Original Article

National interventional council data for the year 2018-India

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ABSTRACT

Objective: The National interventional Council of Cardiological Society of India (CSI–NIC) is the society representing all the practising interventional cardiologists across country. Every year National interventional council collects the data of coronary and non-coronary interventions across all the cath labs in the country and data will be presented at annual meet. This Data will show the burden of disease, number of interventions and adaption of various newer procedures from various centers across India.

Methods: Retrospective collection of data pertaining to all the coronary and non coronary interventions across India for the period of 1 year from January 1st 2018 to December 31st 2018. This data was collected by various methods like online submission, email based collection of data and filled proforma from all working cath labs all over the country. All the data was compiled and analysed for various interventional procedures.

Results: A total of 4,38,351 percutaneous interventions were performed in 1 year period during 2018 and utilized 5,78,164 coronary stents with a 13.14% increase in number of procedures from 709 centers. The major indication for PCI was post myocardial infarction. There was an increase in use of adjunctive imaging techniques along with PCI, increase in number of Transcatheter aortic valve replacements (TAVR) across country.

Conclusions: The prevalence and number of percutaneous coronary interventions for coronary artery disease were on rising trend year by year. There was an increase in number of multivessel PCI, complex PCI, intravascular imaging guided precision PCI and the number of TAVR performed compared to previous year.

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1. Objective

Cardiovascular diseases (CVD) are the leading cause of death worldwide. The developing countries like India are facing the rapid increase in incidence of cardiovascular morbidity and mortality. South Asians had a higher prevalence of conventional coronary artery disease risk factors with high prevalence of premature coronary artery disease at the most productive years of life. The Global Burden of Disease study estimated the age-standardized CVD death rate of 272 per 1,00,000 population in India, which is higher than the global average of 235 per 1,00,000 population.1 Cardiovascular disease strikes Indians a decade earlier than western population.2 This nation wide registry was established by National intervention council—Cardiological society of India (NIC–CSI), and this council collects data from all working cardiac catheterisation labs across India and this data will be analysed. The number of interventional procedures has grown exponentially in India since last few years along with increase in number of interventional cardiologists and number of cath labs in tier 2 and tier 3 cities across various states.3 This data shows the temporal trends in number of coronary and non coronary interventions across country year by year. Here we are presenting the data for the year 2018.

2. Methods

A comprehensive proforma was made available for online uploading of the data along with email based collection or filled up hard copy collection from each centre. We also collected overall number data from National Pharmaceutical Pricing Authority (NPPA) data base, Cath lab companies, Medical device companies.
All the data collected was compiled and made into excel sheet. All the data pertaining to not only the number and type of interventions but also the prevailing practices in PCI and other interventions were collected from January 1st 2018 to 31 December 2018 all over India. This data was analysed for the number of procedures and various coronary and non coronary interventions during 1 year period using MS excel software. The results were compared with the previous year data which was published. This year we analysed the data as per different states and bigger private as well as public group of hospitals spread across India. We feel this way in future combining the data from few high volume centres across the country can get us full and complete data thus enabling us to do high quality research work.

3. Results

A total of 4,38,351 percutaneous interventions (PCI) were performed in 1 year period during 2018, from 709 cardiac centers with a 13.14% rate of growth when compared to data in 2017 (Fig. 1 & Table 1).

Demographic analysis revealed that 69.81% were males, 12.17% of the procedures were performed in age group less than 40 years old and 16.74% procedures in more than 70 years old. Still 38.11% of patients were self paying group who paid the procedural expenses themselves and 46.6% patients were by government sponsored projects and remaining only 15.2% had private health insurances. The number of annual procedures per center according to the interventional data state wise, top 5 major hospital groups and top 5 individual center wise was shown in Table 2, Table 3a and b respectively.

