

# Pharmacoeconomics Status in Asia and an Emerging Hub in the Indo-Pak

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## ABSTRACT

**Objective:** A review has been carried out to understand pharmacoeconomics and its development in the Asian region. **Findings:** Pharmacoeconomics is a subset of health economics which applies the methodologies and principles of health economics in clinical decision making. Currently, a number of countries around the globe have implemented pharmacoeconomics in their health care systems. However, the development of pharmacoeconomics in the Asia is very debatable. With countries like South Korea, Japan, China and Thailand where health economics is not only being implemented but is also progressing very rapidly, the southern part of Asia specifically India and Pakistan are far behind. **Summary:** Pharmacoeconomics is in very infancy in the South Asia especially in India and Pakistan. It is the need of the hour to improve the practice and development of new pharmacoeconomics guidelines to meet up the standards of the remaining world.

**Key words:** Asia, Development, India, Pakistan, Pharmacoeconomics, Opportunities.

**Key Message:** Pharmacoeconomics is a relatively new term for Indo-Pak as compared to rest of the world. A lot of work is needed to be done in this regards to meet up the requirements of the remaining world. This article aims to establish its understanding and current state in Asia.

## INTRODUCTION

In the recent era, different approaches have been considered for the improvement of patient's quality of life whether it is in terms of medication, therapy or pharmaceutical service etc. Whenever any intervention is made, it is necessary to find out whether the added cost of the intervention is worthy of the benefits obtained from that intervention. Pharmacoeconomic analysis is employed to address such questions.<sup>1</sup> All economic analyses are aimed at making the best choices within the defined parameters. Pharmacoeconomics have been defined as "the description and analysis of the costs of drug therapy to health care systems and society".<sup>2</sup> Pharmacoeconomics is the application of the basic principle of economics, its methodology and technology for analysis in the process of medical interventions

to yield utmost value to the patient, health care system and society. It aims at utilizing the maximum of scarce health resources.<sup>3,4</sup> Identification, measurement and comparison of the resources consumed and the clinical, humanistic and economic outcomes of pharmaceutical services and products are studied in pharmacoeconomics.<sup>5</sup> It provides a basis for resource allocation and utilization. In current scenario, it has become an essential part of decision making of health policy.<sup>6</sup>

## Brief History

The history of pharmacoeconomics dates back from 1986 when it was first time used in a public forum at a meeting of pharmacists in Canada. The term had been used by

Submission Date: 25-10-2018;  
Revision Date: 24-01-2019;  
Accepted Date: 25-04-2019

DOI: 10.5530/ijper.53.3.71

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the pharmaceutical industries then. Today, it is used by a number of practitioners and researchers.<sup>7</sup>

### Why Pharmacoeconomics?

The economic relationship associated with drug research, production, distribution, storage and pricing of drug is well described by pharmacoeconomics. The cost and consequences of pharmaceutical services and products are identified, measured and compared by it. All sectors involved in pharmaceuticals are regulated by and under the influence of pharmacoeconomics.<sup>8</sup>

Pharmacoeconomics is needed in the industrial, government as well as private sector. Figure 1 highlights the need of Pharmacoeconomics in these sectors.<sup>9</sup>

### Pharmacoeconomics Evaluation Methods

Costs in Pharmacoeconomics are the resource consumed while consequences of therapies are the clinical and humanistic outcomes. Costs and consequences serve as the pillars for Pharmacoeconomics because any of the evaluation methods applied in Pharmacoeconomics assess the cost and consequences. These evaluation methods play an important role in acceptance of innovative treatments by the patients and health care providers by determining the impact of cost of such treatments/interventions.<sup>10</sup> Pharmacoeconomics methods have been applied in a variety of fields of health-care and their use have been increasing day by day. The methods employed in Pharmacoeconomics have been categorized as humanistic and economic evaluation tools.<sup>11</sup> Humanistic evaluation tools aids physicians in quantifying the worth of pharmaceuticals. A number of methods have been used to determine the impact of a disease and treatment alternatives on patients health related quality of life, patient preferences and patient's satisfactions while economic tools assist in identification, measurement and comparison of the cost and consequences of treatments/programs and their alternatives. The economic evaluation methods and their application have been summarized in Table 1.<sup>12-26</sup>

### Drug Development and Pharmacoeconomics

Pharmacoeconomics plays a pivotal role in drug development. Annually, millions of dollars are spent by the pharmaceutical industries for drug development. Figure 2 shows the cost involved during various phases of drug development as well as the time consumed. There is minimal cost and time in Clinical Trial Design, Investigational New Drug (IND) Application and Food and Drug Administration (FDA).

