The presence of common risk factors for cervical cancer among women attending the Visual Inspection with Acetic Acid (VIA) Clinic at the Georgetown Public Hospital Co-operation (GPHC)

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Abstract

Background: Guyana has the third highest incidence and rate of death from cervical cancer in the Western Hemisphere. There are several predisposing factors including HPV infection, early age of menarche, young age of first sexual experience and first full term pregnancy, multiple sexual partner, smoking, low socioeconomic status.

Aim: to determine the common risk factors for cervical cancer among women attending the GPHC VIA clinic

Methodology: A Self-Administered pretested and validated questionnaire which seeks to identify common risk factors for cervical factors among all women between the ages of 16 and 35 that attended The VIA Clinic at GPHC. Data was collected during a 1 week period Monday to Thursday (VIA Clinic Days), a total of 48 women participated in the Study.

Results: There was a 60% response to the study. 25% were of the low socioeconomic status. Only 18.7% of women had a papanicolaou smear in the last three years. 31.25% had a positive family history of cancer (breast and cervical). 18.8% had menarche before the age of 12 years. 95% of the women were sexually active with 47.9% having had their first sexual intercourse between the ages of 17-20. 21.7% of women had multiple sex partners and practice unprotected sexual intercourse. In addition a little less that half of the participants consumed a low fruit diet and a significant majority ate smoked and canned foods regularly.

Conclusion: Lack and irregular use of condoms at every coitus, multiple partners, inadequate diet among others were the main factors that predisposes the women to become infected with the human papilloma virus and subsequently development of cervical cancer.

Introduction

Human papilloma virus (HPV) is a sexually transmitted infection and it is a major factor implicated in the development of cervical cancer. It has been proposed that while the use of condoms in preventing human papillomavirus infection is unknown, condom use has been associated with a lower rate of cervical cancer, an HPV-associated disease. HIV infection can indirectly cause an increase in the risk of developing cervical cancer. The HIV virus damages the CD4+ T helper cells that form part of our immune response. Any disruption in the immune system predisposes an individual to developing other infections such as HPV or Chlamydia.

Although HPV is the usual suspect in cervical cancer, studies now suggests that lifestyle factors also play a part in its development. It has been reported that that smoking together with an HPV infection can greatly increase cervical cancer risk. Researchers reviewed the medical records of 105,760 Swedish women, identifying 375 women with cervical cancer and 363 cancer-
free controls. Smokers with high levels of HPV infection had a 27-fold increased risk of cervical cancer compared to smokers with no HPV. Other associated risk factors included diet, such as low serum vitamin A and E levels. Reproductive factors, apart from first sexual experience, multiparty and use of oral hormones, extend to include age of menarche and age of first full term pregnancy. It has been reported that, women who were younger than 17 years when they had their first full-term pregnancy are almost 2 times more likely to get cervical cancer later in life than women who waited to get pregnant until they were 25 years or older.

**Justification**

Guyana has a population of 257000 women between the ages of 15 and older, current estimates indicate that every year 161 women are diagnosed with cervical cancer and 74 die from the disease. Cervical cancer ranks as the 1st most frequent cancer among women in Guyana, and the 1st most frequent cancer among women between 15 and 44 years of age. In South America, 13.2% of women in the general population are estimated to harbour cervical HPV infection. Cancer is the major cause of death of black women in Guyana. Guyana has the third highest incidence and rate of death from cervical cancer in the Western Hemisphere.

**Objective of the study**

To identify the most common risk factor for cervical cancer among women attending the VIA clinic

**Design and Methodology**

The study group consisted of all the women between the ages 16-35 who presented themselves at the Gynaecology Clinic specially design to offer the services of The Visual Inspection with Acetic Acid Test (VIA) at Georgetown Public Hospital Corporation (GPHC) during a period of one 1 week Monday to Thursday, during the month of July 2012. Women who were younger than 16 an older than 35 were excluded from the study in addition to those who were pregnant or those who refuse to be part of the study.

After obtaining Ethical Clearance and permission from GPHC and consent from each of the women in addition to explaining the purpose of the study a pretested validated questionnaire was self-administered to those who agreed to participate in the study. and after explaining the purpose of the study. A total of 48 women participated in the study. Four consecutive VIA clinic days, Monday to Thursday, were used to obtain the data from the questionnaire. After data collection was completed, a spread sheet was prepared using Windows Microsoft Office Excel. From the spread sheet, the graphs and charts were formulated using the same program. Graphs were produced from the following questions based on the objectives of the research.

**Results and Discussion**

This study covered a sample population of forty eight (48) persons, 60% response of the expected. Their ages ranged between sixteen (16) years to thirty five (35) years with the majority of participants, 41.6% in the 31-35 age range. The Major ethnicity, 41.6%, that participated was Africans followed by the 37.5% being of a mixed race. There was only one Amerindian participant. Most were single women of Christian background and only 18.7% of women had a papanicolaou smear in the last three years, 95% of the women were sexually active with 47.9% having had their first sexual intercourse between the ages of 17-20 years.
Table 1: Shows the results for the various risk factors that can lead to the development of cervical cancer among women researched at the VIA clinic at the GPHC

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>No. of exposed participants</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection with HIV</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Infection with HPV</td>
<td>1</td>
<td>2.1%</td>
</tr>
<tr>
<td>Infection with Chlamydia</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Use of Oral contraceptives &gt; 5 years</td>
<td>4</td>
<td>8.3%</td>
</tr>
<tr>
<td>Irregular/lack of condom usage</td>
<td>40</td>
<td>83.3%</td>
</tr>
<tr>
<td>Smoking</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Alcohol use &gt;14 shots/week</td>
<td>20</td>
<td>41.6%</td>
</tr>
<tr>
<td>Low Fruit and vegetable intake – Lack of vitamins A and E &lt;3 times/week</td>
<td>21</td>
<td>43.8%</td>
</tr>
<tr>
<td>Papaya intake &lt; once/week</td>
<td>29</td>
<td>60.4%</td>
</tr>
<tr>
<td>Smoked Foods</td>
<td>40</td>
<td>83.3%</td>
</tr>
<tr>
<td>Canned or plastic contained foods</td>
<td>39</td>
<td>81.3%</td>
</tr>
<tr>
<td>Multiple partners &gt;3</td>
<td>13</td>
<td>27.1%</td>
</tr>
<tr>
<td>Age of menarche &lt;12 years</td>
<td>8</td>
<td>16.7%</td>
</tr>
<tr>
<td>Full term pregnancies &gt; 3</td>
<td>29</td>
<td>60.4%</td>
</tr>
<tr>
<td>Age of first pregnancy &lt; 17 years</td>
<td>4</td>
<td>8.3%</td>
</tr>
<tr>
<td>Age of first sexual intercourse &lt; 16 years</td>
<td>8</td>
<td>16.7%</td>
</tr>
<tr>
<td>Low socioeconomic status</td>
<td>11</td>
<td>22.9%</td>
</tr>
<tr>
<td>Family history of cervical cancer</td>
<td>3</td>
<td>6.3%</td>
</tr>
<tr>
<td>Failure to get regular screening (pap smear)</td>
<td>33</td>
<td>68.8%</td>
</tr>
<tr>
<td>Douching once/more per week</td>
<td>14</td>
<td>29.1%</td>
</tr>
</tbody>
</table>

Generally 31.2% of the women had a family history of cancer, 14.6% had a sexually transmitted infection (syphilis, gonorrhoea and HPV). In addition the results indicated that none of the women smoked neither were HIV positive, however 25% of the women were exposed to second hand smoke. only 6.3% had a family history of cervical cancer and only 8.3% had a pregnancy before age 16. However a significant majority of the women (83%) practiced irregular condom use, just under half consumed alcohol regularly, ate foods rich in fruits and vegetables regularly, a significant majority (60%) did not consume such a papaya a good source of vitamin A regularly, ate smoked foods (83.3%) and canned foods, which are both sources of carcinogens (81.3%) , had more than 3 full term pregnancies (60.4%), and do not do regular screening(68.8%). The results also indicated that over a quarter of the women had more than 3 sexual partners and just under a quarter of the women were from low socioeconomic background, and had experienced menarche less than 12 years of age and had their first sexual encounter less than 16 years of age. Fortunately only 2.1% of the women were tested positive for HPV. There are many studies that have suggested that vegetable consumption and circulating cis-lycopene may be protective against HPV persistence. Lycopene is a carotenoid pigment and phytochemical found in tomatoes and other red fruits & vegetables, such as red carrots, watermelons and papayas. Smoked foods and canned foods contain carcinogens such as nitropyrenes and sodium nitrites respectively, both have been implicated in carcinogenesis.
The figure indicated that the majority of the women had more than 3 sexual partners since their first coitus, however about one fifth of the women had as much as 6 sexual partners since their first coitus and a few had more than 8.

Conclusion

Lack and irregular use of condoms at every coitus, inadequate diet, multiple sex partners, and inadequate screening were the main factor that predisposes women who attend the VIA clinic at GPHC to become infected with the human papilloma virus and subsequently to develop cervical cancer. Although there is a massive awareness programme on screening methods such as VIA testing and papanicolaou tests, emphasis should be place on primary preventative measures.

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Public Health Correlates of Co-Infections of Syphilis and Hepatitis B Among People Living with HIV at the General Hospital, Calabar

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Abstract

Introduction: HBV and Syphilis share certain epidemiological characteristics and route of transmission with HIV, and co-infections are not uncommon. Against the backdrop of the need for understanding of the risk factors as a cornerstone for designing effective prevention and control interventions, this research determined the prevalence and some determinants of co-infection of hepatitis and syphilis among PLHIVs.

Methods: Descriptive cross sectional study among 350 PLHIVs seen at the General Hospital Calabar selected using multistage sampling method. Disease screenings were done using standard techniques. Data was analyzed using the SPSS software version 17.0.

Results: Prevalence of HBV and Syphilis were 0.014% and 0.086%, with co-infection rate of 1 out of 351 cases. Co-infections was not statistically significantly associated with any of the diseases (X^2 of 3.013 and p value of 0.006) despite only 205(58.3%) having low estimated sexual risk scores.

Conclusion: Though co-infection prevalence rate is low, HBV and syphilis screening should be included in pre-HAART care, and towards encouragement of sexual behavioural change among PLHIVs.

Key words: PLHIVs, Co-infections, Prevalence, Syphilis, HBV.

Introduction

Around the world, millions of people are infected with some kind of Sexually Transmitted Infection (STI), making them a major global public health problem. Human immunodeficiency virus (HIV), hepatitis B and C viruses (HBV and HCV) are the three most common chronic viral infections in this category (Sarabanan et al., 2007). Their common modes of transmission are the denominator shared by these infectious diseases of humans (Alter, 2006, McGovern, 2007). Worldwide, chronic HBV infection affects about 10% of HIV-infected patients(Puoti, 2002).

In sub-Saharan Africa, it is estimated that 25 million people are infected with the HIV virus, and another 50 million people are HBV positive(Ocama, Opio and Lee, 2005)

The prevalence of chronic HBV co-infection among HIV-infected individuals in areas of low HBV endemicity has been reported to range from 6% to 14% (Alter, 2006; Spradlong et al., 2010). Prevalence figures are scarce in Nigeria and co-infection often remain undiagnosed in resource-limited settings because routine testing of both infections are not a part of most of the national programmes and guidelines.

The fact that HBV and HIV share certain epidemiological characteristics such as risk populations and transmission routes with syphilis puts HIV positive individuals at risk of co-infection with hepatitis B or syphilis or both. Co-infection with HIV has a major impact on the natural history, diagnosis, progression, morbidity, and mortality of HBV infection, most especially in the era of HAART (McGovern and Sherman, 2009).

The rate of progression and complications from viral hepatitis has been reported to be accelerated in patients with HIV co-infection. HIV/HBV co-infected individuals are 6 times more likely to develop chronic hepatitis B than HIV negative individuals and this is more likely to occur in HIV infected men with lower CD4+ cells(McGovern B, 2007).
Studies have shown that the clinical manifestations of certain STDs such as syphilis and HBV could facilitate the transmission of HIV. With syphilis, there is an increase in the shedding of HIV in co-infected individuals, because of the presence of a chancre which provides a mechanical break in the protective skin barrier, allowing access to the spread of HIV. The course of acute HBV may be modified in the presence of HIV infection, with a lower incidence of icteric illness and lower rates of spontaneous clearance of HBV. Thus a thorough understanding of the risk factors is a cornerstone for designing effective prevention and control interventions (Ezzati et al., 2002)

With the advent of human right, there has been an increase in the incidence of gay relationships. Possible occurrences of genital infections from deep penetrative anal and other form of sexual intercourse are common. Situation is worsened with the outburst of high risk group such as MSM and IDU. This research determined the prevalence and some determinants of co-infection of hepatitis and syphilis among PLHIVs seen at the Calabar General Hospital in Southern Nigeria.

Methods

**Study area:** Calabar is the capital of Cross rivers state, and the General Hospital is one of the predominant health facility in the state providing health care at the secondary level. The HIV prevalence in the state was 5.2%, a bit higher than the national average put at 5.1% (NACA 2010). The hospital received funding from NGOs funding HIV activities at one level or the other. The project site have an estimate of about 500 clients in HIV care. Syphilis and hepatitis test are not routinely carried out as part of the comprehensive care for HIV diagnosed clients

**Study population:** consists of registered HIV positive clients on ART aged 15 years and above and who has been receiving treatment within the hospital for at least 6 months.

**Study design:** descriptive crops sectional study among PLHIVs

**Sample size estimation:** Using the modified Leslie Fischer's formula for calculation of sample size for population less than 10,000 and p of 0.5, a sample size of 234 was calculated and this was increased to 260 to account for cases of attrition for any reason.

**Sampling methods:** A multi staged sampling method was employed in sample selection. In the 1st stage, 2 of the 4 clinic days were selected using simple balloting. In stage 2 on a clinic day, an alternative clinic week was randomly selected by simple balloting, and questions were randomly allocated to each selected clinic day. On a clinic day, a sampling frame of all diagnosed clients in the HAART clinic was made and a systematic sampling of 1 in 3 was used in selecting subjects for the study, and this continued until allocated questionnaires got exhausted.

**Ethical approval:** was obtained from LAUTECH Teaching Hospital Health Research ethics committee. Further permission was obtained from the site project director. A written informed consent was obtained from each client who eventually took part in the study.

**Data collection:** Laboratory scientists attached to the ART clinic conducted all the laboratory tests. A structured checklist specifically drafted to compliment the laboratory investigation was administered by trained ART nurses who could speak the local language. Variables in the checklist include socio-demographic characteristics, pattern of use of ART, current sexual risk behaviour.

**Laboratory analysis**

Blood was collected by routine phlebotomy and tested for hepatitis B surface antigen (HBsAg) using a one-step lateral flow rapid chromatographic immunoassay that qualitatively detects HBsAg. Antibodies used were developed against whole hepatitis B antigen isolated from HBV (Acumen labs and diagnostic centre, Bangalore, India) and has a relative sensitivity greater than 99.0%, relative specificity is 97.0%, and accuracy of 98.5%.

HIV 1/2 was tested according to the Nigerian national serial algorithm using Determine test kits (Abbot, Japan for Inverness Medical, Japan) first, which is a qualitative immunochromatographic assay that detects HIV 1 and 2 antibodies using recombinant antigens and synthetic peptides. While a positive Determine connotes HIV positive and further testing done using UniGold, a negative determine was
recorded as negative. VDRL screening test was used to label subjects as positive or non-reactive to the Syphilis test.

**Data analysis:** data collected was cleaned and entered into the SPSS software version 17.0 after validating data entered using double entry technique and searching for outlier values. Frequency tables and chart were generated. Correlation between socio-demographic data and other variables and prevalence of co-infections were carried out using bi-variate and multivariate data analysis. Statistically significant p values was set at <0.05 for all inferential statistics.

**Results**

Table 1 shows the distribution of the patients screened for Hepatitis B virus and syphilis according to sex and age range. 4.8 percent of the patients were within the age range less than 20, 39.2% within 21-30, 32% within 31-40, 17% within 41-50 and 7% was above 51.

Table 2 showed the results obtained for the HBV and Syphilis, 0.014% of the patients comprising 0.0057% males and 0.0086% females were positive for HBV. 0.0086 percent comprising male and female were positive for Syphilis in which 0.026% were male and 0.06% were female. Table 2 also shows that the female had a higher percent rate of the infection in both HBV (0.0086%) compare to male (0.0057%) while Syphilis show (0.06%) in female as against (0.026%) in male. There was a single case of co-infection of both HBV and syphilis.

Table 3 showed that 91(26.0%) of respondents had a CD4 cell count of less than 350, 269(76.9%) had calculated ART adherence percentage of 90-95% while 205(58.3%) had low estimated sexual risk scores.

**Discussions**

The prevalence of HBV among HIV patients in this study was 0.014% while that of Syphilis was 0.086% while co-infections was very very low in prevalence. This proportion is less when compared to several other studies within and outside Nigerian (Okocha et al., 2012; Pittman et al., 2014, Ankur et al., 2012). This may not be unconnected to the fact that most of the studies used high risk sexual group such as MSM and sex workers. However is still shows that prevalence of single infection and co-infections are not uncommon in the study area.

The rate of syphilis in the study was lower than the 2.7% projected by the National Behavioral Survey for syphilis infection among Nigerians. Syphilis and HIV are both transmitted sexually hence it is not surprising that more people were co-infected with syphilis than hepatitis. HIV has several effects on syphilis as it relate to its presentation, diagnosis, disease progression, and therapy. Syphilis however thus responsible for the risk of HIV transmission and acquisition due to presentation of causing genital ulcers. Sexually active men and women are prone to risk of infection with syphilis than HBV. Meanwhile, the incidence of co-infection of both HBV and Syphilis in HIV infected patients were not predominant(Ankur et al., 2014)

Co-infection of HBV and syphilis were found only in patients on ART while none were found on NART. A simple cross tabulation of these two variables showed no statistical significant association with X² of 3.013 and p value of 0.016. This is supported by another study (Silverman et al., 2008). Liver cirrhosis, cancer and subsequent death may eventually be due to untreated hepatitis, association between hepatitis and elevation of liver enzyme are also reported. There are some highlighted challenges that are likely to be encountered in treatment of patients who were co-infected with hepatitis as in which HAART regimen to use, how to reduce further hepatic damage, and when to initiate the patient on HAART, as in resource-limited settings with limited ARV options.

In conclusion, this study have shown that co-infections of HIV/HBV and HIV/Syphilis occur in our environment just like any other communities due to the fact that we shared some characteristics like transmission pathways, synergistic effects of these viruses and the effects of hepatitis and syphilis on presentation, morbidity, and mortality of HIV infection. Though co-infection prevalence rate is low, HBV and syphilis screening should be included among the investigations to be done by pre-HAART and this
could also an indication for community education and screening and encouragement of sexual
behavioural change.

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research.

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Conflict of interest: None.

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Table 1: Distribution of HIV patients according to Age and Sex.

<table>
<thead>
<tr>
<th>Range</th>
<th>Number screened for hepatitis B virus and Syphilis antibodies</th>
<th>Male</th>
<th>Male (%)</th>
<th>Female</th>
<th>Female (%)</th>
<th>Total</th>
<th>%Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td></td>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;20</td>
<td></td>
<td>6</td>
<td>0.017094017</td>
<td>11</td>
<td>0.031339031</td>
<td>17</td>
<td>0.048433</td>
</tr>
<tr>
<td>20-30</td>
<td></td>
<td>55</td>
<td>0.156695157</td>
<td>82</td>
<td>0.233618234</td>
<td>137</td>
<td>0.390313</td>
</tr>
<tr>
<td>30-40</td>
<td></td>
<td>44</td>
<td>0.125356125</td>
<td>68</td>
<td>0.193732194</td>
<td>112</td>
<td>0.319088</td>
</tr>
<tr>
<td>40-50</td>
<td></td>
<td>23</td>
<td>0.065527066</td>
<td>37</td>
<td>0.105413105</td>
<td>60</td>
<td>0.17094</td>
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<tr>
<td>&gt;60</td>
<td></td>
<td>9</td>
<td>0.025641026</td>
<td>16</td>
<td>0.045584046</td>
<td>25</td>
<td>0.071225</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>137</td>
<td>0.39031339</td>
<td>214</td>
<td>0.60968661</td>
<td>351</td>
<td>1</td>
</tr>
</tbody>
</table>
**Table 2:** Prevalence of hepatitis B and syphilis antibodies

<table>
<thead>
<tr>
<th>Tests carried out</th>
<th>Number of samples tested</th>
<th>Number of samples positive</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBsAg</td>
<td>351</td>
<td>2(0.0057%)</td>
<td>3(0.0086%)</td>
<td>5(0.014%)</td>
<td></td>
</tr>
<tr>
<td>Syphilis Ab</td>
<td>351</td>
<td>9(0.026%)</td>
<td>21(0.06%)</td>
<td>30(0.086%)</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3:** HIV management and sexual behavior pattern

<table>
<thead>
<tr>
<th>CD4 count at time of examinations</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;350 cells</td>
<td>91</td>
<td>26.0</td>
</tr>
<tr>
<td>&gt;350 cells</td>
<td>260</td>
<td>74.0</td>
</tr>
<tr>
<td>Calculated ART adherence %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;90%</td>
<td>32</td>
<td>9.1</td>
</tr>
<tr>
<td>90-95%</td>
<td>269</td>
<td>76.9</td>
</tr>
<tr>
<td>&gt;95%</td>
<td>50</td>
<td>14.0</td>
</tr>
<tr>
<td>Estimated sexual risk score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>146</td>
<td>41.7</td>
</tr>
<tr>
<td>Low</td>
<td>205</td>
<td>58.3</td>
</tr>
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</table>
Sero-Prevalence of Major Transfusion-Transmitted Infections (TTIS) Among Blood Donors Of Nnewi, Southeastern Nigeria

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Abstract

Background: The field of transfusion medicine has encountered a huge problem in providing safe blood and blood products; therefore there is a need to improve testing for Transfusion transmitted Diseases (TTDs) and the selection of blood donors.

Objective: The objective of the present study was to estimate the prevalence of TTIs among healthy blood donors.

Methods: A total of 12,326 healthy blood donors reporting to our blood bank in Nnamdi Azikiwe University Teaching Hospital, Nnewi, were screened for Hepatitis B surface Antigen (HBsAg), Hepatitis C virus (HCV), Human Immunodeficiency virus (HIV) and Venereal Disease Research Laboratories (VDRL) tests.

Results: A total of 12,326 healthy blood donors aged 18-60 years were screened for TTIs. Out of these 333 donors (2.7%) were seropositive for HBsAg,219 (1.8%) were seropositive for HIV,195 (1.6%) were seropositive for HCV and 57 (0.5%) had shown sero positivity for syphilis. More male donors 660 (5.4%) were infected with TTIs than female donors 144(1.2%).The prevalence of TTIs in this study showed higher prevalence among donors 18 – 40 years of age (5.3%) compared to 41-60 years of age group. The rate of co infectivity in our study was 0.3% (33/12,326).

Conclusion: This study reflects that blood transfusion is one of the risk factors of spread of TTIs especially in developing countries where rapid test-based screening protocol tends to be used increasingly in blood banks. Therefore, proper donor selection and public awareness campaign targeting communities in poor countries will be an important measure to curb the spread of TTIs through blood transfusion.

Keywords: transfusion; HIV; HBV; HCV; syphilis; seroprevalence

Introduction

The most important transfusion transmittable infections (TTIs) are Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV) and Syphilis. According to World Health Organization, about 2 billion people are living with HBV, 200 million people are infected HCV While 33.4 million are infected with HIV (WHO, 2013; UNAIDS, 2011; WHO, 2012). Blood transfusion carries the risk of transmitting the life threatening transfusion transmissible infections. HIV, hepatitis B, and hepatitis C are major public health problems in developing countries .They are transmitted parentally, vertically, or through high-risk sexual behaviors and can cause fatal acute and chronic life-threatening disorders. Discovery of these hazards brought a dramatic change in attitude of physicians and patients about transfusion of blood (Mujeeb SA, Kausar A, Khalid M, 2000) It is mandatory to test each donor's blood for syphilis by a Venereal
Disease Reference Laboratory (VDRL), and for HBsAg, anti-HCV, and anti-HIV. Transmission of TTIs during the serologically window period still poses a threat to blood safety in environments where there is high rate of TTIs. HBV and HCV are the two established causes of post transfusion hepatitis. There is potential transmission of viruses during the immunological window period (i.e. the period of early infectivity when an immunologic test is non-reactive). These window periods are slightly shorter in case of HIV virus which is the causative agent of AIDS. Blood transfusion is a therapeutic procedure, as there is no genuine substitution. But contaminated blood transfusion can transmit infectious diseases and can be fatal instead of saving life. Safe blood transfusion services are a cornerstone of an effective high quality health care system (Manzoor I, Hashmi N, Daud S, 2009). The aim of this current study was to estimate the Sero-prevalence of transfusion transmitted infections among healthy blood donors at a tertiary healthcare teaching hospital in Nnewi, Nigeria. This knowledge might give us the idea of disease burden of the community and to provide information for relevant polices.

Methodology

Inclusion criteria: Haemoglobin more than 12gm% for both males and females, weight more than 50kg with no history of hepatitis, chronic infections or high risk behaviour.

Exclusion criteria: An exclusion criterion is the pervious history of HBV, HCV and HIV infections. Before screening, all blood donors were subjected to routine physical checkups for exclusion criteria. Apparently unhealthy or malnourished individuals were also refused for blood donations.

Methods

The present study was carried out in the Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria. A total of 12,326 donors were analyzed for the prevalence of Transfusion Transmitted Diseases over a period of four years from January 2007 to December 2010. The participants included replacement donors who donated for ailing family members, close relatives or friends of the recipient. The voluntary donations primarily were obtained from medical and laboratory science students, staff of the hospital, walk in donors, and outdoor blood donation camps. Care was taken to eliminate professional and paid donors by taking history and clinical examination. Basic information regarding age, sex, occupation, number of previous donations was obtained. All samples were screened for hepatitis B surface antigen (HBsAg) and HCV by chromatographic methods. Syphilis was detected by the Venereal disease research laboratory test (VDRL) (Omega Diagnostics Ltd.). All the reactive samples were repeated in duplicate before labeling them seropositive for HBV, HCV and syphilis while HIV test was done according to the national testing algorithm. Only qualified donors were bled to avoid wastage of blood pints. All the tests were performed according to the manufacturers’ instructions.

Results

A total of 12,326 donors were screened over the 4 years study period. Male donors 10,055(81.6%) outnumbered female donors 2,271(18.4%). Out of the 12,326 donors screened, 804 (6.5%) had serological evidence of infection with at least one infectious maker. The total number of donors tested for syphilis antibodies were 10,783 because VDRL testing commenced six months later (June) in the blood bank in 2007. The prevalence of HBsAg infection formed the majority 333(2.7%) of the total TTIs screened over the period of study while the prevalence of HIV, HCV and syphilis were 219(1.8%), 195 (1.6%) and 57 (0.5%) respectively. The prevalence of TTIs among donors 18-40 years of age group in this study was 3.5 times (5.3%) higher than those in 41-60 years of age group (1.5%) -table 3.TTIs was more dominant among male donors 660(5.4%) than in female donors 144( 1.2%). The donors in age 21-30 years age group had the highest rate of infectivity to HBsAg 122 (1.0%) and HIV (0.7%) but less than 20 years and 31-40
years of age groups had the highest reactivity 58 (0.5%) and 18 (0.4%) to HCV and syphilis antibodies respectively. Co-infection was seen in 33/804 (4.1%) of the total transfusion transmitted disease (TTD) positive donors of which 1(0.1%) donor had triple TTIs (HBV, HCV and syphilis) but none of the blood donors reacted to 4 of the TTIs tested for in our study. The highest was found in HBV and HCV co-infection 15 (1.9%).

