# Original Article

# A study on price variation of different regimens for non-small cell lung carcinoma available in Indian Pharmaceutical market and Jan Aushadhi Scheme

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# Abstract

# Lung cancer is very much common among male population in India. It accounts 11.3% of all new cancers and also is the most common cause of cancer death (13.7%). In India out-of-pocket expenditure (OOPE) and catastrophic health spending (CHS) on institutional delivery remain high over time, across all states and socio-economic groups. In this backdrop this study aimed to evaluate the price variation of Gemcitabine plus Cisplatin regimen for locally advanced non-small cell lung carcinoma available in different brands in retail market and under Jan Aushadhi Scheme. Price of Gemcitabine and Cisplatin manufactured by different pharmaceutical companies, in the same strength and dosage forms, was obtained from different reliable online sources. Price of drugs available under JAS was obtained from official website of Jan Aushadhi Scheme. The percentage variation among minimum, maximum and JAS cost of Gemcitabine plus Cisplatin 21 days cycle and 28 days cycle was calculated for 6 cycles. Other available therapies for NSCLC available in JAS were also compared. Percentage variation between lowest and highest cost of therapy with GC 21- days cycle in the two sectors ranged between 625%-1541%, respectively. Likewise, the variation between lowest and highest cost of therapy with GC 28-days cycle was between 870-2145% respectively. These results reflect that the cost of therapy for non-small cell lung carcinoma using GC regimen has wide variation. Purchase of medications from the Jan Aushadhi Scheme can lead to significant savings for NSCLC patients and ultimately decrease the economic burden.

**Key Words**

# Non-small Cell Lung Cancer, Jan Aushadhi India, Generics

# Introduction

The rising healthcare costs, and non-affordability of basic healthcare needs are the major concern in Indian population. India being the second largest populated country in the world, with majority of the people belonging to weaker sections (1). According to WHO survey performed in the year 2011, 21.20% of Indian population live below international poverty line(2) The 2019 human development report by United Nations Development Programme (UNDP) on Multidimensional Poverty Index (MPI): Developing Countries, shows that the contribution of deprivation in Health dimension to overall multidimensional poverty is 31.9% (3).

Indian pharmaceutical industry supplies over 50 per cent of global demand for various vaccines, 40 per cent of generic demand in the US and 25 per cent of all medicine in UK. India accounts for 20 per cent of global exports in generics. India’s pharmaceutical exports stood at US$ 20.90 billion in FY2020 and Indian pharmaceutical sector is expected to grow to US$ 100 billion by 2025. Medicine spending in India is projected to grow 9-12% over the next five years, leading India to become one of the top 10 countries in terms of medicine spending(4).

India is the largest provider of generic drugs globally. To curb the non-affordability of medicines and to reduce the excessive healthcare expenditure, the government of India started Pradhan Mantri Bhartiya Janaushadhi Pariyojona (PMBJP) scheme in April 2008 with a vision of “Quality medicines at affordable price for all.” This scheme has ensured the smooth flow of supply of generic medicines for most of the categories that too at a fair price. But due to various reasons like poor support and supply, lack of awareness about the scheme among both public and physicians, stigma of prescribers towards generic medicines the project was futile in the first attempt (5). PMBJP was reintroducing under a brand of Jan Aushadhi Stores (JAS) after recognizing and rectifying the weaknesses in the implementation previously (5).

Now Jan Aushadhi Stores (JAS) has supply of approximately all generics of different categories necessary for the population. Non-small cell lung carcinoma (NSCLC) therapy was targeted to assess the effect of JAS supply over brands in terms of out-of-pocket expenditure towards chemotherapy.

Lung cancer is most prevalent in male gender worldwide and also leading cause of cancer death in patients of both genders. Of all new cancer cases in males of India, lung cancer accounts for the highest toll i.e., 11.3%. 13.7% cancer death occurs due to lung cancer which is highest in the category. The incidence of lung cancer is increasing in both Indian males and females in comparison to the declining trend in men of developing countries (6). According to projected incidence of cancer statistics in India 2020, One in 68 Indian males will develop lung cancer during their lifetime (0-74 years of age) (7). Treatment of lung cancer is evolving with time but in India many conventional therapeutic regimens are still in use. Newer therapies incur more expense than conventional therapies (6).

