EFFECT OF TRACE ELEMENT SUPPLEMENTS ON READING COMPREHENSION OF CHILDREN WITH READING DISABILITIES IN JOS METROPOLIS, PLATEAU STATE

By

OFOJEKWU, MARY-JANE NKECHI
Department of Medical Laboratory Sciences
Faculty of Medical Sciences
University of Jos. Nigeria
+2348034006199

ADEBISI, RUFUS OLANREWAJU, *Ph.D*
Department of Communication & Behaviour Disorders
Federal College of Education (Special)
P.M.B. 1089, Oyo. Oyo State, Nigeria
aderufus2@gmail.com
+2347036001217

&

JINGAU, ALI AMINU
Department of Educational Psychology
Federal College of Education, Kano
Kano State, Nigeria
jingaua@gmail.com
+2348033050025

Abstract

The study investigated the effect of trace elements supplements on reading comprehension of children with reading disabilities in Jos metropolis, Plateau state. The objective was to ascertain the effect of trace element supplements on the reading comprehension of children with reading disabilities. Research question and hypothesis were formulated. The research was an experimental in nature and non-equivalent pre-test, post-test experimental and control group design was employed. Reading comprehension assessment was determined using Umolu's Informal Reading Inventory. Quantum Magnetic Resonance Analyzer was used to analyse the trace elements status of the pupils with reading disabilities. Ten pupils from primary four and five were used for the study. Five out of the ten pupils were the experimental group, and they received trace element supplements, while the remaining five were the control group and did not receive supplements. The treatment lasted for six weeks. The results of the treatments were analysed using t-test for independent samples and analysis of variance (ANOVA). The findings on the study revealed the important of supplements in improving the reading performance of pupils as discussed in the text. Finally, the researcher recommended the use of supplements to children with reading disabilities. However, special educators and other professionals should conduct more studies on finding the causes and treatments of central nervous system at the molecular levels, more especially as it concern the learning disabled child.

Keywords: Trace Element Supplements, Reading Comprehension, Children with Reading Disabilities

Introduction

At the birth of a baby, right in the hospital; parents eagerly track their baby's development, watching for the emergence of cognitive, motor, and communication skills. However, when it seems that the child is not

developing a skill on time, parents become worried. The fear is usually allayed as the child's skills eventually emerge. However, some of these important skills unfortunately do not emerge or are not fully developed. For instant, the baby may not cry at birth or keeps salivating uncontrollably and cannot hold his neck. The child might not learn to crawl or walk until many months after most children of his age group do. Furthermore, as the child grows and starts school, the child might have severe trouble holding the writing materials. Perhaps, the child might not be able to read despite having a good teacher. The problem of reading disabilities can be attributed to central nervous system dysfunction or brain damage which occur at the pre-natal, peri-natal or post-natal stages of the developmental milestone.

Reading can be defined as the act of decoding written or printed materials or symbols. It may be done silently or orally (Andzayi, 2004). Reading encompasses the ability to comprehend and interpret symbols whether written or printed. Reading disabilities is a learning disorder that involves significant impairment of reading accuracy, speed, or comprehension to the extent that the impairment interferes with academic achievement or activities of daily life (Andzayi & Umolu (2004). Children with reading disability cannot read between lines and most often see reading exercises as punishment. Usually the children with reading difficulty are not blind, yet were unable to interpret or give concrete meaning to what was visualized. Lerner (1985) termed the phenomenon "word blindness". Reading disability leads to failure in school since those affected cannot get meaning from printed or written massages. It affects about 15- 20% of children worldwide, more commonly boys. It is no doubt that affected children will be frustrated, develop low self esteem and loose interest in studying.

Moreover, for a good reading comprehension activity to take place, the individual uses the brain to decode, think, interpret and understand the printed material. There are many factors that could interfere with the activities of the brain during learning processes. Learning disabilities was defined according to National Joint Committee on Learning Disabilities (NJCLD) as a generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual and presume to be due to central nervous system dysfunction. Although, learning disabilities may occur concomitantly with other handicapping conditions (sensory impairment, mental retardation, social and emotional disturbance) or environmental influences (cultural difference, inappropriate instructions, psycholinguistic factors), it is not the direct result of these conditions or influence (Learner, 1985). By the definition, reading disorders are intrinsic and presume to be due to central nervous system dysfunction. Trace elements have been indicated in the proper functioning of the central nervous system and neurotransmitters (Ofojekwu, Nnanna, Okolie, Odewumi, Ikechukwu, Isiguzoro & Lugos, 2013).

