



## Blood Donations in Correctional Centres in North Central Nigeria: The Implications on Recipients' Safety

### Dons de sang dans les centres correctionnels du centre-nord du Nigeria : les implications sur la sécurité des receveurs de sang

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#### ABSTRACT

**Introduction:** Cardinal considerations for blood donor recruitment are the donor and recipient safety. High prevalence of transfusion transmissible infections has been documented among inmates in correctional homes, putting blood donation from this organisation at potential high risk of disease transmission.

**Aims and objectives:** This study determined the characteristics of prison inmates' blood donors and the prevalence of transfusion transmissible diseases.

**Methods:** Records of inmate volunteer blood donors who donated to the blood service, from January 2018 to March 2019 were studied. Their biodata, responses to administered blood donation questionnaire and the outcome of Enzyme linked immune-sorbent assay screening tests for the human immunodeficiency, hepatitis B, hepatitis C viruses and syphilis of donated blood were reviewed.

**Results:** 800 inmates were in the Jos, while 150 and 120 respectively were in the Pankshin and Shendam Correctional Homes. The inmate volunteer blood donors were 18 (2.8%) females and 625 (97.2%) males with the mean age of 32.5 years. Pre-donation minimum diastolic and systolic blood pressures of 50 and 90 mmHg respectively while the maximum diastolic and systolic blood pressures of 110 and 180 mmHg were recorded. The weight of the inmates who donated blood to the service ranged between 49 kg and 98 kg with a mean of 65.7 kg. The haemoglobin concentration of the donors, determined by HemoCue®Hb 301 System, ranged between 12.0 g/dL and 22.6 g/dL. Transfusion transmissible infections contaminated 105 (24.0%) units collected at the Jos Centre; 1.6%, 3.8%, 17.1% and 1.4%; HIV, HCV, HBV and syphilis respectively. The infectious agents were in the same order, positive in 3.5%, 5.3%, 23.0% and 0.9% of blood units collected from Pankshin, while units from the Shendam inmates were 1.1%, 7.6%, 16.3% and 1.1% reactive for the infectious agents.

**Conclusion:** It is concluded from this study that, fixed blood donation clinic in correctional homes could provide opportunity for repeat blood collections from identified safe donors with overall blood transfusion infection safety advantage.

#### RÉSUMÉ

**Introduction :** Les considérations primordiales pour le recrutement des donneurs de sang sont la sécurité du donneur et du receveur. Une prévalence élevée d'infections transmissibles par transfusion a été documentée parmi les détenus des maisons de correction, ce qui expose les dons de sang de cette organisation à un risque potentiel élevé de transmission de maladies.

**Buts et objectifs :** Cette étude a déterminé les caractéristiques des donneurs de sang des détenus et la prévalence des maladies transmissibles par transfusion.

**Méthodes :** Les dossiers des détenus donneurs de sang volontaires qui ont fait un don au service du sang, de janvier 2018 à mars 2019 ont été étudiés. Leurs biodonnées, les réponses au questionnaire sur le don de sang administré et les résultats des tests de dépistage par dosage immuno-sorbant lié aux enzymes pour l'immunodéficiência humaine, l'hépatite B, les virus de l'hépatite C et la syphilis du sang donné ont été examinés.

**Résultats :** 800 détenus se trouvaient dans le Centre de Jos tandis que 150 et 120 se trouvaient respectivement dans les maisons de correction de Pankshin et de Shendam. Les détenus donneurs de sang volontaires étaient 18 (2,8 %) femmes et 625 (97,2 %) hommes avec un âge moyen de 32.5 ans. Les pressions artérielles diastolique et systolique minimales avant le don étaient de 50 et 90mmHg respectivement, tandis que les

pressions artérielles diastolique et systolique maximales étaient de 110 et 180mmHg. Le poids des détenus qui ont donné du sang au service variait entre 49Kg et 98Kg avec une moyenne de 65.7Kg. La concentration en hémoglobine des donneurs, déterminée par le système HemoCue®Hb 301, était comprise entre 12.0 g/dL et 22.6 g/dL. Les infections transmissibles transfusionnelles ont contaminé 105 (24.0%) unités collectées au Centre de Jos ; 1.6%, 3.8%, 17.1% et 1.4% pour le VIH, VHC, VHB et syphilis respectivement. Les agents infectieux étaient dans le même ordre, positifs dans 3,5%, 5,3%, 23,0% et 0,9% des unités de sang collectées à Pankshin, tandis que les unités des détenus de Shendam étaient 1.1%, 7.6%, 16.3% et 1,1% réactifs pour le agents infectieux.

