STATUS OF BLOOD SAFETY IN THE WHO AFRICAN REGION[1] ten years after adoption of the regional strategy

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INTRODUCTION

Blood Safety

National blood policies are driven by two main principles. The adequacy of the blood supply or the lack of it and the risk of untoward effects to blood transfusion both immunological and non immunological, including the transfusion of pathogens known to be transmitted through blood transfusion. Moreover, there is always the risk of emerging threats to the security of the blood supply from new infectious diseases as tenets of their epidemiology unfold. Additionally selection of donors at reduced risk of infection against the backdrop of high prevalence rates in the general population further increases the risk of transmission in the region. Unsafe blood transfusions may continue to contribute to the spread of HIV and other blood transfusion-transmissible infections unless stringent measures are taken to reverse the situation.[1,2]

Blood safety therefore aims at ensuring universal access to quality blood and blood products at an affordable cost both to public authorities and patients. To ensure this, all stages in the blood transfusion value chain should be done in such way that eliminates these risks. The product must be of the right efficacy and adequate in quantity to correct the homeostatic defect in the normal physiology of the blood for the patient. Safe hospital and bedside practices such as compatibility as well as traceability should be done in a manner that ensures the ultimate safety of the patient. Blood transfusions should also be limited to those absolutely necessary and be conducted as part of a sustainable programme within the health system. This calls for a well coordinated blood service with quality systems in all areas as recommended by WHO.[2] Cognizant of the increased risk to the blood supply posed by collection of blood from family replacement and paid donors, WHO has recommended that Member States develop national blood services based on collection of blood from voluntary non remunerated blood donors,[3] coupled with universal testing of donated blood in accordance with quality requirements and the reduction of unnecessary transfusions. Member countries therefore ought to phase out family and other types of donors not only to further minimize the risk of disease transmission through contaminated blood, but also to ensure universal availability of blood in a sustainable way.[3,4]

The demand for safe blood in the WHO African Region

Based on WHO estimation, the population of 836 969 536 people in 2010 living in the 46 Member States of the WHO African Region need over 8 million units of blood per annum.[5] Globally, more than half a million women die each year as a result of complications of pregnancy and child birth.[6] The most common cause of maternal death is severe bleeding, which contributes to 44% of maternal deaths in Africa south of the Sahara.[7] Studies report that up to 50% of transfusions given to children are related to malaria induced anaemia.[8,9,10] Additionally, other causes of the need for blood transfusion abound. These include anaemia as a result of sickle-cell disease, malnutrition, road traffic accidents as well as other forms and causes of injury. Moreover, the Region is fraught with manmade as well as natural disasters which have a considerable impact on the demand for blood. Unfortunately, many countries in the region do not collect enough blood for their populations; blood donation rates in Africa are generally low, about 4.15 per 1 000 of the population in 2006 compared with developed countries where it is generally greater than 30 per 1 000 of the population[11 12]. Thus, although the health systems are not yet developed to the level that would require much blood, going by the standard, most of countries in the region, collect less than half of the blood needed to meet the transfusion requirements of their populations.

Challenges in obtaining adequate safe blood

Inadequate implementation of the recommendations of WHO requiring member states to place blood safety at the heart of their health priorities coupled with failure to translate commitments enshrined in policies and resolutions to practical outcomes, poses a challenge to universal access to a safe blood supply by the population in the region. Additionally, blood safety is faced with insufficient human, material and financial resources needed to collect and test blood from safer blood donors. The acute shortages of trained and dedicated manpower are frequently cited as one of the main constraints faced by blood transfusion services in the WHO African Region.[13, 13b] In an environment with high prevalence of Transfusion Transmitted Infections (TTIs) such as HIV and HBV, selection of safe blood donors at reduced risk of infection, routine screening of TTIs in a quality assured manner, are essential to ensure the safety of blood and blood products as is the appropriate prescription and use of these products. These have proved to be challenges to the safety of the blood supply in the region over the years.[14,15,16,17]

WHO in its concerted efforts with Member States and partners have been addressing this. The WHO Regional Office conducted two surveys in 2004 and 2006 using the questionnaire on the Global Database on Blood Safety (GDBS) in order to get detailed data and generate relevant information from Member States regarding the status of the blood safety situation in the region[18]. This is crucial for designing strategies and interventions based on sound evidence. The survey reported here was done in 2011 in order to get updated data on blood safety. The Blood safety indicator tool used was prepared using key elements of the questionnaire from the (GDBS). This tool was sent to all Member States to be filled by a senior staff of the NBTS or a designated official of the Ministry of Health. All member States were requested to provide data for the period 1 January to 31 December 2010 and send it back to the Regional office in Brazzaville for compilation and analysis. Questions asked included those on administrative information, facilities for blood collection and supply, blood donors and blood collection, screening for transfusion-transmissible infections, blood component preparation, storage and transportation as well as the clinical use of blood and blood components. At the same time, an additional questionnaire related to achievements of the targets of the regional strategy for blood safety was sent to all Members States. A few countries that did not provide data for some indicators were not considered in the analysis regarding these same indicators.

METHODOLOGY

Tools used in the Survey

The blood safety indicator tool was prepared using key elements of the questionnaire on the GDBS. An additional questionnaire was designed to collected data on the achievement of the targets of the regional strategy. Both questionnaires were sent to all the 46 Member states in order to be filled by a senior staff member of the NBTS or a designated official of the Ministry of Health. The blood safety indicator tool contained six sections namely;

1. Administrative information
2. Facilities for blood collection and supply
3. Blood donors and blood collection
4. Screening for transfusion-transmissible infections
5. Blood component preparation, storage and transportation
6. Clinical use of blood and blood components

These sections provide the necessary information on the vital and logical stages of the blood transfusion chain. Each section consists of questions which seek to determine the status of the key indicators of the service offered at that particular stage. The data therefore provide, in qualitative and quantitative forms, an assessment of human and infrastructural resources, as well as process and outcome indicators of national blood programmes in the Member States. The questionnaire used to collected data on the achievement of targets of the regional strategy contained questions on the situation analysis, policy and its implementation, legislative framework, funding, voluntary blood donation, TTI screening and quality management.

Data collection and sample size

The two sets of questionnaires were sent to all 46 countries of the WHO African Region through their respective WHO Country Offices. Countries were requested to provide data for the period from 1 January to 31 December 2010. The data was then submitted to the regional office in Brazzaville for compilation and analysis.

Data analysis

Data entry was done using Microsoft Office Access 2007 and cross-checked for accuracy by several teams. Completion of data entry was followed by comprehensive data cleaning. Data analysis and table preparation were done using Microsoft Excel worksheet 2007 and Microsoft Word 2007 respectively.

The countries were divided into three categories based on the attainment of the target of the regional strategy on voluntary blood donation. Group A at least 80% of VNRBD, group B 50 - 79% VNRBD, and group C below 50% of VNRBD. For each blood centre, country and/or group of countries, variables reported or calculated were number, rate, and percentage. The total population of the WHO African region used for estimates was that defined by UNDP in 2010.[19]

Data quality

The submitted questionnaires were examined for errors, appropriateness and quality of data by the Blood Safety Team at the Regional Office and WHO Head Quarters in Geneva. Where necessary, countries were requested to provide additional information and clarifications on missing or doubtful values by phone or email.

Limitations of the survey and data analysis

Some countries did not respond to the survey and details of the status of the blood services could thus not be established. These are Angola, Liberia and Seychelles. An additional major constraint was the delay in collecting and submitting data to the Regional office leading to delays in compiling, collation, analysis and publication of the report. A number of countries did not provide responses to all the questions. Whenever data was lacking or inconsistent for a specific parameter, the corresponding country was not considered in the analysis for that same parameter. Since not all countries reported on each parameter, the number of countries, centres, units transfused for example depended on the number of countries that responded to the particular question and may not be similar in the results.

RESULTS

Out of the 46 countries of the WHO African Region that received the questionnaire, 43 submitted responses to the regional office, a response rate of 93.4%. Three countries namely, Angola, Liberia and Seychelles did not provide any data and could not be included in the analysis.

The total population of the WHO African Region was 836 969 536 while the population of the 43 countries that responded was 813 806 984 (97.2%) UNDP estimates of 2010.

