

Trends and Profile of Permanent Pacemaker Implantation in Nepal. Experience From Tertiary Cardiac Center (SGNHC) From 2001 to 2020.

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Abstract

Background and Aims: The number of pacemaker implantation is increasing at various centres of Nepal with increase in cardiac services. However, there are few data available regarding the pacemaker implantation in Nepal. This study intend to focus and study trends and profile of permanent pacemaker implantation (PPI) of 19 years experience at the referral tertiary cardiac center which will reflect intended objective of this study.

Methods: This was a retrospective cross sectional study done at Shahid Gangalal National Heart Centre (SGNHC). The data of the patient who underwent PPI from 2001 November to 2020 August were reviewed. Patients data including age, sex, indication for pacing, mode of pacing, type of pacemaker implanted, implantation parameters such as lead impedance and threshold were recorded and analyzed.

Results: A total of 3631 pacemaker implantation were performed at SGNHC from 2001 November to 2020 August. Among the total patients, 59.4% were male with mean age of 65.2±15.2 years. The most common indication was degenerative complete heart block (74.8%). Sick sinus syndrome (8.2%) was the second most common indication of pacing. The single chamber were implanted in 93.3% cases and dual chamber in 6.7% cases. VVIR was the most common mode of implantation in 93.1% cases, followed by DDDR (6.7%). AAIR (0.1%) and VDD in 0.1% cases. The total number of pacemaker implanted yearly in SGNHC has increased since the early year of implantation. During the early years most of the pacemakers were Single chamber (VVI) pacemaker and the implantation of dual chamber pacemaker increased gradually from year 2010 onwards. After the year 2010 the implantation of dual chamber pacemaker has increased significantly compared to prior to 2010 (p=0.001). There were no gender differences in use of single chamber and dual chamber implantation during this period. (p value= 0.489). The dual chamber were implanted mostly in age group less than 65 year compared to more than 65 years (P value=0.001).

Conclusion: There is gradual increase in the number of pacemaker implantation yearly at SGNHC and since 2010 there is also increase in number of dual chamber pacemaker implantation though the single chamber pacemaker outnumbered the dual chamber implantation.

Keywords: Nepal; Permanent Pacemaker.

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Introduction

Pacemaker implantation is the treatment of choice in electrophysiological conditions like sinus node disease,

atrioventricular (AV) node disease, which cause or may cause either prognostically or symptomatically significant bradycardia.¹

A worldwide survey undertaken for Pacemaker implantation in

calendar year 2009 and compared to a similar survey conducted in 2005 showed, virtually all countries showed increases in implant numbers over the 4 years between surveys. High-degree atrioventricular block and sick sinus syndrome remain the major indications for implantation of a cardiac pacemaker. There remains a high percentage of VVI (R) pacing in the developing countries, although compared to the 2005 survey, virtually all countries had increased the percentage of DDDR implants.²

There are few studies and reports have been published regarding clinical profile, short term outcome, experiences in pacemaker implantation in different center in our part of the world.³⁻⁷

This study intended focusing on permanent pacemaker implantation (PPI) of 19 years data at the referral tertiary cardiac center which will highlight and reflect a clear picture of the trends and profile of PPI implantation in Nepal.

Methods

This is a single centre retrospective observational study which was performed in the Department of Cardiology, Shahid Gangalal National Heart Centre (SGNHC), Bansbari, Kathmandu. All the patient's data were collected from the hospital records after having permission of institutional review committee. Patients who underwent PPI from 2001 November (first case) to 2020 August 31 were included in the study. Patients data including age, sex, indication for pacing, mode of pacing, type of pacemaker implanted, implantation parameters such as lead impedance and threshold were searched in the records. All data was entered into an electronic spread sheet (Microsoft Excel, Redmond) and The Statistical analysis was done using the SPSS Version 20 software (SPSS INC, Chicago, III). Categorical variables were presented as proportions or percentages. After processing of all available information, statistical analysis of their significance was done. All parametric values were expressed as mean & nonparametric values were expressed in percentage (%). The significance of difference between two groups was determined by using unpaired students't test, Pearson's chi-square test and 'z' test where applicable. 'P' value of less than 0.05 was considered to be significant.

