2019 SCIENCELINE
Asian Journal of Social and Economic Sciences
Asian J. Soc. Econ. Sci., 8(1): 01-13, March 25, 2019
AJSES
ISSN: 2383-0948

Relationship between gender discrimination and human development in India

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ABSTRACT

This article attempted to review past literature and available data to come out with a definite substance to support the case of diminishing discrimination against females in India. The proposed Null hypothesis, "There is no relationship between Human Development Index (HDI) and Gender Gap Index (GGI)" will be tested to support whether with changing Human Development Index (HDI) of the country gender gap (discrimination against women) is also changing. Hence the Alternative Hypothesis (H_a), "There is a relationship between Human Development Index (GDI) and Gender Gap Index (GGI)" is accepted. In other words, with increasing Human Development Index (HDI), Gender Gap Index (GGI) is increasing or gap between the two genders is reducing in India. The analysis of and conclusion drawn from the study were based on the secondary data used from various national and international publications. Statistical test such as test of significance was applied to test hypothesis. Analysis of data indicated a positive relationship between Human Development Index and Gender Gap Index in case of India. This paper presented only a direction for undertaking more detailed scientific studies to ascertain cause and effect and factors responsible for this relationship. This paper did not imply that Human Development Index directly affected reduction in gender gap.

Original Article

PII: S238309481900001-8

Rec. 24 August 2017
Acc. 25 June 2018
Pub. 25 March 2019

Keywords

Discrimination, Egalitarian, Gender Gap Index, Gender Discrimination, Gender Inequality Index, Human Development Index.

INTRODUCTION

This article is based on secondary data including published documents, reports and statistical tables. Secondary data has been taken mainly from International organizations like UNDP and UNESCO, World Economic Forum, World Bank Statistics and other agencies. Data tables and graphs have been used for comprehending the issues of importance.

Among other factors, discrimination causes unrest in a civil society. Discrimination is the root cause of many disadvantages a female has been facing for centuries in one form or the other. The modern form of discrimination mainly includes discrimination against race, caste and creed, social status and gender to name a few. The affects of discrimination are more tangible in a heterogeneous society comprising of different socio-economic-cultural-religious people. Heterogeneity in a country, more often than not becomes a cause of discrimination against the female (http://ncw.nic.in/pdfReports/report_of_expert_committee_gender_and_education.pdf, p-17). Gender inequality and gender gap in this article refers to discrimination against female.

Human Development Index (HDI) is considered an adequate measure for understanding the developmental status of a country that considers three components together to make a composite index. United Nations Development Programme (UNDP) has been using HDI since 1990 as a comparable indicator and countries across the world are ranked accordingly based on the value of the index. The HDI includes three components i.e. Health (Life Expectancy at Birth), Education (Mean Years - a 25 years old or older person has spent in schools and Expected Years of Schooling that a 5 years old child will spend with his education in his whole life) and Income (Estimated Gross National Income (GNI) at purchasing power parity per capita of a country). The global HDI for the year 2013 is 0.702 while India ranks 135 with HDI value of 0.586 (Human Development Report (HDR) 2014, Table 1).

Inequality is one of the most ruthless factors impeding progress towards formation of an egalitarian society. A society where people can live without any discrimination can only be possible if economic and social needs of the people are satisfied. Income, health (longevity) and education are the three

basic needs of the people. Income, good health and education in a society help in building an egalitarian society by providing necessary inputs to income generation and provision of good health services to the people. These three components have been well recognized by the United Nations and have been included in estimating Human Development Index (HDI).

Discrimination deprives people of equal opportunities, may it, income generating activities, health care services, educational needs or any other necessities of human being. Despite the advancement in income, health and educational status globally, discrimination against certain groups of people still persists. According to Human Development Report 2014 "large disparities in income, wealth, education, health and other dimensions persists across the world, heightening the vulnerability of marginalized groups and undermining their ability to recover from shocks. People clustered at the bottom of socioeconomic distribution are not there randomly. They lack a sufficient range of capabilities to enable them to live a fulfilling life and they typically are most vulnerable to health risks, environmental calamities and economic shocks (HDR 2014, p. 36). Here, an attempt has been made to take a general view of association in human development and gender gap between male and female, in terms of Human Development Index (HDI) and Gender Gap Index (GGI).

Table 1 - Trend in Human Development Index (HDI)

HDI Rank	Country	1990	2000	2005	2008	2010	2011	2012	2013
1	Norway	0.841	0.91	0.935	0.937	0.939	0.941	0.943	0.944
2	Australia	0.866	0.898	0.912	0.922	0.926	0.928	0.931	0.933
135	India	0.431	0.483	0.527	0.554	0.570	0.581	0.583	0.586
186	Congo (Democratic Republic of the .....)	0.319	0.274	0.292	0.307	0.319	0.323	0.333	0.338
187	Niger	0.218	0.262	0.293	0.309	0.323	0.328	0.335	0.337
	Very high human development	0.798	0.849	0.870	0.879	0.879	0.885	0.889	0.89
	High human development	0.593	0.643	0.682	0.71	0.723	0.729	0.733	0.735
	Medium human development	0.474	0.528	0.565	0.587	0.601	0.609	0.612	0.614
	Low human development	0.367	0.403	0.444	0.471	0.479	0.486	0.490	0.493
	South Asia	0.438	0.491	0.533	0.56	0.573	0.582	0.586	0.588
	World	0.597	0.639	0.667	0.667	0.685	0.693	0.700	0.702

Source: Human Development Report, 2014.

Review of Literature

Issues related to gender inequality have been very crucial to human development especially the women. This issue has been discussed in several international and national forums and has gained attention from social scientists and educationalist in recent past. United Nations Development Programme (UNDP), World Economic Forum, UNESCO, World Bank and many international agencies have been able to attract people to work in this area of social development and thereby suggesting ways and means for further development in reducing the gender gap with critical evaluation of national programmes undertaken by the governments.

