1.05-37.60         | 6.27 | .04     | 1.180-2.443 | 1.698 | .004    |
| Father                            | 71(86.6)       | 11(13.4)          | 0.24-6.38          | 1.24 | .79     | NA      | NA   | NA      |
| Biological relation               | 55(77.5)       | 16(22.5)          | 0.09-2.66          | 0.49 | .41     | NA      | NA   | NA      |
| **Age of PCG**                    |                |                   |                    |      |         |        |      |         |
| ≤29                               | 109(74.7)      | 37(25.3)          | 0.09-1.81          | 0.40 | .23     | NA      | NA   | NA      |
| 30-39                             | 114(78.6)      | 31(21.4)          | 0.23-1.11          | 0.51 | .09     | 0.372-1.185 | 0.664 | .17     |
| ≥50 (Ref)                         | 40(90.9)       | 4(9.1)            | 0.21-1.46          | 0.56 | .23     | NA      | NA   | NA      |
| **Gender of PCG**                 |                |                   |                    |      |         |        |      |         |
| Male                              | 83(81.4)       | 19(18.6)          | 0.09-1.37          | 0.40 | .23     | NA      | NA   | NA      |
| Female (Ref)                      | 241(78.5)      | 66(21.5)          | 0.23-1.11          | 0.51 | .09     | 0.372-1.185 | 0.664 | .17     |
| **Marital status of PCG**         |                |                   |                    |      |         |        |      |         |
| With a partner                    | 209(77.4)      | 61(22.6)          | 0.23-1.11          | 0.51 | .09     | 0.372-1.185 | 0.664 | .17     |
| Without a partner (Ref)           | 115(82.7)      | 24(17.3)          | 0.21-1.46          | 0.56 | .23     | NA      | NA   | NA      |
| **Ethnic group of PCG**           |                |                   |                    |      |         |        |      |         |
| Tiv                               | 275(79.7)      | 70(20.3)          | 0.25-2.03          | 0.71 | .52     | NA      | NA   | NA      |
| Non-Tiv (Ref)                     | 49(76.6)       | 15(23.4)          | 0.25-2.03          | 0.71 | .52     | NA      | NA   | NA      |
| **Education of PCG**              |                |                   |                    |      |         |        |      |         |
| Non-formal                        | 138(86.8)      | 21(13.2)          | 1.29-20.91         | 5.19 | .02     | 1.127-1.990 | 1.498 | .005    |
| Primary                           | 56(77.8)       | 16(22.2)          | 0.80-15.65         | 3.53 | .09     | NA      | NA   | NA      |
| Secondary                         | 117(75.0)      | 39(25.0)          | 0.59-8.78          | 2.27 | .23     | NA      | NA   | NA      |
| Post-secondary (Ref)              | 13(59.1)       | 9(40.9)           | 0.25-2.03          | 0.71 | .52     | NA      | NA   | NA      |
| **Monthly income of PCG (Naira)** |                |                   |                    |      |         |        |      |         |
| <5,000                            | 116(78.4)      | 32(21.6)          | 0.25-2.03          | 0.71 | .52     | NA      | NA   | NA      |
| 5,000-<11,000                     | 98(77.2)       | 29(22.8)          | 0.30-2.03          | 0.77 | .60     | NA      | NA   | NA      |
| 11,000-<20,000                    | 33(76.7)       | 10(23.3)          | 0.17-1.96          | 0.57 | .37     | NA      | NA   | NA      |
| ≥20,000 (Ref)                     | 77(84.6)       | 14(15.4)          | 0.45-107.98        | 7.00 | .16     | NA      | NA   | NA      |
| **Religion of PCG**               |                |                   |                    |      |         |        |      |         |
| Christianity                      | 322(79.3)      | 84(20.7)          | 0.45-107.98        | 7.00 | .16     | NA      | NA   | NA      |
| Islam (Ref)                       | 2(66.7)        | 1(33.3)           | 0.25-2.03          | 0.71 | .52     | NA      | NA   | NA      |
| Residence of PCG | 184(83.6) | 36(16.4) | 0.92-3.88 | 1.88  | .08   | 0.668-2.008 | 1.158 | .60  |
|------------------|----------|----------|-----------|-------|-------|------------|-------|------|
| Rural            | 140(74.1)| 49(25.9) |           |       |       |            |       |      |
| Urban (Ref)      |          |          |           |       |       |            |       |      |
| PCG also use CAM | Yes      | 138(98.6)| 2(1.4)    | 7.45-127.34 | 30.79 | <.001 | 8.049-141.856 | 33.790 | .000 |
| No (Ref)         | 186(69.1)| 83(30.9) |           |       |       |            |       |      |
| PCG also use HAART| Yes     | 220(79.4)| 57(20.6)  | 0.63-1.73 | 1.04  | .88     | NA    | NA   |
| No (Ref)         | 104(78.8)| 28(21.2) |           |       |       |            |       |      |
| PCG has received counselling on HAART | Yes | 287(78.6)| 78(21.4)  | 0.04-1.43 | 0.22  | .11     | NA    | NA   |
| No (Ref)         | 37(84.1) | 7(15.9)  |           |       |       |            |       |      |
| Gender of the child| Male      | 160(82.9)| 33(17.1)  | 1.08-4.09 | 2.10  | .03     | 1.230-3.730 | 2.142 | .007 |
| Female (Ref)     | 164(75.9)| 52(24.1) |           |       |       |            |       |      |
| Age of the child (years) | ≤9 (Ref) | 324(83.7)| 63(16.3)  | NA     | NA    | NA     | NA    | NA   |
|                  | 10-15    | 0(0.0)   | 22(100.0) | NA     | NA    | NA     | NA    | NA   |
| Optimal adherence of the child on HAART | Yes | 291(79.5)| 75(20.5)  | NA     | NA    | NA     | NA    | NA   |
| No (Ref)         | 33(76.7) | 10(23.3) |           |       |       |            |       |      |
| Types of HAART child is on | AZT/3TC/NVP(Ref) | 203(78.7)| 55(21.3)  | NA     | NA    | NA     | NA    | NA   |
|                  | d4T/3TC/NVP | 85(76.6)| 26(23.4)  | NA     | NA    | NA     | NA    | NA   |
|                  | ABC/3TC/LPV | 36(90.0)| 4(10.0)   | NA     | NA    | NA     | NA    | NA   |
| Duration on HAART by the child | ≤12 months(Ref) | 116(82.9)| 24(17.1)  | NA     | NA    | NA     | NA    | NA   |
|                  | >12–24 months | 48(80.0)| 12(20.0)  | NA     | NA    | NA     | NA    | NA   |
|                  | >24–36 months | 44(72.1)| 17(27.9)  | NA     | NA    | NA     | NA    | NA   |
|                  | >36 months   | 116(78.4)| 32       | NA     | NA    | NA     | NA    | NA   |
| Number of siblings of the child | ≤4(Ref) | 305(79.6)| 78(20.4)  | NA     | NA    | NA     | NA    | NA   |
|                  | >4         | 19(73.1) | 7(28.9)   | NA     | NA    | NA     | NA    | NA   |
### Table 4 Continued