Results

During the 19 years experiences from November 2001 to August 2020, 3631 pacemaker implanted in SGNHC. The mean age group of the study population was 65.2±15.2 years with 59.5% being Male patients and 40.5%, female patients. The single chamber was implanted in 93.3% cases and dual chamber in 6.7% cases. VVIR was the most common mode of implantation in 93.1% cases, followed by DDDR (6.7%), AAIR (0.1%) and VDD in 0.1% cases as shown in table 1.

Table 1: Baseline characteristics of the permanent pacemaker implantation patients (2001-2020).

Variable	Frequency
Age (Mean±SD)	65.2±15.2 years
Sex (N/%)	
Male	2159 (59.5%)
Female	1472 (40.5%)
Type of Permanent Pacemaker (N/%)	
Single Chamber	3389 (93.3%)

Dual Chamber	242 (6.7%)
Mode of Permanent Pacemaker (N/%)	
VVIR	3379 (93.1%)
DDDR	242 (6.7%)
AAIR	5 (0.1%)
VDD	3 (0.1)

Degenerative complete heart block (CHB) was the most common indication of pacemaker implantation in 74.8% cases followed by sinus node disease in 8.2% cases. The other indication of pacemaker implantation are shown in table 2. Pulse generator replacement was done in 7.1% cases and Redo PPI were done in 2.5% cases.

Table 2: Indication of permanent pacemaker implantation.

Indication	Number (%)
Degenerative CHB	2716 (74.8)
Sick Sinus Syndrome	299 (8.2)
2:1 AV Block	103 (2.8)
Congenital CHB	80 (2.2)
Bifascicular Block	30 (0.8)
High Grade AV Block	29 (0.8)
Trifascicular Block	16 (0.4)
Post Operative CHB	8 (0.2)
Pulse Generator Replacement	258 (7.1)
Redo PPI	92 (2.5)

The total number of pacemaker implanted yearly in SGNHC has increased since the early year of implantation as shown in figure 1. During the early years most of the pacemakers were single chamber (VVI) pacemaker and the implantation of dual chamber pacemaker increased gradually from year 2010 onwards as shown in figure 2.

Figure 1: Trends of pacemaker implantation from November 2001 to August 2020.

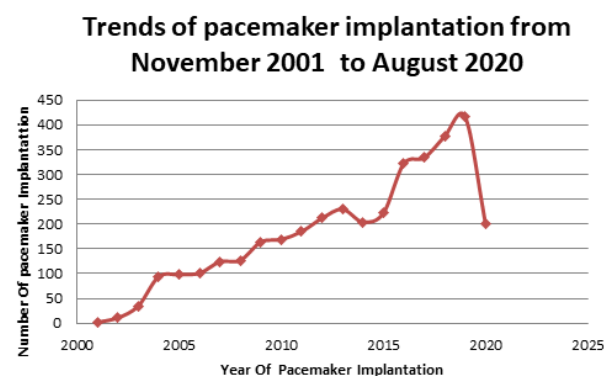
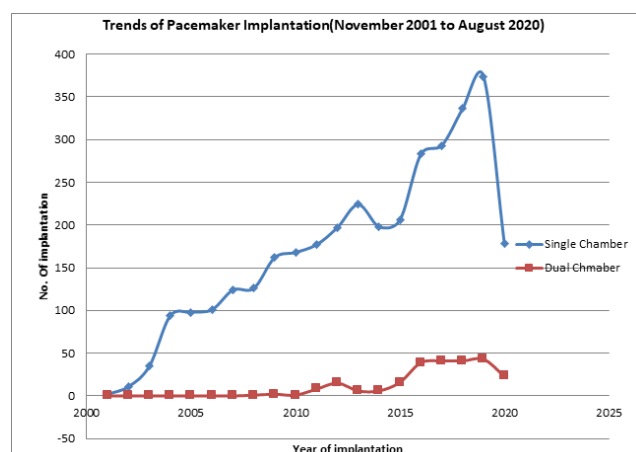


Figure 2: Trends of single vs. dual chamber pacemaker implantation from November 2001 to August 2020.

