

Cost Comparisons of Some Leading Brands of the Antidiabetic Drug, Nateglinide, Available in an Indian City

Vikram Anant Rajadnya^{1*} and Diya Amol More²

¹Department of pharmacology, D Y Ptatil Medical College ,Kolhapur 416006 Maharashtra, India.

²D Y Ptatil Medical College ,Kolhapur 416006 Maharashtra, India.

*Corresponding author E-mail : diyamore2000@gmail.com

<https://dx.doi.org/10.13005/bpj/2184>

(Received: 28 September 2020; accepted: 04 June 2021)

Antidiabetic drugs have to be taken for life , in majority of the patients. Price differences can lead to huge economic burden on the patients of diabetes, especially when cost considerations are not undertaken by the healthcare provider . This study was aimed to compare the annual cost a patient has to bear , of five different most commonly prescribed brands of nateglinide 60mg and four different brands of Nateglinide 120mg, in Kolhapur city. **Methods:** Authors purchased a strip of 10 tablets each of four leading brands of Nateglinide 120 milligrams in one city, Kolhapur,India and compared the annual cost of these four brands amongst each other . Then a strip of 10 tablets each of five leading brands of Nateglinide 60 milligrams were bought and the annual cost of these brands were compared between these five brands. These costs were compared directly as well as using percentages. The data was collected, analysed and presented. **Results:** The data of prices of preparations of five different bnds of a single antidiabetic drug, Nateglinide 60mg and four different brands of Nateglinide 120mg shows that the annual cost of the costliest brand among all the brands of Nateglinide 60mg is almost two times that of the cheapest brand, or it is almost 200 percent that of the cheapest brand and for Nateglinide 120mg the annual cost of costliest brand is also two times that of the cheapest brand or it is almost 200 percent that of the cheapest brand. **Conclusions:** There was considerable difference in the annual cost among the different brands of the drug. India being a country with majority of the population being highly price sensitive, the prescribing physician must be very careful in selecting the brands of drugs . The costliest preparation of Nateglinide can add to a significant amount on the patient's annual budget. Thus, in a country like India, Pharmacoeconomics must have an important place while prescribing medicines.

Keywords: Annual cost; Antidiabetics; Nateglinide 60mg; Nateglinde 120mg; Pharmacoeconomics.

Diabetes mellitus is a leading cause of morbidity and mortality world over. As per International Diabetes Fedration(IDF) estimates, there are 450 million people with Diabetes Worldwide in 2017 and figure is expected to increase to 700 million by the year 2045¹. The number of people with diabetes in India had increased from 26.0 million (95% UI 23.4–28.6)

in 1990 to 65.0 million (58.7–71.1) in 2016 ². Volume of sales puts India as the third globally, considering the annual sales³. India exports medicines to many countries in the world and is manufacturing base for drugs. But at the same time this results in great price variation, likely when the government is unable to provide low cost medications to the people and they are forced to

purchase such medications from the private sector⁴. As antidiabetic drugs are to be taken for life, in majority of the diabetic patients, even a small price variation results in a huge financial burden on patients especially on those who are in lower socioeconomic status of the developing countries. In India, as medical insurance is in its initial stages, more than eighty percent of healthcare expenditure is paid by the patients.

In 1997, NPPA (National Pharmaceutical Pricing Authority) was established for ensuring availability and affordability of the drugs. The drug price control order (DPCO) 2013 is one such effort under NPPA. It is noteworthy that the DPCO was implemented by the government with the aim of bringing down the cost of essential medicines⁵

This study was undertaken to evaluate the cost variation in different brands of the antidiabetic drug, Nateglinide 60mg and Nateglinide 120mg. This drug is an oral antidiabetic drug prescribed to reduce the postprandial hyperglycemia and hence taken before every meal i.e. three times a day in majority of Indians. The drug is initially given in dose of 120mg per dose and as the treatment continues the dose is reduced to 60mg per dose once the desired level of HbA1C is achieved⁶

MATERIALS AND METHODS

Nateglinide 120mg

This study was conducted in Kolhapur city of India. Authors purchased strips of 10 tablets each of four leading different brands of Nateglinide 120 milligram from the local market. The price paid was the M.R.P. (Maximum Retail Price). All the four strips were manufactured, within last eight months. The four different brand strips were labeled as A, B, and C, E respectively under the coding, to maintain the confidentiality of those brands. The price of the strips of 10 tablets of each brand were recorded under their specific code name.