| History of death of a sibling on HAART | Yes | No (Ref) |
|---------------------------------------|-----|----------|
| Yes                                   | 20(80.0) | 5(20.0) |
| No (Ref)                              | 304(79.2) | 80(20.8) |

| CAM relieves side effects of HAART | Yes (Ref) | No |
|------------------------------------|-----------|----|
| Yes                                | 303(98.7) | 4(1.3) |
| No                                 | 17(100.0) | 0(0.0) |

| CAM boost child’s immunity | Yes (Ref) | No |
|----------------------------|-----------|----|
| Yes                       | 276(98.6) | 4(1.4) |
| No                        | 44(100.0) | 0(0.0) |

| CAM prevents opportunistic infections | Yes (Ref) | No |
|--------------------------------------|-----------|----|
| Yes                                  | 273(98.6) | 4(1.4) |
| No                                   | 47(100.0) | 0(0.0) |

| CAM causes no harm | Yes (Ref) | No |
|--------------------|-----------|----|
| Yes                | 259(98.5) | 4(1.5) |
| No                 | 61(100.0) | 0(0.0) |

| CAM helps ART in its function | Yes (Ref) | No |
|-------------------------------|-----------|----|
| Yes                           | 120(96.8) | 4(3.2) |
| No                            | 200(100.0) | 0(0.0) |

| CAM relieves some symptoms of HIV/AIDS | Yes (Ref) | No |
|---------------------------------------|-----------|----|
| Yes                                   | 117(96.7) | 4(3.3) |
| No                                    | 203(100.0) | 0(0.0) |

| CAM provides cure for HIV | Yes (Ref) | No |
|---------------------------|-----------|----|
| Yes                       | 69(100.0) | 0(0.0) |
| No                        | 0(0.0) | 255(100.0) |

| CAM reduces child’s HIV viral load | Yes (Ref) | No |
|-----------------------------------|-----------|----|
| Yes                               | 27(100.0) | 0(0.0) |
| No                                | 293(98.7) | 4(1.3) |

