

A PHARMACOECONOMIC EVALUATION OF DRUGS IN PATIENTS OF PAINFUL DIABETIC NEUROPATHY

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ABSTRACT

Objectives: To study the effect of methylcobalamin, the combination of methylcobalamin with pregabalin, and methylcobalamin with duloxetine in patients with painful diabetic neuropathy after comparing the safety, tolerability, and economic implications of all three study groups.

Methods: The present study was a prospective, open-labeled, interventional, randomized, and parallel-group study conducted on 100 patients of painful diabetic nephropathy from the outpatient department of the hospital who were recruited after obtaining informed consent. The permission for the study was taken from the Institutional Ethical Committee. The patients were randomized into three study groups: A, B, and C, on methylcobalamin, methylcobalamin, pregabalin, methylcobalamin, and duloxetine.

Results: The mean value of the price of each tablet from all the brands of the respective drugs and finally calculating the cost for the whole 3 months which comes out to be Rs. 797.4 for group A, Rs. 1940.4 for group B, and Rs. 1163.7 for group C. The cost of the entire treatment and the effect produced in terms of the difference in the visual analog scale score from day 1 to the end of week 12 which are 0.58 for group A, 3.82 for group b, and 4.17 for group C.

Conclusion: The primary purpose of the pharmacoeconomic evaluation is not to directly alter the therapeutic decisions of the physicians but to help the physicians, pharmacists, and policymakers to make informed decisions about whether the cost and extra benefits of the new drug are meaningful within the given budget.

Keywords: Diabetic neuropathy, Pharmacoeconomics, Visual analog scale score, Economic burden.

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INTRODUCTION

Pharmacoeconomics, a sub-discipline of health economics, refers to that scientific discipline that analyses and compares the economic value of one pharmaceutical product or treatment to another [1]. Any pharmacoeconomic study assesses the cost expressed in the form of monetary terms and effects expressed in the form of effectiveness, efficacy, enhanced quality of life, or monetary value of a pharmaceutical product. Data which gets generated from studies conducted on pharmacoeconomics have the potential to impact the domains such as reimbursement under central and state government schemes, import and export of pharmaceutical products, health insurance, planning of future health-care benefit programs, technologies, and subsidies on health products [2].

Due to expensive health care, the expenses of health insurance frameworks are a matter of worry to the patients, governing body as well as service experts. This all is a result of extended innovation, extended life expectancy, amplified interest in social insurance quality, and altering way of life and administrations [3]. Medicine, being part of treatments, is a small and significant parameter for health costs. The affordability of health intervention advances keeps on being the subject of discussion, which is progressively centered on giving cost-effective and quality new health interventions. It is a well-known fact now that pharmacoeconomics assessment plays an important role in assisting the government in making decisions about the latest pharmaceutical products and helping patients access new health interventions [4].

About 31% and 47% of hospital admissions in urban and rural India are financed by sales of assets and loans. A lot of attempts have been made by the governments in the form of the Central Government

Health Scheme, health financing coverage in terms of the Employees State Insurance Scheme, Universal Health Insurance Scheme, etc., the majority of which have been failed to cover the majority of the population. The major reason is that these schemes are for the formal employment sector. In contrast, around 70% of India's population employed are in the informal sector, which has kept them out of the "safety net" mechanism [5]. One of the major points of view regarding pharmacoeconomics is to support clinicians, physicians, other health-care professionals, multi-disciplined researchers, or those who wish to add a financial viewpoint to their examinations of health intervention and health service [6]. Pharmacoeconomics data is utilized in helping to build up the efficacy of pharmaceutical items to furnish information to help value arrangements with national pharmaceutical buyers, set up signs for explicit items in the medication endorsement process, and position health interventions against the therapeutic equivalent drug [7]. The drug development process is well known to be expensive, time-consuming, complicated, and expensive. Thus, there is a major need to incorporate pharmacoeconomics in the process of drug development at the beginning stage to properly allot resources [8].

Aims and objectives

To study the effect of methylcobalamin, the combination of methylcobalamin with pregabalin, and methylcobalamin with duloxetine in patients with painful diabetic neuropathy after comparing the safety, tolerability, and economic implications of all the three study groups.

