

**PREVALENCE OF ADVERSE REACTIONS AMONG FIRST-TIME AND REPEAT WHOLE BLOOD DONORS IN NORTHWESTERN NIGERIA.**

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**Abstract**

**Introduction:** Blood donation is crucial for healthcare systems and generally safe. However, donors can experience adverse reactions, ranging from mild dizziness and bruising to more serious complications like vasovagal syncope and hematomas. Incidence rates vary globally and within Nigeria. This study aimed to determine the prevalence, and types of adverse donor reactions at Ahmadu Bello University Teaching Hospital (ABUTH) Zaria, Kaduna State.

**Material and Method:** This cross-sectional prospective study, was conducted at ABUTH Zaria over four months (April 2017-July 2017). After obtaining ethical approval and informed consent, 1022 donors, selected via convenient sampling, completed a semi-structured questionnaire detailing their socio-demographics, frequency of donation history, and any discomfort experienced before, during, immediately after, and 24 hours post-donation, with severity graded according to American Association of Blood Banks (AABB) standards. Data was collected using a checklist questionnaire and analyzed using SPSS version 20.0, with statistical significance set at  $p \leq 0.05$ .

**Results:** Over the four-months study period, our study of 1001 blood donors at ABUTH Zaria revealed a 28.1% prevalence of mild, grade 1 adverse reactions, primarily dizziness, with males significantly more affected than females. The mean age of the blood donors was  $31 \pm 10$  years, and while adverse reactions were associated with the 61-75kg weight range in males ( $p=0.012$ ), overall weight and donation frequency had no relationship with adverse reactions in either gender with  $p$  values of 0.887 and 0.623 respectively.

**Conclusion:** This study concluded that mild grade 1 adverse reactions, primarily dizziness, are prevalent among blood donors in Zaria, necessitating vigilant monitoring and tailored care, and suggesting broader, longitudinal studies to improve donor safety and blood supply.

**Keywords:** Adverse donor reactions, Whole blood donors, Dizziness, Frequency of donation and Weight

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## INTRODUCTION

Blood is a critical component of health systems worldwide, ensuring the availability of life-saving blood products for transfusion, surgeries, and emergency medical care.<sup>1</sup> However, while the process is generally safe donors can experience adverse reactions ranging from mild symptoms such as dizziness and bruising to more severe complications like vasovagal syncope, nerve injuries, or even hematomas.<sup>2,3</sup> Understanding these reactions is essential for improving donor safety, enhancing donor retention, and optimizing blood collection procedures.

Adverse blood donor reactions (ADRs) are generally infrequent and mild, but they do occur. Globally the incidence of adverse reactions among blood donors varies with studies reporting rate ranging from 0.08% to 13%.<sup>4</sup> In Asia, the occurrence of blood donor adverse reactions was influenced by sociodemographic factors such as age, donation type, donation history, and donation sites.<sup>5</sup> In a Nigerian tertiary hospital in the Southeast found a prevalence of 1.6% with vasovagal reactions accounting for 82.14% of cases.<sup>6</sup> Another study reported an overall adverse reaction rate of 2.05%, with higher rates observed among blood donors aged 18-25 years, female blood donors, first-time donors, and those with lower body weight.<sup>7</sup> These findings underscore the importance of implementing targeted strategies to mitigate risks among specific donor groups in Nigeria, such as first-time blood donors and younger individuals.

Blood donation is generally safe; however, some blood donors may experience vasovagal reactions (VVR) which are characterized by dizziness, lightheadedness, nausea, and fainting.<sup>8</sup> Haematoma occurs when blood leaks into the surrounding tissues at the venipuncture site, leading to bruising and swelling. This can result from improper needle insertion, movement during donation, or fragile veins.<sup>9</sup> Certain blood donor characteristics can influence the likelihood of

adverse reactions such as young blood donors aged 18-29 years, first-time blood component donors, and whole blood donors.<sup>5</sup> Psychological factors such as anxiety and fear particularly first-time donors are more susceptible to VVR.<sup>10</sup> Other psychological factors may result from previous negative experiences, coping mechanisms, and perceived self-efficacy.<sup>11-13</sup>

Conducting a study on blood donor adverse reactions in Zaria is imperative to address regional data gaps since studies were conducted in various parts of Nigeria, and there is a lack of data specific to Northwestern Nigeria, including Zaria. Research conducted in Asaba, Southern Nigeria, has an overall ADR rate of 2.18% for needle injuries and 2.83% for VVR.<sup>14</sup> Other rationales are to consider local demographic factors, improve blood donor safety, and inform national health policies.<sup>15,16</sup>

Our study aimed to determine the prevalence, and types of adverse donor reactions at ABUTH Zaria, Kaduna State.