Blood Donation and Blood Availability

Total Number of Units of Blood Collected

The total units of blood collected in the year and the proportion of voluntary blood donations were reported from 43 countries and were analyzed based on the three defined groups. A total of 3 486 192 units of blood were collected ranging from 942 units in Equatorial Guinea with a population of 700 401 to 949 789 units in South Africa with a population of 50 132 817. The number of units of blood donated in each group is indicated in Table 1.

Table 1: Number of blood donations and donation rates per category.

Group	Countries (n)	Total blood donation (n)	Population (n)	Donation rate (units /1 000 inhabitants)
Group A	19	1 980 349	437 286 128	4.5
Group B	7	666 783	91 255 989	7.3
Group C	17	839 060	285 264 867	2.9
All countries	43	3 486 192	813 806 984	4.3

The average annual blood donation rate was 4.3units per 1 000 of the population with a range from 0.2/1 000 in Nigeria to 33.8/1 000 in Mauritius (Table 2). Only five countries were collecting at least 10 units/1 000 population namely, Algeria, Botswana, Congo, Mauritius and South Africa; Table 2.

Table 2: Donation rates in each country.

Group A		
S/No	**Country**	**%**
1	Benin	6.6
2	Botswana	10.0
3	Burkina Faso	3.7
4	Burundi	4.4
5	Ivory Coast	4.5
6	Eritrea	2.8
7	Kenya	3.5
8	Lesotho	2.1
9	Mauritius	33.8
10	Namibia	9.6
11	Nigeria*	0.2
12	Rwanda	3.6
13	South Africa	18.6
14	Swaziland	8.4
15	Togo	5.9
16	Uganda	6.0
17	Tanzania	2.7
18	Zambia	6.8
19	Zimbabwe	5.1
Group B		
S/No	**Country**	**%**
1	Algeria	11.9
2	Cape Verde	5.6
3	Central African Republic	2.5
4	Malawi	5.5
5	Mozambique	4.7
6	Sao Tome and Principe	5.4
7	Senegal	4.5

Group C		
S/No	**Country**	**%**
1	Cameroon	2.7
2	Chad	2.7
3	Comoros	3.7
4	Congo	10.1
5	DRC	4.7
6	E. Guinea	0.9
7	Ethiopia	0.6
8	Gabon	8.4
9	Gambia	7.2
10	Ghana	5.4
11	Guinea	2.4
12	Guinea Bissau	2.7
13	Madagascar	1.2
14	Mali	3.1
15	Mauritania	2.5
16	Niger	3.5
17	Sierra Leone	5.2

R: rate (units/1,000 of the population);

Type of blood donation

All the 43 countries reported data on the percentage of voluntary non remunerated, family replacement and paid blood donations during 2010. The average proportion of VNRBD was 74.8% ranging from 0% in Equatorial Guinea to 100% in ten countries (Tables 3 and 4). Only the Democratic Republic of Congo (DRC) reported paid donations representing 4.98% of their total donations. Of the 130 830 blood donations reported by Ghana, the origin of 84 units (0.06%) was from unknown types of blood donors.

Only 33 countries provided data on the number of blood donations per donor per year. The average in these countries was 1.2 donations ranging from 1 to 2.2 donations.

Table 3: Number of donations and type of donation per group.

Group	Type of donation				
	VNRBD n (%)	Family replacement donation n (%)	Paid donation n (%)	Un-known type n (%)	All types of donation n (%)
Group A	1 920 800 (97.0)	18 567 (3.0)	0 (0.0)	0 (0.0)	1 980 349 (100.0)
Group B	411 422 (61.7)	255 361 (38.3)	0 (0.0)	0 (0.0)	666 783 (100.0)
Group C	234 495 (27.9)	588 422 (70.1)	16 059 (1.9)	84 (0.1)	839 060 (100.0)
All countries	**2 607 699 (74.8)**	**862 350 (24.7)**	**16 059 (0.4)**	**84 (0.1)**	**3 486 192 (100.0)**

Table 4: Percentage of Voluntary Non-Remunerated Blood Donations in each country.

Group A		
S/No	**Country**	**%**
1	Benin	92.1
2	Botswana	100.0
3	Burkina Faso	100.0
4	Burundi	99.9
5	Côte d'Ivoire	100.0
6	Eritrea	88.4
7	Kenya	100.0
8	Lesotho	93.8
9	Mauritius	88.6
10	Namibia	100.0
11	*Nigeria	94.2
12	Rwanda	100.0
13	South Africa	100.0
14	Swaziland	100.0
15	Togo	98.3
16	Uganda	100.0
17	Tanzania	94.9
18	Zambia	99.9
19	Zimbabwe	100.0
Group B		
S/No	**Country**	**%**
1	Algeria	60.0
2	Cape Verde	77.3
3	Central African Republic	68.0
4	Malawi	57.3
5	Mozambique	61.2
6	Sao Tome and Principe	53.4
7	Senegal	79.4
Group C		
S/No	**Country**	**%**
1	Cameroon	10.0
2	Chad	4.7
3	Comoros	15.7
4	Congo	35.5
5	DRC	35.0
6	Equatorial Guinea	0.0
7	Ethiopia	23.5
8	Gabon	30.0
9	Gambia	24.1
10	Ghana	27.1
11	Guinea	14.7
12	Guinea Bissau	19.9
13	Madagascar	18.4
14	Mali	30.4
15	Mauritania	31.3
16	Niger	36.3
17	Sierra Leone	9.7

* *This represents blood collected from the 16 stand alone blood centres in Nigeria only.*

Of the 3 486 192 donations in the 43 countries, 23 264 (0.7%) were collected by apheresis in seven countries namely Algeria, Botswana, Central African Republic (CAR), Mauritius, Namibia, South Africa and Zimbabwe (Table 5). The proportion of blood donations collected using apheresis is ranged from 0.13% in Mauritius to 2.2% in South Africa.

Table 5: Number and percentage of donations according to the type of collection.

Type of blood donation	Type of blood collection		
	Whole blood n (%)	Apheresis n (%)	All types of collection n (%)
VNRBD n (%)	2 585 184 (74.2)	22 515 (0.6)	2 607 699 (74.8)
Family replacement blood donation n (%)	861 601 (24.6)	749 (0.1)	862 350 (24.7)
Paid donation n (%)	16 059 (0.4)	0 (0.0)	16 059 (0.4)
Unknown n (%)	84 (0.1)	0 (0.0)	84 (0.1)
All types of donation n (%)	**3 462 928 (99.3)**	**23 264 (0.7)**	**3 486 192 (100.0)**

Blood donor deferral rate and reasons

Thirty six countries reported data on blood donor deferral. For a total of 3 179 480 blood donations reported, 425 780 blood donors were deferred for various reasons. The average deferral rate was 11.7% ranging from 1.8% in Burundi to 64.3% in Eritrea. The summary of deferred donors per reason per group is shown in table 6.

Table 6: Blood donor deferral rate and reasons for deferral in each group.

		Group of countries			All countries
		Group A	Group B	Group C	
		Deferral rate (%)	Deferral rate (%)	Deferral rate (%)	Deferral rate (%)
Reasons for deferral	Low weight	0.9	0.6	0.3	0.7
	Low haemoglobin	1.5	1.1	1.6	1.4
	Other medical conditions	1.8	6.0	3.1	3.0
	High-risk behaviour	0.8	0.1	1.7	0.8
	Travel	0.1	0.1	0.0	0.1
	Other reasons	l7.8	3.5	2.1	5.7
	All reasons	**12.9**	**11.4**	**8.8**	**11.7**

Facilities for blood collection and supply

The 43 countries reported existence of 1 728 blood centres (Table 7) of which 1 492 (86.3%) provided data used for this report (Table 8). Out of these, 131 (8.7%) were stand-alone while 1 362 (91.3%) were hospital-based. The questionnaire did not specify whether these were part of the hospital administration or were just located in the hospital premises.

Table 7: Number and type of blood transfusion centres in the countries.

Group	Type of blood centre in the country		
	Stand alone n (%)	Hospital-based n (%)	All types of centre n(%)
Group A	84 (46.6)	96 (53.4)	**180 (100.0)**
Group B	9 (2.2)	391 (97.8)	**400 (100.0)**
Group C	38 (3.3)	1 110 (96.7)	**1 148 (100.0)**
All countries	**131 (7.6)**	**1 597 (92.4)**	**1 728 (100.0)**

Table 8: Number and type of blood transfusion centres that provided data in the report.