In order to measure human development and gender gap a number of indices have been constructed, however, some of them have been critically argued for not being adequate and appropriate to serve their purpose. United Nations Development Programme (UNDP) gender related measures; Gender Related Development Index (GDI) & Gender Empowerment Measures (GEM) have been criticized for choice of dimensions, choice of variable and construction of gender inequality index. These indices do not reflect certain sociological manifestations such as participation in community or family decisions and in physical integrity, etc. A few authors such as Dijkstra and Hanmer (2000), Dijkstra (2002) have criticized GDI and GEM for conceptual and methodical limitations and Jutting and Morrison (2005) for omission of inequalities for women in social institutions whereas they are crucial in developing countries. Dollar and Gatti (1999) conclude that some countries can be relatively egalitarian in one dimension but relatively unequal in other dimensions.

Lastly, the construction of composite indicators is challenged by the authors/researchers.

Bardhan and Klasen (1999) have critically argued that construction of the two gender-related indices proposed by UNDP in the 1995 Human Development Report, the Gender-Related Development Index (GDI) and the Gender Empowerment Measure (GEM) in particular ways with the assumptions made therein to overcome data gaps severely limit their usefulness and result in very misleading international comparisons.

The Global Gender Gap Report 2006 reveals no country in the world has been able to overcome gender gap completely, however, a few Nordic countries (Sweden as the most successful in narrowing the gap closed over 80 percent) have been successful in bridging the gender gap substantially down. India ranks 98 in the order, signifying a very poor performer with very high gender gap.

A study (Measuring Gender (In) Equality: The OECD Gender, Institution and Development Data Base, 2008), indicates that inequalities in social institutions are particularly pronounced in countries with low female literacy rates but correlate less strongly with Gross Domestic Product per capita. An econometric analysis suggests a clearly negative correlation between gender inequalities of the OECD Development Centre and women's labour force participation. In another study, Shawn F. Dorius and Glenn Firebaugh (2010), in their article "Trends in Global Inequality" have indicated decline in global gender inequality. Besides, a few studies have also been carried out in the areas of gender equity indicating interest of scholars and academicians in related areas. However, this study aims at focusing on Indian perspective of gender inequality and its association with human development in India.

METHODOLOGY

Description

Here, different aspects of development in a country and its people are discussed in brief. Each individual person is a micro unit of a country and development of micro units together leads to macro development of the country. Some of the terms related to human development are described in the following lines to know their effect on development of a country.

1) Human Development Index (HDI)

Human Development Index (HDI) is a composite index estimated by taking geometric mean of three indices namely, life expectancy index (LEI- A long and healthy life: Life expectancy at birth), education index (Mean years of schooling and Expected years of schooling) and income index (A decent standard of living; GNI per capita (PPPUS $). Human Development index (HDI) is an indicator of human development estimated by taking into account the three important components of development. Human development index (HDI) is an indicator of potential human development whereas income index reflects per capita income (GNI-gross national income) of a country. Education index (expected years of schooling index and mean years of schooling index) and life expectancy index (long and healthy life) respectively measure status of education and average life span of the people of a country. Since 2010 United Nations Development Programme (UNDP) has been estimating human development index (HDI) by using a new formula which is more comprehensive in nature (HDR 2014, Technical Notes) and has been widely recognized across the world as a measure of human development.

Human Development Index (HDI) categorizes the countries into four i.e. the very high human development, high human development, medium human development and low human development categories. India falls into the medium human development category with HDI value of 0.586 and ranks 135 in the year 2013. Trend of HDI in India for last decade or so indicates an ever progressing index values for human development. In other words, HDI reflects improvement in health status with increasing life expectancy at birth, educational status and per capita higher income of the people. However, India becomes the worst performing country of South Asia after Afghanistan when its Human Development Index (HDI) is adjusted for gender inequality. As regards to gender equality, Pakistan, Nepal and Bangladesh, which are poorer than India and have lower HDIs, do comparatively better than India, the HDR 2013 reveals (http://timesofindia.indiatimes.com/india/Gender-equality-in-India-among-worst-in-world-UN/articleshow/18982029.cms).

Human Development Index of India has gone up from 0.483 in the year 2000 to 0.586 in the year 2013 which is very close to South Asia region (HDI- 0.588) but still remains far below Norway, the country with highest HDI of 0.944. Trends in Human Development Index (HDI) for India exhibit a continuous upward movement indicating thereby an improvement in

human development in India. So far as human development is concerned, many developing countries including India have performed better than predicted since 2000, HDR 2013 reveals.

Though the incremental growth is not substantial yet, it definitely signifies progression in human development in India over the years. Human Development Index (HDI) of India which was 0.431 in the year 1990 moved up to 0.483 in the year 2000 and further to 0.527 in 2005. Following on the rising trend HDI value of India touched 0.586 marks in the year 2013. As mentioned earlier, human development index (HDI) is a measure of three dimensions and improvement in the index is an indicator of improvement in health (Life expectancy at birth-66.4 years), education (MYS-4.4 yrs & EYS-11.7 yrs) and income (Per capita income 5,150 PPP US$) of citizen of a country if each component contributes to it. Thus incessant progress in human development index of India over the years suggests improvement in health, education and income status of the people of India. It is a matter of further research to know which component has contributed significantly.

2) Educational Status

Educational status is one of the most crucial elements that determines economic participation and opportunity of the people, especially in organized sector. Minimum educational qualification is one of the criteria in most organized sectors for employment. Education index is one of the most recognized indicators that international agencies use for estimating human development index of countries. Education, not only helps maintain social status of women but also the possibility of increase in wages because of a positive relationship between wages and years of schooling (Weil 2009). Female education is negatively correlated with fertility rate and lower fertility rate reduces population growth, hence increases economic growth per capita. Literacy is known to be negatively correlated to mortality rate (Tilak, 2006). Infant mortality is reduced by 5-10 percent with one year of female education (Schultz, 1993 in Tembon & Fort, 2008).

So far as India's educational status is concerned ratio of female to male primary enrollment (percentage of girls to boys enrolled at Primary level in Public and Private Schools) has been almost constant between 2009 and 2011, however, ratio of female to male secondary and tertiary enrollment has improved in the same period. This indicates more females than males have been getting enrolled in secondary and tertiary education in India between 2009 and 2011.

