A CORRELATION BETWEEN HEALTH INNOVATION AND EXPENDITURE FOSTERING HEALTH REFORM IN INDIA:A DESCRIPTIVE ANALYSIS

OBJECTIVES: This study explores the relationship between a group of medical innovations and a set of health care expenditure variables before the introduction of health reform and after.

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INTRODUCTION

- In recent years, developing countries have been facing increasing health care costs. Population aging and increased life expectancy escalate health expenditure.
- Therefore, policymakers implement health care reform for controlling the costs and improving health care outcomes Providing affordable health care insurance and access for all and simultaneously confronting increased health care expenditure has been a major objective of health care reforms.
- Expenditure on medical technology has rapidly increased since the late 1990s
- Health policymakers are under increasing pressure to control the escalating health care expenditure. Therefore, the policymakers have become more interested in expensive areas such as medical innovation. The policymakers try to strike a balance between the costs and the benefits of medical innovation

OECD Countries	Discription of health reform	Year (reform started)
Austria	To change reimbursement for cost containment motives and to improve coordination of health care	2005
Canada	To change primary care system in order to promote cost containment and for better coordination of health care	2000
Chile	To increase accessibility of health care with chronic diseases, and to improve treatment outcomes, hospitalization rates,	2010
Denmark	To revamp the hospital sector, and to improve coordination across different public areas	2010
Estonia	To improve hospitals and long-term care and to improve quality c	2000
Germany	To increase cost sharing and to promote care coordination	2004
Japan	To promote care coordination, to improve quality of care in hospitals, create an informative pharmaceutical market and cost containment	2006
Mexico	To expand insurance coverage	2001
Netherlands	To manage competition among insurers and promote cost contain	2006
Norway	To develop primary care and hospital care and to promote care coordination and cost containment	2002
Portugal	To reform primary care with the aim to promote care coordination and cost containment	2009
Brazil	To provide compulsory social health insurance and decentralize h	2009
India	To widen health insurance coverage to change delivery and reimbursement models/To promate 3A's	2010
United states	To widen health insurance coverage to change delivery and reimbursement models	2010

- Understanding the relationship between medical innovation and health care expenditure is crucial for policymakers to make effective decisions on resource allocation.
- Medical innovation is one of the key drivers of health care expenditure. None of these reform programs prioritize improving medical technology and innovation.
- It is commonly accepted that technological advances are among the most important indicators of growth in health care spending over time.

LITRATURE REVIEW

S.No	Author	Article	Salient Features
1.	Ikegami N, Campbell JC.	Japan's health care system: containing costs and attempting reform.	In Japan, the medical innovation capacity of the health industry is high; in any case, there is a generally held conviction that innovative headway is the essential driver of increments in healthcare costs. The Japanese framework attempts to keep costs low, especially in the region of diagnostics. This arrangement makes diagnostics, particularly, accessible. In 2006, Japan charged the Medical Law Reform and Pharmaceutical Affairs Act, which was administered in 2009. Significant changes presented by the updated law are tending to and ordering over-the-counter medications as indicated by the hazard in question, requiring authorized drug specialists or enrolled deals people to sell them, and setting up an educational pharmaceutical condition. Researchers propose that Japan needs a healthcare framework intended to conquer imbalances about age, business status, and family circumstance. The Japan Vision: Health Care 2035 has offered a future point of view on improving healthcare.
2.	Nigenda G, Wirtz VJ, Gonzalez-Robledo LM, Reich MR.	Evaluating the implementation of Mexico's Health Reform: The Case of Seguro	In Mexico, the poor are most certainly not secured by standardized savings. Moreover, a high extent of the population funds healthcare all through of-pocket costs. Mexican health reform began in 2001; it delivered sustainable development in people in general assets gave to healthcare and expanded health inclusion. In 2012, the Mexican government presented a general medical coverage framework called Seguro Popular, which covers a wide scope of administrations. Nonetheless, investigations show that the usage of Seguro Popular confronted difficulties, for example, restricted institutional limit, constrained data frameworks, and insufficient utilization of money related assets. Mexico's involvement in the usage of health reform may offer a few experiences for different nations to broaden health inclusion.
3.	Schafer W, Kroneman M, Boerma W et al.	The Netherlands Health System Review. Health Systems in Transition 2010	The Netherlands performs well in healthcare contrasted and most other OECD nations. The Netherlands human services framework has been experiencing change since 2006. New medical innovations have been utilized in the Netherlands with the help of judicious policymaking under a health reform arrangement since the 1990s. Global correlations show that the Netherlands has lower anti-microbial use, a smaller number of avoidable hospitalizations, and a lower avoidable mortality. Nonetheless, development has eased back extensively in the wake of returning to progressively conventional segment concurrences on burning through .
4.	Ringard A, Sagan A., Saunes IS. et al.	Norway: Health system review.	Among the European nations, Norway can be set at the top according to the innovation level of its healthcare framework. Norway has the most elevated level of doctor thickness among the OECD nations. Be that as it may, protracted holding up times have been a major issue in the Norwegian healthcare framework, and a few endeavours have been attempted to lessen them. The new treatment decision change was actualized in 2015. In prior changes, less consideration was paid to tolerant rights, while current changes strengthen understanding decision and increment the stock of both open and private administrations. It may be prudent for other OECD nations to handle high holding up times by following the innovations in Norway.