Group of countries	Type of blood centre in the report		
	Stand alone n (%)	Hospital-based n (%)	All types of centre n (%)
Group A	84 (59.6)	57 (40.4)	**141 (100.0)**
Group B	9 (2.2)	391 (97.8)	**400 (100.0)**
Group C	37 (3.9)	914 (96.1)	**951 (100.0)**
All countries	**130 (8.7)**	**1 362 (91.3)**	**1 492 (100.0)**

Achievements on targets of the Regional strategy

Thirty-six countries responded to questions related to achievements of the targets in the regional strategy. The ten countries that did not respond were not included in the analysis. Among the 36 countries, 30 had already made a situation analysis, 29 had adopted and were implementing a national blood policy, of these 11 countries had a legislation.

Screening for transfusion-transmissible infections

Centres performing blood screening

Out of 43 countries that provided data, 42 reported existence of 1 492 blood centres that provided response on screening blood for TTIs. Out of these centres, 1 276 (85.5%) were performing screening of blood donations for TTIs (Table 9).

Table 9: Number and percentage of blood centres performing laboratory screening of blood donations for TTIs per group.

Group	Centres in report (n)	Centres which perform screening n (%)
Group A	141	114 (80.8)
Group B	400	211 (52.7)
Group C	951	951 (100.0)
All countries	**1 492**	**1276 (85.5%)**

The number of centres performing blood donation screening for HIV, HBV, HCV, and Syphilis in each country is indicated in table 10.

Table 10: Number and percentage of blood centres performing laboratory screening of blood donations for TTIs per country.

Country	Centre in report (n)	Centre Performing screening n (%)
Group A		
Benin	38	38 (100.0)
Botswana	2	2 (100.0)
Burkina Faso	4	4 (100.0)
Burundi	7	7 (100.0)
Côte d'Ivoire	14	2 (14.3)
Eritrea	1	1 (100.0)
Kenya	6	6 (100.0)
Lesotho	1	1 (100.0)
Mauritius	1	1 (100.0)
Namibia	1	1 (100.0)
Nigeria*	16	16 (100.0)
Rwanda	3	2 (100.0)
South Africa	11	3 (27.3)
Swaziland	1	1 (100.0)
Togo	4	4 (100.0)
Uganda	7	7 (100.0)
Tanzania	7	7 (100.0)
Zambia	9	9 (100.0)
Zimbabwe	8	1 (12.5)
Group B		
Algeria	187	187 (100.0)
Cape Verde	5	5 (100.0)
CAR	2	2 (100.0)
Malawi	38	36 (94 .7)
Mozambique	149	149 (100.0)
Sao Tome and Principe	1	1 (100.0)
Senegal	18	18 (100.0)
Group C		
Cameroon	15	15 (100.0)
Chad	43	43 (100.0)
Comoros	5	5 (100.0)
Congo	23	23 (100.0)
DRC**	577	577 (100.0)
Equatorial Guinea	3	3 (100.0)
Ethiopia	14	14 (100.0)
Gabon	1	1 (100.0)
Gambia	7	7 (100.0)
Ghana	155	155 (100.0)
Guinea	19	19 (100.0)
Guinea Bissau	7	7 (100.0)
Madagascar	42	42 (100.0)
Mali	7	7 (100.0)
Mauritania	1	1 (100.0)
Niger	5	5 (100.0)
Sierra Leone	27	27 (100.0)

TTIs screening

Forty three (43) countries reported data on TTIs screening. With the exception of DRC, 42 (97.6%) were screening hundred percent for HIV, 38 (88.3%) for HBV, 36 (83.7%) for HCV and 37 (86.0%) for Syphilis (Tables 11 and 12).

Table 11: Number of countries testing 100% of blood donations for various TTIs.

Group	Countries (n)	Transfusion Transmissible Infections			
		HIV	HBV	HCV	Syphilis
Group A	19	19	19	19	18
Group B	7	7	6	6	6
Group C	17	16	13	11	13
All countries	**43**	**42**	**38**	**36**	**37**

One country, DRC was testing less than 100% of units collected for HIV, 5 countries less than 100% for HBV, and 7 countries less than 100% for HCV, and 6 countries less than 100% for Syphilis.

Table 12: Proportion of units tested in countries screening less than 100% of blood donations for at least one TTI .

Group	Countries	Transfusion Transmissible Infections			
		HIV (%)	HBV (%)	HCV (%)	Syphilis (%)
Group A	Togo	100	100	100	**91.8**
Group B	Malawi	-100	**99.9**	**63.9**	**99.9**
Group C	Cameroon	-100	**99.7**	**98.6**	**98.5**
	Chad	-100	**99.8**	**94.0**	**98.1**
	Comores	-100	100	**83.1**	100
	DRC	**99.0**	**96.0**	**84.0**	**92.0**
	Guinea	100	**93.3**	**68.9**	**88.8**
	Niger	100	100	91.8	100

Table 13 shows the total number of units and percentage of blood tested for the major TTIs. Some countries are testing donations for malaria such as Malawi (68.3%), Sao Tome and Principe (60.3%) and Sierra Leone (16.2%). Gabon tests-all their blood donations for HTLV. The prevalence of HTLV was 0.36% in Gabon and there was no data on the prevalence of malaria for Sao Tome and Principe while this was 0.33% in Malawi and reportedly 0% in Sierra Leone.

Table 13: Number and proportion of units of blood tested for TTIs in each group.

Group	Total donations (n)	Units Tested for Transfusion Transmissible Infections			
		HIV n(%)	HBV n(%)	HCV n(%)	Syphilis n(%)
Group A	1 980 349	1 980 349 (100.0)	1 980 349 (100.0)	1 980 349 (100.0)	1 977 561 (99.8)
Group B	666 783	666 783 (100.0)	666 762 (99.9)	640 614 (96.1)	666 743 (99.9)
Group C	839 060	835 855 (99.6)	815 601 (97.2)	762 506 (90.9)	799 254 (95.2)
All countries	**3 486 192**	**3 482 987 (99.9)**	**3 462 712 (99.3)**	**3 383 469 (97.0)**	**3 443 568 (98.8)**

Percentage of blood units reactive for TTIs

All the 43 countries, except Cameroon and Gambia provided data on TTIs reactivity or /positivity. Seventeen countries were performing confirmatory test for HIV, 12 for HBV, 10 for HCV and 11 for Syphilis. The median percentage of reactive blood units to TTIs was 1.2% for HIV, 4.3% for HBV, 0.9% HCV and 1.2% for Syphilis. Table 14 shows the median proportion and the range in each group.

Table 14: Median percentage and range of blood units reactive for TTIs.

Group	Transfusion Transmissible Infection reactivity			
	HIV (%)	HBV (%)	HCV (%)	Syphilis (%)
Group A	1.1 [0.1-4.8]	2.9 [0.1-10.1]	0.9 [0.02-5.3]	0.4 [0.0-1.7]
Group B	0.7 [0.3-6.8]	3.1 [0.6-11.1]	0.7 [0.4-1.9]	0.6 [0.4-2.5]
Group C	2.2 [0.0-29.1]	7.1 [0.0-23.7]	1.2 [0.0-3.8]	1.5 [0.0-29.5]
All countries	**1.2 [0.0-29.1]**	**4.3 [0.0-23.7]**	**0.9 [0.0-5.3]**	**1.2 [0.0-29.5]**

Confirmatory tests were performed in 9 out of 19 (47.3%) countries in group A for HIV compared to 3 countries out of 7 (42.8%) in group B and 5 countries out of 17 (29.4%) in group C. For HBV, 7 countries (36.8%) in group A were performing confirmatory test compared to 2 (28.6%) in group and 3 (17.6%) in group C. For HCV, 7 countries (36.8%) in group A were performing this test, 1 country (14.2%) in group B and 1 (5.9%) in group C. For Syphilis, 7 countries (31.6%) were performing confirmatory test in group A compared to 2 (28.6%) in group B and 3 (17.6%) in group C. Details of percentage of blood donations reactive /confirmed for TTIs per country are reported in Tables 15a, 15b, and 15c.

Table 15a: Percentage of blood units reactive/confirmed for TTIs in group A.