## MATERIAL AND METHODS

### STUDY DESIGN AND SAMPLING TECHNIQUE

The study was a cross-sectional prospective study where a semi-structured questionnaire was administered to the blood donors after obtaining informed consent from the participants at the blood donation unit of the Haematology Department of Ahmadu Bello University Teaching Hospital (ABUTH) Zaria, Kaduna state. The study was approved by the Health Research Ethical Committee (HREC) of ABUTH-Zaria. Each donor consented in front of a witness. Donor privacy and confidentiality were secured. Donors were given a chance to withdraw from the study if they did not feel comfortable. Convenient sampling of all consented blood donors was adopted. All blood donors that passed the selection criteria were recruited after being counseled that if they noticed or felt any discomfort before, during sample collection, immediately after

collection, and 24 hours after collection of blood they should inform the researchers during phone calls. Exclusion criteria are those who did not give their consent. Blood donors were recruited over four months (April 2017 to July 2017).

### SAMPLE SIZE CALCULATION

The sample size was calculated using the formula  $n = \frac{N}{1+N(e^2)}$  where  $N$  is the approximate number of blood donors screened within the year and  $e$  is the margin of error (5%). In the blood donation unit of the haematology department ABUTH, an average of 6079 blood donors were screened annually in ABUTH, Zaria.<sup>17</sup> Therefore,  $n = \frac{6079}{1+6079(0.05^2)} = 375.31 \sim 375$  blood donors. However, 1022 blood donors were recruited to improve the validity of the result over the four months.

### STUDY SETTING

Zaria which is the Zazzau is a city in Kaduna State with a rich history spanning over a millennium.<sup>18</sup> Originating in the 11th century, it was among the foundational members of the Hausa Bakwai.<sup>18</sup> The town was a crucial hub for trans-Saharan trade, notably in the exchange of slaves, textiles, and various commodities.<sup>18</sup> Ahmadu Bello University Teaching Hospital, (ABUTH) Zaria, is one of the earliest teaching hospitals in Nigeria, established in 1967 as the teaching hospital for Ahmadu Bello

University (ABU) Zaria, one of the premier universities. The hospital provides specialized medical services in almost all specialties and training of health professionals while delivering high-quality medical care to the region, the whole country, and the neighboring countries like Chad and Niger Republic. The hospital is located in the north-western part of Nigeria.

### Data collection

Blood Donor screening was conducted using a checklist questionnaire organized by the blood donation unit, which included age  $\geq 18$  years, body weight  $> 50\text{kg}$ , packed cell volume  $\geq 38.0\%$ , and blood pressure  $\frac{120}{80} \text{ mmHg}$ . Only those that passed the questions on the questionnaire and examination were able to donate. Socio-demographics, weight, frequency of blood donation, and phone number were assessed. Also, the type of discomfort or any unusual feeling, or pain was recorded before, during, and after blood donation. Then phone calls were made at 24 hours. Any adverse effects reported were recorded.

