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Research Article

The impact of attending Pre-school Education on later Academic Achievement of Students: Empirical Evidences from Dessie, Ethiopia

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Socio-economic status,
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Abstract

Attending pre-school education is considered as the first step in child's educational journey and it is among the major factors determining later success of students in the academic arena. This study examined the association between attending pre-school education and academic achievement of grade 8 students. The academic performance of students with and without pre-school experience was compared. Data from 538 randomly selected students were obtained from 13 junior secondary schools of Dessie town, Ethiopia. Analysis was undertaken using percentage, mean, Chi-square test, independent-samples t-test and linear regression. The result revealed a statistically significant mean difference between students with and without pre-school education experience favoring the former. Attending pre-school education has statistically significant association with students' academic performance in regional examination. The proportions of high achieving students were found to be statistically higher for those with pre-school education. The propensity of attending pre-school education is high for students from better-off and educated families. Since the program in Ethiopia is largely left for the private sector, reconsideration is needed to allow children from low and middle classes to have the opportunity of pre-school education. Strategies that provide pre-school education for rural people should be designed as well. Furthermore, extensive research with large representative sample size has to be conducted.

Introduction

The development of any country relies largely on the quality of human capital. Education plays a vital role in the development of human capital and is linked with individuals' well-being and opportunities for better living (Memon et al, 2010, Farooq et al., 2011 and Ababa et al., 2012). As a result, researchers have long been interested in examining variables contributing effectively to the quality of performance of learners (Farooq et al., 2011). Students' academic performance is affected by hosts of individual and external factors, including individual and household characteristics, socioeconomic situation, school related factors and government policies (Dayioglu and Turut-Asik, 2004; Farooq et. al, 2011). Most research findings have confirmed that children's earliest experiences in life can have a profound effect on their success in later grade levels and beyond. The earliest years of a child's life represent a crucial period of biological, psychological, social and emotional growth and change. The first five years of life represent a critical window of opportunity in the healthy development of young children; what children learn and feel during this time will be foundational to the rest of their life (Weiss and Offenberg, 2002; Sacks and Ruzzi, 2005; Slaby et al., 2005; Robin et al., 2006; Woodhead et al., 2009; Berlinski, et al., 2009; Bibi and Ali, 2012; Young Lives, 2013; Yoshikawa et al., 2013). Attending pre-school education is the first step in child's educational journey and it is among the major factors determining later success of students in the academic arena (Taiwo and Tyolo, 2002; Weiss and Offenberg, 2002; Finn, et al., 2005; Bibi and Ali, 2012). Barnett (2008) underlined the importance of pre-school education as '…well-designed pre-school education programs produce long-term improvements in school success including higher achievement test scores, lower rates of grade repetition, and higher educational attainment and graduation; reduced delinquency and crime in

childhood and adulthood. Sacks and Ruzzi (2005) and Yoshikawa et al. (2013) have concluded that the foundations of brain architecture and subsequent lifelong developmental potential are laid down in a child's early years. Early childhood is the time when children's brain development advances at a pace greater than any other stage in life (Tassew, 2011). As a result of all these factors, early childhood education is now under the global spotlight more than ever before (Woodhead et al., 2009).