**Conclusion :** Il est conclu à partir de cette étude qu'une collecte de don de sang fixe dans les maisons de correction pourrait offrir la possibilité de prélèvements répétés de sang auprès de donneurs sûrs identifiés avec un avantage global en matière de sécurité des infections transfusionnelles.

## INTRODUCTION

The traditional sources of blood for transfusion in Nigeria are mainly from paid and family replacement donors, donating in the hospitals, with high rate of transfusion transmissible infections.<sup>1,2</sup> Blood sourcing from altruistic donors is being developed by the National Blood Transfusion Service in its six geopolitical zones. Voluntary Blood donation can be organised in the donor clinic of the blood service (indoor) or outdoor at the premises of consenting organisations.<sup>3,4</sup> Worldwide efforts backed by appropriate policy and operational guidelines are made, to transform blood sourcing from replacement and paid to voluntary non-remunerated blood donations at either indoor blood service centres or outdoor camps.<sup>5,6</sup> Blood donation drives, held in camps provide opportunity for people of both sex, age and social standing to voluntarily enrol into this important and necessary service of life saving.<sup>7</sup> We had earlier established the contribution of various organisations in immense altruistic blood donation to the National Blood Transfusion Service in North Central Nigeria over a ten year period.<sup>6</sup> The organisations which ranked chiefly in blood donation activities included the religious, educational, community and governments agencies.<sup>8</sup>

Nwogoh et al. (2011) demonstrated the high rate of transfusion transmissible infections (TTIs) among commercial donors in South-South Nigeria compared to replacement and other donor types. Human immunodeficiency virus, in their study, accounted for the highest rate (7.2%) with co-infection in (0.6%) of studied donors.<sup>9</sup> A large study of 15,898 mainly family replacement donors in the University of Maiduguri Teaching Hospital, dominated by the male sex, recorded a prevalence of 4.0% HIV sero-positivity.<sup>10</sup> This further highlighted the inherent risk of disease transmission through transfusion of blood sourced from this group. An eleven-year review of infections among 24,979 hospital blood donors in Calabar, Nigeria, documented a combined transfusion transmissible infections rate of 14.96%. HIV was responsible for the highest reactions rate (4.2%) while syphilis was the least common (3.1%).<sup>11</sup> Similar but lower prevailing infection rates have been reported among blood donors in a rural setting in Southern Ethiopia, East Africa.<sup>12</sup>

Infections that are transmissible through blood transfusion have been reported at various rates throughout the world. A meta-analysis of

nineteen European and twenty-one extra European countries reported prevalence of 4%, 18% and 24% for HIV, HBV and HCV respectively among prison inmates.<sup>13</sup> Another report of a meta-analysis of hepatitis B and C in prisons worldwide, Maradi and others observed an overall prevalence of 5.2% HBV infection with the highest rate of 13.1% in Africa. The same analysis revealed the highest prevalence of hepatitis C among prisoners in Australia against a global rate of 13.2%.<sup>14</sup> Both hepatitis B and C were reported at similarly high seropositivity rates among a predominantly male prison inmates in Karamanmaras, Turkey.<sup>15</sup> A Mexican study report however showed a very low infection rates for HBV, HCV, HIV and syphilis (below a unit) among their prison inmates.<sup>16</sup> A large multicentre study of HIV, HBV, HCV and syphilis among prisoners and prison officers in Ghana documented high rate of infections in both groups, though higher among the inmates than their officers except HCV.<sup>17</sup> High rate of infection with HBV (23%), HIV (18%) and HCV (12.3%) was observed among prison inmates in Nasarawa state of Nigeria, in 2009.<sup>18</sup>

