



# Cost and Financial Challenges of Accessing Bone Marrow Transplantation: Opinion Survey in a Nigerian Tertiary Institution

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## Authors' contributions:

*This work was carried out in collaboration among all authors. Author NMU designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AO and NOA managed the analyses of the study. Author NOA managed the literature searches. All authors read and approved the final manuscript.*

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## ABSTRACT

**Background:** Bone Marrow Transplantation is a procedure that involves infusion of bone marrow cells to a recipient to treat bone marrow diseases like leukemia, sickle cell disease and autoimmune diseases. This medical intervention was first done in the early sixties and has since become popular in many countries. However, same cannot be said of African countries especially resource poor nations like Nigeria due to the expensive nature of the procedure. This study is aimed at seeking the opinion of Nigerians in a university community concerning the cost of Bone Marrow Transplantation and how to subsidize the cost and make the treatment accessible for Nigerians.

**Materials and Methods:** A questionnaire was used to collect information from participants at Edo University Iyamho, Edo State, Nigeria. Data was analyzed using SPSS version 23.

**Results:** A total of 196 respondents were interviewed out of which 85.2% said the Bone Marrow Transplantation is very expensive and same percentage of respondents said government's intervention would reduce the cost. One hundred and sixty-five (84.2%) agreed that the role of

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National Health Insurance Scheme will also reduce the cost. Corruption was identified by 86.3% of participants as the major impediment towards subsidizing the cost of the procedure.

**Conclusion/Recommendation:** We conclude that the cost of Bone Marrow Transplantation is very expensive to Nigerians and government need to play vital role towards subsidizing the cost. Activating the National Health Insurance Scheme and tackling corruption are the main ways the cost would be subsidized.

*Keywords: Challenges; bone marrow transplantation; tertiary institution; Nigeria.*

## 1. INTRODUCTION

Bone marrow transplantation (BMT) is a medical procedure which involves the infusion of haematopoietic stem cells (bone marrow cells) to reconstitute the haematopoietic system of a patient [1]. It is a procedure used in treatment of many blood and bone marrow diseases such as sickle cell anaemia, leukemia, autoimmune diseases [2] and many others. There are two basic types of transplants: allogeneic and autologous, depending on who donates the bone marrow or stem cells. Allogeneic BMT: Donor and Recipient are two separate individuals and transplant is done using the stem cells of donor. Autologous BMT: Donor and Recipient are same individuals, where transplant is done using patient's own stem cells [3]. The infusion of bone marrow stem cells usually follows a conditioning/preparative regimen composed of agents aimed at creating marrow space, immuno-suppression of the patient's immune system and prevention of rejection [1].

Historically, bone marrow transplantation was first developed by Dr. E. Donnall Thomas to treat haematopoietic malignancies in 1963 [4]. He received a Nobel prize in 1990 for his pioneering work in bone marrow transplantation in treating haematological malignancies [4]. The first physician to perform a successful human bone marrow transplant on a disease other than cancer was Robert A. Good at the University of Minnesota in 1968. In 1975, John Kersey, also of the same institution, performed the first successful bone marrow transplant to cure lymphoma. His patient, a 16-year-old-boy, is today the longest-living lymphoma transplant survivor [5].

In Nigeria, efforts worthy of commendation have been made by Bazuaye et al in 2011 at the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria in pioneering the procedure in Nigeria [6]. Lack of political will on the part of Nigerian government led to non-sustenance of Bone marrow transplantation at UBTH. Currently,

the procedure is available in only one privately-owned hospital [7] in Nigeria where the cost of the service is about 10 million naira (approximately 26,000 USD) which is beyond the reach of many Nigerians. In United States of America Bone marrow transplantation costs approximately \$193,000 per patient [8,9].

The aim of this study is to survey the opinion of a university community concerning the cost of bone marrow transplantation in Nigeria and seek their suggestions towards reducing the cost and make the service available and accessible by Nigerians.

## 2. MATERIALS AND METHODS

### 2.1 Study Design

This was a descriptive cross-sectional study carried out at Edo University Iyamho (EUI), Edo State, Nigeria, over a period of 4 weeks. EUI is an Edo State Government-owned tertiary institution found in 2016 and located in Iyamho, a town in Etsako West Local Government Area of Edo State, Nigeria.

### 2.2 Study Population

Using the random selection technique, a total of 196 individuals, comprising Students and Staff of Edo University Iyamho, were selected for this study.