We adopted the grading of the severity from American Association of Blood Banks (AABB) (2014) of adverse donor reaction (ADR) which was graded into 1 to 5. However, grades 4 (life-threatening) and 5 (death) are not shown on the severity assessment tool because they are rare. For this study, we adopted grades 1, 2, and 3 as shown below.<sup>19</sup>

Severity grade	Factors to consider when assigning severity donor adverse event (DAE) tool	DAE examples
Grade 1	No Outside Medical Care (OMC) <b>AND</b> Short duration $\leq 2$ weeks <b>AND</b> No limitation on Activities of Daily Living (ADL) <b>AND</b> Resolved with no or minimal	<ul style="list-style-type: none"> <li>• Arterial puncture, pressure bandage applied, resolved without intervention or sequelae</li> <li>• Vasovagal event that resolves with comfort care and/or oral hydration</li> <li>• Citrate reaction resolved with oral calcium or reduction in infusion rate</li> </ul>
Grade 2	OMC, no hospitalization <b>OR</b> Duration $> 2$ weeks- $\leq 6$ months <b>OR</b> Limitations on ADL for $\leq 2$ weeks	<ul style="list-style-type: none"> <li>• Superficial thrombophlebitis resolved with oral antibiotics, no sequelae</li> <li>• Vasovagal event that requires transport to ER for IV hydration</li> <li>• Lacerations requiring sutures</li> </ul>
Grade 3	Not life-threatening <b>AND any of the following</b> Hospitalization <b>OR</b> Duration $> 6$ months <b>OR</b> Limitations on ADL $> 2$ weeks <b>OR</b> Require surgery <b>OR</b> Other serious complications (Category E)	<ul style="list-style-type: none"> <li>• Arteriovenous fistula requiring surgical repair</li> <li>• Fracture, dental injury, or concussion</li> <li>• TIA and other cardiovascular events, which are not life-threatening</li> </ul>

## STATISTICAL ANALYSIS

SPSS statistical software (version 20.0) was used for data entry and analysis. The frequencies of different reactions at the time of donation and the next day were collated. The results were presented in simple charts, tables, means, and standard deviation; chi-square was conducted as appropriate and the level of significance was set at  $P \leq 0.05$ .

## RESULTS

A total of 1022 blood donors were enrolled over four months at the blood donation unit of ABUTH Zaria, Kaduna State. Out of which 1001 completed the study, 21 of the participants opted out of the study by not responding to phone calls. All the ADRs occurred at the time of the blood collection. The prevalence of ADRs was 28.1% in this study and were of mild, grade 1 adverse reactions. The mean and standard deviation of the age of the study participants were  $31 \pm 10$  years and the age range of 18-76 years. Males made up 890 (88.9%) while 111 (11.1%) were females. The socio-demographic profile and weight of the study participants are shown in Table 1. The frequency of donor blood reactions is presented in figure 1, while the distribution of donor adverse reactions by age and relation between blood donor weights, frequency of donation with blood donor reactions are presented in Tables 2 and 3 respectively.

## DISCUSSION

Blood donors remain the backbone of the blood bank as, without them the blood bank will not exist. A 28.1% prevalence of mild (grade 1) adverse reactions was observed in our study of consenting donors. This finding was higher than that of John et al in Nnewi<sup>6</sup> and that of Smajic et al in Tuzla<sup>7</sup> which were both retrospective studies and had a higher sample size than our study. The higher prevalence may be a result of the relatively

lower number of blood donors evaluated in our study. Also, many Nigeria hospitals including ours do not have a system for reporting donor ADRs as stated by the World Health Organization.<sup>20</sup>

The higher number of male blood donors in this study is not surprising in our environment because of the low number of female blood donors. This was also reported by Oluwumi et al, who stated that women tend to donate less compared to males because of the poor attitude of hospital staff and lack of confidentiality among others.<sup>21</sup> Not only that, women tend to believe that their Packed Cell Volume is always low due to menstruation and childbirth.<sup>22,23</sup>

Dizziness has been identified as the most prevalent with a frequency of 74.1% among blood donors. This observation aligns with the findings from Smajic et al in Tuzla<sup>7</sup> and that of Eluke et al in Nigeria.<sup>14</sup> This may be a result of a sudden decrease in volume which leads to a drop in blood pressure which may cause dizziness or lightheadedness, especially if the body does not compensate quickly.<sup>24</sup> "Dizziness can be caused by factors such as VVR, dehydration, and rapid movement after donation.<sup>24-26</sup> To prevent donors from having dizziness, they should be advised to take plenty of fluid before and after the procedures.<sup>27,28</sup> But when it occurs during or after the blood collection, the client's foot of the bed should be elevated to improve blood circulation to the brain.<sup>29</sup>

The age group 25-35 years was mostly affected (45.9%) and this was contrary to the finding of Sun et al in shenzhen<sup>5</sup> and that of Sultan et al in Pakistan<sup>30</sup> who reported ADRs in the younger age group of 18-29 years and 30 years respectively. This change in the age group may be influenced by regional factors such as donor recruitment strategies, health status, and reporting practice.