METHODS

The present study was a prospective, open-labeled, interventional, randomized, and parallel-group study conducted on 100 patients of painful diabetic nephropathy from the outpatient department of

Table 1: Cost comparison of the three groups

Unit used	Methylcobalamin (Rs.)	Pregabalin+methylcobalamin (Rs.)	Duloxetine+methylcobalamin (Rs.)
Brand A	3.7	19.9	10.98
Brand B	5.3	20.8	13.50
Brand C	6.5	24	14.3
Brand D	9.7	-	-
Brand E	13	-	-
Brand F	15	-	-
Mean	8.86	21.56	12.93
Cost for 3 months	797.4	1940.4	1163.7

the hospital who were recruited after taking informed consent. The permission for the study was taken from the Institutional Ethical Committee. The patients were randomized into three study groups: A, B, and C, on methylcobalamin, methylcobalamin and pregabalin, and methylcobalamin and duloxetine, respectively. The patients were assessed at intervals on days 0, 4, 8, and 12 weeks. Various tests were performed, such as thermal sensitivity testing, monofilament test, visual analog scale (VAS), and tuning fork test. These were used to analyze pressure, pain, vibration, and thermal sensitivity. The data collected from this study were organized by presenting it in appropriate tables and graphs, which are statistically analyzed for percentages and inferences.

RESULTS

Table 1 measures the mean value of the price of each tablet from all the brands of the respective drugs and finally calculates the cost for the whole 3 months, which comes out to be Rs. 797.4 for group A, Rs. 1940.4 for group B, and Rs. 1163.7 for group C.

Table 2 represents the cost of the whole treatment and the effect produced in terms of the difference in VAS score from day 1 to the end of week 12, which are 0.58 for group A, 3.82 for group B, and 4.17 for group C.

Table 3 calculated all three groups' average cost-effectiveness ratio (ACER). The ratio of resources used per unit of clinical benefit appears to be 1374.82 for group A, 507.96 for group B, and 279.06 for group C.

Table 4 estimates the magnitude of added cost for each unit improvement in health measured as incremental cost-effectiveness ratio (ICER). Thus, group C will cost an extra Rs. 102.03 for each unit improvement, and group B will cost Rs. 352.77 over group A. Therefore, it was observed that group C is the most cost-effective.

DISCUSSION

It was observed that the cost of treatment of diabetic neuropathy could be highly reduced by timely identification of diabetes, thereby preventing the development of associated comorbidities. It is a well-known fact that the chronic disease of diabetes mellitus (DM) can cripple the economy of a developing nation like India; hence the available resources must be more judiciously through economic evaluation of therapeutic options, among others. Cost-effective analysis is one of the most commonly applied forms of economic analysis in drug therapy. It determines the cost variation between therapies with similar results in a particular therapeutic area. India is the diabetes capital of the world, plus the chronic nature of diabetes, leads to the cost associated with the disease being enormous [9].

As well known, diabetes is on the increase worldwide [10] as well as in India will be the most affected. Moreover, poor people and the uneducated are more affected; hence, the instituted therapy must be possible, reachable, and cost-effective [11,12]. For this, adequate information, communication strategy, education, and effective government policy must be put in place to safeguard the health of the individuals of the nation from the ruination of DM.

Table 2: Cost consequence analysis

Drug	Cost (Rs.)	Effect (difference in mean VAS scores)
Methylcobalamin	797.4	0.58
Pregabalin+methylcobalamin	1940.4	3.82
Duloxetine+methylcobalamin	1163.7	4.17

VAS: Visual Analog Scale

Table 3: Average cost-effectiveness ratio

Drug	Cost (Rs.)	Effect (difference in mean VAS scores)	ACER
Methylcobalamin	797.4	0.58	1374.82
Pregabalin+methylcobalamin	1940.4	3.82	507.96
Duloxetine+methylcobalamin	1163.7	4.17	279.06

