ABOUT JAHR

The Journal of AIDS and HIV Research (JAHR) is published monthly (one volume per year) by Academic Journals.

Journal of AIDS and HIV Research (JAHR) is an open access journal that provides rapid publication (monthly) of articles in all areas of the subject like the implications for gender-based HIV and AIDS prevention interventions, Sputum cellularity in pulmonary tuberculosis, Comparative tolerability and efficacy of stavudine 30 mg versus stavudine 40 mg in patients on combination antiretroviral therapy, HIV and sexual risk behaviours amongst intravenous drug users etc.

The Journal welcomes the submission of manuscripts that meet the general criteria of significance and scientific excellence. Papers will be published shortly after acceptance. All articles published in JAHR are peerreviewed

Submission of Manuscript

Submit manuscripts as e-mail attachment to the Editorial Office at: jahr@academicjournals.org. A manuscript number will be mailed to the corresponding author shortly after submission.

The Journal of AIDS and HIV Research will only accept manuscripts submitted as e-mail attachments.

Please read the Instructions for Authors before submitting your manuscript. The manuscript files should be given the last name of the first author.
Editors

Prof. Bechan Sharma,
Department of Biochemistry,
University of Allahabad,
Allahabad,
India.

Dr. John E. Lewis,
University of Miami,
Miller School of Medicine,
1120 NW 14th Street
Suite #1474 (D21)
Miami, FL 33136
USA.

Prof. Ruta Dubakiene,
Vilnius University,
Lithuania.

Prof. William Nuhu Ogala,
Ahmadu Bello University Teaching Hospital,
Zaria, Nigeria.
Editorial Board

Dr. Arun Kumar,
Manipal College of Medical Sciences, India.

Dr. Manal Fouad Ismail,
Faculty of Pharmacy, Cairo University, Egypt.

Dr. Esrat Gharaei Gathabad,
Mazandaran University of Medical Sciences, Sari Faculty of Pharmacy, Iran.

Dr. P. Aparanji,
Department of Biochemistry, Andhra University Visakhapatnam, India.

Dr. Amzad Hossain,
Atomic Energy Centre, GPO Box 164, Ramna, Dhaka-1000, Bangladesh.

Prof. Irvin Mpofu,
University of Namibia, Namibia.

Dr. Rajiv Nehra,
Muzaffarnagar Medical College, India.

Dr. Marion W. Mutugi,
Jomo Kenyatta University of Agriculture and Technology, Kenya.

Dr. Emmanuel Nwabueze Aguwa,
Department of Community Medicine, College of Medicine, University of Nigeria, Enugu Campus, Nigeria.

Dr. William A. Zule,
RTI International, USA.

Dr. M. Abhilash,
The Oxford College Of Engineering, Bommanahalli, Hosur Road, Bangalore 560068, India.

Dr. Fukai Bao,
Kunming Medical University, China.

Dr. Baligh Ramzi Yehia,
University of Pennsylvania School of Medicine, Philadelphia, PA, USA.

Dr. Khandokar Mohammad Istiak,
University of Dhaka, Dhaka-1000, Bangladesh.

Dr. Aamir Shahzad,
Max F. Perutz Laboratories, University of Vienna, Vienna Bio center, A-1030 Vienna, Austria.

Dr. Subarna Ganguli,
Pharmacy college in Kolkata, West Bengal, India.

Dr. Mehmert Kale,
Dept. of Virology, Mehmet Akif Ersoy University, Faculty of Veterinary Medicine, Turkey.

Mr. Shakeel Ahmed Ibne Mahmood
Bangladesh AIDS Prevention Society, BAPS, Bangladesh Youth Wing, National AIDS Committee, Bangladesh.

Dr. Adewumi, Moses Olubusuyi,
Department of Virology, College of Medicine, University College Hospital, University of Ibadan, Ibadan, Nigeria.

Dr. Theodoros Eleftheriadis,
General Hospital of Serres, Serres, Greece.

Dr. Keertan Dheda,
University of Cape Town, South Africa.
ARTICLES

Research Articles

Change in serum lipid profiles and glucose after switching from stavudine/lamivudine to zidovudine/lamivudine in non-nucleoside reverse transcriptase inhibitors based anti-retroviral regimens in Southern Ethiopia
Agete Tadewos and Demissie Assegu

Bottleneck analysis of challenges facing sexual and reproductive health and human immunodeficiency virus (HIV) services integration in Southwestern Nigeria
Adebimpe Wasiu Olalekan, Adeleke Najemdeen Ajao, Farinloye Emmanuel Oludele And Efuntoye Adeola Ebun
Full Length Research Paper

Change in serum lipid profiles and glucose after switching from stavudine/lamivudine to zidovudine/lamivudine in non-nucleoside reverse transcriptase inhibitors based anti-retroviral regimens in Southern Ethiopia

Agete Tadewos* and Demissie Assegu

Referral Hospital Laboratory, College of Medicine and Health Science, Hawassa University, Southern Ethiopia.

Received 7 December, 2014; Accepted 18 February, 2015

Data concerning any difference in serum lipid profiles and glucose level after patients switched from stavudine to zidovudine in Ethiopia is very limited. Seventy eight adults receiving antiretroviral therapy (ART) that included stavudine/lamivudine with either of efavirenz or nevirapine during ART initiation were enrolled. Of these patients, 53 were switched to zidovudine/lamivudine/nevirapine (NVP-group) and the rest 25 were switched to zidovudine/lamivudine/efavirenz (EFV-group). Serum lipid profiles and glucose were determined after overnight fasting. Dyslipidemia and dysglycaemia were assessed according to the United State National Cholesterol Education program-III guideline. Statistical analysis was done using Statistical Package for Social Sciences (SPSS) Version 20. Of the 78 patients, 39.7% were males and 60.3% were females. At the end of the study follow-up, the prevalence of TC ≥ 200 mg/dl, LDL-c ≥ 130 mg/dl, TG ≥ 150 mg/dl, HDL-c < 40 mg/dl and glucose ≥ 110 mg/dl were higher in EFV group when compared with NVP. About 74.4% patients had at least two laboratory abnormalities which is compatible with a diagnosis of dyslipidemia at 12 month of post switch. Four lipid profiles abnormal within a single individual was 16% in EFV and 3.8% in NVP group, p = 0.08. Raised HDL-c concentration was observed in NVP group in both periods when compared with EFV. In addition, patients that switched from d4T/3TC/NVP to AZT/3TC/NVP had a significant change in TC and TG (p = 0.001 for both). Also TC ≥ 200 mg/dl was decreased from 49 to 16% (p = 0.04). Furthermore, sex was significantly and negatively associated with raised TC and TGs among patients using NVP based regimen. Raised HDL-c concentration, decreased proportion of abnormal lipid profiles and abnormal glucose was observed in the NVP group. Based on these findings, NVP may be expected to reduce the risk of cardiovascular diseases.

Key words: Dyslipidemia, dysglycaemia, human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS), antiretroviral therapy, Ethiopia.

