

IMPACT OF REAL TIME INTERVENTION OF PHARMACOECONOMICS OF ANTIHYPERTENSIVE DRUGS ON MEDICAL UNDERGRADUATES IN A TERTIARY CARE HOSPITAL**Kamlesh Garg^{1*}, Veena Verma², C. D. Tripathi³, Surinder Kumar⁴, Neeraj Kumar⁵ and Priyanka⁶**Associate Professor¹, Director -Professor and Head², Director- Professor³, Junior Resident^{5,6}, Department of Pharmacology, Department of Anaesthesia⁴, VMMC and Safdarjung Hospital, New Delhi.**Corresponding Author: Dr. Kamlesh Garg**

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ABSTRACT

Pharmacoeconomics is emerging field in medical education and therapeutics, but its inclusion in the medical curriculum is still lacking. The sensitisation of medical students during 2nd M.B.B.S will inculcate the habits of prescribing medicines on pharmacoeconomics principles so that patient and society can be benefitted. This project was planned to encourage students use of generic and rational drugs. Student's performance on Pharmacoeconomics was assessed by pre and post intervention questionnaire. Intervention was in the form of Lectures on Pharmacoeconomics and calculation of difference of costs of generic and branded version of the same antihypertensive drug prescribed in the outpatient department (OPD). The intervention was found to be highly effective when pre and post intervention results were compared and difference was found to be statistically significant in area of Awareness, Knowledge and Methods of application of Pharmacoeconomics. At the same time, after teaching cost minimisation analysis to students, it was also concluded that cost of antihypertensive can be reduced by 35.70% if all the generic drugs are prescribed in place of branded drugs. Thus, Pharmacoeconomics can be introduced in 2nd year medical curriculum so that the future prescribers can deliver cost effective health care.

KEYWORDS: Pharmacoeconomics, Generic drugs, Branded drugs, Cost-minimisation analysis.**INTRODUCTION**

Pharmacoeconomics plays an important role in treatment of a disease. Increasing health care cost is a major concern for the Governments around the world especially in developing countries. Even individually rising cost of drug therapy has increased the financial burden on the patient which in turn influences the compliance of the patient which is an important aspect of therapy of chronic illnesses like Hypertension, Diabetes and Bronchial Asthma etc. The aim of the Pharmacoeconomics is to identify what is most efficient, so that greatest amount of benefit can be bought for a given amount of money or resources. In a country like India with scarce resources, the responsibility of a physician is much more. Therefore, the concepts of Pharmacoeconomics are essential for Physicians to prescribe individualised drug therapy with minimal costs to improve the cost-effectiveness of the drug therapy.^[1]

Presently, Undergraduate medical students are not exposed to economic realities of the prescription and drug therapies. This results in prescribing costly or branded drugs leading to incomplete drug treatment, poor patient compliance and increased morbidity and mortality. As undergraduate medical students are future prescribers, it is necessary to inculcate the habit of

prescribing medicine according to the Principal of Pharmacoeconomics and ESPS data (Efficacy, Suitability, Price and Safety).^[2] Hence medical undergraduates should be sensitised towards concept of Pharmacoeconomics during their formative years.

This project was planned to sensitise undergraduate medical students regarding generic & rational use of drugs. At the same, this helped the students to learn about the concept of Pharmacoeconomics evaluation with help of cost minimisation analysis of antihypertensive drugs. Hypertension was chosen because this is among the most common chronic condition in middle aged and older individuals and there are numerous pharmacological agents that can be chosen to treat hypertension by physicians in clinical practice.

AIMS AND OBJECTIVES

1. To sensitise the medical undergraduates regarding theoretical and practical aspects of Pharmacoeconomics.
2. To promote generic use of drugs by educating cost minimisation analysis to medical undergraduates.

