

Article

EFFECTS OF ELECTRIC LOAD SHEDDING ON ACADEMIC PERFORMANCE OF STUDENTS IN KHYBER PAKHTUNKHWA**Junaid Ahmed Khan ***

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Abstract: This study was carried out in District Buner, Khyber Pakhtunkhwa (KP) province of Pakistan to find out the effects of electric load-shedding on the academic performance of students. District Buner was purposively selected for the study because people in this area have been observing long hours of electric load-shedding in recent years. A total of 120 respondents were selected randomly from 10 different institutions through proportional allocation sampling technique. A well designed and a pretested questionnaire was prepared for collection of data. In order to find the effects of electric load-shedding on academic performance of students in the study area, multiple linear regression model was used. The students' scores in annual examinations of the years 2016 and 2017 are taken as dependent variables and number of hours of electric load-shedding during the 10 weeks before preparation for annual exam, among others, such as parents' income, parents' education and household size are the independent variables. The results show that long hours of electric load-shedding has an adverse effect on the academic performance of students. Keeping in view the results of the study, the study recommends the provincial government of KP to take appropriate actions to eradicate this problem.

Received: 24th February, 2022**Accepted:** 15th March, 2022**Published:** 31st March, 2022**INTRODUCTION**

Energy is an important component of socio-economic development of a country (Jan and Akram, 2018). If the energy used for casual house hold level is not in utilizable form and affordable prices there is limited possibility of development. In Pakistan, only 55 percent of people have access to electricity. The surveys carried out in this regard show that Pakistan is one of the economies of lowest per capita commercial energy electricity supply. Approximately 68 percent of the people live in rural areas. Majority of them have lack of access to commercial energy. They use animal dung and other biomass such as agricultural wastes to fulfill their daily energy requirements. Presently, majority of the areas of Pakistan are facing drastic (12-20 hours per day) shutdowns because of deficiency of electric supply more than 3 GW. Many of the commercial industries are closed or banned of their operation during particular seasons in order to overcome the needs of people which negatively affecting

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the industrial production and livelihoods of thousands of families (Haq and Hussain, 2008). Electricity performs a vital role in both economic and social development of a country. Worldwide countries sensibly distribute and utilize their human natural, and financial resources to achieve these goals. Electric energy consumed per capita has a strong relationship with indicators of social development (HDI and GDP per capita). If the electricity consumption per capita is increased, it will raise the economic growth directly as well as achieve improved social development indirectly--especially for the countries having low or medium human development. Mostly, the basics step for improving an economy from low to a medium (HDI) is to achieve 500kwh electricity per capita. When normal quality and quantity of electricity is utilized for daily purposes like pumping water, provision of light, and preserving medicines and foods, then the livelihoods of the community show a significant improvement. This shows the obvious long-term correlation between consumption of electricity per capita and other social-economic indicators (Leung and Meisen, 2005).

"Education for all" is a slogan of today at international level. Pakistani government is so committed to achieve the target of generalizing primary education all over the country. Government is taking various steps in this regard. New schools and other educational institutions are being made so that the students can be enlightened with education. The partnership and collaboration of public-private with non-government organizations (NGOs) are also giving hands to the government in order to achieve the target of generalization of primary education. Government is introducing various schemes and making the infrastructure of schools better to attract students and parents. Unfortunately, various social aspects bother governmental efforts, for example, ignorance about importance of education, inappropriate quality of teaching and poverty. That is why the government fails to achieve the goal of universalization of primary education. People also consider the government institutions as unsatisfactory and they think that the aim of quality education is not achieved (Khan, 2010).

Nowadays, electric load-shedding is a common phenomenon due to failure of appropriate power supply. The hours-long and unscheduled electric load-shedding has been adding much to the miseries of the students, more especially, during the days of their preparation for exam. It is almost impossible to study without electricity due to which the time of the students is wasted. Consequently, their desired grades are affected. Similarly, majority of the educational activities are based on electricity. The technology used in educational purposes is computer based. The students prepare assignments and take examinations with the help of computers, which are operated through electricity. Due to electric load-shedding, these activities are disturbed. The entire process halts due to electric load-shedding. It makes the students to lose their entire unsaved work. Along with the adverse effect of electric load-shedding to their studies, it has been witnessed that electric load-shedding has adverse effects on the health of the students. It increases their stress on the eyesight of the students and as a result, it gets weaker. Their schedule is disturbed due to the electric load-shedding. This is considered as big loss as far as student is concerned. This affects human capital in a country. Keeping in view the complications of the electric load-shedding, this study was carried out with the objective to find out the extent of electricity shortfall and its effects on the education of rural population. The study tests the null hypothesis (H_0) that there is no effect of electric load-shedding on the academic performance of the students.

