

Education and its Impact on Social Change in Punjab

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DOI: <http://dx.doi.org/10.21013/jems.v4.n1.p11>

How to cite this paper:

Sarkaria, M., & Sharma, S. (2016). Education and its Impact on Social Change in Punjab. *IRA International Journal of Education and Multidisciplinary Studies* (ISSN 2455–2526), 4(1). doi:<http://dx.doi.org/10.21013/jems.v4.n1.p11>

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ABSTRACT

Significance of education in the development process has been well recognized by the educational planners, economists and development planners the world over. Based on empirical evidences of connection between education and socio-economic development, this paper posits that education is instrumental in the socio-economic development. Specifically, this paper examines the impact of educational progress on fertility rate, population growth rate, child/infant mortality rate, life expectancy, gender disparity, poverty of the state. The analysis is based on information of the entire state on various variables such as literacy rate, enrolment, per capita income, fertility rate, population growth rate, incidence of poverty, etc. gathered from the secondary sources from 1966 onward. To sort out the strength and direction of relationships between education and various components of social developments, data have been analyzed by employing simple regression models.

The findings show that female education at all levels has been found to be highly significant in lowering infant mortality. Male and female life expectancy at birth and at specific ages have been found to be positively related with enrolment at different educational levels.

In line with the research conducted in different parts of the world, this study also confirms that increased female education at all the stages (i.e. primary, elementary, secondary and for all education levels put together) consistently lowers fertility rates.

Our regression results show positive relationship between the progress of education at different stages and the gender disparity in infant mortality. Further, The poverty reduction effect of education has been confirmed from the inverse relationship of the educational progress at different stages of schooling with the incidence of deprivation (poverty).

Keywords: *Education, Fertility, Population Growth, Poverty, Gender Disparity*

Introduction

Since education is widely referred to as prime mover of growth and development of economy and widely described as an agent of economic and social transformation, both, the economists and the educationists have shown interests to study the relationship between socio-economic development and education. It has been observed that, by and large, developed countries perform better on educational indicators and enjoy better social status. Education is now recognized as a basic human right as it is closely linked to virtually all dimensions of development - human, economic, and social. It is also a key factor in improving governance. Investment in education supports a much broader agenda including health, nutrition, the values of the environment and community participation, and as such results in multiplicity of benefits.

Basic education gives people access to information through both print and electronic media, equips them to cope better with work and family responsibilities, and changes the perception they have of themselves. It enhances their self-confidence to participate in community affairs and influence political issues. Basic education is the key with which individuals can unlock the full range of their talents and realize their creative potential. Basic education also empowers entire nations in ways more than one: Educated citizens and workers have the skills to make democratic institutions function effectively, to meet the demands for a more sophisticated workforce, to work for a cleaner environment, and to meet their obligations as parents and citizens¹.

¹ United Nations Educational, Scientific, and Cultural Organization. 1997. *Adult Education in a Polarizing World*. Paris. Accessed on 5-6-2011 through <http://www.adb.org/Documents/Policies/Education/educ0300.asp?p=educ>

The benefits of education are not limited to economic paybacks only² and the social development is not the outcome of education only. Apart from education, social development is affected by economic growth, natural endowment, etc. This paper investigates economic and non-economic benefits of education using secondary data at the macro level. As social development is not the result of education alone we have included various control variables in the regression models which may affect the social development. Further, as women education has been shown to play pivotal role in the social and economic development, a section of the paper has been devoted to describe the role of women education in the process of development. Specifically, this paper examines the impact of educational progress women education on fertility rate and IMR and of overall education on sex-ratio, population growth rate, life expectancy, gender disparity, poverty in Punjab.

Education and Social Development

It is widely acknowledged that apart from improving economy at all levels of a nation, education creates better citizens and helps to upgrade the general standard of living in a society. Therefore, positive social change is associated with the progress of education. Evidences in favour of education as an agent of change in many developing countries, including India, have been persuading planners for making heavy investment in it (Olaniyan and Okemakinde, 2008).

