Association between executive functions and familial socioeconomic status of primary school children of Nepal: A Cross-sectional study.

Sourav Manna[1*], Dayaram Ghimire[1], Anirban Majumder[1], Shyambabu Rauniyar[2], Nirdhan Yadav[3]

[1]Department of Physiology National Medical College Birgunj,Nepal

[2]Department of Anatomy National Medical College Birgunj,Nepal

[3]Department of Biochemistry National Medical College Birgunj,Nepal

Abstract:

Socioeconomic status was strongly associated with the achievement of executive function of the children during childhood. The purpose of the study was to investigate the influence of socioeconomic status (SES) on executive function among the primary school children. Cross sectional study was conducted on 850(422 boys and 428 girls) primary school children. The socioeconomic status was evaluated by modified Kuppuswami scale. The subjects were divided into upper, middle and lower economic groups. The executive functions of the children were evaluated by methods of colour trail test (CTT), Colour cancellation test (CCT), Picture Completion test (PCT), and Phonemic fluency test (FAS). Results revealed that the score belongs to lower socioeconomic group was significantly lower compared to children of middle and upper economic group. SES was significantly($p<0.001$) and positively correlated with PCT and FAS and negatively correlated with CTT and CCT. Multiple regression analysis demonstrated that after adjusting the effect of age, height, weight and BMI, the SES had significant impact on the executive functions of the children.

Keywords: Cross sectional study, Socioeconomic Status, Executive functions

Introduction

The executive functions consist of a large number of skills that occurs in an integrate manner which enable individual for performing voluntary actions. Such voluntary actions are self-regulatory and self-organized (Banich 2009; Fuster 2002). It was demonstrated that executive functions consist of core competencies such as working memory- the ability of individual to hold the complex information in mind (Sarsour et al.2011.,Diamond 2013), inhibition – it is the ability the well learned response for proper well appropriate response(Barkley 2001) and cognitive flexibility- it is the ability of individual to change the behaviour according to changes of the situation.(Davidson et al., 2006; Diamond, 2006 ,Diamond 2013). It was highlighted that the definition of executive functions changes according to changes in the degree of weight in either process control of working memory, inhibition, or other components (Weyandt 2005). The progressive development of inhibitory function occurs in prefrontal areas of the brain. (Sarsour et al.2011). It was noted that the improvement of inhibiting behaviours in younger children are less efficient as compared to that of older children and indicated that improvement of inhibiting activity is faster in older children (Brocki and Bohlin, 2004., Piccolo et al.2016).

The prefrontal cortex (PFC) and its widespread connections with other different regions of brain are measured to be the neural substrate for executive functions (Fuster, 1997., Sarsour et al.2011) through which the different environmental stimulus are processed by PFC. The prolonged maturation and development of PFC after postnatal period are indexed by synaptopgenesis, neural prunning and myelination. (Devison et al.2006.,Diamond 2002,2006). It was stated that PFC is highly sensitive to the environmental stimuli and the development of executive functions are the results of the interaction between PFC and the environmental stimuli (Diamond et al. 2007., Diamond 2009)

Socioeconomic status (SES) of a person depends upon the level of income and other social factors (Manna et al.2016). However, economic status is a major factor which is related to the SES. Socioeconomic status refers to an individual's position within a social structure (Manna et al.2016). It is one of the important determinant factors for the health status. Socioeconomic status is the combination of the social and economic variables(Hackman et al. 2010., Lipina and Segretin, 2015.,Manna et al.2016).

In multiple researches, it was well documented that there was a relation between family SES and children outcome. Family SES was associated with numerous physical health outcome which was risk factors for adult morbidities. (Chen et al.2002., Sarsour et al.2011). It was found from the studies that childhood poverty influences a broad range of child outcomes such as physical health, cognition, achievements in school, emotion, and behavioural domains. (Sarsour et al.2011). Lower SES is associated with poor school achievements as explained in different studies (Currie, 2005; Malecki & Demaray, 2006; Marks, 2006; Toutkoushian & Curtis, 2005), and poor performances specifically in math (Case, Griffin, & Kelly, 1999) and language skills (Hoff, 2003; Raviv, Kessenich, & Morrison, 2004), along with increment of psychopathology and mental illness in the children. (Essex et al., 2006; Tuvblad, Grann, & Lichtenstein,2006).

Rrecent study of neuroscience had indicated that SES had strong significant influence on executive functions of the children. (Hackman & Farah (2009., Hackman, Farah, & Meaney (2010). Disparities in SES and its effect on executive functions have been widely documented (Lipina et al.2005., Sarsour et al.2011) . Higher socioeconomic status was associated with better executive function. (Lipina et al.2004., Mezzacappa 2004.,Hughes and Ensor,2005.,Blair et al.2011.,Wiebe et al.2011)). Several researchers had pointed out that prefrontal cortex of the brain is the site for executive function which undergoes a continuous change for long period during post-natal development (Casey et al.2000) and PFC was particularly influenced by the experiences in childhood (Casey et al.2000). Event-related potentials (ERPs) studies that measures brain activity via electrodes on the scalp demonstrated that neural processing in the prefrontal cortex varies with socioeconomic status. (D'Angiulli 2011.,Stevens et al.2009) Lower socioeconomic group children have limitations in selective attention as compared to children of higher socioeconomic status.(D'Angiulli 2011.,Stevens et al.2009).

