

**Journal of Education & Social Sciences**

ISSN: 2410-5767 (Online)

ISSN: 2414-8091 (Print)

**Children Health and Academic Achievements:  
A Micro-econometric Analysis**

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**Manuscript Information**

**Submission Date:** November 04, 2020

**Reviews Completed:** February 02, 2021

**Acceptance Date:** February 15, 2021

**Publication Date:** March 5, 2021

**Citation in APA Style:**

Hussain, A., Sial, M. H., Hassan, N., & Qamar, R. (2021). Children Health and Academic Achievements: A Micro-econometric Analysis, *Journal of Education & Social Sciences*, 9(1), 1-15.

**DOI:** <https://doi.org/10.20547/jess0912109101>





## Children Health and Academic Achievements: A Micro-econometric Analysis

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**Abstract:** The study examines the effect of children's health on their educational performance in Sargodha city, Pakistan. The data utilized for the study were collected from a primary level survey of randomly selected children attending various private and public schools in Sargodha during 2016. The study employs a multinomial logistic regression model to estimate the effect of children's health status as determined by the Body Mass Index (BMI) on their academic performance. To control the role of other socio-economic factors that might affect children's educational achievements, the study also includes such variables as study hours and school type. The regression estimates reveal that controlling for other factors, children's health status has a significant positive contribution toward their educational achievements. Results also depict that school type and study hours had a significant impact on children's academic performance. Children from private schools, as compared to public schools, were more likely to achieve high scores. The study's findings suggest that to improve children's educational performance, the parents need to pay serious attention to their nutrition and health. There is also an immediate need for public policies to promote awareness about the role of children's health on their academic achievements. Additionally, the results suggest that there is a need for further research to explore the factors responsible for the relatively poor performance of the students attending public versus private schools in Sargodha.

**Keywords:** Children health status, educational performance, study time, Body Mass Index (BMI), school type, multinomial logistic model.

## Introduction

Health, education, income and decent standards of living are key indicators of Human Development Index (HDI). There is adverse situation of health, mortality rate, education and performance in Pakistan. These indicators play role as essential aspects of economic and human development. Pakistan's HDI ranked at 152 in 2018. However, in 2013 it was ranked at 146. The situation goes worse as years increased. Some other developing countries; Bangladesh, India, Srilanka, Bhutan, Maldives, and Nepal are ranked at 135,

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129, 71, 134, 104, and 147 respectively. Status of Pakistan HDI remain very low entire the international arena.

Health is a basic universal human need and inspiration. The development of any society can be judged by quality of its population's health. Children in every community are considered bigger human investment and important natural resource (Becker, 2007). Child health is also regarded as the quality of life with some development indicators such as income, occupation, educational attainment and socioeconomic status. Health and education in human beings are considered as investment. These assure capacity to learn, job opportunities, productive contribution with personal development (Kaushik, Raj, Mishra, & Singh, 2012).

In developing countries 4% of children die due to malnutrition and low socioeconomic status. Mostly children's parents have lower socioeconomic status, lower education level, and lower purchasing power (Jarotimi & Ijadunola, 2007). Maternal education and knowledge about health, has long and short term impact on child health with proper care and better nurturing. Children's health is considered as a key indicator of economic development and quality of life in developing countries. It is also closely linked to other development determinants such as adult health, educational attainment and achievement, income and occupational productivity. In recent years, despite the existence of clear health targets in the form of Millennium Development Goals (MDGs), Pakistan has been unable to make significant progress in improving the health status of children. It is advised by the health care providers to parents and teachers that if children are health, only then, they can learn at optimal level. Educational system in Pakistan has unaffordable access, low quality along with non functioning schools. So, access to quality education is not easy. For this reason, out of total 22.33 million, around 5.8 million of age group 5-9 are out of school out of which more than 50% are girls (The State of Pakistan's Economy - Second Quarterly Report 2019–20, 2020).