INTRODUCTION

Highly active antiretroviral therapy (HAART) has effectively reduced morbidity and mortality among patients living with human immunodeficiency virus (HIV) infection (Grinspoon et al., 2005; John et al., 2001). In
addition, HAART also has a potential to significantly reduce the risk of HIV transmission and the spread of tuberculosis (UNAIDS, 2013). Since its introduction, patients have started to live longer, however co-morbid problems have been emerged. Among these challenges, lipid profile derangements, insulin resistance, and diabetes are some of the metabolic complications of long-term use of HAART (Cohan, 2000; DAD, 2003). Dyslipidemia in HIV-infected patients using HAART includes, elevated level of total cholesterol (TC), LDL cholesterol (LDL-c), triglycerides (TG), and decreased HDL-cholesterol (HDL-c), and severe hypertriglyceridemia in several patients (El-Sadr et al., 2005). Stavudine (d4T) from nucleoside reverse transcriptase inhibitors (NRTIs) regimens is the most commonly mentioned antiretroviral agent that is being associated with metabolic syndrome (MS) and HIV related fat accumulation (Matinez et al., 2004; Jemsek et al., 2006). Lipodystrophy and lipohypertrophy are associated with multiple metabolic derangements in the setting of HIV infection and antiretroviral therapy (ART). In addition, visceral adipose tissue (VAT) has been linked to CVD in HIV-infected men irrespective of BMI or waist girth (Haubrich et al., 2009). The protease inhibitors (PIs) in general have been reported to be highly associated with MS (Cerrato et al., 2012). However, non-nucleoside reverse transcriptase inhibitors (NNRTIs) based regimens importantly differ from PI-based regimens by being associated with marked increases of HDL-c and slighter raises of LDL-c and TGs (Van der Valk et al., 2001; Tashima et al., 2003). Furthermore dyslipidemia like hypertriglyceridemia, low level of HDL-c and insulin resistance can occur concurrently in HIV infection, which eventually raises the risk of cardiovascular disease (CVD) (Pao et al., 2008).

Following the recommendations from WHO 2010 guidelines, 2013 d4T was phased-out in Ethiopia from adults’ treatment option, due to its metabolic toxicity than other NRTIs (WHO, 2010). The replacing of d4T + lamivudine (3TC) with zidovudine (AZT) + 3TC is not as a result of immunological failure but for the risks of metabolic and anthropometric alterations in HIV-infected patients. Therefore, this cohort study was designed to examine the effect of regimens substitution in lipid profiles, serum glucose and cardiovascular risks after 12 month of post switch, in a resource limited setting.

**METHODOLOGY**

**Study setting and population**

This prospective cohort study was carried out from May 2013 to July 2014 at ART clinic of Hawassa University Teaching Referral Hospital. Eligible patients were HIV-infected, immunologically stable adults and initial NRTI backbone was d4T+3TC with one of the NNRTI (either EFV or NVP). The inclusion criteria for this sub study were the patients who had continued with their initial antiretroviral regimens for a minimum of two years of treatment. Any patient who had changed antiretroviral drug in the initial regimen due to any reason before current switching was excluded. All recruited patients were those patients that switched from d4T+3TC to AZT+3TC without changing NNRTI-based regimens. All participants were ≥18 years of age, and have a good ART adherence (adherence rate ≥95%). A good adherence is defined by missing <2 dose of 30 doses or <3 dose of 60 doses; and it was adopted from Ethiopian Federal Ministry of Health (FMoH), HIV Care/ART follow-up form. Participants receiving statin drugs, pregnant women, known diabetes mellitus patients, patients who took alcohol within 24 h and renal failures were excluded. Subjects were monitored at the time of switching (month 0) and 12 month subsequently for serum lipid profiles and glucose analysis.

For all participants, data were collected on the socio-demographic information together with body mass index, medical history including diabetes mellitus, renal failures and use of drugs that alter lipid profiles. CD4+ lymphocyte count was done by K2EDTA anticoagulated blood using flow cytometry instrument (Becton Dickinson, CA, USA). After an overnight fast of 8 to 12 h, venous blood was collected in plain tube from each patient and it was centrifuged within 15 to 20 min of collection at 3000 cycles/min for 5 min. Then serum was separated immediately for determination of serum glucose and lipid profiles (TC, HDL-c, LDL-c and TGs) using A25 Random Access Analyzer (BioSystems™, Spain). Serum glucose level was measured by the glucose oxidase method (GOD-PAP). Enzymatic colorimetric assay method was used for the measurement of TC (CHOD-PAP method) and TG (GPO-PAP method) while direct homogeneous enzymatic colorimetric assay technique was used for the measurement of HDL-c and LDL-c. The required reagents for all these tests were from Human Gesellschaft für Biochemica und Diagnostica mbH (Germany).

Finally, lipid profile derangements was defined as TC ≥200 mg/dl, HDL-c <40 mg/dl, LDL-c ≥130 mg/dl and TG ≥150 mg/dl, while a fasting glucose level ≥110 mg/dl for dysglycaemia according to the United States National Cholesterol Education Program, Adult Treatment Panel (NCEP-ATP) III guidelines (NCEP-III, 2002). To assess cardiovascular risk, Castelli’s Index I was calculated, TC/HDL-c ratio: a Castelli’s Index I >5.1 for men and >4.4 for women were considered indicative of an elevated CVD risk (Castelli et al., 1983).

**Statistical analysis**

Analysis included for all participants showing as a minimum of one visit after initiating AZT. Mean (± standard deviation, SD), median (interquartile range at 25 and 75th, IQR) and frequencies were used to describe patients’ characteristic as appropriate. Chi-square test and Mann-Whitney U test were used to compare categorical and continuous variables between the two treatment groups (EFV vs. NVP). Pair-samples T test were used to compare measures between the switch baseline and at 12 months after initiating AZT. The independent variables were evaluated with logistic regression to identify the factors that were associated with abnormal lipid profile and glucose. P-value less than 0.05 was considered as statistically significant at 95% confidence interval (CI).

*Corresponding author. E-mail: aggetetadewos@yahoo.com. Tel: +251-913-175126.
Author(s) agree that this article remain permanently open access under the terms of the Creative Commons Attribution License 4.0 International License.
Ethical clearance

The study was approved by Institutional Review Board (IRB) of Hawassa University College of Medicine and Health Science. Written informed consent was obtained from all participants.

RESULTS

General characteristics of study participants

A total of 80 HIV-infected patients met the inclusion criteria of this study; however, 78 patients (males 31 (39.7%), females 47(60.3%)) were followed until the end of this study. Data from patients who were lost to follow-up were not included in this analysis. Patients switched from the d4T/3TC/EFV to AZT/3TC/EFV and from d4T/3TC/NVP to AZT/3TC/NVP at the time of regimen substitutions. Of the 78 patients, 25 (32%) were in the AZT/3TC/EFV group and 53 (68%) were in the AZT/3TC/NVP group. Baseline age of the individuals was 40.9 months with standard deviation of 7.8. There was a significant differences in age ≥40 years, in CD4+ T-lymphocyte categories and duration of HAART experiences in between NNRTI groups, p=0.05. However, median CD4+ cells count and the rest demographic characteristics were not significantly different from the switch baseline (0 month) in between NNRTIs, p ≥ 0.05 (Table 1).