Different environmental factors such as stress, cognitive stimulation at home, prenatal education, occupation and nutrition were found to vary along with socioeconomic status that contributes in executive functions. (Bradley and Corwyn,2002., Evans 2004).

Discussion above clarifies that majority of the studies were conducted in western population and only few from India. Not a single study was found in the literature that was conducted in Nepal. In order to fulfil these

lacunae, in the present study, some efforts have been given to evaluate the effect of socioeconomic status on executive functions in different socioeconomic gradient of primary school children of Bara, Parsa and Rautahat districts in Nepal.

Methods

Organization of Study and design:

The cross-sectional study was performed for approximately one and half years from August 2017 to January 2019. The data used were obtained from the different schools of Bara, Parsa and Rautahat districts in Nepal. Nepal is situated on the lap of Himalaya and it is stretching from east to west. It is located between 80^0 and 89° east longitudes and 26° and 31° north latitudes. It is 48^{th} largest populous and 93^{rd}largest country by area. Nepal have 26.4 million population. Major ethnic group in Nepal are Sherpa, Gurung, Thakali, Tamang Rai, Limbu, Tharu, Newar, Bhramin, Chhetri, Chepang, Magar. Hindus are forming the demographic majority. It is landlock country in south asia. East, West and Southern part of Nepal is surrounded by India and its Northern border is China. Nepal's climate is influenced by maritime and continental factors, and has four distinct seasons. Spring lasts from March to May, and is warm with rain showers, and temperatures around 22°C. Summer, from June to August, is the monsoon season when the hills turn lush and green.

Participants:

850 children with 422 boys and 428 girls within the age range (5 to 10 years) were eligible for all executive function were measures during data collection. The mean age of the boys were 7.47 years (SD 1.64), and girls were 7.51 years (SD 1.72). The consent was taken from the school as well as form the parent prior to the experimental trial. The protocols of the experiments were explained verbally in both national and local languages (Nepali and Bhojpuri). All the experimental measurements were taken on the same day or another day as per their agreement by fixing prior appointments. Ethical approval and prior permission were obtained from the institutional Ethics Committee before commencement of the study and the experiments was performed in accordance with the ethical standards of the committee and with the Helsinki declaration. Apparent healthy children, 5- 10 years of age, not suffering from any acute illness and physical deformities were recruited as participants in this study. The children suffering from neuropsychological disorder and using antipsychotic drug for a long period of time were excluded from this study.

Measurements

Socioeconomic status:

The socio-economic status (SES) of the study participants were evaluated by modified Kuppuswami scale (Ghosh and Ghosh,2009) by considering the level of education, occupation and economic condition of the family that has been expressed in terms of socioeconomic Scale. The socioeconomic status was resolute by the scores which has been suggested in this scale. The score obtained by each participant from education, occupation and income that were added up to obtain the final score. The subjects were categorized into three socioeconomic groups on account of SES scores, as shown below:

SES score 1-15: lower socioeconomic group.

SES score 16-25: middle socioeconomic group.

SES c score 26-29: upper socioeconomic group.

Sociodemographic factor

A pre-structured schedule questioner containing different sociodemographic variables (Parental years of education, Parental income, parental occupation, family size) was used to determine sociodemographic status of the study participants. The score of parental years of education was determined by interviewing the parents of their educational level (Noble et al.2015).

According to their educational level the score was given as such.

Educational Level	Years	Score
Post graduate	17	17
Graduate	15	15
Post high school diploma	12	12
High school certificate	10	10
Middle school certificate	8	8
Primary school certificate	4	4
Illiterate	0	0

The score of parental occupation was resolute by interviewing the parents of their occupation by questionnaire methods. The occupational score of the parents was determined by modified Kuppuswami scale (Ghosh and Ghosh, 2009)) as presented below:

Occupation	Score
Profession	10
Semi Profession	6
Clarical,Shop- Owner,Farmer	5
Skilled worker	4
Semi skilled worker	3
Unskilled worker	2
Unemployed	1

Parental income was scored by asking the parents of their monthly income. On the basis of monthly income of parents, the income score was determined according to modified Kuppuswami scale (Ghosh and Ghosh 2009) of socioeconomic status which is shown below:

Monthly income in NPR	Score
≥ 45751	12
22851-45750	10
17151-22850	6
11451-17150	4
6851-11450	3
2301-6850	2
≤ 2300	1

The score of family size was determined by interviewing the parents about the number of members in their families. The score was as follows:

No of member in family	Score
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

Executive Functions

Colour trails test (D'Elia 1986):

This test measures focused attention and conceptual tracking. The participants were instructed to s connect the numbers 1–25 printed in two colours irrespective of the colour on colour trails. The student required to connect the numbers from 1 to 25 alternating between pink and yellow circles and disregarding the numbers in circles of the alternate colour on colour trails. Time taken to complete each part was the score.

