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Understanding the Epidemiological Transition in India: The Shift to Non-Communicable Diseases and its impact

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Abstract

Non-Communicable diseases are the rising cause of morbidity and untimely mortality worldwide. More than 75% of the disease burden occur in low- and middle-income countries. It encompasses a vast group of disease such as cardiovascular diseases, cancer, diabetes and chronic respiratory diseases. It contributes about 38 million deaths globally and about 5.67 million deaths in India (**W.H.O. 2014**). According to the study of Indian Council of Medical Research (ICMR) the percentage of deaths caused by non-communicable diseases (NCDs) in India have increased from 37% in 1990 to 61 % in 2016. It results in high health care demand and rising burden in terms of health care expenditure. The chief risk factors contributing to high prevalence of NCDs involve self-management, genetic predisposition, environmental influences, underlying medical conditions and socio-demographic characteristics.The financial and social burden of NCDs is immense and the financial investment to alleviate this burden on patients, families and caregivers is comparatively small**(ncdalliance.org).** There is a strong and urgent imperative for investment in NCDs management. The objective of study is to examine Epidemiological transition of India from 1990 to 2020 And show how per capita income of individuals is a determining factor in this transition with the help of correlation analysis. It also discusses disease burden in terms of high out of pocket health expenditure. It also aims to determine the trends of non-communicable diseases in India and analyse the trends of health care cost due to NCDs. It highlights the need for interventions and approaches for the preventions of risk factors of non-communicable diseases in India. The study is descriptive and based on secondary data analysis.

Key words: non-communicable diseases, Financial and social burden & out of pocket health expenditure, epidemiological transition

Introduction

Non-communicable diseases are diseases that are not spread through infection or through other people, but are typically caused by unhealthy behaviours **(thenationonlineng.net)**. Non-communicable diseases (NCDs), also known as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental and behavioural factors **(who, 2021)**.

so that a better coordinated strategy can be formed right from WHO level to district NCD cell level in which all the stakeholders can be involved to fight this common cause of reducing the grip of NCDs on human health.

This research paper aims to see decadal epidemiological transition of India in terms of how the nature of disease changed. It also aims to analyse how per capita income as a factor influencing this transition. **The epidemiological transition theory**

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by Abdel Omran (1971) also explains how countries transitioning from higher rate of Infectious disease to higher prevalence of chronic disease as they grow economically. Paper also analyses rend of NCD in India with increasing Prevalence. This paper also recognises the rising out of pocket expenditure and huge financial burden that it has. Nearly 40 percent of NCD deaths are premature (i.e. occur before the age of 70 years), losing individuals in their productive years can have a devastating impact on families, society, and the economy (**Accelerating Global Health Pathways to Health Equity for the G20, PHFI 2023**). NCDs have a profound impact on health, hindering human development and exacerbating existing health inequalities (**Accelerating Global Health Pathways to Health Equity for the G20, PHFI 2023**). These affect physical and mental well-being, limit educational opportunities, and create socioeconomic disparities, impeding overall economic growth and societal progress (UN 2019). The United Nations (UN) has set a target of a 25-percent reduction in mortality from NCDs by 2025 (**Accelerating Global Health Pathways to Health Equity for the G20, PHFI 2023**). The Government of India has implemented National programme for prevention and control of Cancer, Diabetes, cardiovascular disease and stroke (NPCDCS) in order to prevent and control the major NCDs (**PIB, GOVT. OF INDIA**). Therefore, it is very important to study the prevalence and growth of Non communicable Disease so that required remedial measures can be taken to achieve the SDG goal 3.4 .

The study is based on secondary data sources where data has been taken from various trusted sources to draw conclusion from it.

Table -1 : Global Shift in Disease Burden

	Communicable Disease	Non Communicable Disease
2002	42%	57%
2020	32%	67%

Data Source – Data taken from WHO, Report (2020)

Non-communicable diseases are rising year on year and since the start of the century till today there can be seen a shift in disease burden of non-communicable disease. This shift in disease burden shows that the paradigm of health care policies should incorporate non-communicable disease as priority subject.

Objective of Study

1. To analyse the decadal transition of epidemiological burden in India
2. To analyse if there is a correlation between disease DAYL and per capita income
3. To analyse the problem of NCDs in Asia with special reference to LMIC.
4. To analyse the recent trend and growth of NCDs in India.
5. To study the high out of pocket expenditure of NCDs on individual.

Review of Literature

According to Nethan S. et al. (2017), the primary risk factors for NCDs in India include tobacco and alcohol use , physical inactivity, overweight and obesity, increased fat and sodium intake , low fruit and vegetable intake and raised level of blood pressure , glucose and cholesterol . National surveys like NFHS and GATS provide data on NCD risk factors. There has been a significant decrease in tobacco and alcohol use but an increase in overweight and obesity cases from 2005 to 2016. The paper emphasizes the need for comprehensive NCD risk factor surveillance in India to inform public health policies and programs.

