



CLINICAL CORRELATES OF PATIENTS WHO HAD PACEMAKER IMPLANTATION IN PORT HARCOURT, SOUTHERN NIGERIA

Chibuike Eze Nwafor¹, Maxwell Ogamegbunam²

¹Cardiology Unit, Department of Medicine, University of Port Harcourt and University of Port Harcourt Teaching Hospital NIGERIA

²Goodheart Medical Consultants NIGERIA

Corresponding Author: Chibuike Eze Nwafor, Cardiology Unit, Department of Medicine, University of Port Harcourt and University of Port Harcourt Teaching Hospital, NIGERIA, **Email:** eze.nwafor@uniport.edu.ng

ABSTRACT

Background: Permanent pacemaker implantation is a relatively safe procedure that significantly improves morbidity and mortality among patients with symptomatic bradycardia. There is limited information on the clinical correlates of pacemaker patients in the south-south Nigeria, especially in a private tertiary cardiac clinic. This study is aimed at describing the clinical correlates as seen in patients who had pacemaker implantation in a private hospital in Port Harcourt, Southern Nigeria.

Materials and Methods: This was a retrospective study of patients who had pacemaker implantation in the University of Port Harcourt Teaching hospital from 2012 to 2013 and Goodheart Medical Consultants Hospital in Port Harcourt, Southern Nigeria from 2014 to 2023.

Results: The mean age (\pm SD) of total population at the time of implantation was 66.8 (\pm 10.6) years. Men were more than the women (51.8% vs. 48.2%). Single-chamber unit was mostly implanted, single-chambers were in 25 (60.98%) while Dual chamber units were implanted in 16 (39.02%) of patients. Complete heart block (CHB) was the most common (60.98%) indication for permanent pacemaker insertion followed by second degree atrioventricular block (29.27%) and other indications (9.76%). The most common presenting symptoms were dizziness (in 56.1% of patients), blackout (24.4%), and dyspnea (19.5%). The complications observed were Lead dislodgment/malfunction, pocket infection in 3 patients each, and device expulsion in 2 patients.

Conclusion: Pacemaker implantation in Port Harcourt south-south, Nigeria started in September 2012. There was great apathy and inertia on the side of patients and their relations as well as poor infrastructures, hence, the few numbers of patients at the onset. The major reason for pacemaker implantation were complete heart block (CHB) and second-degree Atrioventricular block (2nd degree AVB). Pacemaker implantation is a highly effective procedure in treatment of symptomatic bradycardia. It is a lifesaving procedure as it improves quality of life and is associated with relatively low complications and has now achieved a wider acceptance among the populace.

KEYWORDS: Pacemaker, Pacemaker Implantation, Port Harcourt, Heart Block, Second Degree Atrioventricular Block, UPTH, Goodheart Medical Consultants.

INTRODUCTION

The permanent cardiac pacemaker implantation is currently one of the most commonly performed interventions on the heart and is certainly the most successful form of cardiac intervention involving a

prosthesis(1–3) however, in most African countries such as Nigeria, pacemaker implantation is not widely

performed in most places.(4,5) On October 8, 1958, Drs. Senning and Elmqvist implanted the first permanent electronic pacemaker in Sweden using a thoracotomy to suture two epicardial leads, the device was only in place

for a few hours.(6) Since then, pacemakers have been the recommended course of treatment for heart block and bradyarrhythmia for more than 50 years.(6,7)

The pacemaker's basic function is to pace the heart when there are no intrinsic impulses present and if intrinsic cardiac electrical activity is detected, it can then be used to limit pacing.(3) Pacemakers are commonly implanted in older individuals to treat or prevent bradycardia and ensure a normal heart rate during physical activity. (2) Research worldwide indicates that the median age for pacemaker implantation is between 64 and 77 years, with a predominance of male patients ranging from 53.5% to 60%. (3,8,9) In addition to experiencing syncope, dizziness, palpitations, and other symptoms, patients with symptomatic bradycardia run the risk of developing heart failure and sudden cardiac death from ventricular arrhythmia or prolonged asystole, as per 2013 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy. (10) Complications associated with pacemaker implantation include venous thromboembolism, lead breakage, dislodgment, and puncture.(12)

There are not many studies in the south-south region of Nigeria as regards pacemaker implantation and patients' clinical characteristics. This study is aimed at describing the clinical correlates as seen in patients who had pacemaker implantation in a private hospital in Port Harcourt, Rivers State, Southern, Nigeria.