3.1. Indications for PCI

The major indication for PCI was post myocardial infarction (28.91%) followed by unstable angina/non ST elevation MI (23.73%), chronic stable angina (18.85%) and Primary PCI (18.34%) (Fig. 3) The number of primary PCI for STEMI were done in 14% of cases. Rescue PCI was performed in 4.45%. The PCI done in cardiogenic shock was reported in 3.34%.

Single vessel disease contributes to 75.27% with Left anterior descending artery (LAD) in 46.6% of PCI procedures and multivessel PCI was performed in 2.5% of all patients. Only POBA was done in 1.92% of patients for various reasons. Glycoprotein IIb/IIIa inhibitors were used in 17.95% of procedures. Bivalurudin was used in 0.89% procedures.

The adjunctive imaging like IVUS/OCT was used in 4.22% of PCI and physiological assessment like FFR was used in only 1.61%. Rotablation for plaque modification was used in 0.77% of PCI. When compared to the previous years there was a significant increase in use of Imaging and Physiological assessment of coronary stenosis (Table 4).

3.2. Stent data

A total of 5,78,164 stents were used out which 98.12% were drug eluting stents. Made in India stents contributing to approximately 48.81% of DES used and remaining stents were from multinational companies (Fig. 4).

Over all reported mortality rate was 1.48% and mortality during primary PCI was 2.56%. Emergency CABG was required in 0.59%. The in hospital MI was reported in 1.03% post procedure. Acute kidney injury occurred in 1.31%. Major bleeding was reported in 0.34% of total procedures.

3.3. Sub group analysis

3.3.1. Acute myocardial infarction

As per one year data, there are 30 lakhs expected STEMI cases in India out of which 12 lakhs were Thrombolysed (as per industry data) and only 57,512 patients received primary PCI. Total Acute MI patients reported were 1,77,968 out of which Cardiogenic Shock at presentation in was in 8016 (4.56%) patients and IABP was used in 4438 (2.49%) (Fig. 5).

3.3.2. Complex coronary interventions

Intervention to Left main (LM) coronary artery was done in 10,082 (2.45%) of total coronary interventions. Out of these left main interventions bifurcation PCI was performed in 3540 (35.2%) patients. Left main was the culprit vessel in 1450 (2.5%) of all primary PCI patients. Adjunctive imaging like IVUS/OCT for Left main PCI was performed in only 2891 (28.6%) of procedures.

Intervention to previous surgical bypass grafts were done in 1% of patients. Over all 4.32% of the procedure were done for bifurcation disease and 3.5% of PCI were done for chronic total occlusions out of which very few (0.29%) were retrograde. Instant restenosis PCI procedures decreased from 2.3% in 2013 to 1.6% inspite of significant increase in number of complex procedures and multi vessel stenting year after year (Table 5).

3.3.3. Non coronary interventions

Total non coronary interventions were performed in 11,859 patients. Renal angioplasty was done in 1644 patients, carotid stenting was done in 1757 patients and other peripheral interventions were done in 8458 patients.

Post MI ventricular septal ruptures were also treated with various percutaneous devices. Total of 53 post MI VSD closures were performed with various devices.

3.3.4. Structural interventions and Transcatheter aortic valve replacement (TAVR)

Percutaneous mitral balloon valvuloplasty (PBMV) was done 8345 patients followed by pulmonary valve balloon dilatation in 1230 patients and aortic valve balloon dilatation in 757 patients.

![Fig. 1. Annual growth in coronary interventions.](image-url)
Total 308 TAVRs performed out which self expanding TAVR valve was used in 180 and balloon expandable valve used in 128 patients. LAA occluder device procedures were performed in 75 patients and paravalvular leak device closure was done in 29 patients all over India.

3.3.5. Paediatric interventions

A total of 9407 device closures of left to right shunts were performed out which ASD constitutes 4866 and PDA 3301 and VSD of 1240 procedures.