A study in Argentina (Berlinski et al., 2009) disclosed that one year of pre-school school increases average third grade test scores by 8%. In addition to the improvement in academic performance, pre-school school attendance positively affects student's self-control, attention, effort, class participation and discipline. By taking the average result of grade 5 students, a study by Bibi and Ali (2012) in Pakistan, found that 71% of student with pre-school education were high achievers while it was only 29% for students with no pre-school experience. This indicates that pre-school education equips children with prerequisite skills that make learning easier and faster for children. Also pre-school helps children become responsible and to take an active part in curricular and co-curricular activities. Another study in Botswana by Taiwo and Tyolo (2002) found that pupils with pre-school education experience significantly out-performed their counterparts without such experience in English language, Mathematics and Science subjects. A longitudinal study by Magnuson et al. (2007) also disclosed that children who attended pre-school have higher levels of academic skills than their peers who have no the experience. Similarly, a study in Georgia (Fitzpatrick, 2008) found that the Mathematics result of children with pre-school education increased by 8.2 percentage points. A study in California (Slaby et al., 2005) also found that children who are exposed to pre-school have a greater chance of academic success throughout their schooling. In Nigeria, students with formal kindergarten education performed significantly better than those without the experience (Eweniyi, 2012). Osakwe (2009) revealed a significant difference between pupils who had pre-school education and those without in their academic performances-cognitive ability, social skills and motor skills. Barnett (1995) after reviewing the results of 36 studies has boldly concluded that early childhood programs can produce sizable long-term effects on school achievement, grade retention, placement in special education, and social adjustment. Recent study in Turkey by Behsat and Ramazan (2014) also found that pre-school education has a significant impact on the academic performance of junior secondary school students.

A study in Ethiopia (Young Lives, 2013) disclosed that attending pre-school education improves early enrolment in formal primary education and the grade completed; children who attended pre-school tend to have completed a higher grade than those who did not. A study by Tassew (2011) in Ethiopia underlined that early childhood education attendance is positively associated with a substantial improvement in children's cognitive development. Using an econometric model, he found that children who have been attending kindergarten have scored 24.4% higher in the raw score of the Peabody Picture Vocabulary Test and 19.6 % in cognitive development than those without pre-school experiences which was statically significant. Though pre-school education has a profound significance, the service in Ethiopia is restricted in urban centers and for children from the better-off families. Moreover, little research has been done so far in Ethiopia. From the ongoing discussion, one can easily understand that more empirical based research has to be done to convince policy makers and practitioners to expand pre-school education to reach the unserved portion of the population.

Problem Statement and Rationale

Pre-school education encompasses the education system given for children with age group of three to six and is also called nursery school education and kindergarten education. Pre-school education in Ethiopia caters for children aged 4–6 years, but it is not compulsory (Woodhead et al., 2009). Even though early childhood care and education has been identified as one of the priorities for the education sector due to its role for the overall improvement of quality of education and reduction of drop out as well as repetition rates in later stages of formal schooling (MoE, 2010), the coverage of pre-school education in the country is very low (Tassew, 2011; Young Lives, 2013). The enrollment rate has increased only from 2 to 6.2 percent from 2001 to 2013; a change of 4.2 within 13 years (MoE, 2001/2013). The rate has been even lower for Amhara National Regional State (ANRS) (see Fig. 1). This low enrollment rate in pre-school education implies that, most students in Ethiopia join primary education without having any pre-school exposure. The program is chiefly left for the private sector (Tassew 2011) where low and middle income classes have little capacity to afford the payment.