MATERIALS AND METHODS

This is a retrospective study of all patients who received

pacemaker implantation at the Goodheart Medical Consultant Hospital, Port Harcourt between 2012 and

2023. This study consisted of 41 patients aged between 50 and 87 years. Data extracted included patients' demographics, clinical parameters, indications for pacing, device types, and outcomes. Equipment used include C-ARM Adonis HF AE60HFS (Adonis Medical Systems PVT LTD. E-70, Phase VIII, Indl. Area, A.A.S Nagar Mohali (Punjab) 160 055), pacemaker devices implanted (St Jude and Medtronic devices).

Inclusion Criteria

The study included all patients who, during the period under review, required permanent transvenous pacemakers due to symptomatic bradycardia.

Exclusion Criteria

Patients who did not have symptomatic bradycardia or with multiple pathologies that made them unsuitable for interventional procedures at the time they were seen.

Data Analysis

Statistical analysis was performed using of Stata version 15.0 (Stata Corp, College Station, Texas, USA). The results were presented in tabular or graphical forms, as were appropriate. Descriptive and inferential statistical analysis was done. The results of continuous measurements are presented as mean ± SD (min-max) and results of categorical measurements are presented as number (%). Significance was assessed at 5% level (p value ≤ 0.05) of significance.

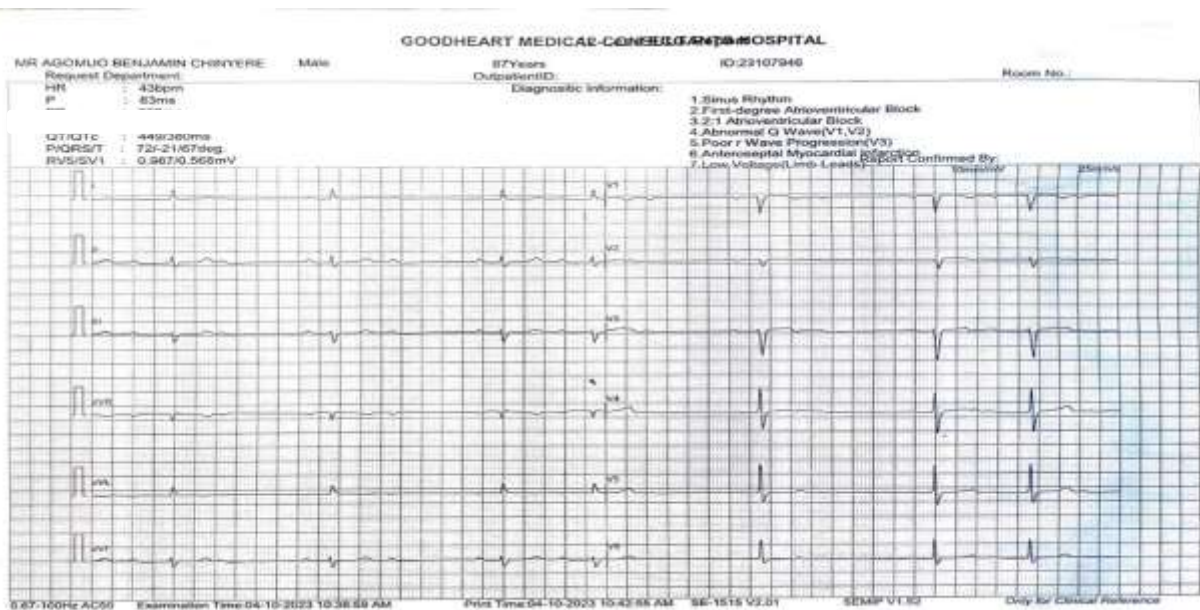


FIGURE 1- Patient's ECG before Pacemaker Implantation

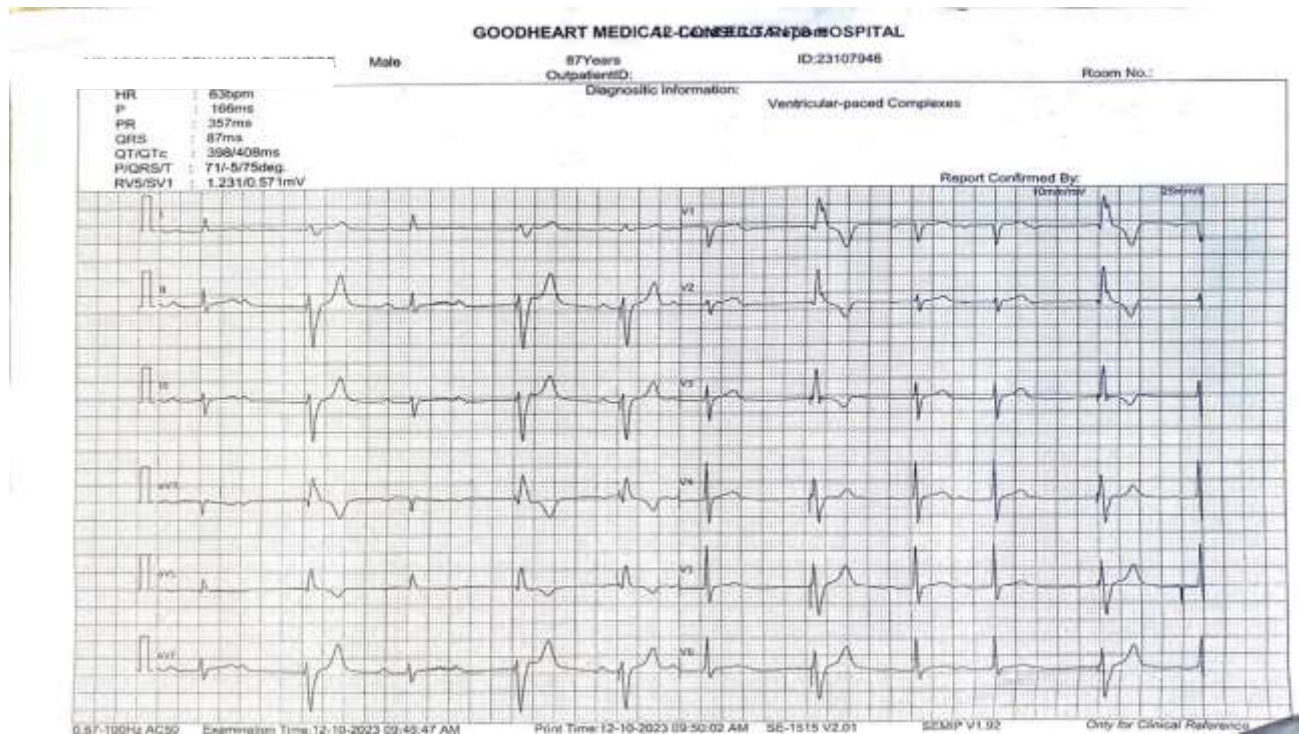


FIGURE 2- Patient's ECG Six Days After Pacemaker Implantation

RESULTS

Forty-one patients, of whom 21 (51.2%) were males and 20 (48.8%) were females (sex ratio = 1:1), and who had undergone permanent pacemaker implantation were enrolled in this study. The mean age of the patients was 66.8 ±10.6 years and mean heart rate was 32.6 ±4.5 beats per minute. Majority of the pacemaker patients were in the age range of 50 – 60 years (36.6%), followed by 51 - 70 years (26.8%), 71 – 80 years (22%) then patients above 80 years of age (14.6%). Single and double chamber devices were implanted in the patients, single-chamber devices were implanted in 25 patients (60.98%) while double-chamber devices were implanted in 16 (30.02%) of the patients. The demographic and other baseline characteristics of the study population are shown in Table 1.