MATERIAL AND METHODS

The study was conducted in the Department of Pharmacology, VMMC and Safdarjung Hospital, New Delhi. Permission from Institutional Ethics Committee was taken. 150 MBBS students of 2nd Professional (5th Semester) were voluntarily enrolled in the study after taking their verbal consent. A team of faculty members of Department of Pharmacology was made, who compiled the questionnaire, study material and assessed the questionnaire about Pharmacoeconomics. We prepared 150 copies of questionnaire. The first part of the questionnaire contained information regarding their name, roll number. The second part of questionnaire contained 15 multiple choice questions, five each from three of awareness, knowledge and methods of application of Pharmacoeconomics. The students were given Pre-intervention questionnaire to assess their awareness, knowledge and applicability. They were asked to select one option as answer which is most appropriate to a particular question. Sufficient time and special instructions regarding filling of Performa was given to the students. The questionnaire was standardized as each respondent was exposed to the same questions and same system of coding responses.^[3] Then series of 5 lectures on the topic "Pharmacoeconomics"

were organised and the sub-headings covered were: Definition, Aims and objectives, Terminologies, methods of pharmacoeconomic evaluation, factors affecting the pharmacoeconomics evaluation. Then the students were asked to visit medicine out Patient Department (OPD) during their clinical posting timings. Students were asked to bring prescription (2 each) of stage 2 hypertensive patients on any two anti-hypertensive drugs. Inclusion Criterion for selection of prescription was: Hypertensive patients receiving two anti-hypertensive drugs and the exclusion criterion were: a) Hypertensive patients having any co-morbid conditions like diabetes, hyperlipidemia or any other illness b) Hypertensive patients receiving more or less than two drugs. They were instructed to fill a Performa containing details of prescription and their costs from CIIMS, MIMS, drug today etc. for cost of branded drugs.^[4] A list from hospital pharmacy was provided for the cost of generic drugs. One of the filled Performa have been shown as following.

Performa

S.no. of the student: 47. Diagnosis: Grade II Hypertension.
Dept.: Medicine Blood Pressure: 126/84 mm of Hg

1. How many generic/branded/total drugs are there in OPD slip?

Total no. of drugs	No. of generic drugs (%)	No. of brand drugs (%)
03	00	100

2. What is the difference in cost of generic/branded drugs

S no.	Name of prescribed drug	No. of tablets	Cost of generic drug(G)in Rs.	Cost of branded drug(B) in Rs.	Difference(C) in cost(B-G)in Rs.	%difference in cost (C/B)x100
1.	Tab. Angicam 5mg	01	0.67	1.40	0.73	52.14
2.	Tab. Telpres 20 mg	01	2.1	03	0.90	30
3.	Tab Pan 40mg	01	0.42	0.60	0.18	30

1. What is the total cost of present prescription (A) per day Rs. 05
2. What is the total cost of present prescription (Y) per month, (Ax30) Rs. 150
3. What will be the total cost of prescription (X) for one month if all generic drugs would have been prescribed Rs. 95.70
4. What is the different in cost of prescription (D) for one month containing all generic drugs and present prescription (Y-X) Rs 54.20?
5. What is the % difference in above cost (D) for one month, (D/Y) x100 36.20%
6. Is this Prescription rational: yes

They were taught to do cost minimisation analysis of these prescriptions. They were asked to calculate cost of present prescription for one day and then for one month.⁵ Then the total cost of prescription will be calculated for one month if all the generic drugs would have been prescribed in place of branded drugs. Then they were asked to find out the percentage difference

between the present prescription and the hypothetical prescription with all generic drugs. Then, we, the faculty members compiled the above costs of all the prescriptions separately and found out the percentage difference between the present prescriptions and the hypothetical prescription with all generic drugs. After that, same questionnaire was given to students in post intervention period. Then results of correct answers were compared between Pre & post intervention and expressed as percentage response in three categories from the total as 100%. Then p value was calculated using student paired student t test.

RESULTS

There were two type of evaluation done. Firstly, we evaluated the impact of our training of Pharmacoeconomics on medical undergraduates by comparison of percentage of Right answers to the questions of the Questionnaire after intervention in three areas of awareness, Knowledge and Applicability. The data is expressed in percentage and was analysed using

descriptive statistics.^[5] Secondly, cost-minimisation analysis of anti-hypertensive drugs was done by

comparing cost of present prescription and a hypothetical prescription with all generic drugs.

Table I: Showing the comparisons of Right and wrong answers before and after the intervention in the area of awareness about Pharmacoeconomics.

