

Impact of Seasonal Agriculture on Blood Donations in Kano, Northwest Nigeria and its Implications on Health Care

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Abstract

Background: Blood donation is generally inadequate in Nigeria. Kano state is the most populous state in northern Nigeria where agriculture is a major occupation. Hence, we hypothesized that blood donations would be lower during rainy season as eligible donors become more engrossed in farming activities that distract them from blood donation.

Materials and Methods: Accordingly, we retrospectively studied the amount of blood donations at Aminu Kano Teaching Hospital in Kano, northern Nigeria (2009 to 2012).

Results: Data analysis using Chi square test revealed significantly lower mean number of monthly donations during rainy seasons (Mean + SD: 587.2+15) in comparison to dry seasons (Mean + SD: 693.4+18), $p < 0.05$.

Conclusion: There is therefore the need to offset this seasonal shortfall in blood donations, and its potentially adverse implications on health care, by intensifying community enlightenment in order to boost blood donations during the rainy season.

Keywords: Blood; Donations; Seasonal; Agriculture; Kano; Nigeria

Introduction

The World Health Organization recommends that blood donation should be absolutely voluntary and altruistic.¹ Standard recommendations dictate that only healthy persons between the ages of 18 and 65 years with haemoglobin levels of not less than 13.5 g/dl in males or 12.5 g/dl in females are acceptable as donors if they test negative for transfusion-transmissible infections, but pregnant and lactating mothers are not accepted as allogeneic blood donors.¹ However, in most developing nations in Africa, including

Nigeria, voluntary blood donors are scarce due to ignorance, fear and superstitions relating to blood donation.² Consequently, non-voluntary donors, notably commercial and family-replacement donors have become the major alternative sources of blood donations in Nigeria.² Nonetheless, blood donations have always been inadequate with respect to clinical needs in Nigeria.² Moreover, inadequate blood bank reserves are overburdened by high prevalence of anaemia due to poverty, malnutrition, and chronic diseases including malaria and other parasitic diseases, sickle cell

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disease, tuberculosis and HIV/AIDS in the general population.^{3,4,5}

With a population of over 10 million, Kano state is the most populous state in northern Nigeria.⁶ Agriculture is a major occupation in Kano state where more than 70% of the working population are directly or indirectly engaged in agricultural activities, which include both wet season and irrigational farming.^{7,8} The population is actively involved in both subsistence and commercial farming within its rural and urban communities where more than 90% of the land is arable.^{7,8}

Like other parts of northern Nigeria, Kano state has a typical semi-desert Sudan savannah climate with essentially two distinct seasons: a long dry season (October-May) and a short rainy season (June and September), which is associated with intensification of agricultural activities.⁹ Local experience with respect to clinical practice suggests that procurement of blood for allogeneic transfusion is more difficult during the rainy seasons in comparison with the dry season. Therefore, we hypothesized that the amount of blood donations in the region may fall during the rainy season as eligible blood donors become preoccupied with farming activities, a situation that would worsen donor blood scarcity and impede optimal health care delivery within the region. Accordingly, we evaluated the number of blood donations during the rainy and dry seasons at Aminu Kano Teaching Hospital (AKTH), Kano, northwest Nigeria from 2009-2012. If our hypothesis is correct, the mean number of monthly blood donations will be significantly lower during the rainy seasons in comparison with the dry seasons.

Materials and Methods

This is a retrospective analysis of the number of blood donations received during a four-year period, 2009-2012, at the blood donation clinic of the Department of Haematology and Blood Transfusion of AKTH, Kano, northwest Nigeria. AKTH is the largest tertiary hospital in northern Nigeria and is located in Kano, the capital city

of Kano state. By carefully scrutinizing the blood donation register, the number of donations received during each month in each year under review was determined. The mean and standard deviations of the number of donations were determined for individual months. The months were also grouped into seasons (dry and rainy seasons), and the mean and standard deviations of monthly donations were determined for each season.

The data was evaluated for seasonality by analyzing the mean number of donations for individual months as well as the mean number of monthly donations for each season (dry and rainy seasons). The Chi-square test for the null hypothesis was used to check the statistical significance of the values obtained at $p < 0.05$.