The most common presenting symptoms according to indication for implantation were dizziness, blackout,

dyspnea, and weakness, in 56.1%, 24.3%, 14.6%, and 14.6% of patients, respectively. The symptoms presented by the patients before implantation are shown in Figure 1 and Table 2.

Figure 2 is a pie-chart showing the indications for pacemaker implantation. CHB (60.98%, n = 25) was the most indication for pacing the patients, followed by 2nd degree AVB (29.27%, n = 12) and then other indications (9.76%, n = 4).

Table 3 shows the complications associated with each patient. The result revealed that a great majority (87.8%) of the pacemaker patients had no complication. Complication associated with pacemaker implantation in this study include lead dislodgement/malfunction (7.3%), Pocket infection/necrosis (7.3%) and expulsion of device (4.9%).

TABLE 1- Clinical Characteristics of The Pacemaker Patients

Variable	Number (%)
Number of patients	41
Mean age (years)	66.8 ±10.6 (range = 50 – 87 years)
Mean heart rate	32.6 ±4.5
Males	21 (51.2)
Females	20 (48.8)
Age group (years)	

50 – 60	14 (34.1)
61 – 70	12 (29.3)
71 – 80	9 (22)
>80	6 (14.6)
Pacemaker type	
Single chamber (VVIR)	25 (60.98)
Double chamber (DDDR)	16 (39.02)