MATERIALS AND METHODS

1. **Research design**

- **Study Question:** To study the relationship between group of medical innovation and a set of healthcare expenditure variable before the introduction of health reform and after health reform.
- **Study Type:** Descriptive Study
- **Study design** – Correlation Analysis(Measure the degree of association)
- **Research Data:** Secondary data analysis, data collected from OECD, WIPO & NFHS.
- **Research Location/Time: I**ndia & Time period 2000-2009 for pre health reform and 2010-2019 for post health reform

- **Study Indicators** –

➢ A) Health Innovation:- No. of patent or publication

➢ B) Expenditure:- 3 variables constructed

- Before performing CA, logarithmic transformation was applied to both sets of variables to linearize the relationship.
- A multivariate normality distribution assumption has been provided for the two sets of variables.
- Furthermore, Spearman correlation coefficients (rs) showed that there was no multicollinearity in either set of variables and for all variables in the dataset

Study variables		
variable group	Resourse	Variable
Health innovation	WIPO	Advancement in medical technology, pharmaceuticals
Health expenditure	OECD	Health expenditure(per capita)(As a share of GDP)%
Innovation and Expenditure	NFHS	Health expenditure(public)

Table: Descriptive Analysis

	Observation period							
	2000-2009				2010-2019			
Variable	N	Min	Max	Median	N	Min	Max	Median
Medical Technology	154	1	18885	392	154	2	39836	410
Biotechnology	154	1	9764	360	154	1	26542	471.5
Pharmaceuticals	154	3	8461	480	154	3	30447	293
Health expenditure - Public	154	532	768159	12786	154	549	2229400	28139
Health expenditure - Per capita	154	144	5559	1799	154	434	3171	2727
Health expenditure - % of total GDP	154	2.21	4.51	4.18	154	4.73	8.41	6.74

RESULTS

- After the analysis, the first correlation shows the highest correlation between the two sets of variables. The results show the correlation between the two variable groups.
- During the analysis, logarithmic transformation showed that the distribution became symmetric, and a multivariate normality assumption was provided for both the set of variables and for both time periods ($p < 0.01$) 99% confidence interval.
- Spearman correlation coefficients of the two sets of variables indicated that there was no multi collinearity problem between ($rs < 0.70$) the two sets of variables for both time periods.

2000-2009 (pre-health reform)