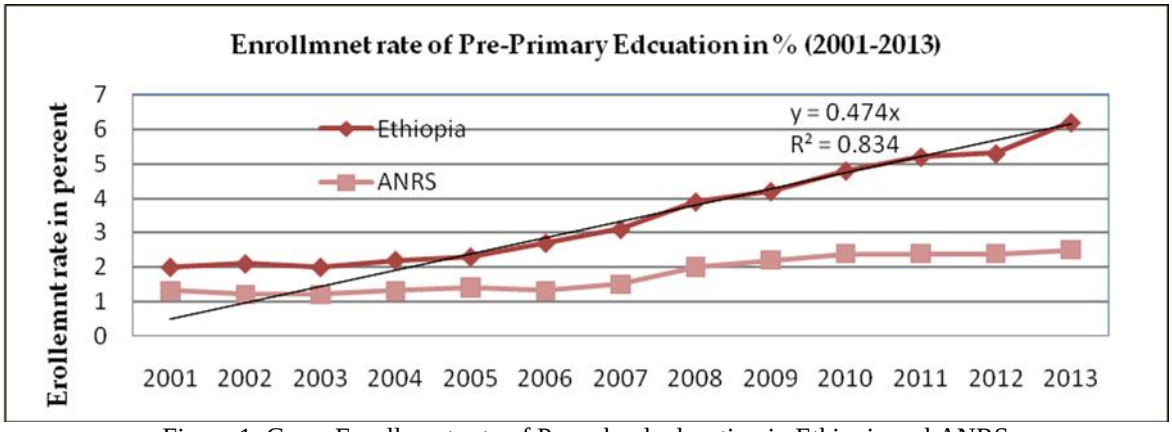

Figure 1: Gross Enrollment rate of Pre-school education in Ethiopia and ANRS
Source: Own Constructed based on MoE (2001-2013)

According to Woodhead et al. (2009), the opportunity to attend pre-school in Ethiopia is almost entirely restricted to urban children; nearly 58% of children in urban communities had attended pre-school at some point while it was less than 4% for rural children. Also private pre-schools are the main option (over 70%) for all groups and that access to private pre-schools strongly favors the more advantaged urban groups. Being unable to pay fees was the main reason for not sending their children to pre-school. Young Lives (2013) also confirmed that few Ethiopian children attend pre-school, and those who do are typically in urban areas from better-off families. Tassew (2011) also argued that public investment in pre-school education in Ethiopia is currently insignificant where the majority of activities are rather left for the private sector. Recently, a new modality has been introduced where elementary schools are expected to handle pre-school education ('O' level) side by side with the primary level.

Though many writers have argued for the multifaceted advantages of pre-school education, there are few studies in Ethiopia (see Woodhead, 2009; Tassew, 2011; Young Lives, 2013) and the argument in Ethiopia is not sufficiently supported with empirical evidences. Evidence based research provides information for policy makers and practitioners so as to give due emphasis for expansion of pre-school education. The purpose of this study, therefore, is to critically look at the impact of attending pre-school education on the academic performance of grade 8 students in their regional examination.

Research Objective and Hypothesis

This research intended to investigate the effects of pre-school education on the academic achievement of students in their regional examination. To that end, the following hypotheses have been formulated.

- H_O1: Having pre-school educational experience has no statistically significant effect on academic achievement of students in regional examination
- H_O2: Parents' educational level has no statistically significant association with the extent of enrollment of their children in pre-school education.
- H_O3: Parents' occupational status has no statistically significant association with the extent of enrollment of their children in pre-school education.

Materials and Methods

Description of Study Area

The study was conducted in South Wollo, Ethiopia, which is one of the twelve administrative zones in Amhara National Regional State (ANRS), located in the Southeastern part of the region between $10^0$10'-$11^0$41'N and $38^0$28'-$40^0$05'E. It is bordered on the South by North Shewa zone, and Oromia region, on the west by East Gojjam Zone, on the Northwest by South Gonder zone, on the north by North Wollo zone and on the East by Afar region (BoFED, 2009). According to Dessie city Administration Educational Office annual report (2014), during 2014 academic year, there were 28 pre-school schools in Dessie town. Of these schools, only 5 (18%) of them were run by the government while 23 (82%) of them were either privately owned or administered by religious institutions. This disproportionate percentage clearly demonstrates how pre-school education in the city is monopolized by private institutions. In the same period, there were 3802 (51.5% male and 48.5% females) students attending pre-school education in Dessie town, slightly favoring males. Out of these students, 3218 (84.6%) were attending their pre-school education in private schools while only 584 (15.4%) were in government owned schools.