The present scenario of education in India where more number of female getting enrolled in institution of higher education is the result of implementation of government policies for women empowerment and increasing awareness. Government of India's policies for women welfare and empowerment has placed huge importance on women's education. Over the years, increased awareness among the females about the government policies for women employment and welfare has significantly contributed in increased enrollment of women in India. India has been spending very less on education if compared with many countries in the world. In terms of percentage of GDP, India has been spending about 3.0 percent of GDP. Expenditure on education (public) in India was 4.3 percent of GDP in the year 2000 which has further dropped to 3.3 percent of GDP in the year 2012 (Table 2). On the other hand Norway spent nearly 7.0 percent of its GDP on education in the same year (World Bank Data, World Development Indicators 2013).

Despite the fact that India has been spending only a small proportion of its GDP on education, there has been an upward trend in the number of expected years of schooling for males and females as well. While expected years of schooling for males have gone up from 9.5 years in 2000 to 11.8 years in 2013, the same has increased from 7.4 years in 2000 to 11.3 years in the year 2013 for females (*UNESCO Institute for Statistics* 2013). On the other hand mean year of schooling remained very low, only 3.2 years for females and 5.6 years for males in the 2012 (Human Development Report 2014, Appendix-1). Mean year of schooling remained constant at 4.4 years during 2010 and 2013 if taken together for male and female.

Education is an investment for making a conscious, caring and responsible mother and a Mothers' education remains a dominant determinant in reducing gender inequity. As educated mothers do understand importance of being sensible to health problems and are likely to be more prompt and regular in averting diseases and seeking treatment to health problems, helping survival of children. Education enables mothers to have knowledge, awareness and

outlook for child care. Follow-up with preventive measures and timely intervention does increase probability of child survival and reduction in child mortality. As has been mentioned in United Nations Millennium Development Goals (MGDs) document (at http://www.un.org/millenniumgoals/pdf/MDG%20Report%202012.pdf,p-2) children of educated mothers—even mothers with only primary schooling—are more likely to survive than children of mothers with no education. Mortality of children can be lowered by targeting the factors responsible for it with adequate and efficient interventions. Besides education, other factors like empowerment of women, removal of financial and social barriers from accessing basic services, easy access of critical services to poor and improving health system accountability may help reduce gender gap and improve equity.

Table 2 - Expenditure on education, Public (% of GDP)

Expenditure on Education, Public (% of GDP)										
Country	**1990**	**2000**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Very high human development	4.8	4.5	5	5.1	5	5.1	5.4	5.2	3.6	5.3
High human development	2.8	4	4.4	4.3	4.6	4.5	5	5.2	4.4	4.6
Medium human development	4.5	4.3	3.5	3.6	3.7	3.8	3.7	3.8	3.1	3.7
Low human development	3.9	3.2	3.4	3.6	3.4	3.9	3.4	3.6	3.7	3.8
Norway	6.4	6.6	7	6.5	6.7	6.4	7.3	6.9	..	6.9
Netherlands	5.6	5	5.5	5.5	5.3	5.5	5.9	6	..	6.0
India	..	4.3	3.1	3.1	..	..	3.2	3.3	..	3.3
Central African Republic	2.2	1.6	1.6	1.4	1.3	1.3	1.3	1.2	1.2	1.2
Monaco	..	1.3	..	..	..	..	1.2	1.3	1.6	1.6

Source: *World Bank (2013). "World Development Indicators 2013." Washington, D.C., USA at http://data.worldbank.org/data-catalog/world-development-indicators*

Note: *Total public expenditure (current and capital) on education expressed as a percentage of GDP. Data in the tables are those available to the Human Development Report Office as of 15 November, 2013, unless otherwise specified.*

3) Status of labour participation

Labour force participation rate (modeled ILO estimates) of female in India has come down from 30 in 2009 to 27.2 in 2013 while labour force participation for male has contracted from 81 from 2009 to 78.8 in 2013 (male population ages 15+, modeled ILO) (Appendix-3). There has been a vast gap between labour force participation of female and male in India during the period 2009-2013.

Sector wise participation of female labour force in India indicated that 65 percent of total female employment is in agriculture sector which declined to 60 percent in 2012. Labour force participation rate of female in industries on the other hand has increased from 18 percent in 2010 to 21 percent in 2012. Similarly, in services sector, participation of female increased from 17 in 2010 to 20 in 2012. Sector wise participation of female labour force in India reveals that female labour force participation has experienced diversification from agriculture to industries and services sector in India during 2010-2012.

Similar trend has been observed from the data that male labour force, engaged in agriculture, has been shifting to industries and services sector over the years. Percentage of male labour force engaged in agriculture came down to 43 percent in 2012 from 46 percent in 2010. Data indicate shifting of male labour force from agriculture to industries (24 percent in 2010 to 26 percent in 2012) and services sector (30 percent in 2010 to 31 percent in 2012.

Unemployment (percentage of female labour force without work but available and seeking employment) has shown a marginal decline between 2010 and 2012. Unemployment of female has come down marginally from 4.4 percent in 2010 to 4.0 percent in 2013. On the contrary, unemployment among male labour force increased marginally from 3.3 percent in 2010 to 3.5 percent in year 2013 (Table 3: World Bank Data @ data.worldbank.org/indicators).

Table 3 - Labour Force Participation in India

Sr. No.	Particulars	2009	2010	2011	2012
1	Labour force participation rate, female (% age of female population ages 15+, modeled ILO estimate)	30	29	27.2	27.2
2	Labour force participation rate, male (% age of male population ages 15+, modeled ILO estimate)	81	79.7	78.8	78.8
3	Employees, agriculture, female (% age of female employment)	-	65	-	60
4	Employees, agriculture, male (% age of male employment)	-	46	-	43
5	Employees, industries, female (% age of female employment)	-	18	-	21
6	Employees, industries, male (% age of male employment)	-	24	-	26
7	Employees, services, female (% age of female employment)	-	17	-	20
8	Employees, services, male (% age of male employment)	-	30	-	31
Sr. No.	**Particulars**	**2010**	**2011**	**2012**	**1013**
9	Unemployment female (% age of female labour force without work but available for and seeking employment) (modeled ILO estimate).	4.4	4.3	4.1	4.0
10	Unemployment male (% age of male labour force without work but available for and seeking employment) (modeled ILO estimate).	3.3	3.3	3.4	3.5

Source: World Bank at worldbank.org/indicators.