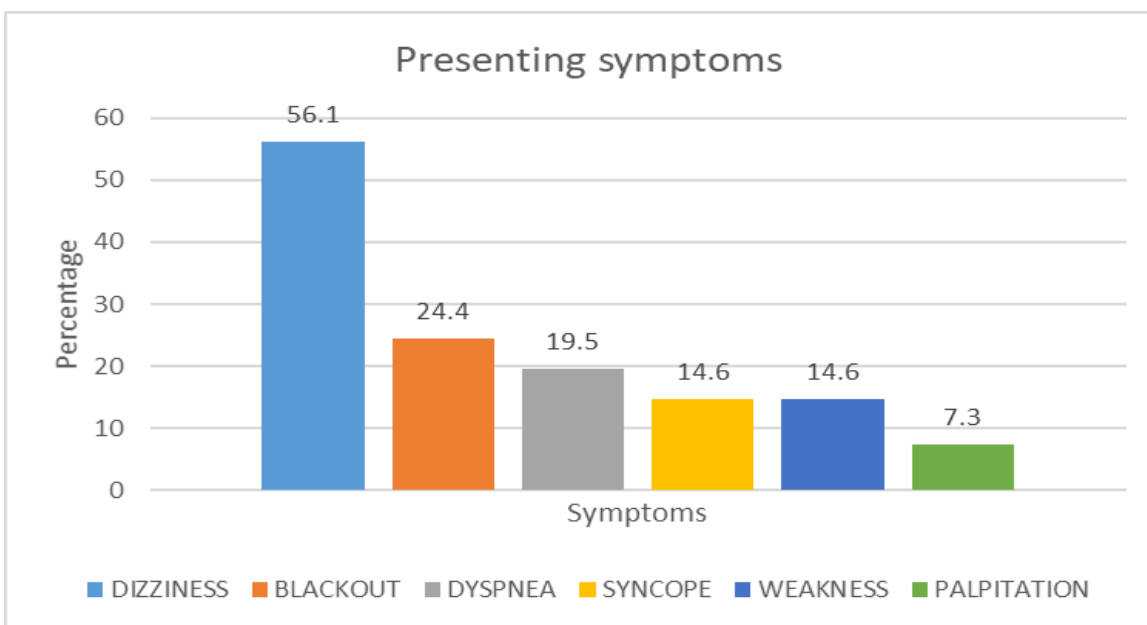


FIGURE 1- Clinical Symptoms of Patients at Presentation

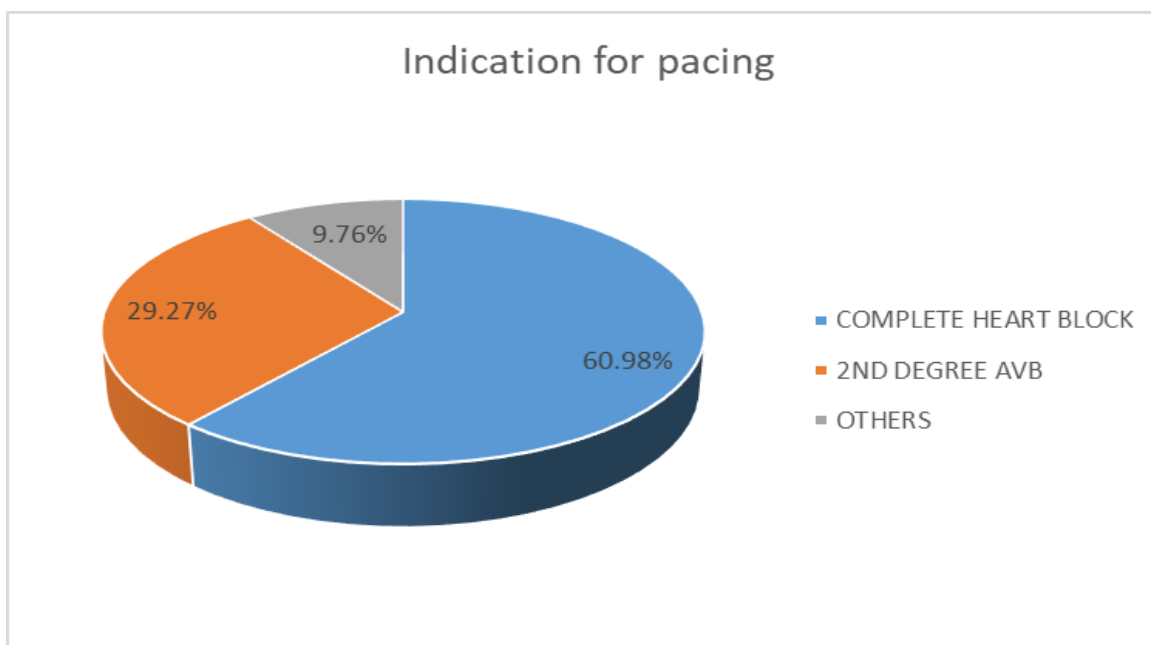


FIGURE 2- Chart Showing the Distribution of Indications of The Patients for Pace Maker Implantation

TABLE 2- Symptoms According to The Indication for Pacemaker Implantation

Clinical symptoms	CHB (n = 25)	2 ND DEGREE AVB (n =12)	OTHERS (n = 4)	TOTAL (n = 41)	P VALUE
Dizziness	14 (56.0)	7 (58.3)	2 (50.0)	23 (56.1)	0.958
Blackout	5 (20.0)	5 (41.7)	0 (0)	10 (24.3)	0.174
Dyspnea	5 (20.0)	2 (16.7)	1 (25.0)	8 (19.5)	0.931
Syncope	3 (12.0)	2 (16.7)	1 (25.0)	6 (14.6)	0.770
Weakness	4 (16.0)	1 (8.3)	1 (25.0)	6 (14.6)	0.683
Palpitation	1 (8.3)	2 (8.0)	0 (0)	3 (7.3)	0.839

TABLE 3- Complications in Pacemaker Patients

Complication	Number of patients	Percentage (%)
Lead dislodgment and malfunction	3	7.3
Pocket infection	3	7.3
Expulsion of device	2	4.9
No complication	37	87.8

DISCUSSION

For symptomatic bradycardia, transvenous cardiac pacemaker implantation is the recommended course of action.(14) Depending on how many right heart chambers are paced, cardiac pacemakers are classified as dual or single chamber devices.(12)

