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Assessing Five Years of Management of Accidental Exposure to Blood at Gao Hospital, Mali

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Authors' contributions

This work was carried out in collaboration among all authors. Author YC designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors LNS, AT, AS and LD referred or recruited subjects. Author AAM entered the data. Authors AAO and JPD performed the statistical analysis. Authors DD and SD managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Accidental exposure to blood (AEB) constitutes a risk of transmission of blood-borne viruses including HIV, hepatitis B and hepatitis C virus especially amongst health workers. This study aims to describe accidental exposure to blood and post exposure management five years after it begin at the Hospital of Gao, since 2012 there is insurrection in this area making difficult to maintain health care system. This study will help to identify gaps to fill in order to improve the prevention of blood borne pathogen infection in this hospital.

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All cases of AEB declared at the Hospital from January 1st 2007 to December 31, 2011 have been enrolled. The sociodemographic profile of victims, the circumstances of the accident, the post exposure management and the follow up of subject have been registered. Data were entered and analyzed with the SPSS software. Chi square test was used with the level of significance $p<0.05$.
During the 60 months of the study, an average of 124 workers were employed at the Hospital of Gao and 15 cases of accidental blood exposure were declared equal to an incidence density of 4.2 cases per 100 persons per year. Males were the most affected (60%). Nurses and lab technicians represent the majority of victims (53.3%). The most frequent type of accident was the injury by cannula needle sticks during intravenous injections (73.3%). Most of the cases received High Activity Antiretroviral Therapy (HAART) within a mean delay of 25 Hours from the accident, and the regiment (AZT/3TC/LPV/r) is predominantly used. HIV serology was done in 53.3% of subjects and revealed 1 positive case. Initial blood tests in all victims were normal. The HAART observance was worst among medical doctors ($p < 0.001$). No contaminations by HIV were detected after 6 months of follow up.
The frequency of declared accidental exposures to blood at the Hospital of Gao is low. The post exposure management is facing a problem of observance of the treatment whenever it shows efficacy in all cases.

Keywords: Blood exposure; HAART; HIV; prevention; Mali.

1. INTRODUCTION

All over the world, Sub-Saharan Africa is the region suffering the most from HIV infections (In 2012, out of 35 million HIV infected subject worldwide, 24.7 million live in Africa) [1]. Initially, the fight against HIV was more focused on sexual transmission, however, there are other routes of transmission such as blood and body fluids. It is estimated that approximately 3 million health professionals are victims of exposure to blood and body fluid each year [2]. High numbers of exposure is likely to occur in countries with limited resources, where these diseases have a high prevalence and the ratio of caregiver by-population is low [3]. Therefore new measures are being taken into account in the fight against HIV infection. In Mali, since 2004 thorough decentralization policy free HIV treatment with HAART has expanded nationwide. This free treatment reached the region of Gao in 2006. HIV prevalence in the population of Gao has increased from 0.6 to 1.1% between 2001 and 2006 [4,5]. On the other hand, the ratio of nurses per inhabitant has not changed [6]. In this study we are evaluating the management of AEB that started at the Hospital of Gao in 2007 in order to describe the frequency of AEB, the epidemiological profile of victims and the outcome of the post exposure measures.

2. MATERIALS AND METHODS

This is a prospective, descriptive and analytical study carried out from 1 January 2007 to 31 December 2011 at the Hospital of Gao. This period covers the first five years of implementation of post-exposure management of AEB in this hospital. We included all cases reported to the referring doctor of the hospital as AEB. This referring doctor is not only following the AEB that occurred in the Hospital of Gao but also all cases referred by the peripheral health centers where HAART is not available. Cases of sexual exposure are not included in this study. The referring doctor collected data from all the subject, as he is the one doing the initial and follow-up visits. He is also centralizing results of the lab tests. Variables were reported on an anonymous notification forms with the sociodemographic characteristics of the victims including the duration of professional experience, circumstance surrounding the AEB, post-exposure measures and the outcome. As recommended by the national guidelines, the following bioassays (HIV serology, syphilis and Hepatitis B; blood count; hepatic transaminases and serum creatinine) have been performed in victims before HAART treatment. The decision to use HAART post exposure treatment was based on the level of the risk estimated according to the severity of the injury and the infectiousness of the source. The victims were followed as outpatients for 6 months. Those who were on HAART benefited monitoring during treatment to assess the side effects and adherence. The adherence and assessment of HAART side effect were monitored trough self-reporting by subject or questions during follow up visits performed at day 7, 14 and 28 after starting HAART. To determine the outcome of AEB post exposure prophylaxis, the control of serology at 3

