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ORIGINAL RESEARCH ARTICLE

CLINICAL PROFILE OF PATIENTS UNDERGOING PERMANENT PACEMAKER IMPLANTATION AT A TERTIARY CARE CENTER: A RETROSPECTIVE STUDY

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ABSTRACT

Background: Permanent Pacemaker Implantation is indicated in patients with symptomatic bradycardia, heart block, or other conduction abnormalities that result in a slow or irregular heartbeat. Each year about 1.25 million permanent pacemakers are implanted worldwide. In Nepal, we lack proper registry dedicated to PPI. We aimed to assess the clinical profile of patients undergoing PPI at a tertiary care center in Chitwan.

Methods: This was a retrospective cross-sectional study conducted in Unit of Cardiology, Department of Internal Medicine at Chitwan Medical College. Hospital records were reviewed for the patients who underwent PPI from 1st November 2016 to 30th August, 2023. Sociodemographic profile, indication, characteristics of PPI and in-hospital complications including mortality were recorded. Data was analyzed using IBM SPSS version 21.0. Categorical variables were presented as frequency/percentage and continuous variables were presented as mean and standard deviation

Results: A total of 224 patients were included. The mean age of the patients was 69.7 ± 12.7 years (Range: 7 – 94 years). There was a male predominance 125 (55.80%) among the patients. Hypertension was the most common comorbidity 102 (45.5%) followed by Diabetes Mellitus 47 (20.98%). Single chamber type of permanent pacemaker was the mostly used for pacing which accounted for 214 (95.53%) of the total cases. Complete heart block (CHB) was the most frequent indication of PPI 136 (60.71%), followed by sick sinus syndrome. Complication developed in 11 (4.91%) patients. Among them, lead displacement 4 (1.78%) was the most common complication.

Conclusions: In our study there was male predominance. Hypertension was most common comorbidity, Single chamber pacemaker was the commonest PPI and CHB was commonest indication. PPI at our center had minimal complications of which lead displacement was commonest complication.

INTRODUCTION

Permanent Pacemaker Implantation (PPI) is indicated in patients with symptomatic bradycardia, heart block, or other conduction abnormalities that result in a slow or irregular heartbeat. PPI significantly improves quality of life and reduces the risk of mortality in case of bradyarrythmias.[1] The development of pioneer permanent pacing happened in the late 1950s and is a safe and cost effective therapeutic measure which is programmable, traceable via telemetry and has various modes.[2]

Each year about 1.25 million permanent pacemakers are implanted worldwide.[3,4] In Nepal, we lack proper registry dedicated to PPI, however the largest data available is of 3631 permanent pacemaker implantation performed at Sahid Gangalal National Heart Center from 2001 November to 2020 August.[5] Another study done at Manmohan Cardiothoracic Vascular and Transplant Centre included 277 patients, in 5 years. [6]

We aimed to assess the clinical profile of patients undergoing PPI in tertiary care centre in Chitwan.

METHODS

This was a retrospective study conducted in the Cardiology Unit, Department of Internal Medicine at Chitwan Medical College Teaching Hospital, after receiving ethical approval from Institutional Review Committee of Chitwan Medical College (Ref no- CMC-IRC/080/081-092). Hospital records were reviewed for the patients using physical records and electronic registry system (MIDAS) who underwent PPI from 1st November 2016 to 30th August, 2023. Patients with incomplete medical records and those who had replacements of generators, removal of device, or an implantation of defibrillators/resynchronizers were excluded from the study. Total enumerative sampling was done. Variables included patient sociodemographic profile, indications and characteristics of PPI and in-hospital complications including mortality. Data was analyzed using IBM SPSS version 21.0. Categorical variables were presented as frequency/percentage and continuous variables were presented as mean and standard deviation.

RESULTS

A total of 224 patients were included in the study from 2016 – 2023 AD. The median age of the patients was 71 years (Range: 7 – 94 years). About two-third of the patients 141 (62.9%) were between 61 – 80 years of age (Table 1).