### 2.3 Data Collection

Information was collected from respondents using semi-structured and tested questionnaires. The respondents were approached at their duty posts, hostels, classrooms and offices. In the questionnaires the respondents were expected to provide information concerning their biodata such as the age, sex, marital status, religion, tribe, occupation and educational level.

They were also asked to provide information about their opinion concerning the cost of bone marrow transplantation: whether it is very

expensive and whether Nigerians can easily afford it. In addition, the respondents were also asked to suggest from given options the various ways the cost of bone marrow transplantation can be reduced, is there any policy by government to reduce the cost, is the government doing enough to subsidize medical treatment and if the government has the capacity to subsidize medical treatment. Finally, they were asked to mention the factors responsible for the government's inability to subsidize medical treatment. One hundred and ninety six respondents were approached and interviewed.

## 2.4 Data Analysis

The Data collected were entered and analyzed using Statistical Package for Scientific Solutions (SPSS) version 23.0 software. Selected variables were presented using frequency distribution tables.

## 3. RESULTS

One hundred and ninety six (196) people were interviewed. Table 1 shows the distribution of socio-demographic characteristics of the respondents. The mean age was  $21.7 \pm 2.4$  years while the modal age group was 15-19 years representing 87(44.7%) of the respondents. The median age was 25years and age range was 17-58years. Seventy nine percent (79%) of the respondents were actually within the age of (15-24) years. The females were 110(56.1%) and males 86(43.9%) with resultant male to female ratio of 1 to 1.27. One hundred and sixty one (82.1%) were single while 34(17.3%) were married. Only one respondent (0.5%) was divorced. One hundred and fifty-five (79.1%) of the respondents were university undergraduates while 37(18.8%) were civil servants. Lecturers were 5(2.5%) and 2(1.0%) respondents did not indicate their occupation. In terms of religious affiliation of the respondents, majority of them [178 (90.8%)] were Christians while 16 (8.2%) were Muslims. African traditional religion and Hindu faithfuls were only 1(0.5%), respectively. Tertiary education was the highest level of education of almost all the respondents [190(96.9%)]. Those with secondary education and primary school education were 3(1.5%) and 2(1.0%), respectively. Tribal distribution showed that Bini and Igbo were of the majority representing 38(19.3%) and 36(18.4%), respectively. This was followed by the Yoruba and Urhobo which were 22(11.2%), respectively. Etsako was 19(9.7%) and Ishan 13(6.6%), Hausa was 5(2.6%) while It shekiri was 4(2.0%).

The other minor small tribes jointly contributed 37(18.9%) of the study population.

Table 2 indicates that majority of the study population 165(84.2%) understood what is Bone Marrow Transplantation (BMT) whereas 31(15.8%) did not understand.

Tables 3 shows the respondents' response towards the cost of 10 million naira to have a bone marrow transplantation. One hundred and sixty seven (85.2%) said the procedure is very expensive, 16(8.2%) disagreed to the fact that it is expensive while 13(11.7%) did not provide any answer. However, about half of the respondents, 94(48%) believed the medical treatment is affordable while 55(28%) said it is not affordable whereas 47(24%) did not respond.

Table 4 shows the response of the respondents to various ways and modalities to minimize the cost of BMT and make it cheaper and affordable to the citizens. One hundred and nine (55.5%) answered in affirmative that private sector in partnership with the public institutions would reduce the cost, 40(20.4%) did not agree while 47(24%) did not respond. On whether government intervention will reduce the cost, 167(85.2%) were in agreement while only 7(3.6%) did not agree, 22(11.2%) did not respond. The role of National Health Insurance Scheme (NHIS) attracted positive response from 165(84.2%) respondents while only 5(2.6%) disagreed and 26(13.3%) did not respond. Ninety one respondents (46.4%) said churches and faith-based institutions investing in healthcare will reduce the cost, 55(28.1%) disagreed while 50(25.5%) gave no response.

Table 5 shows the respondents' response on the various attitudes of the government towards reducing the cost of Bone Marrow Transplantation. One hundred and thirty one (66.8%) respondents said the government has not made a deliberate policy towards reducing the cost of the medical procedure and 48(24.5%) said the government has made a policy while 17(8.7%) did not respond. Assessing the government's efforts at reducing the cost, majority of the respondents 166(84.7%) said the efforts are not enough, 19(9.7%) said government is making enough efforts while 11(5.6%) did not respond. On whether government actually have the capacity to minimize the cost, 144(73.5%) answered in affirmative, 41(20.9%) said they do not have the capacity while 11(5.6%) provided no answer.