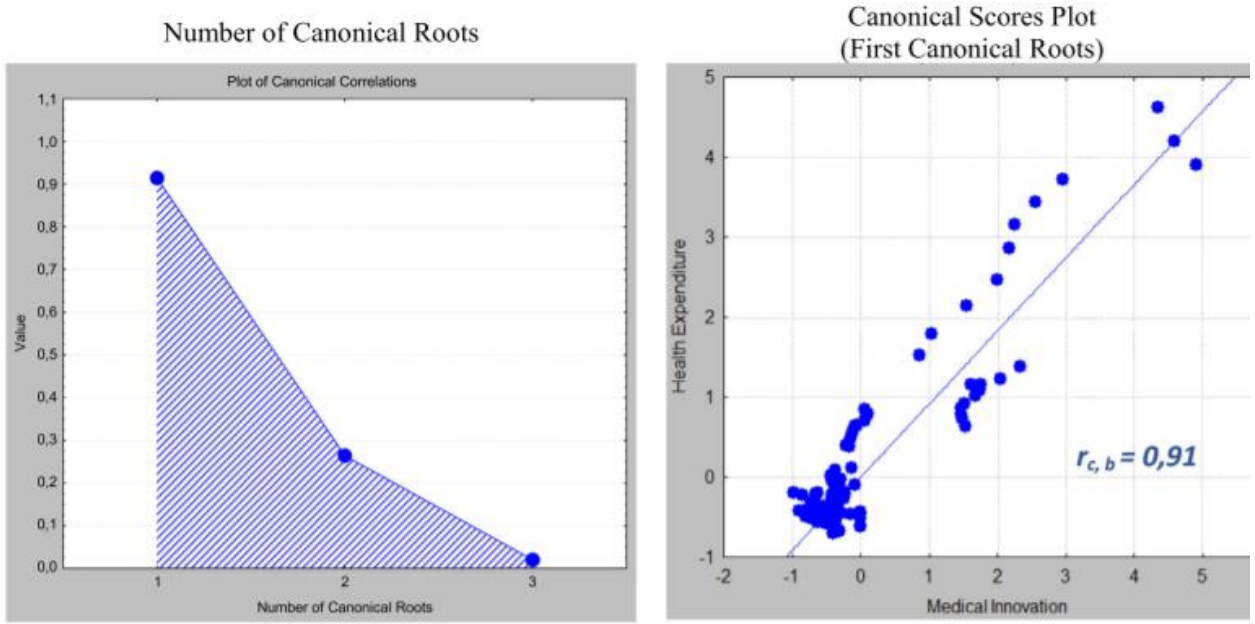
No of roots removed	r_{cb}	X^2	Degree of freedom	Probability	Lambda
0	0.91	281.5	9	0.001	0.152
1	0.26	10.9	4	0.0027	0.929

2010-2019(post-health reform)

No of roots removed	r_{cb}	X^2	Degree of freedom	Probability	Lambda
0	0.94	342.1	9	0.001	0.102
1	0.26	11.7	4	0.0019	0.924

Fig : Number of canonical roots and canonical scores plot.

- **The results also showed a strong positive correlation between medical innovation and health expenditure according to the observations representing before health reform (rcb = 0.91; p < 0.001) and after (rca = 0.94;p < 0.001).**
- **The null hypothesis is that there is no relationship between medical innovation and health expenditure for both the time periods. Bartlett's chi-squared test was used to test the null hypothesis. The results showed that the null hypothesis was rejected for the first root of the two sets of variables.**



POLICY IMPLICATION AND DISCUSSION

Fostering an open innovation environment is one of the strategies for improving innovation capabilities and sharing innovative ideas in the medical market.

The widespread diffusion of new medical technology overwhelms the efforts of policymakers to control increasing costs . Therefore, cost control is one of the promising and popular strategies of managing pharmaceutical market and health reform policies.

The policymakers should focus not only on the costs but also on whether medical technology innovation results in a better value in health care and decreases in inequalities. The motivation behind this focus is to increase the awareness on how the money spent on medical innovation, technology, physicians, pharmaceuticals, and other health services improves the overall health status of the population.

It is suggested for health policymakers to determine health policies to manage the strong relationship between medical innovation and health expenditure variable groups while considering reformist atmosphere. The heart of this advice is to foster a supportive environment to improve medical innovation and health technology while controlling costs.

CONCLUSION

- Advancement and innovation in medical technology used to consider as a health growth indicator for a developing countries over a time period. However, the study signifies the attempt to correlate the health innovation and expenditure as a variable for health care system which proven as a strongly correlated.
- It is imperative to remember that the accomplishment of health reform exertion relies upon practical objectives to policy trends. Moreover, health care reform is one of the major factor which determines relationship direction in contrast with correlation.
- Enhanced channels between health innovation and cost benefit analysis for health can proceed to improved health services and accessibility.
- In context, this study will enhance a reformist direction for policymakers to for development of novel and people centric approach to enhance medical innovation and decrement in health expenditure.
- Additionally many research studies can also be supported by this study where a combat relation between health innovation and expenditure proves to be significant which is beneficial for developing countries to enhance the health care system. This is central in finding out whether the targets of insurance change can be accomplished all the time, alongside controlling expenses and improving health.
- We hope that our observations promote the understanding of the relationship and balance between medical innovation and health care expenditure in India or developing countries while fostering an incentive atmosphere for health reforms.

THANK YOU

ANY QUESTIONS ?