Trace elements are substances that are either essential for normal body functions or to enhance the body's functioning. Trace elements are required in small amounts by all humans for normal growth and development. Food intake of more proteins and carbohydrates foods over vitamin and mineral foods could result to deficiencies in essential minerals in school children. The outcome of this is believed to be the manifestation of reading disabilities, which could have negative effects on reading and school performance. Intake of required Trace element supplements could help reduce the reading disabilities of the children in the classroom and improve their eating habits, thereby enhancing learning and reading abilities (Babudoh & Ihenacho, 2013).

Trace elements are essential nutrients present in diets and are required in minute quantity. According to Etebary, Nikseresht, Sadeghipour and Zarrindast, (2013), trace elements usually serve the function of metalloproteins in neurons and glial cells, while a portion of them exist in the pre-synaptic vesicle and are released with neurotransmitters into the synaptic cleft when necessary. The transport of trace elements by neurotransmitters into the brain is strictly regulated by the "brain barrier system". That is blood-brain and blood- cerebrospinal fluid barrier. The alteration of homeostasis of trace elements in the brain is associated with abnormal functioning of the brain which could lead to reading disorders, cognitive and perception

problem, mental in-coordination etc. Some of the factors that alters trace elements homeostasis include disease/ infection of the brain (for example meningitis, jaundice), genetic abnormalities and trauma to mention but a few. Disease of the brain is also associated with altered homeostasis of the brain.

Ofojekwu, Nnanna, Okolie, Odewumi, Ikechukwu, Isiguzoro and Lugos (2013) submit that trace elements such as zinc, manganese and iron are necessary for growth and functioning/coordination of the brain. Zinc is stored by glutamatergic neurons in synaptic vesicle. It modulates brain excitability and plays a key role in learning. Zinc and manganese influence the concentration of neurotransmitters in the cleft. Also, zinc is essential to many enzymatic activities and normal functioning of the immune system. Zinc is essential in control attention deficit. Iron controls over 70 major arteries and 270 major enzymes. Iron is an important component of hemoglobin, myoglobin and iron containing enzymes (Nduka, 2009). Iron binds and circulates oxygen needed in energy production necessary for several metabolic activities and reading processes (McGilvery & Goldstein 2007). Deficiency of iron alone causes reading disability. Magnesium plays important role in controlling insensitivity, irritability, nervousness, mental depression, mild confusion, trembling and apprehension. Iodine controls mild confusion, stunted growth, thyroid inflammation, heart diseases and stroke.

Iheanacho (2007) states that potassium, sodium and zinc play an important parallel role in providing continuous growth and fine tuning of brain as well as muscular functions necessary for reading comprehension. Adequate trace elements levels cause some persons to metabolize essentially the same information more fully and expansively than others. Therefore, the importance of trace elements in normal functioning of the child particularly during learning experiences cannot be over emphasized. However, Iheanacho (2007) pointed out that deficiency or excess levels of any of the trace elements will disturb the normal functioning of neurophysiology of human beings and could result to some adverse health condition, developmental, behavioural and learning problems.

Trace elements also serve as cofactors with other categories of micro-nutrients called vitamins, for the normal functioning of nerve cells and muscular activities as well as the brain (McGilvery & Goldstein, 2007). Vitamin B complex is the highest quality composition of micronutrients crucial for body metabolism. The components of the vitamin B complex necessary for reading includes thiamine (vitaminB1), riboflavin (B2), niacin(B3), pyridoxine(B6), folic acid (B9), cobalamin (B12). Vitamin B1 protects the heart and neurons system from toxin and converts carbohydrates and fats into energy. B2 is vital for growth, red blood cell production and for normal vision maintenance. B3 is a brain enhancer and is important for nervous system, digestive system and good skin maintenance. B6 ensures that all chemical messages reach their destination. It is also required in formation of red blood cell and various neurotransmitters and helps to maintain nerve function (Etebary et al 2013). Therefore, the purpose of the study is to find out the effect of trace elements supplements on reading comprehension of children with reading disabilities in Jos metropolis.