Colour cancellation test (Kapur 1974)**:**

This test measures of visual scanning /selective attention. This test consists of 150 circles in red, blue, yellow, black and grey. The participants were instructed to sort out only the yellow and red circles as quick as they can. Time taken in seconds to complete the test comprised the score.

Picture completion test (Malin 1969)**:**

This test measures of visuoconceptual ability, visual organization and visuo-conceptual reasoning. It consists of 20 cards with pictures of different objects with a missing feature. The participants are required to name or point out to the missing feature. Number of correct responses comprised the score,

FAS phonemic fluency test ***(***Thais et al.2009**)**

The participants were instructed to generate as many words that begins with letters "F'', "A" and "S" within a 1-minute period for each letter, excluding proper nouns such as people's, city and country names and the same word with a different suffix. The following instructions were given: "If it is said wills a letter of the alphabet. Then, the subjects have to give answers as many words the subject say that begin with this letter, as quickly as possible. For example, if it is said B, the subject has to say bed, big, but they can't say proper nouns like Brazil or Beatriz. Also subject can't say the same word with a different ending". Subsequently, the subjects were asked if they had understood these instructions. Words with one, or more than one meaning were also considered, if the subject pointed out the alternative meaning. Words in other languages that were included in the Bengali Dictionary and widespread words even if not in the dictionary also counted. When the participant corrected their response, this was not considered an error. The final score only included correct answers. The following items were considered errors: intrusions (i.e.: when appropriate answers for a letter were given, but inappropriate in terms of letter used at that time; perseverations (i.e. same words were repeated twice or more); derivations (i.e., words that were varied in number, size, gender and verb conjugations).

Statistical approaches

Descriptive statistics, along with means and standard deviations, were calculated for all the variables that are included in this study. Pearson's correlation coefficient (r) was computed to find out the relationship between all the variables. One-way ANOVA were carried out to find out the differences in executive function across different socioeconomic groups. To address for confounding, regression analyses was undertaken. Socioeconomic status of the participants was entered into regression model as a independent variables against parameters of executive function. P-value set at <0.05 level. Statistical analyses were performed using the statistical software IBM SPSS version 20.

Results:

Assessment of socioeconomic status (SES) of a person or a population is an important aspect in community-based studies because it is an important determinant of health and nutrition of an individual. Assessment of SES of a family would mean categorization of the family in respect of different variables such as, education, occupation, economic status, etc. In the present study the socioeconomic status of the primary school children was assessed by modified Kuppuswami scale (Ghosh and Ghosh 2009) considering the literacy level, occupation and economic condition and was expressed in terms of literacy level and socioeconomic status. The children were divided into three socioeconomic groups, viz., lower, middle and upper according to the norms of Kuppuswami scale.

The frequency and percentage of socioeconomic status of primary school children has been presented in Table 1. It was shown that out of 422 boys about 34.83 % , 26.54 % and 38.38 % of male children were belonging to lower, middle and upper socioeconomic status respectively. On the other hand, out of 428 girls about 29.67%, 28.50 % and 41.82 % girls were belonging to lower, middle and upper socioeconomic status respectively.

Table 1: Frequency (f) and percentage (%) of the children in different socioeconomic statuses

		Socioeconomic status		
Boys (n=422)		Lower	Middle	Upper
	F	147	112	163
	%	34.83	26.54	38.38
Girls (n=428)	F	127	122	179
	%	29.67	28.50	41.82

The performance scores of different cognitive parameters of both boys and girls have been presented in Table 2. From the results it was revealed that mean scores of cognitive parameters such as colour trail test (CTT), colour cancellation test (CCT) were found to be decreased from lower to higher socioeconomic status, indicating improvement of cognitive ability with betterment of socioeconomic condition of the children as those were time parameters. Other cognitive parameters also showed improvement in cognitive functioning, as the sores of different tests, viz., Picture completion test (PCT), FAS phonemic fluency test (FAS), were gradually increased from different socioeconomic gradients.