According to MRP, the annual cost of each brand preparation was calculated for a single patient, based on three times a day dosing prescription.

This data was evaluated in the form of direct cost, as well as in percentages. While calculating the percentages, the cost of the cheapest brand preparation was taken as 100 percent, while parentages of all other preparations were calculated

in comparison to the cheapest brand. Tables and bar diagrams were prepared of this data.

Inclusion criteria

Only those branded preparations, which were obtainable commonly in the local market of Kolhapur city, during the time of the study were included. All of the included drugs were available for oral intake. Brands whose Preparations contained only Nateglinide 120 milligram were selected.

Exclusion criteria

Fixed dose combinations were excluded.

Statistical methods

The prices of a strips of 10 tablets of each of the four brands were noted. On the basis of this data the cost of annual purchase based on three times daily dosing of the preparations for a single patient was calculated and the cost comparisons were done directly and in percentages. The data was presented in the form of bar graphs and tables.

Nateglinide 60mg

This study was conducted in Kolhapur city of India. Authors purchased strips of 10 tablets each of five leading, different brands of Nateglinide 60 milligram from the local market. The price paid was the M.R.P. (Maximum Retail Price). All the five strips were recently manufactured, within last eight months. The five different brand strips were labelled as A, B, C, D, and E respectively to maintain the confidentiality of those brands. The price of the strips of 10 tablets of each brand were noted under their specific code name.

Annual cost of each brand preparation for a single patient was calculated on the basis of MRP for three times a day dosing prescription.

This data was evaluated in the form of direct cost, as well as in percentages. While calculating the percentages, the cost of the lowest priced brand preparation was considered as 100 percent, while parentages of all other preparations were calculated in comparison to the cheapest brand. This data was presented in the form of tables, bar diagrams for better visualization.

Inclusion criteria

Only those branded preparations, which were easily available in the local market of Kolhapur city, during the time of the study were included. All of the included drugs were available for oral intake. Preparations containing only Nateglinide 60 milligram were chosen.

Exclusion criteria

Fixed dose combinations were eliminated.

Statistical methods

The prices of strips of 10 tablets of each of the five brands were noted. Based on this data the cost of annual purchase of the preparations for a single patient was calculated and the cost comparisons were done directly and in percentages. The data was presented as bar diagrams and tables.

RESULTS

Nateglinide 120mg

This study was conducted in Kolhapur city, in Maharashtra state, India. The strips of ten tablets of each of the four leading brand preparations of Nateglinide 120 milligram, were purchased from the local market. All the brand preparations were recently manufactured. All the brand preparations were labelled under the code names A, B, C and E respectively. The cost for ten tablets, the cost of one tablet, the annual cost to a single patient, on the basis of three times daily dosing were calculated in direct figures and in percentages. Thus, it is observed that brand B is

the cheapest one while brand A is the costliest one amongst the four brands. The costs of the remaining brands i.e. brand C and brand E, comes in between. It is also observed that the costliest brand costs almost about two times or almost 200 percent of that of the cheapest brand.

Table 1 shows, the prices for 10 tablets as well as one tablet of each of the four brand preparations of Nateglinide 120mg under the allotted code names. Thus, it can be seen that the brand B provides the drug Nateglinide 120mg, the cheapest, costing 50.00 rupees for 10 tablets, while costing 5.00 rupees for a single tablet. Similarly brand A is the costliest among all four, costing 91.10 rupees for 10 tablets and 9.11 rupees for single tablet. The remaining two brands (C and E) have the same costs.