Statement of the Problem

Children must learn to write so that they can later write to learn. Reading is the basic tool for academic subjects. Failure in school is frequently due to inability to read and comprehend. It was discovered that even the criminal world wants literate workers. Many of the ill of the society including unemployment, school dropout, and juvenile delinquents have been related to reading disabilities. Upon examination, the problem of our schools, of poverty, of the concerns of troubled parents, as well as the plight of most students with learning disabilities, show an association with poor reading comprehension abilities. The overall literacy problem that confronts our nation is serious. Poor reading comprehension is the most frequently reported academics problem in learning disabilities (Kirk, 1985).

Regular teacher finds it very difficult to adequately cater for children with learning disabilities as they lack the prerequisite skills; experience and methodology that would enable them cope with the challenges posed by the children. In addition, special educators still struggle to impact learning skills to children with

learning disabilities, using various teaching methods. In this regards, it becomes very necessary to investigate the problems associated with reading comprehension disorders; the causes, prevention, remedies and treatments. Therefore, the need to intervene to the aid of these children with learning disabilities with the administration of trace elements and vitamins became essential. The research aimed at discovering the type of trace elements supplements needed for effective reading comprehension, spelling, word identification and phonics. Thus, the study focuses on the effect of trace element supplements on reading comprehension of children with reading disabilities.

Purpose of the Study

The purpose of the study is to find out the effect of trace element supplements on reading comprehension of children with reading disabilities in Jos metropolis. Specifically, the objectives of the study are to accomplish the following:

i. To find out the trace elements status of the children with reading comprehension disabilities.
ii. To identify the trace elements necessary for reading comprehension.
iii. To find out the performance of children in reading comprehension before and after treatment.

Research Questions

The following questions guided the study:

i. What is the trace element status of pupils with reading comprehension disabilities?
ii. What are the trace elements supplements required by the pupils with reading comprehension disabilities?
iii. To what extent will trace element supplements affect reading comprehension among children with reading disabilities?
iv. What was the level of trace element in pre and post treatment?

Method

Research Design

The researcher considered quasi-experimental research of Ex-Post facto research design. In this type of design, attempt was made to find explanation for the existing differences between or (among) groups. The design used what already existed and look backward to explain why two or more existing groups are compared retrospectively. In this study, the researchers used two groups of pupils, one group called the treatment and the other control group. The experimental group was exposed to trace element supplements, while the control group did not receive trace element supplements.

Population and Sample

The population of this study consisted all children (both males and females) identified by Umolu's Informal Reading Inventory (IRI) as having reading comprehension difficulties in Ganaka International School, Jos, Plateau State. For that, this study only had relevance within the context of this particular group of children within the particular school. Using simple random sampling technique, a total number of ten (10) primary school pupils were used in this study, five served as the experimental group while the other five represented the control group.

Instrument for Data Collection

Two sets of instruments were used for the study. They were Umolu's Informal Reading Inventory (IRI) and Quantum Resonance Magnetic Analyzer (QRMA). IRI is a reading assessment book that was administered to individual child below his level, to assess his reading comprehension ability. QRMA is a digitalized and computerized to precision. It is designed to test the health status of different vital areas of which the brain and trace elements form the major part, through a hand grip of the Joystick censure, in which individual case

study is digitally analyzed in one minute. The two instruments was validated by experts in Special Education of the University of Jos. The adapted IRI was subjected to a test – re- test analysis with a three week interval in Jos South Local Government (N = 92), with a reliability index of 0.92 using Pearson Correlation coefficient to determine the measure of internal consistency.

Procedure for Data Collection

The researchers sought for permission from the school authority and the parents and guardians of the children, in which the permission was granted to use the samples for the study. Teachers and the parents of the samples were used as research assistants. At pretest, teachers with the researchers collected data of reading level assessment test using IRI from each samples. After, data were collected from the analysis of trace elements from the same samples, using Quantum Resonance Magnetic Analyzer. During intervention, the 20 samples with low concentration of trace elements were divided into experimental and control groups. The experimental group received doses of trace element supplements as treatments, following the report of the Quantum analysis for the period of three months, based on their deficiency, while the control group did not receive any supplements. After intervention, data of reading level assessment test were collected from both the experimental and control groups to ascertain the effect of the trace elements treatment on their reading comprehension. The researchers used the appropriate statistical techniques for data analysis according to the research questions.