Characteristics of the lipid profiles and glucose abnormalities at the switched 0 month

Lipid profile tests (TC, TG, HDL-c, and LDL-c), and glucose were performed for a total of 78 participants. The mean TC, and TC/HDL-c ratio were higher among patients using NVP based regimen when compared with patients using EFV, but not significant. The median (IQR) of TG/HDL-c ratio was 4.3 (3.0 to 10.6) in EFV group and 4.4 (2.6 to 6.9) in NVP group (p=0.52). TG/HDL-c ratio (≥2.4), is an indicator of insulin resistance disorder, which was 84% in EFV group and 81% in NVP group (p=0.76). The mean LDL-c and median value of TG was insignificantly higher in EFV group when compared with NVP group (Table 1). Also, the prevalence of lipid profiles TC ≥ 200 mg/dl and TG ≥150 mg/dl were higher in NVP group when compared with EFV group, but the difference was not significant.

Moreover, the prevalence of HDL-c is below 40 mg/dl, glucose ≥110 mg/dl Castelli’s index I and LDL-c ≥130 mg/dl were higher in EFV group when compared with those on NVP (Table 1). Derangement of four lipid profiles within a single individual (TC, TG, HDL-c, LDL-c) according to NCEP-ATP III was 12% in EFV group and 15.1% in NVP group, (p=0.71). The proportion of patients with serum glucose level >180 mg/dl were 12% in EFV group whereas 3.7% in NVP group.

Characteristics of lipid profiles and glucose after 12 month of AZT/3TC replacement

The mean TC, TC/HDL-c ratio, LDL-c, glucose and median TG were higher among patients using EFV when compared with patients using NVP, but not significant. However, the mean HDL-c value was higher among patients using NVP when compared with those using EFV (Figure 1).

In addition, the prevalence of TC ≥200 mg/dl, LDL-c ≥130 mg/dl, TG ≥150 mg/dl, HDL-c <40 mg/dl, Castelli’s index I and glucose ≥110 mg/dl, were insignificantly higher in EFV group when compared with those on NVP (Figure 2). About 74.4% patients had at least two lipid profile laboratory abnormalities, which is compatible with a diagnosis of dyslipidemia. However, derangement of four lipid profiles within a single individual was higher in EFV group (16%) when compared with NVP group (3.8%), p=0.08. The prevalence of patients with serum glucose level >180 mg/dl was 8.0% in EFV group, whereas 7.5% in NVP. Furthermore, the percentage change of parameters between EFV versus NVP is depicted as shown in Table 2.

Lipid profiles and glucose between switch 0 month versus 12 month of post switch within the same NNRTI based regimen

Patients switched from d4T/3TC/EFV to AZT/3TC/EFV showed insignificant differences in mean and median value of lipid profiles (TC, TG, LDL-c and TC/HDL-c ratio), p≥0.05. The proportions of TC ≥ 200 mg/dl, TG ≥150 mg/dl, HDL-c <40 mg/dl, Castelli’s index I and glucose ≥110 were increased at the 12 month of post switch. In contrast, those patients switched from d4T/3TC/NVP to AZT/3TC/NVP showed a significant decrease in mean TC and median TG (p = 0.001 for both), and also TC ≥200 was significantly decreased from 49 to 16% (p=0.04). Moreover, the proportion of Catelli’s index I, an indicator of the cardiovascular diseases risk, was decreased from 33.9 to 28.3% (Table 3).

Univariate and multivariate analysis were applied to assess possible predicted factors associated with each abnormal lipid profile among patients within NVP regimen. In both models, sex was significantly and negatively the associated risk factor of raised TC and TGs (Table 4).

DISCUSSION

The aim of this cohort study carried out in a resource limited setting was to assess the trend of lipid profile derangements and dysglycaemia among HIV-infected patients switched from d4T/3TC to AZT/3TC based regimens without changing NNRTIs. Most HAART drugs have been found to induce moderate to severe toxic
effects after long-term use and therefore pose a tackle to chemotherapy (Sharma, 2011). Patients are switched to a new regimen because of the adverse effects of d4T therapy, but not due to immunological failure. It was found that the CD4+ cells count in the EFV group was not significantly different from the NVP group, thus shows the EFV is similar in immunological properties in HIV-infected patients when compared with NVP.

In the present study, majority of the patients (74.4%) had at least two laboratory abnormalities, which is compatible with a diagnosis of dyslipidemia according to NCEP-ATP III criteria at the end of the study follow-up. HIV-1 infection itself or use of HAART may induce oxidative stress and it predisposes for further pathogenesis in HIV infected patients (Sharma, 2014). The association between dyslipidemia and HAART has been mainly described for PIs based regimens (Anastos et al., 2007; Nery et al., 2011). Lipid derangements were higher among patients who received d4T when compared with other NRTIs (Kalyanasundaram et al., 2012; Ceccato et al., 2011). NNRTIs derange lipid profiles during therapy (Van der Valk et al., 2001; Young et al., 2005); however, evidences in support of the characterization of dyslipidemia regarding NNRTIs after HAART switching in sub-Saharan African countries are scarce. Similar with our findings: a cohort study report from