The significance of education for the prosperity of mankind can never be overlooked. It plays progressive role in every sphere – be it mental, moral, economic, social, cultural, or political. Its contribution has been acknowledged and applauded by all societies in all times. For instance, four decades ago, the Education Commission (1966, p.3) in India realized: ‘The destiny of India is now being shaped in her class rooms.’ And for that purpose a higher allocation of 5-6 per cent of GNP on education has been reiterated by one and all incessantly. Yet it could not become a practical reality even after six decades of Independence. The President of India, Dr. A. P. J. Abdul Kalam, while addressing the nation on the eve of the 58th Independence Day, strongly advocated the increase in the expenditure on education to 6-7 per cent of the Gross Domestic Product (GDP) from the present 4 per cent to turn India into a “prosperous, happy and strong nation.”

Expenditure on education is now thought of as an investment³ in mankind⁴. Investment in education is termed as ‘Human Wealth’ and ‘Human Capital’. Educated people of any country play key role in its social development. The physical capital of any economy would lay waste devoid of human capital. Consume bundle of wealth to buy the most sophisticated technology or machinery – but of no use without trained and skilled workers to work upon it. Develop a highly efficient and effective system to achieve the goals – but won’t work as desired if not manned by educated personnel to run it. Education and development of a country are inter-dependant. One cannot exist without the other (Natarajan, 1990, Vaizey, 1962).

Brar (2002) has examined the relationship among education, health and economic growth in Punjab and has also compared its performance on educational, health and economic indicators with those of Kerala, which is the top performing state of India on education front. For the study, he culled out the required data from different sources for the years 1971 onwards. His analysis shows that Punjab has gained noticeable economic prosperity in comparisons to the other states of India, primarily on account of its success on agricultural front, a well-developed industrial sector in a few urban pockets and foreign remittances by NRIs. But it has not progressed proportionately on social front.

² The study by Haveman and Wolfe (1984) has enlisted as many as 20 different non-wage benefits of additional education that are not normally incorporated in the models for computing rate of return on investment in education.

³ Investment is precisely defined as “current allocation of resources for the purposes of expanding output at some future date”. Any activity that entails a cost in the current period and raises productivity in the future can be analyzed within the framework of investment theory (Becker, 1975).

⁴ The role of education in development was duly acknowledged even many centuries ago; for example, Plato regarded education to be *sine qua non* for economic health of the society and advocated investment of community’s wealth in education (Atal, 2007:23).

Gupta (1990) examined, amongst other things, socio-economic determinants of child mortality in rural Punjab. For the purpose of her study she collected the required data by surveying eleven villages from Ludhiana district of Punjab. Her study shows that education improves mother's child-care practices, her domestic management of ill-health, efforts at preventive care and use of modern medical services helping ultimately to reduce child mortality.

Mathur and Mamgain (2002) have examined the impact of technical education (TE) and general education (GE) on the socio-economic development of India. The socio-economic development in their study consists of four dimensions viz. Per capita state income (PCI), non-agricultural level of development (NONAG), reduction in the incidence of poverty (POV), and reduction in the incidence of unemployment (UNEMP).

Both, the TE as well as the GE have shown strong positive relationships with PCI and NONAG. The impact of TE on PCI and NONAG is much stronger than that of GE. The correlations of TE as well as that of GE with POV are found to be strong and negative. However, Contrary to expectations, both, the TE and the GE, by and large, are found to be associated positively with UNEMP (but at low level of significance). However, they attribute this unexpected association to, inter alia, inadequate expansion of demand in the productive sectors of the economy.

Tilak (2001) has reviewed the track of educational development in Asian countries in the context of changing socio-economic and political environment. He has shown that expansion of education is positively and highly correlated with socio-economic development. On the basis of his comprehensive review of empirical researches undertaken in Asian countries, he has provided the following tentative generalizations regarding the impact of education on development:

Education, inter alia, contributes significantly:

-to expedite economic growth and the returns to education are not less than those which come from investment in physical capital; to enhance the productivity of work force; in reducing poverty; in improving income distribution; in reducing fertility rate, population growth, child/infant mortality rate etc. and in improving other basic needs.

Rao (2004) sorted out the impact of the literacy rate of male, female, and total population on the infant mortality rate in India. His regression results showed that all the literacy rates had negative impact on infant mortality rate, which implied that infant mortality rate declined with increase in education levels. However, female literacy was found to be most crucial in declining infant mortality rate.

Appiah and McMahon (2002) comprehensively estimated impacts of education on various social indicators in Africa. Education was found to improve infant mortality, increase longevity, strengthen civic institutions and their democratisation, increase political stability, and increase investment in physical capital, and all of these had favourable delayed impact on the economic growth process.

To sum up, overview of literature on relations between educational progress and social development reveals that education is a significant factor in the course of social development of a country.