Q.NO.	Question (Awareness)	Response % (n=150)			
		Right Answers		Wrong Answers	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
1	Definition of Pharmacoeconomics is	12% (18)	81.33% (122)	88% (132)	18.67% (28)
2	What is the aim of Pharmacoeconomics	14.68% (22)	87.33% (131)	85.33% (128)	12.67% (19)
3	Which of the following drugs are usually prescribed by clinicians-generic/branded	66% (99)	98.67% (148)	34% (51)	1.33% (02)
4	Which statement is correct regarding cost of branded/generic drugs	68% (102)	92.67% (139)	32% (48)	7.33 (11)
5	Rational utilisation of drugs involves	23.33% (35)	84.67% (127)	76.67% (115)	15.33 % (23)
	Mean	36.80 %	88.93 %	63.2 %	11.27%

In Table I, in the area of awareness, 88.93 % of the students responded with correct answers after intervention as compared to 36.80 % before intervention. The number of students who responded with wrong answers declined from 63.2% to 11.27% after intervention. The p values in both cases is statistically

significant ($p < 0.005$). This shows that an active intervention can significantly create awareness among medical undergraduates as depicted in above table by increasing the number of correct respondents

Table II: Showing the comparisons of Right and wrong answers before and after the intervention in the area of knowledge about Pharmacoeconomics.

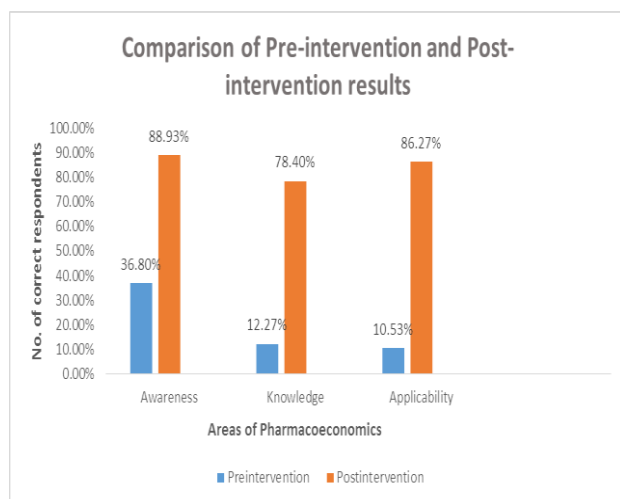
Q.NO.	Question (Knowledge)	Response % (n=150)			
		Right Answers		Wrong Answers	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
1	The factors affecting prices of drugs are	15.33% (23)	67.33% (101)	84.67% (127)	32.67% (49)
2	which of the following cost is not involved in Pharmacoeconomics evaluation	1.33% (02)	58.67% (88)	98.67% (148)	41.33% (62)
3	Cost-effective analysis (CEA) is defined as	2.67% (04)	80% (120)	97.33% (146)	20% (30)
4	Which of the following statement is true regarding cost minimization analysis	4.67% (7)	90.67% (136)	95.33% (143)	9.33% (14)
5	How we can reduce health care expenditure/ By prescribing Generic/ Branded drugs	37.33% (56)	95.33% (143)	62.67% (94)	4.67 % (07)
	Mean	12.27%	78.4%	87.73%	21.6%

In table II, in the area of Knowledge, 78.4 % of the students responded with correct answers after intervention as compared to 12.27% before intervention. The number of students who responded with wrong answers declined from 87.73% to 21.6% after intervention. The p values in both cases is statistically significant ($p < 0.005$). This shows that exposure of medical undergraduates to concepts of Pharmacoeconomics can significantly add to their knowledge as evident in above table by significantly increasing the number of correct respondents.

Table III: Showing the comparisons of Right and wrong answers before and after the intervention in the area of applicability of methods of Pharmacoeconomics.