Table 1. Baseline characteristics at the time of NRTI switching (month 0) in between EFV versus NVP.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
<th>EFV</th>
<th>NVP</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>31 (39.7)</td>
<td>11 (44.0)</td>
<td>20 (37.7)</td>
<td>0.62</td>
</tr>
<tr>
<td>Female</td>
<td>47 (60.3)</td>
<td>14 (56.0)</td>
<td>33 (62.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Age (years), mean ±SD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td>4 (5.1)</td>
<td>1 (4.0)</td>
<td>3 (5.7)</td>
<td></td>
</tr>
<tr>
<td>31-40</td>
<td>35 (44.9)</td>
<td>8 (32.0)</td>
<td>27 (50.9)</td>
<td></td>
</tr>
<tr>
<td>41-50</td>
<td>29 (37.2)</td>
<td>12 (48.0)</td>
<td>17 (32.1)</td>
<td></td>
</tr>
<tr>
<td>&gt;50</td>
<td>10 (12.8)</td>
<td>4 (16.0)</td>
<td>6 (11.3)</td>
<td>0.40</td>
</tr>
<tr>
<td>≥40</td>
<td>41 (52.6)</td>
<td>18 (72.0)</td>
<td>23 (43.4)</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>BMI (kg/m²), mean ±SD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥25 kg/m²</td>
<td>22 (2.9)</td>
<td>22.1 (2.9)</td>
<td>21.9 (2.9)</td>
<td>0.70</td>
</tr>
<tr>
<td>≥25 kg/m²</td>
<td>12 (15.4)</td>
<td>4 (16.0)</td>
<td>8 (15.1)</td>
<td>0.91</td>
</tr>
<tr>
<td><strong>CD4+ count (cells/mm³)</strong></td>
<td>581 (443-848)</td>
<td>560 (445-917)</td>
<td>583 (405-834)</td>
<td>0.47</td>
</tr>
<tr>
<td>&lt;350</td>
<td>13 (16.7)</td>
<td>1 (4.0)</td>
<td>12 (22.6)</td>
<td></td>
</tr>
<tr>
<td>350-500</td>
<td>16 (20.5)</td>
<td>9 (36.0)</td>
<td>7 (13.2)</td>
<td></td>
</tr>
<tr>
<td>&gt;500</td>
<td>49 (62.8%)</td>
<td>15 (60.0)</td>
<td>34 (64.2)</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>HAART experience (month), mean ±SD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-48</td>
<td>14 (17.9)</td>
<td>1 (4.0)</td>
<td>13 (24.5)</td>
<td></td>
</tr>
<tr>
<td>49-72</td>
<td>48 (61.5)</td>
<td>20 (80)</td>
<td>28 (52.8)</td>
<td></td>
</tr>
<tr>
<td>≥73</td>
<td>16 (20.5)</td>
<td>4 (16.0)</td>
<td>12 (22.6)</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>TC (mg/dl), mean ±SD</strong></td>
<td>202 (68)</td>
<td>193 (50)</td>
<td>206 (75)</td>
<td>0.46</td>
</tr>
<tr>
<td>≥200 mg/dl</td>
<td>36 (46.2)</td>
<td>10 (40.0)</td>
<td>26 (49.1)</td>
<td>0.45</td>
</tr>
<tr>
<td><strong>TG (mg/dl)</strong></td>
<td>194 (132-379)</td>
<td>206 (124-439)</td>
<td>187 (134-365)</td>
<td>0.82</td>
</tr>
<tr>
<td>≥150 mg/dl</td>
<td>49 (62.8%)</td>
<td>15 (60.0)</td>
<td>34 (64.2)</td>
<td>0.72</td>
</tr>
<tr>
<td><strong>HDL-cholesterol (mg/dl), mean ±SD</strong></td>
<td>47 (11)</td>
<td>44.6 (8.8)</td>
<td>48.4 (11.8)</td>
<td>0.14</td>
</tr>
<tr>
<td>&lt;40 mg/dl</td>
<td>17 (21.8)</td>
<td>6 (24.0)</td>
<td>11 (20.7)</td>
<td>0.74</td>
</tr>
<tr>
<td><strong>LDL-cholesterol (mg/dl), mean ±SD</strong></td>
<td>107 (44)</td>
<td>109.4 (36)</td>
<td>106.5 (48)</td>
<td>0.50</td>
</tr>
<tr>
<td>≥130 mg</td>
<td>24 (30.8)</td>
<td>9 (36.0)</td>
<td>15 (28.3)</td>
<td>0.49</td>
</tr>
<tr>
<td><strong>Glucose (mg/dl), mean ±SD</strong></td>
<td>125 (46)</td>
<td>138 (65.6)</td>
<td>118.8 (32)</td>
<td>0.07</td>
</tr>
<tr>
<td>≥110 mg/dl</td>
<td>35 (44.9)</td>
<td>14 (56.0)</td>
<td>21 (39.6)</td>
<td>0.17</td>
</tr>
<tr>
<td><strong>TC/HDL-cholesterol ratio, mean ±SD</strong></td>
<td>4.4 (1.5)</td>
<td>4.5 (1.4)</td>
<td>4.4 (1.6)</td>
<td>0.82</td>
</tr>
<tr>
<td>Castelli’s Index I</td>
<td>29 (37.2)</td>
<td>11 (44.0)</td>
<td>18 (33.6)</td>
<td>0.39</td>
</tr>
</tbody>
</table>

TC: Total cholesterol; HDL: high-density lipoprotein; LDL: low-density lipoprotein; SD: standard deviation; BMI: body mass index; TG: triglyceride; EFV: Efavirenz; NVP: Nevirapine; HAART: highly active antiretroviral therapy; Castelli’s Index I (TC/HDL-c ratio) for females >4.4 and males >5.1; *values in median with interquartile range
Germany revealed that a substitution of d4T with other NRTIs may reverse lipid derangements (Claas et al., 2007).

It was found out that the proportions of TC ≥200 mg/dl, TG ≥150 mg/dl, LDL-c ≥130 mg/dl, TC/HDL-c ratio and HDL-c <40 mg/dl were higher in EFV group (48, 76, 32, 48 and 32%) when compared with NVP group (30.2, 62.3, 24.5, 28.3 and 30.2%), respectively. These described abnormal lipid profiles in EFV group are atherogenic (NCEP-III, 2002; Asztalos et al., 2006; Sudano et al., 2006), and suggest a potential risk for the development of cardiovascular diseases in a significant proportion among HIV-infected patients in the near future. The randomized trial report of 2 non-nucleosides (2NN) indicated that patients on NVP group had significantly improved HDL-c concentration and had relatively low lipid profile derangements when compared with those on EFV (van Leth et al., 2004). Also, the finding of the present study indicates HDL-c concentration was slightly higher in the NVP group when compared with EFV, hence it confirms that ART regimen which contains NVP has anti-atherogenic effects (Van der Valk et al., 2001; van Leth et al., 2004), in addition to restoration of patients' health.

Furthermore, the trends of lipid profile within a single group (EFV in NRTI switch 0 month versus EFV at the 12 month of post switch; and NVP in NRTI switch 0 month versus NVP at the 12 month of post switch) was checked. Patients in the EFV group had raised TC/HDL-c, TG, TC and TC/HDL-c when compared with the switch baseline. However, a significant decreasing trend was observed in the mean TC, median TG and TC ≥200 mg/dl in NVP group at the end of the study follow-up when compared with EFV. Similarly, it has been stated that EFV has a deleterious effect on lipids when compared with NVP (Erdembileg et al., 2009; Tungsiripat et al., 2005). These variations may be due to patient characteristics such as life style, gender and race/ethnicity, drug metabolism polymorphism which affect differences in lipid profile between populations taking the same antiretroviral drug (Armstrong et al., 2011). Also treatment duration may contribute to these differences (Tomazic et al., 2004; Jevtovic et al., 2009).

In the present study, univariable and multivariable analysis were applied to assess possible predicted factors associated with each abnormal lipid profile among patients within NVP group. In both models, sex was a significantly and negatively associated risk factor for raised TC and TGs; but the findings are not in line with the cross-sectional study conducted in Cameroon (Pefura Yone et al., 2011).