4) Gender Gap Index (GGI)

India ranked 101 in the world among 136 countries, the global gender gap report 2013 stated. But India has fared better in terms of the political empowerment of women. India's global gender gap[1] index was 0.655 on a 0 to 1 scale, with 0 denoting inequality and 1 equality. India with a ranking of 98 in 2006 did not fare well in the following years in terms of gender gap, hovering between rankings 114 and 112 between 2007 and 2011. India's Gender Gap Index (GGI) ranking improved to 105th in the year 2012 (http://www.thehindu.com/opinion/blogs/blog-datadelve/article5275487.ece).

The World Economic Forum introduced Global Gender Gap Report in the year 2006. The Global Economic Report provides a framework for capturing the magnitude and scope of gender-based disparities around the world. Gender Gap Index (GGI) provides for a point of reference on national gender gap based on economic, political, education and health criteria to facilitate effective comparison across countries/regions over time. The rankings are designed to create greater awareness among a global audience of the challenges posed by gender gaps and the opportunities created by reducing them (Global Gender Gap 2013, P.3).

Gender Equality refers to the equal rights, responsibilities and opportunities of women, men, girls and boys. This entails that women's and men's rights, responsibilities and opportunities do not depend on whether they are born male or female and that the interests, needs and priorities of both women and men are taken into consideration. Furthermore, there is an increasing acceptance that gender equality is not a women's issue but should concern and fully engage men and women as well since equality between men and women is seen both as a human right issue and a precondition for, and indicator of, sustainable and people centered development (Global Gender Gap Report 2006, P. 5).

According to the Global Gender Gap Report 2014, women have shown much progress on gender equality especially in entering politics and workforce. There are more women than men who have entered the labour force, 26 percent more parliamentarians and 50 percent female ministers now than nine years ago. However, a lot remains to be done to reduce the gender gap consistently across the globe.

The Global Gender Gap Report 2014 draws attention to persisting gender gap divides across and within regions. Based on the nine years of data available for the 111 countries that have been part of the report since its inception, the world has seen only

[1] The Global Gender Gap Index tries to measure the 'relative gaps between women and men' across countries in four key areas - health, education, economics and politics. The rankings are based on four of sub-indices that measure economic participation and opportunity, educational attainment, health and survival and political empowerment. The political sub-index measures the gap between men and women at the apex of the political decision-making hierarchy in terms of the ratio of women to men in minister-level positions and in parliament. The ratio of women to men in terms of years in executive office (prime minister or president) for the past 50 years is also taken into consideration (https://www.thehindu.com/opinion/blogs/blog-datadelve/article5275487.ece).

a small improvement in equality for women in the workplace. According to the Global Gender Gap Report 2014, the gender gap for economic participation and opportunity now stands at 60% worldwide, having closed by 4% from 56% in 2006.

Global scenario of gender gap depicts maximum reduction in terms of health and survival with a gap standing at 96% globally, with 35 countries having closed the gap entirely. It is the only sub-index which declined over past nine years. Next in line is the educational attainment gap, standing at 94% globally; 25 countries have closed the gap entirely. Gender gap for economic participation and opportunity lags stubbornly behind. Though sub-index political empowerment has witnessed substantial improvement since 2006 yet, it has stood at 21%, when compared with other sub-indices of Gender Gap Index (GII) (Global Gender Gap Report 2014, p. 12).

India gains four places in the ranking based on the improvement in the years with the female head of state indicator, although India's score on the economic participation and opportunity sub- index decreased. India along with Yemen, Pakistan, Bangladesh and Nepal has both large educational gender gap as well as economic ones (The Global Gender Gap Report 2013, p.29).

In terms of GGI score, India has improved its overall status, from a score of 0.601 in 2006 to 0.655 in 2013, a difference of 0.054 points and 8.99 percent growth over 2006. However, health and survival sub-index has not seen much improvement over the years. Other sub-indices of GGI, such as political empowerment, economic participation and opportunity and educational attainment have witnessed little improvement in 2013 over 2006.

5) Gender Inequality Index (GII)

Gender Inequality Index (GII) is a composite measure of loss to achievement in reproductive health, empowerment and labour market participation due to gender inequalities. It takes into account the loss in achievement that a country suffers to, in respect to the key aspects of human development. Gender Inequality Index (GII) was introduced in 2010 by United Nations Development Programme (UNDP) as an improvement over Gender Development Index (GDI) and Gender Empowerment Measure (GEM). Higher the value of Gender Inequality Index (GII), greater is the inequality or higher loss to human development (*HDR 2012*). However, Permanyer (2013) criticizes GII for being unnecessarily complicated in order to satisfy certain statistical properties that are otherwise satisfied by much simpler indices. In addition, the GII incorporates both (absolute) women-specific indicators and (relative) "women-versus-men" indicators into a single formula, creating important conceptual and methodological problems.

Inequality reduces pace of human development. This is most marked for inequality in health and education and less for inequality in income, where effects are substantial for high and very high HDI countries. An analysis of 132 developed and developing countries finds an inverse relationship between inequality and human development (HDR 2013).

India ranks 117 out of 152 countries in 2013 with a Gender Inequality Index (GII) value of 0.563. Women in India held 10.9 percent of parliamentary seats, 26.6 percent of adult women have reached at least some secondary education compared to 50.4 percent men. Maternal Mortality Ratio (MMR-200) i.e. 200 women die from pregnancy related causes for every 1,00,000 live births and 32.8 births to adolescent (ages 15-19 years) for every 1000 adolescents in the country. Female participation in the labour market is 28.8 percent compared to 80.9 percent for male (HDR 2014, Table 4).