Group A	Transfusion Transmissible Infections							
	HIV (%)		HBV(%)		HCV (%)		Syphilis (%)	
	Reactive	Confirmed	Reactive	Confirmed	Reactive	Confirmed	Reactive	Confirmed
Benin	0.9	0.1	7.1	1.0	2.2	0.2	1.7	0.2
Botswana	3.6	0.9	2.9	-	0.3	-	0.2	0.1
Burkina Faso	1.8	-	10.1	-	5.3	-	1.3	-
Burundi	0.4	-	2.7	-	1.3	-	0.1	-
Côte d'Ivoire	0.6	0.5	5.1	-	1.7	-	0.9	-
Eritrea	1.2	-	2.8	-	0.6	-	1.0	-
Kenya	0.9	-	2.0	-	0.8	-	0.2	-
Lesotho	3.1	-	0.9	-	0.7	-	0.4	-
Mauritius	0.1	0.04	0.2	0.1	0.6	0.4	0.1	0.1
Namibia	0.4	-	0.8	-	0.1	-	0.2	-
Nigeria	2.0	-	8.2	-	2.5	-	0.4	-
Rwanda	0.3	-	1.9	-	1.1	-	1.3	-
South Africa	0.2	0.2	0.1	0.1	0.02	0.0	0.2	0.1
Swaziland	2.0	2.0	3.0	3.0	0.3	0.2	0.0	0.0
Togo	1.1	0.3	6.1	0.7	2.0	0.5	0.8	-
Uganda	1.2	0.9	4.0	2.6	3.2	1.6	0.1	0.1
Tanzania	1.2	-	5.3	-	0.6	-	0.4	-
Zambia	4.8	-	6.8	-	1.0	-	0.8	-
Zimbabwe	0.7	0.7	1.0	0.9	0.3	0.3	0.7	0.7
All countries of group A	**0.8**	**-**	**2.3**	**-**	**0.9**	**-**	**0.4**	**-**

Table 15b: Percentage of blood units reactive/confirmed TTIs in group B.

Group B	Transfusion Transmissible Infections							
	HIV (%)		HBV(%)		HCV (%)		Syphilis (%)	
	Reactive	Confirmed	Reactive	Confirmed	Reactive	Confirmed	Reactive	Confirmed
Algeria	0.3	0.05	0.9	0.4	0.5	0.2	0.6	0.3
Cape Verde	0.4	0.1	2.1	2.0	0.4	-	0.4	0.4
Central African Republic	0.7	-	0.6	-	0.5	-	0.6	-
Malawi	2.3	-	3.1	-	1.9	-	1.2	-
Mozambique	6.8	-	6.0	-	0.8	-	0.7	-
Sao Tome and Principe	1.0	0.7	7.4	-	1.7	-	2.5	-
Senegal	0.2	-	11.1	-	0.7	-	0.4	-
All countries of Group B	**1.6**	-	**2.8**	-	**0.7**	-	**1.2**	-

Table 15c: Percentage of blood units reactive/confirmed TTIs in group C.

Group C	Transfusion Transmissible Infections							
	HIV (%)		HBV(%)		HCV (%)		Syphilis (%)	
	Reactive	Confirmed	Reactive	Confirmed	Reactive	Confirmed	Reactive	Confirmed
Cameroon	-	-	-	-	-	-	-	-
Chad	2.7	-	10.1	-	0.5	-	1.2	-
Comoros	0.0	-	4.7	4.3	3.5	-	2.7	2.3
Congo	2.8	2.1	7.1	-	1.9	-	5.1	-
DRC	2.8	-	4.0	-	1.9	-	1.2	-
Equatorial Guinea	29.1	-	15.4	-	3.8	-	29.5	-
Ethiopia	1.9	-	5.1	-	0.6	-	0.1	-
Gabon	1.2	-	3.1	-	0.5	-	4.7	-
Gambia	1.1	1.1	NR	-	NR	-	NR	-
Ghana	1.9	-	5.1	-	1.0	-	0.6	-
Guinea	4.0	-	10.5	-	0.5	-	0.5	-
Guinea Bissau	0.0	-	0.0	-	0.0	-	0.0	-
Madagascar	0.5	0.0	4.0	-	0.7	-	1.9	-
Mali	2.7	-	14.0	-	2.1	-	0.5	-
Mauritania	1.0	0.2	23.7	23.7	1.2	-	3.3	3.3
Niger	2.2	-	12.4	-	1.6	-	1.5	-
Sierra Leone	3.7	3.6	11.6	11.6	2.2	2.2	2.0	2.0
All countries of Group C	**2.3**	-	**6.1**	-	**1.4**	-	**1.3**	-

Quality assurance in TTI testing

Out of the 43 countries, 27 reported that a proportion of their blood donations were screened in a quality assured manner. The average proportion of blood donations screened in a quality assured manner for the four TTIs was 95.3% for HIV, 88.9% for HBV, 90.1% for HCV and 79.9% for Syphilis. Details of proportions in each group are shown in table 16.

Thirty three (33) countries out of 43 provided responses on the number and proportion of centres using Standard Operating Procedures (SOPs) and /or participating in an External Quality Assessment scheme (EQAS) for different TTIs. Among the 1 050 centres which reported on this parameter, a total of 283 centres (26.9%) were using SOPs while 201 centres (19.1%) were participating in EQAS for HIV, 82 (7.8%) for HBV, 82 (7.8%) for HCV and 56 (5.3%) for Syphilis (Table 17).

Table 16: Reported proportion of blood donations screened in a quality-assured manner in each group.

Group	Countries (n)	Proportion of Blood donation screened in a quality assured manner (%)			
		HIV	HBV	HCV	Syphilis
A	13	99.2	93.4	93.4	85.2
B	3	100	75.9	95.3	73.8
C	11	84.9	80.1	80.4	67.8
All countries	**27**	95.3	88.9	90.1	79.9

Table 17: Number and proportion of centres in the report using SOPs and participating in EQAS.

Group	Countries (n)	Centres in report (n)	Centres using SOPs n (%)	Centres participating in EQAS n (%)			
				HIV	HBV	HCV	Syphilis
Group A	16	101	64 (64.3)	40 (39.6)	31 (30.7)	31 (30.7)	18 (17.8)
Group B	5	59	54 (91.5)	53 (89.8)	20 (33.9)	20 (33.9)	18 (30.5)
Group C	12	890	164 (18.4)	108 (12.1)	31 (3.5)	31 (3.5)	20 (2.2)
All countries	**33**	**1050**	**283 (26.9)**	**201 (19.1)**	**82 (7.8)**	**82 (7.8)**	**56 (5.3)**

Blood components preparation, storage and transportation

Blood component preparation

A total of 40 out of 43 countries reported preparation of blood components. Red cell concentrates were being prepared in 35 of the 40 countries while platelets and fresh frozen plasma (FFP) was prepared in 27 and 30 countries respectively.

Table 18: Number of countries preparing blood components in each group.

Group	Country (n)	Blood components			
		Red Cells (n)	Platelets (n)	FFP (n)	Cryopre-cipitate (n)
Group A	19	17	15	15	**5**
Group B	7	7	4	5	**3**
Group C	17	11	8	10	**3**
All countries	**43**	**35**	**27**	**30**	**11**

Out of 1 397 centres 440 (31.5%) were preparing blood components and 227 (19.8%) paediatrics units.

Table 19: Number and percentage of centres in the report preparing blood components and paediatric units.

Group	Countries (n)	Centres in the report (n)	Centres preparing blood components n (%)	Centres preparing paediatrics units n (%)
Group A	17	139	61 (43.9)	75 (53.9)
Group B	7	400	331 (82.7)	157 (39.2)
Group C	13	858	48 (5.6)	45 (5.2)
All countries	**37**	**1 397**	**440 (31.5)**	**277 (19.8)**

Blood components preparation (Total blood components prepared)

Out of 3 427 851 blood donations, 2 068 174 (60.3%) were separated into components. The proportion of countries separating 100% of blood donations was 5.3% in group A, 14.3% in group B and 11.8% in group C. Swaziland in group A, Central African Republic in group B, Gabon and Mauritania in group C. Table 21 shows the proportion of donations separated in each country. Only Mauritius, Namibia, South Africa, Zimbabwe, Botswana and Algeria prepared blood components through apheresis procedures.