Post-marketing costs are around \$312 million while the opportunity costs during the drug development sums up to around \$1200 million.

The costs of research and development are much higher than other departments of the pharmaceutical industries. It takes around 14 – 16 years and 2870 million dollars for a drug to be developed and marketed.<sup>27,28</sup> Previously, this cost was 840 million dollars. As a consequence of inflation, there have been a sharp rise in drug development costs. The rise has been at a rate of 8.5% per annum.<sup>29</sup>

Pharmacoeconomic studies carried out during the new drug development process assist in providing data which later on, once the drug gets approved by FDA, is available for health care practitioners for drug formulary decisions. Pharmacoeconomic evaluation should begin in early stages of drug development. Pharmacoeconomic studies such of cost of illness, cost effectiveness analysis, etc. are conducted at the clinical development and post marketing phases.

### Asian Development in the Pharmacoeconomics

Pharmacoeconomic evaluations have been adopted by a number of countries whether developed or developing countries.<sup>30</sup> In developed countries such as Canada and Australia, the results of pharmacoeconomic evaluation

| Industries                               | Government Sector                                                                       | Private Sector                                  |
|------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------|
| Decide best available R & D alternatives | Helps to determine the benefits of the programs initiated and cost associated with them | Aids in designing benefit of insurance coverage |

Figure 1: Why Pharmacoeconomics is Needed.

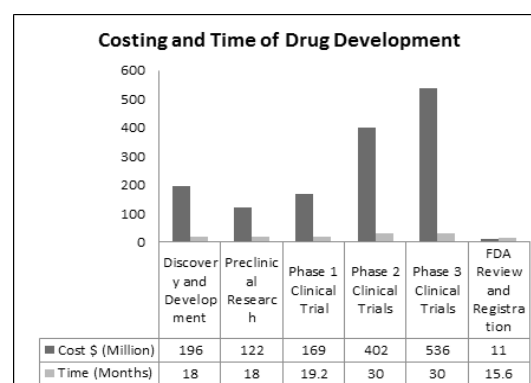


Figure 2: Costing and Time of Drug Development.

**Table 1: Pharmacoeconomics Economic Evaluation Tools.**

| Evaluation Method | Description                                                                                                                                     | Objective                                                                                                                                                                    | Outcome                        | Example                                                                                                                                           | Reference |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| COI               | Identification and estimation of the total cost i.e. direct, indirect or intangible cost of a specific disease.                                 | To provide an estimated insight of the financial burden of a particular disease against which the benefit of treatment and prevention strategies could be measured.          | Monetary                       | A cost of illness study was conducted by Paiboon <i>et al</i> in which economic costs of obesity in Thailand were estimated.                      | 12-14     |
| CMA               | Comparison of multiple drugs having equal efficacy and tolerability.                                                                            | The objective of this method is to select the least costly treatment by determining the cost saved of one treatment over another. The benefits of the treatment remain same. | Assume to be equivalent.       | Cost minimization analysis of dexamethasone with midazolam in mechanically ventilated intensive care patients.                                    | 15-19     |
| CBA               | Identification and measurement of the benefits of a particular program or treatment and computing a net gain benefit over it in monetary terms. | The objective of this method is to identify the benefits of any program or treatment and converting them to monetary units.                                                  | Monetary                       | Comparison of the hospital costs of laparoscopic surgery versus open colorectal surgery was carried out by Braga <i>et al</i> .                   | 11,20     |
| CEA               | Identification and comparison of cost of more than one treatment alternatives per standardized unit of effectiveness.                           | The objective of this method is to evaluate the cost of multiple drug treatments for similar conditions in terms of their effectiveness.                                     | Natural units (clinical cures) | Liu <i>et al</i> worked on the assessment of cost effectiveness of Interleukin genotyping assay and protease inhibitors for treating Hepatitis C. | 21-23     |
| CUA               | Identification and comparison of cost of more than one treatment alternatives per quality adjusted life years.                                  | The objective of this method is to evaluate the consequence of treatment alternatives in terms of quantity as well as quality of life.                                       | Quality adjusted life years    | Dakin <i>et al</i> reported the cost utility analysis of tenofovir disoproxil fumarate in the treatment of chronic hepatitis B                    | 24-26     |