Table 4 - Trends in Indices

Index/Year	2006	2007	2008	2009	2010	2011	2012	2013
Human Development Index (HDI)	0.536	0.546	0.554	0.563	0.570	0.581	0.583	0.586
Gender Gap Index (GGI)	0.601	0.594	0.605	0.615	0.616	0.619	0.644	0.655
Gender Inequality Index (GII)	0.603	0.596	0.594	0.586	0.576	0.571	0.566	0.563

Source: Human Development Reports (HDR) 2014, Global Gender Gap report, 2014 (World Economic Forum), www.cesifo-group.de/...discrimination-Gender/global-gender-gap-index, World Bank data @ www.worldbank.org and www.indexmundi.com/facts/india. Data for GII at http://data.worldbank.org/indicator/SP.ADO.TFRT ; http://data.worldbank.org/indicator/SL.TLF.CACT.ZS?page=1 ; http://genderstats.org/Browse-by-Countries/Country-Indicator?ind=3&srid=2&ctry=356 ; http://data.un.org/Data.aspx?d=WDI&f=imdocatpr Code%3ASP.ADO.TFRT.

In India, gender inequality and its social causes have severe impact on social, economic, health and educational attainment status of women. Though it is argued that men and women are equally affected by gender issues but women are found to be more vulnerable to gender discrimination (**http://en.wikipedia.org/wiki/Gender_inequality_in_India**) . Exception apart, Gender Inequality Index (GII) values in India have steadily decreased over the years (*Table 4*). The down trend in gender inequality index indicates closing gender gap.

Human Development Report 2014 states that the world average score on the GII is 0.451. It reflects a percentage loss of 45.1% in achievement across the three dimensions due to gender inequality. Regional averages range from 12.6% among European Union member states to nearly 57.8% in Sub-Saharan Africa. At the country level losses due to gender inequality range from 2.1% in Slovenia, to 73.3% in Yemen. Sub-Saharan Africa, South Asia and the Arab States suffer larger losses due to gender inequality (57.8%, 53.9% and 54.6% respectively). Low HDI countries suffer the most (one third of HDI value) due to inequalities whereas very high HDI countries lost only 11.0 percent, according to an analysis of IHDI for 132 countries in 2012. Further, 23.0 percent value of HDI was lost due to inequality.[2]

RESULTS AND DISCUSSION

Trend line (Figure 1) shows India's Human Development Index (HDI), Gender Gap Index (GGI) have been gradually increasing while Gender Inequality Index (GII) has been steadily declining over past few years. There has been 0.050 points and 0.054 points rise in HDI and GGI values of India respectively between 2006 and 2013 while GII witnessed 0.040 points decline during the same period.

The index values and trend lines of Human Development Index (HDI) and Gender Gap Index (GGI) imply improvement in India's HDI and GGI components (HDI- Health, Education and Income and GGI- Economic Participation and Opportunity, Educational Attainment, Health & Survival and Political Empowerment).

Health, education and income dimensions of human development index (HDI) have reflected regular improvement in the past three years, however, increase has not been conspicuous (Appendix-1). With respect to overall improvement in GGI, its economic participation and opportunity and political empowerment dimensions have fared better than health & survival and educational attainment during 2006-2013 (Appendix-2). While health and survival component remained static, educational attainment and economic participation and opportunity components of gender gap index (GGI) have observed a marginal slump in the years 2010 and 2011 from previous years but improved again in next two years.

Gender Inequality Index (GII) of India has been on the decline through 2006 to 2013. Maternal mortality ratio, adolescent birth rate, share of seats in Parliament and education (population 25 + years with at least some secondary education) showing improvement have resulted in decline in Gender Inequality Index (GII) of India over the years.

Trend lines indicated strong association between Human Development Index (HDI) and Gender Gap Index (GGI) for past eight years (2006-2013). A correlation coefficient of 0.867 between HDI and GGI approves strong positive association between HDI and GGI during the reference period (2006-2013).

Regression line for HDI and GGI has a good fit of 75 percent with slope (b=0.986) and intercept (a=0.062). A strong correlation coefficient (r=0.867), significant at $p<0.01$ between HDI and GGI maintains that with improving human development index (HDI), gender gap index (GGI) in India has been improving and thereby resulting in reduction of gender gap.

As higher value of gender gap index (GGI) indicates reduction in gender gap (improved status of female), a rise in HDI accompanied by a rise in GGI would point improved status of female with increasing human development index (HDI) in the country.

On the other hand, increasing value of Human Development Index (HDI) for the reference period is accompanied by steadily declining index values of

[2] Inequality-adjusted Human Development Index (IHDI) which examines the average level of human development and its distribution along the dimensions of life expectancy, educational attainment and command over resources needed for a decent living is used to capture effects of inequality on human development. Where there is no equality, IHDI equals the HDI. Greater is the difference between HDI and IHDI, greater the inequality. The analysis is based on IHDI of 132 countries in the year 2012.

Gender Inequality Index (GII) in India. This infers human development in India is inversely associated with gender inequality as indicated by declining gender inequality index values in India during 2006-2013.