Table 20: Number and percentage of blood components prepared in each group.

Group	Countries (n)	Total donations (n)	Whole blood units separated into components n (%)	Red cell preparations n (%)	Other preparations* n (%)
Group A	18	1 954 844	1 372 638 (70.2)	1 292 087 (66.1)	1 182 659 (60.5)
Group B	7	665 012	489 439 (73.6)	487 143 (73.2)	235 821 (35.5)
Group C	15	807 995	206 097 (25.5)	198 102 (24.5)	40 175 (5.0)
All countries	**40**	**3 427 851**	**2 068 174 (60.3)**	**1 977 332 (57.7)**	**1 458 655 (42.5)**

* *Other preparations included Platelets, Fresh Frozen Plasma, Plasma and Cryoprecipitate*

Table 21: Proportion of blood collection separated into components in each country.

Group A		
S/No	**Country**	**%**
1	Benin	39.2
2	Botswana	99.0
3	Burkina Faso	98.4
4	Burundi	13.4
5	Côte d'Ivoire	86.2
6	Eritrea	48.0
7	Kenya	30.8
8	Lesotho	NR
9	Mauritius	47.6
10	Namibia	98.7
11	Nigeria*	0.0
12	Rwanda	58.2
13	South Africa	98.1
14	Swaziland	100.0
15	Togo	72.2
16	Uganda	60.0
17	Tanzania	1.7
18	Zambia	2.0
19	Zimbabwe	22.3
Group B		
S/No	**Country**	**%**
1	Algeria	9.0
2	Cape Verde	87.1
3	Central African Republic	100.0
4	Malawi	4.8
5	Mozambique	99.5
6	Sao Tome and Principe	85.2
7	Senegal	20.5

Group C		
S/No	**Country**	**%**
1	Cameroon	2.8
2	Chad	0.0
3	Comoros	NR
4	Congo	20.5
5	DRC	45.0
6	Equatorial Guinea	NR
7	Ethiopia	16.5
8	Gabon	100.0
9	Gambia	0.0
10	Ghana	2.6
11	Guinea	0.4
12	Guinea Bissau	NR
13	Madagascar	38.6
14	Mali	30.4
15	Mauritania	100.0
16	Niger	7.2
17	Sierra Leone	0.0

* *Only data from Abuja blood centre have been considered in this analysis. NR: No response*

Causes of discard of blood and blood components

Thirty eight countries reported data on causes of discard of blood and blood components: 18 in group A, 6 in group B and 14 in group C. Out of the 3 223 529 blood donations collected in these countries, 356 137 (11.0%) were discarded. The main cause of discard was TTIs (Table 22).

Table 22: Proportion and causes of discarded blood and blood components in each group.

Group	Total donation (n)	Causes of discarded blood and blood components						
		Incomplete collection (%)	TTIs (%)	Expiry (%)	Storage problems (%)	Transport problems (%)	Processing problems (%)	All causes (%)
A	1,884,919	1.2	4.3	2.8	0.1	0.1	0.9	**9.4**
B	559,729	3.2	4.4	6.2	0.1	0.0	2.6	**16.5**
C	778,881	0.8	9.3	0.4	0.3	0.2	0.1	**11.1**
All countries	**3, 223,529**	**1.4**	**5.6**	**2.9**	**0.1**	**0.1**	**0.9**	**11.0**

Storage and transportation of blood

A total of 1 112 out of 1 492 (74.5%) centres reported that they had temperature-monitored cold chain facilities for blood storage, while only 773 out of 1 492 (51.8%) centres reported that they had a temperature-monitored transportation system for blood. Table 23 shows the number and percentage of blood centres in each group with cold chain facilities for storage and transportation of blood.

Table 23: Number and percentage of centres having blood cold chain facilities for storage and transportation of blood.

Group	Countries (n)	Centres in report (n)	Centres storing blood in temperature monitored equipment (n)	Centres transporting blood in temperature monitored cold boxes (n)
A	19	141	103 (73.0)	71 (50.3)
B	7	400	327 (81.7)	54 (13.5)
C	17	951	682 (71.7)	648 (68.1)
All countries	**43**	**1,492**	**1,112 (74.5)**	**773 (51.8)**

Clinical use of blood

Out of 43 countries that responded, 36 provided answers to questions on clinical use of blood. Of the total of 4 697 hospitals, 4 435 hospitals were reported as performing blood transfusion, 478 (10.7%) had a Hospital Transfusion Committee (HTC), 59 (1.3%) had a system for monitoring clinical transfusion practice, and 1 172 (26.4%) had a mechanism for reporting adverse transfusion events and reactions.

Table 24: Number of hospitals monitoring clinical use of blood in each group.

Group	Countries (n)	Total hospitals (n)	Hospitals with a HTC* n(%)	Hospitals performing clinical audits n (%)	Hospitals notifying adverse reactions n(%)
Group A	14	2 509	370 (14.7)	17 (0.7)	943 (37.6)
Group B	7	1 441	101 (7.0)	42 (2.9)	222 (15.4)
Group C	15	485	7 (1.4)	0 (0.0)	7 (1.4)
All countries	**36**	**4 435**	**478 (10.7)**	**59 (1.3)**	**1 172 (26.4)**

Out of 43 countries, 39 countries reported on blood transfusions. Of the 3 558 481 blood units collected, in these countries, 3 279 863 were reported as transfused. The number of blood units transfused as whole blood was 1 154 512 (35.2%), 1 712 088 (52.2%) as red cell concentrates, and 196 792 (6.0%) for FFP. Thirteen countries reported that they transfused less than 25% of their blood as whole blood.
Red cell preparations were the most transfused blood component in group A and B with a frequency of 60.0% and 56.5% respectively, while whole blood was mainly transfused in group C (70.7%).

Table 25: Proportion of blood transfusions as components according to group of countries

Group	Countries (n)	Total donation (n)	Transfusion reported	Proportion of transfused blood components (%)						
				Whole blood (%)	RCC (%)	Platelet, WBD (%)	Platelet apheresis (%)	FFP (%)	Plasma (%)	Cryop (%)
Group A	18	1 944 138	2 227 928	26.8	60.0	2.3	1.2	6.6	1.9	0.9
Group B	5	506 426	555 884	19.4	56.5	13.8	0.3	9.8	0.01	0.02
Group C	16	829 299	774 669	70.7	26.5	1.2	0.0	1.3	0.06	0.02
All countries	39	3 279 863	3 558 481	35.2	52.2	3.8	0.8	6.0	1.2	0.6

WBD: Whole blood derived; FFP: Fresh frozen plasma; Cryop: Cryoprecipitate; RCC: Red cell concentrate

Of the 36 countries that monitored clinical use of blood, only 17 countries reported data on incidents and reactions following blood transfusion from a total of 1 013 719 patients who were transfused. Out of these, 905 had severe incidents and reactions. Seven of the 17 countries did not respond regarding severe incidents or reactions. Details per country are reported in table 26.

Table 26: Number of severe incidents and reactions reported by 17 countries.

S/No	Country	Patients Transfused (n)	Severe incidents/reactions(n)	Frequency (/1,000 patients transfused)
1	Benin	65 171	NR	NA
2	Burkina Faso	20 218	0	0.0
3	Comoros	2 140	NR	NA
4	Congo	15 672	3	1.9
5	DRC	193 309	214	11.0
6	Gabon	11 646	NR	NA
7	Ghana	20 740	10	4.8
8	Guinea	12 453	0	0.0
9	Guinea Bissau	1 722	0	0.0
10	Madagascar	1 083	NR	NA
11	Mozambique	121 316	NR	NA
12	Namibia	12 026	20	16.6
13	Niger	33 737	NR	NA
14	Sao Tome and Principe	1 061	0	0.0
15	South Africa	403 715	658	16.3
16	Swaziland	9 499	0	0.0
17	Zambia	90 211	NR	NA

NR: No response. NA: Not applicable

DISCUSSION

The Blood Safety Indicator tool used in the 2010 survey

The WHO has over the years been collecting data using the GDBS questionnaire every two years. A decision was reached to collect comprehensive data every two years using the detailed GDBS questionnaire and between these to use an abbreviated form focusing on major indicators that could demonstrate progress made in the improvement of organization and management as well as technical areas and safety of the blood supply in Member States annually. The tool used in collecting data in 2010 was thus the abbreviated form of the GDBS questionnaire. The clear and concise questions in the tool were selected so as to ensure closer monitoring and evaluation of the blood safety programmes in the WHO member states without losing the required detail that would jeopardize timely intervention. Although there might have been incomplete answers to some questions, the response rate was comparable with that in 2006, where 44 out of 46 countries responded while only Angola and Seychelles dropped out in 2010.