Blood collection from prison inmates is not a popular practice even in the developed world due to the recognised high risk for transmission of transfusion transmissible diseases. The review of the Arkansas prison plasma scandal revealed that inmates were bled for 7 to 10 dollars and their plasma distributed national and internationally with many of the recipient seroconverting HCV.<sup>19</sup> In Pakistan, where extra 30 days remission were granted to prisoners who donate blood, a rejection rate of 17.6% was recorded following pre-donation rapid diagnostic kits screening of volunteers for HBV and HCV.<sup>20</sup> Zoon in 1995 recognised injection drug abuse before or during incarceration, secondary gains leading to denial of TTIs risks as potential threats to transfusion safety.<sup>21</sup> While Nigeria is making efforts to meet its blood needs by sourcing for altruistic volunteer donors in line with the World Health Organisation (WHO) guidelines, the inmates in correction institutions may be a potential source if carefully explored.<sup>22</sup> The earlier description of blood donation and TTIs among blood donors who are prison inmates in our setting has not previously been reported. This work will meet the need of base line information on prison inmate voluntary blood donors and rationale for the acceptance or rejection of prisoners as donors with lower infection risk in Nigeria.

This study sought to determine the characteristics of prison inmates' blood donors and the prevalence of transfusion transmissible diseases in the various prison formations in Plateau State, Nigeria.

## MATERIALS AND METHODS

Records of inmate volunteer blood donors who donated to the blood service during blood donation camps, from January 2018 to March 2019 and consented to participate in the research were studied. Information on their biodata, responses to administered blood donation questionnaire was reviewed. The outcome of Enzyme linked immune-sorbent assay (ELISA) screening tests for the human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV) and syphilis of donated blood were reviewed for all the formations visited (Jos, Pankshin and Shendam prisons). Data was inputted into and analysed using the Epi info statistical software. Approval for this work was obtained from the Research Ethics Committee of the National Blood Transfusion Service, North Central Zonal Centre, Jos; Nigeria.

## RESULTS

Five outdoor blood donation clinics were carried out in the Reformation Centres located in Jos, Pankshin and Shendam, respectively in the Northern, Central and Southern Senatorial Districts of Plateau State, North Central Geopolitical Region of Nigeria, within the study period. About 800 inmates were in the Jos reformation centre, while 150 and 120 were respectively confined in Pankshin and Shendam homes. The total 1070 inmates in the three studied sites consisted of 74 (6.9%) females and 996 (93.1%) males. Eighteen (2.8%) of the inmate volunteer blood donors were females while 625 (97.2%) were males. The mean age of all the studied volunteer inmate blood donors was 32.5 years, range 19-57 years.

Pre-donation clinical assessment revealed the minimum diastolic and systolic blood pressures of 50 and 90 mmHg respectively and maximum diastolic and systolic blood pressures of 110 and 180 mmHg among the inmate blood givers. The average diastolic and systolic blood pressure of the inmate voluntary blood donors were respectively 78 and 122 mmHg. The weight of the inmates who donated blood to the service ranged between 49 kg and 98 kg with a mean of 65.7 kg. The haemoglobin concentration of the donors within the confinement of the reformation centres, determined by HemoCue®Hb 301 System, ranged between 12.0 g/dL and 22.6 g/dL, with a mean of 13.7 g/dL.

A total of five blood drives were conducted within the reviewed period, three in Jos prison, with a mean donation rate of 146 units per drive, one clinic each in Pankshin that yielded 113 and Shendam reformation centre where 92 blood donors donated, from 800, 150 and 120 inmates respectively. The blood donation call response rate among inmates in this study was 643 (60.1%), with 18 (24.3%) out of 74 females and 625 (62.8%) of 996 males. A total of 643 units were collected in the five blood donation clinics carried out at correction homes across the state with a donation per clinic of 128.6; **table 1**.

An analysis of the blood units collected from inmates in the Jos reformation centre at three blood drive clinics revealed increasing blood collection from 80 to 169 and 189 units with a corresponding declining crude TTIs rates from; 47.5% to 25.4% and 12.7% with an overall rate of 24.0% (per cent cumulative TTIs in cumulative number of donations for the three drives in Jos prison; **Table 2**). Specific TTIs prevalence declined with each clinic visit to the reformation centre in the city to 0.3%, 1.2%, 10.6% and 0.0% for HIV, HCV, HBV and Syphilis markers respectively (**Table 2**).