Research Methods and sources of Data

Survey descriptive research design (using already existing data) was employed in carrying out this study. Grade 8 regional Examination results of 2014 academic year (standardized examination result obtained from Dessie city administration educational office) were used as a source of data in this study. Grade 8 regional examination is considered as exit examination for entrance of secondary level. Regional results are preferred to the school based examination results because standardized admissions tests are good predictors of students' achievement (Lauzon, 2001) and can measure performance more consistently than examinations prepared at school level. School based tests may reflect the effects and biases of the instrument (EACEA, 2010). Hence, standardized regional examination results were used to examine the impact of pre-school experience of students on academic achievement. Information on students' background was collected using a structured questionnaire with the help of school principals. Key informant in-depth interview with school principals using a semi-structured questionnaire and informal interview with parents were conducted to substantiate the analysis.

Target Population, Sampling Procedures and Samples

Target populations for this study were grade 8 students of junior secondary schools from Dessie city administration. Students were selected proportionally using a semi-stratified sampling method. From the list of private and government junior secondary schools in Dessie, 13 out of 29 schools (7 government and 6 private) were selected using a simple random lottery method. From these selected schools, one section of each school was selected randomly and all students of the selected section have been included in the study. Finally, the results of 538 randomly selected students were analyzed.

Data Analysis and Interpretation

After the necessary data were collected from master roster, tabulation and analyses were carried out using SPSS version 20. Different statistical methods were employed for analysis purpose. Comparisons based on the proportion of the top ten and bottom ten percent achieving groups were done using percentage and chi-square tests. An independent-samples t-test was used to test the mean difference in regional examination result between students who had attended pre-school education and who had not. Chi-square test was applied to examine the degree of associations between parents' educational level and occupational status with the propensity of enrollment of their children in pre-school education. Linear regression was used to examine the impact of attending pre-school education on students' result when other factors are taken into consideration. In order to substantiate the quantitative analysis, qualitative data obtained from key informant interview was incorporated. Finally interpretations of the results and plausible recommendations have been drawn based on the major findings of the study.

Results

This section examines the impact of attending pre-school education on the performance of students in regional examination. In addition, it assesses the association between educational level and occupational status of parents with the degree of enrollment of their children in pre-school education.

Table 1: Demographic Characteristics of respondents

School Type	No	%	Sex	No	%	Age category	No	%	KG	No	%
Gov't	295	54.8	Male	263	48.9	12-14	318	59	Yes	328	61
Private	243	45.2	Female	275	51.1	15 & above	220	41	No	210	39
Total	538	100	Total	538	100	Total	538	100	Total	538	100

In table 1, the characteristics of the 538 students (48.9% males and 51.1% females) are shown. The proportion of students from government schools were 54.8% while the remaining 45.2% were from private schools. The gender disparity in enrollment was 1.045 favoring females. 59 % of the students were below the age of 14 years while 41% of them were above 15 years old. The average age was found to be 14.6 years old (*SD* = 1.26). Of all sampled students, 61% had pre-school education experience and the remaining 39% have joined primary grades without having any pre-school education.

Table 2: Independent-samples t-test value of attending pre-school education (KG)

Subject	KG	N	Mean	SD	MD	df	t	p	Cohen's *d*[1]
Average	Yes	328	55.72	11.8	12.16	483*	12.5*	0.00	1.09
	No	210	43.56	10.5					
Amharic	Yes	328	37.70	7.84	8.84	536	12.3	.000	1.08
	no	210	28.86	8.59					
English	Yes	328	28.88	10.6	8.75	536	10.3	.000	0.95
	no	210	20.13	7.8					
Maths	Yes	328	19.07	7.4	5.84	536	9.6	.000	0.87
	no	210	13.23	5.98					
Physics	Yes	328	16.33	5.61	3.43	536	7.3	.000	0.66
	no	210	12.90	4.76					
Biology	Yes	328	31.73	9.96	7.44	536	8.9	.000	0.8
	no	210	24.29	8.54					
Chemistry	Yes	328	30.43	10.08	8.41	536	10.2	.000	0.93
	no	210	22.02	8.1					
Social studies	Yes	328	33.11	7.48	6.30	536	9.2	.000	0.81
	no	210	26.81	8.08					
Civics	Yes	328	47.96	5.68	5.17	536	8.7	.000	0.75
	no	210	42.79	8.14					