ACER: Average cost-effectiveness ratio, VAS: Visual Analog Scale

Table 4: Incremental cost-effectiveness ratio

Drug	Cost (Rs.)	Effect
Methylcobalamin	797.4	0.58
Pregabalin+methylcobalamin	1940.4	3.82
Duloxetine+methylcobalamin	1163.7	4.17
ICER (between Groups A and B)	1143/3.24=352.77	
ICER (between Groups A and C)	366.3/3.59=102.03	

ICER: Incremental cost-effectiveness ratio

From my results, it was depicted that group C is the most efficacious as well as most cost-effective. The present study reveals duloxetine and methylcobalamin to be cost-effective options (Tables 1-4) which is consistent with the findings of Bellows *et al.* (2012), which proves duloxetine to be more cost-effective; however, this in addition to methylcobalamin was not studied [13]. Roy *et al.* (2017) also reported duloxetine to be more cost-effective than pregabalin [14].

The comparison with developing countries in Asia and Africa is more difficult due to the lack of information on patient health-care expenditures for most of these countries. However, where data are available, they suggest, as expected, much lower levels of expenditure. For example, the study assessing the treatment costs of diabetes in Karachi-Pakistan [15] estimated the annual mean treatment costs per DM patient to be \$197 only. Another example is a study from Iran in 2009, which gave an annual cost figure of US \$ 152/DM patient [16]. Similarly, in Tunisia, an analysis in 1994 estimated an annual cost figure as low as US \$ 117 [17]; in Egypt, costs were even lower, and a study in Sudan showed direct costs to amount to USD 175/year [18]. Middle-income countries, such as Latin America and the Arabian region, tend to be between Western and developing countries [19]. Of course, treatment costs exclude many intangible costs, which are also very high in developing countries. For example, the World Bank and World Health Organization suggest that 80% of the annual intangible losses related to DM and its complications are incurred in developing countries.

Currie *et al.* (1997) reported 8.7% of funds from the acute sector of government for DM in the United Kingdom with an average of £ 2,101 cost/year for citizens with DM compared to £308/year for citizens without illness of DM [20]. The use of duloxetine as a second-line drug resulted in savings of 77,071 pounds for every 1,000 treated patients with an additional 29 patients who achieved complete pain response as compared to the standard UK treatment. Other quality-adjusted life years (QALYs) were achieved at 1.88 QALYs/1,000 patients. It is also worth mentioning that the UK-based economic model suggests that the use of duloxetine as a second-line drug in diabetic peripheral neuropathic pain is cost-effective as well as beneficial [21].

One of the most commonly applied types of economic analysis in drug therapy is cost-effective analysis, which determines the cost variation between various treatments with similar outcomes in a particular therapeutic region [9]. The chronic nature of diabetes leads to the monetary relations associated with the disease being massive. In India, the diabetes capital of the world, the major purpose for pharmacoeconomic evaluation.

CONCLUSION

The primary purpose of the pharmacoeconomic evaluation is not to directly alter the therapeutic decisions of the physicians but to help the physicians, pharmacists, and policymakers make informed decisions about whether the cost and extra benefits of the new drug are meaningful within the given budget. Overall, the observations indicate that more research regarding pharmacoeconomics is required necessarily to compare the high-quality research for peripheral diabetic neuropathy combination medication and treatment performed from the societal and economic perspectives. To strengthen the reliability of the analysis, metrics such as incidence of adverse drug reaction, adherence, and utility value of pain levels should be examined to verify the strength of basic results.

LIMITATIONS

The present research study studies the effect, safety, tolerability, and economic implications of these drugs. Yet, the research has limitations in the form of a small sample size and a short research period. The research design has flaws as it was an open-label study. Had blinding been done, the research would have minimized the risk of bias. Further studies of bigger sample size and study duration are required in this field to see the long-term efficacy of drugs and combinations in managing pain.

ETHICAL APPROVAL

Ethical consideration from the institutional ethical committee.

CONFLICTS OF INTERESTS

None.

AUTHORS CONTRIBUTIONS

Dr. Jaspinder Pratap Singh: Data collection applying statistics, rechecking data and validation, and helping prepare the manuscript. Dr. Chetna Sharma: Rechecking data and validation and helping prepare the manuscript. Dr. Aashish Sharma: Literature search and help in preparing the manuscript.

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