LITERATURE REVIEW

Bayar and Özel (2014) applied different economic tests to various economies and it clearly shows that there is an obvious interconnection between economic growth and electricity consumption in the countries. This study verifies that those countries are developed even more rapidly than the advanced countries, which kept balance and updated system of electricity production and consumption during the period of 1970 to 2011. It was found that there was positive effect on the economic betterment of an economy and there was two-way connection between economic growth and the consumption of electricity.

Pakistan has severe energy shortages which cannot be fulfilled by using the domestic resources at least it might not be done in short time. The reasons are underinvestment, and partly implemented modifications and infighting. The government has been trying to come forward to overcome the energy problems of the public but still those are not enough because of political instability, low quality ingredients and machinery, corruption etc. Various organizations and countries are interested to invest here and help to fulfill the need of Pakistan. These include the South Asian Association for Regional Cooperation (SAARC) and the Economic Cooperation Organization (ECO), both of which need to be developed with a focus on energy and development (Kugelman, 2013).

Zaman et al., (2012) found out that university campus students have been suffering from electricity shortfall and having a tough time. This study further explains the problems of electric shutdowns faced by the students of

university campus. The result shows that the electric shortfall has prominent adverse effect on the studies of the student in university. The students suffer more in nighttime as compared to daytime. It makes the students unable to precede their studies conveniently and prepare a proper timetable due to these electric shutdowns. Lectures based on multimedia are not properly delivered. The grades of the students are also affected due to late submission of the assignments and homework.

According to UNESCO (2008), the impact of access to electricity on educational attainment is theoretically unclear as there could be multiple mechanisms at work. One possible mechanism that may access to electricity increases demand for low skilled labor. This would increase the opportunity cost for students to stay in school and would lead to a drop in educational attainment. Another could be that access to electricity brings in manufacturing jobs. This would require higher skilled labor increasing the returns to human capital, which would cause students to be more likely to stay in school. There is a myriad of other possible mechanisms, which makes the impact of electricity on educational attainment uncertain.

METHODOLOGY

The study was carried out in district Buner Khyber Pakhtunkhwa (KP) consists of 35 districts. Like other rural areas, District Buner is suffering from the electric load-shedding. The main grid station is located on the land of Tehsil Gagra but still there is electric load-shedding that exceeds more than 12 to 18 hours per day. In this background, this study was conducted in district Buner to assess the effects of electric load-shedding on academic performance of students. Multi stage sampling technique was applied. In first step, District Buner was selected purposively. There are 72 government high schools, 39 higher secondary schools, 51 private high schools, 11 private colleges, four government degree colleges and one university in District Buner (BISE Swat 2017; DEO 2017). Therefore, in second step, 10 different educational institutions were selected randomly from these institutions. In third step, students were selected from high classes (Grade 9 and 10) in case of schools, and randomly from colleges and other institutions. Sum of 120 students were selected from these institutions using proportion allocation sampling technique and data were collected according to the requirement. Data were collected using a pre-tested questionnaire. To analyze the data, multiple regression model was used. The multiple linear regression equation is as follows:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon_i \quad (1)$$

Where, Y_i is the dependent variable which shows students' scores in annual examination, X_1 is the number of hours of electric load-shedding during study hours, X_2 is parents' income (in Pakistani rupees), X_3 is number of household members, X_4 is level of education (Years), β_0 is intercept, β_s regression coefficients, and ϵ_i is error term.

RESULTS

In order to find the effect of electric load-shedding on the academic performance of students in selected areas of District Buner was focused to be the main objective of this study. This section includes the outcomes, results and discussions of the research that was carried out for the study.

Age of Respondents

Age is a very important factor that plays an important role in various developmental activities. Generally, young ones and middle-aged people are more energetic and focused to get education. Mungas et al., (1996) determined in his study that age plays a key role in educational achievements. The sampled respondents were divided into three categories i.e. 15-20, 21-25 and 26-30.