Situation of education also renders a question. To face the increasing challenges of growth and development, Pakistan remain unable to enhance the capacity of people because of least amount of investment in education. This low investment creates great obstacle in the way of economic progress (Hussain, 2015). Pakistan is developing country and literacy rate is only 59.13% in 2017. Analysed from data that literacy rate in urban areas of Pakistan is higher that is 76 percent in contrast of rural areas, where it is 51 percent. There are so many health related issues in children belonging from different socioeconomic status. Sargodha is most developing city of Punjab, Pakistan. Children in this city are 35% of population. It is the 11th larger city of Pakistan. Almost 25.50% of children aged 5 to 16 and 16.30% to 13. 20% respectively in this city are not enrolled in school. It was found from survey that about to 72% of school going children are enrolled in government sectors schools, while 27.20% of children getting their education from private schools. This study particularly focuses on the health and educational performance of children, which are key dimensions of HDI, that how children health plays effective role in their educational performance in Sargodha city.

In Pakistan, Studies on children health and education have found in scatters by different researchers in different cities and districts, are mentioned (Babar, Muzaffar, Khan, & Imdad, 2010; Hussain, 2015; Anwar, Nasreen, Batool, Husain, et al., 2013). Present

study incorporates children health and their educational performance. It also comprises socioeconomic analysis in a manner that which factors are responsible for contributing children health and their educational performance in Sargodha city. Key objective of this study is to examine the children health and their educational performance in Sargodha city, to check that to estimate the impact of key determinants on educational performance of children. This study particularly focused on health and educational performance of children, which are the key indicators of HDI. Children belonging from 5 to 12 years age group, are generally vulnerable about nutrition and health, because they have had more rapid growth. Proper diet, care for mental and physical development essentially required in this age.

## Review of Literature

Masjedi, Eftekhari, Babajafari, and Tabatabaee (2016) conducted a study to assess the association among socioeconomic factors and nutritional status in elementary school children, Shiraz, Iran using Multinomial logistic regression. Cross-sectional study analysis in primary school, with sample size of 740 collected through clustered random sampling was used in May, 2015 on demographic features, personal characteristics, birth order, weight, height, education grades, BMI, children size in family, parents' education and occupation, age, divorce, feeding period, sleep duration, TV and games play, meal times, eating pattern, and economic status. It was found that chances of being underweight are higher in those children who do not take afternoon food and energy.

Al-Agha, Tatwany, Aiash, Mandourah, and Abukhalil (2015) examined the multifactorial effect of socioeconomic status, parents' education, and number of siblings on the body mass index of children in Jeddah, Saudi Arabia from 2014-15 using crosssectional survey of 521 children selected from clinic of KAUH To check the difference between means of BMI in each category of parents' education and monthly income, ANOVA test was conducted. Another test 'Tukey's honest significant difference (HSD) test was also performed for differences of means of parental education and economic status. By concluding the results, obesity and overweight in children in Jeddah, associated with low level of parents education, and increasing number of family members. Carey, Singh, Brown III, and Wilkinson (2015) examined through crosssectional study that effects of childhood obesity has largely focused on its projected effects in adulthood. However, evidence show that childhood obesity could have more immediate effects on school results. Study evidenced that increasing weight status in children has associated with lower poverty school results. Brook (2014) found that students with better wellbeing and health have more chances to get better and high academic achievements. Effective emotional, cognitive, and social competencies are also interrelated with better achievement, wellbeing and greater health. Ethics, culture, and environment of school also affect achievement and health of pupils. A positive significant association exist among educational attainment, outcomes and physical activity of students.

Holliday, Cimetta, Cutshaw, Yaden, and Marx (2014) used the multiple linear regression technique to examine the relationship between school readiness, hours of childcare,

health status, home language, parents' education and their compatibility for a sample of 230 number of children selected from Arizona, which were below the federal poverty line. Study revealed that increasing hours of childcare and health found to be more significantly associated with learning approaches, and higher mathematical proficiency. Literacy served as resilient factor to the achievement gap between students belonging from high and low income families. [Ng, Zakaria, Lai, and Confessore \(2016\)](#) conducted an analysis on academic achievement and time use for study in Kelantan state, Malaysia. Study contributes in literature by analyzing the increasing trends among students to spent time on related or non-related school activities and checked their impact on educational achievement. Stratified random sampling used to gather the data on school type, study time, gender, related and non-related activities of secondary school students. Study aimed to investigate the comparison about time used for school related and non-related activities and effort of students. Association between variables checked through the correlation analysis in this study. Academic grades of students were gathered from the transcripts provided from the respective schools. A well made questionnaire was distributed among students captured all aspects of study time use and relevant educational performance of students. To test the correlation between targeted variables, bivariate and t-test comparison of means were taken. Evidence showed that study time and effort for study can improve the educational performance of students. Study also contributes by providing a conceptual frame work and guidelines for improvement in the time efforts for study and educational outcomes.