Table 2: Mean ± SD and ANOVA of different cognitive parameters among different socioeconomic groups of primary school children

Cognitive parameter	Lower economic group		Middle economic group		Upper economic group		F -ratio	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Colour trail test (CTT)	160.58 ±66.0	151.26 ±67.61	96.60 ±30.54 ***	89.08 ±24.48 ***	82.50 ±28.41 *** ###	82.21 ±34.16 *** #	129.67 $$$	105.52 $$$
Colour cancellation test (CCT)	166.23 ±65.88	145.27 ±54.34	99.55 ±32.47 ***	93.29 ±24.85 ***	91.32 ±39.62 ***	85.64 ±37.84 *** #	107.29 $$$	94.40 $$$
Picture completion test (PCT)	2.85 ±1.03	2.91 ±1.08	3.90 ±0.89 ***	3.82 ±1.05 ***	3.95 ±0.80 ***	3.95 ±0.85 ***	67.81 $$$	49.25 $$$
Fas phonemic fluency test (FAS)	2.27 ±1.57	1.96 ±1.51	3.83 ±1.89 ***	3.98 ±1.81 ***	4.54 ±2.50 *** ##	4.42 ±2.61 *** #	48.74 $$$	57.63 $$$

w.r.t. Lower economic gr : * p<0.05, ** p<0.01, *** p<0.001, , w.r.t. Middle Economic gr: # p<0.05, ## p<0.01, ### p<0.001 F ratio: $$ $ p<0.001

The ANOVA was computed to find out significant variation between different socioeconomic gradients. The results of ANOVA showed that there were significant variations ($p<0.001$) within the different socioeconomic gradients. Post hoc analysis demonstrated that the boys and girls of primary school belonging to lower socioeconomic status had lesser performance scores compared to that of middle and upper socioeconomic status. On the other hand, the participant belonging to upper socioeconomic status showed significantly ($p<0.001$) greater scores than rest of the socioeconomic group.

The results of correlation coefficients of the scores of different cognitive parameters with composite score of socioeconomic status of the children have been shown in Table 3. From the results it was noted that all the score of cognitive parameters were significantly ($p<0.001$) and positively correlated with socioeconomic status except CTT and CCT. A significant ($p<0.001$) negative correlation was observed between socioeconomic status and CTT and CCT.

Table 3: Correlation coefficient of cognitive skill with socioeconomic composite score

Cognitive parameters	Boys	Girls
Colour trail test (CTT)	-0.610*	-0.572*
Colour cancellation test (CCT)	-0.553*	-0.565*
Picture complitation test (PCT)	0.489*	0.446*
Fas phonemic fluency test (FAS)	0.518***	0.473***

***p<0.001

Correlation coefficients of the score of different cognitive parameters with different socioeconomic factors and family sizes have been shown in Table 4. From the results it was noted that all the cognitive parameters, were significantly ($p<0.001$) and positively correlated with different socioeconomic factors, except with family size, CTT and CCT.

The CTT and CCT had significant negative correlation ($p<0.001$) with different socioeconomic factors except with family size.

Table 4: correlation coefficient of cognitive parameter with different socioeconomic factors

Socio-economic factors	Colour trail test (CTT)	Colour cancellation test (CCT)	Picture completion test (PCT)	Fas phonemic fluency test (FAS)
Parental yrs of education	-0.429***	-0.386***	0.282***	0.262***
Parental occupation	-0.366***	-0.353***	0.278***	0.285***
Parental income	-0.360***	-0.353***	0.279***	0.277***
Family size	0.368***	0.356***	-0.226***	-0.223***

***p<0.001

It was noted that the family size had significant positive correlation ($p<0.001$) with the scores of CTT and CCT where as it was significantly ($p<0.001$) and negatively correlated with rest of the cognitive parameters.

Linear regression analysis of socioeconomic status with the score of cognitive skills of both boys and girls has been presented in Tables 5 and 6 respectively. It was observed from the results of regression analysis that socioeconomic status (SES) had significant ($p<0.001$) association with the score of different cognitive parameters.

Table 5: Regression analysis of socioeconomic status as independent variable and cognitive parameters are dependent variables (Boys)

*

Variables	**Unadjusted**						**Adjusted#**			
	B	**SeB**	**B**	**R^2 change**	**F change**	**T**	**B**	**SeB**	**B**	**T**
CTT	-4.68	0.293	-0.607	-0.368	256.44	-16.01***	**-4.175**	**0.361**	**-0.541**	**-11.55*** **
CCT	-4.38	0.320	-0.547	0.299	187.85	-13.70***	**-3.54**	**0.403**	**-0.442**	**-8.79*** **
PCT	0.069	0.006	0.48	0.235	135.37	11.63***	**0.055**	**0.007**	**0.386**	**7.42*** **
FAS	0.168	0.013	0.520	0.271	163.47	12.78***	**0.113**	**0.015**	**0.352**	**7.69*** **

**p<0.001 # after adjusting age , height, weight, and BMI

[CTT- colour trail test, CCT- colour cancellation test, PCT- picture completion test, FAS - Fas phonemic fluency test]

Table 6: Regression analysis of socioeconomic status as independent variable and cognitive parameters are dependent variables (Girls)