Results

Research Question One: What is the trace element status of pupils with reading comprehension disabilities?

Table 1: Analysis of trace element status of pupils with reading comprehension disabilities using quantum resonance magnetic analyzer.

S/N	*Gp*	*Set*	*Ca*	*Fe*	*Zn*	*Se*	*k*	*mg*	*Cu*	*VA*	*VB$_1$*	*VB$_6$*	*VB$_3$*	*VC*	
		1.219	1.151-3.021	1.143-1.847	0.847-1.989	0.689-2.045	0.474-0.987	0.474-0.992	0.346-0.749	2.124-0.401	14.477-4.192	0.824-21.348	4.543-1.942	5.023	
1	Ex	1	Ma	Ma	Sa	Mi	Sa	Sa	Mi		Ma			Ma	
2	Co	1	Ma	Ma	Sa	Mi	Sa	Sa	Mi		Ma			Ma	
3	Ex	2		Ma		Mi			Sa				Sa	Sa	Ma
4	Co	2		Ma		Mi			Sa				Sa	Sa	Ma
5	Ex	3		Sa	Ma	Ma	Ma	Sa	Mi	Sa	Sa				
6	Co	3		Sa	Ma	Ma	Ma	Sa	Mi	Sa	Sa				
7	Ex	4		Sa	Mi	Ma		Ma	Mi				Ma	Ma	
8	Co	4		Sa	Mi	Ma		Ma	Mi				Ma	Ma	
9	Ex	5		Ma	Mi	Sa	Ma		Mi	Mi			Ma	Ma	Ma
10	Co	5		Ma	Mi	Sa	Ma		Mi	Mi			Ma	Ma	Ma

Keys:	Ma	Moderately Abnormal	VA	Vitamin A	Ca Calcium
	Mi	Mildly Abnormal	VB1	Vitamin B1	Fe Iron
	Sa	Severely Abnormal	VB3	Vitamin B3	Se Selenium
	Ex	Experimental group	VB6	Vitamin B6	K Potassium
	Co	Control Group	VE	Vitamin E	Mg Magnesium
	NR	Normal range			Cu Copper

Table 1 shows thirteen collective trace elements deficient in the participants. The table gives the description of the trace elements status of the pupils. The table specifically shows five sets of similar levels of trace element deficiencies for the ten pupils. For instant, pupils in serial numbers 1 and 2 are in set 1 and both have similar iron deficiencies. One of them was the experimental group (N/SI) and the other was the control group (S/N2). Both groups had moderately abnormally in calcium, iron, vitamin B1, Vitamin C severe abnormality in Zinc, potassium and magnesium; mildly abnormality in selenium and copper. It also shows

that calcium is deficient in set 2 and 5 pupils. However, supplements are provided to the pupils in experimental group based on trace element deficiency detected in the individuals.

Research Question Two: What are the trace elements supplements required by the pupils with reading comprehension disabilities?

Table 2: Trace element supplement provided

Set	*Grp*	*Zn*	*Ca*	*F. Acid*	*Fer*	*Bco*	*VitC*	*VB6*	*VB1*	*VB3*	*Mg*	*Mult*
1	Ex	*	*	*	*	*	*	*	*		*	*
2	Ex	*	*	*	*	*	*	*	*			*
3	Ex	*	*	*	*	*	*	*	*	*	*	*
4	Ex	*	*	*	*	*	*	*				*
5	EX	*	*	*	*	*	*	*			*	*

Keys: Vit c Vitamin C VE Vitamin E Fer Ferrous Zn Zinc
VB6 Vitamin B6 Bco B Complex Mg Magnesium Ca calcium
F. Acid Folic Acid VB1 Vitamin B1 Mult Multivitamins

Table 2 showed the trace element supplements given to the pupils in the experimental group to build up the levels of reduced trace elements as observed in the study. The asterisk indicated the trace elements given to the individual pupils. The table showed that all the pupils were treated with zinc, folic acid, ferrous, B complex, Vitamin C, vitamin B6 and multivitamins. These are the basic mineral necessary for cognition and learning. In addition to the above supplements, Set 1 was the only child that received calcium and set 3 was also the only child that was given V.B3. While vitamin E was given to set 2 and 5, VB1 to set 1 are 3, finally magnesium to set 1, 3 and 5.