COI = Cost of Illness, CMA = Cost Minimization Analysis, CBA = Cost Benefit Analysis, CEA = Cost Effectiveness Analysis, CUA = Cost Utility Analysis.

studies are required to be submitted to the government and they also have mandatory guidelines which need to be followed to carry out such studies. While in United States, there aren't any compulsory guidelines stated by the government, however, there are a set of guidelines issued by the insurance companies that are continuously participating in the health care systems.<sup>31</sup> As compared to Europe, North America and Oceania the pharmacoeconomic development started late in Asia.<sup>32</sup>

Asia being the largest continent in terms of population with 60% of world's population and a fast-growing economy, the adoption of pharmacoeconomics by Asia has been slow as compared to other continents.<sup>33</sup>

The rate of adoption of Pharmacoeconomics in the Asian region is quite variable. Some of the Asian countries are progressing very fast and are working for the development of requirements by the government for pharmacoeconomics data. This data is utilized for the approval of new pharmaceuticals. Many Asian Universities have established pharmacoeconomics department while in some cases, where such department doesn't exist, courses are being taught related to pharmacoeconomics.

There is also an increase number of publications in the field of Pharmacoeconomics over the past few years. Despite of such progress there are a number of challenges in the Asian region.<sup>34,35</sup>

A number of Asian countries have adopted and implemented health care interventions. Economic evaluation of these interventions is also being performed as these interventions are used for decision making.<sup>36,37</sup> The development of Pharmacoeconomics has been more in the Northeast region rather than the Southern region. Pharmacoeconomics have been formally adopted by South Korea, Thailand and Taiwan.<sup>38</sup>

The National Evidence Based Health Care Agency has been set up in South Korea. This agency is responsible for reviewing evidence related to health economics.<sup>36</sup> Health Intervention and Technology Assessment Program has been established in Thailand for providing evidence on Pharmacoeconomics before reimbursement.<sup>39</sup> Reimbursement and pricing of medical technologies in Taiwan are reviewed by Center of Drug Evaluation. In China, pharmacoeconomic guidelines have been developed. Currently, measures are being made by researchers

to implement and utilize these guidelines.<sup>40</sup> The number of pharmacogenomic and health technology assessment publications has increased rapidly over the past years. The number of published studies in China has increased from 91 in 1998 to 421 in 2007 to more than 1000 in 2016.<sup>41,42</sup> Malaysia has also developed pharmacoeconomic guidelines and is now towards the phase of implementation. Similarly, Indonesia has also adopted pharmacoeconomic guidelines which are being used by the Ministry of Health for clinical decision making.<sup>38</sup> International Society of Pharmacoeconomics and Outcomes Research Asia Consortium have been established to provide a platform for integration of Pharmacoeconomics in clinical decision making in Asian countries.<sup>35</sup> Thorat *et al.* has reported the current state of cost utility analyses in Asia. Data was collected from 2000 to 2012. It was observed out of 3414 reported publications on CUA only 175 i.e. 5.1% belonged to Asia. However, the number of published CUA in Asia has increased from 19 in 2000-2004 to 107 in 2009-2012. Of these 175 published CUA, majority were from Japan (33.1%), followed by Taiwan (15.4%), China (14.9%), Thailand (8%) and South Korea (6.9%) respectively. While the contribution of the remaining Asian countries including India, Iran, Bangladesh was less than 4% and in which no published CUA were reported from Pakistan.<sup>43</sup>

Cost utility analysis an important economic tool of Pharmacoeconomics is widely being used and adopted by the developed countries.<sup>37</sup> The adoption of CUA in the Asian region is still in infancy. Absence of resources, data, expertise and resources and lacking willingness among decision makers to adopt Pharmacoeconomics are some of the factors that have contributed for the slow utilization of this economic tool. CUA in Asia focuses mainly on pharmaceuticals. There has been a steady growth in the number of CUA in Asia. Though a lot of improvement is required in this regard to meet up the levels of the non-Asian countries.<sup>43</sup>