Table 1. The incidence of TTIs among blood donors for the 4 years of study.

<table>
<thead>
<tr>
<th>TTI type</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Average incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV</td>
<td>2%</td>
<td>2%</td>
<td>1.5%</td>
<td>1.7%</td>
<td>1.7%</td>
</tr>
<tr>
<td>HBV</td>
<td>1.7%</td>
<td>3.3%</td>
<td>2.8%</td>
<td>2.9%</td>
<td>2.7%</td>
</tr>
<tr>
<td>HCV</td>
<td>0.8%</td>
<td>2.1%</td>
<td>1.4%</td>
<td>2.1%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Syphilis</td>
<td>0.1%</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.2%</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

Table 2. Sex distribution of TTIs

<table>
<thead>
<tr>
<th>Sex of Blood donor</th>
<th>Total no screened</th>
<th>No positive for HIV</th>
<th>No positive for HBV</th>
<th>No positive for HCV</th>
<th>No +ve for syphilis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>10,055</td>
<td>169 (1.3%)</td>
<td>290 (2.3%)</td>
<td>160 (1.3%)</td>
<td>47 (0.4%)</td>
</tr>
<tr>
<td>Female</td>
<td>2,271</td>
<td>59 (0.5%)</td>
<td>43 (0.3%)</td>
<td>35 (0.3%)</td>
<td>16 (0.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>12,326</td>
<td>219 (1.8%)</td>
<td>333 (2.7%)</td>
<td>195 (1.6%)</td>
<td>57 (0.5%)</td>
</tr>
</tbody>
</table>

Table 3. Age distribution of TTIs among blood donors

<table>
<thead>
<tr>
<th>Age group</th>
<th>Number positive for HIV</th>
<th>Number positive for HBV</th>
<th>Number positive for HCV</th>
<th>Number positive for syphilis</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20 years</td>
<td>36 (0.3%)</td>
<td>98 (0.8%)</td>
<td>58 (0.5%)</td>
<td>14 (0.1%)</td>
</tr>
<tr>
<td>21-30</td>
<td>86 (0.7%)</td>
<td>122 (1.0%)</td>
<td>50 (0.4%)</td>
<td>13 (0.1%)</td>
</tr>
<tr>
<td>31-40</td>
<td>56 (0.4%)</td>
<td>65 (0.5%)</td>
<td>36 (0.3%)</td>
<td>18 (0.2%)</td>
</tr>
<tr>
<td>41-50</td>
<td>25 (0.2%)</td>
<td>32 (0.3%)</td>
<td>30 (0.2%)</td>
<td>6 (0.04%)</td>
</tr>
<tr>
<td>51-60</td>
<td>16 (0.1%)</td>
<td>16 (0.1%)</td>
<td>21 (0.2%)</td>
<td>6 (0.04%)</td>
</tr>
<tr>
<td>Total</td>
<td>219 (1.8%)</td>
<td>333 (2.7%)</td>
<td>195 (1.6%)</td>
<td>57 (0.5%)</td>
</tr>
</tbody>
</table>

Discussion

Over a decade, our blood bank has successfully shifted from paid and employer –organized dentitions to voluntary donations. The TTIs studied are endemic and therefore constitute a serious threat to blood safety in Nigeria. To ensure safety, it is critical to monitor ongoing epidemic information, not only from high-risk groups, but also from individuals from the general population such as voluntary blood donors.

Currently, prevention of TTIs depends on proper pre-donation selection of donors and serological testing of infectious markers in those donors. The main objective of our study was to determine the sero-prevalence of TTI’s including HIV, HBV, HCV and Syphilis among healthy blood donors of Nnewi, Nigeria.
The total numbers of donors included in this study were around 12,326 and the total prevalence rates of TTI’s among those donors was 6.5% This is similar to the 6.9% found by EL-Gilany and EL-Fedawy,(2006) found in 1,257 voluntary donors in Egypt. The prevalence of HIV in this study was 1.8% which is very low compared to many other African countries 2-20% in Kenyan donors (Moore A, et al, 2001) and 5.9% in Ethiopian donors (Sentjens R et al, 2002). Hepatitis B is one of the most infectious disease, it has infected around 2 billion people world-wide, including an estimated 400 million chronically infected cases (Schreiber GB, MP Busch.et al, 1996). It is also hyper endemic in sub-Saharan Africa and Asia (Isselbacher KJ, JR Wands, 1991).

In our study the prevalence rate of HBsAg was 2.7%. This figure is higher than 1.1% found by Ejele et al. (2005) in Niger delta region of Nigeria, and 2.2% found by Bhatii et al.(2007) in Pakistani donors. However, other studies have shown an increased HBV rate for instance 4% in Kenya donors (Abdulla F, Mwanda FO, Rana W,2005) 8.8% in Tanzania donors (Matee MI et al,1999) and 4.3% in Egyptian donors (Alavian SM and Fallahian F,2009).Although there is a slight difference in the rate of HBV among the blood donor categories, the overall HBV rate is very high when compared to the prevalence of HIV, HCV and Syphilis among the same group of donors we studied. In our opinion, the reason behind the high rate of HBV is most probably the high infectivity potential of the virus, immunization status, and cultural practices like circumcision, immunization; tattooing and bloodletting exercise to treat different diseases could expose one to HBV infection.

From this study, the prevalence rate of HCV was 1.6%, this is low when compared to 2.7% in Egypt (EL-Gilany AH and EL-Fedawy, 2006). But it is a bit higher when compared to 0.2% in Kenya (Abdalla F, Mwanda FO, Rana W, 2005) and (Elfaki et al, Elfaki AM, Eldour AA and Elsheikh NM, 2008) found no cases of HCV infection in the 260 Sudanese blood donors they studied. The low prevalence of HCV in our study when compared to HBV might be due to the fact that HCV is less infective when compared to HBV and HCV is transmitted primarily through transfusion of blood or blood products, intravenous drug abuse and needle sharing which are not very common in our setting. The Sero-prevalence of syphilis in this study was 0.5%. This figure is a little higher when compared to 0.2% among blood donors in Niger delta of Nigeria (Erhabor O, Nwoka E, and Adias TC, 2007) and 0% prevalence among Iranian donors (Zohreh A, Mazyar G, Bashir H et al, 2005) Nevertheless, it is very low compared to 7.5% found by Adjei et al. (, 2003) among Ghanaian blood donors and 12.7% found by Matee et al (1999) among Tanzanian donors.

The results of this study and from other studies worldwide suggests an increase in Hepatitis infection yet nothing much is been done for its prevention as greater emphasize are placed on HIV/AIDS prevention and treatments by various government organizations, World Health Organization and UNAIDS. Co-infection was seen in 33/12326 (0.03%) of the total transfusion transmitted disease (TTD) positive donors of which 1(0.01%) donor had triple TTI’s (HBV, HCV and syphilis) but none of the blood donors reacted to 4 of the TTI’s tested for in our study. The highest was found in HBV and HCV co-infection 15 (1.9%).The mode of transmission of HIV, HBV, and HCV is the same and includes unsafe sexual contact, using sharp materials contaminated with body fluid, mother to child and transfusion of blood and blood products.

The prevalence of TTI’s appears to be substantially lower among blood donors than in the general population of Anambra state, Nigeria, because of successfully screening and selection of donors who are at lower risk of infection. Albeit, the current reliance on serology tests, with no Nucleic Acid Technology (NAT) testing for routine donor screening may detect relatively high residual risk compared to serologic method.

Blood banks are important in screening donors of TTI’s for recipients’ safety as well as determining the disease burdens of HIV, HBV, HCV and syphilis among healthy donors.
Limitations: The study had the following limitations: We did not compare prevalence of TTIs between voluntary and replacement. The test kits used for the screening cannot detect infections in window period as this may have increased the sensitivity of detection. Data was extracted retrospectively.

Recommendations:

The population Seroprevalence of TTIs which potentially threatens the safety of blood supply along with the rising transfusion demands for blood in low income setting should necessitate a widespread implementation of more sensitive donor screening technology—the nucleic acid testing method as a gold choice to detect the residual risk of many TTIs. Further research should be carried out particularly in the implementation of NAT testing of TTIs to ensure blood safety and availability in Nnewi, Nigeria.

Blood donors should first and foremost be properly screened before blood donation to avoid wastage of blood pints; this is the practice in Nnewi, Nigeria.

Conclusion-The HBV rate on both voluntary and replacement donors is very high compared to HIV, HCV, and Syphilis and this needs further investigation including studying the prevalence rate of HBV in the general population to address the issue. Finally even though the prevalence of HIV, HBV, HCV and Syphilis is low, ensuring blood safety has long way to go.

References

[1]. World Health Organization (WHO) Hepatitis B. Fact sheet Number 204.
The Antimicrobial Properties of Terminalia Glaucescens and Zanthoxylum Zanthoxyloides Extracts and the Spectrum of their Activity.

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Abstract

The antimicrobial activity of the ethanol extracts of two Nigerian chewing sticks (Terminalia glaucescens and Zanthoxylum zanthoxyloides) against oral bacteria and fungi isolates implicated in dental caries were assessed. The aim of the study is to isolate microbial organisms associated with dental caries and to assess the antimicrobial activity of the ethanol extracts of Zanthoxylum zanthoxyloides and Terminalia glaucescens stem used as chewing sticks. The dental extracts from 20 patients with clinical features of dental caries were collected from School of dental technology and therapy clinic, Trans-ekulu, Enugu. The patients comprised of 8 males and 12 females with ages ranging from 16-40 years. The disc diffusion method was used in evaluating sensitivity to the extracts and it was observed that all the isolates were sensitive to T. glaucescens at different levels of concentration with a MIC and MBC of 6.25mg/ml for S. pyogenes. The isolated and tested dental pathogens were Escherisia coli, Pseudomonas aerugenosa, Streptococcus mutans, Streptococcus pyogenes, Staphylococcus aureus and Candida albicans. However, of the all the isolates E. coli proved resistant to Z. zanthoxyloides extract. Conventional antibiotics were used as positive control while distilled water was used as negative control.

The ability of T. glaucescens and Z. zanthoxyloides extracts to inhibit the growth of the bacteria and fungi in this study is an indication that the plant can be used as a source for antimicrobial agent in the formulation of toothpaste and mouth wash, thus justifying the use of the plant locally as chewing sticks.

Keywords: Dental Caries, Zanthoxylum zanthoxyloides and Terminalia glaucescens.

1.0 Introduction

Dental caries is an infectious microbial disease that results in localized dissolution and destruction of calcified tissues of the teeth. The human oral cavity harbours species of bacteria, fungi and protozoa. The oral cavity causes major dental diseases such as caries and periodontitis. Dental problem is known to be one of the most common health problem in the importance throughout the world. (Almas, 2001). The food debris, acid, bacteria, and saliva combine in the mouth to form a sticky substance called “plaque” that adheres to the teeth and this plaque leads to tooth decay. Ethnomedicinal plants in form of chewing sticks used for the cure of dental problems in this work include Zanthoxylum zanthoxyloides (Oriata / tejovati ) and Terminalia glaucescens ( Idiodan / arjun).
1.2 How dental caries occurs and developed.

The pathogenic organisms will first colonize on tooth surfaces, synthesize insoluble polysaccharides from sucrose. This synthesis allows adhesion to smooth surfaces and appears to be important in the formation of smooth surface caries and then, ferment sucrose to form lactic acid. (Holt et al., 1994)

Significance of the Study

This study is designed with the intent that it will serve as an available reference source and be of good value to researchers in this field; thus updating the existing literature in this subject matter. Moreover, the study will assist government and medical personnel in using these extracts as a source for antimicrobial agent in the formulation of toothpaste, thus justifying the use of the plant locally as chewing sticks and implementation for better service delivery.

Statement of Problem

- Dental caries is steadily increasing in the underdeveloped and developing countries. Treatment is expensive and not a realistic option for the poor.
- Also, there are diseases that spread from the oral cavity to other vital organs, for example infective endocarditis that leads to severe morbidity and mortality.
- Hence, there is an urgent need to promote traditional preventive measures that are acceptable, easily available, and cost effective.
The main objectives of this work therefore is:
1. To isolate microbial organisms associated with dental caries.
2. To assess the antimicrobial activity of the ethanol extracts of *Zanthoxylum zanthoxyloides* and *Terminalia glaucescens* used as chewing stick.
3. Determination of Minimum Inhibitory Concentration (MIC) of the extracts.
4. Determination of Minimum Bactericidal Concentration (MBC) of the extracts.
5. To objectively compare the antimicrobial activity of these extracts with conventional antimicrobial.

**Literature Review**

Dental caries is a microbial infectious disease that occurs in the localized dissolution and destruction of the calcified tissues of the teeth. *Streptococcus* group (*S. salivarius, S. mitis, S.mutans* etc) are known as the causative bacteria and fungi in the formation of dental plaque and dental caries (Pretorius *et al.*, 2003). The acid producing *S. mutans* inhabiting the mouth causes damage by dissolving tooth structures in the presence of fermentable carbohydrates such as sucrose, fructose, and glucose. When food debris, acid, bacteria, and saliva combine in the mouth and form a sticky substance which adheres to the teeth called plaque. If not removed thoroughly and routinely, the plaque will result to tooth decay. (Wolinsky and Sote, 1984).

Persistent or chronic dental disease has suggestively linked to diabetes, high blood pressure and heart disease later in life. Heat, cold or sweet foods and drinks worsen the dental disease pain. Treatment often prevents further infection. Dental caries also lead to the cause of bad breath and foul tastes etc. Infection can progress aggressively and spread from the tooth to surrounding soft tissues which may lead to an edentulous mouth (Kleinberg, 2002).

Erythromycin and penicillin are the two antibiotics reported to prevent dental caries effectively in animals and humans but has great adverse effect that prevented their used clinically. Recent natural remedies has been introduced with the use of medicinal plants, which has a good reservoirs of chemotherapeutants and has been contributed as an alternative for antibiotic effects such as hypersensitivity reaction, supra infections, and teeth staining.

It has been well documented that medicinal plants confer antimicrobial activity against oral bacteria. The literature survey of the folklore medicine reveals the use of *Zanthoxylum zanthoxyloides* (Oriata Yoruba and Tejovita- English) leaves maintain oral hygiene and stem of *Terminalia glaucescens* (Idiodan- Yoruba and Arjun- English) for the treatment of tooth-ache. (Ogundiya *et al.*, 2014).

Though recent reports show the antibacterial activity of *Zanthoxylum zanthoxyloides* and *Terminalia glaucescens* against the cariogenic bacteria (Fufulu, 1975), its antibacterial and antifungal activity with ethanolic solvent extracts are screened in this study. This study is focused on assessing the plant extracts with good ethanol solvent and the present investigation on *Streptococcus pyogenes, Streptococcus mutans, Staphylococcus aureus, Escherichia coli, Pseudomonas aerogena* and *Candida albicans* which are the bacterial and fungal strains selected as target organisms from infected patients with caries and screened using ethanol extracts of the stem of *Zanthoxylum zanthoxyloides* and *Terminalia glaucescens* (Barry and Thornsberry 1991). *In vivo* trials is been carried out for the treatment of dental caries by external application on the caries tooth once the antimicrobial property of the plant extracts has been screened under ‘in vitro’ condition against oral pathogens (Ogundiya *et al.*, 2008).

It has been reported that in Nigeria, some of the chewing sticks being used are obtained from the following plants: *Garcinia manni* (aki inu- Igbo), *Masularia acuminate* (Pako-Yoruba), *Terminalia glaucescens* (Idiodan-Yoruba, Arjun- English), *Zanthoxylum zanthoxyloides* (Oriata- Yoruba, Tejovati- English) and *Azadiracta indica* (Neem- English). (Akande and Hayashi (1998).  

*T. glaucescens* and *Z. zanthoxyloides* are widely used plants for chewing stick application in Nigeria and this has lead to their vast array of studies on its antimicrobial activity against some oral pathogens.
2.0 Methods

2.1 Collection and identification of plant parts and dental caries Pathogens.

- **Plant Materials Collection**
  The small branches of locally available *Z. zanthoxyloides* and *T. glaucescens* were collected from local Ogbeite main market Enugu and were authenticated by Prof. Okigbo R.N of the department of Botany of Nnamdi Azikiwe University, Awka. These plant materials were dried under the sun for two weeks and also cut into pieces of approximately 15cms and transferred to the oven set at 45°C for 20-30mins before it was reduced to fine powder with the aid of mechanical grinder. The powder plant materials were collected and stored in a tightly covered glass jar for further studies.

- **Collection and Recovery of Caries Sample**
  The dental extracts from 20 (twenty) patients with clinical features of dental caries were collected from School of dental technology and therapy clinic, Trans-ekulu, Enugu. The patients comprised of 8 males and 12 females with ages ranging from 16-40 years.
  The samples were collected under strict aseptic conditions and patient’s consent. Prior to the collection of dental caries sampling, patient was made to rinse the tooth with water. The tooth and the surrounding field were cleaned with 3% hydrogen peroxide and then decontaminated with a 2.5% sodium hypochlorite solution. The food debris on the chewing surface was removed using a dental excavating instrument. The tooth was then extracted by a clinician and then introduced into the 20ml broth of Brain Heart Infusion (BHI) in appropriate sterile screw cap bottles. The dental caries sample was collected from the extracted tooth using an excavator under aseptic conditions. The clinical samples were mixed well using a magnetic stirrer before incubation. The samples were then inoculated using the streak plate technique on to nutrient and sabouraud dextrose agar under various culture conditions- aerobic, microaerophilic, and anaerobic culture conditions for each patient sample (Holding and Colee, 1971).
  The organism isolated was identified on the basis of morphological, cultural and biochemical characteristics according to standard procedures (Holding and Colee, 1971).

2.2 Preparation and Extraction of Plant Materials.

- **Ethanol Extraction**
  20g of fine-powder stem of *Z. zanthoxyloides* and *T. glaucescens* was weighed and soaked in 200mls of ethanol in a conical flask and kept at room temperature (25°C) in a rotary shaker for 48 hours. After 48 hours, filtered through Whatman No1 filter paper; solvent was allowed to evaporate and stored at room temperature until when required for use.

2.3 Identification of the Isolates

  The isolated organisms were identified using sub-culturing, gram staining technique and biochemical test like catalase test, indole test, coagualase test, methyl red test, oxalase test, sugar fermentation test.

2.4 Test Organisms

- **ISOLATION OF THE TEST ORGANISMS.**
  The dental specimen collected was streaked out on Nutrient agar and Sabouraud dextrose agar plates. The plates were incubated at 37°C for 24 hours for bacterial isolates and 31°C for 48 hours for fungi. Colonies that developed were respectively sub-cultured into freshly prepared Nutrient agar and Sabouraud dextrose agar.

2.5 Preparation of Sensitivity Disc:

  Disc of 6mm in diameter was punched out using Whatman No1 filter paper. Placed in bijou bottles, then sterilized the disc by autoclaving at 121°C for 15mins, and allowed to cool.

- **PREPARATION OF SENSITIVITY DISC WITH ETHANOL EXTRACTS OF *Z. zanthoxyloides* and *T. glaucescens***:
The stock solutions of the ethanolic crude extracts (i.e. that were recovered) of these two plants were prepared by dissolving 0.5g (i.e. 500mg) of each of the two plant extracts in 5ml Dimethyl sulphoxide (DMSO). Therefore, each stock solution had a concentration of 100mg/ml.

Different concentrations of each of the plant extract were prepared from this stock. These are 100mg/ml, 50mg/ml, 25mg/ml, 12.5mg/ml, 6.25mg/ml, and 3.13mg/ml by serial double dilution, followed by introducing the disc in each concentration. The disc was allowed to absorb the solution for 10mins and kept for further analysis. Each paper disc is capable of absorbing 0.01ml.

2.6 Determination of Antimicrobial Activities of Extracts.

Disc Diffusion Assay: Antibacterial activity of the ethanolic extracts of the plant sample was evaluated by noting the zone of inhibition against the test organisms. (Schaeken et al., 1986).

Antimicrobial activity was carried out using disc-diffusion method.

Two colonies of 24-hour plate culture of each organism was transferred aseptically into 10ml sterile normal saline in a test tube and mixed thoroughly for uniform distribution. A sterile cotton swab was used to spread the resulting suspension uniformly on the surface of oven-dried Nutrient agar and Sabouraud dextrose agar plates for bacteria and fungi respectively. The disc containing each concentration were impregnated on the culture plates and incubated at 37°C for 24hours and 31°C for 48hours for bacterial and fungal isolates respectively.

Conventional antibiotics were used as positive controls for bacteria and fungi respectively; distilled water was used as negative control. The plates were then incubated accordingly. The zones of inhibition were measured and recorded after incubation. The inhibition around the extracts indicated antimicrobial activity of the extracts against the test organisms. The diameters of these zones were measured diagonally in millimetre with a ruler and the mean value for each organism from the triplicate cultured plates was recorded. Using the disc diffusion technique, an already made gram positive and gram negative (Asodisks Atlas Diagnostics, Enugu, Nigeria) standard antibiotic sensitivity disc bought from a laboratory chemical equipment store in Enugu state was used as positive control for bacteria while ketoconanzole was used as positive control for fungi. Distilled water was used as negative control for all the test organisms.

2.7 Determination of Minimum Inhibitory Concentration (MIC) of the extracts:

The MIC for bacteria was determined as the lowest concentration of the extracts inhibiting the visual growth of the test cultures on the agar plate. The initial concentration of the plant extracts (100mg/ml) was diluted using double fold serial dilution by transferring 5ml of the sterile plant extract (stock solution) into 5ml of sterile normal saline to obtain 50mg/ml concentration. Different concentrations were 50, 25, 12.5, 6.25 and 3.13 mg/ml respectively. Each dilution was introduced into nutrient agar plates and Sabouraud dextrose agar plate already seeded with the respective test organism. All test plates were incubated at 37°C for 24hrs for bacteria and 31°C for 72hrs for fungi. The Minimum Inhibitory Concentration (MIC) of the extracts for each test organism was regarded as the agar plate with the lowest concentrations without growth.

2.8 Determination of Minimum Bactericidal Concentration (MBC) of the extracts:

The Minimum Bactericidal Concentration (MBC) of the plant extracts were determined by the method described by Holding and Colee (1971). Samples were taken from plates with no visible growth in the MIC assay and subcultured on freshly prepared nutrient agar plates and Sabouraud dextrose agar plate and later incubated at 37°C for 24 hrs and 31°C for 48hrs for bacteria and fungi respectively. The MBC was taken as the concentration of the extract that did not show any growth on a new set of agar plates.

2.9 Statistical Analysis

- Mean value: The mean value for each organism from triplicate cultured plates was recorded.
- \[ M = \frac{\Sigma x}{n} \] (where M=mean, x= recorded values, n=number)
**Result:**

The microorganisms isolated from the teeth of patients with clinical features of dental carries were: *Escherichia coli, Pseudomonas aeruginosa, Streptococcus mutans, Streptococcus pyogenes, Staphylococcus aureus* and *Candida albicans* (Table 1). The organism isolated was identified on the basis of morphological, cultural and biochemical characteristics according to standard procedures (Holding and Colee, 1971).

The sex distribution of dental caries is demonstrated by table 2, fig.3 & 4 and it was observed that of the 20 specimens evaluated, 8 were from male and 12 from female patients. *Streptococcus mutans* and *Candida albicans* were predominantly more common in females than males. Table 3 and fig. 5 shows the age distribution of dental caries. It was observed that *Streptococcus mutans* and *Candida albicans* which are common dental caries pathogens were predominately found in the younger age group i.e. 16-30 years.

The antimicrobial activity of extracts of the stem of *T. glaucescens* was significant and varied with concentration on each of the isolated organism (table 4). *S. pyogenes* and *S. aureus* were particularly sensitive to *T. glaucescens* even at a low concentration of 6.25mg/ml. Other isolates inhibited by *T. glaucescens* in descending order included: *S. mutans, P. aeruginosa, E. coli* and *C. albicans*.

The extract of *Z. zanthoxyloides* also showed good antimicrobial activities against *C. albicans, S. mutans, S. pyogenes, S. aureus* as well as *P. aeruginosa* in that order (Table 5).

The implication of this data is that *C. albicans* and *S. mutans* which are implicated in dental caries were significantly inhibited by *Z. zanthoxyloides* even at fairly low concentration of 6.25mg/ml. Fig 6,Tables 6 & 7 show the Minimum Inhibitory Concentrations(MICs) and Minimum Bactericidal Concentrations(MBCs) values of both *T. glaucescens* and *Z. zanthoxyloides* extracts respectively.

It was observed that *T. glaucescens* also had the lowest MIC of 6.25mg/ml for *S. aureus* and *S. pyogenes* . *S. Pyogenes* also maintained 6.25mg/ml as MBC but *S. aureus* needed a concentration of 12.5mg/ml for bactericidal effect to occur.

The extract of *Z. zanthoxyloides* also showed good antimicrobial activities against *P. aeruginosa, S. aureus, S. pyogenes*, as well as *C. albicans* even at a low concentration of 6.25mg/ml.

This implies that *Z. zanthoxyloides* has a higher potency than *T. glaucescens* against dental caries pathogens(*S. mutans* and *C. albicans*).

**Table 1:** Isolated Organism from Dental Carries sample

<table>
<thead>
<tr>
<th>ISOLATED ORGANISMS</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Streptococcus pyogenes</em>,</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em>,</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em>,</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
</tr>
<tr>
<td><em>Streptococcus mutans</em>,</td>
</tr>
<tr>
<td><em>Candida albicans</em></td>
</tr>
</tbody>
</table>

**Table 2:** Sex distribution of Isolated organisms.

<table>
<thead>
<tr>
<th>ISOLATED ORGANISM</th>
<th>MALE</th>
<th>FEMALE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>8</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>5</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>S. mutans</td>
<td>6</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>S. aureus</td>
<td>7</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>S. pyogenes</td>
<td>6</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>C. albicans</td>
<td>6</td>
<td>10</td>
<td>16</td>
</tr>
</tbody>
</table>
Fig 3. Pie chart showing the sex distribution of the patients in the study.

Fig. 4 Bar chart showing the sex distribution of the patients with dental pathogens.

Table 3. Age distribution of patients with dental pathogens.

<table>
<thead>
<tr>
<th>Organisms</th>
<th>16-20yrs</th>
<th>21-25yrs</th>
<th>26-30yrs</th>
<th>31-35yrs</th>
<th>36-40yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>S. mutans</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>S. aureus</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>S. pyogenes</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>C. albicans</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Fig. 5. Bar chart showing the Age distribution of the patients with dental pathogens.

Table 4: Zone of inhibition in mm of various concentration of the ethanol extract of T. glaucescens stem on test organisms.