*Value for equal variances not assumed is taken (based on Levene's Test for Equality of Variances)

As shown in table 2, an independent-samples t-test compared the mean result of students with and without pre-school education experience was conducted, and found a statistically significant mean difference (($t(483) = 12.5$, $p < 0.001$)) between the two groups. The mean of students with pre-school education was significantly higher ($m = 55.72$, $SD = 11.8$) than the mean of students without the experience ($m = 43.56$, SD = 10.5) in regional examination. The mean difference, according to Cohen's d value is strong (1.09). Similarly, comparison by performance in different subjects revealed statistically significance mean differences in all subjects. The findings are in agreement with research findings of Bibi and Ali (2012), Yoshikawa et al. (2013) and Behsat and Ramazan (2014) who found that pre-school experiences have significant impact on later grade academic achievements. The highest mean differences were observed in Amharic, English and Chemistry followed by Biology and social studies subjects. The effects are strong for Amharic and moderate for remaining subjects. School principals and head of the educational office agreed with the result. According to the views of these individuals, students who had pre-school experiences are outpacing their counterparts. Their language competency is especially admirable. Generally speaking, pre-school education has more effect on language performance. The result supports the finding of Taiwo and Tyolo (2002), Weiss and Offenberg (2002), Magnuson et al. (2007), Yoshikawa et al. (2013) and Bibi and Ali (2012) who asserted that early childhood education enabled to improve children's early language skills. A statistically significant mean difference in English language performance was also found in Nigeria between pupils with formal kindergarten experience and those without such experience (Eweniyi, 2012). Melhuish et al. (2012) also found that attending high quality and effective pre-school benefited students for English and mathematics attainment at age 11 in England.

Table 3: Chi-square test on proportion of top and bottom achieving groups based on their pre-school education experience

1 Cohen's *d* value is calculated based on Muijs (2004:136-137) as Cohen *d*= [(Mean$_1$ – Mean$_2$)/pooled standard deviation] where pooled standard deviation is the average of the standard deviations of the two groups. 0-0.2 (weak effect); 0.21-0.5(modest effect); 0.51-1(moderate effect) and greater than 1.0(strong effect)

Table 3 shows that, comparison between the proportions of top ten and bottom ten percent achieving groups in terms of their experience of pre-school education revealing that 90.7% of top ten achievers have experiences of pre-school education while only 9.3% of that group is without any pre-school education. In the contrast, the proportion of students with pre-school education experience in the bottom ten achieving groups was only 20.4% with 79.6% having no experience of pre-school education. A chi-square test of independence compared the proportion of students having pre-school education and those with no experience in the top and bottom achieving groups. A statistically significant association was found (χ^2 (1) = 54.15, $p < 0.05$) with a strong V value (0.708, $p < 0.05$). Students with pre-school education were more likely to be represented in the top and less likely to be the bottom than expected and the opposite was true for those students without the experience. This is good evidence supporting the findings of (Bibi and Ali, 2012) who disclosed that pre-school education contributes to better academic achievement of students in their later grades. Young Lives study (2013) also found that 18% of the children who attended pre-school in Ethiopia were reported to perform excellently in primary school as compared to 10% of the children who had not.

Linear regression analysis was undertaken to examine the effect of attending pre-school education with students' average result in regional examination when other factors like parent SES, personal and school related factors are taken in to account. The variables were coded as: attending KG (1 = yes; 0 = otherwise); Mother and fathers education (1 = no formal education, 2 = grade 1 up to 8, 3 = grade 9 up to 12 and 4 = above grade12); school type (1 = government, 2 = private); sex of student (1 = male , 2 = female); Mother and father age (1 = less than 45 years old, 2 = otherwise); father and mother living together (1 =yes, 0 = otherwise) and average study time per day (1 = less than 2.3 hours, 2 = above 2.3 hours).