### Pharmacoeconomics in the Indo-Pak

Population wise India ranks second while Pakistan ranks sixth largest country in the world.<sup>44</sup> Despite of 2.262 trillion USD and 283.7 billion USD Gross Domestic Product (GDP) of India and Pakistan, the per capita on health is only 68 USD for former while 38 USD for latter respectively. This amount is much less as compared to that of China, Japan, Thailand, Malaysia and South Korea (Figure 3).<sup>45</sup> Unfortunately, in case of Pakistan, this value is lower than 44 USD i.e. World Health Organization's prescribed level of health expenditure per capita.<sup>46</sup>

In India, the pharmaceutical sector is rapidly progressing. However, the role of Pharmacoeconomics is in infancy.<sup>47</sup> National list of Essential Medicines is also

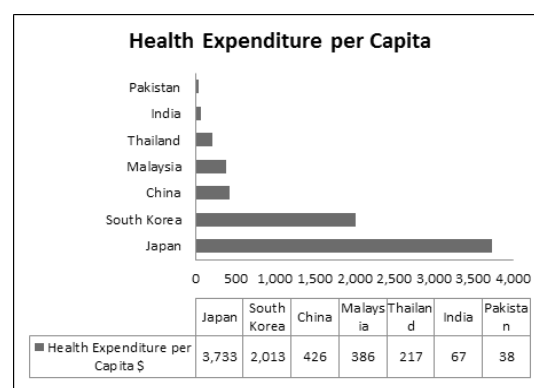


Figure 3: Health Care Expenditure of Asian Countries.

present but it serves as a model only. Many states have initiated to develop while some have developed pharmacoeconomic guidelines, but implementation lacks.<sup>48</sup> Development and implementation of pharmacoeconomic guidelines in India will also assist in establishing health technology assessment in India.<sup>49</sup>

The Ministry of Health in Pakistan governs Drug Control Organization. This agency is responsible for the approval of health technologies.<sup>50</sup> As compared to India, Pharmacoeconomics do not exist in Pakistan. Although, over the last few years Pharmacoeconomics have emerged as a new discipline but it is a long road for the adoption and implementation of health economics in Pakistan.<sup>51</sup>

## CONCLUSION

Access to healthcare is a fundamental right of human which is recognized globally. With the changes in health care needs, Pharmacoeconomics is must, as it plays a prominent role in health policy decision making. Over the past few years, a number of Asian countries have developed and implemented Pharmacoeconomics guidelines, but South Asian countries are still behind. It is the need of hour for South Asian countries to prepare and adopt Pharmacoeconomics to cope up with the emerging challenges of the health care system.

## ACKNOWLEDGEMENT

None.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

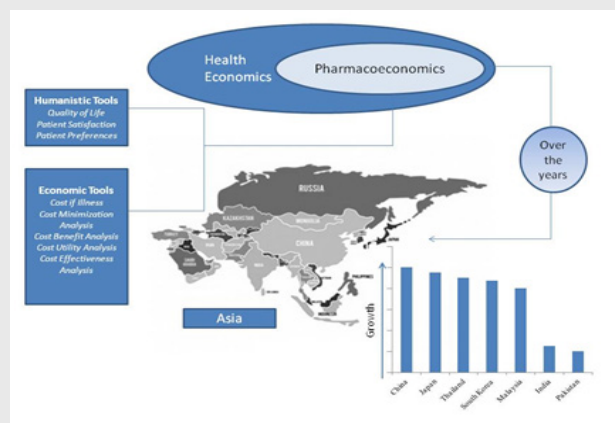
## ABBREVIATIONS

**COI:** Cost of Illness; **CMA:** Cost Minimization Analysis; **CBA:** Cost Benefit Analysis; **CEA:** Cost Effectiveness Analysis; **CUA:** Cost Utility Analysis.

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## PICTORIAL ABSTRACT



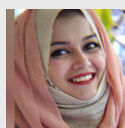
## SUMMARY

- Pharmacoeconomics deals with the cost and consequences of drug therapy to health care society by working either economically evaluating the drug therapy or evaluating the humanistic outcomes. Evaluation assists in allocation and utilization of scarce health resources. Though the term is being frequently used and applied throughout the world, its application in the Asian region is very varying especially in India and Pakistan where it is very new. The development of pharmacoeconomics is at a very slow pace in Indo-Pak and measures should be taken to improve the practice and development of pharmacoeconomics in this region.

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**Cite this article:** Sadia H, Rehman H, Naveed S. Pharmacoeconomics Status in Asia and an Emerging Hub in the Indo-Pak. Indian J of Pharmaceutical Education and Research. 2019;53(3):376-81.