Figure 1 shows the distribution of respondents on the basis of age. According to the results, 29 percent of the total respondents belonged to age group of 21-25 years. The remaining 3 percent respondents were from the third age group, which is 26-30 years. This shows that respondents from different age constituted the sample. This confirms that a variety of response could be recorded from respondents as effect of an intervention or an obstacle is different of different age groups. Age has a key role and effect on attitude, mentality and capability of the individuals.

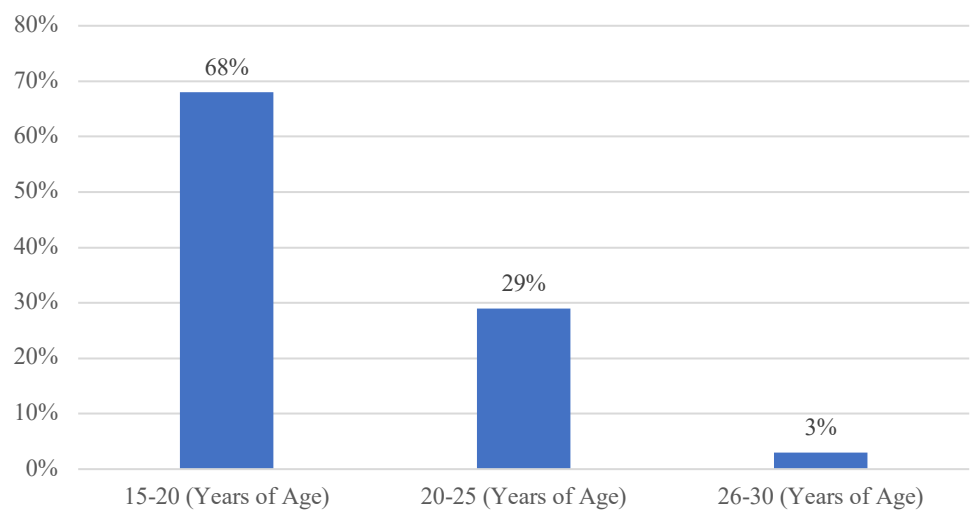


Figure 1: Age groups of respondents

Educational Level of Respondents

Schooling or education of an individual enlightens one’s mind and future. It helps us in the utilization of resources and making the life comfortable. Education grows up the mutual understanding and civilization among the communities. It improves one’s attitude and behavior. Educational level can be defined as the procedure of increasing knowledge, apparition and other attractive characteristics, which are significant to change the manner of the sampled respondents towards positive changes and all the aspects of life improvement (Melkote, 1988). Figure 2 shows the distribution of respondents based on educational level.

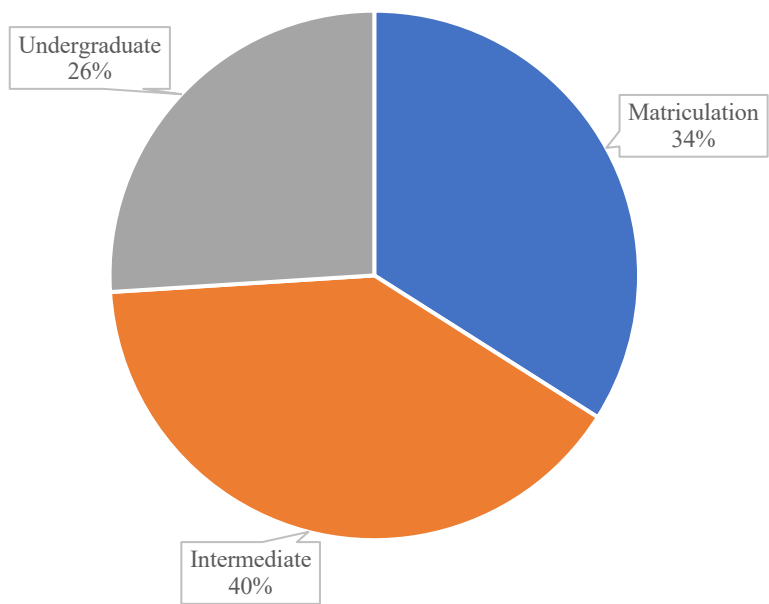


Figure 2: Distribution of respondents on the basis of level of education

This study is concerned with the education; hence all the sampled respondents were educated and everyone responded according to his/her own opinion. Figure 2 illustrates that majority of the respondents belonged to the intermediate level, which constitutes 40 percent of the total sampled respondents.