The reasons why these two countries did not respond need to be ascertained to prevent a repeat of the same in the subsequent surveys. Liberia has consistently not responded since 2004 and this may call for some customized approach such as a specific mission or engaging the blood safety focal point in the WHO country office. For the first time, deferral rate and reasons for deferral as well as frequency of adverse reactions in transfused patients were part of the questions asked from countries. This was an improvement on the previous questionnaires. However, TTI prevalence rate per donor type was not captured by the current tool, although a proven fact, this information is important while advocating for phasing out of paid and replacement donation types as well as monitoring effectiveness of donor retention strategies. Three countries did not participate in this survey. Some countries did not provide all the data required.

For instance, only 16 blood centres in the report provided data on the number of blood donations in Nigeria. The data from hospital based centres in this country was not provided. Generally, only a few data were reported on clinical use of blood, particularly on adverse events and transfusion reactions. This is a reflection of the level of development of the clinical interface and linkage between blood centres and hospitals which requires much effort to improve. As in the previous surveys, some answers did not reflect the situation on the ground in some few countries when compared to observations made during other WHO missions in these countries. For example, Cameroon has not provided data on TTI prevalence in all the three surveys, despite its availability. Although there are shortcomings, interesting and useful information was adduced, as was important developments and trends. The tool will require minor revision to capture data on prevalence per donor type. This may need inserting the required formulae in the tool so that it can be derived automatically.

Additionally, issues of organization and management of blood transfusion services still need close monitoring in the WHO African Region and hence need inclusion in the questionnaire. Mechanisms to obtain missing data should be devised to minimize the risk of not obtaining the true situation in some countries and hence the region. There is for instance no data to use as basis for accurate assessment of the current blood safety situation in Liberia which remains unknown except that obtained through other means. It cannot be deduced that the situation in Angola or Seychelles has improved or deteriorated since the last survey. In the same vein, data from Nigeria does not reflect the situation in the whole country. It is inconceivable that Nigeria with a population of 167 million people could have a total collection of only 36 211 units a reduction by 463 779 units compared with units reported in 2006. These countries with apparent challenge in data collection and reporting need to be given more attention and support so as to improve the situation in the subsequent surveys.

Blood donation – Total blood units collected

The total number of blood donations increased from 3 191 808 units to 3 486 192 units for a population of 769 717 000 in 2006 and a population 813 806 984 in 2010 respectively. Going by the WHO standard of collecting at least 10 units of blood per 1000 of the population as the amount of blood required for blood transfusion needs per country per year, there was a shortfall of 4 651 871 units of blood on target for the region in 2010[5]. The shortfall however, differs from country to country and 10 countries have attained the target. Blood has a very short shelf life; therefore collecting enough units per year implies that these countries have improved their blood sourcing systems to ensure sustainable collection throughout the year. Considering the level of health system development in many countries in Africa, 10/1000 is more often an overestimate of the actual need. For example a country like Ethiopia with over 80 million people and less than 20 000 beds in total therefore requires 800 000 units of blood implying 40 units per bed per year which may be an overestimate of what is actually required by the current level of development of the health system.

The average annual blood donation rate decreased from 5.1 units/1 000 population in 2004 to 4.1/1 000 in 2006 but has increased to 4.3/1 000 in 2010[11]. The average donation rate reveals that 24 countries collected more than 4.3 units/1000 of the population compared to 16 that had exceeded this rate in 2006 (table 2; AFRO database on blood safety).

Only 5 countries were collecting at least 10 units/1 000 of the population as recommended by WHO[4]. In this group, Congo was the only new country that attained the target, while Namibia has not maintained the required donation rate. Although anecdotal, it could very well be that their current blood supply meets their current transfusion requirements and there is a balance between supply and demand at less than 1% of the population. The details of this finding need to be examined as the approach could provide some best practice to emulate in other countries.

Blood units collected by type of donation

The number of countries in group A remained the same at 19, while it increased from 4 to 7 in group B and reduced from 21 to 17 in group C. Of the four countries in group B in 2006, Mauritius and Eritrea improved on their voluntary blood donations and moved from group B to A, Seychelles did not respond to the questionnaire and Mozambique remained in the same group. Central African Republic, Malawi and Senegal moved from group A to B probably due to improved coverage and quality of reporting. Sao Tome and Principe moved from group C to B. Nigeria moved from C to group A. however, data from Nigeria was not representative of the country situation as it was only from 16 centres which provided data. Algeria and Cape Verde moved from group C to B. Thus although there are changes in the number of countries in the groups they are not necessarily the same countries in these groups as in the 2006 report. The absolute number of units collected from voluntary blood donors has increased from 2 469 693 in 2006 to 2 607 699 units in 2010 although the overall average voluntary blood collections reduced from 77.3% in 2006 to 74.8% in 2010.

Progress in voluntary blood donation varies from year to year in many countries[20]. For instance, Cape Verde made the best progress increasing the proportion of VNRBD from 35% in 2006 to 77.3% in 2010 a steady increase from 53% in 2004. It is of particular interest to note that Central African Republic declined from 100% to 68% VNRBD as well as Chad, Cameroon and Ghana whose proportion of VNRBD has declined from 15% to 4.7%, 25% to 10%, and 43% to 27.1% respectively. Although this could be attributed to better data collection and analysis by the said countries, the exact cause ought to be ascertained so as to design remedial measures to avert further decline.

Paid donations were only reported in the Democratic Republic of Congo representing a small proportion (4.98%) of their total collections. Anecdotal evidence indicates a system of surrogate family members presenting for donation with the motive of receiving payment in return. These types of donors are usually found hovering around hospital premises and are indistinguishable from genuine family replacement blood donors. In these types of donors, neither the safety of the donor nor that of the recipient can be guaranteed.

Whole blood donation was the predominant type while aphaeresis donation represented only 0.7% of all donations. This depicts the level of development of blood transfusion services in Africa whose priorities and focus are mainly geared towards securing adequate number of voluntary blood donors and sound organizational capacities besides financial constraints that go with the use of the required technologies and expertise as would allow aphaeresis.

Deferral rate and reasons for donor deferral

The mean deferral rate was 11.8% ranging from 1.8% in Burundi to 64.3% in Eritrea. It was clearly higher in Group A (12.9%) than in Group B (11.4%) and group C (8.8%). These results may be due to a more rigorous medical selection in Group A. The deferral rate of 64.3% in Eritrea is alarmingly high and might be restricting and eliminating eligible donors. However going by the reactive rates for TTIs, this may not necessarily be the case. For example Eritrea has a prevalence rate of 1.2% for HIV while Burundi has 0.4% with a deferral rate of only 1.8%. The level of evidence used in development of blood donor selection criteria remains mainly that of expert opinion. Most of questionnaires and risk factors used during medical selection of blood donors therefore have not yet been validated by epidemiological studies[21]. Studies therefore need to be conducted to secure some improved level of evidence in setting criteria for eligibility.

Countries did not provide the required details on reasons for deferral as expected; most of donors were deferred for 'other reasons or medical conditions' in 8.7% out of 11.7%. The fact that only 1.4% was deferred for low haemoglobin is questionable since anaemia is frequently reported between 10 and 30% among African blood donors[23,24,25]. The methods used in these studies, and those used in screening for selection of blood donors are different, and thus not comparable.

Facilities for blood collection and supply

A big proportion of centres (86.3%) in the countries were covered in the report. Thus, data analyzed in this report generally reflect the situation of blood safety in the WHO African Region[26]. Only 131 of 1492 centres were stand alone with hospital-based centres predominating. The proportion of standalone centres was 59% in group A as compared to 2.2% and 3.9% in group B and C respectively. There is also evidence of better policy implementation in group A countries as evidenced by the level of achievement on regional targets. This raises a number of concerns in the area of organization and management particularly coordination of the services in the other groups particularly group C. One would wonder whether the hospital centres are part of hospital establishments or hospital laboratories or part of the national blood transfusion service just located in hospitals. Whatever the case might be, it would be better to analyse this particular situation on case by case basis and make recommendations and interventions specific for each country.