Results

A total of 13,584 donations (6,991 in 2009; 7,793 in 2010; 8,121 in 2011; 8,679 in 2012) were collected during the 4-year period under review. The monthly distribution and mean values are shown in Table 1 and Figure 1, the analysis of which showed a nonlinear relationship between individual months and mean number of donations with significantly lower values during the rainy season months in comparison with the dry season (X^2 test, $p < 0.05$). Moreover, there were no significant differences between the mean number of donations during the rainy season months of June (577.5+16), July (596+16), August (568.8+17) and September (606.5+20); $p < 0.05$.

When individual months were grouped into seasons, the seasonal distribution and mean values of donations are shown in Table 2, the analysis of which revealed that the mean number of monthly donations were significantly lower during the rainy season in comparison with the dry season (X^2 test, $p < 0.05$).

Discussion

The results of this study revealed a significant fall in the number of blood donations during

Table 1: Monthly number of blood donations in Kano, northwest Nigeria, years 2009-2012

	YEAR 2009	YEAR 2010	YEAR 2011	YEAR 2012	MONTHLY MEAN+ SD
January	648	677	783	736	711+25
February	591	697	655	751	673.5+23
March	630	684	726	778	704.5+24
April	593	696	650	735	668.5+18
May	631	722	678	771	700.5+21
June	504	560	607	639	577.5+16
July	540	572	617	655	596+16
August	500	548	600	627	568.8+17
September	526	633	585	682	606.5+20
October	589	662	704	767	680.5+22
November	626	676	737	795	708.5+23
December	613	666	779	743	700.3+24
Annual Total	6991	7793	8121	8679	

FIGURE 1: MONTHLY MEAN NUMBER OF BLOOD DONATIONS, KANO, NIGERIA, 2009-2012

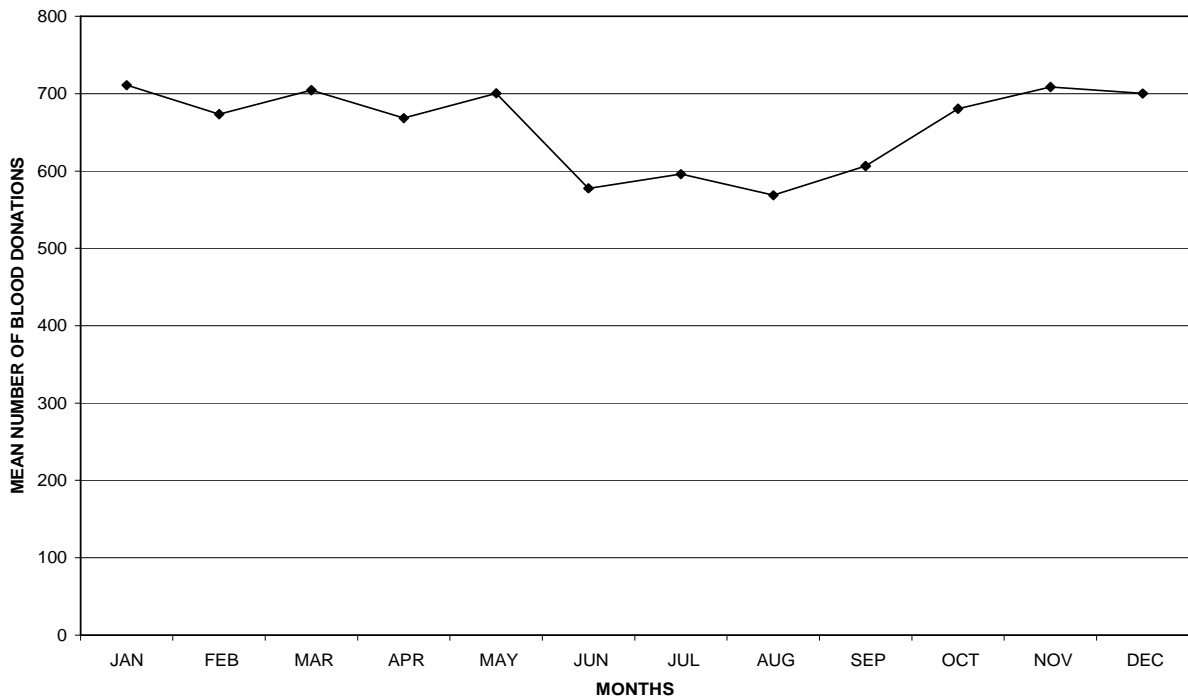


Table 2: Seasonal number of blood donations in Kano, northwest Nigeria, 2009-2012