Similarly, 34 percent belonged to matric level, and the remaining 26 percent of the total respondents belonged to bachelor level. Educated people have better mentality than uneducated people and they can make far better decisions as compared to uneducated ones.

Scores Obtained by Respondents in Annual Examinations 2016

Students' academic performance is measured mostly in grades or scores per semester or annually. The grades tell us about the ability and mentality of the students. It is obvious that students having good mentality and enough ability can get good grades and while those who work less due to some reasons, their grades will be disturbed. Baird (1985) stated the same that for high-level occupations high grades are prioritized and influence in admission is made to those who have high scores in their academics. Figure 3 represents percentage scores obtained by respondents in last exam 2016.

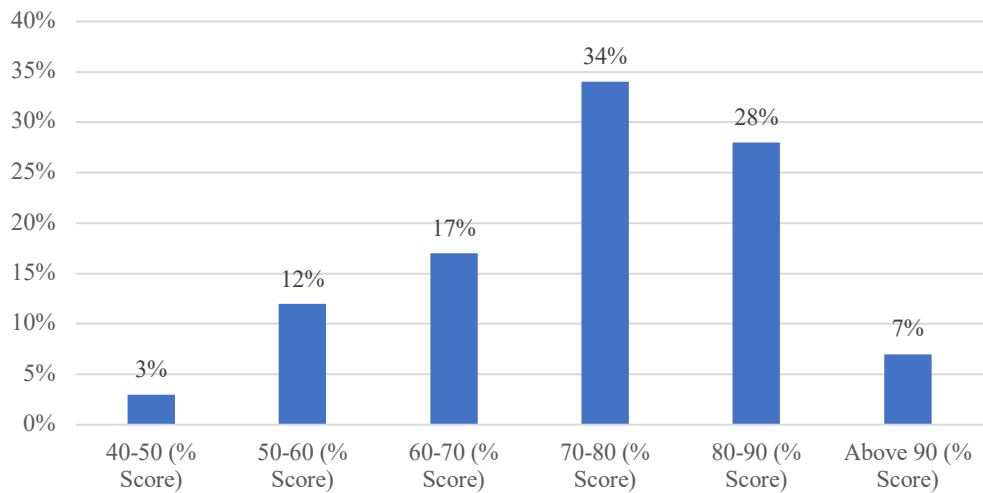


Figure 3: Students' (in %) Performance in Annual Examination 2016

Scores Obtained by Respondents in Annual Examinations 2017

The performance of the students is usually measured in scores or grades. Scores obtained are of great importance for the students as it is the aim of almost every student to get good grades and form a better future. Baird (1985) stated the same that in competitive exams and high-profile professions, the preference is given mostly to those who have high grades and good academic performance overall. This study is also concerned with the grades and academic performance of the students as shown in Figure 4.

The same figure clearly shows the change in scores obtained by the students. Majority of respondents declared electric load-shedding to be the main reason of disturbance in their study. According to figure 4, only 4 percent respondents got above 90 percent scores and 20 percent students have obtained 80-90 percent scores.

Similarly, 31 percent respondents have secured scores in between 70-80 and 24 percent respondents received 60-70 percent scores in their annual exam 2017. While the remaining 17 percent and 5 percent have gotten 50-60 and 40-50 percent scores respectively.

The variance in grades is because of electric load-shedding that affects the students both mentally and physically. The respondents stated that in the year 2017, the electric load-shedding was increased as compared to the year 2016. Hence, their grades are negatively affected.