<table>
<thead>
<tr>
<th>Test organisms</th>
<th>Concentration of extract(mg/ml)</th>
<th>Sterile distilled water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.13</td>
<td>6.25</td>
</tr>
<tr>
<td>E. coli</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>S. mutans</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>S. aureus</td>
<td>0.0</td>
<td>5.0</td>
</tr>
<tr>
<td>S. pyogenes</td>
<td>0.0</td>
<td>4.5</td>
</tr>
<tr>
<td>C. albicans</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Table 5: Zone of inhibition in mm of various concentration of the ethanol extract of Z. zanthoxyloides stem on test organisms.

<table>
<thead>
<tr>
<th>Test organisms</th>
<th>Concentration of extract(mg/ml)</th>
<th>Sterile distilled water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.13</td>
<td>6.25</td>
</tr>
<tr>
<td>E. coli</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>S. mutans</td>
<td>0.0</td>
<td>5.0</td>
</tr>
<tr>
<td>S. aureus</td>
<td>0.0</td>
<td>4.5</td>
</tr>
<tr>
<td>S. pyogenes</td>
<td>0.0</td>
<td>5.0</td>
</tr>
<tr>
<td>C. albicans</td>
<td>0.0</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Table 6. Minimum Inhibitory Concentrations (MICs) in mg/ml of the ethanol extracts T. glaucescens and Z. zanthoxyloides plant against the isolated organisms.

<table>
<thead>
<tr>
<th>ISOLATED ORGANISM</th>
<th>T. glaucescens</th>
<th>Z. zanthoxyloides</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>25</td>
<td>12.5</td>
</tr>
<tr>
<td>S. mutans</td>
<td>12.5</td>
<td>6.25</td>
</tr>
<tr>
<td>S. aureus</td>
<td>6.25</td>
<td>6.25</td>
</tr>
<tr>
<td>S. pyogenes</td>
<td>6.25</td>
<td>6.25</td>
</tr>
<tr>
<td>C. albicans</td>
<td>50</td>
<td>6.25</td>
</tr>
</tbody>
</table>
Discussion

The microorganisms isolated from the teeth of patients with clinical features of dental caries were: *Escherichia coli, Pseudomonas aeruginosa, Streptococcus mutans, Streptococcus pyogenes, Staphylococcus aureus and Candida albicans*. These organisms were characterised as shown in table 1 and it agrees with the predominant oral pathogens as isolated by Barry and Thornsberry (1991).

However, in the case of dental caries *Streptococcus mutans* and *Candida albicans* are the microorganisms that have been commonly implicated.

The sex distribution of dental caries is demonstrated by table 2 and it was observed that of the 20 specimens evaluated, 8 were from male and 12 from female patients. *Streptococcus mutans* and *Candida albicans* were predominantly more common in females than males. This statistics may be related to the gender differences in eating habits. Females consume more chocolates, sweets, ice creams, cake icing etc than males and may be therefore more prone to caries.

Table 3 showed the age distribution of dental caries. It was observed that *Streptococcus mutans* and *Candida albicans* which are common dental caries pathogens were predominately found in the younger age group i.e. 16-30 years. This may also be reflective of the eating habits of young people in terms of the consumption of earlier listed carries causing snacks. There is also possibility of use of chewing sticks with good antimicrobial activity by the older age group. *E. coli* which is one of the most common oral flora was seen in all the specimens irrespective of sex or age.
The antimicrobial activity of extracts of the stem of *T. glaucescens* was significant and varied with concentration on each of the isolated organism (Table 4). *S. pyogenes* and *S. aureus* were particularly sensitive to *T. glaucescens* even at a low concentration of 6.25mg/ml. Other isolates inhibited by *T. glaucescens* in descending order included: *S. mutans*, *P. aeruginosa*, *E. coli* and *C. albicans*.

The extract of *Z. zanthoxyloides* also showed good antimicrobial activities against *C. albicans*, *S. mutans*, *S. pyogenes*, *S. aureus* as well *P. aeruginosa* in that order (Table 5). The implication of this data is that *C. albicans* and *S. mutans* which are implicated in dental caries were significantly inhibited by *Z. zanthoxyloides* even at fairly low concentrations. This agrees with the study done by (Akande and Hayashi 1998).

Table 6. Showed the Minimum Inhibitory Concentrations (MICs) Concentrations (MFCs) values of *T. glaucescens* and *Z. zanthoxyloides* extract.

For *T. glaucescens*, it was observed that *S. aureus* and *S. pyogenes* also had the lowest MIC of 6.25mg/ml. *S. mutans* and *C. albicans* which are the main causative pathogens implicated in dental caries showed a MIC of 12.5mg/ml and 50mg/dl respectively. This study agreed with a similar study done by (Ogundiya *et al.*, 2008)

For *Z. zanthoxyloides*, the degree of antimicrobial activity is also shown by a low MIC of 6.25mg/ml for *S. mutans* and *C. albicans* which are responsible for dental caries. It was however observed that *Z. zanthoxyloides* extract did not show any appreciable antimicrobial activity against *E. coli* which is a common oral pathogen, though not implicated in dental caries.

The comparison also further showed that the extract of *Z. zanthoxyloides* had lower MICs against almost all the pathogens when compared to *T. glaucescens*. This implies that *Z. zanthxyloides* has a higher potency than *T. glaucescens* against dental caries pathogens- *S. mutans* and *C. albicans*.

The tables also showed that sterile water which was used as negative control had no inhibition of the isolated pathogens.

Table 7. showed the Minimum Bactericidal /Fungicidal Concentrations MBC/MFC of the extract of *T. glaucescens* and *Z. zanthoxyloides*. For *Z. zanthoxyloides*, this indicated a low concentration of 6.25mg/ml was required for bactericidal and fungicidal effect on *S. mutans* and *C. albicans* respectively. For *T. glaucescens* higher concentrations of 25mg/ml and 50mg/ml was required for bactericidal and fungicidal effect on *S. mutans* and *C. albicans* respectively. This obviously makes *Z. zanthoxyloides* more potent.

Table 8. demonstrated varying degree of inhibition of the isolated bacteria by conventional antibiotics which was used as positive control. All the bacteria were found to be resistant to septrin. Ketoconazole was used and seen to inhibit *C. albicans*.

**Conclusion**

This study has proved the *T. glaucescens* and *Z. zanthoxyloides* extracts possess very strong potency in the treatment of various dental infections.

This is illustrated by the capability of their extracts to inhibit the growth of *Escherichia coli*, *Pseudomonas aeruginosa*, *Streptococcus mutans*, *Streptococcus pyogenes*, *Staphylococcus aureus* and *Candida albicans* which are the common oral pathogens. It can also be inferred that these dental pathogens are more prevalent in females and the younger age group which should therefore be the targets for education on healthier eating habits and oral hygiene.

*S. mutans* and *C. albicans* which are the main organisms directly involved in dental caries were significantly inhibited by the two extracts even at fairly low concentrations of 6.25mg/ml for *Z. zanthoxyloides*.

From the lower MICs of *Z. zanthoxyloides* compared to that of *T. glaucescens*, it was observed that the former is generally more potent against dental pathogens implicated in dental caries.

It is therefore concluded that since *T. glaucescens* and *Z. zanthoxyloides* extracts has inhibitory effects against the growth of oral pathogens implicated in dental caries, it is an indication that the plants can be used as a source for antimicrobial agent in the formulation of toothpaste and mouth wash. Therefore the use of their stem locally as chewing stick is justified.
References


The Effects of Socio-Behavioral and Environmental Factors on Infant Mortality: A Review of the Literature

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Abstract

Background: Infant mortality is a global problem which the Millennium Development Goals has aimed to reduce by two-third by the year 2015. Several studies have linked social, behavioral and environmental factors to increased infant mortality rates in the past. The objective of this study was to review the existing literature on the effects of socio-behavioral and environmental factors affecting infant mortality.

Methods: A search of the literature was carried out. The search was conducted using web browsers like Google scholar, Pub Med, Medline and sociological abstracts. The articles were chosen when they were found to be relevant and were reviewed accordingly. Initially, the search was limited to recent articles not earlier than year 2000. But, when enough materials were not found, the search was extended to older articles because they were found to be highly relevant for the study.

Findings: This review revealed that social factors such as poverty, household income, mother’s economic status, nature of care for infants, maternal age, breastfeeding, birth orders, birth intervals, place of delivery, income inequality, social policies, health scheme, mother’s education and postnatal care were found to affect infant mortality. Similarly, environmental factors such as poor residential conditions, nature of water supply, particulate matter air pollution, poor sanitation, heavy metal poisoning and household environmental characteristics were found in the literature to be linked to infant mortality. Behaviors of pregnant women like cigarette smoking, alcohol drinking, sedentary lifestyle, weight gain, utilization of prenatal care facilities and exercises were found to be closely related to infant mortality.

Conclusion: It was concluded that many social, environmental and behavioral factors exist in the literature which were found to affect infant mortality. The knowledge of these factors should be utilized by both governmental and non-governmental organizations in the world to swing into action of arresting and preventing the menace of increasing infant mortality especially in the underdeveloped and developing countries.

Key words: Infant mortality, Social factors, Behavioral factors, Environmental factors.

Introduction

The infant mortality rate which is one of the most important indicators of human development is the number of deaths in children under the age of one year per one thousand (1000) live births in the same year. It can be divided into neonatal and postnatal mortality rates. The neonatal mortality rate can be calculated from deaths occurring in the first four weeks of life, while postnatal mortality rate is calculated from deaths occurring in the remainder of the first year [24]. One of the Millennium Development Goals is the reduction of infant and child mortality by two-thirds by the year 2015. In order to be able to achieve this goal, efforts are geared towards identifying cost-effective strategies as many international agencies have advocated for more resources to be directed to the health sector. A means of getting this done is to identify and rank in order of importance the socio-behavioral and environmental factors that affect infant mortality with the aim of providing solutions so as to reduce infant mortality rate globally.

In the developed countries of the world, neonatal deaths account for almost two-thirds of infant mortality [1]. It has been documented that infant mortality rates are far lower in wealthier countries than
poorer ones. Several studies have linked infant mortality to environmental factors in the past. Health behaviors of mothers have been associated with infant mortality rates in the literature. Many authors have attributed high infant mortality to social, behavioral and environmental factors in the past. Many of the countries with relatively high infant mortality rate are either underdeveloped or developing countries. It is therefore intuitive to review the past literature regarding the impact of socio-behavioral and environmental factors on infant mortality so as to have an idea of the achievement so far and to suggest further ways forward. This study is aimed at reviewing the effects of socio-behavioral and environmental factors on infant mortality.

Methodology

A search of the literature was carried out starting with combinations of the following search terms: infant, mortality, rate, social, behavior, and environment. The search was conducted using web browsers like Google Scholar search engine, PubMed, Medline and sociological abstracts. In order to be able to know the extent to which the search includes consideration of the effects of social, behavioral and environmental factors on infant mortality, the search was carried out using search terms like ‘social factors and infant mortality’, ‘behavioral factors and infant mortality’, and ‘environmental factors and infant mortality’. The articles were chosen when found to be relevant and were reviewed accordingly. Initially, the search was limited to recent articles not earlier than year 2000. But, when enough materials were not found, the search was extended to older articles because they were found to be highly relevant for the study. Altogether, a total of 58 articles were found but, out of these, 30 were found to be highly relevant and were reviewed accordingly.

Review of the literature

Social factors and infant mortality

Many studies have identified various determinants of infant mortality in the past. Similarly, several factors including bio-demographic and socio-economic have been associated with infant mortality. It has also been observed that social relationships whether in quantity or quality affects physical and mental health [2]. It also affects health behavior as well as mortality risk. These authors noted that Sociologists have established the link between social relationships and health outcomes. They also reported that the effects of social relationships on health is both short and long term in nature. These effects used to emerge in childhood and carried along throughout life to bring about resultant advantages or disadvantages in health.

The major findings of sociological stress research are that: the damaging effects on physical and mental health are great when stressors are comprehensively measured, the primary way by which gender, racial-ethnic, marital status and social class inequalities in physical and mental health are produced is through differential exposure to stressful experiences. Discrimination stress also harm minority group members. Furthermore, the proliferation of stressors over life course and across generations has widened the health gaps between the advantaged and disadvantaged group members. Possession of high levels of mastery, self-esteem and social support by individuals leads to reduction of stressors on health and well-being [3]. The author of this article also pointed out that in order to be able to solve the problem of health inequalities, situations that increases stress of the people must be the focus of programs and policies of governmental and non-governmental levels of interventions. Such programs and policies must be made to also target children who are at risk of ill-health and distress as a result of poverty.

Some studies in India and the world in general have suggested that poverty and household income are important upstream determinants of infant mortality [4]. This is why the Government of India at one time targeted unemployment and underemployment (which are predisposing factors for poverty) by providing paid employment to households whose adult members volunteered to do unskilled manual work. This is because improved income brings about many structural and behavioral factors like better housing and living conditions, food security, access to clean water and proper sanitation, access to health care, infant
care and feeding habit practices that influence the immediate risk factors for infant mortality like malnutrition, diarrhea and acute respiratory infections. Once the issue of rural poverty is addressed through provision of employment, the goal of improved infant survival will be achieved [5].

A study was conducted to examine the determinants of child mortality in rural Nigeria. The authors made use of 2008 Nigerian Demographic and Health survey data for the purpose of the study. It was found out that secondary education of mother, age of mother at first birth, place of delivery, type of birth, child ever breastfed, sex of child were among the significant factors influencing child mortality in rural Nigeria [6]. However, in a similar study on the pattern and determinants of infant mortality in rural Nigeria, it was revealed that approximately half of the respondents have experienced infant mortality within the study period. Furthermore, thirty five percent of the infant mortality occurred in the first month of birth. Six determinants of infant mortality were identified by the study. These included mothers’ economic status, nature of care for the infant, quality of household infrastructure, maternal age, quality of life of the infant and quality of attention given to the infant. They eventually recommended improvement of health facilities and education of the child to help in the reduction of infant mortality rate in the rural areas [7]. It will be noted that both studies [6],[7] commonly identified maternal age as a determinant of infant mortality. Further identification of mother’s education, place of delivery, type of delivery, breastfeeding and child’s sex as determinants of infant mortality was made [6] while in addition, other factors such as mother’s economic status, nature of care for the infant, quality of household infrastructure, infants’ quality of life and attention given to child were identified as being among the determinants of infant mortality in Nigeria [7].

While neonatal mortality rate is related to maternal and obstetric factors such as congenital abnormalities, low birth weight, birth injuries, birth asphyxia and tetanus, post neonatal mortality rate on the other hand is related to varieties of environmental factors. However, poverty, inadequate health care, congenital problems, infectious diseases as well as injuries have been attributed to the causes of infant mortality [25]

In 1988, comparison was done between the approach of the European countries and that of United States of America in lowering infant mortality. While the European countries then were providing more social, financial and educational support to families with pregnant women and infants, the United States was expanding medically-oriented prenatal care as a high priority. The approach of the European countries was far more effective in reducing mortality rates than that of the United States [26]. This is another confirmation of the impact of socio-economic factors on infant mortality.

High focus of interventions on social and economic empowerment of women through education and employment so as to achieve the Millennium Development Goals (MDGs) of reducing infant mortality by 2015 has been recommended in the literature [8]. The work of the authors centered on the socio-economic determinants of infant mortality in Kenya. The outcome of the study revealed infant mortality rate of 79.6 per 1000 deaths in Kenya as of 2003. The major determinants of this were breastfeeding, ethnicity and sex of the child. Birth order and birth intervals were significant variables in the rural areas. It has been pointed out that infant mortality and birth outcomes which are key population health indicators have life-long implications for individuals and they are unevenly distributed globally.

In another study conducted to examine the determinants of child mortality in rural Nigeria, the authors made use of 2008 Nigerian Demographic and Health survey data for the purpose of the study. They found out that secondary education of mother, age of mother at first birth, place of delivery, type of birth, child ever breastfed, sex of child were among the significant factors influencing child mortality in rural Nigeria [6]. Another study conceptualized framework and systematically reviewed the literature on hypothesized social determinants and intermediary determinants within the United States of America and Western Europe. The evidence suggested that income inequality and social policies may help to explain cross-country variations in infant mortality and birth outcomes [9].

Some important determinants of infant and child mortality in a local government area of Oyo state, Nigeria were examined recently. The authors’ findings revealed that among the major determinants listed,
poverty, malaria, postnatal care, health scheme and breastfeeding were the major determinants of child mortality in the state. Even though, HIV was found to have catalyzed child mortality, it was not a major determinant in the study [10].

Environmental factors and health

There are many environmental factors that have negative impacts on the health of humans. The literature of five common home environmental health risks namely: lead, carbon monoxide, radon, pesticides and volatile organic compounds was reviewed. The author observed that people spend most of their time indoors and that human exposure to pollutants occur not only outside of buildings but, indoors as well. He further reiterated that indoor air pollution was gaining more public attention and there have been reports of sick building syndrome, mould and death resulting from carbon monoxide poisoning [11].

In 2002, it was noted that environmental health threats were increasing that time throughout the United States of America especially, in low-income populations. Selected lines of evidence which suggested that clinicians should consider interactions between humans and their environments as being basic to providing effective primary care were highlighted. The subject areas included exposure to environmental agents, reproductive toxicity, pulmonary disease, neurobehavioral toxicity, endocrine disruptors, mechanism of environmental disease as well as cultural competence. The authors observed that the biomedical technology and community awareness request that physicians pay greater attention to advances in environmental medicine. They finally reiterated that in order to adequately respond to increasing concerns about the role of the environment in human health, clinicians, researchers, health educators, public policy officials, therapists and the public in general should join together to decrease the risk of environmental health threats and thereby increasing the quality of life [12].

Some researchers have observed in the past that poverty, access to health care, behavior or environmental factors only cannot be used to explain racial disparities. The involvement of genetic factor was also emphasized. They noted that individuals vary greatly in their response to environmental agents. The variability usually overshadow important environmental contributions to disease risk and it poses a barrier to efforts in investigating the etiology of diseases. They also noted that health disparity is a significant public health problem which cannot be addressed using the usual approaches for funding and priority setting. It was again emphasized that the present emphasis on basic and clinical research without the inputs of public health and the social sciences does not provide the interdisciplinary research teams required to address such a complex health disparity problem [13].

Effects of environmental factors on infant mortality

Various environmental factors have been attributed either to an increase or a decrease in infant mortality in the past. A study was conducted in 2008 on the role of the environment in the decline of infant mortality as it affects England and Wales. The study tested the proposition that the contribution of environmental factors to the reduction of infant mortality in the early twentieth century was greater than that made by the alleviation of poverty. The outcome of the study showed that infant mortality by father’s occupation was averagely reduced by 35% from a peak infant mortality rate of 132 with wide variation. However, the removal of poor residential conditions was associated with the decline [14].

Effects of the health service and environmental factors on infant mortality in Sri Lanka were studied in 1980 [15]. The major findings of the study revealed that regional variations in the infant mortality rates of Sri Lanka are large, ranging from 26 per 1000 to 91 per 1000 live births. The differences are more strongly associated with regional variations in environmental determinants of mortality than with regional variations in public health expenditure. The most significant environmental factor associated with interregional infant mortality rates was found to be the nature of water supply.

Air pollution has been linked to infant mortality in the literature. The attributable risk of post neonatal infant mortality in 23 United States of America metropolitan areas related to particulate matter has was assessed in the literature. Following the assessment, it was discovered that ambient air pollutions measured by particulate matter contributes to a substantial fraction of infant death especially for those due
to sudden infant death syndrome and respiratory disease [16]. The relationship between cause-specific post neonatal infant mortality and chronic early-life exposure to particulate matter and gaseous air pollutants across the United States was evaluated in 2008 [17]. At the end of the study, the result supported that particulate matter air pollution is a risk factor for respiratory-related post neonatal mortality and suggested that ozone may be associated with sudden infant death syndrome in the United States.

Similarly, in a recent article which discussed the impact of environmental factors on birth outcomes during the last two decades, the author reiterated the correlation between air pollutants and adverse pregnancy including low birth weight and infant mortality. The result showed a positive correlation between air pollution and infant mortality. The article also supported the association between some air pollutants and low birth weight which is also a predisposing factor for infant mortality [29].

Investigation has been conducted on the impact of three key pollutants on infant mortality rates. These pollutants are carbon monoxide, particulate matter and ozone. It was revealed that although, particulate matter and ozone have no impact on infant mortality, exposure to higher levels of ambient carbon monoxide elevates the infant mortality rate [30].

Child mortality rates still remains unacceptably high in sub-Saharan African countries as approximately half of childhood deaths takes place in sub-Saharan Africa despite the region having only one fifth of the world’s children population [18]. In a study conducted by the authors in 2012, they examined the environmental determinants of child mortality in Nigeria using principal component analysis as a data reduction technique. The result showed that household environmental characteristics do have significant impact on mortality.

The joint effects of air pollution exposure and measures of socio-economic status in a population level analysis of pregnancy outcomes in North Carolina was examined in 2014 [19]. The researchers calculated daily measurements of particulate matter in aerodynamic diameter and ozone through a spatial hierarchical Bayesian model which produced census-tract level point predictions. The outcome of their study revealed that maternal race and education as well as neighborhood household income were associated with adverse birth outcomes. Predicted concentrations of ozone were also associated with an additional effect on reduction in birth weight and increased risks of being born low birth weight which is a predisposing factor to infant mortality.

**Behavioral factors and health**

Long ago, certain behaviors have been associated with increased risk of specific diseases. Examples are: tobacco use, alcohol consumption, inadequate physical activity, certain sexual practices and diets. Cigarette-smoking has been identified as a major cause of preventable morbidity and mortality in the United States of America. Smoking causes an increased risk of heart disease and cancer. Smoking during pregnancy has also been associated with negative pregnancy outcomes [20].

Obesity is a major risk factor for diabetes. Hypertension, coronary heart disease and certain forms of cancer have also been linked to overweight in adults. These adults are also at risk of developing gallbladder disease, osteoarthritis, sleep apnea and respiratory problems. It has been observed that as important as the genetic factors are, the contribution of diet and physical activity to maintenance of appropriate body weight cannot be overlooked. Inactivity and poor dietary patterns has been ranked as the second leading factor contributing to mortality in the United States of America after tobacco use [20]. Therefore, the practice of regular physical exercises under the supervision of a health expert like a Physiotherapist is a very good health behavior. Such a healthy behavior is capable of improving the health status of individuals while preventing the development of many health problems.

Alcohol consumption is another behavioral factor related to health. It has been identified as top contributor to death in the United States of America after tobacco use, diet and activity patterns. Hypertension, arrhythmias, cardiomyopathy and stroke have been linked to long-term excessive alcohol drinking. The effects of poor sexual relationship and practices on health are enormous. Both infectious
diseases and unwanted pregnancies have always been possible outcome of sexual relationships. These two are crucial public health issues in the recent times. It has been noted that women are at higher risk than men for many of these sexually transmitted diseases and that young women are more susceptible than older ones [20].

**Behavioral factors and infant mortality**

The association between health behaviors of mothers and infant mortality rates have been established. Investigation have been conducted on how health-seeking behavior of mothers was affecting infant and child mortality in Bangladesh. It was noted that despite availability of health centers at lowest administrative level, the utilization of health center was poor with only 27.4% of the mothers utilizing antenatal care services. The result of the study identified some important determinants of child survival of different components of under-five mortality including neonatal, infant and child mortalities [28].

In 1998, researchers investigated the degree to which four behavioral risk factors explained the observed association between socio-economic characteristics and all-cause mortality. The behavioral risk factors include cigarette smoking, alcohol drinking, sedentary lifestyle and relative body weight. It was reported that the risk of dying was significantly raised for the lowest income and the middle-income groups when health risk behaviors were considered [21]. The mother’s health-seeking behavior and childhood mortality in Pakistan was also examined in 1996. The result revealed that neonatal, infant and child mortality rates were the highest among children of mothers aged twenty years and below. It was further revealed that infant mortality reduced as the length of the birth interval increases. Similarly, the mother’s education had positive effects on the neonatal, infant and child survival. Factors such as antenatal care, place of delivery, assistance during delivery and immunization also influenced neonatal, infant and child mortality in Pakistan [22].

The role of behavioral factors in explaining racial/ethnic disparities in infant mortality has also been investigated [23]. The focus was on weight gain during pregnancy, prenatal care utilization, exercise, vitamin use and substance use during pregnancy. The result suggested that behavioral factors were partially responsible for the observed race/ethnic differentials in infant mortality. In addition to the identified behaviors of pregnant mothers causing infant mortality, the use of unprescribed drugs (self-medication) during pregnancy can contribute to infant mortality. The unguided use of local herbs especially by pregnant women in the rural communities can as well predispose to infant mortality. All these unhealthy health behaviors should be checked through appropriate policies and health campaign programs.

Mortality has been found in the literature to be significantly associated with breastfeeding duration, total health care visits and low birth weight [27]. The authors of the study however concluded that complex and multiple factors may be involved in mortality of under 5-year-old children and that combined efforts would be necessary to improve child health indicators.

**Conclusion**

This review revealed that there are many research works in the literature that have tried to find out the effects of social, behavioral and environmental factors on infant mortality globally. Among the social factors that were found to affect infant mortality are poverty, household income, mother’s economic status, nature of care for infants, maternal age, quality of life of infants, breastfeeding and birth orders. Others include birth intervals, place of delivery, income inequality, social policies, malaria, health scheme, mother’s education and postnatal care. Similarly, environmental factors such as poor residential conditions, nature of water supply, particulate matter air pollution, poor sanitation, heavy metal poisoning and household environmental characteristics have been found in the literature to be linked to infant mortality in the underdeveloped, developing and developed countries of the world. Behaviors of pregnant women like cigarette smoking, alcohol drinking, sedentary lifestyle, weight gain, utilization of prenatal care facilities and exercises were found in the literature to be closely related to infant mortality. Therefore, based on the findings from this study, both governmental and non-governmental organizations
in the world should swing into action of preventing the menace of increasing infant mortality especially in the underdeveloped and developing countries. This will assist in the achievement of the Millennium Development Goals of achieving reduction of infant mortality globally by the year 2015.

References

Evaluation of HIV Seropositivity Among MDR-TB Adult Patients at Ndola Central Hospital

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Abstract

Objective: This paper evaluates HIV sero-positivity among Multi-Drug Resistance Tuberculosis adult patients at Ndola Central Hospital, Ndola, Zambia.

Research question: How many patients who were admitted at Ndola Central Hospital had HIV / MDR- TB co-infections, and how many died?

Method: A Retrospective Cohort study using the existing data and laboratory results in patient files and MDR TB register (sampling frame) were reviewed for all MDR TB patients whose culture and drug susceptibility test done at Ndola Central Hospital were assessed for HIV sero-status from January 2010 to June 2014. Review of records was done from 15/08/2014 to 22/08/14 and sample comprised of 114 records which were available during the stated period using convenient sampling. A semi-structured questionnaire was used for data collection on the existing data base on patient’s file and MDR- TB patient register. Data analyzed using Epi data version 3 and bivariate analysis.

Results: The study revealed that 68.1% of the MDR TB patients were males, compared to 31.9% females; however there was no association between MDR TB and sex. The study showed that 42% of the respondents with MDR TB were co-infected with HIV. It also revealed that mortality among HIV / MDR TB co-infected patients was 36% and those negative accounted 12.7% showing an association between HIV sero status and MDR TB co-infection mortality.