According to Yadav et al. (2018), The growing menace of NCDs in the context of a rapidly increasing older population calls for bold policy initiatives, which are currently either underfunded or limited in coverage and uncoordinated. A drastic overhaul of the health system and behavioural changes are thus needed. The study focuses on comparing the burden of selected non-communicable diseases (NCDs) between 2004 and 2014 based on gender. They use statistical methods such as the t-test to analyse mean differences and examine changes in the distribution of NCDs and related factors (such as age, rural/urban status, marital status, caste, and affluence) by gender. Importantly, the study acknowledges that these comparisons do not imply causality, but they do provide valuable insights despite potential confounding variables.

According to Agarwal A. et al. (2021), By 2030, 75% of India's total mortality will be NCDs. The authors use a macroeconomic model to estimate India's potential macroeconomic losses due to NCDs from 2015 to 2030. The leading cause of death are Cardio vascular Disease, Diabetes, Respiratory Disease and Cancer. It highlights the macroeconomic costs of NCDs estimating a per capita cost of $3158 from 2015 to 2030. The study also touches on the potential exacerbation of NCD burden due to the Covid- 19 Pandemic. The study notes disparities in diagnosis and access to healthcare, particularly in rural areas and the challenges posed by an aging population. Suggestions include implementing prevention and diagnosis programs, addressing mental health education and resources, focusing on multi-morbidities, and considering taxes on products linked to NCD risks. The document also emphasizes the importance of timely policy responses to mitigate the economic and health impacts of NCDs.

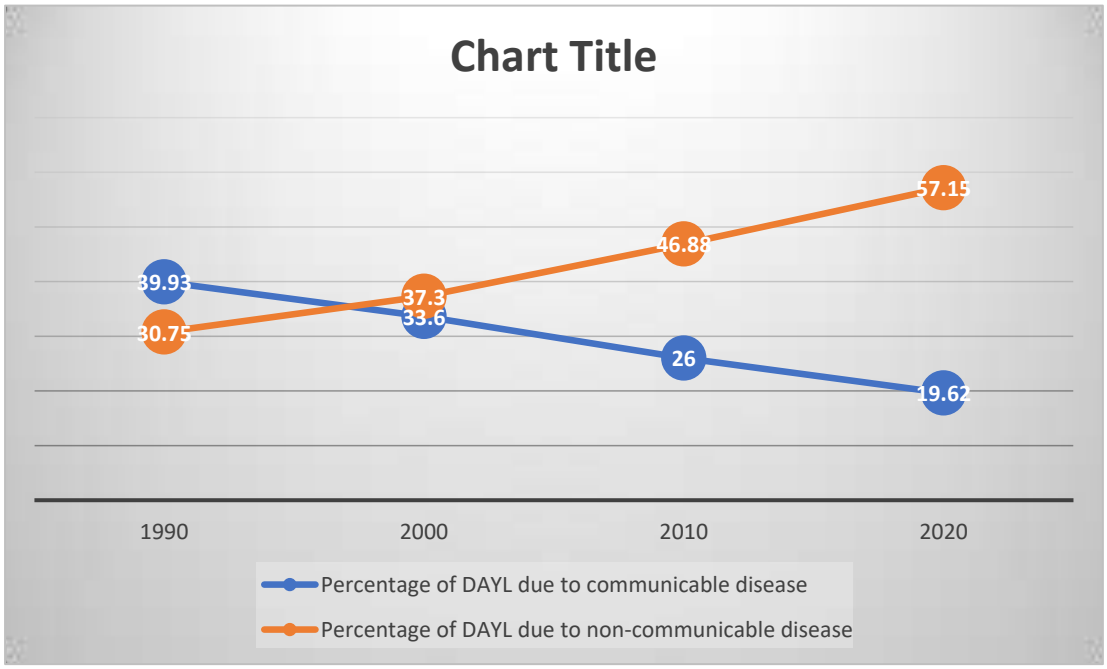
According to Bahera S. et al.(2021), households affected by Non-Communicable Diseases (NCDs) face a significant economic burden. In public facilities 27.68% of NCD households and 14.59% of Non – NCD households experience Catastrophic Health Expenditure (CHE).The study identifies a significant relationship between CHE and various socio-economic factors, including residence, caste, religion, household size, economic status, and the presence of elderly members. The study emphasizes the need for government intervention to alleviate the economic strain of NCDs on households, suggesting customized health insurance packages as a potential solution.