In our study, ADRs were observed predominantly in individuals weighing between 61-75 kg. This finding is similar to the research from Pakistan, where blood donors weighing less than 70kg experienced a higher incidence of VVR and nausea.<sup>30</sup> Similarly, a study in Saudi Arabia identified blood donors weighing less than 75 kg as having a higher risk of ADR post donation. Implementing measures such as ensuring proper hydration, providing pre-donation counseling, and close monitoring during and after donation can help mitigate risks.<sup>16</sup>

Repeat blood donors were the most affected by adverse ADRs and this was contrary to the findings of Eluke et al in Nigeria<sup>14</sup> and that of Gupta et al<sup>15</sup> in India which were found in first-time blood donors. First-time donors are the most likely to have ADRs because of anxiety about what will transpire during the donation process. ADRs in repeat blood donors can deter donors from future donation which will affect the blood supply in the centre.<sup>31</sup> However, the first-time blood donors were few in our study, which may be the reason, effort should be put in place to counsel all blood donors irrespective of their donation times. This will minimize the occurrence of adverse effects among blood donors.

Our study indicates a statistically significant association between increased weight and risk of ADRs in males ( $p = 0.012$ ), whereas no such association was observed in females ( $p = 0.743$ ). This was similar to the finding in Pakistan reporting a significant association between VVR in males only.<sup>30</sup> Conversely, research from Ethiopia found no significant between weight and ADRs.<sup>32</sup> Our blood donors were predominantly male with few females, and factors attributing to the low number of females include menarche, pregnancy, and lactation.<sup>32</sup>

The frequency of blood donation does not significantly impact the occurrence of adverse donor reactions in both male and female blood donors, with p-values of 0.887 and 0.623, respectively. This was contrary to the study by Demircioğlu et al<sup>33</sup> who found a significant number of first-time donors having reactions. Therefore, adverse donor reactions should be looked for in all categories of blood donors. Understanding that donation frequency does not impact ADRs in Zaria suggests that efforts to encourage repeat donations can be pursued without increasing donor risk. However, continuous monitoring and individualized assessment remain crucial to maintaining donor safety and addressing any ADRs promptly.

Table 1: Socio-demographic and weight of blood donors

Characteristics n(%)	Age (Years)					Weight (Kg)				
	18-24	25-35	36-50	≥ 51	Mean±SD	50-60	61-75	76-90	≥ 91	Mean±SD
Total number of donors 1001, (100)	261 26.1	483 48.2	172 17.2	85 8.5	31.65±10	332 33.2	530 52.9	117 11.7	22 2.2	66.06±10
Males 890 (88.9)	209 23.5	443 49.8	160 18.0	78 8.8	32.08±10	293 32.9	474 52.3	101 11.3	22 2.5	66.20±80
Females 111 (11.1)	52 46.8	40 36.6	12 36.6	7 6.3	30.00 ± 35	39 35.1	56 50.5	16 14.4	16 14.4	
First-time donors 31 (3.1)	9 29.0	14 45.6	8 25.8	0 0	30.35±80	8 26.8	21 67.7	0 0	2 6.5	67.06±10
Repeat donors 970 (96.9)	252 26.0	469 48.4	164 16.9	85 8.8	31.60±10	324 33.4	509 52.5	117 12.1	20 2.1	66.03±10