The Objectives

Major objective of this paper is to examine the impact of education on the social development of Punjab. The specific objectives of this study are listed as below:

1. To examine the impact of educational progress of women education on fertility rate;
2. To analyze the effect of growth in education on the population growth rate;
3. To study the relationship between women education and child/infant mortality rate;
4. To explore the relationship between education and life expectancy;
5. To examine the impact of education on gender disparity;

Data Base and Methodology

The Sample and Period of the Study

To fulfill the objectives of this study, we required information of the entire state on various variables such as literacy rate, enrolment, fertility rate, population growth rate, etc. Data on these variables are available from the secondary sources. We have sought to collect data from 1966 onward as the present Punjab came into being in 1966 on linguistic basis.

Data Collection

Data on various indicators of education and social development for the state of Punjab have been collected from secondary sources such as annual budget, Statistical Abstract of Punjab, Census of India, NSSO, etc.

Data Analysis

To sort out the strength and direction of relationships between education and various components of social developments, data have been analyzed by employing simple regression models. Data have been analyzed by using PASW (Predictive Analytics Software formerly SPSS Software) version 18.0 on computer.

Variables and Hypotheses

Indicators of Educational Growth (Variables and their data source is given in Appendix-I)

Enrolment Ratios: The enrolment ratio is the most widely used indicator for the assessment of educational coverage. It provides the proportion of children enrolled in the schools to the total age-specific population. For the purpose of this study we have computed level-wise enrolment ratios. The level-wise enrolment ratio provides the coverage of children by a specific level of education, e.g. primary or secondary. There are two types of level-wise enrolment ratios viz. the Gross Enrolment Ratio (GER) and the Net Enrolment ratio (NER). The net enrolment ratio is considered more appropriate as it is age-specific. Since age has been taken into account in the numerator, NER never exceeds 100 percent. For planning purposes, NER is considered more reliable indicator than GER, as it is age specific (Zaidi, 1997). NER is computed as under:

For the primary level of education (i.e. grades 1-5)

$$\text{Net Enrolment Ratio (NER}_1\text{)} = \frac{\text{Total enrolment in grades 1-5 aged 6-11 in the year 't'}}{\text{Total population aged 6-11 in the year 't'}} \times 100$$

Further, data on enrolments could be found only for the years 1981, 1991 and 2000 when this study was conducted. So we formed time series for NERs by using appropriate statistical technique.

Infant Mortality Rate (IMR): IMR shows the number of children dying, before celebrating their first birthday, per thousand live births. A number of researchers have employed this variable to show the social outcome of education (Appiah and McMahan 2002, Brar 2002). A negative association is expected between education of females and infant mortality rate. However, education of mother may also have unhealthy effects on child's health. Many researchers have revealed that educated women tend to breastfeed for a shorter duration than others⁵

Fertility Rate (TFR): Total fertility rate indicates live births per thousand women (15-49 years). Female education is expected to lower fertility rate because more educated females are better able to comprehend and utilize contraception techniques. Further, the number of childbearing years is diminished as females stay in school longer. Furthermore, educated women would like to have fewer children so that they can enter job markets.

⁵ See e.g., United Nations 1995

Life Expectancy (LEXP): Life expectancy is an index of health of population. Expansion of education is expected to improve life expectancy. Those with more education are expected to live longer because education enables them to acquire knowledge about nutrition and other health improving techniques. In this study we have worked out the relationships of education with life expectancy of males and females at birth as well as at the age of 60.

Gender Disparity (GNDS): We have taken three variables to represent gender disparity. Gender disparity in infant mortality (GNDSIMR) is computed by dividing female infant mortality by male infant mortality. The other two variables taken to represent gender disparity are sex ratio for ages (GNDSSRALAG) and sex ratio of children of 0-6 years (GNDSSR₀₋₆). Sex ratio is defined as number of females per 1,000 males. The progress of education is expected to correct all type of gender bias.

Population Growth (POP, POPGR): We have employed two indicators of population growth in our study - Population increase in absolute figures (POP) and annual growth rates of population (POPGR). The effects of education on net population growth rates follow directly from infant mortality, longevity and fertility effects (Appiah and McMahon 2002). In other words, educational growth improves health, increases longevity, reduces infant mortality and fertility rate. States with high female literacy levels usually have low rates of population growth: Kerala, where female literacy is the highest in India, has reduced its annual population growth rate to 1.3 per cent by 1991 (minimum in India). Crude Birth Rate (CBR) and United Death Rate (CDR), Infant Mortality Ratio (IMR) are also minimum in Kerala⁶.