Variables	**Unadjusted**						**Adjusted#**			
	B	SeB	β	R^2 change	F change	T	B	SeB	B	T
CTT	-4.17	0.279	-0.573	0.328	223.79	-14.96***	**-3.29**	**0.343**	**-0.453**	**-9.61*** **
CCT	-3.66	0.250	-0.566	0.320	215.47	-14.67***	**-2.83**	**0.308**	**-0.437**	**-9.20*** **
PCT	0.066	0.007	0.446	0.199	113.77	10.66***	**0.056**	**0.007**	**0.378**	**7.42*** **
FAS	0.150	0.013	0.473	0.224	132.31	11.50***	**0.115**	**0.015**	**0.363**	**7.61*** **

***p<0.001 # after adjusting age, height , weight, BMI.

[CTT- colour trail test, CCT- colour cancellation test, PCT- picture completion test, FAS - Fas phonemic fluency test]

The result of multiple regression analysis demonstrated that after controlling for the effect of the age, height, weight, and BMI, it was found that SES had significant impact on the cognitive parameters. Therefore, socioeconomic status might be one of the important confounding factors for the variability of the cognitive performances.

Discussion

The result of the present study showed that executive function such as, visuospatial function (PCT) and phonemic verbal fluency (FAS) of the children had strong and positive correlation ($p<0.001$) with socioeconomic status. The attention parameters (CTT, & CCT) were negatively ($p<0.001$) correlated with socioeconomic status. The lower score in CCT and CTT indicated improvement in performance. Thus, it pointed out that the attention, visuospatial function and phonemic verbal fluency might be increased with the improvement of SES. Our results were in conformity with the result of Farah et al. (2006)., Noble et al. (2007) suggested that attention and visuospatial function of the children was positively correlated with socioeconomic status. It was found from the results that performances of the tests of attention and visuospatial function of the children gradually increased with the improvement of parental socioeconomic gradient.

Roza et al. (2010) investigated on the effect of socioeconomic status and stress reactivity impact on neuro cognitive performances of children and they suggested that children with a younger age and low SES exhibited lower cognitive performance compared with older children with a high SES when the children were 6 years old. At 16 years of age, however, the result was the opposite. Children with low SES exhibited better selective attention than children with high SES. These results, however, might have been influenced by the fact that each age group had a few participants and the fact that children with low SES were more likely to leave school or refuse to participate in research because of their cognitive deficits.

Amza (2013) and Noble et al. (2007) investigated the effect of socioeconomic status on brain development demonstrated that SES on five basic cognitive systems: language, executive function, memory, spatial cognition, and visual. Middle-class children performed better than low-income peers on language, memory, and executive function such as fluency test and visuospatial function.

Several researches focused specifically on the neurocognitive effects of poverty helps to further clarify possible changes in the brain, with different studies providing evidence of SES influences on executive function (Hanson et al. 2012). It was established that frontal lobe had been implicated in executive functions such as planning, impulse control, and control of attention (Stuss 2011). It was reported that this brain region also had a protracted course of post-natal development and might be particularly vulnerable to the effects of early stress and experience (Toga et al. 2006). Additionally, alterations in the frontal lobe might be particularly important for the elevated rates of learning, behavioural, and health problems of children from low SES backgrounds was suggested. The results of longitudinal research suggested that increased duration of a child's exposure to poverty was related to greater deficits in executive function and working memory in adulthood (Evans et al. 2009). Further work examining SES, behavioural performance, and the neural correlates of selective attention had found differences in evoked brain activity.

Electroencephalographic study of D'Angiulli et al. (2012) showed that children with higher SES had greater differentiation of event-related potentials between relevant and irrelevant stimuli in a task of detecting sequences of tones compared with children with low SES who had hypo activity in medial frontal regions. Other studies on EEG showed that young children from lower-SES backgrounds display lower electrical activity when deploying different aspects of selective attention, a cognitive process dependent on the frontal lobe (D'Anguilli et al. 2008., Stevens et al., 2009).

Low SES environments influence the rate of human infant brain development. Infants, toddlers and preschoolers from lower income families began their lives with similar gray matter brain volumes but had lower total gray matter compared with those from middle and high-income households by toddlerhood (Hansons et al. 2013). A large body of research has found the frontal lobe is centrally involved with executive functions such as planning, impulse control, and control of attention (Stuss 2011). Previous research established that the parietal lobe was important for sensory integration and aspects of visual attention as well as responsible for visuospatial functioning (Blakemore 2005). Development of the parietal lobe might be particularly important for connectivity between brain regions and it was also established that the volume of parietal lobe was decreased in the children of the family of lower socioeconomic status and therefore visuospatial functioning activity also was decreased in the children of the family of the lower socioeconomic status (Hansons et al. 2013). In regards to neurobiological mechanisms, the differences in volume might be due to neuronal remodelling, rather than birth of new neurons (or neurogenesis) (May, 2011., Zatorre 2012). Volumetric differences associated with environmental experience were likely related to an increase in synapses along with increases in supportive tissue, including both capillaries and glia (Anderson 2011).