Conclusion: HIV / MDR TB co-infection is a major public health problem needing urgent interventions, and proper treatment options for policy direction.

Keywords: Evaluation, HIV / MDR-TB co-infection, Ndola, Zambia.

1. Introduction

HIV/MDR TB co-infection is a major challenge in the management and control of tuberculosis globally. According to World Health Organization (WHO), they reported that in 2010 there were 350,000 people who died with active TB and HIV infection, meaning an increase between 2010 and 2011 (1). However in November 2012 UNAIDS reported that there had been a 13% reduction in TB associated HIV deaths in the last two years. The relationship between HIV infection and multi drug resistant MDR TB is not well understood, but there is currently no evidence supporting an association between MDR TB and HIV outside of institutional outbreaks of MDR TB (2). However, the high number of deaths from MDR TB in people who have both MDR TB and HIV can have devastating and demoralizing effects on communities, and this has already been seen in South Africa (3). In Zambia the magnitude of HIV / MDR TB co-infections is not well established as there is scanty literature and hence need to carry out a study on HIV / MDR TB co-infection. Analysis of records at Ndola central hospital showed that there had been an increase in MDR TB cases. In view of the above, the study aimed at evaluating HIV / MDR TB co-infection among adult patients who were admitted at Ndola central hospital MDR TB ward from January 2010 to June 2014.
1.1 General Objective
To evaluate HIV seropositivity among adult MDR TB patients who were admitted at Ndola Central Hospital, Ndola, Zambia.

1.2 Specific Objective
1. To establish HIV / MDR- TB co-infections among adult patients at Ndola Central Hospital.
2. To determine the mortality rate among adult HIV/MDR TB co-infected patients at Ndola Central Hospital.

1.3 Research Question
1. How many patients who were admitted at Ndola Central Hospital had HIV / MDR- TB co-infections?
2. How many patients who were admitted at Ndola Central Hospital with HIV/ MDR TB co-infection died?

1.4 Definitions
1.4.1 General Definitions of Resistance
The category IV diagnostic criteria is defined as “chronic cases” i.e. still smear positive after supervised retreatment; proven or suspected MDR- TB.
A patient is determined to have drug resistant TB only through laboratory confirmation (culture and drug susceptibility testing) of resistance of one or more first line anti-tuberculosis treatment.
Multi-drug resistant (MDR-TB) tuberculosis that is resistant to at least Isoniazid and Rifampcin.
Drug resistance refers to patient pulmonary tuberculosis coughing out bacilli resistant to one or more anti-tuberculosis drugs.
HIV / MDR TB co-infection refers to having both HIV infection and either latent TB or active TB disease. When someone has both HIV and TB, each disease speeds up the progress of the other.

1.5 Justification
The investigator wishes to establish HIV sero-positivity in MDR- TB Co-infection as it is a major threat to the health of the nation. The investigation from the public health perspective will help in understanding the magnitude of the problem in Ndola in order to come up with good policy prescriptions in the prevention and control of HIV / MDR- TB co-infection. The study will also generate first hand data based on local experience and will strengthen planning and implementation. Furthermore the problem deserves new research as it is a public health problem which needs urgent attention due to its severity, contagiousness and expensive treatment modalities.

2. Literature Review
2.0 Disease Burden
The risk of death in MDR TB co-infected individuals is also twice that of HIV infected individuals without TB, even when CD4+ cell count (cluster of differentiation count) and antiretroviral therapy are taken into account (4).
World health organization reported that 14.8% of TB patients have HIV co-infection, and as many as 50-80% have HIV co-infection in parts of sub-Saharan Africa (5). The incidence of TB
associated with HIV is believed to have peaked at 1.39 million in 2005 and is now decreasing (6). However, globally, TB remains the most common cause of death among patients with AIDS, killing 1 of 3 patients (7). After decades of steady decline, the number of TB cases in the United States increased in the mid-1980s (8). However, analysis of trends focused on the period 2008−2013 suggests that globally, the proportion of new cases with MDR-TB was 3.5% in 2013 (20). Low CD4+ count on commencement of ART has been associated with opportunistic infections like tuberculosis. The CIPRA HT001 study demonstrated that starting ART at a CD4+ count of 200-350 cells/µL compared with waiting until the CD4+ count is <200 cells/µL reduced the risk of active TB by 50%. (9).

However, a meta analysis of the protective effect of ART on the development of TB demonstrated a 65% risk reduction in TB incidence across all CD4+ cell counts. A substantial reduction of 57% was seen in persons with CD4+ counts of >350 cells/µL, and the greatest impact was seen in those with CD4+ counts of <200 cells/µL accounted 84% reduction in TB incidence.(10)

In Zambia MDR TB prevalence was estimated at 1.8% new cases and 2.3% among retreatments (26). Winston Zulu was a prominent global advocate first to speak out openly about the problems of TB and HIV co-infection (11). According to the National survey done from 2000 to 2011 revealed that there was no data available on MDR TB and HIV co-infection and only 65 MDR TB cases were notified and put on second line treatment according to WHO guidelines (24). Therefore there is need for the investigator to establish HIV sero-positivity among MDR TB patients.


WHO 2010 stipulates that 1.3 million cases of MDR TB in the 27 countries with the highest burden of MDR TB will need to be treated between 2010 and 2015 (1). Currently the Stop TB Partnership's Global Plan to Stop TB now has as a target stating that by 2015, all HIV positive TB patients should be receiving antiretroviral treatment (12). PTN 052 study found that initiation of ART at a CD4 count of ≥350 cells/µL vs. waiting until the CD4 count dropped to <250 cells/µL, was associated with a 47% reduction in the risk of active TB (12). An analysis of financial implication and communication strategies for policy makers; in prevention and control of HIV / MDR TB co-infection will be important. The estimated cost of treatment requires several billions of dollars, which is far in excess of the existing level of funding. According to WHO 2010, all countries with a high burden of MDR TB, treatment per course of treatment for one person is more than 100% of the gross national income per capita (the cost of second line anti-tuberculosis drugs alone) is typically $2000 to $4000 per patient (1). The provision of anti retroviral treatment and anti TB treatment cause great challenges.

2.2 Financial Implications Associated With HIV/MDR Tb Co-Infection

Zambia is among high burden countries in Africa with HIV estimated death rate of 11000 in 2004 and 7600 in 2012 (22). In Zambia anti-retro viral drugs and anti tuberculosis drugs are usually provided for free by the Government, however challenges arise due to scarcity of resources in some areas due to increased demand and limited funding to procure the health care requisites. Demand for health care services is high in public hospitals as consumers are able to enter the market freely without any constraints and are able to consume goods and services at anytime they want, though most often quality is compromised. However, the private sector provide quality services at a fee, and only the elite are able to access and procure these services. Never the less, competition arises between public service providers and private sector and we find that, low quality providers price out high quality providers. Evidence suggests that failure to involve all care providers used by HIV/MDR TB suspects and patients hampers case detection, delays diagnosis, leads to inappropriate and incomplete treatment, contributes to increasing drug
resistance and places an unnecessary financial burden on patients (21). Engaging all relevant health care providers in TB care and control through public-private mix approaches is an essential component of the World Health Organization's (WHO's) Stop TB Strategy. Public-Private Mix for TB Care and Control represents a comprehensive approach for systematic involvement of all relevant health care providers in TB control to promote the use of International Standards for TB Care and achieve national and global TB control targets (22). The public-private partnership will focus on service provision, education and advocacy, infrastructure and capacity building by training health providers for skill enhancement. The measure of efficiency used in cost-effectiveness analyses is the cost-effectiveness ratio, which is the ratio of program costs to a health-related outcome such as lives saved from HIV/MDR TB co-infection, life-years saved, or cases of HIV / MDR TB prevented. The Zambian government has a role of ensuring that production, regulation and distribution of drugs and laboratory requisites are available in all health care facilities and patient have access to these services.

2.3 Challenges of HIV/MDR TB Co-Infection

HIV/MDR TB is associated with associated with high pill burden, cumulative toxicities, high mortality, difficult to diagnose, drugs used in the treatment of both conditions have overlapping toxicity and Immune reconstitution inflammatory syndrome (IRIS) and inadequate funding.

2.4 Statement of a Problem

Review of data highlights an increase in the prevalence of HIV/MDR-TB globally. It is estimated that one third of the 40 million people living with HIV/AIDS worldwide are co-infected with TB (15). In Zambia a study done in southern province in Batoka revealed that 56% of TB patients were co-infected with HIV.(16) A study done at Ndola Central hospital revealed that 44% of patients admitted in MDR TB ward had Multi drug resistance TB, 33% had Mono resistance, while 22.6% had Poly resistance (14).

However no studies have been done on HIV / MDR TB co-infection to evaluate HIV/MDR TB co-infection and establish the disease burden and magnitude at Ndola Central Hospital. In view of the above the investigator would like to establish HIV/ MDRTB co-infection in order to explore and recommend interventions which will help curb the scurge and for policy recommendation. Hence the need to answer the research question which says; how many patients who were admitted at Ndola Central Hospital had HIV / MDR- TB co-infections? Also, how many of these patients who were admitted at Ndola Central Hospital with HIV/ MDR TB co-infection died?

3. Methodology

3.1 Research Design

A Retrospective Cohort study using the existing data and laboratory results in patient files and MDR TB register was reviewed at Ndola Central Hospital for all MDR TB patients whose culture and drug susceptibility test was done at Ndola Central Hospital and were assessed for HIV sero-status. Period under review involves patients who were admitted between January 2010 and June 2014. Data on the patient’s characteristics were obtained from the MDR- TB treatment files and MDR-TB register.

3.2 Research Setting

The study was carried out at Ndola Central Hospital MDR TB ward. The site was purposively selected as it is a referral centre for MDR TB patients covering Copperbelt Province, North Western, Luapula, Northern and Muchinga Province in Zambia. Currently, there are only two Hospitals where MDR TB patients are admitted in Zambia and Ndola is one of them.

3.3 Study Population
A cohort of all MDR- TB patients who were admitted at Ndola Central Hospital for MDR TB between January 2010 and 2014 June in MDR TB ward were assessed for their HIV sero-status through review of records.

3.4 Sample Selection

Convenient sampling method was used as it involved the review of all records at the research site for MDR TB ward from January 2010 to June 2014.  

**Inclusion criteria:** All MDR- TB patients’ category IV cohort, who were confirmed with smear positive or negative, Notified, on treatment and/ or completed treatment at Ndola Central Hospital from January 2010 to June 2014 will be assessed for their HIV status.

**Exclusion criteria:** All MDR- TB patients category IV cohort, who were confirmed with smear positive or negative, Notified, on treatment and/ or completed treatment outside Ndola central hospital from January 2010 to June 2014 were not assessed for their HIV status.

3.5 Data Collection Tool

Semi-structured questionnaire modified from the Zambia National Tuberculosis and Leprosy Control program for category IV treatment MDR- TB guideline was used during review of records (see appendix II).

3.6 Data Collection Technique:

This study used a semi-structured questionnaire through observation to enhance proper data collection on the existing data base in the patient’s file and MDR- TB patient register. Data was collected for three days from 15th to 22nd August 2014.

3.6 Sample Size:

The sample size was 114 adult patients who were notified since 2010 up to 2014 June this was a population study.

3.7 Ethical Consideration:

Consent was obtained from Ndola Central Hospital to review the register and patients’ files. There was no risk and immediate benefits to those patients whose – files were reviewed. Consent was not obtained from patients whose records were reviewed as permission was sort from Ndola central hospital. Patients were not interviewed and were in a natural setting and hence were not exposed to emotional or physical harm since there was no contact with the investigator. Confidentiality and anonymity was maintained to all patients records as their names did not appear on the questionnaire, instead the serial number were used. Privacy was maintained as all patients records were reviewed in a private room and filled in questionnaires were kept under lock and key after each review.

4. Data Presentation and Analysis

4.0 Introduction

The study aimed at assessing HIV seropositivity among MDR TB adult patients who were admitted at NCH and analyzed the financial implications and recommended communication strategies for policy makers. A Total of 114 records were reviewed from January 2010 to June 2014 for MDR TB patients and assessed for HIV sero-status. The patients were admitted in the MDR TB ward at Ndola Central Hospital from 2010 to 2014 June who were assessed for their HIV sero status by reviewing of records. Category IV treatment cohort consists of a subset of patients recorded in category IV register who started category treatment during the specified time period (2010 to 2014 June).The findings of the study were based on analysis of data collected
from the patients’ records and MDR TB register. The data was sorted out for completeness, categorized and coded. Data was analyzed using Epi Data version 3. The data was analyzed by univariate analysis to make frequency tables. The data was presented using tables, Pie chart and graphs for easy communication.

4.1 Demographic Data

<table>
<thead>
<tr>
<th>Sex</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>77</td>
<td>68</td>
</tr>
<tr>
<td>Female</td>
<td>37</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>114</td>
<td>100</td>
</tr>
</tbody>
</table>

This shows that 68% of the respondents were males, compared to 32% of females.

Figure1: MDR TB in relation to sex (n=114)

Figure1: Shows that 24% of the males were MDR TB negative, and 15% were MDR TB positive, while 10% of females were negative and 10% were positive. Those with unknown MDR TB status, males accounted 10%, while females were 5%.
Figure 2: HIV sero-status with MDR TB

The above figure shows that, almost half of the respondents with MDR TB 47 (42%) were co-infected with HIV, while 43 (37.7%) were negative.

Table 2: HIV +VE / MDR TB co-infection mortality (n=47

<table>
<thead>
<tr>
<th>HIV/MDR TB mortality</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV /MDR TB</td>
<td>47</td>
<td>100%</td>
</tr>
<tr>
<td>M HIV +VE /MDR TB deaths</td>
<td>17</td>
<td>36%</td>
</tr>
</tbody>
</table>

The table above shows that among the 47 (100%) MDR TB patients who were HIV sero positive, 17 (36%) died.

Table 3: HIV sero-status and MDR Tb co-infection mortality (n=23)

<table>
<thead>
<tr>
<th>HIV sero-status</th>
<th>Multi-drug resistance Tb mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>17 (36.1%)</td>
</tr>
<tr>
<td>Negative</td>
<td>6 (12.7%)</td>
</tr>
<tr>
<td>Total</td>
<td>23 (48.9%)</td>
</tr>
</tbody>
</table>

The above table shows that mortality was high 17 (36%) among MDR TB co-infected patients, than those who were negative 6 (12.7%).

Table 4: Drug Sensitivity Test (DST) Result (n=114)

<table>
<thead>
<tr>
<th>DST result</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>mono resistant</td>
<td>28</td>
<td>33.3</td>
</tr>
<tr>
<td>Multi-Drug resistant</td>
<td>37</td>
<td>44.0</td>
</tr>
<tr>
<td>Poly resistant</td>
<td>19</td>
<td>22.6</td>
</tr>
<tr>
<td>Total</td>
<td>84</td>
<td>100</td>
</tr>
<tr>
<td>Missing Result</td>
<td>30</td>
<td>26.3</td>
</tr>
<tr>
<td>Total</td>
<td>114</td>
<td>100.0</td>
</tr>
</tbody>
</table>

This table shows that only 44% of admitted patients had MDR TB, 33% had Mono resistance, while 22.6% had Poly resistance to TB drugs, while 26.3% had incomplete records.

5. Discussion of Findings

The main objective of the study was to evaluate HIV/ MDR TB co-infection among adult patients who were admitted at Ndola Central Hospital in MDR TB ward from January 2010 to 2014 June. The Cohort study involved review of 114 patients’ records and MDR TB register which were obtained from MDR TB ward at NCH. Review of records was done from 15/08/14 to 22/08/14 using a structured checklist. In this study the themes used to discuss the findings are: Demographic Characteristics, and HIV/ MDR TB co-infection.

The study revealed that 68.1% of the MDR TB patients were males, compared to 31.9% females. The findings further showed that 24% of the males had MDR TB negative, and 15% had MDR TB positive, while 10% of females were negative and the other 10% were positive. Those with unknown MDR TB status, males accounted 10%, while females were 5%. Never the less, sex was not associated with MDR TB (P value 0.704; Pearson chi-square). This finding could be attributed to poor health seeking behavior by most males and nature of work.

The study findings revealed that, almost half 42% of the respondents with MDR TB were co-infected with HIV, while those who were negative accounted 37.7%. These findings compliments findings done in South Africa which revealed that Out of the 1413 patients that tested for HIV infection, 554 (39.2%) tested positive (18). These findings could be higher than this as 38% of
the MDR TB patients; their HIV status was not known. Never the less research done in India revealed that HIV sero-positivity was 4.42% (19). Their findings were lower than the findings in this study and could be attributed to variation in risk factors and approach to interventions being employed in the prevention and control of HIV / MDR TB co-infection in each country. This study revealed that mortality among HIV / MDR TB co-infected patients was 36% and those who were negative accounted 12.7%. These findings are almost similar to a study which was done in South Africa which reported that 22.7% of HIV co-infected MDR TB patients had died within 2 years, and that excess mortality was higher in HIV infected, compared to HIV uninfected (18). This could be associated with weakened defence mechanism, drug toxicities, availability of opportunistic infections, drug interactions and poor nutritional status of HIV MDR TB co-infected patients. The study also reported that only 44% of patients who were admitted had MDR TB, 33% had Mono resistance, while 22.6% had Poly resistance to TB drugs while 26.3% had incomplete records. This shows that Zambia is among the nations with HIV/ MDR TB co-infection which needs urgent attention and prioritization.

5.1 Communication Strategies Needed to be Developed to Curb HIV/MDR TB Co-Infection.

Strategies to prevent and control MDR TB co-infection should focus on public awareness campaigns on dangers of these diseases, prevention and control campaigns in the community through social / mass media. I will ensure that communities are sensitized and are empowered on MDR TB co-Infection. Community mobilization done to identify and solve health problems like MDR TB co-infection, develop policies and plans that support individual and community health efforts. Community based media should be used such as local newspapers, local radio station and posters, drama, concerts, rallies other mass media channels to disseminate the information etc. Good cost effective preventive strategies for HIV / MDR TB co-infection should focus on condom social marketing, peer education, school based education programs, mass media campaigns and community based programs. Moral persuasion is cardinal to reset behavior norms to a better standard of care and change will be self sustaining as it requires strong advocates at local level (22). At the same time there is need to improve partnership with private and communities by exploring the use of alternative services delivery approaches such as community-home based care to ensure early diagnosis, appropriate referral and prompt care for each disease.

5.2 Dissemination of Findings

The findings of the study will be disseminated to Ndola Central Hospital, and Ministry Of Health

5.3 Strength/ Limitation of the Study

Findings may be generalized as it is a population study. It also forms a basis for developing of other related studies. Data generated can be used for decision making by policy makers as it is based on local lived experiences. The data may be of poor quality due to incomplete recording system. Lack of adequate resources such, as funds and the time frame, in which the capstone project was to be completed, were the major limitations. Ndola has been selected for convenience purposes.

Conclusion

HIV / MDR TB co-infection is major public health problem in Zambia due to resistance to first line treatment which is cheaper. The interaction of anti Tb drugs and ARVs also contributes to increase in MDR TB as there are overlapping toxicities which contributes to poor adherence. MDR TB co-infection is associated with high mortality and there is need to ensure early diagnosis and prompt case management. Contact tracing is important in managing exposed
contacts. Public-Private Partnership and community sensitization on importance of early seeking behavior must be emphasized and HIV/MDR TB must be treated as an emergency. Therefore HIV/MDR TB co-infection is a priority area among other public health problems in Zambia. This means that we need strong political commitment, across multiple government sector and private sector to increase partnership among various stakeholders. At the same time funding should be improved towards interventions for HIV/MDR TB co-infections. This requires capacity building and training of health care providers towards MDR TB co-infection management. New innovations are required and this calls for research to come up with evidence based literature to help in development of policies and strategies that can help to curb the scourge.

**Recommendations**

The linkage system for ART and TB services should be strengthened, and skilled workforce should be available to provide leadership to other health care providers in MDR TB wards.

There is need to scale up rapid testing and detection of all MDR TB cases and patients should have prompt access to appropriate MDR-TB care.

The government through MOH should ensure that there is good supply of quality drugs for HIV/MDR TB co-infection treatment.

MOH/NCH need to implement appropriate TB control measures to minimize risk of transmission through advocacy and partnership with community and other stakeholders if morbidity and mortality of HIV/MDR-TB/co-infection is to be controlled.

There is need to ensure that health care providers are trained in the management of HIV/MDR TB co-infected patient to monitor toxicities and provide quality care if mortality is to be reduced. There should be good leadership and planning to develop strategies and monitor interventions. Infection prevention protocols should be disseminated to all health care facilities and the community at large. The government should ensure availability, accessibility, affordability and acceptability of HIV/MDR TB health care package.

The government should support research for new insights and innovative solutions to HIV/MDR TB co-infection.

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RUNNING HEAD: HIV/ MDR TB CO-INFECTION 25

Appendix I: Budget

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNIT COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Stationary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) printer toner</td>
<td>1</td>
<td>K1,200</td>
<td>K1,200</td>
</tr>
<tr>
<td>(b) A4 paper</td>
<td>10</td>
<td>K35</td>
<td>K350</td>
</tr>
<tr>
<td>(c) Pens</td>
<td>10</td>
<td>K1,50</td>
<td>K15</td>
</tr>
<tr>
<td>(d) Pencils</td>
<td>10</td>
<td>K1</td>
<td>K10</td>
</tr>
<tr>
<td>(e) Rubbers</td>
<td>5</td>
<td>K3</td>
<td>K15</td>
</tr>
<tr>
<td>(f) Tipex</td>
<td>4</td>
<td>K8</td>
<td>K32</td>
</tr>
<tr>
<td>(g) Files</td>
<td>5</td>
<td>K5</td>
<td>K25</td>
</tr>
<tr>
<td>(h) Laptop</td>
<td>1</td>
<td>K7,500</td>
<td>K7,500</td>
</tr>
<tr>
<td>(i) Flash disk</td>
<td>2</td>
<td>K200</td>
<td>K400</td>
</tr>
<tr>
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### Budget Justification

A total of K29,974.70 (Twenty nine thousand, nine hundred and seventy four, seventy ngwee) will be required for stationary, services, personnel and travel expenses in order to carry out this research project successfully.

### Appendix II: Semi-Structure Questionnaire (HIV/MDR TB)

**REVIEW OF RECORDS RETROSPECTIVELY**

- **DATE**
- **PLACE OF INTERVIEW**
- **NAME OF INTERVIEWER**
- **SERIAL NUMBER**
- Demographic data: sex F / M Age
- Disease classification pulmonary ………… / extra pulmonary
- Date of treatment
- Type of patient
- Treatment category ………Initial………….or changes in treatment………...
- Category IV card suspect ……………. confirmed …………………...…………….
- Reasons for Cat IV ………… start date……………..Completed…………
- Registration Group
- Sputum microscopy result
- Sputum culture
- DSR result
- VCT Results Negative
- DOT's administration supervised………… not supervised………...
- Outcome; cured ……….completed…….Died ……….failed………...
- Defaulted

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<th>K80</th>
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</tr>
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<td>(q) Bags</td>
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<tr>
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<td>K2,997.70</td>
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<td><strong>GRAND TOTAL</strong></td>
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</table>
Malnutrition in the Under-Fives: Assessment of the Knowledge And Practices of Mothers in its Prevention
A study carried out in the Bamendankwe Health Area in North West Cameroon

Article by Bodzewan Fonyuy
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Abstract

Introduction: According to the WHO, malnutrition remains the biggest contributor to child mortality with 6 million children dying from hunger each year. In 2010, protein energy malnutrition was estimated to have resulted in 600,000 deaths from 883,000 deaths, in 1990 another 8400 deaths resulted from iodine and iron deficiency.

The general objective of the study was to find out if mothers of the under-fives leaving in the Bamendakwe Health Area are knowledgeable of the preventive measures against malnutrition.

Materials & Methods: A descriptive cross-sectional design was employed in which a structural questionnaire was used for the collection of primary data from a sample of mothers with under-five children on their knowledge in the prevention of malnutrition.

Results: Results obtained show that feeding a child with a balanced diet will help prevent malnutrition in children less than 5 years.

Discussion: Mothers lacked the means to prevent malnutrition, lacked the knowledge of different foods to feed the child to prevent malnutrition. Ignorance and poverty are associated with malnutrition; according to Kammann (2003), ignorance, lack of adequate funds, unemployment leads a deficit in the means to purchase the right kind of foods rich in proteins.

Conclusion: Malnutrition remains a serious paediatric problem in the under-fives as mothers’ deficit on balanced dieting can result to malnutrition.

Key words: Malnutrition, Marasmus, Kwashiorkor, Health education, Balanced Diets, Breastfeeding, Sanitation, Behaviour Change Communication

Introduction

Malnutrition is a condition that results from eating a diet in which nutrients are not enough or are too much such that it causes health problems. It remains a common pediatric problem worldwide. The nutrients involved are, calories, vitamins, proteins, carbohydrates and mineral. More than half of all deaths in children below five years, have malnutrition as the underlying cause.

In 2014, a program on maternal, newborn child health said if malnutrition occurred during pregnancy or before the second year of age in a child’s life, it may result in permanent health problems in physical and mental development and stunted growth, thin body, very poor energy levels, swollen abdomen and legs.

In 2010 protein energy malnutrition was estimated to have resulted to 600,000 deaths down from 883,000 deaths in 1990, another 8400 deaths resulted from iodine and iron deficiency (Black R et al., 2010).

In 2010, protein energy malnutrition was estimated to have resulted in 600,000 deaths from 883,000 deaths, in 1990 another 8400 deaths resulted from iodine and iron deficiency (Kandala et al., 2010).
Mortality due to malnutrition accounted for 58% of the total mortality in 2006 with approximately 62 million people affected. All causes of deaths combined each year have malnutrition as the leading cause.

In 2006, more than 36 million people died of hunger and diseases due to deficiencies in micro nutrients. According to WHO (1995), malnutrition is the biggest contributor to child mortality, present in half of all cases of death, 6 million children died of hunger every year all over the world.

UNICEF (2011) reported that the number of malnourished people in the world exceeds 1 million accounting to 6 million of the world’s population. In 2006, malnutrition accounted for 58% of total mortality in the world approximately 62 million people that is all causes of death combined each year.

According to the WHO (2008) malnutrition is the biggest contributor to child mortality. 6 million children die of hunger each year.

Cameroon is thought to have 44% of undernourished children in the six member community of central African States (CEMAC). UNICEF says malnutrition affects 3 out of 10 of Cameroonian children. Experts blame the high number on poverty, political neglects and epidemics. The situation, illustrated by increasing numbers of stunted growth and emaciated children, has alarmed child health advocate.

According to Ines Lezama, a nutrition expert with UNICEF Cameroon, the country has being in a red list (danger zone) for a long time and evidence shows that the latest surveys in 2011, the rate of stunting or acute malnutrition is going up and varies according to region ranging from mild prevalence in the fertile south, more severe in the Sahelian and drought–prone Northern regions on the fringes of the Sahara desert.

In Garoua, Cameroon one of the nurses explained that the poverty stricken area, home to 1/3 of the country’s 9 million kids suffer malnutrition. In June 2014, the hospital registered 31 malnourished children, 6 died, 1 recovered and 21 were referred to other hospitals.