NA=Not available
In bivariate regression analyses, the types of CGs, the marital status of the CGs, the educational level of the CGs, the place of residence of the CGs, the gender of the child and the use of CAM by the CGs themselves, were found to be significantly associated with the use of CAM among the respondents. However, at multivariate regression analyses, the types of CG, the educational level of the CG, the gender of the child and the use of CAM by the CG themselves remained independently associated with the administration of CAM among the children on HAART. The likelihood of using CAM in children on HAART was 1.698 times more when the CG was the Father compared to the Mother (95%CI:1.180-2.443, AOR; 1.698, \( P = .004 \)). When CG did not receive any formal education, the risk of using CAM was 1.498 times more compared to when CG attained a post-secondary level of education (95%CI; 1.127-1.990, OR; 1.498, \( P = .005 \)). The odds ratio for the use of CAM increased 33.790-fold when CG also consumed CAM compared to when CG did not use CAM (95%CI;8.049-141.856,AOR;33.790; \( P = .000 \)). Furthermore, the odds ratio for the use of CAM increased 2.142-fold when the child on HAART was of a male gender compared to the female gender (95%CI; 1.230-3.730, AOR; 2.142, \( P = .007 \)).

4. DISCUSSION

To the best of the Authors’ knowledge, this is the first study that determines the prevalence of CAM usage among Nigerian children on HAART and as reported by the CGs, 79.2% (324/409) of the children had used CAM. The use of CAM in the present study (79.2%) was higher than the 22% reported by Ang et al. [21] in the USA among HIV-infected children. It was also higher than the respective 38%, 36% and 25% among Nigerian children with epilepsy, sickle cell anaemia and asthma [5].

The three most commonly used CAM products were herbal concoctions containing majorly Bitter leaves (317/324, 97.8%), Ugu leaves/roots (282, 87.0%) and Neem tree leaves/bark (270, 83.3%). Indian hemp, although classified as a hard drug in Nigeria was also used, albeit sparingly (8.9%), in this study. CGs, also largely used CAM whose contents were unknown (250, 77.2%). Spiritual healing was also sought for by 77.8% of the CGs and was the commonest CAM practice identified.

All the herbal CAMs (except Indian hemp and the branded products) reported in the present study had been classified previously as Medicinal plants in Nigeria [28-30] and had been used before the global HIV epidemics of the 1980s.

Bitter leaf had been used to treat fever, malaria, diarrhoea, dysentery, hepatitis and cough. It is also used as a medicine for wound as a substitute for iodine [31]. It contained sesquiterpene lactones (e.g. vernodalin, vernolepin and vernomygdin) and steroid glycosides (vernoniosides) which have significant antiparasitic activity, making it useful for treating intestinal nematodes [31]. The vernodalin and vernomygdin also have cytotoxic activity [31].

Ugu leaves contain essential oils and vitamins and the root contains cucubitacine and sesquiterpene lactones. Ugu leaves had been used for the treatment of convulsion [32,33]. The leaf extract is useful in the management of hypercholesterolemia, liver problems and impaired defense immune systems [32,34,35]. The amino acid profile of Ugu leaves includes alanine, aspartate, glycine, glutamine, histidine, lysine, methionine, tryptophan, cystine, leucine, arginine, serine, threonine, phenylalanine, valine, tyrosine and isoleucine [32]. The ethanol root extract of Ugu possess anti-plasmodial potential and the blood schizontocidal activity of the root extract is comparable to that of chloroquine [32,36]. Furthermore, the
ethanolic and aqueous extracts of Ugu have been reported to show inhibitory effect on growth on some of the commonly encountered Enterobacteriaceae in Nigeria, namely *Escherichia coli*, *Pseudomonas aeroginosa*, *Proteus sp.* and *Salmonella typhi* [32,37]. The antibacterial activity of the root extract against *Staphylococcus aureus*, *Streptococcus pyogenes*, *Shigella dysenteriae* and *Klebsiella pneumoniae* has also been reported by Odoemena and Essien [32,38].

Neem contains a variety of biologically active compounds that are chemically diverse and structurally complex and more than 140 compounds have been isolated from different parts of Neem [39]. All parts of the Neem tree- leaves, flowers, seeds, fruits, roots and bark have been used traditionally for the treatment of inflammation, infections, fever, skin diseases and dental disorders [39]. Neem leaf and its constituents have been demonstrated to exhibit immunomodulatory, anti-inflammatory, antihyperglycaemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic and anticarcinogenic properties [39]. Recently, a fractionated Neem-leaf extract known as IRAB with reported activities against HIV has been developed into a drug and currently marketed in Nigeria as IRACAP [40].