**Table 1. Socio-demographic characteristics of the respondents**

<b>Characteristics</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Age group (years)</b>		
15-19	87	44.4
20-24	67	34.2
25-29	10	5.1
30-34	8	4.1
35-39	9	4.6
40-44	10	5.1
45-49	2	1.0
50-54	2	1.0
55-59	1	0.5
60-64	0	0
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Gender</b>		
Male	86	43.9
Female	110	56.1
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Marital status</b>		
Single	161	82.1
Married	34	17.3
Divorced	1	0.5
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Occupation</b>		
Student	155	79.1
Civil servant	34	17.4
Lecturer	5	2.5
<b>Nil response</b>	2	1.0
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Religion</b>		
Christian	178	90.8
Muslim	16	8.2
African Traditional Religion	1	0.5
Hindu	1	0.5
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Educational Level</b>		
Tertiary	190	97
Secondary	3	1.5
Primary	2	1.0
<b>Nil response</b>	1	0.5
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Tribe</b>		
Bini	38	19.3
Igbo	36	18.4
Yoruba	22	11.2
Urhobo	22	11.2
Etsako	19	9.7
Ishan	13	6.6
Hausa	5	2.6
Itshekiri	4	2.1
Others	37	18.9
<b>Total</b>	<b>196</b>	<b>100</b>

Table 6 shows the response of the respondents towards the various impediments militating against the government reducing the cost of Bone Marrow Transplantation in Nigeria. Corruption was identified by 169 of the subjects interviewed (86.3%), 3(1.5%) persons did not agree that corruption was the problem while 24(12.2%) did not respond. Looking at lack of

political will, 122(62.2%) persons were in agreement, 6(3.1%) did not agree and 68(34.7%) did not respond. On leadership incompetence, 144(73.5%) were in agreement as contributing to the impediments, only two persons (1.5%) disagreed and 50(25%) did not respond. When we asked about lack of strategic planning, again 144(73.5%) were in support, 3(1.5%) did not

agree while 49(25%) did not respond. Concerning Lack of qualified personnel, 103(52.6%) said it is a contributory factor to impediments in cost reduction by government, 8(4.1%) said it is not and 85(43.3%) did not respond. Again, Poor administration of healthcare is adjudged as a militating factor by 152(77.6%) of respondents, only 2 persons (1%)

were in disagreement while 42(21.4%) did not respond. Finally, more than half of the study population [105(53.6%)] pointed out that conflict of interest among medical personnel is responsible for government's inability to reduce cost of bone marrow transplant, 4(2%) did not agree while 87(44.4%) did not give any response.

**Table 2. Understanding of BMT**

Characteristics	Frequency	Percentage (%)
<b>Do You Understand What is BMT?</b>		
Yes	165	84.2
No	31	15.8
<b>Total</b>	<b>196</b>	<b>100</b>

*BMT= Bone Marrow Transplantation*

**Table 3. Cost and affordability of BMT**

Characteristics	Frequency	Percentage (%)
<b>It is very expensive</b>		
Yes	167	85.2
No	16	8.2
NR	13	11.7
<b>Total</b>	<b>196</b>	<b>100</b>
<b>It is affordable</b>		
Yes	94	48
No	55	28
NR	47	24
<b>Total</b>	<b>196</b>	<b>100</b>

*BMT= Bone Marrow Transplantation; NR= No Response*

**Table 4. Ways of reducing cost of BMT**

Modalities	Frequency	Percentage (%)
<b>Private Public Partnership</b>		
Yes	109	55.6
No	40	1.5
NR	47	24.0
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Government Intervention</b>		
Yes	167	85.2
No	7	3.7
NR	22	11.2
<b>Total</b>	<b>196</b>	<b>100</b>
<b>National Health Insurance Scheme</b>		
Yes	165	84.2
No	5	2.6
NR	26	13.3
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Faith Based Institutions</b>		
Yes	91	46.4
No	55	28.1
NR	50	25.5
<b>Total</b>	<b>196</b>	<b>100</b>

*BMT= Bone Marrow Transplantation; NR= No Response*

**Table 5. Government Efforts at reducing cost of BMT**

Modalities	Frequency	Percentage (%)
<b>Making a Policy</b>		
Yes	48	24.5
No	131	66.8
NR	17	8.7
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Is Government efforts enough</b>		
Yes	19	9.7
No	166	84.7
NR	11	5.6
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Have Capacity to subsidize</b>		
Yes	144	73.5
No	41	20.9
NR	11	5.6
<b>Total</b>	<b>196</b>	<b>100</b>