Table 1: Age wise distribution of patients undergoing PPI (n=224)

Age (Years)	Frequency (%)
≤20	1 (0.4)
21-40	6 (2.67)
41-60	38 (17)
61-80	141 (62.94)
>80	38 (17)

There was a male predominance 125 (55.80%).) with a ratio of 1.26: 1 (Fig 1).

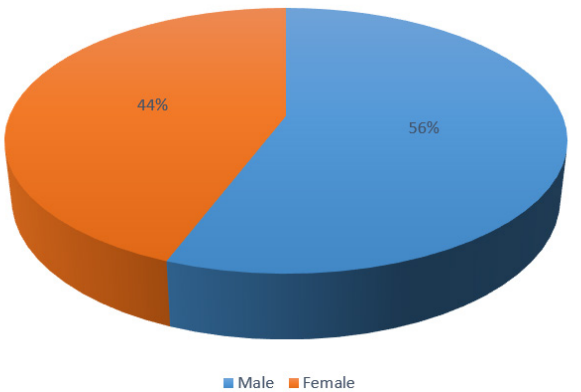

Figure 1: Gender wise distribution among patients undergoing PPI (n=224)

Comorbidities (at least one) was present in 70.1% patients. HTN was the most common comorbidity 102 (45.5%), followed by DM 47 (20.98%) with DCM being the least common comorbidity present 4 (1.78%) (Fig 2).

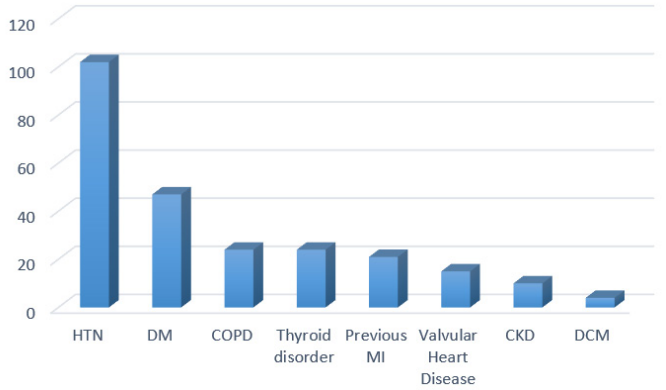

Figure 2: Comorbidities among patients undergoing PPI (n=224)

Single chamber type of permanent pacemaker was the most commonly used for pacing which accounts for 214 (95.53%) of the total cases (Table 2).

Table 2: Mean age, type of pacemaker and its mode

Variables	Total (n=224)	Male (n=125)	Female (n=99)
Mean age (Years) ± SD	69.7 ± 12.7	70.7 ± 12.7	68.6 ± 12.6
Pacemaker type			
Single chamber	214 (95.53)	118 (94.40)	96 (96.96)
Dual chamber	10 (4.46)	7 (5.60)	3 (3.03)

Complete heart block (CHB) is also known as 3rd degree atrioventricular (AV) block was the most common indication of PPI which was followed by sick sinus syndrome (Table 3).

Table 3: Indication of PPI (n=224)

Indication	Male (%)	Female (%)	Total
Complete heart block (CHB)	82 (65.60)	54 (54.54)	136 (60.71)
Sick sinus syndrome	35 (28)	35 (35.35)	70 (30.80)
2:1 AV block	3 (2.40)	5 (5.05)	8 (3.57)
Junctional bradycardia	4 (3.20)	4 (4.04)	8 (3.57)
Symptomatic Bifascicular block	1 (0.80)	0	1 (0.44)
Congenital heart block	0	1 (1.01)	1 (0.44)

Table 4: Complication of PPI (n=11)

Complication	Male (%)	Female (%)	Total
Lead displacement	2 (1.60)	2 (2.02)	4 (1.78)
PPI site infection	2 (1.60)	1 (1.01)	3 (1.33)
PPI site hematoma	1 (0.80)	1 (1.01)	1 (0.44)
Twiddler syndrome	0	1 (1.01)	1 (0.44)
Death	0	1 (1.01)	1 (0.44)

Among 224 patients, complication was developed in 11 (4.91%) patients. Among them, lead displacement 4 (1.78%) was the most common followed by PPI site infection 3 (1.33%) (Table 4). There was one case of mortality related to PPI insertion accounting a prevalence of 0.44%.