Chemotherapeutic agents available in Indian market vary widely in prices. Brands from either higher or lower price range cost beyond the financial capability of middle class or lower middle-class families. Majority of the patients go untreated or partially treated as medicines constitute a substantial proportion of out-of-pocket expenditure (6). Wagner et al found that 41%-56% of households in middle or lower middle-income countries had spent their health expenses entirely on medicines (8). Moreover, patients seeking treatment for chronic and serious diseases, in India, encounter a major crisis of essential medicines at government facilities (9).

As the efficacy andeffectiveness of generic medicines has been reported to besame as brandedmedicinesby different studies(10),(11), the comparison of cost incurred by the medicines listed in JAS and the same branded formulationsold in the market becomes evident.

This study has evaluated the price variation of Gemcitabine plus Cisplatin regimen for locally advanced non-small cell lung carcinoma available in different brands in retail market and under Jan Aushadhi Scheme.

# Methods

This three-month long study targeted the different conventional therapeutic regimens of NSCLC available in Indian market and Jan Aushadhi Scheme. The study was conducted at market sites as well as through desktop research. Most common conventional therapies available for NSCLC were searched and extracted through literature search on MEDLINE, Google Scholar and text books. After literature screening, five different therapies were selected on the basis of their availability, overall response, median survival duration and median 1-year survival.

Accurate dose calculation is a very important aspect of cancer chemotherapy. In this study the dosage for every regimen was calculated on the basis of average body surface area of Indian adults. The dose calculation was done by using this formula;

Standard Dose (mg) X Average Body Surface Area (1.7 m2)= Desired Dose of Chemotherapeutic Agent

Chemotherapy for NSCLC usually runs for 4 to 6 cycles depending on the combination of drugs. It also has interval periods of 21 or 28 days between each cycle. Once the desired doses were calculated for individual agents for one cycle of respective regimen, available dosage forms and strengths were screened to find out the units of packages required for one cycle.

Prices of different brands of chemotherapeutic agents under study were retrieved from different reliable online sources like CIMS online application, [www.1mg.com](http://www.1mg.com), [www.medindia.com](http://www.medindia.com) and [www.indiamart.com](http://www.indiamart.com). All available brands for every agent were listed along with the desired strengths and prices respectively required for one cycle of each regimen. Brands with highest and lowest price were identified among these.

Prices of the chemotherapy agents available in JAS were listed along with their strengths from the PMBJP price list available online at the website of BPPI. Some agents under study were not available in JAS so for these drugs the comparison was done between highest and lowest price of brands available in Indian market. After analysing the doses, strength and units of packages required for one cycle, the cost incurred by using highest price, lowest price and JAS price were calculated. The total direct drug cost for one cycle of each regimen was multiplied by number of cycles required for respective regimens. A market site survey was done to check the availability of the drugs in JAS stores of several public tertiary care hospitals. The procurement and quality validation process were also confirmed from the stores and through email conversation with quality assurance department of PMBJP. The descriptive statistical analysis was performed on Excel to report the results.

***Ethical statement***

The study was performed as per the standard ethical guidelines; however ethical approval was not required as the study was based on secondary data.

# Results

The results from 5 different conventional therapies are presented. Therapies for non-small cell lung carcinoma (NSCLC) evolved with time but some conventional therapies are still effective with high-end overall response rate, median survival duration and 1-year survival (**Table 1**). The intervals and cycles were also extracted from the literature (**Table 1**) (12).

**GC1** is a combination of gemcitabine (1000 mg/m2 IV weekly on D1, D8, D15) and cisplatin (100 mg/m2 IV on D15), which is prescribed for 6 cycles at an interval of every 28 days was reported to have an overall response rate of 52% and median survival duration of 13 months (5) (8).

**GC2** is a combination of gemcitabine (1250 mg/m2 IV weekly on D1, D8); cisplatin (100 mg/m2 IV D1), prescribed for 6 cycles at an interval of every 21 days was reported to have an overall response rate of 40.6% and median survival duration of 8.7 months(5),

**CP** is a combination of cisplatin 75 mg/m2 IV D1; paclitaxel 175 mg/m2 over 24 hours IV D1, prescribed for 6 cycles at an interval of every 21 days was reported to have an overall response rate of 21% and median survival duration of 7.8 months(5), (13).