Research Question Three: To what extent will trace elements supplement affect reading comprehension among children with reading disabilities?

Table 3: Performance of Children in Reading Comprehension

S/N	*Grp*	*Pre*	*Post*	*Difference*
1	Ex	35	74	39
2	Ex	48	69	21
3	Ex	20	58	38
4	Ex	67	91	24
5	Ex	24	47	23
6	Co	25	27	2
7	Co	50	57	7
8	Co	44	49	5
9	Co	30	32	2
10	Co	19	25	6

Keys: Ex Experimental group Co Control group pre Pre-test post Post-test

Reading performance was evaluated based on the pupils' comprehension ability on IRI by Umolu. Table 3 showed the result of reading comprehension test scores of the pupils at the pre and post treatment stages of both experimental and control groups. The table showed that at the pre-treatment stage S/N 4 had the highest scores (67), and S/N 10 had the lowest scores (19). After treatment, the reading performance of all the pupils increased. Interestingly, all the pupils in the experimental groups (S/N 1- 5) recorded the highest difference in performance in reading comprehension. The highest score difference recorded in the experimental group in S/N 1, who had 35 at pre-test and 74 after treatment. The low score difference was recorded in the control group. It also showed that the lowest score difference were recorded in S/N 6 and 9, both had 2 at post test.

Research Question Four: What was the level of trace element in pre and post treatment?

Table 4: Trace element level of the experimental group at pre and post treatment

S/N	*Group*	*Iron*			*Copper*			*Vitamin C*		
		Pre	Post	Dif	Pre	Post	Dif	Pre	Post	Dif
1	Exp	0.845	1.148	0.303	0.376	0.422	0.046	3.817	4.251	0.434
2	Exp	0.864	1.153	0.290	0.084	0.210	0.126	3.622	3.909	0.287
3	Exp	0.658	0.929	0.271	0.301	0.485	0.184	3.358	4.010	0.652
4	Exp	0.568	1.106	0.538	0.459	0.674	0.215	2.461	3.848	1.387
5	Exp	0.997	1.37	0.376	0.474	0.509	0.035	2.281	2.732	0.451

Keys: dif difference pre pre-test post post-test

Table 4 showed the level of trace elements (irons, copper and vitamin C) that was observed reduced in all the participants. The table showed that after treatment, the experimental group had a remarkable increase in the levels of all the trace elements. It also showed that S/N 4 had the highest score difference in iron (0.538) and copper (0.215). S/N 3 had the highest score difference in vitamin C (0.652). Finally, the table showed that the lowest score differences were recorded in S/N 3 with iron (0.271), in S/N 5 with copper (0.035) and in S/N 2 with vitamin C (0.287).

Table 5: Level of Iron, Copper and Vitamin C in the Control Group at Pre and Post Treatment.

S/N	*Group*	*Iron*			*Copper*				*Vitamin C*			
		Pre	Post	Dif	Pre	Post	Dif		Pre	Post	Dif	
1	Control		0.821	0.822	0.001	0.387	0.387	0.000		3.526	3.526	0.000
2	Control	0.613	0.614	0.001	0.424	0.426	0.003		3.511	3.516	0.005	
3	Control	0.611	0.618	0.0070	0.406	0.410	0.004		3.578	3.578	0.000	
4	Control	0.619	0.619	0.000	0.408	0.410	0.002		2.255	3.258	0.003	
5	Control	0.722	0.725	0.0030	0.176	0.176	0.000		2.248	0.249	0.001	

Table 5 showed the level of iron, copper and vitamin C of the control group at pre and post treatment. The table showed that S/N 3 had the highest score difference in iron and copper. S/N 4 had the highest score difference in vitamin C. The table also showed that S/N 1 and 5 had no score difference in iron level. Also S/N 1 and 5 had no score difference in copper level. In the same vein, S/N 1 and 3 had no score difference in vitamin C level after treatment.