Table 2 shows the annual cost of each of the four brand preparations, for a single patient, based on three times daily dosing. Thus it can be observed that the cheapest, i.e. brand B costs 5475 rupees annually, for a single patient based on a one tablet three times daily basis, while the costliest brand, i.e. brand A costs 9975.45 rupees for a single patient based on three tablets daily

Table 1. The prices of a strip of tablets of four different brands of Nateglinide 120 mg

Brands	Price of 10 tablets of 120 mg	Price of 1 tablet of 120 mg
A	91.10	9.11
B	50.00	5.00
C	70	7.00
E	70	7.00

Table 2. Annual cost of Nateglinide tablets to a single patient based on three times daily dosing

Brands	Cost for TDS daily	Cost for TDS annually
A	27.33	9975.45
B	15.00	5475
C	21.00	7665
E	21.00	7665

Table 3. Comparison of the annual cost of four different brands of nateglinide 120 mg in percentage.

Brands	Comparative cost (percentage)
A	182.2%
B	100%
C	140%
E	140%

Table 4. The prices of a strip of 10 tablets of five different brands of Nateglinide 60 mg.

Brands	Price of 10 tablet of 60 mg	Price of 1 tablet of 60 mg
A	55.20	5.54
B	30.00	3.00
C	45	4.5
D	45	4.5
E	45	4.5

dosing. The cost variation between the cheapest and the costliest brand is about two times. The annual cost of remaining two brands viz, C and E fall in between that is 7665 rupees each.

Figure 1 depicts shows the annual cost of each of the four brand preparations, for a single patient, based on three times daily dosing. Thus it can be observed that the cheapest, i.e. brand B costs 5475 rupees annually, for a single patient based on a one tablet three times daily basis, while the costliest brand, i.e. brand A costs 9975.45 rupees for a single patient based on three tablets daily dosing. The cost variation between the cheapest and the costliest brand is about two times. The annual cost of remaining two brands viz, C and E fall in between that is 7665 rupees each.

Table 3 shows the annual cost comparisons

for a single patient, based on a single tablet three times daily basis of all the four brands. This is presented in the form of percentages. Thus, it can be observed that the brand B, the cheapest amongst all four brands is considered to cost 100 percent. In this regard, the costliest brand, i.e. brand A costs 182.2 percent as compared to brand B. Remaining two brands cost as follows: 140 percent for brand C and 140 percent for brand E.

Figure 2 presents the annual cost comparisons for a single patient, based on a single tablet three times daily basis of all the four brands. This is presented in the form of percentages. Thus, it can be seen that the brand B, the cheapest amongst all four brands is considered to cost 100 percent. In this regard, the costliest brand, i.e. brand A costs 182.2percent as compared to brand

Table 5. Annual cost of Nateglinide tablets to a single patient based three times daily dosing daily dosing

Brands	Cost for TDS daily	Cost for TDS annual
A	16.62	6066.3
B	9.00	3285
C	13.5	4927.5
D	13.5	4927.5
E	13.5	4927.5

Table 6. Comparison of the annual cost of five different brands of nateglinide 60 mg in percentage

Brands	Comparative cost in percentage
A	184.66%
B	100%
C	140.86%
D	140.86%
E	140.86%

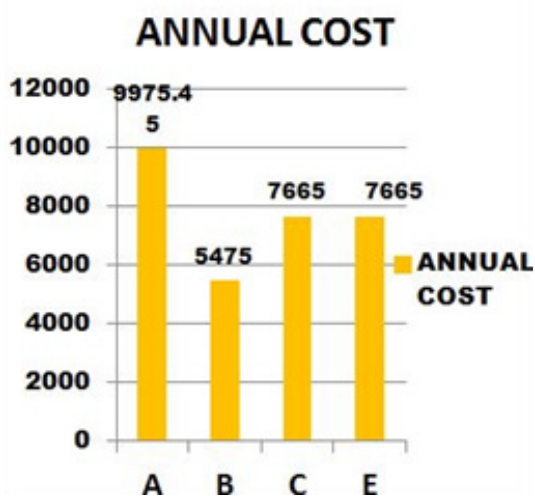


Fig. 1. Annual cost of the four different brand preparations of Nateglinide 120 mg tablets to a single patient.

