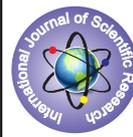


## Pharmacoeconomics of various types of insulin in treatment of diabetic patients.



### Pharmacology

**KEYWORDS:** Pharmacoeconomics, Insulin, Diabetes, Online Medicines, Jan Aushadi.

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### ABSTRACT

**Aims and Objective:** The aim of our study was to evaluate the costs of various brands of insulin those are available in the market.

**Design:** Descriptive–Cross sectional.

**Material and method:** Various insulin preparations available in the market and their prices were noted from our hospital medical store, Medical store outside the Premises, CIMS and Online medical sites.

**Observations:** Regular insulin is the cheapest amongst all the types of insulin available and long acting insulin was costliest. All the available products of Jan Aushadi had lowest price among that particular class of insulin.

**Conclusions:** Various sources make insulin available to patients, but wide variation in the cost is seen. Government of India's initiative Jan Aushadi provides insulin at very reasonable cost.

### Introduction

Diabetes mellitus is briefly defined as chronic metabolic disorder which is characterized by hyperglycemia due to defects in insulin action and/or insulin secretion. Diabetes is broadly classified as type 1 & type 2 diabetes. Type 1 diabetes is due to  $\beta$ -cell destruction thereby causing absolute insulin deficiency and type 2 diabetes occurs mainly due to insulin resistance with relative insulin deficiency.

In September 2012, the World Health Organization reported a global prevalence exceeding 300 million people, predicting a further 60–70% increase by the year 2030<sup>1</sup>. One of the largest increase is expected to occur in India, with the International Diabetes Federation estimating that India alone will have 100 million people with diabetes by 2030<sup>2</sup>. India is infamously termed as the 'Diabetes Capital of the world' because of the high prevalence of diabetes in the country. Situation of diabetes in Maharashtra is not different. In Urban area an increasing trend is observed from 1.5% (1963) to 9.3% (2001) in Mumbai and in rural area a similar trend is seen i.e. 3.9% (1991) to 9.3% (2006)<sup>3</sup>.

In type 1 diabetes insulin is required for lifetime and in type 2 diabetes patient insulin may be required at later stages or in case of failure to control sugars on oral medications or in case of acute emergencies. The rapid addition of insulin therapy is supported by numerous studies showing improved treatment satisfaction and quality-of-life for type 2 diabetic patients who had started using insulin<sup>4,5</sup>.

The discovery of insulin has changed lives of so many patients improving their quality of life. Various insulin preparations are available today depending on the duration of their action. The various insulin preparations utilized in the treatment are short acting, intermediate acting, and long acting types of insulin. There are various trends for use of insulin which varies from region to region and also depends upon treating physician or diabetologist. Some may prefer single dose of long acting insulin or twice a dose of intermediate acting insulin.

Few constraints in use of insulin includes pain, inconvenience, socioeconomic status<sup>6</sup>, financial burden, low knowledge of diabetes and low rate of physician recommendation<sup>7</sup>. There have been increasing trends in the use of self-monitoring devices by patients as well as there are differences in utility of type of insulin, dose and changes in glycemic status in patients treated in rural and urban setup.

Pharmacoeconomics is the economic evaluation of drug therapy,

pharmacy program or pharmacy technology<sup>8</sup>.

We studied the pharmacoeconomics of various insulin preparations available in the market.

### AIMS AND OBJECTIVES

The aim of our study was to evaluate the costs of various brands of insulin those are available in the market.

### MATERIALS AND METHODS

Various insulin preparations available in the market and their prices were noted from our hospital medical store (Pravara Rural Hospital, Loni), Medical store outside the Premises (Local medical shops), CIMS and Online medical sites (Netmeds, 1mg).

We first collected the data from above sources and then presented it according to the class of insulin and did the analysis.

### Statistical analysis

The data was collected and subjected to appropriate statistical tests using graphpad prism software.

### Observations:

We arranged the data according to the class of insulin and their brands. The prices of insulin per 10 Units were calculated. We collected data from all the available sources. Insulin is manufactured/ marketed/ sold by following pharmaceutical companies: Novo Nordisk, Eli Lilly, Biocon, Glenmark, Wockharst, Lupin, Sanofi, Cadila, Sun Pharma, Shreya Life Science, Abbott, USV and Jan Aushadi.

Insulin was classified as regular Insulin, Premixed insulin, Long acting insulin, Rapid acting insulin and intermediate acting insulin.

Data collected was arranged in various groups and they all followed normality test.

Lowest cost was noted in that particular class.

### Short acting insulin (Regular insulin)

We compared the prices of regular insulin of above brands from various sources, total of 29 items were compared. And it was found that on an average cost of insulin was Rs. 3.47/10(SD-0.36) units of insulin and lowest cost was Rs. 2.96/10 U of insulin at Jan Aushadi.

### Intermediate acting insulin (insulin isophane)

We compared the prices of intermediate acting insulin of above brands from various sources. It was found that on an average cost of

insulin was Rs. 2.62/10(SD-0.61) units of insulin and lowest cost was Rs. 1.82/10 U of insulin at online shop(USV-1mg).