months and 6 months after the accident was performed in all victims. Data were entered and analyzed using SPSS 16.0 software. Qualitative data are presented using frequency table and quantitative calculating means and standard deviation. To analyze the relationship between qualitative variables we used Fisher's exact test with a significance threshold of $p \leq 0.05$.

3. RESULTS

During a study period of 60 months, the hospital employed an average of 124 workers involved in patients care. Doctors saw an annual average of 34,259 patients and had 3,079 hospitalizations. During this period, fifteen (15) cases of blood accidental exposure (AEB) were reported, 13 cases were hospital staffs and the remained two were staffs from other health centers of Gao region. The frequency of AEB seen in Gao hospital is estimated at 10.5%. The incidence density, is estimated at 4.2 cases per 100 person per year.

3.1 Demographic Data of Victims

The victims reported to have accidental exposure to blood seen in Gao Hospital were predominantly males (60% of cases). The mean-age of the victims was 35.7 ± 9.6 years. Their average duration of professional activity was 5.5 ± 5.2 years, ranging from 0 to 15 years. The distribution of victims of AEB professional categories shows a predominance of nurses (33.4%) followed by students and medical doctors representing each 26.7% [Table 1].

The most common type of accident was injury by intra venous needles (73.3%) and the majority of AEB (53.3%) occurred during patients care such as performing injections or blood draw in agitated patients or patient with difficult venous access, however a significant proportion of AEB had occurred because of non-compliance with standard safety precautions such as needle recapping (13.3%) or non-disposal of used needles (20%) [Tables 1 and 2]. Fifty-three percent of victims AEB wore gloves at the time of the accident.

The emergency measures were observed by victims of AEB in the following proportions: 100% immediately stopped the activity that caused the accident; 93.3% used an antiseptic solution to soak the wound(s) or rinsed the splash. However one of the victims has put pressure on the site of the accident (finger that was stuck by the needle). All of the victims reported the accident to the referring physician of the hospital, the average delay of reporting is 4.1 ± 6.4 hours. Forty percent of the victims reported their accident to the physician within the first hour [Fig. 1].

Table 1. Occupational categories in different studies

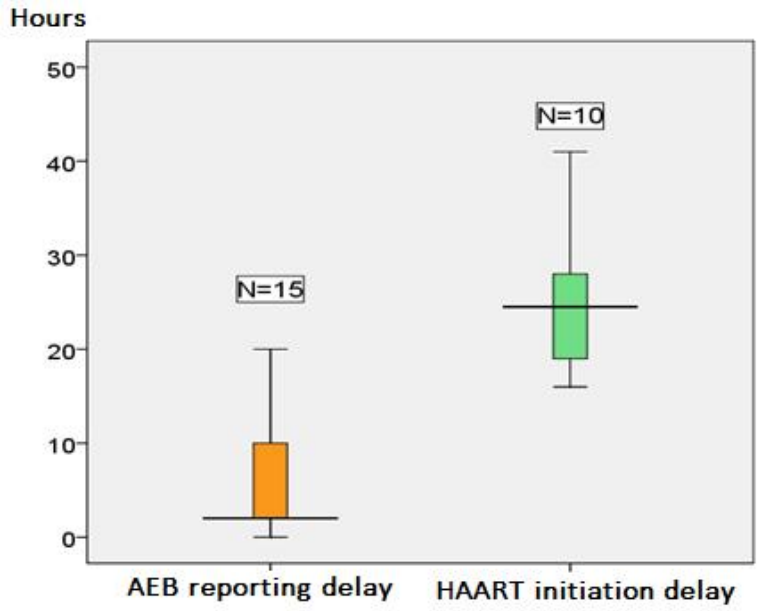
Occupational categories	Ivory-Coast [8]	Senegal [9] 2005-2007	Mali [4] 2007	Mali [10] 2010	Our study (N=15)
Medical Doctors	29.1%	12%	12.5%	25.0%	26.7%
Nurses	19.8%	33%	12.5%	10.7%	33.4%
Caregivers	12.1%	26%	6.25%	10.5%	_
Students	11.5%	26%	50%	32.4%	26.7%
Lab Technicians	14.3%	_	6.25%	07.1%	06.6%
Room cleaners	13.2%	03%	12.5%	14.3%	06.6%
Total	100%	100%	100%	100%	100%