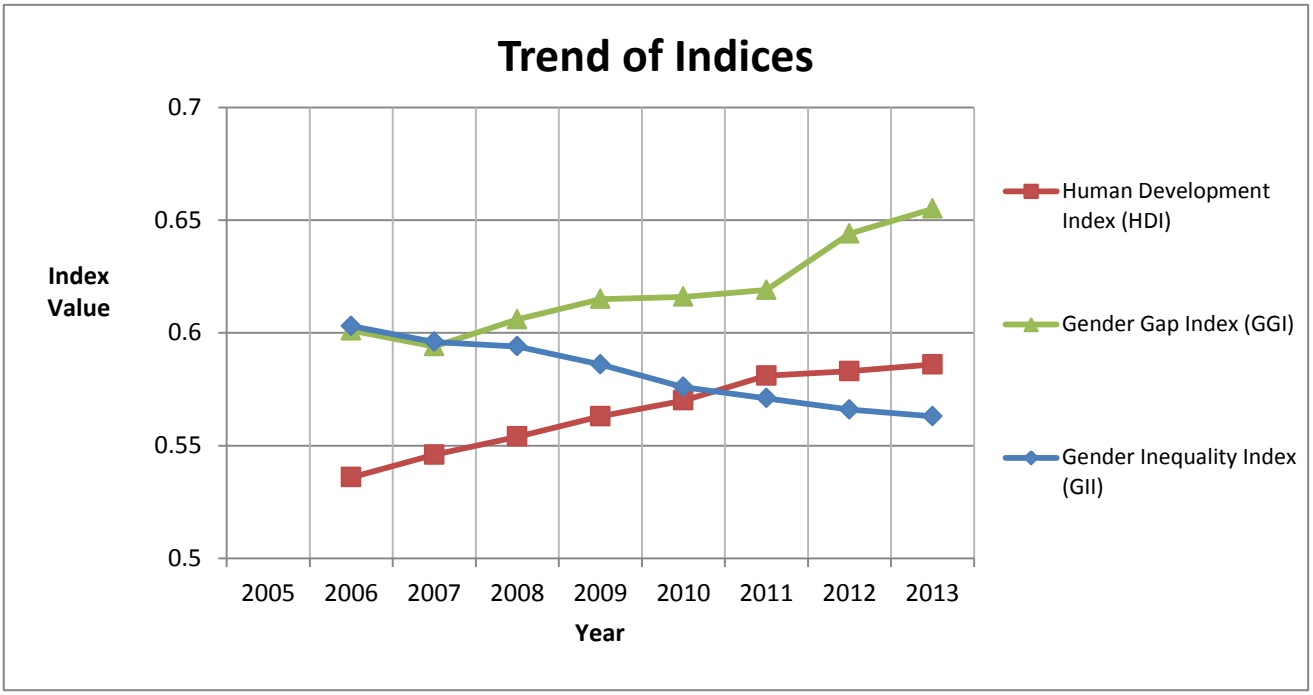

Figure 1: Trends in HDI, GGI and GII Indices (India).