In developed countries, obesity is risk factor and increasing day by day. [Tchicaya, Lorentz, et al. \(2014\)](#) aimed to check the existence of obesity, overweight and normal weight in children by using data from SILC (2007). Children's and parents' socioeconomic and demographic information, household and individual characteristics were collected from questionnaire. Sample of study includes 775 children whose BMI was calculated by self reported height and weight. Results through Multilevel logistic regression show that children weight status strongly based on family and SES. There exist significant association between child obesity risk and overweighted parents. Study suggest to promote a healthy and proper diet, regular physical activities and better education. [Afzal \(2012\)](#) analysed the determinants of children health and nutrition in Punjab in comparison of rural and urban areas. Child health and nutrition status has been focused in this study. Socioeconomic factors were also identified which affect children health in Punjab. A sample data were collected from MICS (2008). Instrumental variable technique was employed for estimation. Results show that mother education and health care knowledge are significant determinants of children health and nutrition. Children health care status has not improved.

By employing cross-sectional survey study on private and public schools' children comparatively, it was seen that majority exist under nourishment and had lower BMI in Ibadan when checked nutrition-status aged 5-10. Public schools' children were under nourished, more heighted and aged than private school children. Although private school pupils had better BMI, nutrition and economic status than public school pupils. . By applying multivariate technique, [Isaacs and Magnuson \(2011\)](#) estimate the relationship of family income, mother education, and children academic achievements and school readi-

ness using the data from ECLS-B (2009). Indicator of any family's SES are considered mother education, and family income. Children's readiness for school was measured through academic skills, physical health, and behavior at school entry. Finding suggest that boosting the level of income and mother education will yield the child's school readiness and educational scores.

Mosiur, Golam, Nasrin, et al. (2009) identified the factor association among malnutrition by employing statistical methods using BDHS (2004). There found many factors affecting the nutrition status of children in relation with their BMI. This study with the help of multivariate logit regression found that girls have lower BMI than boys at the age of 25-49 months. Children are underweight who have not sufficient intaking of vitamin A. A satisfied level of income ensures better children health, education, nutrition and economic status. Father is decision maker of household usually in Asian countries. Environmental factors, improper diet and diseases are more effective on children BMI than genetic produced predisposition. Fat reserves and protein reflected by BMI which in turn shows functional reserves. A cross-sectional study has been conducted to see the socio-economic factors' impact on malnutrition of children. Malnutrition is checked by measuring BMI (Vieweg, Sood, Pandurangi, & Silverman, 2004). Storey, Forshee, Weaver, and Sansalone (2003) examined the association among lifestyle, demographic variable and BMI of different age groups: children aged 6 to 11 years, adolescents aged 12 to 19 and 12 to 16 years. Data used in that study was gathered from NHANES (1998) in US. Multivariate regression was used to check the association between variables. Significant predictors demographically were age, gender, race, family income for BMI. By analysing the association among lifestyle, in children diet factors were not associated with Body Mass Index.

Children health and academic achievement have significant link. Evidence showed that students' health directly linked with educational achievements. Physical activities, and healthy diet are engaged with improved education. Lack of adequate food, vegetables, and dairy products lower the grades of students. Healthy physical activities also significantly associated with better grades, class behavior, attendance and cognitive performance (Barrera, 1990). It has been analysed that multinomial logistic regression was common methodology among different national and foreigner researchers to estimate the unordinal multi-categorical dependent variables in relation with key influential variables. Moreover among all most important determinants of current study, most influential variables has been derived from empirical as well as theoretical literature, are children health, gender, age, weight, height, , educational performance of children, school type, nutritional status derived from BMI, and study time. Research gap also incorporated from the empirical and theoretical literature in terms that very few studies on children health, their educational achievement and socioeconomic influential factor has been conducted meagerly by few researchers.

## **Methodology**

### **Data and Sample Selection**

Basic components of this section are data set, collection and explanation of variables. This study is based on primary data at individual and household level, collected from Sargodha city in the time span of February-April (2016). Body mass index (BMI) for age was used as tool to measure children health status in this study. BMI of children were found by measuring weight, height, age, and gender (height in inches and weight in pounds) with standard BMI machine.