	Dry Season	Rainy Season
Range of Months.	October-May (8 months)	June-September (4 months)
Total number of months in 4 years.	32	16
Total number of blood donations collected in 4 years.	22189	9395
Monthly Mean + SD.	*693.4+18	*587.2+15

*Mean values are statistically significant; X² test, p<0.05.

the rainy season. The downward trend in blood donations during the rainy season is interpreted to be a reflection of increased farming activities that keep eligible donors away from donations as they spend more time in their farm lands. However, it is noteworthy that the study area, Kano state, is predominantly inhabited by the Hausa-Fulani tribes with Islam as their main religion.¹⁰

It is therefore possible that the Islamic annual fasting (Ramadan), which is observed during the ninth month of the Islamic calendar might have contributed to the reduction in blood donations observed in this study. Because the Islamic calendar is lunar, Ramadan occurs in different Gregorian calendar months each year.¹¹ In retrospect, it can be seen that during the period covered by this study (2009-2012), Ramadan was observed during the months of July, August or September¹¹, all of which are also part of the rainy season (June-September) in Kano.⁹ Interestingly, the month of June in which Ramadan was never observed during period of study (2009-2012)¹¹ was also associated with low mean number of donations that was comparatively similar to that seen in July, August and September. This observation suggests that the Ramadan fasting was not a significant factor in the reduction of blood donations observed during the rainy season in this study. The AKTH, Kano runs 24-hour

donation clinic, which provides donation time convenience and flexibility that allows donors to donate after breaking the fast in the evenings. More so, the overwhelming majority (>90%) of our donors are family replacement donors¹² who readily agree to come and donate in the evenings after breaking the fasts. From these perspectives, we surmised that the low frequency of blood donations observed during the rainy season in this study was largely attributable to increased agricultural activities that often keep potential donors in their farmlands at the outskirts of the metropolis.

Like many other developing countries in Africa, Nigeria suffers from year round inadequacy with respect to blood donations.² Hence, the seasonal trend observed in this study is undesirable as it would certainly worsen the prevailing donor blood inadequacy during the rainy season. The rainy season in Nigeria is associated increased surface water availability and denser agricultural and non-agricultural vegetations, which are conducive for reproduction and survival of mosquitoes.¹³ These ecological changes make the rainy season a period of intensification of malaria transmission within the general population resulting in high morbidity.¹⁴ Although malaria is endemic in Nigeria, it is usually more frequent and severer among immunologically vulnerable groups including pregnant women

and children.^{15,16} Malaria is an important cause of anaemia in pregnancy and the incidence of anaemia among pregnant women had been shown to be higher during the rainy season as a result of increased rate of malaria transmission.^{17,18} Similarly, malaria is a major cause of anaemia in children and the severity of the anaemia is higher in the presence of coexisting malnutrition, which is common in African children due to food scarcity, poverty and ignorance.¹⁹

With a population of about 170 million and prevalence of sickle cell disease of about 3%, Nigeria is the most populous black nation that carries the highest burden of sickle cell disease in the world.^{6,20} Sickle cell disease patients are also vulnerable to malaria in whom it is an important cause of severe anaemia and vaso-occlusive crisis, the frequency of which increases during the rainy season.^{21,22}

From the abovementioned perspectives we surmise that the rainy season is a period of increased frequency of anaemia, which would proportionately raise the need for blood transfusion in the community. We therefore infer that the shortfall in blood donations during the rainy season would aggravate the background year round donor blood inadequacy. This situation will certainly have adverse implications on health care since it would create severe donor blood shortage in the face of increased incidence of malaria, anaemia and greater demand for transfusion during the rainy season. This scenario, if unchecked would certainly escalate maternal and childhood mortalities in Nigeria, thereby hampering the attainment of important components of the United Nations millennium development goals, which include global reduction in maternal and childhood morbidities and mortalities especially in developing countries such as Nigeria.²³

Conclusion

The rainy season in Kano state, northwest Nigeria, is associated with low frequency of blood donation that is related to the widespread agrarian culture of the local community. This trend would jeopardize health care delivery in the rainy season, which is also associated to high rate of transmission of malaria, anaemia and greater need for blood transfusion. We therefore recommend that health policy makers should organize regular community based donor enlightenment campaign with the aim of motivating eligible donors to spare more time for blood donation during the rainy season in order to offset the seasonal shortfall and its adverse implications on health care.

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Author Contributions

The author was responsible for the conception, design and analysis and interpretation of data as well as the drafting and revising the intellectual content of the manuscript.

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