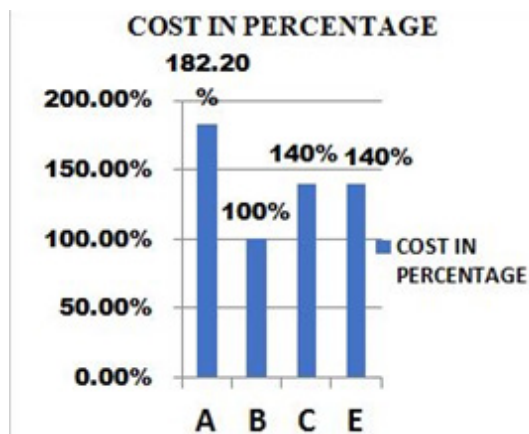


Fig. 2. Comparison of the annual cost of four different brands preparations of nateglinide 120 mg to a single patient

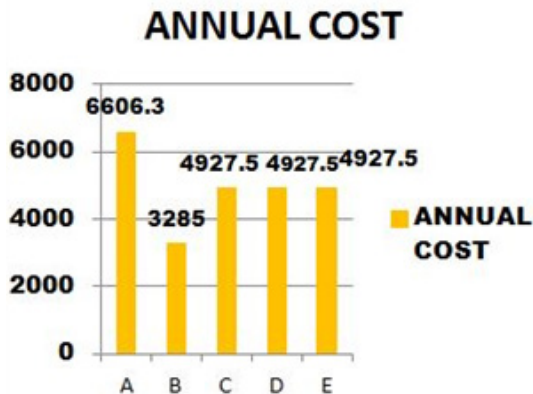


Fig. 3. Annual cost of the five different brand preparations of Nateglinide 60 mg for a single patient

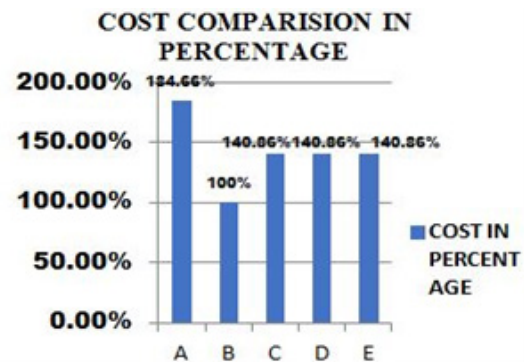


Fig. 4. Comparison of the annual cost of four different brands preparations of nateglinide 60 mg for a single patient.

B. Remaining two brands cost as follows: 140 percent for brand C and 140 percent for brand E. **Nateglinide 60mg**

The current study was conducted in Kolhapur city, in Maharashtra state, India. The strips of ten tablets of each of the five leading brand preparations of Nateglinide 60 milligram, were purchased from the local market. All the brand preparations were recently manufactured. All the brand preparations were designated under the code names A, B, C, D and E respectively. The cost for ten tablets, the cost of one tablet, the annual cost to a single patient, based on single daily dosing were calculated in direct figures and in percentages. Thus, it is observed that brand A is the cheapest one while brand C is the costliest amongst all. The prices of the remaining brands i.e. brands B, D and E, fall in between. It is also seen that the costliest brand cost almost two times or 200 percent more than the cheapest brand.

Table 4 depicts, the prices for 10 tablets as well as of one tablet of each of the five brand preparations under the specified code names. Thus, it can be seen that the brand B provides the drug Nateglinide 60 mg, the cheapest, costing 30.00 rupees for 10 tablets, while costing 3.00 rupees for a one tablet. In contrast brand A is the costliest among all five, costing 55.20 rupees for 10 tablets and 5.54 rupees for single tablet. And the remaining three brands, C, D and E have the same costs .

Table 5 represents the annual cost of each of the five brand preparations , for a single patient, based on three times daily dosing. Thus it

can be observed that the cheapest, i.e. brand B costs 3285 rupees annually, for a single patient taking single tablet three times daily , while the costliest brand, i.e. brand A costs 6066.3 rupees for a single patient based on one tablet three times daily dosing. The cost variations between the cheapest and the costliest brand is almost two times. The annual costs of the remaining three brands viz, C, D, E fall in between that is 4927.5 rupees each.