**EC** is a combination of etoposide 100 mg/m2 IV D1, D2, D3; cisplatin 100 mg/m2 IV D1, prescribed for 4 cycles at an interval of every 21 days was reported to have an overall response rate of 21.9% and median survival duration of 7.2 months(5),(12).

**Table 1: Selected conventional therapies for NSCLC**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Regimen | | Overall Response Rate (%OR) | Median Survival Duration | Median  1-year Survival | Interval | Cycles |
| 1 | **GC1**: Gemcitabine 1000 mg/m2 IV weekly on D1, D8, D15; Cisplatin 100 mg/m2 IV D15 | 52% | 13 months | 61% | Every  28 days | 6 |
| 2 | **GC2**: Gemcitabine 1250 mg/m2 IV weekly on D1, D8; Cisplatin 100 mg/m2 IV D1 | 40.6% | 8.7 months | NA | Every  21 days | 6 |
| 3 | **CP**: Cisplatin 75 mg/m2 IV D1; Paclitaxel 175 mg/m2 over 24 hours IV D1 | 21% | 7.8 months | 31% | Every  21 days | 6 |
| 4 | **EC**: Etoposide 100 mg/m2 IV D1, D2, D3; Cisplatin 100 mg/m2 IV D1 | 21.9% | 7.2 months | NA | Every  21 days | 4 |
| 5 | **IC**: Irinotecan 60 mg/m2 IV D1, D8, D15; Cisplatin 80 mg/m2 IV D1 | 43% | 11.5 months | 37% | Every  28 days | 6 |

**IC** is a combination of irinotecan 60 mg/m2 IV D1, D8, D15; cisplatin 80 mg/m2 IV D1, prescribed for 6 cycles at an interval of every 28 days was reported to have an overall response rate of 43% and median survival duration of 11.5 months(5),(14).

Dose calculation of selected regimens was done to assess the strengths and number of unit packages required. This assessment has helped to calculate the cost incurred. The **table 2** represents the calculated direct drug cost of different therapies.

The highest branded price of **GC1** therapy (6 cycles, every 28 days) has been found to be INR 3,63,000 and lowest branded price was calculated as INR 1,47,250, while JAS price was found to be INR 16,920.The highest branded price of **GC2** therapy (6 cycles, every 21 days) has been found to be INR 2,72,300 and lowest branded price was calculated as INR 1,10,400, while JAS price was found to be INR 17664. The highest branded price of **CP** therapy (6 cycles, every 21 days) has been found to be INR 3,38,850 and lowest branded price was calculated as INR 70,240, while JAS price was found to be INR 7,992.

The highest branded price of **EC** therapy (4 cycles, every 21 days) has been found to be INR 11,215 and lowest branded price was calculated as INR 5,400, while JAS price was found to be INR 1,344. The JAS price of **IC** therapy was not available.

**Table 2: Calculated direct drug cost**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sl. No. | Regimen | Cycles | Highest price (Brands, INR) | Lowest price  (Brands, INR) | JAS price  (INR) |
| **1** | GC1 (every 28 days) | 6 | 3,63,000 | 1,47,250 | 16,920 |
| **2** | GC2 (every 21 days) | 6 | 2,72,300 | 1,10,400 | 17,664 |
| **3** | CP (every 21 days) | 6 | 3,38,850 | 70,240 | 7,992 |
| **4** | EC (every 21 days) | 4 | 11,215 | 5,400 | 1,344 |
| **5** | IC (every 28 days) | 6 | 1,28,070 | 14,880 | NA |

The **table 3** and **Figure 1** represents the percentage of price variation between different therapies available in Indian market and Jan Aushadhi Scheme. The differences between highest cost brands and JAS supply of GC1 regimen is as high as (3,63,000/16,920) 2145%. It is not even negligible in case of comparison with lowest cost brands, which appears to be (1,47,250/16920) 870%.

The differences between highest cost brands and JAS supply of GC2 regimen is as high as (2,72,300/17,664) 1541% and in comparison, with lowest cost brands, it appears to be (1,10,400/17,664) 625%.