Table 2. Mean percentage change of parameters in between NNRTIs after 12 months.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>NNRI</th>
<th>Mean (Switch 0 month)</th>
<th>Mean % change</th>
<th>Std. error of mean</th>
<th>P value</th>
<th>95% Confidence interval of the difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>EFV</td>
<td>193</td>
<td>4.1464</td>
<td>5.8</td>
<td>0.028</td>
<td>1.31724 - 22.91010</td>
</tr>
<tr>
<td></td>
<td>NVP</td>
<td>206</td>
<td>-7.9672</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>EFV</td>
<td>206</td>
<td>4.4214</td>
<td>12.2</td>
<td>0.09</td>
<td>-3.23656 - 41.87073</td>
</tr>
<tr>
<td></td>
<td>NVP</td>
<td>187</td>
<td>-14.8957</td>
<td>5.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL</td>
<td>EFV</td>
<td>44.6</td>
<td>0.7313</td>
<td>7.2</td>
<td>0.70</td>
<td>-22.28461 - 15.17561</td>
</tr>
<tr>
<td></td>
<td>NVP</td>
<td>48.0</td>
<td>4.2858</td>
<td>5.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL</td>
<td>EFV</td>
<td>109</td>
<td>2.3587</td>
<td>6.1</td>
<td>0.96</td>
<td>-16.85793 - 16.20562</td>
</tr>
<tr>
<td></td>
<td>NVP</td>
<td>106.6</td>
<td>2.6848</td>
<td>4.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC/HDL-c</td>
<td>EFV</td>
<td>4.4</td>
<td>14.6798</td>
<td>9.2</td>
<td>0.046</td>
<td>.35638 - 35.38215</td>
</tr>
<tr>
<td></td>
<td>NVP</td>
<td>4.4</td>
<td>-3.1894</td>
<td>4.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td>EFV</td>
<td>138.6</td>
<td>-14.1502</td>
<td>5.6</td>
<td>0.25</td>
<td>-26.21232 - 6.96721</td>
</tr>
<tr>
<td></td>
<td>NVP</td>
<td>119</td>
<td>-4.5276</td>
<td>5.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG/HDL-c</td>
<td>EFV</td>
<td>8.4</td>
<td>-80.7608</td>
<td>4.1</td>
<td>0.43</td>
<td>-5.21640 - 11.94757</td>
</tr>
<tr>
<td></td>
<td>NVP</td>
<td>6.9</td>
<td>-84.1264</td>
<td>2.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TC: Total cholesterol; HDL: high-density lipoprotein; LDL: low-density lipoprotein; SD: standard deviation; TG: triglyceride; EFV: Efavirenz; NVP: Nevirapine. Mean percentage change was calculated for each individual patient as ((concentration [12 month after ART switch] – concentration [switch baseline]) / concentration [switch baseline]) ×100, was adopted from van Leth F et al. (2004).
Antiretroviral-specific risk factors for glucose abnormalities include the exposure to PIs and to certain NRTIs. Of these, the use of PIs has emerged as the strongest risk factor, with studies from the early HAART era suggesting a prevalence of 8 to 46% for the spectrum of glucose metabolism abnormalities, which includes impaired glucose tolerance, insulin resistance and diabetes in patients receiving PIs (Behrens et al., 1999; Mauss et al., 1999). The present study finding indicated no significant differences between EFV and NVP regarding glucose abnormality (≥110 mg/dl); however, the abnormal rate was decreased in both groups after 12 months of post switch. A substitution of d4T to AZT may reverse lipid derangements and it may provide a good opportunity to improve dysregulation of glucose in HIV-treated patients.

A high TG/HDL-C ratio ≥2.4 is a strong indicator of the insulin resistance syndrome (NCEP-III, 2002; Einhorn et al., 2003; McLaughlin et al., 2003), which was higher in EFV group when compared with NVP but not significant (84% versus 71.7%; *p=0.27). So, a wide-ranging analysis of the accessible literature on the toxicity of ARV drugs, their mechanisms of action and possible management strategies are mandatory to combat such complications (Sharma, 2011).

### Conclusion

Our study indicates a decreased proportion of abnormal

### Table 3.

Comparison of parameters between switch baseline and 12 months with in a group.

<table>
<thead>
<tr>
<th>Variable</th>
<th>EFV (Month 0)</th>
<th>EFV (Month 12)</th>
<th>P value</th>
<th>NVP (Month 0)</th>
<th>NVP (Month 12)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC (mg/dl)*</td>
<td>193 (50)</td>
<td>193.6 (46)</td>
<td>0.97</td>
<td>206 (75)</td>
<td>183 (51)</td>
<td>0.001</td>
</tr>
<tr>
<td>TG (mg/dl)*</td>
<td>109 (36)</td>
<td>117 (68)</td>
<td>0.07</td>
<td>119 (32)</td>
<td>109.5 (40)</td>
<td>0.16</td>
</tr>
<tr>
<td>HDL-c (mg/dl)*</td>
<td>44.6 (8.9)</td>
<td>44 (15)</td>
<td>0.85</td>
<td>48 (11.8)</td>
<td>48.7 (16.3)</td>
<td>0.89</td>
</tr>
<tr>
<td>LDL-c (mg/dl)*</td>
<td>106 (34.5)</td>
<td>9 (36.0)</td>
<td>0.34</td>
<td>4.4 (1.6)</td>
<td>3.9 (1.2)</td>
<td>0.11</td>
</tr>
<tr>
<td>Glucose (mg/dl)*</td>
<td>138.6 (65)</td>
<td>117 (68)</td>
<td>0.07</td>
<td>119 (32)</td>
<td>109.5 (40)</td>
<td>0.16</td>
</tr>
<tr>
<td>CD4+ cells/mm³*</td>
<td>560 (445-917)</td>
<td>580 (494-967)</td>
<td>0.49</td>
<td>583 (405-834)</td>
<td>551 (361-767)</td>
<td>0.27</td>
</tr>
<tr>
<td>Age ≥200 (mg/dl)**</td>
<td>10 (40.0)</td>
<td>12 (48.0)</td>
<td>0.56</td>
<td>26 (49.0)</td>
<td>16 (30.2)</td>
<td>0.04</td>
</tr>
<tr>
<td>Age ≥150 (mg/dl)**</td>
<td>15 (60.0)</td>
<td>19 (76.0)</td>
<td>0.22</td>
<td>34 (64.1)</td>
<td>33 (62.2)</td>
<td>0.84</td>
</tr>
<tr>
<td>HDL-c&lt; 40 (mg/dl)**</td>
<td>6 (24.0)</td>
<td>8 (32.0)</td>
<td>0.52</td>
<td>11 (20.7)</td>
<td>16 (30.2)</td>
<td>0.26</td>
</tr>
<tr>
<td>LDL-c&gt;130 (mg/dl)**</td>
<td>9 (36.0)</td>
<td>8 (32.0)</td>
<td>0.76</td>
<td>15 (28.3)</td>
<td>13 (24.5)</td>
<td>0.65</td>
</tr>
<tr>
<td>Glucose ≥110 (mg/dl)**</td>
<td>14 (56.0)</td>
<td>9 (36.0)</td>
<td>0.15</td>
<td>21 (39.6)</td>
<td>14 (26.4)</td>
<td>0.14</td>
</tr>
<tr>
<td>Castelli's Index I**</td>
<td>11 (44.0)</td>
<td>12 (48.0)</td>
<td>0.77</td>
<td>18 (33.9)</td>
<td>15 (28.3)</td>
<td>0.52</td>
</tr>
</tbody>
</table>

TC: Total cholesterol; HDL-c: high-density lipoprotein cholesterol; LDL-c: low-density lipoprotein cholesterol; SD: standard deviation; TG: triglyceride; EFV: Efavirenz; NVP: Nevirapine; Castelli’s Index I (TC/HDL-c ratio) for females >4.4 and males >5.1; *Values in mean with standard deviation; **Values in number with percentage; †Values in median with interquartile range; Month (0), switch baseline.

### Table 4.

Determinants of abnormal lipid profiles in the NVP group at the 12 month of NRTI switch.