Screening for transfusion-transmissible infections - Centres performing screening of donated blood

The proportion of centres performing the screening of blood donations in the 42 countries was 85.1%, ranging from 52.7% in group B to 100% in group C. with 3 out of 11, 1 out of 8 and 2 out of 14 representing, South Africa, Zimbabwe and Cote D'Ivoire, respectively having the lowest number of centres performing screening of blood compared to the total number of centres in the country. Historically, these countries started with a large number of centres performing TTI screening and evolved over time to consolidate to a few centres. This of course goes with improvement of the requisite infrastructure like effective transportation of samples and communication of results. On the other hand countries like Mozambique for example, have 149 centres each of which performs TTI testing. Interestingly there 149 hospitals that perform blood transfusion which may imply a hospital based horizontally fragmented service with minimal coordination and compromise on the quality of testing. The situation ranges between these two extremes and requires customized recommendations and approach taking political, economic and other realities into consideration while promoting quality of the services in these countries. Current priority should however be put on refining the testing algorithms and reducing the number of testing centres through better organisation, management and coordination.

Blood donation screened for TTIs

Much progress has been made in the area of screening for TTIs. A total of 42 countries out of 43 (97.6%) that responded were testing 100% of their donations for HIV in 2010. There is an improvement when this proportion is compared to 92.5% of countries (37 out of 40) in 2004 and to 95.2% (40 out of 42) in 2006. Concerning HBV and HCV, 88.3% and 83.7% of countries were testing 100% of their donations respectively. The proportions were 78% and 49% in 2004 compared to 83% and 59% in 2006. These results show an improvement for HBV testing and marked improvement for HCV. Only 3 486 units of blood were not screened for HIV in 2010 as compared to 70,000 in 2006[18,11] a tremendous improvement in the coverage of testing for this disease marker. Although coverage of testing for HBV, HCV and Syphilis have improved since the previous two surveys, there is still need to lay strategies and strive for 100% coverage in all countries. The fate of the 3 486 unscreened units against HIV is not known and may or may not have been transfused which information needs to be adduced from subsequent surveys so as to assess the risk of transmission in the affected countries.

Observation in countries shows that the failure to screen 100% of units against TTIs are due to frequent stocks outage for kits and supplies in some countries while in others testing of some of these diseases is not done due to economic constraints. There is therefore need to improve the coverage of testing in countries through building capacity to ensure the continuous availability of the required equipment and supplies through improved procurement procedures and stock management.

Proportion of blood units reactive/positive to TTIs

In general the frequency of TTIs among blood donors remained lower than the general population in all groups and in countries with high burden of diseases transmitted through blood transfusion in accordance with WHO recommendations and strategies. For example South Africa, Botswana, Swaziland have maintained their prevalence well below that of the general population as indicated in tables 16 a, b and c and compared to their national prevalence data. This was however marked in countries that rely on and have employed strategies to promote recruitment and retention of voluntary blood donors.

There continues to be a generally higher burden of HBV infection among west African blood donors than in the other parts of the region; As in 2006, the frequency of HBsAg is very high (> 10%) in some countries of West Africa and Central Africa such as Burkina Faso, Chad, Equatorial Guinea, Guinea, Mali, Mauritania, Niger, Senegal, and Sierra Leone. A higher proportion of blood units reactive for HCV is also noted in most of these countries as well as in group C as reported in previous studies [15,22]. Corte d'Ivoire has shown a tremendous improvement in lowering the frequency of HCV among its blood donors from 11.96% in 2006 to 1.7% in 2010, the strategies employed, could help improve the situation in other countries with the same high burden of disease. HTLV continues to be isolated in Gabon and more structured epidemiological studies are required to elucidate the epidemiology of the disease to reduce the spread of this disease within and outside the country. The frequency of TTIs in Equatorial Guinea is alarmingly high compared to countries in the same region. HIV stands at 29.1%, HBV at 15.4 and Syphilis at 29.5%. Interestingly it is only in this country that the prevalence of HIV and Syphilis are comparable in the whole region and if true, it would support postulation that Syphilis is a surrogate marker of high risk sexual behaviour that would expose to HIV infection; the main rationale for its testing. Mozambique too, has a high frequency of HIV among blood donors unlike countries in the same region that have maintained a lower level of the frequency of HIV among their blood donors compared to the general population employing proven strategies to achieve this. These countries need particular attention in organization and management of their blood services as well as enhancing recruitment and retention of voluntary blood donors from low risk populations.

The proportions of blood units reactive/positive to TTIs in 2010 were higher in group C than in groups A and B, indicating that group C countries are collecting blood from high-risk blood donors. Compared to 2006, the median prevalence of blood units reactive/positive for HIV and for HBV decreased from 1.9% to 1.2% and from 6.1% to 4.2% respectively. However, for HCV and Syphilis, this prevalence increased from 0.7% to 0.9% and 0.5% to 1.2% respectively. This is dependent on a number of factors which may be beyond the scope of this report such as the algorithms employed, the test kits on the market, validation of these test kits, storage, lack of skilled human resource among others. It is also of concern that Cameroon has not reported on the frequency of TTIs in the 3 consecutive surveys, probably due to fragmented, uncoordinated hospital based blood transfusion services and lack of appropriate data management system. This country needs to be supported to organize credible blood services. Interestingly, Cameroon has a blood policy supported by ratified legislation (personal communication). Among the countries that performed confirmatory testing, the percentages of true positives were generally lower than the percentages of reactive rates in these same countries except South Africa, Cote d'Ivoire, and Zimbabwe where results of the screening and confirmatory testing are almost similar.

This implies that countries that have well established national blood services with good quality system shown by fewer centres that screen blood than those that collect, false positive results are minimal. Confirmatory testing is not only important in facilitating post donation counselling of blood donors for purposes of referral for further management at specialized centres but also for effective deferral of positive blood donors. Moreover confirmation of test results enables re-inclusion of donors deferred for false reactivity. Loss of donors with false positive results is costly to blood transfusion services.

Screening of Donations in a Quality Assured Manner

In this report as defined by the tool, a centre is said to be testing blood in a quality assured manner if it employs documented SOPs and participates in an external quality assessment scheme. It is therefore possible to use SOPs without participating in an EQAS and vice versa. Additionally this could be done for some of the disease markers and not for all the four recommended in the region. Thus generalising that a country is testing in a quality assured manner can be misleading. There is also evidence from the report that understanding the tenets and term 'testing in quality assured manner' posed a challenge to a number of countries. For instance, 95.3% of blood centres reported screening HIV in a quality-assured manner while only 19.1% of blood centres were using SOPs and participating in an EQAS for this disease. In 2010, 33 countries out of 43 (76.7%) reported participation in EQAS compared to 16 countries out of 42(30.1%) in 2006[11]. The number and proportion of centres using the SOPs and participating in EQAS in group C were lower compared to groups A and B. Out of the 951 centres performing screening in group C, only 201, and 56 participated in EQAS for HIV, HBV, HCV and Syphilis respectively. This once more demonstrates the importance of having a coordinated system with few numbers of centres performing testing. Quality assured testing therefore correlates with categorization of countries.

Blood component preparation storage and transportation-Countries and centres performing blood components preparation

The total number of units converted into components was 2 068 174 units representing 60% of the total number that was collected in the countries that reported component production. There was however no significant increase in the number of countries preparing various components over the years. Thirty seven of 43 countries (86.0%) have centres preparing blood components and paediatric units. The number of countries preparing red cell concentrate was 35 out of 37 compared to 29 out of 40 in 2004 and 32 out of 42 in 2006. The number of countries preparing platelet concentrates was 27 out of 43 compared to 29 out of 40 in 2004 and 25 out of 42 countries in 2006.The number of countries preparing FFP was 30 in 2010 compared to 29 in 2006. Among the categories, 16 prepared components in group A, while B and C had only 3 and 10 countries respectively. There is therefore a slight increase in the number of countries preparing components except for FFP. Among the 40 countries, group A and B had a greater proportion of centres preparing blood components in 2010 compared to group C. It goes without saying that countries whose blood programmes are organized along voluntary blood donations organize better component production programmes as their collections are not patient based, unplanned and more often not centred around emergencies[18,11]. Factors responsible for low component production in countries should be established to enable improvement so as to enhance appropriate clinical use of blood as well as optimizing the use of the converted units.