Indian hemp contains cannabinoids such as tetrahydrocannabinol and cannabidiol and is used as medical therapy to treat disease or alleviate symptoms. It has been used to reduce nausea and vomiting in chemotherapy [41] and people with AIDS, [42] and to treat pain [43] and muscle spasticity [44].

In the present study, Bitter leaf, Ugu leaves/roots and Neem leaves/bark and many other herbal products (including branded products and Indian hemp), were employed as CAM for reasons including: relieving the side effects of antiretroviral drugs (essentially, nausea, vomiting and anorexia); boosting the child’s immunity; preventing opportunistic infection; relieving some symptoms of HIV/AIDS (vomiting, diarrhoea, fever and wasting) and reducing viral load when used with ARV drugs. All of these reasons are in keeping with the aforementioned traditional medicinal values of these herbal products [31-44].

Furthermore, some of these reasons mentioned for CAM use in the present study are also in keeping with the reasons for CAM use among adults HIV/AIDS population of British Columbia, [12] South Africa [15] and Canada [45]. Shah et al. [46] had earlier postulated that, it may be possible to provide new molecules from medicinal plants, which after chemical manipulation will provide new and improved drugs. This may be true for the treatment of HIV/AIDS and other emerging diseases.

In the present study, most of the CAM products taken for the purpose of HIV/AIDS cure were from animal sources (parts of Elephants and snakes). It may be difficult to readily explain why this was so. CGs had also administered anointed water (78.7%) anointed oil (75.6%) and spiritual healing (77.8%) for the cure of their children's HIV/AIDS. Similarly, spiritual healing for HIV infection had been reported among adult HIV/AIDS patients in South Africa [15] and in Mozambique [47]. Nigeria is a highly religious country with a majority (99.3%) of the respondents in the present study professing the Christian faith. References [48,49] to faith healing for numerous diseases and ailments abound in the earthy ministry of Jesus Christ and that of Apostle Paul. Paul also used anointed handkerchiefs and aprons to heal the sick; some Christians believed that any other media including anointed oil and water can also be used to effect healing of diseases. Jesus also commissioned the believers to heal the sick [50] and may also explain why parents seek faith healing from prophets and religious leaders.
Two Muslim respondents also acknowledged the use of faith healing for their children. This finding is in keeping with other researchers in Islamic countries of Saudi Arabia [51] and Pakistan [52]. Reciting the Holy Quran directly on the sick child or on water, which is then drunk by children are common types of CAM used for children in Islam [51,52].

Faith healing has limited adverse effects, it does not interact with conventional therapies, it reduces stress, it raises the spirit of the family and strengthens the immune system [53,54]. Furthermore, 29 (8.9%) respondents had also engaged in sacrificial healing using some animals for the purpose of effecting healing. This often takes place through the assistance and prescription of traditional healers. The basis for this therapy is difficult to explain. However, desperate CGs will engage in all form of therapy for a chronic and incurable disease like HIV/AIDS.

Other forms of CAM practices were not seen among the respondents as they are still uncommon in Nigeria.

The most common source of recommendation for CAM was from other CGs (56.2%) of HIV-infected children. In African context, information regarding aetiologies and places to seek for healing for “mysterious” and incurable diseases are often from Neighbours and similarly affected individuals who often have experienced some relief following their own experiences with the recommended therapy [55].

Curiously, Health workers (Community health extension workers) were identified as a referral source in 12 respondents (3.7%). These are not the primary paediatricians of the children with HIV/AIDS as most respondents (312, 96.3%) that have used CAM did not report its use to the primary health care giver of these children; even though CAM is frequently used (more than once in a week) in more than half (189, 58.3%) of the surveyed respondents. Some possible reasons for non-disclosure of CAM to health workers had been enumerated earlier [9-11].

However, physicians taking care of children with HIV/AIDS need to know about the use of CAM in HIV-infected children on HAART. This is because complex interactions between CAM products and ARV medications had resulted in sub-therapeutic serum levels and/or potentiating the side effects and toxicities of the ARV medications [12-24]. Thankfully, Adams et al. in 2013 had summarized pertinent questions to ask parents about the use of CAM in children. This panel of questionnaires can readily be modified to reflect the common CAM products and practices in any setting [10]. There must be a paradigm shift from assuming that all CAM therapies are necessarily safe because they are more “natural” than conventional drugs [16]. We also need to demystify the so-called “myth of beneficent nature” that equates “natural” with “safe,” and “safe” with “beneficial” as this is false and potentially harmful [56].