A questionnaire was developed, with the help of different previous studies to conduct this study pertained children health status, their educational performance, nutrition status, school type, and children's activities. Educational performance of students was obtained by final results taken by their respective schools. Children aged 4 to 12 years old are included in this analysis.

A population of 2311 students was targeted from randomly selected public and private schools in city. Sample size has drawn with the help of Yamane (1967)'s formula. By employing that formula, a sample size of 341 students was found. Due to time, resources, and budget constraints only 220 children selected from different private and government schools for analysis whose height, age, weight were properly measured twice with the help of standard weight machine. Both girls and boys are included in sample. Children's age was also assessed from schools record. SES, diet, and other factors affecting children health and their educational performance discussed from mothers. Children's mothers were interviewed properly in relax and adequate atmosphere. This activity provided the complete detailed information on 220 children's health and educational performance in Sargodha city.

Primary data were analysed by using SPSS 19 version. Standard BMI calculator software for children was used to calculate the indices values of body mass of children. Also categorised as the underweight, normal weight, overweight and obese on the basis of BMI values, age, and gender. Each child's height, weight, age, and gender was measured and entered properly. Difference and association among variables' groups were tested by conducted the chi-square test and odd ratio analysis.

## **Empirical Framework**

### **Multinomial Logistic Regression**

In the present study multinomial logistic regression (MNL) technique has been utilized to estimate the models. There are some reasons to choose multinomial logistic regression instead of other most often used techniques. Multinomial logistic regression has many advantages: This technique is most robust to the violations of equal variance, multivariate normality and covariance matrices assumptions. It is a diagnostic statistics and easy to interpret. Linear relationship doesn't assume for independent and dependent variables in MNL. Independent variables are not necessarily bounded in this technique. Another

advantage of MNLR is that there is no assumption for the normality of error terms. So due to its advantages MNLR is used widely as a solving tool.

In MNLR, each category of response variable is compared to the reference category. The probability of association of other categories is compared to the probability of reference category membership. N-1 categories are used for N categories. Equation of basic model for MNLR is formulated.

The logistic model with multiple predictors can be written as:

$$\pi(x) = (P(Y = 1)|x_1, x_2, \dots, x_k) \tag{1}$$

Logistic regression model with multiple predictors is given by:

$$\text{Logit}(\pi(x)) = \log\left(\frac{\pi(x)}{1 - \pi(x)}\right) = \alpha + \beta_1x_1 + \beta_2x_2 + \dots + \beta_px_p \tag{2}$$

MNLR depict the relationship between predictors ( $X_1, X_2, X_3, \dots, X_P$ ) and probability  $\pi_j$ .

$$\pi(x) = \frac{\alpha + \beta_1x_1 + \beta_2x_2 + \dots + \beta_px_p}{1 + \exp(\alpha + \beta_1x_1 + \beta_2x_2 + \dots + \beta_px_p)} \tag{3}$$

$$\pi_j(x_i) = \frac{\exp(\alpha_{0i} + \beta_{1j}x_{1i} + \beta_{2j}x_{2i} + \dots + \beta_{pj}x_{pi})}{1 + \sum_{j=1}^{k-1} \exp(\alpha_{0i} + \beta_{1j}x_{1i} + \beta_{2j}x_{2i} + \dots + \beta_{pj}x_{pi})} \tag{4}$$

Here  $j = 1, 2, 3, \dots, (k - 1); i = 1, 2, \dots, n; \pi_j(x)$  is the probability of dependent variable and hence equals to  $\text{Prob}(Y = j|x_1, x_2, \dots, x_p)$  for the x predictors at fixed setting (Fredua, 2015).

## Models Specification

The emphasis of current study is to check the children educational performance with influential factors and their health with key determinants. To observe these impacts, following two models are incorporated to conduct the analysis:

### Model 1: Educational Performance and Influential Factors

$$\text{Educational Performance} = f(\text{School type}, \text{Health Status}, \text{Study Time}) \tag{5}$$

Econometrically it is formed as:

$$\text{EDU\_PRFM} = \alpha + \beta_1(\text{SCH\_TYP}) + \beta_2(\text{H\_S}) + \beta_3(\text{TIME}) \tag{6}$$

Where,

*EDU\\_PRFM* = Educational Performance

*SCH\\_TYP* = School Type

*H\\_S* = Health Status

*TIME* = Study Time

In model Educational performance is dependent categorical variables respectively. ‘ $\alpha$ ’ is a constant term, while ‘ $\beta_1, \beta_2$ , and  $\beta_3$ ’, are coefficients of independent variables.