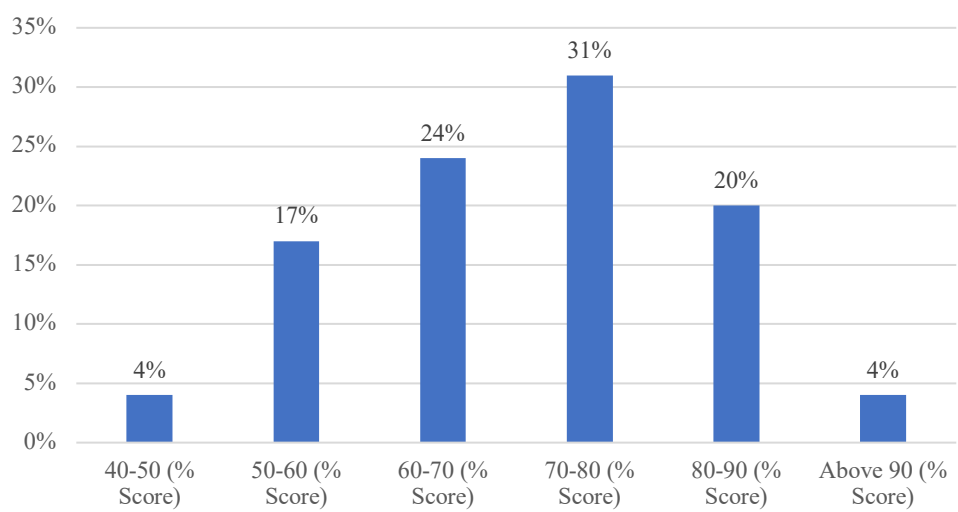


Figure 4: Students' (in %) Performance in Annual Examination 2017

Duration of Electric Load-Shedding in Years 2016 and 2017

Electric energy is of key importance for daily life. Due to increase in population and advancement, everyone is concerned with electricity either directly or indirectly in order to fulfill their daily needs but unfortunately in Pakistan, for the last few decades, the population has been suffering from long durations of electric load-shedding because the power generating sources are not enough while consumption is increasing day by day. This widens the demand supply gap and leads to electric load-shedding of eight to ten hours in city areas and 16 to 20 hours in rural areas (FODP, 2010).

Electric load-shedding also affects the students in various aspects. Electric load-shedding mainly disturbs their study. The following figure shows the duration of electric load-shedding according to the respondents' reply. Figure 5 displays the duration of electric load-shedding according to the sampled respondents. According to the figure, 9 percent of them said there is 2 to 4 hours electric load-shedding per day. Similarly, 12 percent respondents stated that electric load-shedding continues for 4 to 6 hours each day and 16 percent of the respondents declared that it remains for 6 to 8 hours in a day.

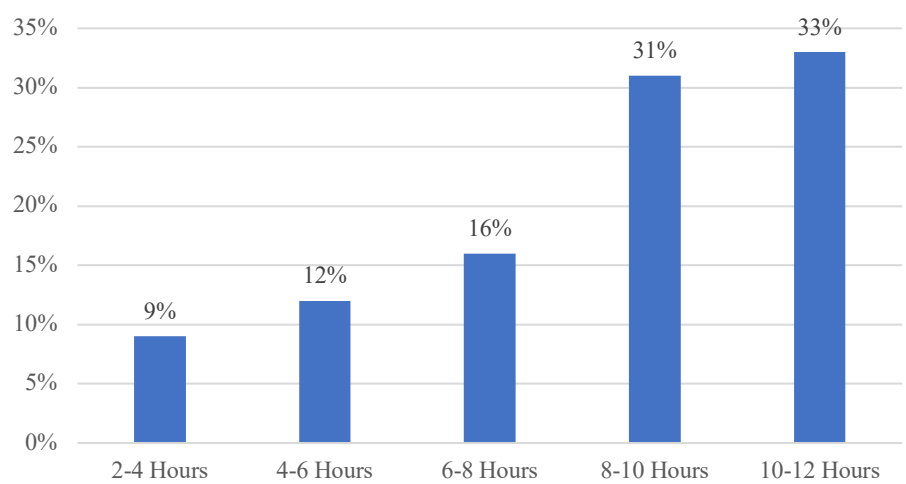


Figure 5: Hours of Electric Load-Shedding (in %) (Field Survey, 2018)

Also, 31 percent of the respondents informed that electric load-shedding exceeds to 8 to 10 hours per day and 33 percent of the total respondents claimed that everyday there is 10 to 12 hours electric load-shedding daily. This confirms that electric load-shedding has been the main issue of today's livelihood in Pakistan.

Parents' Income of Respondents

Parents' socio-economic status is positively associated with the educational achievements of their children as confirmed by (Björklund and Salvanes, 2011). Same was found in this study that parents having better income can spend enough on their kids' education. They can study appropriately up to their desired level while those having less income suffer from various financial crisis and they can't study up to their anticipated level. In this study, the parents' income is distributed in to five different categories as shown in Figure 6.