In multivariate regression analyses, the types of CG, the educational level of the CG, the gender of the child and the use of CAM by the CG themselves remained independently associated with the administration of CAM among the children on HAART.

The use of CAM by CGs is the strongest independent predictor as the odds ratio increased 33.790-fold when CGs also consumed CAM compared to when CG do not use CAM. Other studies also supported this strong parental influence to use CAM in children when CGs also use CAM [51,57,58]. This tendency may stem from the experienced favorable outcome following the use of CAM by the parents and/or because decisions are often made by
parents within the model of constrained parental autonomy [59] even when the outcome of CAM use is not favorable. Although this autonomy may not be absolute when it involves adolescents [60]; however, most children (387, 94.6%) in this study were ≤ 9 years of age. In addition, Prussing et al. [61] had earlier noticed that CGs also have the tendency to give CAM to their children if only to just appear like a good parent.

Also, the odds ratio for the use of CAM increased 2.142-fold when the child on HAART is of a male gender compared to the female gender. The import of this gender influence may be difficult to explain, but the strong societal preference for a male child in African culture may drive parents to any length in safe-guiding the survival of the male child including using CAM, especially, for an incurable and a potentially fatal disease like HIV/AIDS.

The likelihood of using CAM in children on HAART was 1.698 times more when the CG is the father compared to the mother. In our setting, decision making in accessing healthcare is essentially paternalistic with little room for a shared decision making between couples. In any way, children are hardly consulted before the decision to use CAM for them is made. This finding however, contrasts with the reports from United States and Norway where mothers are more likely to use CAM for their children than fathers [58,62,63]. This discrepancy may be due to the facts that mothers are more economically independent and more likely to be equal partners in decision making about choices of health intervention in resource endowed countries.

Furthermore, we also found that when CG did not receive any formal education, the risk of using CAM is 1.498 times more compared to when CG attained a post-secondary level of education. This finding is in conflict with Andersen's Socio-behavioral Model [64] whereby, a higher parental education was assumed to be a predisposing factor for CAM use as affirmed in some studies [65,66]. In our own setting, CAM is still regarded as a dirty earthy therapy for the uneducated folks. The educated folks engage in medical tourism seeking for state-of-the-art conventional therapy which unfortunately may not provide solution to some diseases.

The present study is strengthened by the fact that questionnaires were administered by research assistants who were not the primary paediatricians of the HIV-infected children and by so doing social biases by CGs about the use of CAM was reduced substantially. Also, the quality of information gathered was assured by providing samples of the common CAM products and photographs of the different alternative medical practices. The limitation includes the fact that CGs could only identified some herbal and animal products components of the concoctions that were used as CAMs. It may be possible that the component parts that the CGs could not identified were the main active ingredients of the concoctions.

5. CONCLUSION

CAM use is common in Nigerian children on HAART. Through folk stories, proverbs, plays and songs, health education was given to the CGs on the importance of disclosing CAM to the health care givers. Also, emphasis was laid on the danger inherent in the indiscriminate use of CAM and the potential harmful interactions of CAM and antiretroviral medicines. The high prevalence of CAM use in the present study had also stimulated an interest for a future study that will assess the potential interaction of the commonly used CAM (i.e. Bitter leaves, Ugu leaves/roots and Neem tree leaves/bark) and the antiretroviral medicines.
CONSENT

Written consent of the caregivers were sought for and gotten for the study. The study’s objectives were explained to the caregivers of the children on HAART. It was emphasized that the information tendered during the interview would be treated with utmost confidentiality and that anyone was at liberty to decline participation. It was also underscored that declination to participate will not affect the care and treatment of the child.

ETHICAL APPROVAL

Ethical approval for the study was obtained from the Hospital Research and Ethics Committee of the Federal Medical Centre, Makurdi, Benue State, Nigeria.

ACKNOWLEDGEMENTS

We wish to acknowledge the listed doctors who served as Research assistants and administered the questionnaires but did not meet the authorship criteria: A. A. Ogah, K. B. Anweh, J. K. Orbunde, S. A. Ogwuche. We appreciate all the parents of the children who participated in the study. We appreciate Dr. J Abah, the Principal Investigator and all the members of AIDS Prevention Initiative in Nigeria (APIN)/Harvard PEPFAR (The USA President’s Emergency Plan for AIDS Relief) programme of FMC, Makurdi.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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