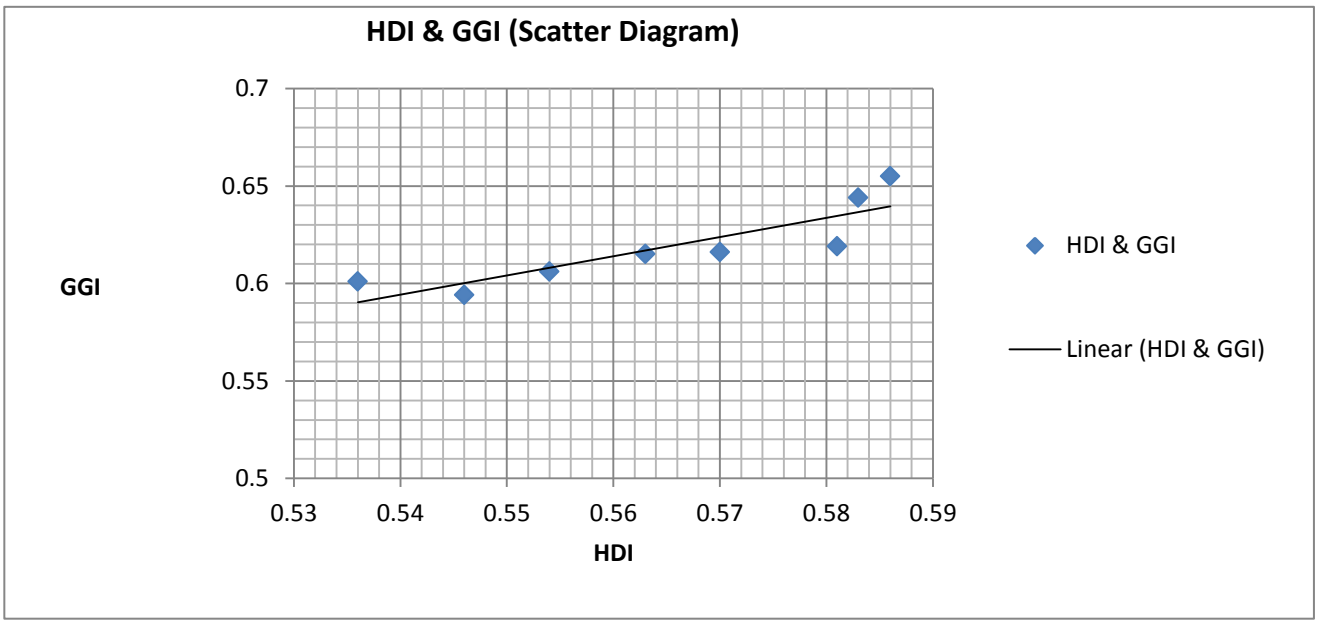

Figure 2: Scatter Diagram (Regression Line) - HDI & GGI

For Regression Line (Linear Equation) $Y = a + bX$ *(HDI & GGI)*

Intercept, a = 0.062 Slope, b = 0.986 Correlation, r = 0.867

RSQRD, $r^2 = 0.752$ t Value = 4.270 p value for t = 0.0053

R is significant at $p < 0.01$

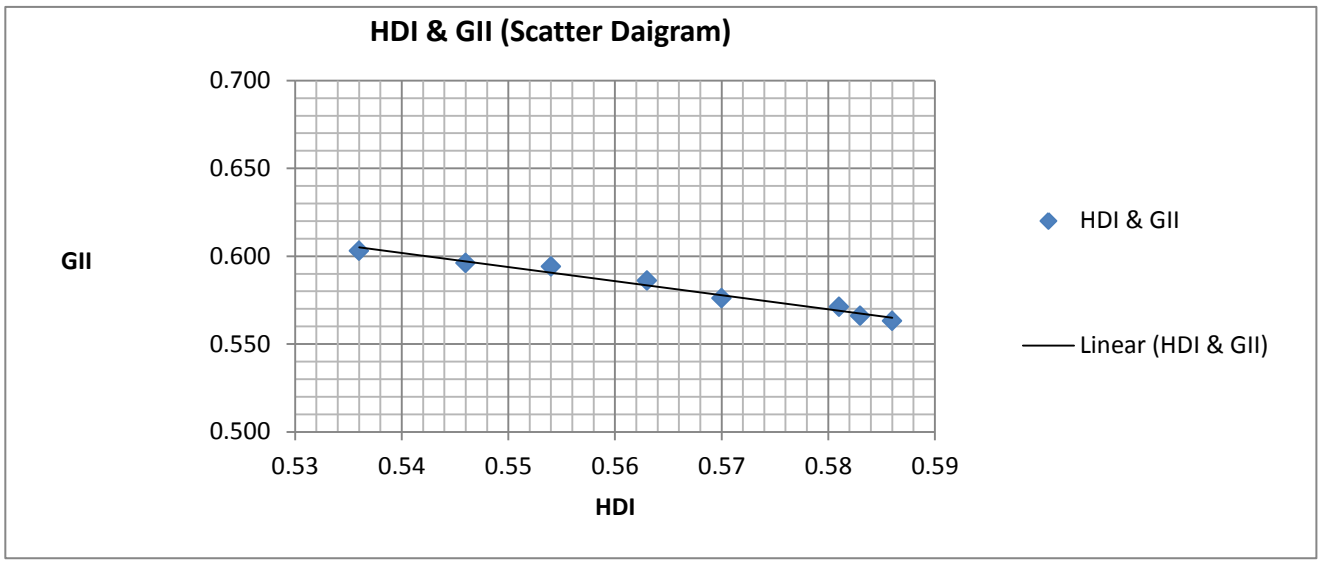

Figure 3: Scatter Diagram (Regression Line) - HDI and GII

For Regression Line (Linear Equation) Y = a + bX (HDI & GII)

Intercept, a = 1.036	Slope, b = -0.804	Correlation, r = -0.988
RSQRD, r^2 = 0.977	t Value = 15.887	p value for t = 0.0000

R is significant at p < 0.01

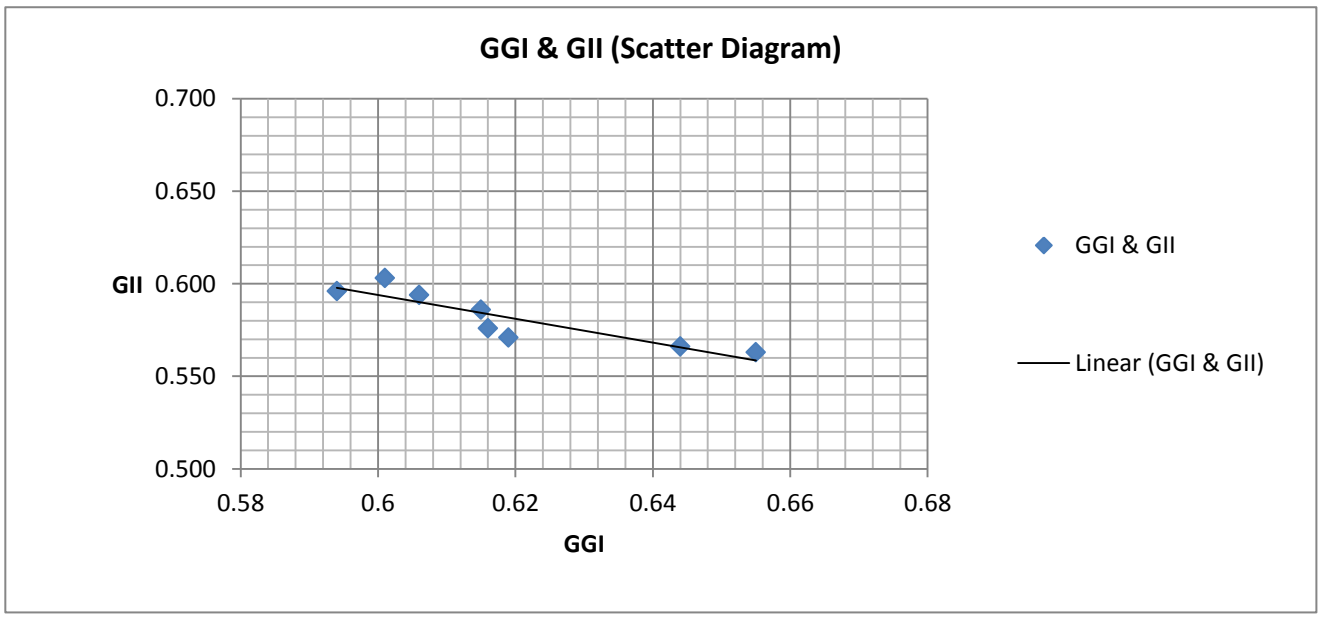

Figure 4: Scatter Diagram (Regression Line) - GGI and GII

For Regression Line (Linear Equation) Y = a + bX (GGI & GII)

Intercept, a = 0.979	Slope, b = -0.642	Correlation, r = -0.896
RSQRD, r^2 = 0.803	t Value = 4.951	p value for t = 0.0026

R is significant at p < 0.01

CONCLUSION

A simple linear regression was performed on eight years' data to determine any significant relationship between (HDI), (GGI) and (GII). The assumptions governing this test are; (1) that both variables are plausibly normally distributed, (2) that there is a linear relationship between them and (3) the null hypothesis is that there is no association between them.

The t-statistic for the slope was significant at $p<0.01$ and $t(6)=4.270$, Significance of t-test at $p<0.01$ corroborates that a strong positive correlation (0.867) exists between HDI and GGI signifying that with increasing HDI of India, Gender gap or discrimination against female has been sinking over the years. Coefficient of determination ($R^2=0.752$) signifies that 75.2 percent of variance in gender gap is "explained" by human development (variation in the data is determined by the regression line). Hence the Null Hypothesis (H_o)"There is no relationship between Human Development Index (HDI) and Gender Gap Index (GGI)" is rejected. And an alternative Hypothesis (H_a) "There is a relationship between HDI and GGI is accepted. It is construed that with increasing HDI, Gender Gap Index (GGI) increases or gap between the two genders reduces.