Blood components preparation

The number of units of blood separated into components was not asked in 2006 and thus it is not possible to compare the two surveys in this regard. The variability of blood components indicated above and the amount separated into components at 60% of total collections is considerable taking note of the capacities within countries in this regard. Component production allows optimal use of each unit of blood and allows replacement of only that component responsible for homeostatic defect in the physiology of the patient's blood. Implementation of this modern blood transfusion practice will be further enhanced with production of more components in the region. Of the 440 centres that prepared components only 227 prepared paediatric packs (19.8%) table 18. There is therefore need to increase the number of paediatric preparations considering that many transfusions are to this group of patients in the African Region. It is not uncommon during support supervision to countries to find a portion of a unit of blood being transfused to one child and the rest of the unit discarded. Some hospitals even store the remaining part of the unit even after violation of the sterile closed system making the unit susceptible to acquiring infection. This leads to much wastage as well as increasing the risk of bacterial and other infections to the patient.

Countries therefore need to be supported to improve blood component production and preparation of paediatric packs to effectively improve appropriate clinical use of blood and avoid wastage of a scarce resource while averting the risk to contamination associated with an open unit of blood.

Causes of discard of blood and blood components

In this report, the leading cause of discard for blood is reactivity to markers of infections transmitted through blood transfusion. However, the proportion of blood units discarded for TTIs decreased (table 22) from 9.3% in 2006 to 7.5% in 2010. The proportion of discarded units was higher in group C in which countries depend mainly on family replacement donations unlike countries of groups A and B. This proves further that it is worthwhile to invest in collection of blood from low-risk blood donors which remains the foundation of any safe blood supply. Other major causes of discard of blood units observed are collection of insufficient volumes, outdating, and processing problems. These problems are encountered in groups A and B because of their level of development of their blood transfusion services and hence practices. It also reveals deficiencies in the process of blood collection, blood components preparation and stock management in group C countries. This highlights the need to target the training of staff and building capacity for component preparation and inventory management in group C countries.

Storage and transportation of blood

Maintenance of a cold chain from vein to vein and keeping blood at the stipulated storage temperatures and conditions is mandatory if blood has to be viable and efficacious at the time of use and that it will do no harm to the patient[27]. There is an increase in the number of countries reporting that more than 50% of their blood transfusion centres had optimal conditions for storage and transportation of the blood. This represents 34 out of 43 countries in 2010 compared to 25 out of 43 countries in 2006.

For blood transportation, the number of countries was 21 out of 43 in 2010 compared to 11 out of 39 in 2006. Despite this increase, the proportion of countries having facilities for transportation of blood products is still low. Except for platelets and plasma derived products, collected blood must be kept at 2- 10°C during transportation and stored between 2°C and 6°C until use.

Freezing of red blood cells causes haemolysis releasing free haemoglobin which is toxic to the kidneys and other organs [28]. There is need to improve the capacity of blood centres in all countries in cold chain maintenance as well as proper storage and transportation so as to prevent deterioration of blood and blood components as well as untoward effects.

Clinical use of blood

Despite the fact that the question was asked differently in 2010, the percentage of blood transfused as red cell concentrate was 52.2% being higher in group A (60%) and B (56.5%) countries and minimal in group C (26.5%) countries. This is an improvement compared to 2006 where only 24 countries were transfusing more than 75% as whole blood. Generally, the required arrangements to secure a sound clinical interface were not well developed in many countries. Only 478 of 4 435 (10.7%) hospitals that performed blood transfusions had a hospital transfusion committee (HTC). While only 59 hospitals (1.3%) were performing audit on blood transfusion and only 26% (1172) were reporting incidents and reactions on blood transfusion.[29] There were 905 incidents reported from four countries of the 17 that responded to the question on incidents. Thus reporting on the fate of a transfused unit of blood and that of the transfused patient is still a challenge to many countries in the region and needs to be improved. Establishment of HTCs and other mechanisms of reporting and linkage between hospitals and blood centres need to be explored and enhanced. For instance, observation during WHO missions show that some blood centres of Burkina Faso (group A) reported great improvement in adverse reaction notification a practice which needs to be emulated by other countries.

Achievements of targets set in the Regional strategy

The results of previous and current surveys revealed a slow progress in situation analysis in countries of WHO African Region. Thirty countries out of 36 (83,3%) in 2010 had already analyzed their blood safety situation. This report revealed that the number of countries implementing a blood policy increased from 23 out of 42 (54.7%) in 2006 to 29 out of 43 (67.4%) in 2010. As in the previous report, only 11 countries have adopted the appropriate legislation to make provisions of the policies enforceable under the law. The slow progress in adopting and implementing legislation needs more advocacy to encourage national governments, regardless of the group of countries since it seems to be unrelated to the proportion of voluntary blood donations. There is great improvement in the screening of HIV and other transfusion transmissible infections in 2010. However, the target of 100% of blood units screened for HIV and other transfusion transmissible infections is yet to be attained by all the countries in the region: 1 country is still screening less than 100% of blood units for HIV, 5 countries for HBV, 7 for HCV and 6 for Syphilis. This in itself increases the risk of transmission of these diseases through blood transfusion. When considering the fourth target of Regional strategy, some countries have significantly improved collection of blood from VNRBD while others are showing decreasing trends. The number of countries that have exceeded 80% of VNRBD did not change; 19 countries out of 42 in 2006 compared to 19 countries out of 43 in 2010. This is in spite of the huge amounts of external resources that have been invested in blood transfusion services in the region. The reasons for this may vary from country to country but mainly hinges on poor governance structures for the blood transfusion services which basically is not one of the main focus areas of the funding agencies. This is also a reflection of the status of the entire health system in some of the countries. Countries should be supported to bridge the remaining gaps in attainment of the regional targets on blood safety.

Gaps and constraining factors

Despite progress made important gaps to be bridged still remain: low policy implementation rate; poor coordination of blood services in many countries; lack of regulation; collection of blood from family replacement donors, only 20 countries have achieved the target of 80% of blood donations collected from voluntary donors; shortage of blood mostly in rural areas. Screening of all units of blood collected for all major TTIs is still to be achieved by some countries and the quality management programme based on established norms and standards needs to be strengthened. In addition, very few countries have established a functional haemovigilance system. These gaps are mainly due to the following constraints: lack of policy commitment in a few countries, despite development and adoption of national policies; low government funding and reliance on external funding; lack of human resources, high staff turnover and lack of career prospects for BTS staffs; lack of adequate infrastructures and equipments; lack of incentive for BTS staff. Poor management procedures coupled with poor management capacities impact negatively on blood services. Finally absence of reliable data collection systems and poor monitoring and evaluation programmes lead to missed opportunities to identify gaps and to address them properly.

CONCLUSION

There has been much improvement in the status of blood safety in the WHO African Region since the Ministers of health through the regional committee passed the required resolution and adopted the regional strategy on blood safety in 1994 and 2001 respectively[4]. Much focus and attention has been given to improving blood transfusion services by Member States with support of their development partners. Consequently, organization and management of blood transfusion services as well as availability and safety of blood have improved tremendously in a number of countries. However, many countries continue to face challenges both in managerial and technical areas: lack or poor coordination at national level, collection of blood in insufficient quantity from low risk donors, partial screening of blood collected for some of the TTIs, lack of adequate storage and transportation facilities, inappropriate use of blood and poor quality systems. Consequently these countries are yet to reach the minimum requirements for providing quality blood transfusion services to their populations.

Most of the countries that have established well-structured and functional national blood services in the Region are today facing issues of sustainability, particularly at the expiry of external funding. Governments ought to allocate sufficient funding for the Blood services as well as devise mechanisms to consolidate the gains and to continue improving the safety, availability and accessibility of blood and blood products to patients. The year 2012 marks the end of the period set for attaining the targets set in the Regional Strategy for blood safety. Many countries are still far from achieving some of the targets. The results of this survey should be used to identify gaps in Member States and devise strategies and specific and effective interventions that will enable bridging those gaps

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