The types and circumstances of occurrence of AEB

Table 2. Distribution of cases of AEB according to circumstance of occurrence

Circumstance of AEB	N	%
Injection in agitated patients	**6**	**40**
Needle not eliminated	3	20
Recapping needle	2	13,3
Waste Manipulation	2	13,3
Injection with difficult venous access	2	13,3
Total	**15**	**100**

The post exposure management of AEB



Graph 1. Delay in AEB reporting and in HAART post-exposure prophylaxis

HAART post-exposure prophylaxis started within an average time of 24.5 ± 7.2 hours, the maximum delay was 41 hours after the accident. The identity of the patients (sources of contamination) has not been established in 4 cases (20% of AEB were caused by needles that was not disposed properly). HIV serology of the patients (sources of contamination) has been performed in 53.3% and one case revealed positive for HIV1. (Summary in advance you that there has been no n + cases, correct this contradiction) After risk assessment, five victims have not received ARVs, in the ten remaining cases, HAART post exposure prophylaxis of was made predominantly (80%) with one month Zidovudin/Lamividin/Lopinavir boosted by ritonavir regimen (AZT/3TC/LPV/r) [Table 3].

3.2 The Medical Follow Up of Victims

All the victims were followed for 6 months. The observance of the short duration of triple therapy was lower among physicians / pharmacists compared to other occupational groups because of side effects (p = 0.03) [Table 4].

Table 3. Distribution of victims of AEB according to HAART regiment used for post exposure prophylaxis

HAART regimen	N	%
AZT/3TC/NVP	1	10
AZT/3TC/IDV	1	10
AZT/3TC/LPVr	**8**	**80**
Sous Total	10	100
No HAART	5	33,3
Total	**15**	**100**

Table 4. Relationship between adherence to HAART and occupational category

Occupational category	Adherence to HAART		Total
	Poor	Good	
Care staff	1	6	7
Doctors	**3**	0	3
Total	**4**	**6**	**10**

All 15 victims had a negative HIV serology at 3 months and 6 months after the accident.

4. DISCUSSION

4.1 Demographic and Occupational Characteristics of Victims

Male are predominant in our study, this result is consistent with several African series: Daou in Mali found a sex ratio (M/F) of 4.3 [7], Ehui in Ivory Coast 1.4 [8]; However Dieng in Senegal found 0.7 [9] and there are several European series where the dominance is female. This is probably related to the number of female employed as health care staffs in the different countries. In our victims, the mean age was 33.8 ± 7.4 years this is close to the 33.8 ± 7.4 years found in the Ivorian series by Ehui [8] and 32 ± 6.5 years in the Senegalese series by Dieng [9]. It should be noted here that this mean-age is similar to the average age of our staffs at the hospital of Gao. We found the duration of professional activity of our exposed staff was 5.5 ± 5.2 years, ranging from 0 to 15 years. We did not analyze the relationship between the duration of professional activity and the occurrence of AEB, because we don't have these data in the staff who haven't got AEB, However, some authors have found a correlation between the numbers of year of experience of the staffs and the frequency of AEB [10,11], this finding could be explained by the continuous exposure to safety training trough years of professional practice.