The sources of data for various variables used in this study are contained in Appendix-I.

Models

In order to sort out the effects of educational growth on social development, the following linear models have been employed:

For Effect of Education on Infant Mortality

Following regression equation has been used to sort out the impact of education on Infant mortality (abbreviation of variables and their definition is contained in Appendix I):

$$IMR = \beta_0 + \beta_1 (NER_{1F}) + e$$

$$IMR = \beta_0 + \beta_1 ((NER_{2F}) + e$$

$$IMR = \beta_0 + \beta_1 (NER_{3F}) + e$$

$$IMR = \beta_0 + \beta_1 (NER_{4F}) + e$$

$$IMR = \beta_0 + \beta_1 (PCI) + e$$

Regression equation with PCI has been computed to examine the effect of per capita income on IMR.

Effect of Education on Life Expectancy

$$LEXP = \beta_0 + \beta_1 (IMR) + e$$

$$LEXP = \beta_0 + \beta_1 (NERT) + e$$

$$LEXP = \beta_0 + \beta_1 (PCI) + e$$

Regression equations with IMR and PCI have been computed to examine their effect on LEXP.

For Effect of Education on Fertility Rate

$$TFR = \beta_0 + \beta_1 (NER_{1F}) + e$$

$$TFR = \beta_0 + \beta_1 (NER_{2F}) + e$$

$$TFR = \beta_0 + \beta_1 (NER_{3F}) + e$$

$$TFR = \beta_0 + \beta_1 (NER_{4F}) + e$$

⁶ News Letter-43, Oct.-Dec. 1993, Publication Number 77, Population Education Cell, S.I.S.E., SCERT, Punjab, Chandigarh, p.1 and also see Ramachandran, Singh, Kapoor and Lamba (2000), Population Growth-Trends, Projections, Challenges and Opportunities, (Working Paper No. 2/2000-PC). Planning Commission. Retrieved on 18-7-2011 from http://planningcommission.nic.in/reports/wrkpapers/wp_hwpaper.pdf

For Effect of Education on Gender Disparity

$$\begin{aligned} \text{GNDSIMR} &= \beta_0 + \beta_1 (\text{NER}_{1T}) + e \\ \text{GNDSIMR} &= \beta_0 + \beta_1 (\text{NER}_{2T}) + e \\ \text{GNDSIMR} &= \beta_0 + \beta_1 (\text{NER}_{3T}) + e \\ \text{GNDSIMR} &= \beta_0 + \beta_1 (\text{NER}_{4T}) + e \\ \text{GNDSSRALAG} &= \beta_0 + \beta_1 (\text{NER}_{1T}) + e \\ \text{GNDSSRALAG} &= \beta_0 + \beta_1 (\text{NER}_{2T}) + e \\ \text{GNDSSRALAG} &= \beta_0 + \beta_1 (\text{NER}_{3T}) + e \\ \text{GNDSSRALAG} &= \beta_0 + \beta_1 (\text{NER}_{4T}) + e \\ \text{GNDSSR}_{0-6} &= \beta_0 + \beta_1 (\text{NER}_{1T}) + e \\ \text{GNDSSR}_{0-6} &= \beta_0 + \beta_1 (\text{NER}_{2T}) + e \\ \text{GNDSSR}_{0-6} &= \beta_0 + \beta_1 (\text{NER}_{3T}) + e \\ \text{GNDSSR}_{0-6} &= \beta_0 + \beta_1 (\text{NER}_{4T}) + e \end{aligned}$$

For Effect of Education on Population Growth

$$\begin{aligned} \text{POP} &= \beta_0 + \beta_1 (\text{NER}_{1T}) + e \\ \text{POP} &= \beta_0 + \beta_1 (\text{NER}_{2T}) + e \\ \text{POP} &= \beta_0 + \beta_1 (\text{NER}_{3T}) + e \\ \text{POP} &= \beta_0 + \beta_1 (\text{NER}_{4T}) + e \\ \text{POPGR} &= \beta_0 + \beta_1 (\text{NER}_{1T}) + e \\ \text{POPGR} &= \beta_0 + \beta_1 (\text{NER}_{2T}) + e \\ \text{POPGR} &= \beta_0 + \beta_1 (\text{NER}_{3T}) + e \\ \text{POPGR} &= \beta_0 + \beta_1 (\text{NER}_{4T}) + e \end{aligned}$$

Such models have been used by Appiah and McMahan (2002) and Mathur and Mamgain (2002).