The differences between highest cost brands and JAS supply of CP regimen is as high as (3,38,850/7,992) 4239% and in comparison, with lowest cost brands, it appears to be (70,240/7,992) 878%.

**Table 3: Percentage of price variation between different therapies**

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No. | Regimen | % variation b/w High  & JAS price | % variation b/w Low  & JAS price |
| 1 | GC1 (every 28 days) | 2145% | 870% |
| 2 | GC2 (every 21 days) | 1541% | 625% |
| 3 | CP (every 21 days) | 4239% | 878% |
| 4 | EC (every 21 days) | 834% | 401% |
| 5 | IC (every 28 days) | NA | NA |

The differences between highest cost brands and JAS supply of EC regimen is as high as (11,215/1,344) 834% and in comparison, with lowest cost brands, it appears to be (5,400/1,344) 401%. Comparison of highest and lowest brand price with JAS supply was not possible for IC regimen as irinotecan is not available under JAS supply.

**Figure 1: Graphical representation of Percentage of price variation between different therapies**

**Discussion**

In India drugs and medicines form a substantial portion of out-of-pocket expenditure on health among households. The current study has demonstrated the price variation of different non-small cell lung carcinoma therapies. This study considers the price of the medicine as the direct cost to patients.

The GC1 which is a combination of gemcitabine (1000 mg/m2 IV weekly on D1, D8, D15) and cisplatin (100 mg/m2 IV on D15), 6 cycles at an interval of every 28 days is most promising regimen among these therapies. In comparison to it, regimen comprising of irinotecan (60 mg/m2 IV D1, D8, D15) and cisplatin (80 mg/m2 IV D1) for 6 cycles at an interval of every 28 days is another therapy that has shown similar median survival duration(12).

There was a remarkable difference between the direct drug costs of therapies comprising of highest cost brands, lowest cost brands and JAS supplies respectively. The highest difference (4239%) was noted in the cost of CP regimen as the brands available for paclitaxel in Indian market is of very high price and has a wide range of variation even in between brands.

According to a knowledge, attitude, and practices (KAP) Study including 48 doctors, 83.3% of doctors knew that the Jan Aushadhi medicines are cheaper than other brand products, whereas 25% of doctors believed that generic medicines are slow to act. Almost all doctors (83.3%) agreed that the economic condition of the patient should be the prescribing criteria for generic medicine(1).

A systematic review on perception of generic medicines among general population and doctors observed that 28.04% of people believed that generic medicines are of low quality, less efficacy, and more side effects than brand medicines. Even the doctors (28.54%) agreed that generic medicines are less safe, of poor quality (28.04%), and with more side effects. They observed that there were lots of misconceptions about the safety and efficacy among the respondents(15).

Jan Aushadhi Stores (JAS) has supply of approximately all generics of different categories necessary for the population. Increased awareness about the scheme among both public and physicians, stigma of prescribers towards generic medicines would benefit and promote the use of JAS supply.

**Limitations of the study**

This study is restricted to calculation and analysis of direct cost of chemotherapeutic agents under study. Any conclusion associated with effect of these medicines or the disease on indirect cost cannot be drawn from this study.

# Conclusions

There is a growing evidence that the effectiveness of generics available under Jan Aushadhi scheme and drugs available in pharmaceutical market is same. It was also confirmed by quality assurance department of PMBJP that JAS supply of chemotherapeutic drugs is of equal efficacy and safety as other brands. In addition, this paper reported a significant drop in direct drug cost, for several effective therapies of NSCLC available in India, by procuring drugs available under JAS, which concludes that prescribing generics under JAS can save a tremendous amount of expenditure on healthcare. Pharmacist working at Jan Aushadhi Stores also projected light on the fact that, surveys and campaigns to aware both patients and physicians can significantly decrease the health care expenditure.

This article can change the perception of general public pertaining to generics marketed all across India. As these findings can also provide a thorough understanding of cost of the NSCLC regimen both in pharmaceutical market and Jan Aushadhi scheme which may attract people from lower socio-economic status to purchase medications from Jan Aushadhi store.

In a country of more than 1.25 Billion populations with majority spending out of pocket, this article can also assist policy makers who are part of healthcare decision making and develop hospital formularies in allocating the resources effectively.