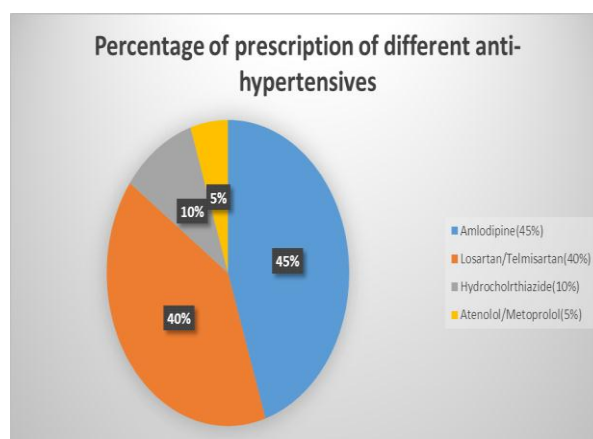
Q.NO.	Question (Applicability)	Response % (n=150)			
		Right Answers		Wrong Answers	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
1	The aims and objectives of Pharmacoeconomics evaluation are	6.67% (10)	80.67% (121)	93.33% (140)	19.33% (29)
2	Which of the following is not a method of pharma economics evaluation	4.67% (07)	84.67% (127)	95.33% (143)	15.33% (23)
3	The most common type of analysis in Pharmacoeconomics evaluation is	3.33% (5)	84% (126)	96.67% (145)	16% (24)
4	The goal of pharmacoeconomics can be achieved through the following method/ methods	14.67% (22)	88.67% (133)	85.33% (128)	11.33% (17)
5	Which of the following is not a limiting factor for pharmacoeconomics evaluation	23.33% (35)	93.33% (140)	76.67% (115)	6.67% (10)
	Mean	10.53%	86.27%	89.47%	13.73%

In table III, in the area of applicability of methods of Pharmacoeconomics, 86.27% of the students responded with correct answers after intervention as compared to 10.53% before intervention. The number of students who responded with wrong answers declined from 87.73% to 21.6% after intervention. The p values in both cases is statistically significant ($p < 0.005$). This proves that sensitising the medical undergraduates to methods of application of Pharmacoeconomics can significantly improve their perception regarding the subject.

**Figure 1.**

The figure I shows the impact of intervention on the three areas of Pharmacoeconomics i.e. awareness, knowledge and applicability of Pharmacoeconomics. The number of correct respondents are significantly higher in post intervention group and level of significance is highest in methods of application of Pharmacoeconomics with p value = 0.0001. This depicts that 2nd professional undergraduates have little awareness and knowledge about basics concepts of Pharmacoeconomics but they are not very much aware of methods of application of Pharmacoeconomics.

Prescription analysis: The 150 students had collected two prescriptions each of hypertensive patients and they were taught to do cost minimisation analysis of the prescriptions they brought their own. The sample prescription has shown the difference of 36.20% if all generic drugs are prescribed in place of present prescription containing all branded drugs. On pooling the data about type and cost of all the 300 prescriptions, it was analysed that Blood pressure was controlled in all the patients and was in range of 120-138/80-96 mm of Hg. Amlodipine was the most commonly prescribed antihypertensive drug (45%). The percentage of prescribed Losartan/ Telmisartan was 40% whereas Hydrochlorothiazide was prescribed to 10% and Metoprolol & Atenolol was prescribed to 5% of the patients. (Fig. II) Amlodipine was the only drug which was prescribed by generic name in 33% of prescriptions (Fig. III), no other anti-hypertensive was prescribed by generic name. It was then calculated that if all the generic drugs would have been in place of branded drugs, cost of antihypertensive therapy could be reduced by 35.70%. This was also observed that 87% of the prescription were rational.

**Figure 2.**

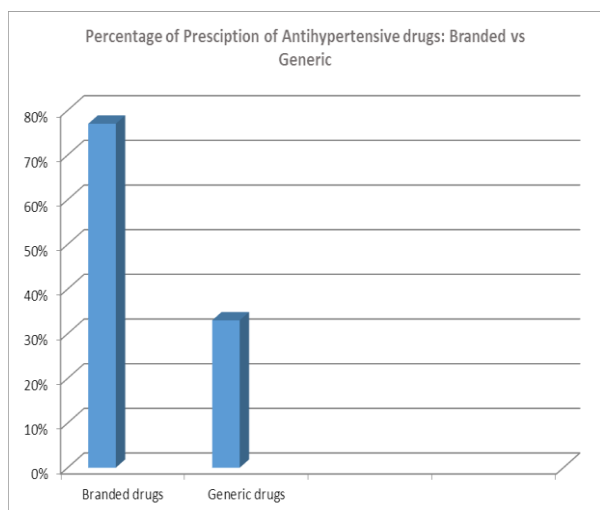


Figure 3.