Figure 3 represents the annual cost of each of the five brand preparations , for a single patient , based on single daily dosing . Thus it can be observed that the cheapest, i.e. brand B costs 3285 rupees annually, for a single patient taking single tablet three times daily , while the costliest brand, i.e. brand A costs 6066.3 rupees for a single patient based on one tablet three times daily dosing. The cost variations between the cheapest and the costliest brand is almost two times. The annual costs of the remaining three brands viz, C, D, E fall in between that is 4927.5 rupees each.

Table 6 presents the annual cost comparisons for a single patient, based on a single tablet three times daily basis of all the five brands. This is converted in the form of percentage in such a way that the brand B, the cheapest amongst all five brands is considered to cost 100 percent. Hence , the costliest brand, i.e. brand A costs 184.66 percent as compared to brand B. Remaining three brands cost as follows: 140.86 percent for brand B, 140.86 percent for brand D and 140.86 percent for brand E.

Figure 4 presents the annual cost comparisons for a single patient, based on a single tablet three times daily basis of all the five brands. This is converted in the form of percentage such a way that the brand B, the cheapest amongst all five brands is considered to cost 100 percent. Hence, the costliest brand, i.e. brand A costs 184.66 percent as compared to brand B. Remaining three brands cost as follows: 140.86 percent for brand B, 140.86 percent for brand D and 140.86 percent for brand E

DISCUSSION

Management of Diabetes Mellitus in Indian patients includes lifestyle modification, which in turn includes adequate nutrition and dietary changes, exercise, yoga and stress management⁷. Drugs are prescribed only when the above lifestyle modifications fail to maintain the blood sugar level or could not be adapted due to various reasons.

When the drug therapy becomes necessary the drugs acting by increasing first phase of insulin secretion are used to prevent post prandial hyperglycaemia⁸. This group of drugs include Meglinitide/D-phenylalanine analogues (k_{ATP} channel blocker) such as Nateglinide and sulfonylurease such as Gliclazide. These are some of the most commonly prescribed and popular antidiabetic drugs to prevent postprandial hyperglycaemia in diabetes⁹

Profit margin of pharmaceutical companies shows extreme variations, often ranging from 1000% to 4000%¹⁰. In 1995, the first Drug Price Control Order (DPCO-1995) was issued which included the prices of seventy six drugs under the price control¹¹. For the benefit of patients, government authorizes the NPPA to regulate prices of medicines which are included in the National List of Essential Medicines (NLEM) in 2013 i.e. 348 essential medicines. Government is trying its level best for ensuring availability and affordability of medicines for all citizens of India. The order authorized the NPPA to regulate the medicine prices of not only NLEM but also medicines which are not listed in NLEM (non-NLEM)¹². But even after these efforts there is are great price differences and some drug brand preparations still cost more than the other brands.

Every pharmaceutical company desires to quote its own price of the medicines they manufacture without hampering their profit margin¹³. In the USA there is no strict price regulation and thus the drug companies are willing to invest more on research and development¹⁴

But for the sake of society there must be a regulatory system. This is even more important in India as there is no well-defined social security system. In addition medical insurance coverage is very poor and most of the health-related expenditures are borne by the patients themselves. About 39 million Indians are facing great economic burden every year due to rising health care costs and 30% patients die at home following discharge against medical advice from the intensive care units due to non-affordability of treatment¹⁵

In the present study the difference in annual cost of Nateglinide 60mg and 120mg for a single patient ranges between 100 percent to 200 percent each between the cheapest and the costliest brand amongst those selected for this study. Thus, while prescribing Nateglinide 60mg or 120mg to the patient, the Pharmacoeconomics of this drug must be considered. Prescribing costlier brand preparations, without being reasonable to the patients must be discouraged, especially in a country like India.

Thus, it might be stated that every physician must work on pharmacoeconomics of drugs, especially for conditions like diabetes mellitus, where drug treatment might be required for many years or many times for life.