Findings

The results of least squares estimation of regression equations, which seeks to explain the effects of education in terms of various components of social development are contained in Tables 1.1 to 1.5

Effect of Education on Infant Mortality

The regression results contained in Table 1.1 show that education of females at primary, elementary and secondary levels is inversely related to infant mortality rate. Overall female education (i.e. for the age group 6-18) is also showing the same relation with IMR. In other words, female education at all levels is highly significant in lowering infant mortality. This shows that educated mothers remain aware of various health programmes of the State (e.g. National Immunization Programme) and hence, are expected to act positively to do away with various causes of infant mortality. As expected, per capita income is negatively associated with infant mortality. Put differently, higher per capita income helps in lowering infant mortality. All the relations are statistically significant at 0.01 level.

Table 1.1
Regression Coefficients (Standardized) Educational Growth and Infant Mortality Rate
(Dependent Variable: IMR)

Determinants	Standardised β	t-value	Adjusted r^2	F-value
NER _{1F}	-0.864*	-7.287	0.733	53.095*
NER _{2F}	-0.868*	-7.408	0.739	54.871*
NER _{3F}	-0.870*	-7.473	0.743	55.850*
NER _{4F}	-0.825*	-6.199	0.663	38.422*
PCI	-0.899*	-8.713	0.798	75.924*

Number of Observations: 20

*: Significant at 1 per cent level.

Effect of Education on Life Expectancy

Secondary education enrolment rate is considered a key determinant of life expectancy (Appiah and McMahon, 2002). Table 1.2 shows that male and female life expectancy at birth and at specific ages is consistently positively related with enrolment at different educational levels. Enrolments at the elementary and the secondary stages are statistically significant at 0.01 level and also for the combined enrolments for the age groups of 6-18 years. This finding is consistent with studies by Cochrane et al., 1980 and Grossman and Kaestner, 1997 who after controlling for income find that those with more education live longer. The study of Frank and Mustard (1994) also reports that education enables individuals to gain knowledge about nutrition that lowers mortality rates and increases life expectancy.

Table 1.2
Regression Coefficients (Standardized) for Educational Growth and Life Expectancy
(Dependent Variable: LEXP)

Determinants	Dependent Variable: LEXP _{0M}				Dependent Variable: LEXP _{0F}			
	Standardised β	t-value	Adjusted r^2	F-value	Standardised β	t-value	Adjusted r^2	F-value
NER _{1T}	0.607**	2.754	0.320	7.58**	0.560**	2.436	0.261	5.94**
NER _{2T}	0.941*	9.987	0.876	99.73*	0.939*	9.885	0.874	97.72*
NER _{3T}	0.938*	9.726	0.870	94.59*	0.931*	9.169	0.856	83.97*
NER _{4T}	0.937*	9.667	0.868	93.45*	0.932*	9.251	0.858	85.58*
IMR	-0.916*	-8.248	0.827	68.03*	-0.907*	-7.746	0.808	60.01*
PCI	0.944*	10.298	0.882	106.56*	0.932*	9.284	0.859	86.19*
PCI _{Ig}	0.946*	10.529	0.887	110.86*	0.938*	9.780	0.871	95.65*
Determinants	Dependent Variable: LEXP _{60M}				Dependent Variable: LEXP _{60F}			
	Standardised β	t-value	Adjusted r^2	F-value	Standardised β	t-value	Adjusted r^2	F-value
NER _{1T}	0.631*	2.229	0.351	8.58*	0.240	0.890	0.015	0.80
NER _{2T}	0.937*	9.697	0.869	94.03*	0.791*	4.463	0.597	21.74*
NER _{3T}	0.938*	9.729	0.870	94.65*	0.754*	4.136	0.535	17.11*
NER _{4T}	0.936*	9.584	0.866	91.85*	0.764*	4.271	0.552	18.24*
IMR	-0.918*	-8.337	0.830	69.51*	-0.721*	-3.746	0.482	14.04*
PCI	0.946*	10.561	0.888	111.54	0.732*	3.878	0.501	15.04*
PCI _{Ig}	0.946*	10.571	0.888	111.75*	0.757*	4.174	0.540	17.42*

Number of Observations: 15.