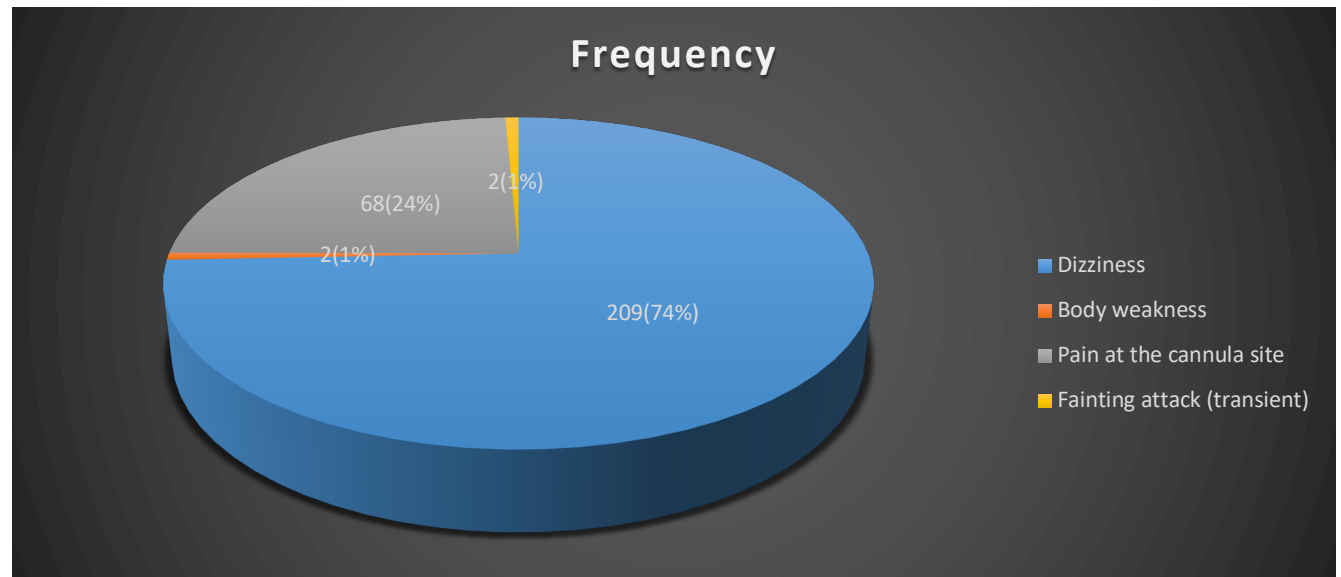


Figure 1: Frequency of blood donor reactions among blood donors

Table 2: Distribution of blood donor adverse reactions by age group

Adverse reaction	Age distribution (years)				Total
	18-24	25-35	36-50	>50	
Dizziness	54	97	44	14	209
Pain in the cannula	6	31	9	22	68
Body weakness	0	1	0	1	2
Fainting attack (transient)	1	0	0	1	2
Total	61	129	53	38	281



Table 3: Relation between blood donor weights, frequency of donation with blood donor reactions reaction

Sex	Type of reaction	Weight (Kg)				Chi-square p-value	First timer	Repeat blood donor	Chi-square p-value
		≤ 60	61-75	76-90	≥ 91				
Male	Dizziness	62	106	23	2	0.012	6	187	0.887
	Pain in the cannula	38	10	10	2		2	58	
	Body weakness	1	1	0	0		0	2	
	Fainting attack	0	0	0	0		0	0	
Female	Dizziness	6	10	0	-	0.743	0	16	0.449
	Pain in the cannula	4	4	0	-		0	8	
	Body weakness	0	0	0	0		0	0	
	Fainting attack	0	2	0	-		0	2	

## CONCLUSION

In conclusion, this study revealed a significant prevalence of mild ADRs, predominantly dizziness, among blood donors at ABUTH Zaria, highlighting the importance of vigilant monitoring and tailored donor care. While the findings indicate that male repeat donors and those within the 61-75kg weight range are at a higher risk and that donation frequency doesn't significantly influence reactions, the study underscores the necessity for continuous monitoring and individualized assessment to ensure blood donor safety.

The limitations of this study, including its single-center scope and limited follow-up, suggest the need for broader, longitudinal studies across Northwestern Nigeria, incorporating standardized data collection and extended follow-up periods.

Addressing these limitations will enhance our understanding of ADRs, improve blood donor retention, and ultimately strengthen the blood supply system.

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## Conflicts of interest

The authors declare that they have no financial or personal relationships which may have inappropriately influenced them in writing this paper.

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