Published in the Ghana

http://kadint.net/our-journal.html

Role of Clinical Neuropsychologists in the Evaluation and Management of Diabetes Mellitus in Ghana: A Position Statement

Jacob Owusu Sarfo

All Nations University College, Ghana
Assistant Head of Department, School of Humanities and Social Sciences
E-mail: sarfojo@yahoo.com

Abstract

Ghana's Ministry of Health is gradually improving the state of mental health among patients with biomedical conditions. Nonetheless, many recent studies have showed that some chronic medical conditions present cognitive deficits that need specialist evaluation and care. The aim of this paper is to provide a summary analysis regarding the current need for neuropsychologists in Ghana's diabetes care. The rationale is to move for a paradigm shift with regards to the current state of diabetes care in Ghana. Thus, it advocates for policy reform in the management of DM and the inclusion of neuropsychologists among Ghana's existing structure for diabetes care.

Keywords: Neuropsychologist; Diabetes Mellitus; Ministry of Health; Mental Health; Ghana.

Overview of Diabetes Mellitus

Diabetes mellitus (DM) is a common metabolic condition that has gained recent global concern. This condition is noted to show a prolonged state of hyperglycaemia, complemented by a disorder of food nutrients' metabolism as a result of allied problems in insulin secretion, insulin action, or both (American Diabetes Association [ADA], 2003). There are three main types of DM. These include Type 1 diabetes mellitus (DM1) [formerly called Insulin-Dependent Diabetes Mellitus], Type 2 diabetes mellitus (DM2) [formerly called Non-Insulin Dependent Diabetes Mellitus], and Gestational Diabetes Mellitus (which occurs as a result of pregnancy). According to the clinical diagnostic protocol by the World Health Organization for DM, the individual shall record a range of blood glucose symptomatic of diabetes mellitus either by: a Fasting Venous Plasma Glucose [FPG] ≥7.0 mmol/l or Venous Plasma Glucose ≥11.1 mmol/l at two hours after a 75g oral glucose load {Oral Glucose Tolerance Test [OGTT]} (WHO & IDF, 2006).

Ghana is estimated to have a fast growing rate for diabetes. At the end of 2012, diabetic cases (between 20-79 years) in 1000s increased in Ghana from approximately 354.02 (IDF, 2012) to 440.00 at the end of 2013 (IDF, 2013). DM cases like all chronic conditions have become much of a concern due to its prolonged duration and huge national socioeconomic burden (IDF, 2012). In addition, studies have indicated that most chronic conditions often exhibit some significant neuropsychological deficits (Annweiler et al., 2011; Boeka, & Lokken, 2008; Ostrosky-Solis, Mendoza, & Ardila, 2001). Although cognitive deficits among individuals diagnosed with DM in Ghana may not be reported during routine medical check-ups, a recent study observed some significant deficits among Ghanaian participants (Sarfo, & Mate-Kole, 2014).

Neuro-psychopathology of Diabetes

The initial discovery of cognitive deficits among DM1 cases by Miles and Root (1922) gave the footing for many empirical studies in diabetes neuropsychological and neurological functioning. These studies included various techniques of data collection like brain imaging (Garde, Mortensoen, Krabbe, Rostrup, & Larsson, 2002; Van Harten, de Leeuw, Weinstein, Scheltens, & Biessels, 2006) and neuropsychological battery (Ryan, & Becker, 1999; Ryan, Longstreet, &

Morrow, 1985; Ryan, Vega, & Drash, 1985; Ryan, Vega, Longstreet, & Drash, 1984; Sarfo, & Mate-Kole, 2014).

Causal theories for these cognitive impairments have been offered by various researchers. The first assumption explaining the cognitive deficits among DM patients may be due to brain cellular losses or deaths due to poor glucose supply (Magistretti, & Pellerin, 1996). Brain imaging techniques have supported this assumption showing graphic areas of cellular deaths among DM patients (Garde et al., 2002; Van Harten et al., 2006). This assumption is followed by the relative effect of poor glucose supply, leading to imbalances in the supply and use of neurotransmitters like acetylcholine, glutamate and Gama Acetyl Butyric Acid (Schulingkamp, Pagano, Hung, & Raffa, 2000).

Another assumption has also been associated with negative consequences to excessively normalise metabolism among patients resulting usually into symptomatic or asymptomatic hypoglycaemia especially in DM1 cases (Ack, Miller, & Weil, 1961; Ryan, & Becker, 1999; Ryan et al., 1985; Ryan et al., 1985; Ryan et al., 1984). Although hypoglycaemia is the most implicated for cognitive declines in this area, some contrary studies have also associated hyperglycaemia with negative neurological effects. This is possible by its connection with diabetic ketoacidosis (DKA) and hyperosmolar hyperglycaemic state [HHS]. A study by Kitabchi, Umpierrez, Murphy & Kreisberg (2006) outlined hyperglycaemic to have some uncommon neurological declines among clinical diabetic samples. This resulted in cerebral oedema, a lethal case of prolonged hyperglycaemic complications mostly occurring in 0.7–1.0% among newly diagnosed children and 72-74% of young adults in their twenties. In both cases of DKA and HHS, all the clinical manifestations of hyperglycaemia are exhibited clinically with central nervous system dysfunctions that are characterised with incidents of seizures, pupillary deviations, incontinence, bradycardia (slow heart rate) and respiratory arrest. Notwithstanding these findings, Weinger and Jacobson (1998) observed both hypoglycaemia and hyperglycaemia as having negative effects on cognitive functioning of diabetics. An explanation offered to this assumption is that, the central nervous system is dependent on a specific glucose intake for its energy and survival. Thus, an acute glycaemic imbalance (hypo or hyper) may be destructive (Brands & Kessels, 2009).