*: Significant at 1 per cent level. **: Significant at 1 per cent level.

As expected, LEXP and IMR are showing negative association and are statistically significant in all regression equations. Infant mortality is important to longevity. Education influences life expectancy mostly through this channel. In other words, education reduces infant mortality that in turn influences longevity favourably.

Effect of Education on Fertility Rate

Table 135 contains the regression coefficients for educational progress of female and total fertility rate on the basis of 17 years time series data. The indicators of enrolment growth for different age groups and education levels are inversely related with fertility rates. All the relations are statistically significant at 0.01 level.

It shows that increased female education at all the stages (i.e. primary, elementary, secondary and for all education levels put together) consistently lowers fertility rates. Research conducted in different parts of the world over the last 25 years shows that women with more education make a better transition to adulthood and have smaller, healthier families. They usually have their first sexual experience later, marry later, prefer smaller families and are likely to use contraceptives as compared to their less educated counterparts (Sarkaria, 2002). Presumably, more educated females can better comprehend and utilize contraception techniques. Further, the number of childbearing years is diminished as females stay in schools longer and furthermore education provides economic incentives to women to have fewer children so that they can enter job markets (Cochrane, 1979; Moore et al. 1993; Schultz, 1993)

Table 1.3
Regression Coefficients (Standardized) for Female Education and Fertility Rate
(Dependent Variable: TFR)

Determinants	Standardised β	t- value	Adjusted r^2	F- value
NER _{1F}	-0.963*	-13.922	0.923	193.827*
NER _{2F}	-0.968*	-14.889	0.932	221.694*
NER _{3F}	-0.961*	-13.421	0.918	180.118*
NER _{4F}	-0.937*	-10.345	0.869	107.010*

Number of Observations: 17

*: Significant at 1 per cent level.

Effect of Education on Gender Disparity

Our regression results show positive relationships between the progress of education at different stages and the gender disparity in infant mortality. Despite improvement in literacy, expansion in outreach of health care services and rise in overall living standards, the sex composition of infant mortality trends in Punjab indicates that greater vulnerability of the girl child. This implies preponderance of social, cultural and economic rather than health, education and medical factors. This fact is endorsed by the fertility data of Census 2001, which reveals that the more educated the mother; the more the chances that she will resort to female foeticide. In Punjab, the girl-boy ratio is 845:1000 in case of illiterate mothers and 745:1000 when the mothers are literate (Jerath 2005).

Table 1.4
Regression Coefficients (Standardized) for Gender Disparity

Determinants	Dependent Variable: GNDSIMR			
	Standardised β	t-value	Adjusted r^2	F-value
NER _{1T}	0.424	1.986	0.134	3.945
NER _{2T}	0.525**	2.616	0.235	6.841**
NER _{3T}	0.529**	2.645	0.240	6.995**
NER _{4T}	0.528**	2.637	0.239	6.955**
Determinants	Dependent Variable: GNDSSRALAG			
	Standardised β	t-value	Adjusted r^2	F-value
NER _{1T}	-0.926*	-10.438	0.850	108.952*
NER _{2T}	-0.414	-1.931	0.126	3.728
NER _{3T}	-0.579*	-3.010	0.298	9.057*
NER _{4T}	-0.560**	-2.867	0.275	8.217**
Determinants	Dependent Variable: GNDSSR ₀₋₆			

	Standardised β	t-value	Adjusted r^2	F-value
NER _{1T}	-0.965*	-15.639	0.928	244.579*
NER _{2T}	-0.880*	-7.873	0.762	61.978*
NER _{3T}	-0.954*	-13.504	0.905	182.348*
NER _{4T}	-0.949*	-12.501	0.891	156.282*

Number of Observations: 20

*: Significant at 1 per cent level. **: Significant at 5 per cent level.

The relationships of sex ratios (for total as well as for child population) with the expansion of education at different stages are negative and, by and large, statistically significant. The sex composition of the population is an important indicator of social development. But, in Punjab, the sex ratios show declining trend for total as well as the child population (0-6 age group). This gloomy scenario may broadly be explained in terms of variations in sex composition of births and sex differences in mortality. Further, this unfavorable situation can also be attributed to socio-economic and cultural aspects of the society. The overall preference for the male child clubbed with the failure of the law enforcing machinery in banning the sex determination tests which are available at affordable prices in Punjab has deteriorated this imbalance beyond doubt.