Many effective and commonly used chemotherapeutic agents are still not available or listed under JAS supplies. Addition of these missing agents can broaden the reach of this mission, even for patients of other types of carcinoma.

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**Conflicts of interest**

Authors declare that they have no competing interests.

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NONE

# References

1. Sadiq S KV, Khajuria K. Knowledge, attitude, and practices towards Jan Aushadhi scheme. Natl J Physiol Pharm Pharmacol 2017;7(9):977-82. [doi:10.5455/njppp.2017.7.0514113052017](http://dx.doi.org/10.5455/njppp.2017.7.0514113052017)

2. Proportion of population below the International Poverty Line WHO; 2011 [cited 2020 25 December]. Available from: <https://www.who.int/data/maternal-newborn-child-adolescent-ageing/indicator-explorer-new/mca/proportion-of-population-below-the-international-poverty-line>.

3. Global Multidimensional Poverty Index 2019 Illuminating inequalities. International: UNDP; 2019. http://hdr.undp.org/en/2019-MPI. Accessed December 25,2020.

4. Indian Pharmaceuticals Industry Report. India: Indian brand equity foundation, An initiative of the Ministry of Commerce & Industry, Government of India; 2020 November. https://www.ibef.org/industry/pharmaceutical-india.aspx. Accessed December 25,2020.

5. Mukherjee K. A Cost Analysis of the Jan Aushadhi Scheme in India. International Journal of Health Policy and Management. 2017;6(5):253-6. doi: [10.15171/ijhpm.2017.02](https://dx.doi.org/10.15171/ijhpm.2017.02)

6. Behera D, Balamugesh T. Lung cancer in India. Indian J Chest Dis Allied Sci. 2004;46(4):269-81. <https://doi.org/10.1016/j.jtho.2016.11.101>

7. Mathur P, Sathishkumar K, Chaturvedi M, Das P, Sudarshan KL, Santhappan S, et al. Cancer Statistics, 2020: Report From National Cancer Registry Programme, India. JCO Global Oncology. 2020(6):1063-75. doi: 10.1200/GO.20.00122

8. Wagner AK, Graves AJ, Reiss SK, Lecates R, Zhang F, Ross-Degnan D. Access to care and medicines, burden of health care expenditures, and risk protection: results from the World Health Survey. Health Policy. 2011;100(2-3):151-8. doi: 10.1016/j.healthpol.2010.08.004

9. Bhargava A, Kalantri SP. The crisis in access to essential medicines in India: key issues which call for action. Indian J Med Ethics. 2013;10(2):86-95. doi: 10.20529/IJME.2013.028

10. Davit BM, Nwakama PE, Buehler GJ, Conner DP, Haidar SH, Patel DT, et al. Comparing generic and innovator drugs: a review of 12 years of bioequivalence data from the United States Food and Drug Administration. Ann Pharmacother. 2009;43(10):1583-97. doi: 10.1345

11. S G. Generic drugs: Are they equivalent? : ScienceBasedMedicine.org; 2012 [cited 2020. Available from: <https://sciencebasedmedicine.org/generic-drugs-are-they-equivalent/>. .

12. Abratt RP, Bezwoda WR, Falkson G, Goedhals L, Hacking D, Rugg TA. Efficacy and safety profile of gemcitabine in non-small-cell lung cancer: a phase II study. J Clin Oncol. 1994;12(8):1535-40. doi: 10.1200/JCO

13. Dipiro JT TR, Yee GC, Matzke GR, Wells BG, Posey LM, editor. Pharmacotherapy: a pathophysiologic approach. 2005 ed: McGraw-Hill; 2005.

14. Cardenal F, López-Cabrerizo MP, Antón A, Alberola V, Massuti B, Carrato A, et al. Randomized phase III study of gemcitabine-cisplatin versus etoposide-cisplatin in the treatment of locally advanced or metastatic non-small-cell lung cancer. J Clin Oncol. 1999;17(1):12-8. doi: 10.1200

15. Colgan S, Faasse K, Martin LR, Stephens MH, Grey A, Petrie KJ. Perceptions of generic medication in the general population, doctors and pharmacists: a systematic review. BMJ Open. 2015;5(12):e008915-e. doi: 10.1136/bmjopen-2015-008915