## Results and Discussions

Descriptive statistics are presented along with frequency distribution and percentage of categorical variables. In section 5.2 comparative analysis or chi-square statistics to check the association among categorical variables has been used.

### Descriptive Statistics

In Table 1 summary statistics of continuous variables has been described. These variables include family income, age, weight height and number of children in this study.

In this primary data analysis, children age ranged at 8 years, with mean value of 7.88 years and std. deviation exist at the value of 2. Average children weight was 43.31 pounds, minimum and maximum weight was 23 and 100 pounds respectively its SD lie at 10.10. Mean height of students was found as 45.33 inches. Its range lie at 29 inches with 4.93.

Children in every society are not only affected by the parental care and their food intake pattern they get, they are also very sensitive to the factors beyond the sphere of influence of their household. There is need to develop the parameters of research on education and health of children and must focus on the areas that are until now unexploited. Such areas can be describe briefly as intergenerational impact of education on children health, well made health and education related channels by which health status' knowledge be transmitted and form that which type of data is most useful. Maternal education could influence child nutritional status by improving the health knowledge, reproductive behavior and be using modern health care services.

Table 2 revealed the results of primary data analysis about children health, that among 220 number of children, there 147 children were normal weighted, 61 found underweight, 9 children exist in overweight category while only 3 number of children were obese. It was found that normal weighted, underweight, overweight, and obese children were 66.80%, 27.70%, 4.10%, and 1.40% respectively.

In this analysis Table 3 describe that one hundred number of children were male, while one hundred and twenty were female. By incorporating the percentage male and female in this study included, were 45.50% and 54.50% respectively.

Results clearly represented in Table 4 show that 121 number of students were belonged from private schools and 99 students belonged from government schools. Percentage of students from private and public schools found 55% and 45% respectively.

In Table 5 educational performance of students has been described in categories. Categories were developed with the help of obtained marks out of total marks and described as 80% and above, 65% to 79%, 50% to 64%, and below 50%. One hundred and twelve number of students scored 80% and above, 46 number of students scored among 65% to 79%, 35 students achieved among 50% to 64%, while 27 number of students perform to below 50 percent.

Table 6 represent the nutritional status of children. Nutritional status of children has been derived from BMI of children and categorised as normal nutritioned and not-normal nutritioned status of health. Majority among students was found normally nutritioned

that one hundred and forty seven with 66.82 percentage. Seventy three with 33.18 percent number of students were not nutritioned normally.

In Table 7 effect of study time has been captured on educational performance of students. Study time described in two categories as more than two hours and one to two hours of study. Study time of Ninety six with 43.60% students was more than two hours, while one hundred and twenty four with 56.40% number of students did their study for one to two hours.

## **Multinomial Logistic Regression Results**

Multinomial logistic regression has been used to estimate the children health, their educational performance and socioeconomic association. Two models has utilized to analyse this study. One model contains variables; educational performane, school type, nutrition, and study time. Educational performance also used as dependent variable with four categories of percentage of marks. These categories are as; 80% and Above, 65% to 79%, 50% to 64%, and below 50%. Another model contains variables; BMI, mother education, family income, and number of children. BMI is dependent categorical variable, used as proxy for children health, with four categories as normal weight, underweight, overweight, and obese. Underweight is used as reference category. The relationship of BMI and educational performance of children with some key social determinants has been checked.

### **Results of MNL Model of Children's Educational Performance**

This contains the estimations of empirical model; children's educational performance with the key determinants of educational achievement as school type, nutritional status and study time. Educational performance in that model used as dependent categorical variable and divided in four categories 80% and above, 65% to 79%, 50% to 64%, and below 50 percent. Below 50% used as reference category in this technique. All variables' results further described in following sections with respect to each category of educational performance with reference category of below 50 percent. Further sections are incorporated in detail with the help of table 2. This section interpret the results of multinomial logistic regression of educational performance with key determinants, of children score 80% and above category, this section describes results of educational performance of 65% to 79% category.