It was found from results that different socioeconomic factors such as parental years of education, occupation, income and finally numbers of family members were directly correlated with different cognitive parameters. Desforges and Abouchaar, (2003) suggested that parental involvement was influential element that provoked the positive development of learning and educational output of the children. Desforges and Abouchaar, (2003) reported that parental involvement takes many forms including good parenting in the home, including the provision of a secure and stable environment, intellectual stimulation. Low Socioeconomic families were least likely to be involved in their students' education (Turney and Kao, 2009., Ratcliff and Hunt, 2009., Van Velsor and Orozco, 2007). Low Socioeconomic families were often working all of the time to take care of their families, and they have no time to participate in their child's education at home (Ratcliff and Hunt, 2009). Based on a study involving low socioeconomic mothers, mothers want to be involved in their child's education, but the other household problems were that they were less comfortable around teachers, and so they do not get involved (Machen, Wilson &Notar, 2005).

Parental education level was also important factors for children educational and behavioural outcomes. Parent's educational level and the parental involvement strategies at home revealed that parent with higher educational level were more involved with their children's studies compared to parents of lower socioeconomic status (Matalka 2014., Piccolo et al.2016). The parents with lower socioeconomic status, their educational level was very poor, so, their involvement in home at their child's study was very less. Parents with high educational level were more involved in discussion on school activities taking by the children at school so that to understand the activities and other things that their children do in school, identifying academic problems at school that being faced by children so that to discuss it with the children, the school teachers and principle in order to find best solutions for these problems (Piccolo et al.2016). They were also more likely to be involved in assisting their children with their homework, and in identifying homework in order to make difficulties easier to them and also to save the time that the children spend in trying to solve and complete their homework. Moreover, they are

more likely to be involved in identifying learning patterns of their children and in determining time limits for their children everyday study activities (Matalka 2014).

Conclusion:

Socioeconomic status was important influential factors for development of executive function of the children. The executive function of the children belonging to lower socioeconomic status was significantly lower than the children of middle and upper socioeconomic status.

Parental years of education, parental occupation and income and family size might be other important determining factors for lower performances of motor ability of the children belonging to lower socioeconomic status. It was evidenced that Stress was very much common in lower socioeconomic children. It might be due to the fact that children living in stressful environment had smaller brain size and fewer cell body and dendrite and synapse. In case of children belonging to higher socioeconomic status might have higher brain volume due to increase number of capillaries and glial cell large no of dendrite and synapse.

Conflict of Interests

The authors declare that there is no conflict of interests.

Acknowledgments

The author would like to thank all primary school children participating in this study. The author also thanks to all primary school teachers and parents of the children.

Funding Information

There is no funding source for this study.

List of Abbreviation

SES- Socio Economic Status, CTT- Colour Trail Test, CCT- Colour Cancellation Test

PCT- Picture completion Test, FAS- Fas phonemic Fluency Test,BMI-Body Mass Index

PFC- Pre Frontal Cortex, ANOVA- Analysis Of Variance, SD- Standard Deviation

INR- Indian Rupee

Reference:

Anderson B.J. (2011): Plasticity of gray matter volume: The cellular and synaptic plasticity that underlies volumetric change. Dev Psychobiol ,53: 456–465.

Azma sheeva. (2013): Poverty and the developing brain:Insight from neuroimaging. Synesis: A Journal of Science, Technology, Ethics, and Policy .4: G40-46.

Banich MT. Executive function: The search for a integrated account. Curr Direct Psychol Sci. 2009; 18:89–94.

Barkley, R.A. (2001). The executive functions and self-regulation: An evolutionary neuropsychological perspective. Neuropsychology Review, 11(1), 1–29.

Blair C, Granger DA, Willoughby M et al. Salivary cortisol mediates effects of poverty and parenting on executive functions in early childhood. Child Development. 2011; 82(6): 1970-1984.

Blakemore S.J., Frith U. (2005): The Learning Brain: Lessons for education.Malden: Blackwell Publishing. p 216.

Brocki KC, Bohlin G. Executive functions in children aged 6 to 13: A dimensional and developmental study. Developmental Neuropsychology. 2004; 26:571–593.

Casey BJ, Giedd JN, Thomas KM. Structural and functional brain development and its relation to cognitive development.Biological Psychology 2000; 54(1-3): 241-257.

Chen, E., Matthews, K.A., & Boyce, W.T. (2002). Socioeconomic differences in children's health: How and why do these relationships change with age? Psychology Bulletin, 128(2), 295–329.

Currie, J. (2005). Health disparities and gaps in school readiness.The Future of Children, 15(1), 117–138.

D' Elia LF, Satz P, Uchiyama C.L, White T. (1996): Florida, Psychological Assessment Resources. Color trails test.