<table>
<thead>
<tr>
<th>Outcome variable</th>
<th>Explanatory variable</th>
<th>Unadjusted odds ratio</th>
<th>95%CI</th>
<th>P value</th>
<th>Adjusted odds ratio</th>
<th>95%CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC ≥200 mg/dl</td>
<td>Sex</td>
<td>0.15</td>
<td>0.03-0.76</td>
<td>0.02</td>
<td>0.14</td>
<td>0.02-0.88</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>0.48</td>
<td>0.14-1.65</td>
<td>0.24</td>
<td>1.05</td>
<td>0.25-4.56</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>BMI</td>
<td>0.73</td>
<td>0.13-4.12</td>
<td>0.73</td>
<td>0.89</td>
<td>0.13-6.09</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td>CD4+ count</td>
<td>1.27</td>
<td>0.38-4.22</td>
<td>0.69</td>
<td>1.02</td>
<td>0.27-3.84</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td>HAART</td>
<td>0.96</td>
<td>0.25-3.70</td>
<td>0.95</td>
<td>0.88</td>
<td>0.20-3.83</td>
<td>0.86</td>
</tr>
<tr>
<td>TG ≥150 mg/dl</td>
<td>Sex</td>
<td>0.09</td>
<td>0.18-4.6</td>
<td>0.004</td>
<td>12.76</td>
<td>2.01-80.99</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>2.47</td>
<td>0.76-8.00</td>
<td>0.13</td>
<td>0.98</td>
<td>0.22-4.35</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td>BMI</td>
<td>1.00</td>
<td>0.21-4.78</td>
<td>0.98</td>
<td>0.84</td>
<td>0.12-5.93</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>CD4+ count</td>
<td>0.79</td>
<td>0.26-3.48</td>
<td>0.79</td>
<td>1.87</td>
<td>0.48-7.23</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>HAART</td>
<td>0.96</td>
<td>0.26-3.48</td>
<td>0.95</td>
<td>1.22</td>
<td>0.28-5.37</td>
<td>0.79</td>
</tr>
</tbody>
</table>

TC: Total cholesterol; TG: triglyceride; HAART: highly active antiretroviral therapy; BMI: body mass index. BMI <25 kg/m²; Females, Age ≤ 40 years, CD4+ count ≥500 cells/mm³; HAART experience >48 months.
Figure 1. Comparing of mean (standard deviation) and median (interquartile range) measures between EFV vs. NVP groups at the 12 month of NRTI switching.

Figure 2. Comparisons of lipid profile derangements and dysglycaemia in the EFV versus NVP group at the 12 month of NRTI switching according to NCEP-ATP III.
TC, TG, HDL-c, LDL-c, TC/HDL-c ratio and glucose among patients using NVP when compared with EFV at the end of the study follow-up according to NCEP-ATP III. Also raised HDL-c was seen in NVP group. Based on these findings, HAART regimens which contain NVP may be expected to reduce the risk of cardiovascular diseases. Therefore, it is recommended that lipid profiles should be monitored periodically for the maximum benefit of patients’ health management.

ACKNOWLEDGEMENTS

The authors acknowledged the laboratory technologists and technicians of the Hawassa University Referral Hospital and ART clinic nurses for their boundless support during data collection. Their gratefulness is also extended to the Hawassa University Referral Hospital for materials and reagents support; and the HIV/AIDS patients for their eagerly participation in the study.

Abbreviations: 2NN, 2 Non-nucleosides; AIDS, acquired immunodeficiency syndrome; HAART, highly active antiretroviral therapy; 3TC, lamivudine; HIV, human immunodeficiency virus; AZT, zidovudine; d4T, stavudine; EFV, efavirenz; ART, antiretroviral therapy; HDL-c, HDL-cholesterol; LDL-c, LDL-cholesterol; NNRTIs, non-nucleoside reverse transcriptase inhibitors; NVP, nevirapine; PIs, protease inhibitors; TC, total cholesterol; TG, triglycerides; SPSS, Statistical Package for Social Sciences; NCEP-ATP, United States National Cholesterol Education Program, Adult Treatment Panel.

Conflict of interest

The authors declare no competing interests.

REFERENCES


Pefura Yone EW, Betyoumin AF, Kengue AP, Folefack FJK, Ngogang J (2011). First-line antiretroviral therapy and dyslipidemia in people...
living with HIV-1 in Cameroon: a cross-sectional study. AIDS Res. Ther. 8:33.
Full Length Research Paper

Bottleneck analysis of challenges facing sexual and reproductive health and human immunodeficiency virus (HIV) services integration in Southwestern Nigeria

Adebimpe Wasiu Olalekan*1, Adeleke Najemdeen Ajao2, Farinloye Emmanuel Oludele2 and Efuntoyede Adeola Ebun3

1Department of Community Medicine, College of Health Sciences Osun State University Osogbo, PMB 4494 Osogbo, Nigeria
2Department of Obstetrics and Gynecology, College of Health Sciences Osun State University Osogbo, PMB 4494 Osogbo, Nigeria
3Family Health International/SIDHAS project, Abuja Nigeria

Received 30 October, 2014; Accepted 2 February, 2015

Services integration ensures easy access to multiple services in a cost effective way. Integration of sexual and reproductive health (SRH) and human immunodeficiency virus (HIV) services is poor in Nigeria. Removing bottlenecks to successful integration has been of high programmatic priority most especially in resource poor settings. This study determined bottlenecks to effective SRH/HIV services integration in Osun State in Southwestern Nigeria. This study combined descriptive cross sectional and retrospective study designs by collecting validated routine data on SRH/HIV integration from 100 randomly selected health care facilities. Research instruments for descriptive data collection were semi structured self administered questionnaires for health care workers, and exit interviews for patients using a designed checklist. Data was analyzed using a combination of Statistical Package for Social Sciences (SPSS) and Excel software(s). The study found that only 31.9% of the health facilities had been trained on SRH/HIV integration, 42.1% of the health facilities were providing services within reach of the communities served, while 32.4% said they regularly complete the integrative referral process. Using the World Bank model of the bottlenecks analysis (BNA) process, three major bottlenecks to SRH/HIV services integration were determined. These include inadequate capacity building and poor access to SRH/HIV integrated services on the supply side. On the demand side, the major bottleneck identified was poor continuous utilization of services. Commodity challenges, poor initial utilization and poor quality of services were not among the leading bottlenecks identified. Several reasons were given as causes of these bottlenecks. Circumventing identified bottlenecks would strengthen SRH/HIV integration in order for patients to benefit from the two services simultaneously. All efforts should be geared towards removing these evidence based bottlenecks.

Key words: Sexual and reproductive health/ human immunodeficiency virus (SRH/HIV) integration, bottlenecks analysis (BNA), health facilities, Osun State, Nigeria.

INTRODUCTION

In resource poor settings such as Nigeria, it is logical to integrate the provision of reproductive health and HIV/AIDS services in order to improve access of patients to multiple services, thereby improving the alarming
Reproductive Health (RH) and Human Immunodeficiency Virus (HIV) infection services indices. Further evidence for services integration was the fact that Nigeria has low contraceptive prevalence rates, high unmet needs for contraception (National Population Commission [NPC], 2009) and a relatively high national HIV prevalence put at 4.1% (Federal Ministry of Health [FMoH], 2010). According to the World Health Organization (WHO, 2004), integration is the combination of different kinds of services or operational programmes to ensure maximized collective outcomes. Clients requiring both services require common needs and resources from the health system, therefore such services can be provided under same roof, by the same health care providers under the same roof and during same working hours. Unfortunately, SRH/HIV integration is poor in Nigeria, and SRH and HIV services are often provided in a parallel way in most health systems (NPC, 2009).