#### **Educational Performance of Children (80% and Above)**

In Table 12, effect of some key factors has captured on educational performance of children. This section interpret the results of MNL for children's educational performance of scoring category '80% and above'. Reference category for this analysis is to score 'below 50%'. School type contains two categories; private and government school. Reference category for school type is government schools and results are described comparatively for private schools. It has found that children getting their education from private schools

have 7.41 times increasing chances to get 80% and above percentage as compared to children who enrolled in government schools. Results show that 55% of children were engaged with private schools whereas 45% of children were getting their education from government schools. There are 50.5% of total children scored "80% and above" in this analysis. Results can be justified with the study findings of [Okon and Archibong \(2015\)](#) that educational performance of private schools' children is better than the students who attain their education from public sectors schools.

Nutritional status as children health has been derived from body mass index of children. Normal weighted children are considered as normally nutritioned, while not normally nutritioned children are underweight, overweight and obese. Nutritional status contains two categories; normally nutritioned children and not-normally nutritioned children. Reference category for nutritional status is not normally nutritioned children, and results are discussed comparatively for normally nutritioned children. Analysed from results that normal or healthy zoned children perform better in their educational exams than to the children which are not normal or under nourished. There found 9.61 times more chances to achieve 80% and above as performance, when children are normally nutritioned as compared to not normally nutritioned children with the reference category of below 50% educational performance. There is significant association between children health as normally nutritioned and their educational performance as percentage. These findings are coincide with the studies of [Sarma, Wijesinghe, Sivananthawerl, et al. \(2013\)](#). According to their study findings, nutrition play significant and influential role on the higher achievement of students.

Study time captures the significant association towards educational performance of children. Study time has been described in hours and categories are as; more than 2 hours and 1 to 2 hours. Reference category for study time is 1 to 2 hours of study and results are comparatively discussed for more than 2 hours of study time. There is 88.38% probability of higher educational performance, when children study 'more than two hours', as compare to 'one to two hours' of study time. Findings on study time and educational achievement found to be consistent with [Lenkeit and Caro \(2014\)](#). In their study significant association among study time and students educational achievement exist.

### **Educational Performance of Children (65% to 79%)**

Results of multinomial logistic regression for '65% to 79%' educational performance category has interpreted. These results described in terms of below 50 percent category. Results revealed that there exist 9.31 times significant increasing chances to perform between 65 to 79 percent, when children getting their education from private school as compared to government school. By incorporating the value of p-value (0.000) school type find to be significantly associated with the educational performance of children. Findings on this variable are consistent with the study of [Bedi and Garg \(2002\)](#). In their study, most influential variables were students educational achievement and comparative effectiveness of public and private schools. School type also contributed more significantly on the children's educational achievement as well as future career.

Nutritional Status is used as children health hence it has been derived from body mass

index of children. Nutritional status also found statistically significant with achieved scores of children. Results show that there exist 12.02 times more chances of normally nutritioned children to perform well in ranged between 65 to 79 percent as compared to not normally nutritioned or the children which are not healthy. Results are consistent with [Olanipekun, Obatolu, Fasoyiro, and Ogunba \(2012\)](#). They found the impact of students' nourishment status on their performance. Under-nourish children had less probability to achieve higher grades.

Study time also contributes a statistically significant link for range 65% to 79% score achievement. Proper time and adequate planning for study contributes influentially. Results from table 5.12 show that more than two hours of study, has 14.42 times increasing probability to perform better as compared to less hours of study time. Descriptively 21.8% of children scored between "65% to 79%". Findings are also coincide with the study of [Geckova, Tavel, van Dijk, Abel, and Reijneveld \(2010\)](#).

### **Educational Performance of Children (50% to 64%)**

Results of multinomial logistic regression of children's educational achievement model for 50% to 64% achievement category has been discussed in this section 5.3.1.3. These are described with the reference of below 50 percent. Evidenced from results that there is only 2.02 percent probability to perform between 50 to 64 percent of private school children as compared to the children getting their education from government school. School type and educational performance of children found statistically significant in thia analysis. 15.9% of children have scored among "50% to 64%" and 11.8% of children scored "below 50%". These findings are consistent with the study of [Anwar et al. \(2013\)](#).

Children health as normally nutritioned has significant relationship with their educational performance and achievement. There is 3.87 times likelihood to perform between 50 to 64 percent when children are normally nutritioned or healthy with the comparison of not normally nutritioned children. These findings are also coincide with the studies of [Sarma et al. \(2013\)](#).