D'Angiulli A., Van Roon P. M., Weinberg J., Oberlander T. F.,Grunau R. E., Hertzman C., Maggi, S. (2012). Frontal EEG/ERP correlates of attentional processes, cortisol and motivational states in adolescents from lower and higher socioeconomic status. Frontiers in Human Neuroscience, 6: 306-312.

D'AngiulliA, Weinberg J, Grunau R, Hertzman C, and Grebenkov P. Towards a cognitive science of social inequality: Children's attentionrelated ERPs and salivary cortisol vary with their socioeconomic status. Proceedings of the 30th Cognitive Science Society Annual Meeting.211-216

Davidson, M.C., Amso, D., Anderson, L.C., & Diamond, A. (2006). Development of cognitive control and executive functions from 4 to 13 years: Evidence from manipulations of memory, inhibition,and task switching. Neuropsychologia, 44(11), 2037–2078.

Desforges C., Abouchaar A. (2003): The impact of parental involvement, parental support and family education on pupil achievement and adjustment: A literature review. Research Report, no.433. Queen'sPrinter, *No.33.*

Diamond A. Executive Functions. Annu Rev Psychol. 2013;64:135–68.

Diamond, A. (2002). Normal development of prefrontal cortex from birth to young adulthood: Cognitive functions, anatomy, and biochemistry. In D.T. Stuss & R.T. Knight (Eds.), Principles of frontal lobe function (pp. 466–503). New York, NY: Oxford University Press.

Diamond, A. (2006). The early development of executive functions.In E. Bialystok & F.I.M. Craik (Eds.), Lifespan cognition: Mechanisms of change (pp. 70–95). New York, NY: Oxford University Press.

Diamond, A. (2009). The interplay of biology and the environment broadly defined. Developmental Psychology, 45(1), 1–8.

Diamond, A., Barnett, W.S., Thomas, J., & Munro, S. (2007).Preschool program improves cognitive control. Science,

Essex, M.J., Kraemer, H.C., Armstrong, J.M., Boyce, T., Goldsmith,H.H., Klein, M.H.,yKupfer, D.J. (2006). Exploring risk factors for the emergence of children's mental health problems. Archives of General Psychiatry, 63(11), 1246–1256.

Farah M.J., Shera D.M., Savage J.H., Betancourt L., Gianetta J.M.,Brodsky N.L., Malmud E.K., Hurt H.(2006): Childhood poverty:Specific associations with neurocognitive development. Brain Res, 1110(1): 166-74.

Fuster JM. Frontal lobe and cognitive development. J Neurocytol. 2002;31(3–5):373–85

Ghosh A, Ghosh T.K.(2009):Modification of Kupuswami's socioeconomic status scale in context to Nepal. Indian Pediatrics,46,1104-1105.

Hackman, D.A., & Farah, M.J. (2009). Socioeconomic status and the developing brain. Trends in Cognitive Sciences, 13(2), 65–73.

Hackman, D.A., Farah, M.J., & Meaney, M.J. (2010). Socioeconomic status and the brain: Mechanistic insights from human and animal research. Nature Reviews. Neuroscience, 11(9),651–659.

Hackman, D.A., Farah, M.J., & Meaney, M.J. (2010). Socioeconomic status and the brain: Mechanistic insights from human and animal research. Nature Reviews. Neuroscience, 11(9),651–659.

Hanson J .L., Hair N., Shen D.G., Shi F., Gilmore J.H., et al. (2013): Family Poverty Affects the Rate of Human Infant Brain Growth. PLoS ONE, 8(12).

Hanson J.L., Hackman D.A .(2012): Cognitive neuroscience and SES disparities. In: Wolfe BL, Evans WN, Seeman TE, (eds). Biological Consequences of Socioeconomic Inequalities, New York, NY : Russell Sage Foundation,pp 292.

Hoff, E. (2003). The specificity of environmental influence:Socioeconomic status affects early vocabulary development via maternal speech. Child Development, 74(5), 1368–1378.

Hughes C, Ensor R. Executive function and theory of mind in 2 year olds: a family affair? Developmental Neuropsychology . 2005; 28(2): 645-668.

Kapur M. (1974): **Measurement of organic brain dysfunction.** Ph.D thesis submitted to Bangalore University.

Kishiyama, MM, Boyce WT, Jimenez AM, Perry LM, Knight RT. Socioeconomic disparities affect prefrontal function in children.Journal of Cognitive Neuroscience 2008; 21(6):1106-1115.

Lipina JL, Segretin MS. (2015):Strengths and weakness of neuroscientific investigations of childhood poverty: future directions. Front Hum Neurosci.;9(53):1–11.

Lipina SJ, Martelli MI, Vuelta B, Colombo JA(2005). Performance on the A-not-B task of Argentinian infants from unsatisfied and satisfied basic needs homes. International Journal of Psychology. 39: 49-60.