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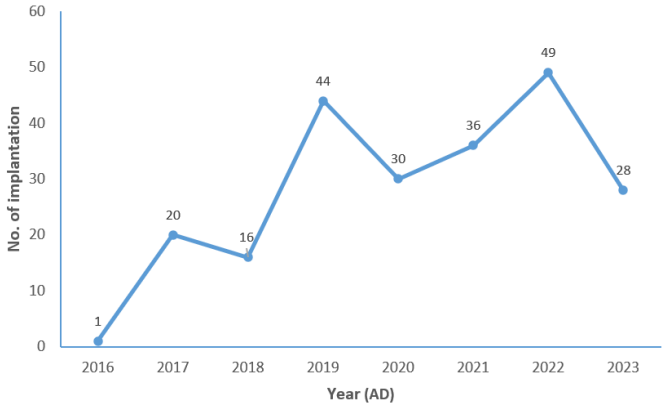

Figure 3: Trend of no. of implantations from 2016 - 2023

DISCUSSION

Among 224 patients, just over half 125 (55.80%) were males with a male-female ratio of 1.26:1. The observed male predominance might be due to male dominating society of Nepal and increased health seeking behavior for male patients. Studies done in Nepal by Jha S et al [7] and Khanal J et al [8] have also showed a male predominance. The minimum age of the patient was seven years and maximum age was 94 years. Most of the patients were above 60 years which include 179 (79.94%). The mean age of the study population was 69.7 years which was comparable with study done in Poland (63.5) [9] and India (60.5) [10]. Previous studies done in Nepal also had similar mean age of 65.2 and 65.82 years.[5,6]

In our study, single chamber pacemaker 214 (95.53%) outnumbered the double chamber pacemaker 10 (4.46%). The use of single chamber in our perspective might be due to low income country and to reduce the financial burden among the patients. Study done in India [10] and different study done in Nepal [5-8] preferred single chamber over dual chamber pacemaker. However, study done in Australia had preference of dual chamber (74%) over single chamber pacemaker.[11] Stronger financial status and coverage of insurance might be the contributing factors.

The most common indication of PPI was complete heart block 136 (60.71%) followed by sick sinus syndrome 69 (30.80%). Study done in Nepal by Thapa et al, Jha et al, and Khanal et al had similar findings. However, study done by Dhungana M et al showed a lesser incidence of sick sinus syndrome (8.2%) as compared to our study.[5] Study done in western world had a high incidence of sick sinus syndrome as an indication of permanent pacemaker implantation.[12,13,14] The reason could be attributed to advanced technology and early diagnosis of the disease in that part of world.

In our study, the complication rate following PPI was 4.91%. A study done in Nepal had similar complication rate.[6] However, the complication rate in our study was lower than a study done in China.[15] These changes may be due to variation of operator experience as well as baseline characteristics of patients. Lead displacement was the most common complication and was more common in females. Our findings echoed that of a study done by Qin D et al.[16] There was a single mortality; The patient was an elderly female with multiple comorbidities including coronary artery disease, diabetes mellitus and hypertension. Comorbidities present in the patients at the time of PPI are established causes of increased mortality.[17] Overall complication rates were higher in females compared to male. Similar complication rates were also noted in studies carried out in Australia and USA.[12,13] The trend of PPI increased gradually from 2016 to mid of 2023. The reason might be due to the improving diagnostic capabilities at various levels of the health care systems leading to increasing referrals. The dip in number of PPI during the phase of 2019 to 2021 was seen due to COVID pandemic.

The limitation of our study is that this was a single centered retrospective study. We couldn't correlate various risk factors, type and mode of PPI with age and genders. Being a single centered study it cannot reflect the whole scenario of Nepalese population.

CONCLUSION

In our study there was male predominance. Hypertension was most common comorbidity, Single chamber pacemaker was the commonest PPI and CHB was commonest indication. PPI at our center had minimal complications of which lead displacement was commonest complication.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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