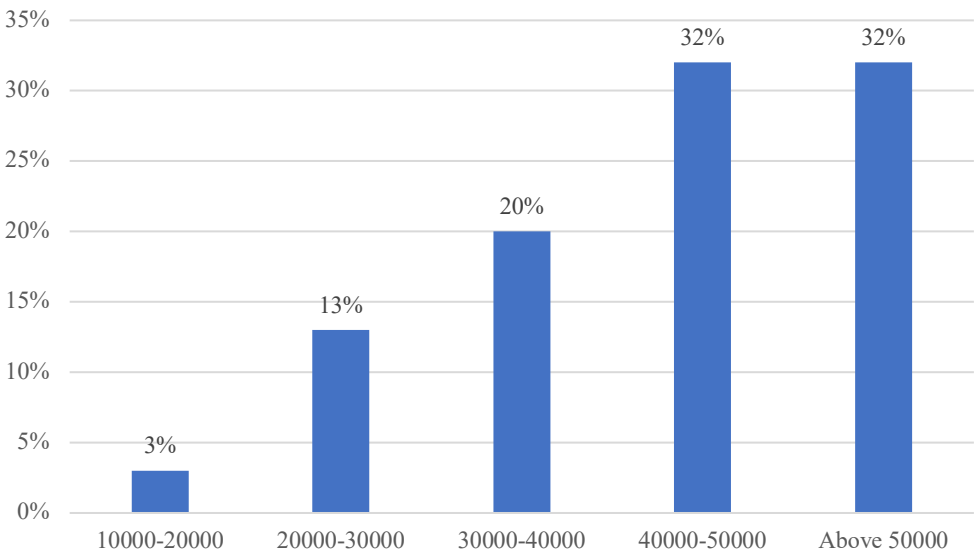


Figure 6: Income Level of Parents of Respondents (in Pakistani Rupees) (Field Survey, 2018)

The Figure 6 clearly shows that monthly income of 32 percent of the respondents was between 40,000 to 50,000. Similarly, 32 percent of respondents stated that their parents' monthly income was above 50,000. The figure further indicated that monthly income of 20 percent respondents was 30,000 to 40,000 rupees and 13 percent respondents' parents had income between 20,000 to 30,000 rupees per month. The remaining 3 percent of respondents declared that their parents' income was between 10,000 and 20,000. The financial aspect matters in education because the respondents whose parents have better income having good grades while those who did not have good income couldn't get good grades due to financial issues.

Education Level of Respondents' Parents

Parental education is a direct input to the education of their children. There is a small to moderate, and practically meaningful, relationship between parental involvement and academic achievement of their children and mostly more educated parents can provide better education and environment to their children as found by McLachlan et al. (2013); Fan and Chen (2001). Same is the case in this study that verifies that there is a direct influence of parental education and involvement is a strong predictor of their children's education. Figure 7 shows educational level of the respondents' parents. The figure shows educational level of the students' parents according to which, 4 percent of the parents of respondents were master degree holders. Similarly, 28 percent of respondents' parents had bachelor degree education and 37 percent of them have intermediate level of education. According to the figure, the parents of 18 percent of respondents were matriculate, 11 percent were educated up to middle level and the rest 3 percent were illiterate. As far as parental education is concerned, it is an evident input in their children's education.

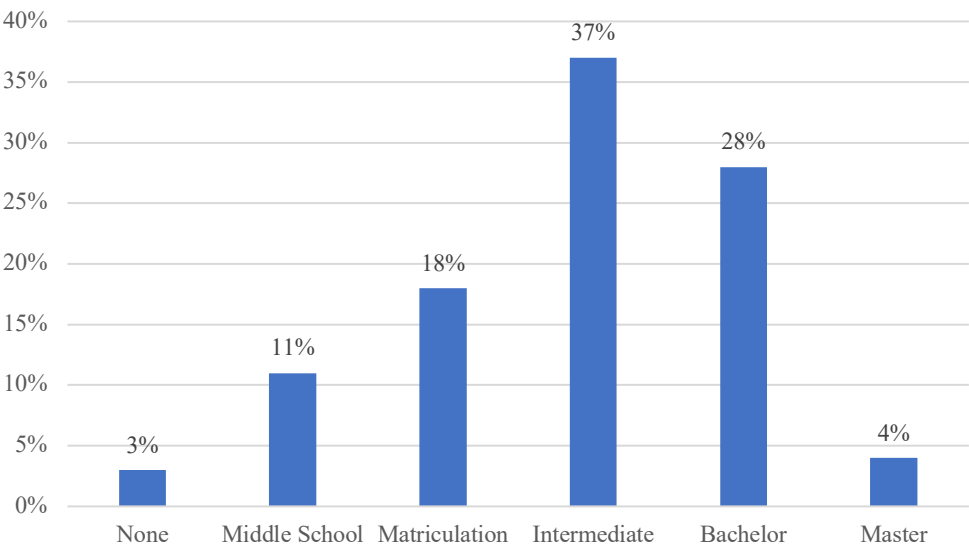


Figure 7: Education Level of Parents of Respondents (Field Survey, 2018)