Lipina SJ, Martelli MI, Vuelta BL, Injoque-Ricle I, Colombo JA. (2004):Poverty and executive performance in preschool pupils from Buenos Aires city (Republica Argentina). Interdisciplinaria.; 21(2): 153-193.

Machen S. M., Wilson J. D., Notar C. E. (2005): Parental involvement in the classroom. *Journal of* Instructional Psychology, 32(1): 13-16 .

Malecki, C.K., & Demaray, M.K. (2006). Social support as a buffer in the relationship between socioeconomic status and academic performance. School Psychology Quarterly, 21(4), 375–395.

Malin A.J. (1969)**: Malin's intelligence scale for Indian children (MISIC).** Indian Journal of Mental Retardation, **4:**15-25.

Manna S., Pal A., Dhara P.C(2016):. Effect of Socio-Economic Statuson Learning Ability of Bengali (Indian) Primary School Children. Advances in Applied Physiology.1(1), 12-17.

Matalka F.I.M. (2014): The Influence of Parental Socioeconomic Status on Their Involvement at Home. International Journal of Humanities and Social Science, 4(5):146-154.

May A .(2011): Experience-dependent structural plasticity in the adult human brain. Trends in Cognitive Sciences, 15: 475–482.

Mezzacappa E. Alerting, orienting, and executive attention: Developmental properties and sociodemographic correlates in an epidemiological sample of young, urban children. Child Development. 2004; 75(5): 1373-1386.

Noble K. G., McCandliss B. D., Farah M. J. (2007): Socioeconomic gradients predict individual differences in neurocognitive abilities. , *10*(4), 464–480.

Noble K.G.,Houston S.M., Brito N.H., Kan E., Kuperman J., Amaral D.G.,Bloss C.S., Murray S.S., Gruen J.R., Chang L.,Kenet T.(2015):Family Income, Parental education and brain structure in children and adolescents. Nature Neuroscience,doi:10.1038/nn 3983.

Piccolo R.L.D., Arteche A.X., Fonseca R.P., Grassi- Oliveira R., Salles J.F(2006): Influence of family socioeconomic status on IQ,language, memory,executive function of Brazilian children. Research and review 29: 23.

Ratcliff N., Hunt G. (2009). Building teacher-family partnerships: The role of teacher preparation. Education, 129 (3): 495-505.

Raviv, T., Kessenich, M., & Morrison, F.J. (2004). A mediational model of the association between socioeconomic status and threeyear- old language abilities: The role of parenting factors. Early Childhood Research Quarterly, 19(4), 528–547.

Roza S.J, van Batenburg-Eddes T., Steegers E.A., Jaddoe V.W., Mackenbach J.P., Hofman A., Verhulst F .C., Tiemeier H. (2010): Maternal folic acid supplement use in early pregnancy and child behavioural problems: the Generation R Study. Br J Nutr, 103:445–452.

Sarsour K.,Sheridan M., Jutte D.,Neiru-Jeter A.,Hinshaw S.,Boys W.T(2011): Family socioeconomic status and child executive function; The roles of language and home environment,and single parent hood. Journal of International Neuropsychological society, 17: 120- 132.

Stevens C, Lauinger B, Neville H. Differences in the neural mechanisms of selective attention in children from different socioeconomic backgrounds: an event?related brain potential study. Developmental Science. 2009; 12(4):634-646.

Stuss D.T. (2011): Functions of the frontal lobes: relation to executive functions. Journal of the International Neuropsychological Society, 17: 759–765.

Thais H.M., Helenice C.F., Etelvina L.S.,Viviane A.C., Patricia P.F., Anne M.K.(2009): Dementia .Neuropsychologia, 3(1): 55-60.

Toga A. W., Thompson P. M., Sowell, E. R. (2006). Mapping brain maturation. Trends Neurosc, 29; 148–159.

Turney K., Kao G. (2009): Barriers to school involvement: Are immigrant parents disadvantaged? Journal of Educational sResearch, 102(4): 257-271.

Tuvblad, C., Grann, M., & Lichtenstein, P. (2006). Heritability for adolescent antisocial behavior differs with socioeconomic status:Gene-environment interaction. Journal of Child Psychology and Psychiatry, 47(7), 734–743.

Van Velsor P., Orozco G. L. (2007): Involving low-income parents in the schools: Community centric strategies for school counselors. Professional School Counseling: American School CounselorAssociation, 11(1): 17-24.

Weyandt LL. Executive function in children, adolescents, and adults with attention deficit hyperactivity disorder: introduction to the special issue. Dev Neuropsychol. 2005;27(1):1–10.

Wiebe SA, Sheffield T, Nelson JM, Clark CAC, Chevalier N, & Espy KA. The structure of executive function in 3-year-olds. Journal of Experimental Child Psychology 2011; 108(3): 436-452.

Zatorre R.J., Fields R.D., Johansen-Berg H. (2012): Plasticity in gray and white:neuroimaging changes in brain structure during learning. 15: 528–536.