According to the most recent study by the National Institute of Statistics (NIS), published in October 2011, 33% of under 5’s in Cameroon suffer from chronic malnutrition and 14% are severely malnourished. The Far North has the highest number of malnourished children as a result of lack of food resulting from the lean period which last mid June to the end of August.

Celine Essengue, a UNICEF staff gave her assessment situation and says Cameroon provides enough food to feed her children and so has no need to import food but poverty acts as a barrier of getting a balanced meal. UNICEF states that an estimate of 57,616 children under the age of five are at risk of severe malnutrition in the North and Far North regions of the country and that 145 000 children under 5 years will suffer stunted growth. Mothers’ education of the first sign of malnutrition and to take their children as soon as possible for check up is quite primordial.

In the North West region of Cameroon, the researcher witnessed cases of malnutrition-related diseases in the Bamendakwe Integrated Health Centre in which mothers often consulted their children for disease related to growth and under weight. He realized that most of these babies suffered from malnutrition related illnesses and that if the mothers were knowledgeable about the preventive measures of malnutrition then these children would not be sick as some presented with prostration.

**Research Question**

What is the knowledge and practical measures needed by mothers of the under-fives in the prevention of malnutrition in children?
Study Objectives

General Objective

To find out if mothers of the under-fives living in the Bamendakwe Health Area are knowledgeable of the preventive measures against malnutrition.

Specific Objectives

- To assess the knowledge of mothers with under-five children in the prevention of malnutrition.
- To assess the various measures employed by mothers in prevention of malnutrition in the under-fives.
- To find out the problems faced by mothers in the prevention of malnutrition.
- To ascertain the additional information mothers of the under-fives need to improve on good infant nutrition.

Hypothesis

Mothers who are knowledgeable of the practices to prevent malnutrition in the under fives have a likelihood that these infants would grow healthily and have good cognitive outcomes than those who are not.

Methodology

Study Design

A descriptive cross-sectional design was employed in which a structural questionnaire was used for the collection of primary data from a sample of mothers with under-five children on their knowledge in the prevention of malnutrition.

Study Population

The study involved mothers of the under-fives living in the Bamendankwe Health Area.

Sample Size and Sampling Procedure.

The sample size was calculated using the formula below:

\[ N = \frac{(z)^2 \times p(1-p)}{e^2} \]

Where,
- \( N \) = the required sample size
- \( z \) = confidence interval of 95% (z=1.96)
- \( p \) = the population of households (15%)
- \( e \) = random error of 5% (type 1 value of 0.05)
- \( N \) = 120 respondents.

A systematic random sampling procedure was used to obtain a sample size of 120 women as they arrive for the Antenatal Clinic and Infant Welfare Clinics Sessions. Self administered questionnaire were used to collect data from the study population. 120 women living in the Bamendankwe Health Area and using the health facility were sampled and a questionnaire administered to them.
Data Analysis Method

Data was analysed and presented in graphics (pie charts, histograms and bar charts); data was entered in Epiinfo software 6.0 and exported to SPSS for analysis.

Presentation and Analysis of Results

Distribution of respondents according to age

![Age distribution of respondents](image)

**Figure 1:** Age distribution of respondents

Out of the 60 respondents recruited for the study, 40(33.3%) were within the age range 15-25 years, 52(43.33%) were within the age range of 26-35 years, 20(16.67%) were within the age range 36-45 years and 8(6.67%) were within the age range 46 and above years old.

Distribution of respondents according to denomination

![Distributions of respondents according to denomination](image)

**Figure 2:** Distributions of respondents according to denomination

From the figure above out of the 120 respondents, 50(40.66%) were Catholics, 30(25%) were Presbyterians, 14(11.66%) were Baptist, 6(5%) were Pentecostal and 20(16.67%) were Muslims.
Distribution of respondents according to marital status

From the total of 120 respondents as can be seen on the table above, 80(66.67%) were married, 26(21.67%) were single, 8(6.67%) were divorced and 6(5%) were widows.

Distribution of respondents according to level of education

From the above, it shows that out of the 120 respondents, 60(50%) have attained at least primary school, 20(16.67%) had gone to secondary school, 4 (3.33%) have attained university and 36(30%) had no formal education.

Distribution of respondents according to occupation

Figure 3: Distribution of respondents according to marital status

Figure 4: Distribution of respondents according to level of education

Figure 5: Distribution of respondents according to occupation
From the figure above, it shows that out of the 120 respondents recruited, 20(16.67%) were students, 60(50%) were farmers, 10(8.33%) were business women, 8(6.67%) were hair dressers 4(3.33%) were tailors, 8 (6.67%) were teachers and 10 (8.33%) were house wife.

**Distribution of respondents according to number of children alive**

<table>
<thead>
<tr>
<th>Number Of Children Alive</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>8.33</td>
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<tr>
<td>2</td>
<td>16</td>
<td>13.33</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>33.33</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>16.67</td>
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<tr>
<td>6 and above</td>
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<td>3.33</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>120</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

From the table 1, out of the 120 respondents recruited for this study, 10(8.33%) had 1 child, 16 (13.33%) had 2 children, 30 (25%) had 3 children, 40(33.33%) had 4 children, 20(16.67%) had 5 children and 4(3.33%) had 6 children and above.

**Knowledge of Malnutrition**

**Distribution of respondents according to their knowledge on malnutrition**

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
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<td>Lack of food</td>
<td>4</td>
<td>3.33</td>
</tr>
<tr>
<td>Eating food that contain insufficient nutrients</td>
<td>73</td>
<td>60%</td>
</tr>
<tr>
<td>Irregular feeding pattern</td>
<td>20</td>
<td>16.67</td>
</tr>
<tr>
<td>Low quantity of food being eaten</td>
<td>24</td>
<td>20%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>120</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Out of the 120 respondents recruited for this study, 4(3.33%) thought malnutrition is lack of food, 72(60%) thought that malnutrition is eating food with insufficient food nutrients, 20(16.67%) thought malnutrition is irregular feeding pattern and 24(20%) said malnutrition was eating food in low quantity.

**Distribution of respondents according to their knowledge of diseases caused by malnutrition.**

[Figure 6: Distribution of respondents according to their knowledge on caused by malnutrition]
Out of the 100 respondents who said malnutrition causes diseases, 80 (66.67%) said malnutrition will lead to kwashiorkor, 10 (8.33%) said malnutrition could cause marasmus and 10 (8.33%) said they did not know. **Distribution of respondents on their knowledge of the complications of malnutrition**

![Distribution of respondents relative to their knowledge of the complications of malnutrition](image)

**Figure 7**: Distribution of respondents relative to their knowledge of the complications of malnutrition

Out of the 80 respondents who said malnutrition can cause damage to a child’s growth, 68 (85%) said malnutrition has stunted growth as a complication and 12 (15%) said brain retardation is a complication of malnutrition. **Responses of respondents on diseases that can be severe as a result of malnutrition in children below 5 years**

![Responses of respondents on diseases that can be severe as a result of malnutrition in children below 5 years](image)

**Figure 8**: Responses of respondents on diseases that can be severe as a result of malnutrition in children below 5 years

From the figure above out of the 90 respondents who said malnutrition could cause severity of diseases in children, 50 (55.56%) said malaria can be severe in a child if a child is malnourished, 10 (11.11%) said typhoid will be severe as a result of malnutrition, 20 (22.22%) said GIT infection will be severe in a child that is malnourished and 10 (11.11%) said common cold could be severe in a malnourished child.
Knowledge on Prevention of Malnutrition

Distribution of respondents on the prevention of malnutrition

![Figure 9: Preventive measures against malnutrition](image)

Out of the 116 respondents who said malnutrition could be prevented, 32 (27.59%) said weighing the child regularly will help prevent malnutrition, 40 (41.38%) said for prevention purposes, a breastfeeding mother should eat well before breastfeeding a child and 44 (48.28%) said feeding a child with a balance diet will help prevent malnutrition in children less than 5 years.

Responses on reasons for mixed feeding

![Figure 10: Responses on reasons for mixed feeding](image)

From the figure, out of the 80 respondents who practice mixed feeding, 50 (62.5%) do this because they think the child fills hungry before 6 months, 20 (25%) did not practice breastfeeding exclusively because they are too busy and 10 (12.5%) did not breastfeed their children because they were pregnant before then.
Distribution of respondents according to signs and symptoms of malnutrition

Figure 11: Distribution of respondents according to signs and symptoms of malnutrition

From the 104 respondents who said they could identify malnutrition in a child, 40(38.46%) said malnutrition can be recognised by a marked weight loss, 24(23.08%) said a child with red hair is showing malnutrition, 20(19.23%) said protruded stomach is a sign of malnutrition and 20(19.23%) said a child with a head larger than the body is suffering from malnutrition.

Distribution of respondents according to different foods given to children

Figure 12: Distribution of respondents according to different foods given to children

From the 120 respondents taken for this study, 60(50%) feed their children with pap mixed with Cray fish, 30(25%) fed their children with rice and beans, 20(16.67) fed their children with soya beans, 10(8.33%) said they fed their children with Corn-Fufu and Okro, 10(8.67% said they fed their children with Achu and groundnut soup and 10 (8.67%) said they fed their children with bitter-leaf.
Distribution of respondents relative to where malnutrition should be managed

![Pie chart showing distribution of respondents](image)

**Figure 13:** Distribution of respondents relative to where malnutrition should be managed.

Out of the 120 recruited respondents, 50(41.67%) said malnutrition can be managed at home and 70(58.33%) said malnutrition can best be managed in the hospital.

**Problems Encountered in the Prevention of Malnutrition**

Distribution of respondents relative to problems faced in the prevention of malnutrition.

![Bar chart showing distribution of problems](image)

**Figure 14:** Distribution of respondents relative to problem faced in the prevention of malnutrition.

Out of the 120 recruited respondents, 50(30%) did not have what it takes to prevent malnutrition, 40(33.33%) did not have the knowledge to prevent malnutrition, 10(8.33%) did not have time to care for children, 10(8.33%) are faced with lack of cooperation from husband and 10(8.33%) did not have any problem in the prevention of malnutrition.
Respondents’ proposed solutions envisaged to salvage the problems.

![Figure 15](image)

Figure 15. Respondents’ proposed solutions to salvage the problems encountered.

From the 110 respondents who had problem in preventing malnutrition, 50(45.45%) said government should reduce food prices, 10(9.09%) taught IEC should be extended to husbands, 20(18.18%) said more job opportunities should be created and 30(27.27%) said some nutritious food items should be offered to women during IWC.

**Practical Guidelines Geared at Preventing Malnutrition.**

**Distribution of respondents relative to information needed from health personnel**

![Figure 16](image)

Figure 16: Distribution of respondents relative to information needed from health care providers.

The figure above shows that out of the 120 respondents, 50 (41.67%) said they need IEC on malnutrition, 50 (41.67%) said they need IEC on the prevention of malnutrition, and 20 (16.67%) said they need IEC on good nutrition.
Out of the 120 respondents recruited for this study, 80 (66.67%) said they will effectively put into practice the information given to them by health personnel in order to prevent malnutrition. 30 (25%) said in order to help their children grow well, 10 (8.33%) said they will get the information from health personnel so that they will be able to help sensitize to other women in the community.

**Discussion of Results**

Concerning the distribution of respondents according to occupation, 20 (16.67%) were students, 60 (50%) were farmers, 10 (8.33%) were business women, 8 (6.67%) were hairdressers, 4 (3.33%) were tailors, 8 (6.67%) were teachers and 10 (8.33%) were housewives. Most of the women were farmers in developing countries, most rural women are farmers and these women lack farm to market roads which at the end, they cannot sell some of these foods in order to purchase some nutrients which they do not cultivate. According to Goghlan B et al. (2010), poor socio-economic position is associated with chronic malnutrition since it inhibits purchase of nutrient foods such as milk, meat, poultry, and fruits; conversely UNICEF (2008) said Cameroon produces enough food to feed its children and so has no need to import food but poverty acts as a barrier of getting a balanced meal. Klasen S. (2008) intimated that most of the time these women farm a single type of food, thus deriving too much of one’s diet from a single source, such as eating almost exclusively corn or rice leading malnutrition.

On the level of education of respondents, 60 (50%) have attended primary education, 20 (16.67%) secondary education, 4 (3.33%) attended tertiary education whilst 36 (30%) have had no formal education. According to Mosley W. (1984), low parental education is associated to malnutrition.

**Knowledge of Malnutrition**

Concerning their distribution according to knowledge on what malnutrition, 72 (60%) had good knowledge on what malnutrition is. Malnutrition results from inadequate intake of nutrients that the body needs to maintain healthy tissues and organ functions; 40% had no knowledge of malnutrition and for this reason, some women do practice preventive measures against malnutrition because they do not know its importance.

On the distribution of respondents according to their knowledge on the complications of malnutrition, 80 (66.67%) of women had a good knowledge while 40 (33.33%) did not have. All
the 80 who knew said stunted growth was a complication of malnutrition. Reed BA (1996) said apart from stunted growth, malnutrition also has wasting, kwashiorkor, marasmus, as well as weakened immunity, so women who do not know won’t practice and so their children run this risk.

**Knowledge in the Prevention of Malnutrition**

As concerns the distribution of the respondents on the prevention of malnutrition, 58 (96.67%) said malnutrition can be prevented. Out of the 116, 56 (48.28%) said feeding the child with a balanced diet will prevent malnutrition in their children. It was a good idea in contrary to some women who thought that more meat is to be eaten by the father; according to UNICEF (2008), some children are malnourished as a result of ignorance.

As concerns the distribution of respondents according to breastfeeding practices, 40 (33.33%) do practice exclusive breastfeeding while 80 (66.67%) do not practice exclusive breastfeeding. Most women were aware of the benefits of breastfeeding but still find it very difficult to practice exclusive breastfeeding (Gwatkin DR et al., 2000).

According to (WHO, 1995), about ¼ of the women stop breastfeeding their children before 3 months, leaving the child hungry and vulnerable to infections. So breastfeeding education helps in preventing malnutrition.

Respondents’ responses on knowledge of signs and symptoms of malnutrition were apparent, 104 (86.67%) could enlist the signs and symptoms of malnutrition in a child. According to UNICEF (2008), an estimate of 57,616 million under-fives is at risk of severe malnutrition.

**Problems Encountered in the Prevention of Malnutrition**

Out of the 120 respondents recruited, 50 (46.7%) lacked the means to prevent malnutrition, 40 (33.33%) lacked the knowledge of different foods to feed the child to prevent malnutrition, 10 (8.33%) lacked time, 10 (8.33%) lacked cooperation from husbands to complete the practice of prevention of malnutrition. Ignorance and poverty are associated with malnutrition; according to Kammann EE (2003), ignorance, lack of adequate funds or limited sources of income, unemployment will lead to lack of means to purchase the right kinds of foods rich in proteins.

**Additional guidelines needed from Care-providers to complement the prevention of malnutrition.**

Out of the 120 respondents recruited for this study, 80 (66.67%) said they will effectively put into practice the information given to them by health personnel in order to prevent malnutrition; 10 (8.33%) said they will get the information from health personnel so that they will be able to help sensitize to other women in the community; with falls in line with WHO’s recommendations for IEC dispensed to expectant mothers during ANC.

**Conclusion**

Malnutrition remains a serious paediatric problem in the under-fives as mothers’ deficit on balanced dieting can result to malnutrition. Children who are spaced and well fed will be healthy and have good cognitive abilities than those who are not. Also, mothers lack adequate knowledge in the importance of breastfeeding. Children who are breastfed exclusively and for up to 6 months before the introduction of complementary foods stand a better chance of escaping malnutrition and malnutrition-related infections.

From the study results, it is evident that most children are malnourished not because their mothers lack the knowledge of its prevention but because they lack finances and adequate knowledge on its prevention.
Recommendations

The staff of Bamendakwe Integrated health centre should improve on:

- IEC provided to pregnant women on proper nutrition during pregnancy and post-partum;
- Malnutrition and its complications on the lives of these babies and how they can at their basic level prevent malnutrition with the means and food supply they have at their disposal.

The Ministry of Public Health should:

- Re-inforce the workforce by recruiting more nurses who will reduce the work load in the health centres and have enough time to follow up these mothers during home visits in their homes.
- Provide teaching aids such as flip-charts, posters and video projectors which will lead to satisfactory comprehension of lectures, abandonment of old habits and thus adoption of appropriate practice.

References


Burden of Childhood Diseases at Baptist Hospital Mutengene: A Retrospective Survey.

Article by Edouard Tshimwanga Katayi1, Peter Bernard Hesseling²

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Stellenbosch University

2Tygerberg Children’s Hospital, Department of Pediatrics and Child Health, South Africa

Email:- edouarddr@yahoo.fr

Abstract

Childhood diseases, pediatric cancer burden, Baptist Hospital Mutengene, Cameroon.

The pattern of disease burden has changed worldwide in past decades. Non communicable diseases, including cancers, are the main cause of mortality and morbidity in both high income countries (HICs) and low and middle income countries (LMICs). Pediatric oncology is not seen as a child health priority in most LICs like Cameroon amongst many others where pediatric cancer data are fragmented. The objective of this study was to generate data on childhood diseases at Baptist Hospital Mutengene (BHM) and to measure the burden attributed to pediatric cancer using incidence, mortality, cancer related admission and quality of life in cancer survivors in order to guide resource allocation to the pediatric ward. A retrospective cohort study and a secondary data analysis were conducted from 2006 to 2013. Communicable diseases (malaria, chest infection and diarrhea) constitute the main burden of childhood diseases at BHM based on incidence and mortality. Pediatric cancers led by Burkitt lymphoma are contributing to an extent to the burden of childhood diseases with a proportionate incidence of 1 to 2 cases per 1000 per year and an admission rate of 31.8 per 1000 per year. 26 (13%) of 193 Burkitt lymphoma patients suffered a disability in the course of their illness and treatment and 2 (7.6% of the 26 but 1% of the 193) had a permanent disability due to Burkitt lymphoma, the leading pediatric cancer at BHM. Pediatric cancers contribute to increasing the burden of childhood diseases at BHM based on incidence, admission rate and quality of life of cancer survivors.

A large and increasing proportion of global childhood mortality and morbidity is due to non-communicable disease (NCD) and 6.0% and 18.6% of deaths, in low and middle income countries respectively, among children aged 5 to 14 years are due to cancer (Magrath I, 2013). The burden of childhood cancer has improved during the last decade in HICs where the cure rate has reached 80% (Gupta S, 2014). In HICs 75 to 79% of children with cancer have a 5 years event free survival, but these tremendous advances in the outcome of childhood cancers in HICs are not concomitantly observed in LMICs where 80% of childhood cancers occur with only a 20% cure rate (Howard S.C, 2008). Policy makers are not aware of the current and future magnitude of the burden of cancer (Jemal A, 2012) and of the availability of effective resource adapted treatment protocols (Gopal S, 2012). In Cameroon Pediatric haemato-oncology as a subspecialty was only available at the Chantal Biya foundation children hospital in Yaoundé. The NGO World Child Cancer (WCC) analysis of childhood cancers in Cameroon concluded that there was a lack of locally appropriate protocols for most treatable and easily diagnosed childhood cancers, lack of trained healthcare professionals to administer chemotherapy drugs, and lack of funding for curative drugs and palliative care (WCC, 2013). As part of a twining project between Stellenbosch University/Tygerberg Children's Hospital (TCH) of South Africa and the Cameroon Baptist Convention Health Board (CBCHB) hospitals, Banso Baptist Hospital (BBH), Mbingo Baptist Hospital (MBH), and Baptist Hospital Mutengene (BHM), the Beryl Thyer Memorial
Africa Trust (BTMAT) and World Child Cancer (WCC), three pediatric cancer units now offer comprehensive effective care at minimal cost in the north and south west regions of Cameroon (WCC, 2013). At BHM children diagnosed with cancer are admitted to the general pediatric ward and treated by a team consisting of a physician generally a GP, a pediatric oncology nurse locally trained to administer chemotherapy, and a hospital based pediatric palliative care service. The burden of childhood cancer in this health care setting has not been estimated before.

Pediatric cancer survivors face life-long health issues, including serious chronic conditions and secondary cancers (Melissa M, 2003)

In most LMICs population based childhood cancer registries are non-existent. In Zambia only one out of 9 children suffering of cancer is diagnosed, registered and reported(Jeremy S et al, 2014).

Challenges in treating cancer effectively in LMICs include the lack of availability of trained personnel, essential chemotherapeutic agents, cost of treatment, late stage at presentation, limited or no radiotherapy, limited surgical expertise and supportive care, which all contribute to a low cure rate (Gopal S 2012, WCC 2013, Jeremy S 2014).

In Cameroon statistics of pediatric cancers are rare and fragmented (Enow Orock, G 2012). Three hospitals - based pediatric cancer registries have been established at BBH, MBH and BHM. 111 new cancers in children aged 0 to 15 years were registered in the POND registry at these three CBCHB hospitals in 2013 (CBC HB annual report 2013). The population based cancer registry of Cameroon in Yaoundé has been discontinued because of a lack of financial and, human resources (Enow Orock G 2013).

The objective of this study was to generate dataon childhood diseases at BHM in order to quantify the burden attributed to pediatric cancer in this setting, and to guide decision making in the allocation of resources to the child health department.

The specific objectives were to determine the incidence and mortality of childhood diseases, to calculate childhood cancers related admissions, childhood cancer proportionate incidence and mortality, and to determine the quality of life of survivors of childhood cancers following treatment at BHM.

Methods
A facility based data review retrospective cohort study based was conducted. The research was conducted at Baptist hospital Mutengenein the SW Region of Cameroon. BHM offers medical, spiritual and psychosocial care. The hospital attends to more than 8000 patients per month with different health problems and from various towns like Buea, Limbe, Tiko, Kumba, in the South West Region, and Douala, Nkongsamba, in the Littoral Region.

In December 2013 medical staff at BHM included 12 permanent medical doctors and 74 nurses, with an annual OPD attendance of 106 894, an in-patient attendance of 4 532. The total bed capacity of 87 included 10 beds in the pediatric ward. Members of staff included a dentist, an orthopedic surgeon, an internist and an ophthalmologist.

Pediatric cancer care started in 2006 with treatment of patients with BL. Since then treatment has also been implemented for Kaposi sarcoma, retinoblastoma and Wilms tumors with standardized protocols and supportive care. Children with incurable cancers are offered palliative care.

The study population included all children aged 0 to 15 years seen at BHM from January 2006 to December 2013 at both outpatient and inpatient departments.

The study population was divided into yearly cohorts in order to better calculate the yearly proportionate incidence and mortality of childhood cancers and other childhood illnesses, pediatric cancer admission rate and bed occupancy

Specific data collection tools were used to capture the annual number of pediatric (0 to 15 years) patients at both inpatient and outpatient departments, childhood illnesses incidence and
mortality, pediatric bed occupancy and pediatric cancer relate admission, and the quality of life of survivors of Burkitt lymphoma.

The research proposal was approved by the Cameroon Baptist Convention Institutional Review board (IRB).

Data were obtained from the hospital statistic office, the CBC HB annual reports, the pediatric cancer registry (POND), individual pediatric cancer patient records, and from a previous survey on the outcome of patients diagnosed with BL complicated by paraplegia at diagnosis. Obstetric Labour, delivery, and post-natal ward discharge registers were studied. All new cases of selected childhood illnesses were recorded in order to calculate the proportionate incidence of ten selected childhood illnesses. Data on pediatric mortality were obtained from the hospital’s monthly report forms.

All data were reanalyzed with Microsoft excel.

Results

BHM experienced an expansion in terms of patient attendance, bed capacity, number of deaths and number of doctors. The number of pediatric deaths remained relatively stable below 100 (table 1) with mild fluctuations and an average of 36.9 cases per 1000 per year (SD: 10.2). Pediatric inpatient attendance increased slowly by 8.5% with a gradual relative decreasing bed capacity compared to adults (from 13.6% to 11.4%). Death registration was not available for 2008. Figures in Table 1 were obtained by calculating the average number of deaths for the years 2007 and 2009.

The incidence of different childhood diseases is listed in Table 2. Malaria was the leading cause for consultation in children. The trend of malaria incidence shows a consistent decrease during the study period. The proportionate incidence of childhood cancer was one to two cases per 1000 children per year and ranked 5th after malaria, diarrhea, respiratory infections and anemia. HIV related illnesses, injuries/accidents, malnutrition and neonatal sepsis were not common causes of ill health.

During 2008 incidence data were only recorded for 3 diseases namely cancer, neonatal asphyxia and injury/accident. The incidence for the other diseases in the table was obtained by calculating the average of the number of new cases of each disease for the years 2007 and 2009.

Malaria, neonatal sepsis and asphyxia, anaemia, respiratory infections and diarrhea were the leading causes of death amongst children at BHM (Table 3). Data of neonatal asphyxia proportionate mortality were available and recorded only for the last 3 years of the study period. Cancer, HIV, malnutrition and injuries/accidents were infrequent causes of child death. Mortality data for 2008 were only available for neonatal sepsis. For other causes of death the average of total deaths recorded during 2007 and 2009 was used.

The proportionate incidence of pediatric cancers is provided in Table 4. The 156 cases include 96 males and 60 females, showing a clear male predominance. BL, the most common cancer, accounted for 88.4% of all cases. Kaposi sarcoma, retinoblastoma and rhabdomyosarcoma are gradually being diagnosed. Kaposi sarcoma affects mostly males. Analysis of other cancers is not possible due to the small numbers.

Seventy six per cent of newly diagnosed pediatric cancers came from Southwest region (SWR), mostly from the Fako division (44%) where BHM is located, Meme division (22%), Ndian division (7%) and Manyu division (4%). There was no case from the Kupemanguba and Lebialem divisions. All the retinoblastoma patients were not from the SWR. Other patients came mainly from the neighbouring Littoral region (Wouri and Mungo divisions), and a few from the South and Centre regions. One patient came from Chad. The cancer admission rate per 1000 children/year is detailed in Table 5.
The pediatric inpatient service is highly utilized with average annual bed occupancy of 104.7% (SD 15.5). Admissions due to cancer were averagely 31.8 per 1000 per year (SD 12.8). Both the bed occupancy and cancer related admissions showed a gradual decrease during the last 3 to 4 years of the study period.

Paraplegia was present at diagnosis in 26/193 (13.5%) children diagnosed with BL at BHM since the onset of the service. Twelve cases died during or after treatment. Of the 14 long term survivors 12 (86%) had completely recovered and two (14%) were disabled with neurological sequelae.

Discussion

The organization of a health care system and a health care service, medical treatment services included, requires planning and is part of public health administration. Proper planning and organization of a care and treatment program is difficult without the availability of organized data. Many articles have reported poor documentation and organization of pediatric cancer programs and medical services in LMICs in contrast to HICs (Valsecchi MG 2008, Ribeiro RC 2008, Jeremy S et al, 2014).