Discussion of Findings

The discussion below shows the analysis of the results obtained in the study, which gives an insight of the effect of trace elements supplements on reading comprehension of children with reading disabilities. The research question 1 as shown in table 1 above indicated that children with reading disabilities have deficient level of Zinc, Vitamin A, Calcium, Vitamin B1, Iron, Vitamin B3, Selenium, Vitamin B6, Potassium, Vitamin E, Magnesium, Copper, vitamin C. These minerals play very important roles in learning and cognition. Consequently, table 2 indicates the trace elements supplements required by the pupils with reading comprehension disabilities. The supplements were given to children based on individual deficiencies. Each child was given one tablet of the required trace elements per day, except for zinc and vitamin E which they took every other day for a period of six weeks. This finding was in agreement with Adebisi and Mebu's (2017) similar study on two children with autism. The eighteen collective vitamin and mineral test report for the two children, out of which 13 and 9 test items for sample A and B respectively were deficient in. Their study confirmed that the various vitamin – mineral levels for each of the children were deficient in all but only vitamin and mineral element that were normal. Based on the areas of deficiencies, vitamin and mineral supplements were given to the children.

Moreover, the extent at which trace element supplements affect reading comprehension among struggling readers was identified in table 3. The results showed that in reading comprehension, the range of the difference in performance between the pre and post treatment scores for the experimental group was 21-39, while the control group range in difference was 2-7. Similarly, the study showed that the pupil in the experimental group benefitted from the treatment and recorded higher difference in performance between

the pre and post treatment. For instant, S/N 4 had 67 before treatment and 91 afterwards. The table also revealed that the control groups were still struggling to read. This clearly signified that trace elements intervention is a reliable intervention in the remediation of reading disabilities in children since there was improvement in the experimental group after intervention. The findings in this study are in agreement with other empirical studies on the effect of trace elements on reading performance of children with reading disabilities as well as in cognition. The researchers Babudoh & Iheanacho (2013), Etebary et al (2013), Sujuan, Yinlong, Frederick, Feng, Kathleen, Jill,... Huhg, (2008) and Mike & Laurie (1996) worked on similar study. They are of the view that trace element supplement is a remediation necessary in intervening to the reading comprehension of pupils with reading disabilities.

Research question 4 as analysed in table 4 showed the analysis of trace element in pre and post treatment. It showed the level of trace elements (irons, copper and vitamin C) that was observed reduced in all the participants. After treatment, the experimental group had a remarkable increase in the levels of all the trace elements. The table showed that S/N 4 had the highest score difference in iron (0.538) and copper (0.215). This indicated the reason for his remarkable increase in reading performance in table 4. S/N 3 had the highest score difference in vitamin C (0.652). Finally, the table showed that the lowest score differences were recorded in S/N 3 with iron (0.271), in S/N 5 with copper (0.035) and in S/N 2 with vitamin C (0.287).

However, table 5 revealed that the trace element levels of the pupils in control group had a minute increase. The table show that the trace elements of some pupils never increased. This justified the importance of given supplements since the natural foods are not enough to supplement for the deficiencies. Furthermore, the study is in line with other researchers. John (2011), Nancy (2012) and Masahiro et al, (2013), who supported the use of supplements to regulate deficient trace elements. Trace elements have been identified to play vital roles in proper growth, development, physiology of the human organism, proper functioning of the brain, including perception, discrimination, cognition and memory. The researchers identified the role of nutrients in regulating communication between neurons and hippocampus to improve memory and learning capabilities. Again, the researchers identified the use of trace elements in treating behavioural disorders that could interfere with learning, for example short attention span, attention deficit hyperactive disorders and social skill disorders. The researchers finally proved through the study that trace element supplements are effective method of enhancing reading comprehension. The study will benefit the special need education, pupils, teachers, stake holders and policy makers.

Conclusion

The researchers discovered that reading, cognition and memory is the function of the brain. Trace elements function with other biochemical including neurotransmitters (serotonin, dopamine, opiods, GABA and norepinerphirine), hormones (thyroid hormones), enzymes (digestive enzymes) and vitamins in regulating information transfer and interpretation in the central nervous system. Reading is a function of transfer of information from the sensory organ (eyes), through nerve cells into the axons and interpreted in the brain cells. After treatment with supplements, the researchers discovered improvement in reading comprehension. Thus, indicating that reading disabilities is a function of the central nervous system dysfunction. The study also showed that supplements are necessary in correcting the central nervous system dysfunction.