*BMT = Bone Marrow Transplantation; NR = No Response*

**Table 6. Impediments towards subsidizing BMT**

Impediments	Frequency	Percentage (%)
<b>Corruption</b>		
Yes	169	86.3
No	3	1.5
NR	24	12.2
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Lack of political will</b>		
Yes	122	62.2
No	6	3.1
NR	68	34.7
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Leadership Incompetence</b>		
Yes	144	73.5
No	2	1.5
NR	50	25.0
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Lack of strategic Planning</b>		
Yes	144	73.5
No	3	1.5
NR	49	25.0
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Policy Inconsistency</b>		
Yes	128	65.3
No	5	2.6
NR	63	32.1
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Lack of Qualified Personnel</b>		
Yes	103	52.6
No	8	4.1
NR	85	43.3
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Poor Health Care Administration</b>		
Yes	152	77.6
No	2	1.0
NR	42	21.4
<b>Total</b>	<b>196</b>	<b>100</b>
<b>Conflict of Interest Among Medical Personnel</b>		
Yes	105	53.6
No	4	2.0
NR	87	44.4
<b>Total</b>	<b>196</b>	<b>100</b>

*BMT = Bone Marrow Transplantation; NR = No Response*

#### 4. DISCUSSION

The fact that this study was conducted in a university community where most of the respondents were university undergraduates, explains why about 80% of the study population were within the age range of 15-24 years. This agrees with previous works concerning the age range of university undergraduates [10]. A male to female ratio of 1 to 1.25 which was almost similar to a ratio of 1 to 1.27 that was obtained in a study carried out among undergraduates in southern Nigeria [11]. Nigeria is culturally diverse and multi-ethnic [12] and hence reflected in the tribal distribution in our study. Concerning the cost of Bone marrow transplantation in Nigeria which ranges between N 10 million to N 12 million naira, 85% of the respondents were of the opinion that the amount for Bone Marrow Transplantation is very expensive and 77% also said the treatment is not affordable to average Nigerians. Nigeria is a low income per capital country characterised by a great degree of income wealth inequality and widespread poverty [13]. Our correspondents belong to the middle class of the society. Majority of the respondents were students whose families make an annual income in the range of N600,000 to N7,200,000 (1,536 to 18,438 US Dollars) [14].

The need to reduce the cost of BMT in Nigeria cannot be overemphasized considering the high prevalence of sickle cell disease [15-17] in Nigeria, of which BMT offers great curative potentials [18,19].

To reduce the cost and make the treatment available and affordable, the respondents suggested the following modalities in order of importance: Government intervention and involvement of National Health Insurance Scheme (NHIS) are more preferable than private public partnership and investment in health sector by religious organisations. Government intervention should be channelled towards reducing the cost of hospital stay which has been shown by studies as the main driver of high cost of bone marrow transplantation [20,21]. Nigeria wishes to be among the committee of nations such as Canada and Australia that have government subsidized health care systems [22]. Our study showed also that the National Health Insurance Scheme (NHIS) would also play an important role in making the cost of BMT cheaper and affordable to the citizens. However, studies have shown that the NHIS is yet to fully achieve its intended objectives in Nigeria [23-27]. Our study showed that Corruption ranked the topmost

among other factors serving as stumbling block towards subsidizing cost of BMT in Nigeria. This is in agreement with previous studies which identified corruption as a complex problem which threatens health care access, equity and outcomes [28-31].

#### 5. CONCLUSION

Our study is in agreement with other authors that Bone Marrow Transplantation is very expensive and not affordable by average Nigerians. The intervention by the government and expansion of the coverage of National Health Insurance Scheme to accommodate Bone Marrow Transplantation will definitely make the medical treatment affordable. Corruption has also been identified, from our study, as the chief impediment in implementing policies to minimize cost of bone marrow transplantation. We recommend comprehensive reforms by the government and sufficient enforcement to address endemic corruption in the health sector. This will ultimately ameliorate the inaccessibility not only to Bone Marrow Transplantation but improve the outcome to healthcare to all patients.

#### CONSENT AND ETHICAL APPROVAL

Informed consent was sought for and obtained from the willing respondents after providing explanations on the purpose of the study and having assured them that the information sought for are strictly for the purpose of research. The approval for this study was granted by Research Ethics Committee (REC) of the Faculty of Clinical Sciences of Edo University, Iyamho.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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