The integration of Family Planning (FP) and HIV services is an evidence-based approach to averting unintended pregnancies among HIV positive clients (Kennedy et al., 2004). Basically, there are three approaches to SRH/HIV integration in Nigeria. These include the on-site (e.g. one-stop shop or “comprehensive services approach”), the off-site approach in which RH-HIV services are offered outside the facility through facilitated referral and the mixed-model approach in which some services are initiated in one facility, but are provided in another, or some services are offered in one facility, while others are offered in a different facility. Thus, expanding the scope of SRH/HIV integration would further meet the sexual and reproductive health needs of people living with HIV and vice versa.

Several constraints within and outside the health sector may have undermined the objectives of SRH/HIV integration, and reduced the pace and quality of services. Most integration services in Nigeria were geared towards family planning (FP/HIV integration), thus leaving out the other components of SRH. Most integration efforts are donor driven leaving sustainability of such programmes and services as a big issue. Others include poor community involvement, poor referral systems, poor capacity building and poor infrastructure in terms of clinic space, integration tools, basic equipments and supplies. Vertical programmes with separate procurement lines and information management system were also possible challenges.

In order to circumvent these challenges facing SRH/HIV service integration in Nigeria, FMoH recommended the creation of an enabling environment for integrated RH/HIV service at all levels of health care, improvement in the capacity of Health Care Workers (HCWs) to provide integrated RH and HIV services, and and improved provision and uptake of SRH/HIV integration services in project sites. Health care service providers have prominent roles to play in achieving these objectives of SRH/HIV integration (The Guttmacher Institute, 2004; Bharat et al., 2007). This study determined data driven bottleneck analysis of the challenges facing SRH/HIV Integration in Osun State in Southwestern Nigeria.

**MATERIALS AND METHODS**

**Study area**

Osun State is one of the states in Southwestern Nigeria with a population of about 3.8 million (NPC, 2006). There are 30 Local Government Areas (LGAs) shared among the 3 senatorial districts. There are 2 teaching hospitals, nine general and numerous public and private health facilities providing Primary Health Care (PHC) services in the state. In Osun State like other states in Nigeria, contraceptive prevalence rate is low while maternal mortality is unacceptably high (Harrison, 2009). International donors and local Non Governmental Organizations (NGOs) drive the little efforts at SRH/HIV integration. HIV prevalence in the state stands at 7.7%, a bit lower than the national average put at 4.1% (FMoH, 2010).

**Study design**

Two study designs were employed in this study. The first was a retrospective study of bottleneck analysis of challenges to integration of SRH and HIV services in Osun State. The second was a descriptive cross sectional study carried out for some specific objectives.

**Study population**

Study population includes health facilities, health care service providers, and clients from 15 to 49 years accessing integrated services. Private health facilities and their health care providers were excluded from this study.

**Ethical consideration**

Ethical consideration permission to carry out this study was obtained from UNIOSUN Health Research Ethics Committee after a successful application. Permission was also obtained from health facility managers and project site directors. Written informed consent was obtained from all clients and health care workers who took part in the client exit interviews and health facility surveys, respectively.

**Sampling**

Retrospective data review was done for a period between January and December, 2013. For the selection of PHC facilities for the assessment of integration services, a multistage sampling method was adopted. In the first stage, 2 out of 3 Senatorial districts were
selected using simple random sampling employing simple balloting. In stage II and with 10 LGAs per district, a total of 7 LGAs were selected per district using simple random sampling, making a total of 14 LGAs. Based on each LGA having ten PHCs, a list of all SRH/HIV integrating health facilities were obtained from the State Ministry of Health in Stage III. A total of 90 PHCs were selected randomly from urban to rural health care facilities in the ratio of 2:1.

While all the nine general or secondary level care hospitals were recruited into the study, one out of the two teaching hospitals in the state were randomly selected employing simple balloting. All these ten facilities were recruited into the study to make a total of 100 health care facilities when added to the PHCs. For clients, exit interviews were conducted for any 2 purposively selected clients accessing services within each of the selected health facility on the day of visit.

Data collection

Retrospective data were collected to showcase the bottlenecks. This includes aggregated and validated routine data from registers, monthly summary forms and established data bases such as the NHMIS and NNRIMS at state level. The LGAs monitoring and evaluation officers were actively involved in data synthesis and collection. In situation where data is unavailable, these officers assisted in getting back to the source documents and recorded required data accordingly. Data collectors were trained on the various data elements considered, data synthesis and subsequent management. Some data were obtained by carrying out field specific descriptive cross sectional surveys using semi structured self administered and pre-tested questionnaires among Health Care Workers (HCWs). Using a checklist containing some validated open and close ended questions, client exit interviews were conducted by trained interviewers in order to have relevant data supporting the sub bottlenecks analysis. The client exit questionnaire was translated into Yoruba language and back translated into English to ensure further validity before use.

Study variables

The World Bank/UNICEF Bottleneck Analysis model was employed in getting data for the BNA process. Data related to SRH most especially FP and that of HIV services and integration efforts were collected. Data were collected under six broad headings, namely, capacity building, commodities, access to services, initial and continuous utilization and quality of services.

Data management

Validated health facility data collected for the designated period were analyzed using the Excel software after double entry and cleaning of data, in order to ensure validity of data. Survey data was analyzed using the Statistical Package for Social Sciences (SPSS) software version 17.0. Descriptive analysis was carried out mainly in form of tables and charts to explain some of the reasons why the bottlenecks exist within and outside the health systems.

RESULTS

Figure 1 showed the BNA of challenges facing SRH/HIV integration at the comprehensive or one stop model facilities. On the supply side, only 31.9% of facilities had been trained on SRH/HIV integration, 72.5% of the facilities had no commodity stock-outs in the last 3 months, while 42.1% of the health facilities were providing services within reach of the communities served. On the demand side, initial utilization of FP and/or HIV services