CONCLUSION

Large number of brands of Nateglinide 60 mg and 120mg are available in the market. Pricing of medicines is a very crucial issue and it has direct economic implications on patient resulting into poor compliance to treatment. Beside price control it is also very necessary to monitor manufacturing of drug under GMP (good manufacturing practice) to ensure quality of medicine. It is the moral responsibility of all medical professionals that cost effectiveness of drugs should be analysed before prescribing it to any patient. Among many factors, the cost considerations must hold a very high priority while prescribing, in a country like India.

ACKNOWLEDGMENT

We are thankful to the D Y Patil Medical college, Kolhapur for providing us the opportunity to work in this area of research.

Conflict of interest

None. Authors do not have any conflict of interest whatsoever, including those related to honorarium, grants, membership, employment, ownership of stock or any other interest or non financial interest such as personal or professional relation, affiliation and knowledge of the research topic.

Funding

There is no funding source whatsoever for any part of this original research project.

Statement of informed consent

Not applicable.

Ethical approval

Not applicable.

REFERENCES

1. Harsh Mohan Textbook of PATHOLOGY 8th Ed, 2019, pp 860.
2. Nikhil Tandon, Lalit Dandona et al; The increasing burden of diabetes and variations among the states of India: the Global Burden of Disease Study 1990–2016. India State Level Disease Burden Initiative Diabetes Collaborators *Lancet Glob Health*; 6: e1352–62 (2018). Published Online September 12, 2018. Available at [http://dx.doi.org/10.1016/S2214-109X\(18\)30387-5](http://dx.doi.org/10.1016/S2214-109X(18)30387-5)
3. Banerji A. Review of Asia-Pacific's healthcare systems with emphasis on the role of generic pharmaceuticals. *Academy of Health Care Management J.*; 9(1/2):53A (2013).
4. Kotwani A, Ewen M, Dey D, Iyer S, Lakshmi PK, Patel A, et al. Prices and availability of common medicines at six sites in India using a standard methodology. *Indian J Med Res.*; 125(5):645-54 (2007).
5. DPCO, Drug Price Control Order 2013 – National Pharmaceutical Pricing Authority; 2013. Available at: <http://www.arthapedia.in>
6. Indications and Usage for Nateglinide; medically reviewed by Drugs.com. Last updated on Oct 1, 2019. Available at <https://www.drugs.com/pro/nateglinide.html>
7. KD Tripathi Essentials of MEDICAL PHARMACOLOGY 8th Ed, 2019, pp301-304.
8. KD Tripathi Essentials of MEDICAL PHARMACOLOGY 8th Ed, 2019, pp294-297
9. Ahmad A, Patel I, Sanyal S, Balkrishnan R, Mohanta GP. Availability, cost and affordability of antimalarial medicines in India. *Int J Pharm Clin Res.*; 6(1):7-12 (2014).
10. Harvard School of Public Health, Boston, MA, USA. How Effective Is India's Drug Price Control Regime? 2007. Available at: <https://cdn1.sph.harvard.edu/wp-content/uploads/sites/114/2012/10/RP256.pdf>.
11. Sahay A, Jaikumar S. Does pharmaceutical price regulation result in greater access to essential medicines? Study of the impact of drug price control order on sales volume of drugs in India. Research and publication of Indian Institute of management, Ahmadabad. W.P.2016-02-01, Jan 2016;1-28.
12. DPCO Impact: Pharma cos growth suffers for drugs under price ceiling/ Business Standard News, 2013. Available at: https://www.business-standard.com/article/companies/dpco-impact-pharma-cos-growth-suffers-for-drugs-under-price-ceiling-113081800677_1.html.
13. Vernon, John A, Golec JH, and Hughen WK. The Economics of Pharmaceutical Price Regulation and Importation: Refocusing the Debate. *Amer J Law Medi.*; 32(2-3):175-92 (2006).
14. Balarajan Y, Selvaraj S, Subramanian SV. Health care and equity in India. *Lancet.*; 377(9764):505-15 (2011).