The goal of the current study was to assess the clinical correlates and results of cardiac conduction impairment patients receiving pacemaker implantation in tertiary hospitals (public and private) in south-south Nigeria. 41 patients underwent permanent pacemaker implantation over a period of 10 years. Of these, 25 (60.98%) patients had Complete AV block, 12 (29.67%) had 2nd degree AV block, and 4 (9.76%) had other or combination of conditions which include sick sinus syndrome (SSS), device failure, and change of pacemaker generator. Among the patients with other reasons for implantation, 1 patient had device failure following implantation done overseas, another was for pacemaker replacement, another was for change of pacemaker generator, whereas SSS manifested in 1 patient. CHB was associated with more symptoms hence willingness to accept procedure and support from family members. Whereas some 2nd degree AVB and other indications which were not very symptomatic did not require immediate pacemaker implantation. Some patients who had replacement of devices could not travel to the overseas location where the implantation took place due to logistics and financial challenges therefore regular performance of this procedure locally becomes expedient. This is a means of reducing expensive and hectic overseas travel for medical services. This study covered two tertiary hospitals (a government and a private hospital). Industrial unrest and poor infrastructure necessitated the shift from public to private hospital for the procedure.

The mean age of the patients who had pacemaker implantation was 66.8 ±10.6 years, which is the same as that found in a study in Turkey where the mean age was 66.8 years (15) and similar to that in Iraq (65 years) (7). However this was lower than reported from Ile-Ife, south-west Nigeria (70.3 ± 8.7 years) and Enugu, South-east Nigeria (70 years). (16,17) The age range was 50 to 87 years with most patients between the ages of 50 – 60 years (34.1%) which is consistent with study in Ile Ife, south-west Nigeria in terms of the age range (50 to 84 years) but lower in terms of the most occurring age group 70-79 years (40.9%). (16) This result is consistent with other studies which showed pacemaker implantation is predominantly done in the older population.(2) There is a male preponderance in pacemaker implantation in a worldwide study and a percentage of male patients ranging from 53.5% to 60%.(3,8,9) And this is corroborated by our study with male predominance over female (51.2% vs. 48.8%).

Complete heart block (CHB) also known as 3rd degree AV block was the most common indication for permanent pacemaker implantation with a prevalence of approximately 70%. Majority of studies have likewise shown this to be true.(1,16,18–20) One-year and five-year mortality rates for untreated CHB are 50% and 75%–90%, respectively; five-year survival rates for those who receive treatment are 70%–85%.(21) Second (2nd) degree AV block was the second most occurring indication for pacing (29.3%; n=12). Of the patient with 2nd degree AVB only one (2.4% of total population) had Mobitz II AVB. Other indications (9.8%) for pacemaker implantation in this study include SSS found in only 1 (2.4%) patient (25% of 4 patients) while the remaining 75% (n = 3 of 4 patients) were for change of pacemaker generator of which one of them complained of pain on pacemaker site. The finding for SSS in this study was

similar to two reports from different government tertiary hospitals in Nigeria 4.5% and 9.8% (16,19) but different from studies in India (27%) and Nepal (33.6%). (1,3) In the USA, sinus-node dysfunction was the primary cause for pacemaker installation in more than 50% of cases, and sick sinus syndrome was the most common reason for permanent pacemaker implantation. (22)

Single-chamber pacemaker (VVIR) was the most common type implanted at the initial stage due to the age of the patients, logistics and cost implications (61% of all cases as compared with 35.6% for dual-chamber pacemaker, DDDR). This is consistent with others where single chamber (VVIR) pacemaker was implanted in almost two-thirds of patients while the rest had dual chamber implantation. (1,16,18) The choice of either single or dual chamber depend on several factors and varies with the location and practitioners. The guidelines however favour dual chamber pacemaker in younger subjects and patients with suitable rhythm. And dual chamber is associated with fewer complications than single chambers. (23,24)

The most common presenting symptoms was dizziness occurring in 23 (56.1%) followed by blackout in 10 (24.4%) and dyspnea in 8 (19.5%) patients. This is consistent with a study that reported 63% dizziness in 407 study population (2), but different from findings in other studies. (1,16,18) Some studies reported other symptoms to be the most common clinical presentation, breathlessness (100%)(17), easy fatigability (45.5%)(16). The differences in presenting symptoms may not be due to sample size as some studies have shown diverse presenting symptoms even with lesser sample size than ours, for instance, a study in Turkey found syncope and pre-syncope to be the most common symptom in a sample of 704 patients. (18) The low sample size in this study and other studies from Nigeria confirm the fact that pacemaker implantation is not widely performed in this part of the world. (4,5,25) No single symptom is pathognomonic of a particular form of bradycardia and hence the indication for pacemaker implantation.