DISCUSSION

Pharmacoeconomics education in the developed world is well established and introduced in the curriculum of undergraduates and postgraduate programmes but implementation of Pharmacoeconomics policies are lacking in developing countries. In developing countries like India, to satisfy the health care need of society the knowledge of Pharmacoeconomics is essential for all health care professional right from beginning of their career. Physicians worldwide are facing problems in deciding the most effective and economic treatment. There is a strict need to make formulary decision, design disease management programmes and measure the cost effectiveness of treatment and interventions in health care management. As a teaching doctor its our responsibility to make budding doctors to make aware regarding Pharmacoeconomics from very formative years of their training.

In our study, the assessment in awareness, knowledge and methods of applications of Pharmacoeconomics was done by estimating number of correct respondents in each field. In the area of awareness of Pharmacoeconomics students were aware that branded drugs are more commonly prescribed and are expensive than generic drugs. At the same time, they were unaware of definition and aim of Pharmacoeconomics and Rational utilisation of drugs. In our study 32% of the students are aware of Pharmacoeconomics which can be compared with study conducted by Jayasree D et.al, 2016 in which 32% of participants were having awareness about the topic.^[6] Another study conducted by Savkar et.al, 2014, 50% of the participant who were medical postgraduate were aware of the topic Pharmacoeconomics.^[3]

Considering the Knowledge about Pharmacoeconomics, 37.33% of the 2nd professional M.B.B.S. students knew that expenditure on health care can be reduced by prescribing generic drugs. 15.33% of students knew about factors affecting pricing of drugs and only 4.67% could answer a question about cost-minimisation

analysis. 1.33% of participant could answer correctly about different costs in pharmacoeconomics evaluation which can be compared with study conducted by Tabassum et.al, 2016 in which 20% of postgraduates responded correctly regarding different costs. In the present study, overall, in the area of knowledge the average number of correct respondents were 12.27% which can be compared with study by Tabassum R etal 2016 in which only 16% of the students responded positively.^[7]

In the area of methods of application of Pharmacoeconomics, 10.53% of the students responded positively. Rest of the students did not have any idea of techniques of Pharmacoeconomic evaluation. The present study can be compared with Tabassum R etal 2016 in which only 9% of the students are applying Pharmacoeconomics principles in their day to day clinical practice.^[7]

It is clear from the recent research that knowledge, awareness and methods of application about Pharmacoeconomics are really lacking in medical undergraduates, postgraduates and even in interns. Looking at the present scenario, there is mandate of inclusion of Pharmacoeconomics in the medical undergraduate curriculum. The justification for inclusion of pharmacoeconomics in undergraduate medical curriculum is supported by the research conducted by Nail et.al, 2015 in which a large number of interns reported that undergraduate medical curriculum was not adequate enough to train them regarding rational and generic use of drugs. In this study only 53% interns could understand the concepts of pharmacoeconomics.^[8] Perception towards Pharmacoeconomics is very poor and limited even in post graduate and practising health professionals as documented by Tahashildar et.al, 2015 which showed only 9.67% medical postgraduates and 19.04% of clinicians heard about Pharmacoeconomics.^[9]

The strength of our study is that we performed the Impact of training of pharmacoeconomics on students and compared pre and post intervention results, whereas all the studies previously done just assessed the awareness/knowledge/applicability among undergraduates/postgraduates/interns and did not do any intervention in the form of training regarding pharmacoeconomics. The Limitation in this study was small sample size.

CONCLUSION

Pharmacoeconomics is an exciting area of study and increasing in popularity. Pharmacoeconomics is highly relevant in the present economic scenario. There is an urgent need to introduce this topic in undergraduate and post graduate medical curriculum which will help students in formulating cost effective prescription. Thus the patient, region, nation and society as a whole can be benefitted.

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