4. Discussion

The burden of coronary artery disease and number of coronary interventions performed are increasing year after year.3,4 The number of active centers performing PCI and those who participated in this registry remained almost same as previous year.5 Nearly 4,38,351 percutaneous coronary interventions were performed in 1 year period during 2018 with a 13.14% rate of growth when compared to data in 20176 and utilized 5,78,164 Coronary stents. With increasing evidence for drug eluting stents nearly 98% stents used were drug eluting stents.7 This increase could be due to increased prevalence of coronary artery disease, availability of PCI performing centers in tier 2 cities, wider availability of affordable stents, lowered prices, increased awareness among general population and increased number of interventional cardiologists all over the country. More than 47% of the procedures were performed in high volume centers and only 4.42% centers were preforming nearly 27% of total PCI volume. As south Asians were more prone for premature CAD 12.17% PCI s were performed under the age of 40 years, and this remains nearly same as previous year (2017) data (12.24%).5 The prime indication for PCI was in the context of post MI (35.5%). The indication for PCI remains ACS related in majority of the procedures but the number of primary PCI procedures remained almost same. This may be due to delayed presentation to hospitals, lack of education, relative lack and awareness of primary prevention effects, and lack of uniform availability of diagnostic and interventional facilities.8 According to industry data there were 12 lakh people underwent thrombolysis during this year. The pharmaco invasive strategy can be adopted in India due to wide variation in availability of primary PCI services.9 There was an increase in number of multi vessel PCI when compared to previous years data (19.76% vs 24.63%).5 There was a reduction in number of Rotablation procedures for plaque modification (0.77% in 2018 vs 0.97% in 2017). There was a significant increase in use of intra coronary imaging like IVUS/OCT during this year (4.22% vs 1.16%).5 Physiological assessment of coronary stenosis like FFR was used in only 1.61% despite the strong recommendations for physiological assessment before PCI. Simple non invasive physiological assessments like QFR with software application to angiographic images may be adopted in future as these newer methods had shown equal diagnostic accuracy with invasive FFR.10 There was an increase in number of complex coronary intervention procedures like Left main stenting in 2.45%, intervention to previous surgical bypass grafts in 1% of patients. Over all 4.32% of the procedure were done

### Table 2
State wise procedural percentage.

| State         | Market Share | State         | Market Share |
|---------------|--------------|---------------|--------------|
| Maharashtra   | 14.90%       | Punjab        | 3.30%        |
| Kerala        | 10.39%       | Madhya Pradesh| 2.52%        |
| Karnataka     | 9.41%        | Orissa        | 1.15%        |
| New Delhi     | 9.35%        | Chandigarh    | 1.09%        |
| Gujarat       | 7.79%        | Chhattisgarh  | 0.83%        |
| Tamil Nadu    | 7.71%        | Bihar         | 0.65%        |
| Andhra Pradesh| 5.42%        | Uttarakhand   | 0.6%         |
| Rajasthan     | 5.08%        | Pondicherry   | 0.48%        |
| Telangana     | 4.92%        | Assam         | 0.46%        |
| Haryana       | 4.60%        | Jharkhand     | 0.33%        |
| Uttar Pradesh | 4.53%        | Goa           | 0.27%        |
| West Bengal   | 3.60%        | Others        | 0.62%        |

### Table 3
(a) Top 5 groups of Hospital chains. (b) Top 5 Individual centres according to the percentage of procedural volume.

| Hospital groups | Market Share |
|-----------------|--------------|
| Apollo Hospitals Group (15 centres) | 4.49% (19,681) |
| Fortis Hospitals Group (18 centres) | 3.80% (16,657) |
| Naryanasa Hospitals Group (6 centres) | 1.88% (8240) |
| Medica Hospitals Group (3 centres) | 1.39% (6093) |
| Meditrina Hospitals Group (9 centres) | 1.1% (4387) |