Table 4: Linear regression result (based on regional average result)

ANOVA						R	Adjusted R square
	Sum of Squares	df	Mean Square	F	Sig.		
Regression	42383.460	8	4709.273	54.71	.000	0.699	0.48
Residual	44327.352	516	86.073				
Total	86710.811	524					

Variables	Beta	t	Sig.	Collinearity Statistics	
				Tolerance	VIF
(Constant)		6.991	.000		
Attending Kindergarten	.097	2.495	.013	.660	1.514
Mother education	.184	4.015	.000	.472	2.118
School type	.475	12.271	.000	.663	1.509
Father's age	.058	1.679	.094	.834	1.199
Mother's age	-.034	-.998	.319	.847	1.181
Average study time per day	-.007	-.217	.829	.985	1.016
Sex of the student	.021	.670	.503	.991	1.010
Mother and father live together	.067	2.063	.040	.937	1.067
Father education	.115	2.512	.012	.475	2.106

Table 4 shows, the overall regression model was statistically significant (F (8, 516) = 54.71, $p < 0.001$) indicating that at least one or more of the independent variables have a significant relationship to the dependent variable. Overall predictor variables determine 48% of the variation in average result. Furthermore, attending pre-school education, educational status of parents, school type and being father and mother live together were found to be statistically significant ($p < 0.05$) in determining students' academic result in regional examination. This result clearly revealed that, having pre-school education experience has an impact even when other factors are also taken into consideration (standardized beta = 0.097, $p < 0.05$). Other things being constant, attending preprimary education will increase average result in regional examination by a factor of 0.097 ($p < 0.05$).

Socio-economic status of parents has been worth mentioned often (Woodhead et al., 2009; Tassew, 2011; Farooq et al., 2011; Al-Matalka, 2014) as a major factor affecting the enrollment rate of children in pre-school education. Analyses were conducted to investigate the association between parents' educational level and occupation status (most commonly mentioned socio-economic indicators) and propensity of enrollment of their children in pre-school education using chi-square test of independence.

Table 5: Chi-square test on association between Parents' Education and pre-school Attendance

	Father								Mother							
	Attending KG			Chi-square value					Attending KG			Chi-square value				
Educational level	Yes	no	Total	χ^2	df	p	V	p	Yes	no	Total	χ^2	df	p	V	p
No formal education	28	60	88						39	68	107					
1-8 grade	76	94	170						90	101	191					
9-12 grade	77	25	102	97.67	3	0.00	0.43	0.00	101	24	125	94.15	3	0.00	0.42	0.00
above 12 grade	145	28	173						97	15	112					
Total	326	207	533						327	208	535					

As depicted in table 5, a statistically significant association was found in for both fathers and mother education with extent of enrollment of their children in pre-school education ((χ^2 = 97.67, *df* =3, N=533, $p < .001$, V=0.43) for fathers; and (χ^2 = 94.13, *df* =3, N=535, $p < .001$, V=0.42) for mother)). The propensity of sending their children to pre-school education increases with increasing of the level of education of mothers and fathers. The 'V' value indicates the presence of strong association between the enrollment of children in pre-school education and their parents' level of education.

Table 6: Chi-square test on association between Parents' Occupations and pre-school Attendance

	Father								Mother							
	Attending KG			Chi-square value					Attending KG			Chi-square value				
Occupational status	Yes	no	Total	χ^2	df	p	V	p	Yes	no	Total	χ^2	df	p	V	p
Salaried employment	104	24	128						69	17	86					
Merchant	81	48	129						76	23	99					
No permanent employment	23	37	60	38.72	3	0.00	0.27	0.00	78	63	141	36.77	3	0.00	0.26	0.00
Others*	115	95	210						104	105	209					
Total	323	204	527						327	208	535					