This study considered both early and late complications following pacemaker implantation. Only 8 patients (12%) had complications which were related to poor adherence to instructions with respect to physical activity and follow up visit. 3 patients (7.3%) had lead dislodgment and malfunction and another 3 (7.3%) patients had pocket infection. One patient had both lead dislodgment and pocket infection. In a similar study lead dislodgement was observed in only 1 patient (0.25%), same also for pocket infection. (7) Pneumothorax did not occur in any of the cases compared to other studies. (1,7)

CONCLUSION

Majority of patients exhibited symptoms, which were linked to bradycardia. The older age group was more affected by bradycardia than the younger age group. There are several clinical presentations for symptomatic bradycardia. Elderly males were the most common group receiving permanent pacemaker. More patients had single-chamber than dual chamber pacing. Complete heart block was the most common indication for pacing. The patients' quality of life and symptoms improved following pacemaker implantation for symptomatic bradycardia. Thus, for individuals with symptomatic bradycardia, pacemaker implantation is the only safe, effective therapeutic option with relatively low adverse events.

Our study found that pacemaker implantation is being appreciated in Nigeria and patients are confident in getting their pacemaker device implanted and replaced locally instead of traveling overseas. Public hospitals should minimize the industrial unrest and step up its investment in invasive cardiac procedures.

REFERENCES

1. Kanse VY, Chongtham DS, Salam KS, Nemichandra SC, Upreti S, Singh SD. Clinical profiles and outcomes of patients undergoing pacemaker implantation. *J Med Soc.* 2015 Apr;29(1):40.
2. Lopez-Jimenez F, Goldman L, Orav EJ, Ellenbogen K, Stambler B, Marinchak R, et al. Health values before and after pacemaker implantation. *Am Heart J.* 2002 Oct 1;144(4):687–92.
3. Khanal J, Poudyal RR, Devkota S, Thapa S, Dhungana RR. Clinical Profile and Early Complications after Single and Dual Chamber Permanent Pacemaker Implantation at Manmohan Cardiothoracic Vascular and Transplant Centre, Kathmandu, Nepal. 2015 [cited 2024 Feb 28]; Available from: <http://elibrary.nhrc.gov.np:8080/handle/20.500.14356/1750>
4. Thomas MO. Acceptance of Elective Bradypacing by Patients: An African Perspective. *Pacing Clin Electrophysiol.* 2012;35(1):58–61.
5. Nwafor CE. Cardiac pacemaker insertion in the South-South Region of Nigeria: Prospects and challenges. *Niger Health J.* 2015;15(3):125–30.
6. Kotsakou M, Kioumis I, Lazaridis G, Pitsiou G, Lampaki S, Papaiwannou A, et al. Pacemaker insertion. *Ann Transl Med.* 2015 Mar;3(3):42.