| Individual Centres | Percentage |
|--------------------|------------|
| Sri Jayadeva Institute of Cardiovascular sciences and Research-Bengaluru | 2.2% (9627) |
| G B Pant Institute Of Medical Sciences And Research-Delhi | 2.0% (8776) |
| King George Medical University-Luknow | 1.3% (5789) |
| Sahakaran Arudhayalaya -Kannur | 1.2% (5194) |
| U N Mehta Institute of Cardiology & Research Centre-Ahmedabad | 1.0% (4461) |
for bifurcation disease and 3.5% of PCI were done for chronic total occlusions out of which very few (0.29%) were retrograde. In stent restenosis PCI Procedures decreased from 2.3% in 2013 to 1.6% inspite of significant increase in number of complex procedures and Multivessel stenting year after year (Table 5). This could be considered as success of newer generation DES which have much less TLR requirement on follow up due to less restenosis rates.\textsuperscript{11}

The source of funding was government sponsored schemes in 46.6% and still in 38% procedures the costs were borne by patients themselves incurring huge financial burden to the family. With initiation of mega health schemes like Ayushman Bharath all over India and increased awareness about the importance of Health insurance schemes this sort of financial burden may come down over coming years. There was increase in number of TAVR done during this year as the number of operators, the centers performing TAVR increased along with availability of made in India TAVR valve at a lower cost compared to pre-existing valves.\textsuperscript{12} We are expecting further increase in number of TAVR procedures in coming years with expanding indications for TAVR and increased longevity in Indians. The NIC –CSI should try to capture the real time data which is robust with enormous research potential. We proposed for real time data capture but it could not be materialized this year and it requires cooperation from all the professional colleagues and Hospitals with provision for separate funding and man power for the same.

4.1. Limitations

The data was collected from only 709 centers which represents only 70% of centers according to industry data of total number of cath labs. How ever this data includes all high volume centers across the country. This was a retrospective collection of data and it

| Adjunctive techniques for PCI | % of Total PCI 2013 | 2017 | 2018 |
|-----------------------------|---------------------|------|------|
| Rotablator                  | 0.33% (N: 717)      | 0.97% (N: 3769) | 0.77% (200centres) (N: 3406) |
| IVUS/OCT                    | 0.32% (N:715)       | 1.16% (N:4490)  | 4.22% (154centres) (N:18,514) |
| FFR                         | 1.55% (N: 3373)     | 1.37% (N: 5296) | 1.61% (200centres) (N: 7041) |

Fig. 3. Indications for PCI.

Fig. 4. Total number of stents and number of Drug eluting stents.

Table 4

![Image](image-url)
was voluntary reporting from each centre which was associated with its own limitations.

5. Conclusions

The prevalence and number of percutaneous coronary interventions for coronary artery disease were on rising trend year by year. There was increase in number of multivessel PCI, complex PCI, intravascular imaging guided precision PCI and the number of TAVR performed compared to previous year. Prospective real time data collection with entire patient information along with all procedural details will provide more accurate information about the CAD & total Interventions in India.

Conflict of interest

None.

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Table 5

Complex coronary interventions.

| Complex PCI       | 2013  | 2017  | 2018  |
|-------------------|-------|-------|-------|
| LMCA              | 1.30% | 2.49% | 2.45% |
| Graft PCI         | 1.87% | 1.11% | 1.08% |
| Bifurcation PCI   | 4.44% | 4.55% | 4.32% |
| CTO               | 3.89% | 3.61% | 3.50% |
| Retrograde PCI    | 0.53% | 0.29% | 0.29% |
| Instant Restenosis PCI | 2.33% | 1.88% | 1.86% |
| Multivessel PCI   | 30.04%| 19.76%| 24.63%|

Fig. 5. Total number of Primary PCI.

Table 6

Complex coronary interventions.

| Year | Total Primary PCI | % of Total Interventions |
|------|-------------------|--------------------------|
| 2013 | 24375             | 17.04%                   |
| 2017 | 53,416            | 13.79%                   |
| 2018 | 57,512            | 13.12%                   |