*Others include farmers, retired ones and the like

Similarly table 6 shows, a statistically significant association for both mother and father occupation with extent of enrollment of their children in pre-school education ((χ^2 = 38.72, *df* =3, N=527, $p < .001$, V=0.27) for fathers; and (χ^2 = 36.77, *df* =3, N=535, $p < .001$, V=0.26) for mother). The propensity of sending their children to pre-school education with salaried occupation and for merchants is higher than other groups. The 'V' value indicates the presence of moderate association between the enrollment of children in pre-school education and their parents' occupational statuses. As compared with educational level of parents, the influence of occupation is moderate. Similar finding by Farooq et al. (2011) and Al-Matalka (2014) have disclosed that educational level of the parents has greater impact than parental occupation and income in students' enrollment in pre-school classes.

Discussion and Conclusion

A study in Ethiopia (Woodhead et al., 2009) disclosed that pre-school attendance is negatively associated with poverty, strongly disadvantaging the poorest groups. Only 5% of the poorest children had access to some kind of pre-school, compared to 57% of the most advantaged group in the sample. Mothers' and fathers' own education levels are associated significantly with enrolling their children in pre-school. Tassew (2011) also underlined that pre-school education in Ethiopia is dominated by fee charging kindergartens so that children from low socioeconomic background have very little opportunity to attend this crucial stage of education. Two diploma holder civil servants, during informal interview, have said that the payment for private schools is beyond their capacity and they do not send their children to pre-school schools. They added that, government has to find alternative options which give room for low and middle income classes. Another government worker said that, even though the payment is high for civil servants, he has decided to send his 5 years old daughter to private schools hoping that private schools are better in their facilities and education. One private school owner also agreed saying that, even though most students are from better-off families, there are also students from middle economic families.

Available evidences suggest that early childhood education has a positive effect on educational development of children in later life. Pre-school education in Ethiopia is found in its infancy stage with a high concentration in urban areas. This study found that having pre-school education has a significant association with academic achievement. On average, students with pre-school education have outpaced their counterparts by 12 points even allowing for background factors. On the other hand, the proportion

of being in the top achieving group for students with pre-school education was significantly higher as compared with students who had no experience. Families with high socioeconomic status have more success in preparing their young children for school because they typically have access to a wider range of resources to support young children's mental and physical development. In contrast, parents with low socioeconomic status find themselves struggling to augment financial resources and lack time for their children in imparting values. In this study, socio-economic statuses of parents (mainly educational level and occupational status) were found to be a determinant factor for sending children to pre-school education. Children from better-off and educated families had better opportunity to harness the benefits of pre-school education. Following these findings, the three initial hypotheses have been rejected; pre-school education has impact on later academic achievement of students and parents' socio-economic statuses have implication on enrollment in the program.

Recommendation

Considering the multifaceted benefits of pre-school education for the overall development and academic performance of students in their later life, there is the need of coordination among stakeholders at all levels to expand the service mainly for the rural and poor population. Pre-school education in Ethiopia is largely left for the private sector where low and middle income families have little opportunity. Additionally the service is restricted to urban areas and rural people did not have access. As a result, early childhood education should be encouraged by the government by providing pre-school educational facilities as of the primary and secondary levels (particularly for the low and middle income classes as well as rural people) besides the involvement of the private sector. Further study with a large sample and wider geographical area should be conducted to reach a reliable conclusion. Moreover, rigorous study has to be conducted to evaluate the long lasting effect of pre-school education in academic achievement of students in higher grade levels and national examination results.

Limitation

The following limitations should be taken in to considerations while using the findings of the study. The first limitation is that, some factors that may have an impact on academic achievement were not controlled while testing the effect of pre-school education on academic achievement. Secondly, the samples were taken from one geographical area which may mean results do not generalize. Thirdly, only two socio-economic factors have been used. Income level, family size and other aspects of socio-economic statuses were not included in the analysis. Lastly, parents' SES refers the current situation not the case when students were at pre-school levels. Therefore, caution is needed while interpreting the findings of this study.

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