In 2008, the annually reported incidence of cancer was 12.7 million globally while the reported number of death due to cancer was 7.6 million (Kim JL 2014; Ferlay J, 2010). The 5-year global cancer prevalence was estimated to be 28.8 million in 2008 (Bray F, 2008). According to prediction LMICs are expected to host close to 60 per cent of world cancer by 2050. Knowing the prediction helps and guides public health administrators in the allocation of resources for prevention (Bray F, 2006). Contrary in our study data on incidence and mortality of most childhood diseases were not available for the year 2008. All pediatric admissions and discharges for example are recorded in the general medical ward admission/discharge register that mixes both adults and children in the same register. Our study therefore identified underreporting of cases, the weakness and poor quality of the disease surveillance system, which prevails in many other countries (Bonita R). A recent study at the Windhoek Central Hospital, the only pediatric oncology-referring centre in Namibia, concluded that the incidence of cancer was very low compared to other countries because many cancers were still not diagnosed or reported, and others were not treated in the country (Stefan DC et al, 2014). Pediatric cancer data at BHM however were complete because of the existence of a comprehensive pediatric cancer program with a registry office using POND to record data of all pediatric cancer occurrences, and because of the presence of individual patients’ data collection tool well documented by a pediatric oncology nurse and the supervising physician. This study therefore confirms the important role of cancer registries in the documentation of cancer epidemiology (Gupta S et al. 2014).

The trend analysis of performance indicators of interest to this study shows a considerable increase of most indicators with patient attendance and other indicators having doubled during the study period (table 1), with exception of the pediatric outpatient and inpatient departments attendance, and the pediatric bed capacity that have increased only by 19.5%, 8.5% and 66.6% respectively (table 1). Childhood illnesses, compared to adults illnesses, contribute to the burden of disease at BHM with 14, 9% of overall OPD attendance, 21.5% of overall admission and 23.7% of overall death cases (table 1) because of lack of adequate pediatric OPD and inpatient services as shown by the trend of pediatric bed capacity in contrast to adult bed capacity for example that restrict the demand of pediatric services. These observations are similar to those of the HIV-AIDS control program in Cameroon and in other high HIV burden countries where there is a big gap between adult and pediatric care and treatment services due to quasi absence of organized pediatric HIV care and treatment services resulting in under diagnosed, poor linkage to treatment programs, poor treatment uptake and report of small number of children leaving with HIV who initiate treatment in contrast to adults (PMTCT global report 2014).
Although the pediatric inpatient attendance has increased by only 8.5%, the utilization rate of the pediatric ward exceeded the bed capacity as shown by the trend of pediatric annual bed occupancy rate, which was > 100% most of the time (4 years out of 7) with an average of 104.7% (SD: 15.5). The average admission rate due to cancer was 31.8 per 1000 per year, SD:12.8,(table 5). This means that the demand of pediatric inpatient service is far bigger than the actual pediatric inpatient service capacity that BHM administration is offering. The implication is that some pediatric patients, including those with cancer, are very often admitted in the adult ward where they are mixed with adult patients. There is therefore an urgent need to create additional capacity to treat children, a pediatric inpatient department with a spacious ward and its own staff members separated from the adult, or “general medical ward”, and which must be able to accommodate all pediatric patients and provide a section for pediatric cancer patients.

The trend analysis of the annual proportionate incidence and mortality of 10 selected childhood illnesses placed malaria in the first position and cancer in the fifth with a relatively stable incidence of 1 to 2 new cancer(s) case(s) per 1000 children per year just behind diarrhea, chest infections and anemia in term of incidence(table 2). The trend of malaria incidence showed a consistent decline over time during the study period. The decline of malaria incidence corresponds with the WHO report on the global trend of malaria incidence (WHO 2014). In term of mortality, malaria, chest infections, neonatal sepsis, anemia and diarrhea were successively the top five leading causes of pediatric death(table 3). Cancer was among the least reported causes of death at BHM in our study because many patients with advanced disease and treatment failure die at home rather than in the hospital, and therefore are not captured by hospital death data. Simple, inexpensive chemotherapy can achieve a cure rate of up to 60% at 1 year, implying that at least 40% will die of their illness (Hesseling PB et al, 2012). Some factors (underreporting, incomplete data, the setting) may bias the ranking of childhood diseases incidence and mortality in our study but, our review clearly shows that infectious diseases constitute the burden of childhood diseases at BHM and pediatric cancers are gradually contributing to the burden of disease. The distribution of childhood cancers occurrence at BHM is similar to that reported from the Chantal Biya Foundation pediatric oncology centre in Yaoundé (Enow-Orock G. E et al, 2012), and in a study conducted in children aged 0–15 years in the pediatric oncology ward at the university teaching hospital (UTH) of Lusaka in Zambia. The Zambian findings are consistent with reports from other LMICs in Sub Saharan Africa (Jeremy S. et al, 2014).Burkitt Lymphoma is the leading cancer in children at BHM, and predominates in males. Two of the 26 BL patients with paraplegia,(1 male and 1 female) had permanent squeal indicating that 13% of patient with Burkittlymphoma are at risk of living with a disability (paraplegia) in the course of their illness, and 1 % are left with permanent disability (paraplegia).

We noted that most children diagnosed with cancer at BHM come from the SWR and mainly from four divisions - Fako, Meme, Ndian and to a certain extent Manyu. No cases came from Lebialem or Kupemaneguba divisions probably because of lack of outreach and sensitization, topography and bad roads to and in these two divisions. Some cases did come from the Mungo and Wouri divisions in the Littoral region which shares it’s boundary with the SWR through these two divisions mentioned above. A few cases came from far regions like the Central and South regions, and even from a neighboring country, Chad, due to awareness of the pediatric cancer program at CBC HB hospitals

Conclusions

BHM is expanding its services at a fast rate. Although the burden of disease at BHM attributed to childhood illnesses represent less than 25% of the overall burden of disease in this setting as shown by OPD, in patient attendance and mortality data, the pediatric inpatient service is
overburdened with an average annual bed occupancy rate of 104%, underscoring the need for urgent expansion of this service.

Annual trends of childhood diseases reveal that communicable diseases led by malaria, diarrhea and chest infections contribute far more to the burden of pediatric diseases than cancers. There are gaps in registration and reporting of the incidence and mortality affecting our disease surveillance system, and the need for strategies to improve on data collection tools and reporting systems. Pediatric mortality at BHM showed a stable trend even though death due to cancer occurs more in the community after discharge from the hospital or even before admission because some children had never consulted a western health service provider. Cancer led by BL, occurs at the rate of 1 to 2 per 1000 children per year at BHM. With the pediatric cancer outreach program that aims to create awareness of early warning signs of pediatric cancers in the communities and among health care workers we can predict that if sensitization is done in the two divisions of the SWR not yet reached by the program (Lebialem and Kupemanenguba), the number of new cases of pediatric cancers will increase at BHM as demonstrated by cases coming from far regions like the Centre and South regions that are aware of the treatment program. The completeness and accuracy of pediatric cancer data is due to the existence of the POND cancer registry and good quality of primary data collection tools (patient treatment records).

In seven years of existence the pediatric cancer program of BHM has expanded and now covers 66.7% of the SWR where the hospital is located, and pediatric cancers are gradually contributing more to the burden of pediatric diseases at BHM. It would be of interest to incorporate the cost analysis, DALYs and QALYs into the analysis. Time constraints prevented this. Recommendations to the BHM administration are to increase the bed capacity in the pediatric ward, and to improve the health information management system.

Limitations of this study were that it was limited to a review of a health facility data retrospectively over a time period, and not a case control cohort study.

**Conflict of interest**
We declare no conflict of interest.

**Acknowledgements**
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**References**
[19]. UNAIDS 2014 PROGRESS REPORT ON THE GLOBAL PLAN towards the elimination of new HIV infections among children by 2015 and keeping their mothers alive
APPENDICES

Table 1: BHM performance indicators 2006 - 2013

<table>
<thead>
<tr>
<th>SN</th>
<th>Indicators</th>
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<th>2012</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>In and out patients ‘ load</strong></td>
<td>56,064</td>
<td>52,829</td>
<td>59,728</td>
<td>61,795</td>
<td>87,550</td>
<td>96,629</td>
<td>99,157</td>
<td>111,426</td>
</tr>
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<td></td>
<td>Doctors</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>8</td>
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</tr>
<tr>
<td></td>
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<td>30</td>
<td>43</td>
<td>43</td>
<td>31</td>
<td>42</td>
<td>63</td>
<td>72</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td><strong>2. OPD attendance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D Total OPD attendance:</td>
<td>53,346</td>
<td>50,465</td>
<td>56,689</td>
<td>58,898</td>
<td>84,180</td>
<td>93,252</td>
<td>95,270</td>
<td>106,894</td>
</tr>
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<td></td>
<td>N Paediatric OPD attendance:</td>
<td>13,346</td>
<td>11,766</td>
<td>13,058</td>
<td>11,174</td>
<td>12,943</td>
<td>10,696</td>
<td>15,219</td>
<td>15,960</td>
</tr>
<tr>
<td></td>
<td><strong>% of Pediatric OPD attendance</strong></td>
<td>25%</td>
<td>23.3%</td>
<td>23%</td>
<td>18.9%</td>
<td>15.3%</td>
<td>11.4%</td>
<td>15.9%</td>
<td>14.9%</td>
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<td></td>
<td><strong>3. Inpatient attendance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D Total inpatient attendance:</td>
<td>2 718</td>
<td>2 364</td>
<td>3 039</td>
<td>2 897</td>
<td>3 370</td>
<td>3 377</td>
<td>3 887</td>
<td>4 532</td>
</tr>
<tr>
<td></td>
<td>N Paediatric inpatient attendance:</td>
<td>898</td>
<td>510</td>
<td>639</td>
<td>696</td>
<td>750</td>
<td>706</td>
<td>777</td>
<td>975</td>
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<tr>
<td></td>
<td><strong>% pediatric inpatient attendance</strong></td>
<td>33%</td>
<td>21.5%</td>
<td>21.2%</td>
<td>24%</td>
<td>22.2%</td>
<td>20.9%</td>
<td>19.9%</td>
<td>21.5%</td>
</tr>
<tr>
<td></td>
<td><strong>4. Bed capacity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D Total bed capacity</td>
<td>44</td>
<td>45</td>
<td>44</td>
<td>47</td>
<td>50</td>
<td>50</td>
<td>81</td>
<td>87</td>
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<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>10</td>
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<tr>
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<td><strong>% of pediatric bed capacity</strong></td>
<td>13.6%</td>
<td>13.3%</td>
<td>13.6%</td>
<td>12.7%</td>
<td>12%</td>
<td>12%</td>
<td>8.6%</td>
<td>11.4%</td>
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<tr>
<td></td>
<td><strong>5. Mortality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>D Total Deaths</td>
<td>83</td>
<td>49</td>
<td>75</td>
<td>100</td>
<td>165</td>
<td>114</td>
<td>106</td>
<td>139</td>
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<td>N Paediatric deaths</td>
<td>45</td>
<td>22</td>
<td>30</td>
<td>38</td>
<td>50</td>
<td>26</td>
<td>47</td>
<td>37</td>
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<tr>
<td></td>
<td><strong>% of pediatric death</strong></td>
<td>54.2%</td>
<td>44.8%</td>
<td>40.3%</td>
<td>33.3%</td>
<td>22.6%</td>
<td>44.3%</td>
<td>23.7%</td>
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Key: SN - Serial number, D - Denominator, N – Numerator, NA: not available

Table 2: Incidence of childhood diseases (per 1000)

<table>
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<tr>
<th>SN</th>
<th>Indicators</th>
<th>2006</th>
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<th>2008</th>
<th>2009</th>
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<th>2011</th>
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<tr>
<td>D</td>
<td><strong>Paediatric OPD consultations</strong></td>
<td>13,346</td>
<td>11,766</td>
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<td>11,174</td>
<td>12,943</td>
<td>10,696</td>
<td>15,219</td>
<td>15,960</td>
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<tr>
<td>N1</td>
<td>• New malaria cases</td>
<td>2575</td>
<td>1741</td>
<td>1462</td>
<td>1182</td>
<td>2113</td>
<td>1578</td>
<td>1852</td>
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### Table 3: Proportionate Childhood illnesses mortality per 1000 children per year

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<td>Over all paediatric death</td>
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<td>22</td>
<td>30</td>
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<td>50</td>
<td>26</td>
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<td>33</td>
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<tr>
<td>N1</td>
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<td>02</td>
<td>05</td>
<td>08</td>
<td>03</td>
<td>02</td>
<td>03</td>
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<td>I1</td>
<td>Malaria specific mortality rate</td>
<td>40</td>
<td>90</td>
<td>167</td>
<td>210</td>
<td>60</td>
<td>70</td>
<td>60</td>
<td>150</td>
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<td>N2</td>
<td>Death due diarrhoeal diseases</td>
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<td>01</td>
<td>02</td>
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<td>00</td>
<td>00</td>
<td>00</td>
<td>04</td>
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<tr>
<td>I2</td>
<td>Diarrhoeal diseases specific mortality rate</td>
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<td>67</td>
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### Table 4: Proportionate incidence of Childhood cancers per 1000 children per year

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<td>17</td>
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<td>New cases of retinoblastoma</td>
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Key: SN - Serial number, D - Denominator, N – Numerator, I – Incident
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<td>6</td>
<td>6</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Number of pediatric hospital days</td>
<td>2839</td>
<td>1749</td>
<td>2210</td>
<td>2088</td>
<td>2642</td>
<td>2408</td>
<td>2513</td>
<td>3766</td>
</tr>
<tr>
<td><strong>Bedoccupancy rate</strong></td>
<td><strong>130%</strong></td>
<td><strong>80%</strong></td>
<td><strong>101%</strong></td>
<td><strong>95%</strong></td>
<td><strong>121%</strong></td>
<td><strong>110%</strong></td>
<td><strong>98%</strong></td>
<td><strong>103%</strong></td>
</tr>
<tr>
<td>Number of childhood cancers admissions</td>
<td>5</td>
<td>26</td>
<td>21</td>
<td>30</td>
<td>26</td>
<td>22</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Childhood cancers admission rate</td>
<td>6</td>
<td>50</td>
<td>32</td>
<td>43</td>
<td>34</td>
<td>31</td>
<td>33</td>
<td>26</td>
</tr>
</tbody>
</table>

Key: SN - Serial number, D - Denominator, N – Numerator,

**Table 5:** Childhood cancer admission rate per 1000 admission per Year
Nurses and Physicians’ Perceptions towards Physical Activity Promotion in Kanye Health Facilities – Botswana

Article by Sophonie Ndahayo¹ Monique Mukanyandwi-Ndahayo², Akeem T. Ketlogetswe³, Messina, Gofamodimo⁴
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Abstract
This study on perceptions, practices, and levels of physical activity (PA) promotion by nurses and physicians in Kanye health facilities is a quantitative cross-sectional research. The population comprised 220 prospective respondents (205 nurses and 15 physicians). Of those who agreed to participate, data were collected using a self-administered structured questionnaire after a pilot study. Simple random sampling was used in data collection. Data were analyzed using STATA. Findings were presented in the form of tables and graphs. Results showed 98.4% perceive PA as promoting health, while 92.3% said PA promotion is a daily duty of nurses and physicians. Of the total respondents, 61.3% were engaged in PA. A major finding of this research is that 89.2% of respondents perceive that PA promotion should be a requirement for contemporary health facilities. Results showed that a good number of respondents (67.6%) reported that they promote physical activity. Thus, hypothesis number two that there is a high proportion of nurses and physicians who do not promote PA was rejected at 0.05 level of significance. The study recommended the inclusion of PA promotion and skills in the curriculum of nurses and physicians.

Key words: physical activity (PA), PA promotion, general practice, moderate-intensity PA, engaged in PA.

Introduction
Although major epidemiological advancements have been accomplished in health and allied professions, the mortality, morbidity and disability attributed to noncommunicable diseases (NCDs) in 2004 accounted for about 60% of all mortality and 47% of the global burden of disease. These figures are expected to rise to 73% and 60%, respectively, by 2020 (World Health Organisation – WHO, 2008). Furthermore, the WHO stipulated that the greatest increase will be seen in the African region. NCDs, mainly cardiovascular diseases, cancers, chronic respiratory diseases and diabetes represent a leading threat to human and development. These four diseases are the world’s biggest killers, and 80% of all deaths are from low and middle-income countries. The two main risk factors for NCDs have been identified as diet and physical activity (PA). Steptoe et al. (1999) stated that in Catalonia in the United Kingdom, there was a lack of evidence regarding the levels of physical activity promotion; yet, Donaldson (2009) stated that the benefits of regular physical activity to health, longevity, well being and protection from serious illness have long been established. He emphasised that they easily surpass the effectiveness of any drugs or other medical treatment. The challenge for everyone, young and old alike, is to build these benefits into their daily lives. If a medication existed which had a similar effect, it would be regarded as a “wonder drug” or “miracle cure”. Donaldson (2009) concluded that it is crucial to encourage a culture of physical fitness in the population which spans all ages. This can be
achieved through physical activity promotion programmes by nurses and physicians. A review of literature does not show any study done in Botswana to find out the nature and extent of physical activity promotion in general practice by nurses and physicians.

Therefore, this study sought to investigate perceptions, practices, and the level of physical activity promotion by nurses and physicians in Kanye health facilities.

The broad objective of the study was to identify perceptions towards physical activity promotion to patients by nurses and physicians in Kanye health facilities.

The specific objectives were as follows:
- To determine Kanye health facilities nurses’ and physicians perceptions toward PA
- To identify the proportion of Kanye health facilities nurses and physicians engaged in regular PA
- To establish the frequency of PA health promotion to clients
- To establish factors (demographic and socio-economic) associated with PA promotion by nurses and doctors. For the purpose of this research, it is hypothesised that:
  1. There will be a high proportion of nurses and physicians that are not engaged in PA promotion.
  2. There will be a high proportion of nurses and physicians who do not promote PA to patients.

**Review of literature and related studies**

**Physical activity promotion setting**

While it has been recognised that physical activity (PA) is crucial to maintain health and prevent some noncommunicable diseases, it is also true that most people are still inactive. For example Donaldson (2009) said that inactivity affects 60-70% of the adult population in United Kingdom (UK); yet the potential benefits of physical activity to health are huge. Ribera, McKenna, and Riddoch (2005) showed that 88% of the studied physicians/ nurses promoted PA at least infrequently. Work conditions were perceived as unfavourable, with the main barriers being lack of time, training, and protocols. Physical activity was especially hindered by seeing PA as a secondary task, and patients ignoring recommendations. The research concluded that PA promotion remained to be integrated into practice consultations.

Findings of Sparling, Owen, Lambert, Haskell (2000) and USDHHS (1996) revealed that non-pharmacological, behavioural interventions may be more cost-effective and safer than the alternatives, and encouraging primary-care health professionals to promote physical activity is one feature of this approach. Similarly, Conn (2004) showed that interventions to increase PA reduce anxiety in healthy participants. Interventions were most effective when they included supervised PA, and were delivered to individuals, used moderate or high-intensity PA. Despite the fact that the framework document for the elaboration of the health plans of Catalonia emphasised that by the year 2000, fifty percent of physicians in primary care should promote physical activity to patients, there was a lack of evidence regarding the levels of PA promotion. Furthermore, the practices, barriers and personal behaviours that have been identified as predictors of promotional intensity in other westernised public health services remained unexplored (McKenna & Riddoch, 2005).

**Trend of inactivity**

The life style of many people has changed toward predisposing them to weight gain, which leads to high incidence of non-communicable diseases (Donaldson, 2009). The distance travelled on foot did not only decline in the Western world alone, but observations show that even in the developing world, this trend is prevalent. With inactivity being a major public health problem, the
medical community is searching for effective solutions to prevent these costly and deleterious health consequences (Epstein, 1998).

The United States (US) Department of Health and Human Services -USDHHS (1996) quoted by Ribera, McKenna, and Riddoch (2005) acknowledged that sedentary behaviour is one of the strongest risk-factors for many chronic diseases and conditions, including coronary heart disease, hypertension, diabetes mellitus type 2, osteoporosis, colon cancer, depression and anxiety. A reduction in sedentary lifestyles will have beneficial effects on sedentary-related diseases and will reduce future health-care expenditure (Guallar-Castillon, Lopez, Lozano, et al 2002; Gutierrez-Fisac, Banegas, Rodriguez, & Regidor 2000) quoted in Ribera, McKenna, and Riddoch (2005). Furthermore, Sparling et al (2000) said that while infectious diseases remain endemic in South Africa, morbidity from chronic diseases is increasing along with the prevalence of contributing risk factors such as smoking, sedentary living and a change from a more traditional to a Westernised diet. Levitt et al (1993) quoted in Sparling et al (2000), showed that over 40% of historically, socio-politically, disadvantaged persons living in urban communities reportedly do not participate in any leisure or occupational physical activity.

The role of health professionals in physical activity promotion

Results of a study by Lobelo and Frank (2009) showed that doctors are well positioned to provide physical activity counselling to patients. They are a respected source of health-related information and can provide continuing preventive counselling feedback and follow-up. The same research showed that clinical providers who themselves act on the advice they give, provide better counselling and motivation of their patients to adopt such health advice. It was recommended that medical schools need to increase the promotion of students adopting and maintaining regular physical activity habits to increase the rates and quality of future PA counselling delivered by doctors. This concept can also be extended to nursing schools especially in developing countries where the ratio of patient-nurse is higher than that of patient-physician. This assertion has been supported by the 1999 US Surgeon General report, which stated that health professionals, in addition to being role models for healthy behaviours, need to encourage their patients to get out of their chairs and start fitness programs tailored to their individual needs. An individually tailored exercise programme, delivered by trained nurses from within general practices, was effective in reducing falls in three different centres (Robertson, Devlin, Gardner, & Campbell (2001). This strategy should be combined with other successful interventions to form part of home programmes to prevent falls in elderly people. Results of this study showed that nurses’ health promotion reduced falls by 30% from an incidence rate ratio of 70%.

In addition, results of Sparling, Owen, Lambert and Haskell (2000) affirmed that healthcare settings offer a unique opportunity to counsel adults and young people about physical activity. The same authority went on to say that as esteemed professionals, physicians significantly influence their patients regarding healthy lifestyles.

Further results of a study by Elley, Kerse, Arroll, and Robinson (2003) showed that a trend towards decreasing blood pressure became apparent but no significant difference in four year risk of coronary heart disease among participants who engaged in health physical activity and those who were not. However, their conclusion was that counselling patients in general practice on exercise is effective in increasing physical activity and improving quality of life over 12 months.

In a study to examine the promotion of physical activity by general practitioners (GPs) and practice nurses (PNs), McKenna, Naylor, and McDowell’s (1998) results showed that GPs were less likely to regularly promote physical activity with their patients if they indicated lack of time as a barrier, or lack of incentives, and more likely to promote exercise if they themselves were regular exercisers. For PNs, personal physical activity stage was the strongest significant predictor of promotion level, but with a stronger effect than in the GPs.
The main finding was that GPs in the action or maintenance stage of changing their own physical activity are three times more likely to regularly promote the same behaviour in their patients than those in the other stages. However, for PNs the same difference quadruples the likelihood of them promoting physical activity. Professional readiness to change is influenced by known system barriers in GPs, and not in PNs, but is more strongly predicted by personal physical activity behaviour in both groups.

Nurses were more physically active than the GPs while both reported that the major barrier to being more physically active was a lack of time (McKenna, Naylor, & McDowell, 1997). The data suggested that PNs who are active themselves perceived system barriers as having less limiting effects on their level of physical activity promotion. They also report promoting physical activity more often with different patient groups than the irregularly active PNs. It was established that one possible means to increase levels of physical activity is the concept of preventive care in which general practitioners are encouraged to offer regular health checks to their adult patients, and health promotion services to all registered patients. In addition, Lim and Taylor (2005) highlighted that it is important that clinicians who care for people with health problems such as diabetes and arthritis provide advice on the possible benefits of physical activity as a routine part of clinical care (p. 39). Ribera, McKenna, and Riddoch (2005) found that a majority of staff (88%, n = 214) reported promoting PA in practice consultations. More nurses (93.5%) than physicians (84.1%) reported doing this. Personally active staff (action or maintenance stages) reported promoting PA to all patients. The majority of inactive staff (49.8%) promoted PA with few of their patients.

Recommended duration and type for daily physical activity

The United States department of health and human services (1996), quoted in Sparling, Owen, Lambert, and Haskell (2000) affirmed that when all research is considered collectively, a dose-response relationship between activity levels and disease prevention is clearly evident. Among questions that people debate is how long should one get engaged in physical activity? Pate et al, (1995; NIH, 1996; American College of Sports Medicine quoted in Sparling et al (2000), said that although specific recommendations may vary with age and health status, a consensus guideline is that every adult should accumulate 30 minutes or more of moderate-intensity endurance-type physical activity over the course of most days of the week. A distance of 3.2 kilometers per day could reduce American death rates by 5-6% from cardio-vascular heart diseases (CHD), diabetes, and colon cancer if 50% of the population made increases in physical activity practices (McKenna & Riddoch, 2005).

Over 60% of the adult population in England fail to meet the minimum recommendation of 30 minutes of physical activity five times a week (Donaldson (2009). This poses a substantial risk to public health. Everyone, irrespective of their age, can take action to reverse this dangerous trend, with significant benefits to their health and general wellbeing.

Donaldson’s report continued to say that 61% of men and 71% of women aged 16 years failed to meet the minimum adult recommendations for physical activity. Levels of inactivity amongst children are startlingly high. Amongst two to 15 year olds, 68% of boys and 76% of girls do not meet the minimum recommendation of an hour of moderate physical activity per day. As a result, children are being exposed to health risks including obesity, weak bones and future heart disease. The proportion of the population meeting recommended levels has increased in recent years, but the change is small.

Guidelines for physical activity

Hagberg (2005) guidelines for healthy adults under age 65 are 30 minutes a day, five days a week of moderately intensity physical activity or do vigorously intense cardio 20 minutes a day, three days a week and do eight to 10 strength-training exercise, eight to 12 repetitions of each
exercise twice a week. It should be noted that to lose weight or maintain weight loss, 60 to 90 minutes of physical activity may be necessary. The 30 minute recommendation is for the average healthy adult to maintain and reduce the risk for chronic disease.

Starting an exercise programme, one should choose activities enjoyed most to stay motivated. Activities include aerobic, swimming, jogging, cycling, playing basketball, running, taking stairs, and walking. Walking is described as a great way to do moderate-intensity physical activity.

The guidelines for older adults and adults with chronic conditions are similar to those for younger adults. Strength training is extremely important for all adults, but especially so for older adults, as it prevents loss of muscle mass and bone, and is beneficial for functional health. Three to six months of healthy lifestyle changes, including increased physical exercise, decreased salt intake, and weight loss, are currently recommended as the initial treatment for people with mild to moderate increases in blood pressure. Exercise also helps with weight control and improves blood cholesterol and glucose levels so that one’s risk of having heart attack or stroke is lower, even if the blood pressure is not reduced to normal levels.

Conceptual framework

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceptions</td>
<td>Nurses and physicians’ Physical activity promotion</td>
</tr>
<tr>
<td>Practices (acting on advice)</td>
<td></td>
</tr>
<tr>
<td>Stage of change</td>
<td></td>
</tr>
<tr>
<td>Training in PA</td>
<td></td>
</tr>
<tr>
<td>Profession</td>
<td></td>
</tr>
<tr>
<td>Setting</td>
<td></td>
</tr>
<tr>
<td>Use of preventive care concept</td>
<td></td>
</tr>
</tbody>
</table>

Methodology

Introduction

The purpose of this study was to identify perceptions, practices, and level of physical activity promotion by nurses and physicians to patients in Kanye health facilities. This chapter presented the research design to be followed, population of study, sample size, sampling method, research tool, data collection techniques, data analysis and presentation of findings.