Table 2 : Epidemiological transition in India and per capita income growth

year	Percentage of DAYL due to communicable disease	Percentage change	Percentage of DAYL due to non-communicable disease	Percentage change	Per capita income of India (in thousand rupees)	
1990	39.93	-	30.75	-	368	-
2000	33.60	-6.33	37.30	6.55	442	20.10
2010	26.00	-7.60	46.88	9.58	1350	67.25
2020	19.62	-6.38	57.15	10.27	1915	41.85
Cumulative percentage growth	**-20.31**	-	-	**26.40**	**420.38**	

Data source - Institute for Health Metrics and Evaluation (2021)

This table tracks the transition in India's disease burden from communicable disease to non communicable disease over the decades with increase in per capita income. Per capita income has negative correlation with communicable disease and positive correlation with non communicable disease highlighting the role of income in changing disease pattern. This epidemiological transition is not random. Health experts believe that social determinants of health like income, housing, education play a major role in shaping causes of death within a country (**thinkglobalhealth.org**). These social elements can be determined by per capita income of a country thus it is believed that Infectious Disease persists in poorer countries and as income level of its people in India increased there is a visible change of transition in epidemiological burden of India.



Correlation table -

Parameter	Correlation table between communicable disease and per capita income)	Correlationtable between non-communicable disease and per capita income)
Pearson correlation coefficient (r)	-0.9675	0.979
r^2	0.936	0.9584
P-value	0.03252	0.02104
Covariance	-6388.7742	8408.7833
Sample size (n)	4	4
Statistic	-5.4095	6.7848

The value of r is -0.9675 between communicable disease and per capita income and the value of r is 0.979 between non-communicable disease and per capita income shows a strong negative and positive correlation between per capita income and disease DAYL. The vale of r square is 0.936 and 0.9584 which means that the 93% and 95% of variation in DAYL is explained by per capita income. P vale is0.03252 and 0.02104 which is very less than the threshold value of 0.05 indicating that the chance of Type -1 error is very small thus the relationship between per capita income and DAYL is statistically significant. Therefore, we reject the null hypothesis that there is no correlation between DAYL and per capita income and accept the alternative hypothesis. This means that the change in DAYL majorly is not due to random changes. A negative covariance further indicates negative relationship between variables. It has high t-value -5.4095 and 6.7848 which is not in the region of 95% acceptance showing that independent variable has a statistically strong relationship on dependent variable.

Table 3 : Percentage of Death in Low- Middle -Income Countries (LMIC) of Asia

Country	Percentage of Deaths from NCD
1.China	90%
2.Maldives	85%
3.Sri Lanka	83%
4.Vietnam	81%
5.Thailand	77%
6.Indonesia	76%
7.Singapore	75%
8.Bhutan	73%
9.Malaysia	73%
10.Myanmar	71%
11.Bangladesh	70%

12.Nepal	66%
13.Pakistan	60%
14.India	**66%**
Global Averages	**74%**

Source – WHO Non-Communicable Disease Progress Monitor 2022

Above table shows that there is high burden of death from NCDs in LMICs. Non-communicable Disease disproportionately affects population in Low and Middle – Income Countries (LMICs), where more than three quarter of the global NCD deaths (31.4 million) occur. The primary NCDs responsible for these deaths include CVDs (17.9 million deaths, accounting for 44 percent of all NCD deaths and 31 percent of all global deaths); cancers (nine million deaths, 22 percent of all NCD deaths, and 16 percent of all global deaths); chronic respiratory diseases (3.8 million deaths, nine percent of all NCD deaths, and seven percent of all global deaths); and diabetes (1.6 million deaths, four percent of all NCD deaths and three percent of all global deaths) (**Accelerating Global Health Pathways to Health Equity for the G20, PHFI 2023**).Lower-middle-income countries have the most disparate top 10 causes of death: five non-communicable, four communicable, and one injury. Diabetes is a rising cause of death in this income group: it has moved from the 15th to 9th leading cause of death and the number of deaths from this disease has nearly doubled since 2000 (**factsanddetails.com**).

Table 4 : Growth of Number of persons diagnosed with NCD in India

Year	Total number screened	Diabetes	hypertension	CVDs	Common cancer
2014-15	5924567	559718 (9.45%)	715382 (12.02%)	61302 (1.03%)	11385 (0.19%)
2015-16	12900368	1067774 (8.28%)	1492996 (11.57%)	89922 (0.7.%)	13262 (0.10%)
2016-17	22427125	2175145 (9.70%)	2712204 (12.10%)	104633 (0.47%)	39081 (0.17%)
2017-18	46575176	3728437 (8.00%)	4555231 (9.78%)	183548 (0.39%)	71911 (0.15%)
2018-19	67962186	4148681 (6.1%)	5067912 (7.4%)	177112 (0.26%)	145430 (0.21%)
2019-20	66095757	4996389 (7.55%)	5842446 (8.83%)	226441 (0.34%)	77293 (0.12%)
2020-21	46615704	3754055 (8.05%)	4417013 (9.47%)	148873 (0.32%)	58602 (0.12%)
2021-22	64006683	5594730 (8.7%)	6647609 (10.3%)	157936 (0.24%)	160365 (0.25%)