After the year 2010, the implantation of dual chamber pacemaker has increased significantly compared to prior to 2010 ($p=0.001$). There were no gender differences in use of single chamber and dual chamber implantation during this period. (p value=0.489). The dual chamber were implanted mostly in age group less than 65 years compared to more than 65 years (P value=0.001) as shown in Table 3.

Table 3: Comparison of single vs. dual chamber pacemaker as per gender, age and year of implantation:

Variable	Single Chamber	Dual Chamber	P value
Male	2010	149	<0.489
Female	1379	93	
Age<65	1449	170	<0.001
Age>65	1940	72	
Before 2010	923	4	<0.001
After 2010	2466	236	

Discussion

Our study showed that trend in the implantation of pacemaker has increased gradually from year 2001 up to mid August 2020. In spite of the dual chamber pacemakers being more physiologic ones, the single chamber pacemaker implantation (in 93% cases) outnumbered dual chamber.

The trends in the use of more number of single chamber pacemakers as in our study is similar to the other study done at various cardiac centers of our country³⁻⁷ and India.⁸ However the trend of implantation of pacemaker in other developed countries at USA⁹ and Australia¹⁰ have showed majority of their patients received dual chamber pacemaker. The probable reason behind the difference with less use of dual chamber may be due to its higher cost compared to single chamber. However after the year 2010 there was gradual increase in number of dual chamber implantation. The reason behind the increasing trend toward dual chamber implantation in the recent years could be because of increase in patient awareness and financial strength and increase in physician skill as well as number of physician implanting the device.

In this study, male patients were the predominant pacemaker recipient (59.5%) in comparison to female patients (40.6%) which

were similar to a single centre study conducted in Northern Greece where 54% of patients were male¹¹ and also identical to the 11th world survey for cardiac devices where male population was predominantly higher than the female (68% vs. 32%).² The similar findings has been shown in various study done in our part of the country.³⁻⁷

The mean age of the study population was 65 years which were similar to the other study done at India with mean age of 60.5,⁸ In Poland mean age of 63.5 years¹² and similar to the other study done in our country.³⁻⁷ However in other registries and the 11th world survey mean age ranged from 65 to 80 years in patients who underwent PPM implantation.^{2,13-17}

The most common indication of pacing was found to be the degenerative complete heart block (74.8%) and sick sinus syndrome the second most common (8.2%). The reason might be the degenerative process that lead the disease in the aging population. The indications for permanent pacemaker implantation were similar to the study done in Indian population⁸ and other studies done in our country.³⁻⁷ In contrary, pacemaker registry of Netherlands showed sick sinus syndrome as the prime indicator (42.3%) for pacemaker implantation followed by heart block (38.9%)¹⁸ and Swedish pacemaker registry reported atrioventricular conduction disorders (38%) as the commonest cause followed by sick sinus syndrome (34%).¹⁴

The major limitation of the study was it was single centre study and was a retrospective study. However, since our center is the tertiary referral cardiac centre, the data represents the total context of Nepal as most patients are referred to our centre for the PPI implantation and may give the clear picture of the trends of PPI implantation our country.

Conclusion

There is gradual increase in the number of pacemaker implantation yearly at SGNHC and since 2010 there is also increase in number of dual chamber pacemaker implantation though the single chamber pacemaker outnumbered the dual chamber implantation.

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Conflict of Interest: None

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