![Figure 1. Bottleneck analysis of the one stop shop model/approach to SRH/HIV services integration.](image_url)
Table 1. Breakdown of identified bottlenecks to integration efforts among selected health facilities in Osun State.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sub-bottlenecks</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capacity building</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply side</td>
<td>Staff formally trained on SRH/HIV integration</td>
<td>31.9</td>
</tr>
<tr>
<td></td>
<td>Trained on commodity logistics</td>
<td>11.1</td>
</tr>
<tr>
<td></td>
<td>Health Facility (HF) staff ad step down trainings</td>
<td>8.4</td>
</tr>
<tr>
<td></td>
<td>Had on the job training/refresher trainings</td>
<td>23.7</td>
</tr>
<tr>
<td></td>
<td>Regular mentoring by MoH staff</td>
<td>13.6</td>
</tr>
<tr>
<td></td>
<td>Regular mentoring from implementing partners</td>
<td>43.1</td>
</tr>
<tr>
<td></td>
<td>Trainings were essentially donor driven(among the trained)</td>
<td>75.8</td>
</tr>
<tr>
<td><strong>Access to services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proportion of HF providing integrated services</td>
<td>42.1</td>
</tr>
<tr>
<td></td>
<td>Proportion of communities known to be providing services</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>Referrals services available</td>
<td>65.8</td>
</tr>
<tr>
<td></td>
<td>Adequate distance of HFs to reported catchment areas</td>
<td>76.5</td>
</tr>
<tr>
<td><strong>Continuous utilization</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand side</td>
<td>Proportion of HF clients accessing integrated services</td>
<td>28.1</td>
</tr>
<tr>
<td></td>
<td>Proportion of referrals completed</td>
<td>33.1</td>
</tr>
<tr>
<td></td>
<td>Client satisfaction</td>
<td>72.0</td>
</tr>
<tr>
<td></td>
<td>Facility CYPR adequate (calculated for dual protection)</td>
<td>38.4</td>
</tr>
<tr>
<td></td>
<td>Number of community involvement</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td>Adequate infrastructure(space, equipments)</td>
<td>34.6</td>
</tr>
<tr>
<td></td>
<td>Adequate number of harmonized M and E tools</td>
<td>8.7</td>
</tr>
</tbody>
</table>

...took place among 61.3% of the clients. Continuous utilization or completeness of FP services by HIV clients and vice versa in integrated manner took place among 32.4% of the clients, while quality of service provision was accessed to be high among 52.0% of the health facilities. Thus BNA revealed three important bottlenecks to SRH/HIV services integration. These include inadequate training or capacity and poor access to services bottlenecks on the supply side, while poor continuous utilization constitutes barrier on the demand side.

Table 1 showed further breakdown of identified bottlenecks. Under capacity building, only 31.9% of the health care facilities had their staff formally trained on SRH/HIV integration, 11.1% were trained on FP/HIV commodity logistics, 8.4% had step down trainings, 23.7% had on the job refresher training, 13.6% received regular onsite mentoring by Ministry of Health staff while 43.1% of facilities said that programme mentoring activities were essentially done by implementing partners or NGOs. Among those who were formally trained, 75.8% said trainings were essentially donor driven. In terms of access to services, only 42.1% of the facilities were providing integrated services, only 2.4% of them received community inputs, 65.8% had referral services available while 76.5% said that they were adequately sited in terms of distance of health facilities to reported catchment areas.

For continuous utilization of services, only 28.1% of the facilities had their clients accessing integrated services, 33.1% said they usually have completed referrals, and 72.0% felt that their clients were satisfied with their services. Calculated Couple Year Protection Rate (CYPR) for condoms was adequate among 38.4% of facilities, 2.8% reported community involvement in integration programmes, 34.6% were observed to have adequate infrastructure in terms of space and equipments while only 8.7% had adequate stock of harmonized monitoring and evaluation tools for reporting.

**DISCUSSION**

Only about one third of the health facilities had their staff trained on SRH/HIV integration. This inadequate capacity building trend supports findings from several other studies (FMoH, 2007; Uneke et al., 2007). Training is an essential component of work schedule of staff as it keeps them abreast and afresh of both existing and new knowledge in their areas of expertise and general health knowledge. It can also be a source of motivation for staff...
so they could put in more efforts (Adebimpe et al., 2013). Training could be formal, on the job, step down, refresher or even mentoring and supervision by experts or superior colleagues. Training would afford these staff the opportunity of carrying out better integration activities in their health care facilities. However mentoring pattern described as non significant by respondents in this study supports findings from the Nigerian Mid Term Evaluation (MTE) of SRH/HIV integration efforts (FMoH, 2007), this may be because most mentoring activities are donor dependent with staff of NGOs coming around to give mentoring services. Likewise, three quarter of the respondents said that the formal training they had was also donor driven. However, training on commodity logistics is grossly deficient among studied facilities; this could lead to poor commodity acquisition and inventory management towards contraceptive commodity security in their facilities.

Stock-out of FP and HIV programmes commodities was not an issue in many of the health care facilities, and this supports the Nigerian MTE (FMoH, 2007). This is because FP programmes in Nigeria receives a lot of funding and assistance from United Nations, bilateral and other donor agencies. This is more pronounced for the facilities that have been using Government Contraceptives Logistics Management System (CLMS) to procure and manage their contraceptive commodities.

Only two-fifths of the facilities were providing services within reach of the communities served. This trend supports other studies (Ajala et al., 2005; Jaro and Ibrahim, 2012). Geographical accessibility within maximum of 5 km reach of people served by a health facility is important and central to geographical accessibility. The situation is worsened in areas with bad roads and difficult terrain, which may hamper accessibility to SRH/HIV services and follow up. This may have been the situation in this study despite claims by three-quarter of the facilities saying that they were adequately sited in terms of distance of health facilities to reported catchment areas but only two-fifths were providing integrated SRH/HIV services.

Continuous utilization or completeness of FP services by HIV clients and vice versa in integrated manner took place among one third of clients in the midst of high quality services. About one third said they usually have completed referrals, with poor community involvement in integration programmes. In some other studies (Kambarami et al., 2000; Jahn and De Brouwere, 2001), referral was reported but completion of referral was inadequate. The importance of a two way referral system cannot be over emphasized because it ensures adequate service provision as well as make tracking possible. Many of our clinics are stigmatizing HIV positive clients such as the concept of Antiretroviral Therapy Center or clinic for HIV positive clients or sexually transmitted disease clinics. Many clients being referred to such clinics may not get there eventually for fear of stigma and discrimination and other surmountable challenges.

In our study, one third of the facilities were observed to have adequate infrastructure in terms of space and equipment. In a similar support study (Ajala et al., 2005; Jaro and Ibrahim, 2012), infrastructure was found to be inadequate in many PHCs, thereby hampering provision of quality health services. Rural areas and underserved urban settlement may exhibit discrete format, while the rural setting is made up of settlements units of individual distinct villages. In our study, less than one-tenth had adequate stock of harmonized M and E tools for reporting, and this supports the MTE study (FMoH, 2007), though printing and production of such tools were largely donor driven. One major limitation of this study was the difficulty in getting literatures and data that are peculiar to BNA study using the World Bank/UNICEF model on both the demand and supply sides of identified bottlenecks.

Conclusion

Major bottlenecks constituting challenges to SRH/HIV integration include inadequate training, hindered access to SRH/HIV services and lack of completion of utilization of services. Circumventing these challenges is within the reach and control of stakeholders involved in service integration. These may include step down and in house training on SRH/HIV integration for health care workers, stepped up mentoring and supervisory visits by SMoH officials and supporting implementing partners, the health systems creating an atmosphere of geographical accessibility to services by people in the catchment areas, and stepped up community involvement through improved awareness. In addition, health care workers need to strengthen referral networking systems towards completion of referrals within and even between health facilities.

ACKNOWLEDGEMENTS

The author would like to thank the coordinators and directors of selected health care facilities, the State Hospital Management Board and the health care workers including the M and E officers who made the data collection process possible.

Conflict of interest

The author declares no conflict of interest.

REFERENCES