Design

This research was a population cross-sectional study of whether nurses or physicians promote or do not promote physical activity. This utilised both quantitative and qualitative information from respondents.

Population
The study was conducted in Kanye health facilities in the Southern District, Botswana. The population of study comprised of nurses and physicians at the respective places. Kanye Seventh-day Adventist Hospital, which was the major health facility in the district, had a total of 145 nurses and 12 physicians (KSDAH Personnel Office). Surrounding clinics had a population estimated to 60 nurses and 3 doctors (Matron, Southern District Office). Thus the whole population was 220 prospective respondents.

Sample and sample size

Assuming a conservative physical activity promotion rate estimate of 69% (found in a prior research on physical activity promotion – Fox, Biddle, Edmunds, Bowler, and Killoran 1997) among nurses and physicians, with 5% precision and a 95% confidence interval, the required minimum sample size was 330 randomly selected individuals. However, the sample size was increased to 364 assuming that a non-response of 10% is expected. The formula to determine sample size when an estimate proportion is known was used.

Research tool

A 26- items structured questionnaire was used to collect data from respondents. The tool was filled in by respondents who were selected as members of that sample. The research instrument was pilot tested amongst 5 nurses and physicians randomly chosen from Kanye clinics to determine the reliability and validity of the tool. Results in question 10 and 11 helped the researchers to identify respondents’ stages of change and level of engagement in PA in relation to the trans-theoretical theory.

Data collection technique

Simple random sampling technique was used. The study used primary data collected using a questionnaire. The investigators distributed the questionnaires to individuals who consented to participate in the study. Data collected include demographic characteristics such as age and sex; perceptions towards physical activity. The study will be conducted from 1st July 2011 to 31st September 2011.

Ethical considerations

An application for ethical clearance to conduct the study was submitted to the Ministry of Health Human Research Ethics Committee. A letter seeking authorisation to access nurses and physicians was submitted to the Hospital Administrator of Kanye SDA Hospital and other relevant authorities, that is District Health Team. Data collected from participants was kept confidential and will remain anonymous as no identifiers will be used. The profession of nurse or physician will be considered in data analysis and interpretation. Data was shared only amongst investigators conducting the analysis and used only for the purpose of this study. Data has been stored in a locked drawer at the Kanye College of Nursing, and the consent forms will be kept for at least five years.

Data analysis and presentation

Data was entered in EPI INFO, cleaned and analysed using STATA. The analysis included descriptive analysis of the study population. Frequency tables of demographic and perception related factors will be produced. Cross-tabulations was also run to investigate associations between demographic and physical activity promotion. Chi-square test of association was done to find out whether such relationships are significant.
RESULTS AND DISCUSSIONS

Introduction

This chapter presents results of the study, and discusses them in light of the review of literature and related studies.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Characteristic</th>
<th>Total</th>
<th>Percentage</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>23</td>
<td>35.3</td>
<td>0.426</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>42</td>
<td>64.6</td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>Single</td>
<td>29</td>
<td>44.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>34</td>
<td>52.3</td>
<td>0.521</td>
</tr>
<tr>
<td></td>
<td>Widow</td>
<td>2</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Age-group</td>
<td>≤ 30 years</td>
<td>23</td>
<td>35.3</td>
<td>0.945</td>
</tr>
<tr>
<td></td>
<td>31-50</td>
<td>24</td>
<td>36.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>51 and above</td>
<td>14</td>
<td>21.5</td>
<td></td>
</tr>
<tr>
<td>Religion</td>
<td>Christian</td>
<td>55</td>
<td>84.6</td>
<td>0.489</td>
</tr>
<tr>
<td></td>
<td>Non-Christian</td>
<td>10</td>
<td>15.3</td>
<td></td>
</tr>
<tr>
<td>Profession</td>
<td>Nurse</td>
<td>53</td>
<td>81.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physician</td>
<td>12</td>
<td>18.4</td>
<td></td>
</tr>
<tr>
<td>Work- department</td>
<td>Clinic</td>
<td>37</td>
<td>56.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In-patient</td>
<td>11</td>
<td>16.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>10</td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td>Place of residence</td>
<td>Campus</td>
<td>24</td>
<td>36.9</td>
<td>0.602</td>
</tr>
<tr>
<td></td>
<td>Outside</td>
<td>41</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Diseases suffered</td>
<td>Psychiatric problems</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-communicable</td>
<td>12</td>
<td>18.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>5</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>46</td>
<td>70.7</td>
<td></td>
</tr>
<tr>
<td>Means of transport</td>
<td>Personal car</td>
<td>34</td>
<td>52.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Public</td>
<td>13</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Walking</td>
<td>18</td>
<td>27.6</td>
<td></td>
</tr>
</tbody>
</table>

Though according to the World Health Organisation (2006), the majority of health workers were women, these findings indicated that there were more males (64.6%) in the sample. This is an important finding as studies of factors associated with PA practice, males were found to be more active than females (Finn, Johannsen, and Specker (2002); Lim and Taylor (2005); and Plotnikoff et al. 2006). A sizeable number of respondents (52.3%) were married. More (72.2%) of the respondents were below age 50, which was supposed to be physically active as their strength and vigour are still at a high level. In their study on factors associated with physical activity in Canadian adults with diabetes, Plotnikoff, Taylor, Wilson, Courneya, Sigal, Birkett, Raine, and Svenson (2006), higher PA levels were associated with a younger age, being single, and a higher income. The majority (84.6%) were Christians, who should be exemplary in upholding health principles as advocated by the Bible’s teaching (Beloved, I pray that you may prosper in all things and be in health, just as your soul prospers. If anyone defiles the temple of God, God will destroy him. For the temple of God is holy, which temple you are 3 John verse 2 and 1Corithians 3 verse 17 respectively).

Results showed that 81.5% were nurses and 18.4% were physicians. This is the trend in health care institutions that nurses are more than medical doctors.
Sixty three percent of respondents resided outside of their work place, which an opportunity to walk to or from work, thus practice physical activity easily for those who cannot do the formal PA activities like basketball or football. This study showed that 18.4% suffered from some types of non-communicable diseases, which of a great concern worldwide and regular PA has brought relief to those who decide to practice. This was revealed in the Chief Medical Report of United Kingdom in 2009, which stated that the potential benefits of physical activity to health are huge. If a medication existed which had a similar effect, it would be regarded as a wonder drug or miracle cure.

Table 2 Distribution of nurses and physicians’ perception towards physical activity

<table>
<thead>
<tr>
<th>Variable</th>
<th>Characteristic</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA promotes health</td>
<td>Yes</td>
<td>64</td>
<td>98.4</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>PA promotion is daily duty</td>
<td>Yes</td>
<td>60</td>
<td>92.3</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>5</td>
<td>7.6</td>
</tr>
<tr>
<td>Perception about PA – it is for …</td>
<td>Rich people</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Young people</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Enhance health</td>
<td>47</td>
<td>72.3</td>
</tr>
<tr>
<td></td>
<td>Leisure activity</td>
<td>8</td>
<td>12.3</td>
</tr>
<tr>
<td></td>
<td>Lose weight</td>
<td>8</td>
<td>12.3</td>
</tr>
</tbody>
</table>

The great majority (98.4%) acknowledged that PA promotes health, while 92.3% said that PA promotion is a daily duty of nurses and physicians. Seventy two and 3 decimals percent said that PA enhances health and 12.3% perceived PA as an activity to reduce weight. Some 12.3% considered PA as a leisure activity.

Distribution of proportion of nurses and physicians’ promotion of PA to patients

Results showed that a good number of respondents (67.6%) reported that they promote physical activity. Thus, hypothesis number two that there is a high proportion of nurses and physicians who do not promote PA was rejected at 0.05 level of significance. These findings agree with those of Ribera, McKenna, and Riddoch (2005) who found that a majority of staff (88%, n = 214) reported promoting PA in practice consultations.

Table 3 – Distribution of type of physical activity practiced by respondents

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobics</td>
<td>9</td>
<td>13.8</td>
</tr>
<tr>
<td>Brisk-walking</td>
<td>15</td>
<td>23</td>
</tr>
<tr>
<td>Cycling</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Jogging</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Mountain climbing</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Stairs climbing</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Others</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>None</td>
<td>25</td>
<td>38</td>
</tr>
</tbody>
</table>

Table three above shows that of the total respondents, 38% were not engaged in any physical activity, while 61.3% were engaged in some PA. The findings agree with what other research found that males are more active than women as the studied population had a good representation of males (Finn, Johannsen, and Specker (2002); Lim and Taylor (2005); and Plotnikoff et al. 2006).
Distribution of respondents’ rate of promoting physical activity

Findings in table five show that more respondents (64.6%) sometimes promoted PA, which could be due to lack of time, and other barriers. These results confirmed what Ribera, McKenna, and Riddoch (2005) found that 88% of their studied physicians/nurses promoted PA at least infrequently. It is noticeable however, that 21.5% always promoted physical activity which also tallies with other associations found in the sample such as young age, and male gender.

Distribution of respondents’ perceptions towards whether physicians have opportunity to promote PA

The findings show that 46% of respondents perceived that physicians always have opportunity to promote physical activity, while 43% thought physicians sometimes have the said opportunity. These findings agree with Lobelo, Duperly and Frank (2009) who found that doctors are well positioned to provide physical activity counselling to patients. They are a respected source of health-related information and can provide continuing preventive counselling feedback and follow-up; they may have ethical obligations to prescribe physical activity. Research has shown that clinical providers who themselves act on the advice they give provide better counselling and motivation of their patients to adopt such health advice.

There is compelling evidence that the health of doctors (physicians) matters and those doctors’ own PA practices influence their clinical attitudes towards PA. In their study, Sparling, Owen, Lambert, and Haskell (2000) concluded that there is a need for healthcare clinicians and behavioural scientists to be proactive, persuasive and collaborative with business leaders and policy makers to incorporate environmental features that foster physical activity (e.g. green spaces/parks, walkways, bicycle commuter trails) in all aspects of development. These findings were in line with what was perceived in the table below, showing that always physicians have the responsibility to promote physical activity.

Distribution of respondents’ perceptions towards whether physicians have responsibility to promote PA

The study shows that the majority of respondents (69.2%) perceived that physicians always have the responsibility to promote PA. The was implied by Ribera, McKenna, and Riddoch (2006) found that PA promotion delivery rarely accounted for either patients' individual needs or the circumstances that influenced their interest in PA promotion. This was a missed opportunity in promotional consultations. It is therefore important that during consultations, physicians take the opportunity and promote PA.

Distribution of respondents’ perceptions towards whether nurses have the opportunity to promote PA

The majority of respondents (72%) perceived that nurses have the opportunity to promote PA. These findings is supported by Ryan (2008), who propounded that with their knowledge about health and interaction with co-workers and community leaders, school nurses also serve as an example to those around them by exhibiting healthy lifestyle behaviours. She added that School nurses are uniquely qualified to collaborate with others in planning, implementing, and evaluating a staff health promotion programme. This implies that they can also promote PA. In their study, Ribera, McKenna and Riddoch (2005) established that general practices are an ideal setting to advise on physical activity (PA). A majority of staff (88%, n = 214) reported promoting PA in practice consultations. More nurses (93.5%) than physicians (84.1%) reported doing this. As nurses exercise their duties in general practice, it is evident that they have the opportunity to promote PA. Over 70% of physicians and nurses perceived physical activity promotion as very important. When they perceive PA as important, especially in reducing the major contemporary
killing diseases: diabetes, high blood pressure, stroke, cancer, pulmonary chronic diseases, and then it will be right for them to promote PA to clients. This finding is a baseline for the following table that showed the 67.6% perceived nurses as being responsible for promoting PA.

**Distribution of respondents’ perceptions towards whether nurses have the responsibility to promote PA**

A good number of respondents (67.6%) perceive that nurses have the responsibility to promote PA. According to findings of Rollo (2004), as part of the holistic health assessment, nurses should ask their patients questions about the amount, type and frequency of the exercise they undertake. With a good understanding of the specific benefits for particular conditions they can then make recommendations for lifestyle changes that are relevant to their patients.

The findings of this study agree with McDowell, McKenna, and Naylor (1997) who stated that it is recognised that general practice do promote physical activity.

**Distribution of respondents’ perceptions towards types of barriers to PA**

Respondents’ perception towards types of barriers to PA promotion showed: lack of time 56.9%, lack of resources 13.8% lack of feedback 9.9%, and non-institution support 9.2%. These findings agree with those of Ribera, McKenna and Riddoch (2005) that work conditions were perceived as unfavourable, with the main barriers being lack of (i) time, (ii) training and (iii) protocols. Therefore, PA promotion was opportunistic, focused on selected patients, used generalized messages and was highly dependent on personal interests. Further, McDowell, McKenna, and Naylor (1997) identified that a large proportion of practice nurse (PN) in a single administrative catchment are currently promoting physical activity and this supports the notion that PNs are taking the responsibility for the role of health promotion in the practice environment, provided that they are appropriately trained and experienced, including health promotion. The data suggest that PNs who are active themselves perceive system barriers as having less limiting effects on their level of physical activity promotion.

**Distribution of respondents’ perception towards curriculum having PA promoting skills**

A sizeable number of respondents (69.2) perceived that their curriculum had limited or no preparation for health promotion, while 30.7% perceived that they had enough skills to promote PA. Nevertheless, this percentage is negligible considering the burden of non-communicable diseases in the developing nations. These findings seem to disagree with those of McDowell, McKenna, and Naylor (1997) who found in large number of practice nurses promoting PA. Of the PNs who reported not promoting activity, two thirds had received no formal training in this field in the past five years; significantly fewer than in the promoting PNs. It may be logically speculated that the provision of training may increase the numbers of promoting PNs thereby increasing the potential range for public contact. Though the studied population reported not having received enough training, they at the same time reported promoting PA, probably because of campaigns of the Ministry of health calling all health providers to promote PA to curb the scourge of non-communicable diseases.

**Distribution of respondents’ perceptions towards who should be a role model in PA practice**

Of the total respondents, 30.7% felt that nurses should be role models in PA practice and promotion, while 13.8% felt physicians should be the ones. Perhaps the most important finding of this study is that a sizeable number (53.3) of respondents reported that both nurses and physicians should be role models in practice and promotion of PA. The finding agree well with literature that states that nurses have enough time with patients, and physicians are well respected, thus their
health promoting counsel can be taken very seriously by clients. The findings also confirm the 1999 United States Surgeon General report, which stated that health professionals, in addition to being role models for healthy behaviours, need to encourage their patients to get out of their chairs and start fitness programs tailored to their individual needs.

Distribution of respondents’ perceptions towards PA promotion being a requirement for contemporary health facilities

A great majority of respondents (89.2%) felt that contemporary health facilities should promote physical activity. Only 10.7% of the studied population felt that it is not necessary to promote physical activity. It is very important that the respondents, being health professionals feel the urge to promote PA in the contemporary society as this is one of the objectives of the health objectives of many nations. Findings of this study agree with those of Sparling, Owen, Lambert, Haskell (2000) and USDHHS (1996) which revealed that non-pharmacological, behavioural interventions may be more cost-effective and safer than the alternatives means to alleviate the burden of NCDs, and encouraging primary-care health professionals to promote physical activity is one feature of this approach.

Conclusion

General practice-based physical activity promotion appears to have the potential to influence a larger proportion of patients. Nurses and physicians are in a better position to influence lifestyle changes among patients and local community. They are also better placed to market the more holistic lifestyle-oriented prescription of moderate physical activity currently being advocated by public health officials. The findings of this study are encouraging as the majority of respondents are involved in physical activity promotion and practice. The study revealed that a good number of respondents do not have the skills in PA. It was noted that a sizeable number of the studied sample are in the action and termination stages of the trans-theoretical theory, which shows that there is a great potential of general practice-based PA promotion to bring about lifestyle changes that promote health.

Recommendations

Based on the findings of this study, it recommended that:
1. Nurses’ and physicians’ training institutions include physical activity promotion skills in their curriculum.
2. Considering the prevalence rate of non-communicable diseases in Sub-Saharan Africa countries, and the role played by physical activity in their prevention and control, it is further recommended that the number of nurses may be increased so that time to promote PA may be availed if the number of patience per nurse goes down.
3. Both nurses and physicians should take every available opportunity to promote PA to patients as their advice is seriously appreciated by patients.

References

[26]. U.S. Department of health and human services, Centres for disease control and prevention, National centre for chronic disease prevention and health promotion, and the President’s council on physical fitness


Prevalence of multi-drug resistant tuberculosis among adult patients at Ndola Central Hospital, Ndola, Zambia

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Abstract

Study aimed at determining prevalence of Multi Drug Resistance Tuberculosis at Ndola Central Hospital among Adults, Ndola, Zambia.

A retrospective cohort study review was conducted among adult MDR-TB patients at Ndola Central Hospital from 15th August to 22nd August 2014. All records for MDR TB patients from MDR TB ward were reviewed (January 2010 up to June 2014). Sample size was 114, Convenient sampling was done using MDR- TB treatment register and laboratory results. Data was analyzed using Epi Data version 3, and Pearson Chi square. The findings revealed that 48.2% of the patients with MDR TB had sputum positive results for culture, compared to 6.6% whose sputum was negative. The study also found that, of all (114) MDR TB patients who were admitted in MDR TB ward at Ndola Central Hospital, only 44% had Multi drug resistance, 33% had Mono resistance, while 22.6% had Poly resistance. The findings revealed that 29.8% were new cases, 23.7% treatment failure, and 4.9% relapse. Discussion of findings shows that; almost 50% of the respondents had MDR TB which was confirmed by sputum culture results and others had poly resistance and mono resistance. The respondents were either new cases, treatment failure or relapse cases, which showed that there could be other factors associated with drug resistance.

Conclusion: prevalence rate of MDR TB was 44% and is major threat for TB control measures and proper treatment options.

Keywords: Prevalence, MDR-TB Resistance, Ndola, Zambia.

Chapter one

1.0 “Introduction”

MDR TB is a major health hazard in many countries worldwide and is considered a major threat to TB control and eradication. Globally, 3.5% of new and 20.5% of previously treated TB cases was estimated to have had MDR-TB in 2013. This translates into an estimated 480 000 people having developed MDR-TB in 2013 (1). In Zambia TB is a major public health problem which causes increased morbidity and mortality. The advent of MDR-TB impinges of the successful treatment of this preventable and curable infectious disease.

Analyses of MDR TB Epidemiological changes in Zambia were done in order establish the magnitude of the problem, so that prioritization of interventions on disease prevention and control are implemented for policy and practice. MDR TB is defined as Tuberculosis that is resistant to at least Isoniazid (INH) and Rifampcin (RMP) (2), with or without resistance to other drugs. MDR TB can either be due to acquired resistance or primary resistance. In Zambia we have the National TB Control Programme (NTP) which works in close collaboration with the National TB reference laboratory network to ensure early diagnosis and treatment. Therefore, appropriate management of MDR- TB cases would allow the NTP to achieve good cure rates and reduce the risk of transmission of resistant strains. The prevalence of MDR TB in Zambia is low as there have been scarce studies done to establish the disease burden at national level and district level.
Ndola Central Hospital has been reporting increased incidence and prevalence of MDR TB cases since 2009. It is a referral center for Copperbelt, Northwestern, Northern, Muchinga and Luapula Province covering the northern part of the country. Therefore, the investigator would like to establish the disease burden of MDR-TB.

1.2 Literature review:

This chapter reviewed the literature related to MDR-TB. The literature review provided the reader with an overview of major academic works done by other scholars. An electronic search on key words published only in peer reviewed articles in data bases where university of Zambia subscribes were performed to compile the main body of literature that have been reviewed. Journal articles were also reviewed and made consultation to people involved in TB research for current facts on MDR-TB.

1.2.1 Disease burden

WHO, estimated that, there were about 0.5 million new MDR-TB cases in the world in 2011, and 60% of these cases occurred in Brazil, China, India, the Russian federation and South Africa alone (7). However, WHO 2014 report revealed that there are five high MDR-TB burden countries (Ethiopia, Kazakhstan, Myanmar, Pakistan and Viet Nam) achieved treatment success rates of ≥70%. However, overall only 48% of patients with MDR-TB were successfully treated, largely as a result of high mortality and loss to follow-up (1). The study revealed that proportion of TB cases with drug resistance was about 3.7% of new tuberculosis patients in the world have MDR strain (2). However, recent studies done by NRITLD 2013 revealed that, there about 425000 new MDR TB cases occur in the world and constituted about 5% of overall TB burden (4). Its prevalence worldwide was approximately 2 to 3 times this number (5).

According to WHO 2014, reported that in 2013, there were 480 000 new cases of MDR-TB worldwide, and approximately 210 000 deaths from MDR-TB. Among patients with pulmonary TB who were notified in 2013, an estimated 300 000 had MDR-TB. More than half of these patients were in India, China and the Russian Federation (1). The study done in South Africa revealed that provincial differences confirmed case yield of 32% (range 24%- 45%), smear positive 79% (range (72%- 84%), S - / C+ proportion 21% (range 16% - 28%). The treatment success was 89%, while treatment failure was 10.4% and treatment effectiveness accounted success of 49.2% as an outcome of all patients started on treatment (9). A study done in Ethiopia reported a high prevalence rate of MDR-TB which ranged from 3.3%-46.3% (15).

In Zambia TB is one of the major Health problems with National prevalence of 568/100 000 (14). A retrospective review of national surveillance of MDR- TB data was done in Zambia from 2001 to 2011, the finding revealed that total number of DST performed during 11 year period was 2,038 which accounted for 2.6% (2,038/78,639) of all the retreatment cases notified (12).

Ndola Central hospital has been receiving patients with MDR – TB as a referral center. Review of data shows that there has been an increase in the disease burden as shown below for the year 2013.

2013 first quarter MDR TB new admissions

Table 1: NCH/MDR- Tb ward/ Hmis 2013 (12) showing that there were 26 cases of MDR- TB admissions, among these one died in second quarter.

<table>
<thead>
<tr>
<th></th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>10</td>
<td>3</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Female</td>
<td>15</td>
<td>3</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
1.3 Statement of the problem

Review of data highlights an increase in the prevalence of MDR-TB globally. The global MDR – TB in 2010 was estimated to be 650 000 cases of which majority were reported from Eastern Europe and Asia, with sub-Saharan Africa for a very small undefined proportion (14). According to WHO report there were 480 000 new cases of MDR-TB worldwide, and approximately 210 000 deaths from MDR-TB (1). In Africa data on MDR-TB is scarce, however, between 2007 and 2012, a total of 65,422 MDR-TB cases were reported by 15 countries (15). WHO reported that South Africa comprises of 87.9% of the African burden of MDR-TB with estimated MDR-TB prevalence among all cases in South Africa of 15,419 cases (16). In Zambia 446 cases were reported in 2011 through the National surveillance review (11). However, there has been a steady increase in the number of MDR – TB cases as shown by the statistics from Ndola Central Hospital MDR- TB ward. In 2009 when the Centre was opened there were 4 cases of MDR- TB which were notified as new cases and analysis of 2012 records revealed an increase in the disease burden of 30 cases recorded at NCH/MDR- TB ward. Currently, there are 11 patients admitted with MDR –TB, of these 5 are males and 6 females in 2014 up to June (10). In view of the above, the investigator would like to establish the disease burden in order to explore and recommend interventions which can help curb the scurge and for policy prescription. What could be escalating the prevalence of MDR –TB in Ndola, Zambia? How many patients were admitted at NCH with MDR- TB from 2010 to 2014?

1.4 Justification

The investigator aimed at establishing the magnitude of MDR- TB at NCH among adults as it is a major threat to the health of the nation. The investigation from the public health perspective will help in understanding the disease burden in order to come up with good policy prescriptions in the prevention and control of MDR- TB. The study also generated first hand data based on local experience and strengthens planning and implementation of interventions.

1.5 Case finding

According to the Zambian MDR- TB guideline, MDR- TB should be suspected when a patient has persistent positive acid fast bacilli smear or culture (beyond five months of treatment with category I) or clinical progression of TB while on standard chemotherapy (12).

Chapter two: Objectives

2.0 General Objective

To determine the prevalence of MDR TB: Ndola Central Hospital, Ndola, Zambia

2.1 Specific Objective

1. To establish the proportion of MDR- TB cases at Ndola Central Hospital.
2. To identify factors escalating MDR –TB.

2.2 Research Question

“How many patients were admitted at NCH with MDR- TB from 2010 to 2014?”

2.3 Definitions

2.3.1 General definitions of resistance (10)

The category IV diagnostic criteria is defined as “chronic cases” i.e. still smear positive after supervised retreatment; proven or suspected MDR- TB.
A patient is determined to have drug resistant TB only through laboratory confirmation (culture and drug susceptibility testing) of resistance of one or more first line antituberculosis treatment.

Multi-drug resistant (MDR-TB) tuberculosis that is resistant to at least Isoniazid and Rifampcin.

Drug resistance refers to patient pulmonary tuberculosis coughing out bacilli resistant to one or more anti-tuberculosis drugs.

2.3 Bacteriology and sputum conversion

Bacteriological examinations in patients with drug resistant TB should include sputum smear microscopy and culture. All patients suspected of having MDR- TB must have two sputum samples collected at the health facility. Direct smear can be analyzed at the nearest diagnostic facility, however on sample must be sent for culture and DST (10).

Chapter Three: Methodology

3.1 Research Design

A Retrospective Cohort study using the existing data and laboratory results in patient files and MDR TB register was reviewed at Ndola Central Hospital for all MDR TB patients who had their culture and drug susceptibility test done at Ndola Central Hospital. Period under review involved patients who were admitted between 2010 and June 2014. Data on the patient’s characteristics were obtained from the MDR- TB treatment file and MDR-TB register.

3.2 Research Setting

The study was carried out at Ndola Central Hospital MDR TB ward as it is the second referral centre for MDR-TB in Zambia. The site had been purposely selected as it is a referral centre covering Copperbelt Province, North Western, Luapula, Northern and Muchinga Province.

3.3 Study Population:

A cohort of all 114 MDR- TB patients who were admitted at Ndola Central Hospital for MDR TB between January 2010 and 2014 June in MDR TB ward.

3.4 Sample Selection

Convenient sampling method was used as it involved the use of all research subjects at the research site.

Inclusion criteria: All MDR- TB patients category IV cohort, who were confirmed with smear positive or negative, Notified, on treatment and/ or completed treatment at Ndola Central Hospital from 2010 to 2014 June.

Exclusion criteria: All MDR- TB patients category IV cohort, who were confirmed with smear positive or negative, Notified, on treatment and/ or completed treatment outside Ndola central hospital from 2010 to June 2014.

3.5 Data collection tool

Structured checklist modified from the Zambia National Tuberculosis and Leprosy Control program for category IV treatment MDR- TB guideline was used during review of records (see appendix II).
3.6 Data collection technique

This study used a structured checklist through observation to enhance proper data collection on the existing data base in the patient’s file and MDR- TB patient register. Data was collected from 18th to 23rd August 2014.