Results of Multiple Linear Regression Model

Regression analysis is used to predict the values of one or more responses from a set of variables or to find out the linear association between the variables and responses (Hyötymniemi, 2001). The same multiple linear regression was applied to predict the effect of electric load-shedding on academic performance of students considering some additional variables such as parents’ income, parents’ education and household size. The model seemed to be good fit because the overall model was found highly significant (p-value =0.000) and an R² of 0.960.

The first explanatory variable i.e. parents’ income had beta value with plus sign that indicates that there is a positive relation between the parents’ income and the grades of the students. It shows that if the parents’ income increases by 0.259 rupees the grades of students increase by one percent. In addition, it is recorded that higher income families have access to better education and mostly avail private institutions. The results of the study show resemblance to that of Björklund and Salvanes (2011).

Variables	Coefficients	S. E	t. value	P-value
Parents’ income	.259	.075	3.472	0.001
Parents education	.292	.061	4.814	0.000
Household size	-.300	.064	-4.680	0.000
Duration of electric load-shedding per day (in hours)	-.233	.065	-3.579	0.001
Intercept	2.999	.453	6.624	0.000
R ² =	0.960			
F. Statistic =	69.04			
P-Value =	0.000			

Table 1: Empirical Results of Multiple Regression Model

The next determinant which influences the students' grades is parents' education. It is directly related with the academic performance of their children. The beta value of parents' education according to the table 4.1 illustrates that students' grades increase by one percent if the parents' education increases by 0.292 units. Other studies have determined the same as done by McLachlan et al. (2013). Table 4.3 shows the details. The third explanatory variable was household size. Its coefficient is -0.300. The minus sign shows that the household size is inversely related to the academic performance of the students. The students' grades will increase by one percent if there is decrease in family size by 0.300 member. These results show similarity with study conducted by Rognerud, and Zahl (2005). The fourth independent variable is electric load-shedding which is the most important one and that affects the academic performance of students. Its coefficient is -0.233. The negative sign again shows inverse relationship between electric load-shedding and academic performance of the students. If electric load-shedding increase by 0.233 hours, the students' grades will be decreased by one percent. The same results were found by Sovacool (2014) who confirmed that schools or other educational institutions perform more poorly than electrified ones. Provision of electricity seems to have a positive impact on the academic performance of youths. All the independent variables i.e. Parents' income, parents' education, household size and duration of electric load-shedding were significant predictors of students' academic performance (Scores or Grades). The overall model is highly significant with a p-value less than 0.001. This means that the academic performance of students is significantly affected by electric load-shedding. Thus, the null hypothesis i.e. there is no effect of electric load-shedding on academic performance of students, is rejected.

CONCLUSION

This study was conducted to examine the effect of electric load-shedding on the academic performance of students. Electric load-shedding halts every aspect of life more specifically education. This dearth of electricity at institutions and homes leaves them in dark especially in nighttime. The students face more problems during few weeks before their examination because they study more to prepare for their exam. They suffer more in nighttime as compared to day time. They can't follow a specific time table due to unplanned electric load-shedding. Consequently, their grades are affected. They are also disturbed both mentally and physically due to electric load-shedding. As the study area is rural so it faces long period of electric load-shedding. It is a major issue and the concerned authorities and government are taking various measures to overcome this giant problem but these measures are not enough to overcome electric shortage. Based on the results of the study, it may be suggested that public private sectors are required to come together to work against this problem. Students and individuals may be motivated to study on daily basis in time when there is less electric load-shedding. Based on the results of the study, it can be concluded that electric load-shedding has a negative effect on the studies of majority of students. They can't study properly. It is suggested that government and electric supply units may either minimize the duration of electric load-shedding or change the timing of electric load-shedding especially, during the preparation days before exam. Parents and teachers are suggested to prepare such time table and environment for their children where they suffer from electric load-shedding the least. It is recommended for the students to study on regular daily basis, so they would not have to study for longer times during the preparation days. Hence, they may suffer less from electric load-shedding because of decrease in the duration of study.

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