Regretfully, in most of the under-developed and developing countries, culture also gives a back seat to women. Indian culture gives preference to boys over girls with respect to various matters. Sons are preferred to girls; for they are supposed to support their parents, when they are aged. This cultural preference along with the prevalence of dowry causes subtle neglect of female infants and condition is much more pathetic in poor families. Consequently, parents are least bothered about baby-girls in matters of proper nutrition or vaccination. As a result, death rate for younger girls is high and eventually results in decrease of women population. Sex-ratio change in India is due to bias against women and is ultimately leading to an adverse trend through the century-it moved downward from 972 in 1901 to 927 in 1991, the lowest figure in the century; which moved up to 933 & 940 in 2001 & 2011 respectively and that of Punjab is much lower 882 in 1991, 876 in 2001 and 893 in 2011. India's adverse sex-ratio seems to indicate that mortality was unusually high for Indian woman. Women are still deprived of even the most vital health services and medical care. Only about one third of Indian births are attended by trained medical personnel. This may be taken as one of the many factors, which can be held responsible for India's high infant and maternal mortality rates. Nobel laureate Amartya Sen, rightly argues that low female-male ratio is due to absence of food and health care of women. This critical ratio can further deteriorate as parents can detect in advance the sex of their babies and avoid female births by aborting female fetus.

The low status of women is also evident from certain other attitudes of people. In most Indian families, women are not consulted in financial decisions, kinship relationships and in the selection of spouse. They are not given authority to decide the size of their family. The scenario is not different in Punjab.

It is obvious from the above discussion that women have very poor status in terms of almost every aspect. The analysis revealed that women in India suffer from an adverse sex-ratio, poor health-care, and wide spread illiteracy. They are culturally and socially neglected. Their economic role remains unrecognized.

1.6.5 Education and Population Growth

We have computed regression equations of educational progress with two indicators of population growth viz. with population increase in absolute figures and with annual growth rates. The former is positive and statistically significant at 0.01 level. In other words, population has increased with educational progress. This is not unexpected as the effects of education on population growth follow directly from infant mortality, longevity, and fertility effects. As we have seen in our preceding analyses, educational growth improves health, increases longevity, reduces infant mortality and fertility rate, hence, the net population growth in absolute numbers may tend to increase with

educational progress as is seen in our analysis. However, the rate of population growth has slowed down with educational progress.

Table 1.5
Regression Coefficients (Standardized) for Population Growth

Determinants	Dependent Variable: POP			
	Standardised β	t-value	Adjusted r^2	F-value
NER _{1T}	0.896*	8.564	0.792	73.343*
NER _{2T}	0.954*	13.567	0.906	184.063*
NER _{3T}	0.993*	34.792	0.985	1210.492*
NER _{4T}	0.990*	29.409	0.978	864.910*
Determinants	Dependent Variable: POPGR			
	Standardised β	t-value	Adjusted r^2	F-value
NER _{1T}	-0.429	-2.016	0.139	4.064
NER _{2T}	-0.771*	-5.141	0.572	26.434*
NER _{3T}	-0.721*	-4.410	0.493	19.449*
NER _{4T}	-0.729*	-4.520	0.506	20.431*

Number of Observations: 20

*: Significant at 1 per cent level.

Summary of Findings and Conclusions

The main findings of this paper can be summarized as below:

1. Female education at all levels has been found to be highly significant in lowering infant mortality. This shows that educated mothers remain aware of the various health programmes of the State (e.g. National Immunization Programme) and hence, are expected to act positively to do away with various causes of infant mortality. As expected, per capita income is negatively associated with infant mortality.
2. Male and female life expectancy at birth and at specific ages have been found to be positively related with enrolment at different educational levels. This shows that education enables individuals to gain knowledge about nutrition that lowers mortality rates and increases life expectancy.
3. The indicators of enrolment growth for different age groups and education levels are inversely related with fertility rates. It shows that increased female education at all the stages (i.e. primary, elementary, secondary and for all education levels put together) consistently lower fertility rates. This finding of our study is in line with the research conducted in different parts of the world which shows that women with more education make a better transition to adulthood and have smaller, and healthier families. They usually have their first sexual experience later, marry later, prefer smaller families and are likely to use contraceptives as compared to their less educated counterparts. Further, education provides economic incentives to women to have fewer children so that they can enter job markets.
4. Our regression results show positive relationship between the progress of education at different stages and the gender disparity in infant mortality. This unwanted situation may be attributed to social, cultural and economic rather than health, education and medical factors. The correlations of sex ratios (for total as well as for child population) with the expansion of education at different stages are negative and, by and large, statistically significant. This unfavorable situation can also be attributed to socio-economic and cultural aspects of the society.
5. The relationship of educational progress with population increase in absolute figures is positive and statistically significant at 0.01 level. This is not unexpected as the effects of education on population growth follow directly from infant mortality, longevity, and fertility effects. As educational growth improves health, increases longevity, reduces infant mortality and fertility rate, hence the net population growth in absolute terms may tend to increase with educational progress. However, the rate of population growth has slowed with educational progress.