4.2 The Frequency of the AEB

Two previous studies conducted in Mali found a frequency of AEB to be 4.6% (23 cases reported amongst 502 health care workers) [7] and 5.4% (28 cases reported amongst 514) [11]. These studies were conducted in central hospitals in Mali with larger number of staffs and limited access to the referring doctor for AEB. These frequencies are probably underestimated. Other African studies found higher frequencies like those of Kumacheck in Uganda (19.2%) [12], Dieng in Senegal (40%) [9] and Ehui in Ivory Coast (%) [8]. This variability may be related to the unreported cases in structures, how well post-exposure cases are being managed and the availability of personal protective equipment and how well staffs applied universal precautions. One study showed the disparity in the application of universal precautions in countries with limited resources [13]. It should be noted that, unlike us, none of the studies took into account the duration of exposure to risk using the calculation of incidence density that best reflects the frequency of AEB. These studies are cross sectional with questionnaires sent to caregivers about their history of AEB. It is the same for a study compiling data from West African sub region conducted by Tarantola that found a frequency of 45.7% for AEB e.g 567cases out of 1241 care givers [14].

According to the literature, the most affected professional categories vary. Our series show similarity with the series of Dieng in Senegal with a predominance of nurses, however the studies in Mali and exclusively at the University Hospital of Point G showed a predominance of students [Table 4] [7,8,9,10], it should be noted that this structure is a teaching hospital receiving medical students who are engaging in the learning medical procedures, and also involved in patients care. These alone cannot explain the high frequency of students as victims of AEB since a study at the University Hospital of Treichville in Abidjan shown a frequency much lower than ours.

The types of accident identified and reported by other authors such as the splashing of blood or body fluid on mucous membranes, cutting by scalpel blade, are not found in our series. Several reasons that deserve to be explored could explain these findings: it could be either an under-reporting; or the use of effective security measures. A comprehensive, retrospective study of the staffs on their past accidents and a practical observation study could answer these questions. However needle injuries remain the most common type of accidents. Philip and al in their study have even calculated the average numbers of AEB by caregivers in a health facility in Tanzania, they found 1.9 cases of AEB per staff per year [15].

4.3 The Management of AEB

It has been noted that 66.6% of AEB cases had been taken HAART post-exposure prophylaxis. This rate is significantly higher than Olowookere's who prescribed this prophylaxis in 43% of subjects having professional accidental exposures to blood [16] but lower than Ehui in Ivory Coast (81.6%). [8] The diagrams used included a protease inhibitor (PI) in 90% of cases because we do not know the status of the source patient in 46.7% of cases. In the Ivorian series source subject serology for HIV was also mostly

unknown 55% [8]. Delfraissy in France noticed that 9% of AEB cases stopped the HAART post exposure prophylaxis due to treatment side effects [17], in our study HAART stopped by 40% of cases for the same reasons. However the number of subject who stopped treatment in Ehui's study in Ivory Coast is even greater, he noted that only 39.7% of the subjects put on ARV prophylaxis for AEB had completed their treatments for one month [8]. We also noted significantly poorer treatment adherence amongst doctors and pharmacists compared to other staffs. These differences could be explained by their awareness of HAART medication side effects.

When retesting HIV serology after 6 months follow-up, we have noted no cases of seroconversion in our series. This is similar to Ehui's results, suggesting some effectiveness in management of blood exposure accidents. [8] It must be remembered that the risk of HIV transmission by AEB remains relatively low, it is estimated by Dessalegn in Ethiopia at 0.0035% or 1 in 28 751 health workers per year [18].

In Hospital of Gao only initial training have been conducted in staff on AEB prevention and post exposure management. There were no continuous training on this topic, but poster is displayed on universal precautions and blood post-exposure measure all around the hospital. Many study on AEB management recommend training and preventive programs to improve safety of health care workers [10-14,16,17,19-22]. Initial and ongoing training should be provided to all staffs that are involved in patient care and are in contact with blood born pathogen on how to prevent exposure and on what to do after AEB. All necessary protective equipment should be available to them and their use should be mandatory by the facility.

5. CONCLUSION

Health workers in Gao are faced with AEB in their daily activities. Many of these AEB, are preventable with health care workers compliance with the rules of hygiene and universal precautions. There is a compelling need to regularly remember the rules of prevention in this field.

CONSENT AND ETHICAL CONSIDERATION

As the study is part of routine activity of the hospital, no IRB approval was obtained, but data from subject were recorded anonymously using study numbers on case report forms that were only accessible to dedicated staffs. Moreover lab procedures were only performed with subjects consent. These results help to have evidence to improve the management of subjects.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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