7. Ahmed M. Patients characteristic, indications, and complications of permanent pacemaker implantation: A prospective single-center study. *Med J Babylon*. 2022;19(2):152.
8. Eltrafi A, Currie P, Silas JH. Permanent pacemaker insertion in a district general hospital: indications, patient characteristics, and complications. *Postgrad Med J*. 2000 Jun 1;76(896):337–9.
9. Shenthathar J, Bohra S, Jetley V, Vora A, Lokhandwala Y, Nabar A, et al. A survey of cardiac implantable electronic device implantation in India: By Indian Society of Electrocardiology and Indian Heart Rhythm Society. *Indian Heart J*. 2016 Jan 1;68(1):68–71.
10. Authors/Task Force Members, Brignole M, Auricchio A, Baron-Esquivias G, Bordachar P, Boriani G, et al. 2013 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy: The Task Force on cardiac pacing and resynchronization therapy of the European Society of Cardiology (ESC). Developed in collaboration with the European Heart Rhythm Association (EHRA). *Eur Heart J*. 2013 Aug 1;34(29):2281–329.
11. Harcombe AA, Newell SA, Ludman PF, Wistow TE, Sharples LD, Schofield PM, et al. Late complications following permanent pacemaker implantation or elective unit replacement. *Heart*. 1998 Sep 1;80(3):240–4.
12. Edafe EA, Odia JO, Akpa MR, Dodiya-Manual ST, Oye H, Agadah Z. Experience with cardiac pacing in the Nigerian Delta region. *Niger J Cardiol*. 2020 Dec;17(2):136.
13. Ellenbogen KA, Hellkamp AS, Wilkoff BL, Camunās JL, Love JC, Hadjis TA, et al. Complications arising after implantation of DDD pacemakers: the MOST experience. *Am J Cardiol*. 2003 Sep 15;92(6):740–1.
14. Edwards SJ, Karner C, Trevor N, Wakefield V, Salih F. Dual-chamber pacemakers for treating symptomatic bradycardia due to sick sinus syndrome without atrioventricular block: a systematic review and economic evaluation. *Health Technol Assess*. 2015 Aug 24;19(65):1–210.
15. Permanent pacemaker implantation after open heart surgery - Turkish Journal of Thoracic and Cardiovascular Surgery [Internet]. [cited 2024 Mar 6]. Available from: <https://tgkdc.dergisi.org/abstract.php?lang=tr&id=970>
16. Onakpoya UU, Ojo OO, Eyekpegba OJ, Oguns AE, Akintomide AO. Early experience with permanent pacemaker implantation at a tertiary hospital in Nigeria. *Pan Afr Med J* [Internet]. 2020 Jul 13 [cited 2024 Feb 28];36(1). Available from: <https://www.ajol.info/index.php/pamj/article/view/213237>
17. Ekpe EE, Aghaji MA, Edaigbini SA, Onwuta CN, Anisiuba B. Cardiac pacemaker treatment of heart block in Enugu: a 5 year review. *Niger J Med*. 2008 Apr 22;17(1):7–12.
18. Aktoz M, Uçar MF, Yılmaztepe MA, Taylan G, Altay S. Gender Differences and Demographics and Type of Cardiac Device over a 10-Year Period. *Niger J Clin Pract*. 2018;21(1):27–32.
19. Falase B, Sanusi M, Johnson A. Analysis of a five-year experience of permanent pacemaker implantation at a Nigerian Teaching Hospital: Need for a national database. *Pan Afr Med J* [Internet]. 2014 May 5 [cited 2024 Mar 7];16(1). Available from: <https://www.ajol.info/index.php/pamj/article/view/103275>
20. Adeoye PO, Okonta KE, Salami MA, Adegboye VO. Experience with permanent pacemaker insertion at the University College Hospital, Ibadan, Nigeria. *Niger J Cardiol*. 2013 Jun;10(1):3.
21. Alpert MA, Curtis JJ, Sanfelippo JF, Flaker GC, Walls JT, Mukerji V, et al. Comparative survival after permanent ventricular and dual chamber pacing for patients with chronic high degree atrioventricular block with and without preexistent congestive heart failure. *J Am Coll Cardiol*. 1986 Apr 1;7(4):925–32.
22. Trohman RG, Kim MH, Pinski SL. Cardiac pacing: the state of the art. *The Lancet*. 2004 Nov;364(9446):1701–19.
23. Res JCJ, de Priester JA, van Lier AA, van Engelen CLJM, Bronzwaer PNA, Tan PH, et al. Pneumothorax resulting from subclavian puncture: a complication of permanent pacemaker lead implantation. *Neth Heart J*. 2004 Mar;12(3):101–5.
24. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR, Committee THICPA. Guideline for Prevention of Surgical Site Infection, 1999. *Infect Control Hosp Epidemiol*. 1999 Apr;20(4):247–80.

25. Bonny A, Ngantcha M, Jeilan M, Okello E, Kaviraj B, Talle MA, et al. Statistics on the use of cardiac electronic devices and interventional electrophysiological procedures in Africa from 2011 to 2016: report of the Pan African Society of Cardiology (PASCAR) Cardiac Arrhythmias and Pacing Task Forces. *EP Eur.* 2018 Sep 1;20(9):1513–26.