Implications

Significance of education in the development process has been well recognized by the educational planners, economists and development planners the world over. This study has empirically examined the association of education and social development for Punjab during the last two or three decades. Having confirmed the contribution of education to development, this study put forward the following implications for the state:

1. The State should first treat education as an important investment activity like any other physical capital investment activity and not as consumption expenditure. Education should be taken as an important input into the development process.
2. Socio-economic development of the state is closely integrated with education. The inter-sectoral links between education, economic growth, health, nutrition, population, poverty, etc. should be duly recognized. For satisfactory progress in that direction, development of education should include both quantitative expansion and qualitative improvement.
3. Education of women should be given at least as much importance as is given to that of men. Women's education significantly influences family welfare and health, including improvement in child survival, and population growth, through its impact on fertility and family planning practices. Still one of the main hindrances that come in the way of rural female education is availability of professional education and vocational training in distant institutions usually situated in urban areas. As they are not allowed to go there due to transportation problems and insecurity, government should set up these institutions in the rural areas.

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Appendix –I

Sn	Abbreviation	Variables	Data Source
1	IMR	Infant Mortality Rate	Registrar General of India, Compendium of India's Fertility & Mortality indicators based on sample registration system, New Delhi & various other volumes & websites
2	LEXP	Life Expectancy	Ageing Population of India: an analysis of Census data, Registrar General of India & websites
3	TFR	Total Fertility Rate	Sample Registration system (SRS), Registrar General of India,. Various volumes & websites
4	LEXP_{0M}	Male Life Expectancy (in years) at birth	Same as above
5	LEXP_{0F}	Female Life Expectancy (in years) at birth	Same as above
6	LEXP_{60M}	Male Life Expectancy (in years) at ages 60	Same as above
7	LEXP_{60F}	Female Life Expectancy (in years) at ages 60	Same as above
8	POV	Poverty: Population below poverty line	Various Volumes of NSSO
9	NER_{1T}	Net Enrolment Rates, Primary, Total (6-11)	Director Public Instruction, Schools, Punjab; cf Economic Survey of Punjab
10	NER_{2T}	Net Enrolment Rates, Elementary, Total (11-14)	Same as above
11	NER_{3T}	Net Enrolment Rates, Secondary, Total (14-18)	Same as above
12	NER_{4T}	Net Enrolment Rates, Overall, Total (6-18)	Same as above
13	NER_{1F}	Net Enrolment Rates, Primary, Female (6-11)	Same as above
14	NER_{2F}	Net Enrolment Rates, Secondary, Female (11-14)	Same as above
15	NER_{3F}	Net Enrolment Rates, Secondary, Female (14-18)	Same as above
16	NER_{4F}	Net Enrolment Rates, Secondary, Female (6-18)	Same as above
17	GNDSIMR	Gender Disparity (f/m) in infant mortality	Sample Registration System (SRS) Registrar General, India. Various Volumes. Based on sex specific moving averages
18	GNDSSRAL AG	Gender Disparity in Sex Ratios for all ages, Sex Ratio defined as number of females per 1,000 males	Census of India, India and Punjab
19	GNDSSR₀₋₆	Gender Disparity in Sex Ratios for children of 0-6 age group	Same as above
20	POP	Population increase in absolute figures	Regional Monitoring Service, CMIE, and Census of India and Punjab
21	POPGR	Annual growth rates of population	Same as above
22	EXP_{Gen}	Expenditure on general education	Same as above
23	EXP_{Gen%}	Percentage expenditure on general education	Same as above
24	EXP_{Tech}	Expenditure on technical education	Same as above
25	EXP_{Tech%}	Percentage expenditure on technical education	Same as above