3.7 Sample size:

The sample size was 114 patients who were notified since January 2010 to June 2014, this was a population study.

3.8 Ethical consideration:

Consent was obtained from Ndola Central Hospital to review the register and patients’ files. There was no risk and immediate benefits to those patients whose - files were reviewed. Consent was not obtained from patients whose records were reviewed as permission was sort from Ndola central hospital. Patients were in a natural setting and hence were not exposed to emotional or physical harm since there was no contact with the investigator. Confidentiality and anonymity was maintained to all patients records as their names did not appear on the checklist, instead the serial number were used. Privacy was maintained as all patients records were reviewed in a in a private room and filled in checklists were kept under lock and key after each review.

Chapter Four: Data presentation and analysis

4.0 Introduction

The study aimed at determining the prevalence of MDR TB among adult patients who were admitted at NCH in MDR TB ward. A Total of 114 records were reviewed for MDR TB patients who were admitted in the MDR TB ward at NCH from January 2010 to 2014 June. Category IV treatment cohort consisted of a subset of patients recorded in category IV register who started category treatment during the specified time period (2010 to 2014 June). The findings of the study were based on analysis of data collected from the patients’ records and MDR TB register. The data was sorted out for completeness, categorized and coded. Data was analyzed using Epi Data version 3, and 95% confidence interval was set together with estimates using Pearson Chi square. Cut off point for significance was set at 5%. Statistical significance achieved if P value is 0.05 or less, thereby rejecting the null hypothesis. The data was analyzed by univariate analysis to make frequency tables, then bivariate analysis to make cross tabulations. The data was presented using tables and graph for easy communication.

4.1 Demographic Data

Table 2: Sex (n=114)

<table>
<thead>
<tr>
<th>Sex</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Males)</td>
<td>77</td>
<td>68.1</td>
</tr>
<tr>
<td>2 (Females)</td>
<td>37</td>
<td>31.9</td>
</tr>
<tr>
<td>Total</td>
<td>114</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table above shows that majority 68.1% of the MDR TB patients were males, while 31.9% were females.
Table 3: Frequency of MDR TB patients according to years (n = 114)

<table>
<thead>
<tr>
<th>Years</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>28</td>
<td>24.6</td>
</tr>
<tr>
<td>2011</td>
<td>21</td>
<td>18.4</td>
</tr>
<tr>
<td>2012</td>
<td>30</td>
<td>26.3</td>
</tr>
<tr>
<td>2013</td>
<td>17</td>
<td>14.9</td>
</tr>
<tr>
<td>2014</td>
<td>18</td>
<td>15.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>114</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 3 revealed that there were more cases 26.3% of MDR TB patients who were admitted in 2012 than 14.9% in 2013.

Table 4: Sputum Culture Results (n= 74)

<table>
<thead>
<tr>
<th>Sputum results(culture)</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (positive)</td>
<td>65</td>
<td>87.8</td>
</tr>
<tr>
<td>2 (negative)</td>
<td>9</td>
<td>12.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>74</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 4 shows that majority 87.8% sputum results were positive, while 12.2% were negative.

Table 5: Sputum Microscopy (n = 114)

<table>
<thead>
<tr>
<th>Sputum result</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>106</td>
<td>92.7%</td>
</tr>
<tr>
<td>Negative</td>
<td>8</td>
<td>7.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>114</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Table 5 shows that, 92.7% of sputum results for microscopy were positive, while 7% were negative.

Table 6: Drug Sensitivity Test (DST) Result (n=114)

<table>
<thead>
<tr>
<th>DST results</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Mono)</td>
<td>28</td>
<td>33.3</td>
</tr>
<tr>
<td>2 (MDR)</td>
<td>37</td>
<td>44.0</td>
</tr>
<tr>
<td>3 (Poly)</td>
<td>19</td>
<td>22.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>84</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

The above table shows that only 44% of admitted patients had MDR TB, 33% had Mono resistance, while 22.6% had Poly resistance to TB drugs. However, 26.3% had incomplete or missing records.

Table 7: Reason for Category IV Treatment Card

<table>
<thead>
<tr>
<th>Reason for CAT IV</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>After default</td>
<td>7</td>
<td>6.1</td>
</tr>
<tr>
<td>After failure of first treatment</td>
<td>27</td>
<td>23.7</td>
</tr>
<tr>
<td>New</td>
<td>34</td>
<td>29.8</td>
</tr>
<tr>
<td>Relapse</td>
<td>17</td>
<td>14.9</td>
</tr>
<tr>
<td>After failure of re treatment</td>
<td>1</td>
<td>.9</td>
</tr>
<tr>
<td>transfer in</td>
<td>1</td>
<td>.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>114</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
The table above shows varied reasons for MDR TB, findings revealed that 29.8% were new cases, 23.7% were due to failure of first line treatment, 14.9% were due to relapse, 0.9% due to failure of re treatment, while 6.1% were due to default.

Table 8: Drug Sensitivity Test Result (DST) and Reason for CAT IV Treatment

<table>
<thead>
<tr>
<th>Reasons for cat iv</th>
<th>DST results</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 Mono</td>
<td>2 MDR</td>
</tr>
<tr>
<td>1 Default</td>
<td>2 (40%)</td>
<td>1 (20%)</td>
</tr>
<tr>
<td>2 Failure of first line treatment</td>
<td>5 (23.8%)</td>
<td>13 (61.9%)</td>
</tr>
<tr>
<td>3 New</td>
<td>15 (53.5%)</td>
<td>6 (21.4%)</td>
</tr>
<tr>
<td>4 Relapse</td>
<td>0 (0%)</td>
<td>10 (83.3%)</td>
</tr>
<tr>
<td>5 After failure of re treatment</td>
<td>1 (4.3%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>23 (34.3%)</td>
<td>30 (44.7%)</td>
</tr>
</tbody>
</table>

*Note: Interpretation should be done with caution because denominator is less than 30.

Table 8 shows that most of the patients with failure to first line treatment were due to MDR 61.9%, while Mono resistance was 23.8% and Poly was 14.2%. Pearson Chi square 20.872a, df = 8, P value 0.007 (significant at p < 0.05)

Table 9: DST Result and Sex (n = 114)

<table>
<thead>
<tr>
<th>DST result</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mono</td>
<td>2 MDR</td>
</tr>
<tr>
<td>SEX 1(Males)</td>
<td></td>
</tr>
<tr>
<td>17 (30.9%)</td>
<td>26 (47.2%)</td>
</tr>
<tr>
<td>11 (37.9%)</td>
<td>11 (37.9%)</td>
</tr>
<tr>
<td>Total</td>
<td>28 (33.3%)</td>
</tr>
</tbody>
</table>

Table 9 shows that there were 47.2% males with confirmed MDR TB compared to 37.9% females. However, these proportions were not significantly different (Pearson Chi square 0.702, df = 2, P value = 0.704).

Table 10: Sputum Culture and Drug Resistance

<table>
<thead>
<tr>
<th>Sputum result</th>
<th>Drug resistance</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mono</td>
<td>2 MDR</td>
<td>3 Poly</td>
</tr>
<tr>
<td>1 (positive)</td>
<td>20 (34.4%)</td>
<td>28 (48.2%)</td>
</tr>
<tr>
<td>2 (negative)</td>
<td>1 (25%)</td>
<td>2 (50%)</td>
</tr>
<tr>
<td>Total</td>
<td>21 (33.8%)</td>
<td>30 (48.3%)</td>
</tr>
</tbody>
</table>

Table 10 shows that almost half 48.2% (28) of the patients with MDR TB had sputum positive results for culture, compared to 6.6% (2) whose sputum was negative. Pearson Chi square 0.229a, df = 2, P value 0.892. (Not significant at P< 0.05)

Chapter five: Discussion of Findings

5.0 “Introduction”

The main objective of the study was to determine the prevalence of MDR TB among adult patients who were admitted at Ndola Central Hospital in MDR TB ward from 2010 to 2014 June. The Cohort study involved review of 126 patients’ records and MDR TB register which were obtained from MDR TB ward at NCH and only 114 records met the criteria for selection into the study. Review of records was done from 18/08/14 to 22/08/14 using a structured checklist. In this
study the themes used to discuss the findings are: Demographic Characteristics and Drug resistance results.

In this study majority 68.1% of the MDR TB patients were males, while females accounted 31.9%. However sex was not associated with MDR TB (P value 0.704). This could be attributed to poor health seeking behavior by most males as they seem to be busy and attach little attention even to their own health, however, females have a caring role for all family members and seek medical attention early.

The study findings revealed that, there were 114 cases of MDR TB among adults who were admitted at NCH during the period under review, of these, 26.3% (30) of MDR TB patients were admitted in 2012 while 14.9% (17) in 2013.

Findings revealed that most 87.8% of sputum results for culture were positive, while 12.2% were negative; however, 35.1% had no results. This could be attributed to poor record keeping, poor screening practices or inconsistent laboratory operations due to insufficient reagents. The findings further revealed that, most 92.7% of the sputum results for microscopy were positive, while 7% were negative. This is almost similar with the findings done in South Africa by Weyner who stated that smear positivity was 79%, while S-/C+ proportion was 21% (9). The study findings revealed that there is no association between sputum for culture result and MDR TB (P value 0.892).

The study showed that almost half 48.2% (28) of the patients with MDR TB had sputum positive results for culture, compared to 6.6% (2) whose sputum was negative. This shows that there could be an association between positive sputum result and MDR TB. The study further revealed that, of all (114) MDR TB patients who were admitted in MDR TB ward at NCH, only 44% (37) of these patients had Multi drug resistance , 33% had Mono resistance, while 22.6% had Poly resistance to TB drugs. There was no XDR-TB case found. However, 26.3% had incomplete or missing records. This finding supports the findings of Kapata N (2013) done in Zambia on National Surveillance of MDR TB data reported that the total MDR TB cases were 446, poly resistance was 18.9% and Mono resistance was 8.8% and no case of XDR-TB reported (11).

The findings also showed varied reasons for MDR TB prevalence, findings revealed that 29.8% were new cases, 23.7% were due to failure of first line treatment,14.9% were due to relapse, 0.9% were due to failure of re treatment, while 6.1% were due to default. The findings revealed that there was a significant relationship between reasons for failure and MDR TB (P value 0.007). This compliments the study findings done by NRITLD (2013) whose findings reported that MDR TB was approximately 5% among new TB and 48.2% among re treatments in Iran (5). Study done by Weyner in South Africa revealed that MDR TB in New cases was 1.6%, while in retreatment was 6.7% (9). However, there are variations in these findings as the percentage of new cases in Ndola is higher than theirs and vise versa. This could be attributed to other factors.

5.1 Limitation and strengths of the study

Lack of adequate resources such, as funds and the time frame, in which the research project was completed. Delay in ethical approval was a major challenge. Ndola has been selected for convenience purposes. Notable strength of the study it is the first known research step towards addressing the various implementation problems that constrain service delivery.

5.2 Conclusion

MDR TB is Major threat to successful management of patients due resistance to first line treatment which is cheaper. The study revealed that there was inconsistence in the performance of sputum for culture and drug sensitivity test as a gold standard in determining MDR TB as there were gaps, as some patients were treated based on assumptions.
The other problem was that of incomplete recording system and poor filing of patients’ records, and poor follow up to ascertain patient’s outcome. Gaps were seen in infection prevention as visitors and patients moved freely without infection prevention measure being observed. Therefore, there is need to ensure that management of patients is done by skilled health staff based on analysis of epidemiological disease pattern and understanding treatment modalities. Significant strengthening of human and technical resources, accompanied by sufficient financial resources to create a conducive environment for the admitted patients as it is in deplorable state. There is need to develop and/or reorganize existing logistical operations to improve service delivery. Therefore, there is need to ensure prompt case management and early diagnosis, and Contact tracing is important in managing exposed contacts.

5.3 Recommendations

- Also community sensitization on importance early seeking behavior must be emphasized and MDR TB must be treated as a priority because of its severity and contagiousness.
- Need to strengthen infection prevention practices in MDR TB ward at NCH
- NCH to lobby for funds from MOH to rehabilitate and equip the ward as it is in deplorable state.
- There is need to invest in research of Drug resistance tuberculosis so as to establish the magnitude of the problem.
- NCH to lobby for more staffing for MDR TB ward as there is critical shortage to improve Service delivery.

“Acknowledgement”

My sincere gratitude goes to Ndola Central Hospital Management for granting me an opportunity to undertake this project.

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Association of HIV to Pulmonary Tuberculosis in Chest Clinic of a General Hospital in Lagos, Nigeria

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Abstract

Objective: To determine the prevalence rate of Human Immuno-deficiency Virus(HIV) among tuberculosis (TB) patients in a general hospital in Lagos, Nigeria.

Methods: This is a cross-sectional study. Demographic information was retrieved from the register of TB patients, HIV testing was done through rapid testing and confirmation by the hospital laboratory. Descriptive statistics was used to get the characteristics of the study participants. Bivariate analysis was performed for estimation of odd ratio (OR) and 95% confidence interval (CI). Chi square was utilized for the determination of the relationships that exists between study variables. P-values <0.05 were considered significant.

Results: All the 130 patients gave consent to be tested for HIV. Eighty-eight (88) of the patients were male representing 67.7% of the patients and 85.4% of the patients had sputum smear positive pulmonary tuberculosis (TB) while the rest were sputum smear negative.20 (15.4%) were HIV-positive. HIV prevalence among male patients was 13.6% (p value=0.42), but 19.1% (p value=0.42) among female patients. Prevalence of HIV among sputum smear positive pulmonary TB patients was 13.5% (p value=0.15) and 26.3% (p value=0.15) among sputum smear negative patients.

Conclusions: This study revealed that HIV prevalence is higher among pulmonary TB patients than among the general population in Nigeria. It further lays credence to the close link that exists between active TB and HIV/AIDS infection in Nigeria, and the higher proportion of sputum smear negativity is found in HIV positive patients. There is a need therefore for a program to address HIV/TB co-infection.

Keywords: Tuberculosis, HIV, co-infection, Lagos, Nigeria.
alliance between HIV and TB epidemics has further compounded, in great significance the suffering and mortality attributable to each disease alone. (Raizada et al, 2008).

In the 2004 guidelines for HIV surveillance among TB patients released by the WHO, it was recommended that generalised and concentrated epidemics data from routine HIV should be used for the counselling and testing of all TB patients to form the basis for the surveillance (WHO, 2004, 20 June). The TB-HIV epidemic in Nigeria is said to still be unfolding according to the end of project report of Global HIV/AIDS Initiative Nigeria (GHAIN) in 2010, the report also stated that collaborative activities are more or less at an infancy stage in Nigeria and that there is a need for these activities to be further scaled up at all levels, by all tiers of government and its partners making available committed funds for the implementation of joint TB-HIV activities. In addition, surveillance provides necessary information for the monitoring of the effectiveness of joint strategies that are aimed at reducing the impact of HIV among TB patients.

The objectives of this study were to investigate the feasibility of screening TB patients registered for treatment in a TB clinic at a General Hospital situated in Lagos, Nigeria, and to describe HIV prevalence among these TB patients, with the main aim of determining the HIV prevalence rate among TB patients in Lagos, Nigeria.

**Methods**

A cross-sectional study of all TB patients registered for treatment in the health facility studied, was conducted between January and August 2015. This treatment centre is a catchment area for about 500,000 residents. The selection of this site was based on the fact that it serves a mixture of middle class and low class patients, also that it serves as a referral centre for all suspected TB cases from adjoining smaller health services centres. This centre also boasts of an array of well trained personnel, and an ample and conducive space for delivering health education and counselling of patients with an enhanced assurance of privacy and confidentiality.

All TB patients, diagnosed following National Tuberculosis and Leprosy Control Programme (NTBLCP) guidelines, and who gave informed consent were included in the study. A specially trained nurse and a laboratory scientist were used to provide health education, counselling and testing, with great concern about their privacy and confidentiality.

Data for this study were extracted from a standard TB/HIV registers maintained at the study site. The patients so registered, were tested for HIV using Rapid HIV kit. After the test, the results of those that were negative were handed over to them after post-test counselling. Those that were reactive were sent to the hospital laboratory for confirmation of their HIV status, where a cross check was done using a HIV I&II Determine Rapid kit, and those patients that were found to be reactive, were confirmed using two different ELISA, HIV Ag/Ab Combination made by Abbott Murex and HIV Anti-lab system kits, read by a Multiscan MS ELISA Reader. These TB patients, so confirmed for HIV, were given a post-test counselling and referred to the Anti-retroviral Therapy (ART) clinic of the hospital for further care and support services which included ART according to national guidelines for Nigeria.

**Statistical analysis**

Data were analysed using Statistical Package for Social Sciences (SPSS) V.20.0 (IBM Corporation). Summary statistics were computed for continuous variables. Frequencies were calculated for categorical variables. Chi-square was used to compare different variables between HIV-positive and HIV-negative TB patients. Bivariate analysis was performed for estimation of OR and 95% CI. A p value of <0.05 was considered significant.

**Ethical requirement**

The study was approved by the Ethical Review Committee of the hospital, which is a General Hospital under the auspices of the Lagos State Health Service Commission.
Results

All the 130 patients in the TB register gave consent to be tested for HIV after education and counselling, out of those tested, 20 of them were found to be HIV positive after confirmatory test was done and all the 20 patients whose confirmatory tests results were returned positive came back for their results, and all of them were successfully registered at the ART site.

Table 1: Distribution of tuberculosis patient according to their characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>88</td>
<td>67.7</td>
</tr>
<tr>
<td>Female</td>
<td>42</td>
<td>32.3</td>
</tr>
<tr>
<td><strong>Age in years</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-20</td>
<td>14</td>
<td>10.8</td>
</tr>
<tr>
<td>21-30</td>
<td>41</td>
<td>31.5</td>
</tr>
<tr>
<td>31-40</td>
<td>36</td>
<td>27.7</td>
</tr>
<tr>
<td>41-50</td>
<td>19</td>
<td>14.6</td>
</tr>
<tr>
<td>51-60</td>
<td>11</td>
<td>8.5</td>
</tr>
<tr>
<td>61-70</td>
<td>7</td>
<td>5.4</td>
</tr>
<tr>
<td>71-80</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>HIV status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>110</td>
<td>84.6</td>
</tr>
<tr>
<td>Positive</td>
<td>20</td>
<td>5.4</td>
</tr>
<tr>
<td><strong>Sputum status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*AFB Positive</td>
<td>111</td>
<td>85.4</td>
</tr>
<tr>
<td>*AFB Negative</td>
<td>19</td>
<td>14.6</td>
</tr>
</tbody>
</table>

Table 1 shows that the mean age is 35.6 years (range 12-72 years). Eighty-eight (88) of the patients were male representing 67.7% of the patients and 85.4% of the patients had sputum smear positive pulmonary tuberculosis (TB) while the rest (14.6%) were sputum smear negative. Twenty (20) of the respondents were HIV positive representing 15.4% of the respondents.

Table 2: Distribution of HIV status of tuberculosis patient according to their gender and age

<table>
<thead>
<tr>
<th>HIV status</th>
<th>Odd Ratio (95% CI*)</th>
<th>P-value**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive (%)</td>
<td>Negative (%)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12 (13.6)</td>
<td>76 (86.4)</td>
</tr>
<tr>
<td>Female</td>
<td>8 (19.5)</td>
<td>34 (81.0)</td>
</tr>
<tr>
<td>Age in years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-20 (7.1)</td>
<td>13 (92.9)</td>
<td>0.39 (0.05-3.18)</td>
</tr>
<tr>
<td>21-302 (4.9)</td>
<td>39 (95.1)</td>
<td>0.20 (0.05-0.91)</td>
</tr>
<tr>
<td>31-40 10 (27.8)</td>
<td>26 (72.2)</td>
<td>3.23 (1.21-8.61)</td>
</tr>
<tr>
<td>41-505 (26.3)</td>
<td>14 (73.7)</td>
<td>2.29 (0.72-7.27)</td>
</tr>
<tr>
<td>51-601 (4.3)</td>
<td>10 (85.7)</td>
<td>0.53 (0.06-4.36)</td>
</tr>
<tr>
<td>61-701 (9.1)</td>
<td>6 (90.9)</td>
<td>0.91 (0.10-8.01)</td>
</tr>
<tr>
<td>71-800 (0.0)</td>
<td>2 (100.0)</td>
<td>-0.54</td>
</tr>
</tbody>
</table>

Table 2 shows that the mean age is 35.6 years (range 12-72 years). Eighty-eight (88) of the patients were male representing 67.7% of the patients and 85.4% of the patients had sputum smear positive pulmonary tuberculosis (TB) while the rest (14.6%) were sputum smear negative. Twenty (20) of the respondents were HIV positive representing 15.4% of the respondents.
Table 2 shows that the prevalence of HIV among men was 13.6% and 19.5% among women (p value = 0.42). Prevalence of HIV among sputum smear positive TB cases was 13.5% whereas prevalence of HIV among smear negative TB cases was 0.29%. Prevalence of HIV in TB patients between 18 and 44 years old was 26.3%. Of all the patients that are HIV positive, 13 patients representing sixty five (65) percent are ≤ 40 years while prevalence of HIV among ≥ 40 years old was 35%. Ten (10) patients representing 27.8% of the patients in the age group 31-40 years are HIV positive (p value=0.02).

Discussion

All the 130 patients in the TB register, that were used for this study, gave their consent to be tested for HIV after education and counselling, this 100% consent rate has rarely been recorded in other study, though a refusal rate of <3% was recorded in another study in Pakistan (Hasnain et al., 2012), this can be attributable to the quality of education received about HIV/AIDS by the patients.

There is a significantly higher risk of tuberculosis developing in people living with HIV than in those people not infected with HIV (Knox & Guglielmo, 2006), this is because of the weakening of the immune system that HIV causes and the ability to predispose those with latent TB infection and HIV to develop active TB disease (Barnes, Bloch, Davidson & Snider, 1991). The HIV prevalence in TB patients (15.4%), found in this study, is higher than in the general population of Nigeria, which was 3.1% by 2012 (United Nations Children's Fund, 2013). This notable difference is to further confirm the correlation that exists between HIV infection rates in the general population and the risk of developing TB after exposure (Odaibo et al., 2006) which translates to mean that the higher the rate of HIV infection, especially in areas with high TB endemicity, the greater the risk of acquiring established TB infection and hence a higher rate of HIV/TB co-infection.

This HIV prevalence found in TB patients (15.4%) in this study is also a bit higher than the estimated HIV prevalence of 13 percent reported by the World Health Organisation for 2013, (WHO, 2014), but lower than the prevalence rate reported in other recent studies done around the same location, Akinleye et al. (2015), reported 25.1% in a study done in almost the same location with this study and Onubogu et al., (2010) reported 18.4% in a similar location.

There is also a higher prevalence of HIV co-infection with TB in females than males in this study, 19.5% and 13.6% respectively, with a male to female ratio of the HIV infection being 1 to 1.5, this relationship between HIV status and gender is significant, and contradict result in some other centres in Nigeria (Nwobu, Okodua, & Tafeng, (2004) in Edo, Taura, Sale, & Mohammed, (2008) in Kano; Umeh, Ishaleku, & Hieukwumere (2007) in Nasarawa and Nwachukwu, Orji, & Okereke (2009) in Abia), but corroborated other studies, (Akinleye, et al. 2015 and Onubogu, et al., 2010 in Lagos, Erhabor, Jeremiah Adias & Okere, 2010 in Port Harcourt, and Odaibo, Okonkwo, Lawal & Olaleye (2013) in Oyo state. Biological factors, such as a higher susceptibility to infection and behavioural factors such as early exposure to sexual activity that is common to women due to economic circumstances have also been adduced to be the reason why there is an observed higher infection rate in females than males (Nwobu et al., 2004). Another reason could be as a result of various customs in African countries that viewed women as subordinate to their husbands with little or no say in issues related to sexual relationship (Nwobu, et al, 2004)). Women are also said to be more likely to have lowered immunity probably because
of the stress produced by their biological, economic and cultural roles as care-givers (Umeh, et al 2007).

Daniel et al, (2005), alluded to a higher risk of infectious diseases in women of reproductive age than their male counterparts. This may also be because of the innate characteristics of the female gender to seek out solution to their medical and other problems quicker than their men counterparts, who rather view disclosure of their status, like any state of un-wellness, not compatible with their duty as the bread winner for their family, because of the discrimination they are likely to face when their employers get to know about their HIV status.

The 21-30 age group accounted for 31.5% of the TB patients studied and together with those in the 31-40 age groups accounted for almost three-fifths (59.2%) of all the TB patients studied, this corroborates many other works where it has been established that these age groups were the most vulnerable to TB infection. (Hasnain, et al., 2012,Nwachukwu et al., 2009, Nwobu et al., 2004,Onubogu, et al., 2010 and Umeh et al., 2007). These age groups, most affected by TB, are the most productive age groups and hence the reason why the disease should be promptly diagnosed and managed.

The Prevalence of HIV infection was 1.95 times higher among patients with sputum smear negative pulmonary TB in comparison with patients with sputum positive pulmonary TB this study (prevalence 26.3% vs 13.5% p value 0.15). Although this difference is not significant which could be attributed to the small sample size used for this study. This result is however, comparable to the deduced findings from a similar study in Ethiopia where the likelihood of HIV infection in smear negative patient was 1.78 more when compared with its likelihood in sputum smear positive TB patients, (Tadesse & Tadesse, 2013), though it was a bit higher, and this could be as a result of the difference in the incidence and prevalence rates of both countries and also because of the difference in the localities, demography and cultural orientations of the people of both countries.

**Strength and limitation**

The major limitation to this study is the few number of TB patients used for this study, and this was because of the tendency of the centre strictly practicing a Directly Observed Treatment, short course(DOTS), in which sputum positive patients are referred to the facilities nearest to their residences as prescribed by the WHO, so only TB patients that reside close to this treatment facility used for this study were registered for TB treatment in that facility.

Also, as a matter of ensuring that some patients that are co-infected with HIV and TB are able to receive their treatment under the same roof of the hospital, this treatment site tends to retain some patients that are HIV positive, who ordinarily would have been referred to other facility in the centre, this practice no doubt, will limit the generalizability of the findings of this study for Nigeria, or even Lagos state.

However, the strength of this study lies in the fact that all the patients used for this study were made to test for HIV, a rarity in other previous study, this no doubt will contribute positively to the generalizability of these findings.

**Conclusions**

There is still a high prevalence of HIV co-infection among TB patients, this was further corroborated by this study. This rate of TB/HIV co-infection is still higher among female patients than the male patients.

**Recommendations**

This study further reveals that there is a need for emergency measures to strengthen the TB and HIV collaborative activities, more diagnostic and treatment centers should be provided, people less than 40 years, especially women, should be the primary focus of these measures. More
motivations of the personnel involved in the diagnosis and treatment, especially of TB. Immune boosting supplements should be provided as well as adequate prophylaxis against opportunistic infections. More centres should be provided with the Gene Xpert test facility, which has been acclaimed to be more sensitive in diagnosing TB and even Rifampicin resistance, especially when the result of sputum smear is negative.

The high prevalence of HIV/TB co-infection among the population studied, calls for better screening approach for TB in HIV infected people, and also better health education approach to forestall further spread of the disease from those currently infected to those un-infected.

**Competing interests:** The author declares that there is no competing interests.

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