**Table 1: Blood drives and transfusion transmissible infections in correction centres in Jos**

	No. of clinics	Total donors	Donations per drive	Donations TTI negative n (%)	Donations TTI positive n (%)	HIV n(%)	HCV n(%)	HBV n(%)	Syphilis n(%)
<b>Jos</b>	3	438	146	333 (76.0)	105 (24.0)	7 (1.5)	12 (3.8)	75 (17.1)	6 (1.4)
<b>Pankshin</b>	1	113	113	76 (67.3)	37 (32.7)	4 (3.5)	6 (5.3)	26 (23.0)	1 (0.9)
<b>Shendam</b>	1	92	92	68 (73.9)	24 (25.1)	1 (1.1)	7 (7.6)	15 (16.3)	1 (1.1)
<b>Total</b>	<b>5</b>	<b>643</b>	<b>128.6</b>	<b>477 (74.2)</b>	<b>166 (25.8)</b>	<b>12 (1.9)</b>	<b>30 (4.7)</b>	<b>116 (18.0)</b>	<b>8 (1.2)</b>

TTI, transfusion transmissible infection; HIV, human immunodeficiency virus; HCV, hepatitis C virus; HBV, hepatitis B virus

**Table 2: Analysis of blood units collected on three blood donation clinics from inmates in the Jos reformation centre for TTIs**

Clinics	Units collected	TTIs n (%)	HIV n(%)	HCV n(%)	HBV n(%)	Syphilis n(%)
1 <sup>st</sup>	80	38 (47.5)	2 (2.5)	7 (8.7)	23 (28.6)	6 (7.5)
2 <sup>nd</sup>	169	43 (25.4)	4 (2.3)	7 (4.1)	32 (18.9)	0 (0.0)
3 <sup>rd</sup>	189	24 (12.7)	1 (0.3)	3 (1.2)	20 (10.6)	0 (0.0)
<b>Total</b>	<b>438</b>	<b>105 (24.0)</b>	<b>7 (1.6)</b>	<b>17 (3.9)</b>	<b>75 (17.1)</b>	<b>6 (1.4)</b>

TTI, transfusion transmissible infection; HIV, human immunodeficiency virus; HCV, hepatitis C virus; HBV, hepatitis B virus

## DISCUSSION

The conducts of five voluntary blood donation camps within the Reformation Service of Nigeria in Plateau State over the study period, which yielded a collected 643 blood units, points to the possibility of positive collaboration with institutions to attain 100% blood sourcing from volunteers. The high donation call response among inmates in this study concurred with reports of blood collections among university communities in both developed and developing countries.<sup>3,4,8</sup> The mean age of our inmate donors (32.5 years) with a range of 19 to 57 years are in line with the requirements spelt out in the national operational guidelines on blood transfusion in Nigeria.<sup>3</sup> The low female enrolment observed in this work is similar to reports of blood donors in hospital setting where family replacement and paid donors, who are almost always males, constitute the highest source of blood. This however differs from the experience in a centralised blood service where females accounted for about 30% of our volunteer blood donors.<sup>23</sup> The low enrolled female blood donors at these voluntary blood collection sites may be a reflection of the low number (74) of females in the reformation centres compared to 996 male inmates. Regular monthly menstrual flow with the attendant iron loss, pregnancy and lactation with accompanying increase iron demand might have hindered some female inmates from volunteering to donate blood.

The clinical assessment of blood donors in correction service units reviewed in this studied revealed that all the donors had systolic and diastolic blood pressures, body weight and haemoglobin concentration within the accepted limits for blood donation in Nigeria otherwise deferred.<sup>5</sup> This suggests that the drive team recruited only qualified volunteers guided by the criteria outline in the national blood transfusion service operational manual.<sup>5</sup> The blood service should continue to strengthen and adhere to criteria for suitable blood donor selection to enshrine satisfactory blood donation experience devoid of serious adverse effects that may discourage subsequent repeat voluntary blood donations.<sup>24,25</sup>