Recommendations

The following recommendations have been made based on the findings, which include early identification, diagnosis and assessments of reading disabilities by parents, health care providers and teachers should be encouraged. Also, the use of trace elements supplements in the treatment of reading disabilities should be embraced by parents and stakeholders. Training of the children with special needs has been the primary function of the special educators. Therefore, they should employ all available methods of teaching, rehabilitation, monitoring, remediation and treatment in removing the plight of the children with learning

disabilities. Moreover, children with learning disabilities exhibit some irrational behaviour that could disturb the class, thereby frustrating the class instructions. Therefore, the use of trace elements becomes very crucial in controlling the abnormal behaviours of these children. Also, educational interventions should be run concurrently with the clinical intervention for adequate cognitive function as well as improvement in academic performance, and parents should ensure adequate feeding habit in their homes. The use of junk foods should be highly discouraged.

References

Adebisi, R. O. & Mebu, V. A. (2017). Effects of vitamin – mineral intervention on behaviour problems of two children with autism spectrum disorders in federal capital territory, Abuja, Nigeria. *The Exceptional Child, 19* (1), 177 – 189.

Andzayi, C. A. (2004). *Research in second language reading using a single-subject experiment design: Some fruitful findings and implications for teaching beginning reader.* Jos: LECAPS Publishers.

Andzayi, C. A., & Umolu J. (2004). *Reading instruction in primary and secondary schools.* Jos: Department of special education, University of Jos, Nigeria.

Babudoh, G. B. & Ihenacho, J. I. (2013). Using quantum magnetic resonance image analyser to determine the effect of trace element levels on special needs children with reading disabilities. *International Journal of Literacy and Development, 1* (1), 137 – 146.

Etebary, S; Nikseresht, S., Sadeghipour, H. R., & Zarrindast, M. R. (2013). *Postpartum depression and role of serum trace elements.* Retrieved on 22nd June, 2016 from http:journal.turns.ac.ir/

Ihenacho, J. I. (2007). *Index of consistently present, absent, excess, low trace element status among hyperactive children with learning disabilities: Its implication in special education in Africa.* Jos: University of Jos inaugural lecture. Serial 33.

John, P. (2014). *Zinc found critical within the brain to improve memory and cognition.* Retrieved on 22nd June, 2017 from www.naturalnews.com/zinc.html.

Lerner, J. W. (1985). *Learning disabilities, theories, diagnosis, and teaching strategies*. Boston: Houghton Mifflin Company.

Masahiro, K; Keiko, K; Hironari, K.; Susumu, O. & Yutaka, S. (2013). Zinc and neurodegenerative diseases. In U. Koshore (Ed.), *Mental and behavioural disorders and diseases of the nervous system* (pp.23-30). Tokyo: Machido Press.

McGilvery, W. & Goldstein, G. (2007). *Biochemical functional approach.* Philadelphia: W.B. Saudners Company.

Mike, M. & Laurie, P. (1996). Hair trace element status of appalachian head start children: *The Journal of Orthomolecular Medicine, 11,* 234-244.

Nancy, M. (2012). *Zinc and its use in homeopathy.* Retrieved on 22nd June, 2017 from *http:www.webmd.com/mgmedcine/default.htm#add/3874/zinc+oral/current/*.

Nduka, N. (1999). *Clinical biochemistry for students of pathology*. Lagos: Longman Nigeria Plc.

Ofojekwu, M. N., Nnanna, O. U., Okolie, C. E., Odewumi, L. O., Ikechukwu, O. U. Isiguzoro, I. O. U., & Lugos, M. D. (2013). Hemoglobin and serum iron concentrations in menstruating nulliparous females in Jos, Nigeria. *The Journal for Medical Laboratory Professionals, 44* (2), 97-192.

Sujuan, G; Yinlong, J; Frederick, W; Feng, M; Kathleen, S; Jill, R. & Huhg, C. (2008). Trace element levels and cognitive function in rural elderly Chinese: *Journal of Gerontollogy, Biolological Science Medicine, 63* (6), 635-641.