Study time has only 3.28 times chances to perform average score with more study time as compared to less study time.

### **Goodness of Fit of Models**

Goodness of fit (GOF) test helps to determine whether model is correctly specified or not. GOF is a classic test to check the fit of logistic regression model with two or more than two categories. At the result of model testing, a probability value (of Pearson chi-square) produced. The null hypothesis to be set that 'model is good of fit' or 'model fits well' and it is tested against the alternate hypothesis that 'model is not well specified'. If p-value is less than or equal to 0.05, then we do not accept the null-hypothesis and reject the model. If it is greater than 0.05, then we did not reject the null hypothesis and accept the model. Models' goodness of fit has been checked by the significance of model fitting information, goodness of fit and likelihood ratio tests' values. Below these tables present the significance and information about model fitting, goodness of fit, and likelihood.

## **Results of 'Goodness of Fit' of Estimated Model 01**

Goodness of fit (GOF) of empirical model which determines the relationship between children educational performance and its key determinants, has been analysed to diagnose the model. Model fitting with goodness of fit value and likelihood ratio test, have been described in table 13 and table 14 respectively.

Results from Table 13 show the model fitting information and GOF. It can be analysed from results that model fitting is highly significant at 1% level. Chi-Square value of goodness of fit is 11.76 and p-value is 0.46. Probability value can be seen more than 0.05, so null hypothesis cannot be rejected and it is concluded that model is good of fit.

Table 14 represent the likelihood ratio test as a result of model diagnose testing. Likelihood of reduced model's and chi-square value for school type is 149.53 and 91.48 with zero p-value. Likelihood and chi-square value for study time lie at 110.38 and 52.33. Nutritional status has 75.04 times likelihood of being a good contributor with chi-square value 16.99. Results conclude that there found higher values of variables' likelihood. All variables used in this model, are statistically significant at 1% level.

## **Conclusion**

Aim of this study was to conduct an analysis on children health and their educational performance for a time-span of February to April, 2016 using primary data collected through questionnaire and interview from different randomly selected private and public schools of Sargodha city. Body mass index is used as proxy to the children health determined through BMI, consist on four categories stated as normal weight, underweight, overweight, and obese. Educational performance of children was acquired in percentage form which further taken from obtained marks divided by total marks. Children's result was gathered from their respective schools. Educational performance was described in four categories as children scored; 80% & above, 65% to 79%, 50% to 64%, below 50 percent. Nutritional status of students was consist upon two categories; normally nutritioned children and not-normally nutritioned children. Normal weighted children were considered as normally nutritioned, while obese, underweight, and overweight weight children were kept in not-normally nutritioned category of children health, because underweight, obese, and over weighted physiques were considered as disease in previous studies. School type categorised as private school and government or public school. Study time also used in the current analysis in hours categorized as more than two hours of study time and ranged between 1 to 2 hours of study, after school timings. To fulfill the objectives of study, descriptive statistics, chi-square test multinomial logistic regression (MNLr) were utilized.

The impact of some key determinants (as school type, nutritional status, and study time) has been checked on the educational performance of students. In another mode, impact of mother education, family income and number of children in a family was checked on the health status of children. Results concluded that school type, nutritional status and study time have positively significant and contributing impact on the children educational performance. Educational performance of students also contribute toward development as well as further future achievements in students. Many researchers regarded

these factors as enhancing and contributing in students educational and career achievements. Results imply for educational performance and school type that children from private schools perform better and achieve better scores as compared to children getting their education from public or govt schools. There found more than 9 times significantly increasing chances to achieve higher scores when children engaged to private schools as compared to public school. Nutritional status of children also found statistically significant with increasing probability to secure higher percentage. It has been analysed that normally nutritioned students had better to secure the achievement ranged between 65% to 79% more as compared to others. A well managed study time helps and deliver an influential impact on educational achievement. In the current analysis it was revealed from results that the students who did study more than two hours, had 88 times more probability to achieve higher scores. So all variables' impact and significance can be concluded briefly by reviewing the previous discussion.

## **Policy Recommendations**

The above results elevate some implications for the policy concerning all aspects of health and education generally. The study's findings suggest that to improve children's educational performance, the parents need to focus on their children's health. There is also an immediate need for public policies to promote awareness about children's role in their academic achievement. Additionally, the results suggest that the quality of education in public sector schools needs to be improved in line with the private schools in Sargodha.

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