2022-23 (Till sept 2022)	51465654	4588177 (8.91%)	5267554 (10.23%)	114281 (0.22%)	161308 (0.38%)
Cumulative growth	**7.68%**	**7.19%**	**6.36%**	**0.86%**	**13.16%**

Data source- Annual report of Ministry of Health and Family Welfare (2022-23)

From the table above, it is obvious that NCDs are rising at alarming speed. It is also evident that Government is continuously trying to increase the number of screenings to grasp a better picture of penetration of NCDs so that policies can be better targeted. During 2020 -21 Covid 19 was on the rise and strict lockdown was imposed. This is the reason that total number of screenings was low.

This transition does not only come with new numbers and figures but it also creates burden on the overall health resources of country and has a significant economic impact. And a higher OOPE burden on individual can be seen from below table

Table 5: Average medical expenditure(In INR) on NCD Treatment per hospitalisation cases for in India

Category of ailment	Public hospital	Private hospital	All hospital other than mentioned in previous column*	Total
Cancer	22520 (12.72%)	93305 (52.70 %)	61216 (34.57 %)	177,041
Cardio vascular ailments	6635 (6.79%)	54970 (56.31%)	36001 (36.88%)	97,606
Respiratory ailments	3346 (17.01%)	24049 (58.23%)	13905 (33.66%)	41,300
Gastro -intestinal ailments	3847 (7.18%)	29870 (55.79%)	19821 (37.02%)	53,538
Genito – Urinary Ailments	5345 (8.41%)	33409 (52.59%)	24770 (38.99%)	63,524
Eye Ailments	2605 (8.06%)	18767 (58.13%)	10912 (33.80%)	32,284
Percentage Share in Total Cost of treatment	**8.801 %**	**54.66 %**	**35.81 %**	**465,293**

Data source - Data from NSSO 75 Round, collected and calculated by researcher

*NGOs, Trustee hospitals

NCDs have a sizable economic impact on the households in India, local and National level. Using a macroeconomic model, it is being concluded that during 2015 – 2020, NCDs will result in macroeconomic cost of the $3158 per capita, equivalent to a 7% annual tax on country's GDP

(Agarwal A. et al. (2021**)**. The global cost is estimated to be US$47 trillion between 2010 and 2030 (Bloom et al. 2012), this includes direct expenses related to healthcare services and treatments, as well as indirect costs arising from productivity

loss and strain on healthcare systems. The COVID19 pandemic has further highlighted the vulnerability of individuals with underlying NCDs as they face an increased risk of severe illness and complications (NCDA). Catastrophic health expenditure and out-of-pocket spending, related to NCDs, have drawn attention to prioritising preventive action (**Accelerating Global Health Pathways to Health Equity for the G20, PHFI 2023**).

Conclusion

Given the epidemiological transition that this paper shows, policies and policy makers also need to evolve so that a better coordinated strategy can be made and implemented to meet the unique demands of non-communicable disease. About 85 % of 17 million people who died in early age of 60 years, occur in low and middle income countries (WHO, Report 2019). It poses devastating health and socio-economic consequences for people and communities. The direct and indirect healthcare cost related to NCD treatment made the prevention and control of these diseases a critical development challenges for coming years. India is a lower middle income and largest populous country with more than 1.4 billion people. Its ranked 132 in human development index (2023). India's average NCD prevalence rate is on the higher side than world average. Non-communicable diseases causes a catastrophic health care cost and socio economic burden to the nation since 2000. There has been a remarkable shift in disease burden in almost all strata of population in the country from communicable disease to non communicable disease. This is serious problem to health care system and threat to individual's productive life. Health care burden according to above study is significantly high particularly to those people who seeks care in private facilities and Hospital run by NGO's.

Despite of various ambitious projects and schemes on health care, considerable proportion of people were still under financial risk due to high out of pocket health expenditure. This is alarming and concerning for policymakers and the all the stakeholders in India. There is urgent need on the part of government to make affordable health insurance policies covering risks of almost all the weaker section primarily to protect them from catastrophic cost of treatment and resultant vulnerability due to this. It should also focus on awareness campaign related to non-communicable diseases prevalence and the factors contributing to its occurrence. Primary healthcare system should be more equipped with all the required facilities and manpower and focussed on elementary treatment so that it could help in controlling deaths. By this way we can able to reach the target set by WHO and United Nation mandated SDG Goals to reduce premature deaths from non-communicable diseases.

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