### Rapid acting insulin(Lispro, Aspart, Glulisine)

We compared the prices of rapid acting insulin(lispro, aspart, glulisine) of above brands from various sources. And we found the average cost of the products to be as follows:

Sr no	Insulin type	Average cost in Rs/10U (SD)	Lowest cost Rs/10U
1	Glulisine	8.62(0.38)	8.16(Sanofi-online)
2	Glulisine(pen)	19.39(1.97)	17.16(Sanofi-Netmeds)
3	Glulisine(cartridge)	14.62(0.8)	13.50(Sanofi-Netmeds)
4	Aspart	16.25(0.94)	15(Novo Nordis- Netmed)
5	Aspart(pen)	21.78(2.44)	19.23(Novo Nordis-Netmed)
6	Aspart(cartridge)	16.72(0.71)	15.9(Novo Nordis- Netmed)
7	Lispro(pen)	19.61(1.22)	18.27(Eli Lilly-Netmeds)
8	Lispro(cartridge)	17.66(1.13)	16(Eli Lilly-Netmeds)

Applying ANOVA test it was found that products among rapid acting insulin had significant differences in price( $p < 0.0001$ ). Comparing price of pen it was found to be non significant( $p = 0.081$ ) whereas price of cartridges was significant( $p < 0.0001$ )

### Longacting insulin(Glargine, Degludec, Detemer)

We compared the prices of long acting insulin(glargine, degludec, detemer) of above brands from various sources, 33 items were compared. And we found the average cost of the products to be as follows:

Sr no	Insulin type	Average cost in Rs/10U(SD)	Lowest cost Rs/10U
1	Glargine	16.31(7.45)	6.67(Jan Aushadi)
2	Glargin (Pen)	25.22(4.1)	21.03(Wockhard Netmeds)
3	Glargin(cartridge)	16.48(1.39)	13.8(Biocon-Netmed)
4	Degludec(pen)	57.75(3.28)	52.83(Novo Nordis- Netmed)
5	Detemer(pen)	30.87(2.12)	28.5(Novo Nordis- Netmeds)

Applying ANOVA test it was found that products among long acting insulin had significant differences in price( $p < 0.0001$ ).

### Premixed Insulin(Regular30+intermediate70 & Aspart+ Aspart protamin)

*Regular30+ intermediate 70:*

We compared the prices of premixed(Regular30+intermediate70) insulin of above brands from various sources, total of 20 items were compared. And was found that on an average cost of insulin was Rs. 3.44/10(SD-0.42) units of insulin and lowest cost was Rs. 2.37/10 U of insulin from cadila(mixulin HPI) at online shop(1mg).

*Aspart+ Aspart Protamin:*

We compared the price of premixed(Aspart+ Aspart Protamin) flexpen insulin of above brands from various sources. And was found that on an average cost to be Rs. 20.58/10 units (SD-1.47 of insulin and lowest cost was Rs. 19.2/10 U of insulin from nov nordisk(novomix 30 flexpen) at online shop(netmeds).

We compared the price of premixed(Aspart+ Aspart Protamin) penfill insulin of above brands from various sources. And was found that on an average cost to be Rs. 16.6/10 units (SD-1.18) of insulin and lowest cost was Rs. 15.13/10 U of insulin from nov nordisk(novomix 30 prefill) at online shop(netmeds).

By applying ANOVA test it was found that the data was extremely significant( $p < 0.0001$ ) when all the products were compared.

### Discussion:

Our findings revealed that the prices of various types and brands of insulin showed a wide variation. Regular insulin is the cheapest

amongst all the types of insulin available and long acting insulin was costliest. Diabetes is a chronic morbid condition which requires lifelong insulin therapy in type I diabetic patients. Government of India's initiative to provide drugs at reasonable cost through stores like Jan Aushadi also provides insulin like regular insulin, glargine and biphasic isophane<sup>(10)</sup>. All the available products of jan aushadi had lowest price among that particular class of insulin. After comparing various brands of different types of insulin it was found that for most types of insulin lowest price was offered at online sites (Netmeds,1mg) they offer 5% to maximum of 20% discount on various products. This online stores charge for delivery of products from Rs.49 to Rs.99 depending on the type of product<sup>(9)</sup>. They also have the free delivery system for order of more than Rs 1000 on some online stores<sup>(9)</sup>. The availability of online shopping is limited at rural setup. Local medical shops also offer for such kind of discounts from 5% to 20%, but this has wide variability from product to product and also from customer to customer. The cost of insulin is the major deciding factor for the patients' compliance. In case of many medicines there is a wide difference in the prices between different brands, which could be twofold to more than 100-fold.<sup>(11)</sup> Unlike developed countries, people in developing countries pay the cost of medicines out-of-pocket. In India, more than 80% health financing is borne by patients<sup>(12)</sup>, and the socioeconomic status of patients from rural setup is a major hurdle for compliance of treatment, so the cost of medicines really matters a lot.

### Conclusion:

There are various types of insulin available and are marketed by various pharmaceutical industries. Various sources make insulin available to patients, but wide variation in the cost is seen. Government of India's initiative Jan Aushadi provides insulin at very reasonable cost but it should regulate the prices of all other types of insulin marketed by various pharmaceutical companies.

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