While the recipient risk of acquiring transfusion transmissible infections has reduced in recent years and HIV, HBV and HCV are giving way to new emerging pathogens in the developed world, these agents still threaten the safety of blood supply in developing countries.<sup>26</sup> The high rate of TTIs among blood donors in the reformation centres soars above that documented by researchers in Togo and Senegal among randomly selected inmates in a 2016 study.<sup>27</sup> TTIs recorded in this study is discordantly higher than the TTIs rates earlier reported among randomly selected fresh (first year) university students in Port Harcourt South-South Nigeria.<sup>28</sup> The TTIs rates in our inmate blood givers are similar to that observed among prisoners in Nasarawa and the general population in Keffi and Ilorin, all in North Central Nigeria.<sup>29</sup> TTIs recorded in this study is also comparable to TTIs among hospital blood donors in Calabar in South-South and Osogbo in

South-West Nigeria.<sup>11,30</sup> A comparison is shown in **table 3** of TTIs among inmates in Nigerian prisons and that of Togo and Senegal and also with hospital blood donors in Nigeria. The blood transmissible infections in this study also occurred at similar proportions to first time voluntary and replacement but higher than in regular and lapsed donors documented in an earlier report.<sup>30</sup> The high rate of TTIs among this group calls for diligent application of donor recruitment strategies at all time to further differ potential and consenting donors who may not divulge disqualifying information. Emphasis should be placed on self-risk assessment and self-deferral during blood donor sensitisation, recruitment and pre-donation counselling, particularly among population with high TTIs rates.

**Table 3: The prevalence of TTIs in inmate blood donation in this study compared to other African inmate blood donor studies and with hospital blood donation in Calabar, South-South and Osogbo, South-West Nigeria.**

TTI (%)	Prison inmates				Hospital donors	
	This study	Lafia (NCN) <sup>29</sup>	Togo <sup>27</sup>	Senegal <sup>27</sup>	Calabar <sup>11</sup>	Osogbo
HIV	1.9	18	2.6	1.8	4.2	3.1
HBV	18.0	23	10.9	14.1	4.2	18.6
HCV	4.7	12.3	0.3	4.1	3.6	6.0
Syphilis	1.2				3.1	1.1

TTI, transfusion transmissible infection; HIV, human immunodeficiency virus; HCV, hepatitis C virus; HBV, hepatitis B virus

Analysis of the blood units collected at consecutive blood donation drives from the Jos metropolitan reformation centre had increasing quality and safe donor enrolment as the rates of crude and specific TTIs continued to decline (**Table 2**). The combined TTIs rate among reformation inmates declined from very high values at first blood donation drive (**Table 1**), to similar rates documents in Abeokuta, south western Nigeria among first time blood donors.<sup>31</sup> The TTIs rates declined with repeated blood sourcing at this site to values comparable to the prevalence among blood donors at the regional blood transfusion centre in Nakuru and Tenwek, Kenya, east Africa.<sup>32</sup> The continuous decline in TTIs with repeated blood drive indicates the effectiveness of repeated awareness on blood donation. Some donors who got to know their positive TTIs status might have voluntarily withdrawn from subsequent donation. This observation calls on the National Blood Transfusion Service to start establishing static blood donation clinic where blood could be collected from higher donor pool at regular frequency with superior quality.

## CONCLUSION

We conclude that the high TTIs rate among volunteer blood donors in reformation centres which put recipients at great risk could be reduced by repeated sensitisation and careful prospective donor selection. It is further concluded from this study that a fixed blood donation clinic in reformation centres may provide an opportunity for repeat donations by identified safe donors with overall improvement in blood transfusion safety.

## LIMITATIONS

The authors were unable to carry out confirmatory test on ELISA screen positive donor samples.

## RECOMMENDATIONS

We recommend the establishment of fixed blood donation clinics in institutions for regular awareness sensitisation on blood transfusion safety. The National Blood Transfusion Service policy and operational guidelines should place emphasis on prospective donor self-exclusion. Government should provide resources for the free vaccination of all blood donors who are negative for viral pathogens where possible, while comprehensive care and contact tracing be administered to those that are reactive. Facilities should be provided for the blood service to confirmed outcome of ELISA screening of donated blood. Further study on inmates before incarceration and during confinement may help to understand mode of infection acquisition.

**Conflict of interest:** None

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