A very strong negative correlation (-0.988) between HDI and GII, significant at $p<0.01$ is observed Scatter diagram (regression line) does signify negative correlation between HDI and GII (*Figure* 3).

Similarly, a strong negative correlation (-) 0.896 between Gender Gap Index (GGI) and Gender Inequality Index (GII) is established which is significant at $p<0.01$ and $t(6) =4.951$ (*Table* 5).

This implies an inverse relationship between GGI and GII indicating closing of gender gap in India results in declining the gender inequality during the reference period. In other words, with steadily improving Human Development Index (HDI) and Gender Gap Index (GGI) over the years, inequality between male and female has been shrinking in India. It may be concluded that human development in India is accompanied by reduction in inequality between male and female and as a result gender gap is closing steadily in India.

Table 5 - Values of parameters for significance test.

Indices	r	R^2	t	P	Significance level
HDI & GGI	0.867	0.752	4.270	0.01	P<0.01
HDI & GII	(-) 0.988	0.977	15.887	0.01	P<0.01
GGI & GII	(-) 0.896	0.803	4.951	0.01	P<0.01

Note: Values calculated using statistical formulas.

DECLARATIONS

Acknowledgements

This research paper is self-supported and no grants or assistance is received for this manuscript from any organization/agency/institution/individual. However, I thank my colleagues and individuals for their encouragement, comments, insight and expertise that greatly assisted the research, although they may not agree with all of the interpretations/conclusions of this paper. I would also like to show my gratitude to the reviewers for their insights and comments that helped me to improve this manuscript. Finally, the author takes the responsibility for any errors remaining in the manuscript.

Author's contributions

The author worked fully engaged starting from proposal to end work alone.

Funding

This work is self-supported and no grants or assistance is received for working on this manuscript from any organization /agency/ institution/ individual.

Availability of data and materials

The data made available as additional file, to make some statistical data results available, which is not fully included in the research report.

Competing interests

The author declares that he has no competing interests.

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APPENDIX-I

India's Human Development Index (HDI) trends.

Year	HDI Value	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2011 ppp $)
2006	0.536	64.4	10.1	4.1	3,557
2007	0.546	64.8	10.4	4.2	3,867
2008	0.554	65.0	11.0	4.2	3,957
2009	0.563	65.4	11.0	4.3	4,237
2010	0.570	65.7	11.1	4.4	4,589
2011	0.581	65.9	11.7	4.4	4,841
2012	0.583	66.2	11.7	4.4	5,000
2013	0.586	66.4	11.7	4.4	5,150

Source: Human Development Report (HDR) 2014.

APPENDIX-2

India's Gender Gap Index (GGI) trends.

Year	GGI Value	Economic Participation & Opportunity	Educational Attainment	Health & Survival	Political Empowerment
2006	0.601	0.397	0.819	0.962	0.227
2007	0.594	0.398	0.819	0.932	0.227
2008	0.606	0.399	0.845	0.932	0.248
2009	0.615	0.413	0.843	0.932	0.273
2010	0.616	0.403	0.837	0.931	0.291
2011	0.619	0.396	0.837	0.931	0.312
2012	0.644	0.459	0.853	0.931	0.334
2013	0.655	0.447	0.857	0.931	0.386

Source: Global Gender Gap Reports, World Economic Forum.

APPENDIX-3

India's Gender Inequality Index (GII) trends.

Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Maternal Mortality Ratio (MMR)	280	254	230	230	230	210	200	200	190
Adolescent Birth Rate (ABR)	59.2	54.9	50.6	47.0	43.5	39.9	36.4	32.8	32.4
Population with some Secondary Education (SE_f)	24.2	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6
Population with some Secondary Education (SE_m)	48.9	50.4	50.4	50.4	50.4	50.4	50.4	50.4	50.4
Parliament Representation (female)	0.092	0.092	0.092	0.092	0.109	0.109	0.109	0.109	0.109
Parliament Representation (male)	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999
Labour Force Participation Rate ($LFPR_f$)	0.370	0.350	0.330	0.320	0.300	0.290	0.280	0.272	0.272
Labour Force Participation Rate ($LFPR_m$)	0.830	0.830	0.820	0.820	0.810	0.797	0.797	0.788	0.788
G_f(Geo. mean for female, Health, Emp. & LF)	0.238	0.245	0.247	0.248	0.253	0.257	0.260	0.262	0.265
G_m(Geo. mean for male, Health, Emp. & LF))	1.797	1.806	1.799	1.799	1.791	1.782	1.782	1.775	1.775
***Harmonic Mean* ($G_f G_m$)**	0.421	0.431	0.435	0.436	0.443	0.450	0.454	0.457	0.462
Health (MMR and ABR)	0.500	0.500	0.500	0.500	0.500	0.501	0.501	0.501	0.501
Empowerment (Parliamentary Representation)	4.241	4.330	4.330	4.330	4.399	4.399	4.399	4.399	4.399
LFPR (Labour Force Participation Rate)	0.600	0.590	0.575	0.570	0.555	0.544	0.539	0.530	0.530
***$G_{fm\,GM}$ (Health, Empowerment,* Labour Force)**	1.084	1.085	1.076	1.073	1.069	1.062	1.059	1.053	1.053
Gen. Inequality Index (1-((HARM ($G_f G_m$) / G_{fm})	**0.612**	**0.603**	**0.596**	**0.594**	**0.586**	**0.576**	**0.571**	**0.566**	**0.562**

Note: GII are estimated using UNDP formula (Technical Notes, HDR 2014) with latest available data from various sources mentioned in data sources (minor adjustment in data were made at some places).

Date Sources: Adolescent Birth Rate (ABR) at http://data.un.org/Data.aspx?d=WDI&f=Indicator_Code%3ASP.ADO.TFRT

Maternal Mortality Ratio (India) Modeled data (UNICE, WB, UNFPA)

LFPRf and LFPRm (Labour Force Participation Rate female & male) at http://data.worldbank.org/indicator/SL.TLF.CACT.ZS?page=1, http://data.worldbank.org/indicator/SP.ADO.TFRT. and http://genderstats.org/Browse-by-Countries/Country-Indicator?ind=3&srid=2&ctry=356.