The final assumption has been attributed to various chronic conditions experienced by individuals with DM, such as hypertension and cardiovascular disease (Asimakopoulou, Hampson, & Morrish, 2002; Boeka, & Lokken, 2008), depression (Chau et al., 2011; Sarfo, & Mate-Kole, 2014), longer illness duration (Gregg et al., 2000) and normal aging (Ryan, & Geckle, 2000).

The Place of Neuropsychologists in Ghana's Diabetes Care

Clinical neuropsychologists have been at the vanguard of both clinical and scientific enterprises intended at detecting the clinical manifestations and other functional difficulties related to diabetes care globally. Considering the numerous existing and forthcoming studies in improving the neuropsychological functioning among individuals with DM, there is a need to advocate for similar advancement in Ghana's health system. Aside the differences in assumptions surrounding DM's neuro-psychopathology, there is yet, a lack of agreement over the neuropsychological functions that must be tested, as well as the needed assessment tools that should be employed (Clark, & Asimakopoulou, 2005).

Notwithstanding these difficulties, several cognitive processes have been studied recently in Ghana, comparing individuals with DM2 with a healthy control group [matched on age and education]. This maiden study also confirmed that Ghanaian samples like other DM cases globally share some significant cognitive deficits. Notable areas observed included executive function, learning and memory, visuoconstructional skills, visuospatial function and overall cognitive function (Sarfo, & Mate-Kole, 2014).

The complexity of both psychological and neurological dynamics relevant to diabetes care emphasizes the essential role of the neuropsychologist. Neuropsychologists or clinical psychologists who have been trained in neuropsychology in Ghana can contribute significantly to the development of standardized diabetes assessment tools, independent methods of symptom assessment and general management (Clark, & Asimakopoulou, 2005). This will not only enhance diabetes care in Ghana but allow much room to increase the use of local instruments, thus dealing with ecological concerns related with foreign tests.

The limited number of trained and licenced neuropsychologists in Ghana has led to queries about who should fill the spaces left in Ghana's health system. To address this gap, there ought to be collaborations among the Ministry of Health, Ghana Psychological Council, Ghana Psychological Association, training institutions and other stakeholders in diabetes care. There should also be legislation and other policy reforms that will require (a) the recognition, evaluation, and regulation of neuropsychologists or trained clinical psychologists with adequate training in the neuropsychology of diabetes in Ghana; and (b) compulsory cognitive assessment and possible referrals for DM cases, which is fully absorbed into the National Health Insurance System in Ghana.

References

1. Ack, M., Miller, I., & Weil, W.B. (1961). Intelligence of children with diabetes mellitus. *Pediatr, 28,*764–770.
2. American Diabetes Association (2003). Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (Position Statement). *Diabetes Care, 26*(1), 5–20.
3. Annweiler, C., Schott, A.-M., Abellan Van Kan, G., Rolland, Y., Blain, H., Fantino, B., Herrmann, F.R., & Beauchet, O. (2011). The Five-Times-Sit-To-Stand Test, a Marker of Global Cognitive Functioning Among Community-Dwelling Older Women.*The Journal of Nutrition, Health & Aging, 15, 271-276*.
4. Asimakopoulou, K.G., Hampson, S.E., & Morrish, N. J. (2002). Neuropsychological functioning in older people with type 2 diabetes: the effect of controling for confounding factors. *Diabet Med, 19(4),* 311–316.
5. Boeka, A. G. & Lokken, K. L. (2008). Neuropsychological Performance of a Clinical Sample of Extremely Obese Individuals. *Archives of Clinical Neuropsychology, 23, 467–474.*
6. Brands, A. M. A & Kessels, R. P. C (2009). Diabetes and the brain: Cognitive performance in Type 1 and Type 2 Diabetes. *Neuropsychological Assessment of Neuropsychiatric and Neuromedical Disorders* (3rd Ed.). University Press: Oxford.
7. Chau, P. H., Woo, J., Lee, C. H., Cheung, W. L., Chen, J., Chan, W. M., Hui, L., & McGhee, S. M. (2011). Older people with diabetes have higher risk of depression, cognitive and functional impairments: Implications for diabetes services. *The Journal of Nutrition, Health & Aging,* 15 (9), 751-755.
8. Clark, M., & Asimakopoulou, G. K. (2005).Diabetes in Older Adults Pp. 61-94 in Frank J. Snoek and T. Chas Skinner (ed.), *Psychology in Diabetes Care, 2nd Ed.* West Sussex: John Wiley & Sons.
9. Garde, E., Mortensoen, E. L., Krabbe, K., Rostrup, E., & Larsson, H. B. (2002). Relationship between age-related decline in intelligence and cerebral white-matter hyperintensities in healthy octogenarians: A longitudinal study. *Lancet, 356,* 628-634.
10. Gregg, E. G., Yaffe, K., Cauley, J. A., Rolka, D. B., Blackwell, T. L., Narayan, K. M. V., & Cummings, S. R. (2000). Is diabetes associated with cognitive impairment and cognitive decline among older women? *Arch Intern Med, 160,* 174–179.
11. International Diabetes Federation (2012). IDF *Diabetes Atlas, Fifth edition-2012 update.* https://www.idf.org/sites/default/files/5E_IDFAtlasPoster_2012_EN.pdf. Date retrieved: 21/01/2013
12. International Diabetes Federation (2013). *IDF Diabetes Atlas, Sixth edition.* https:// www.idf.org/diabetesatlas. Date retrieved: 21/04/2014
13. Kitabchi, A. E., Umpierrez, G. E., Murphy, M. B. & Kreisberg, R. A. (2006). Hyperglycemic crises in adult patients with diabetes: a consensus statement from the American Diabetic Association. *Diabetes Care*, 29, 2739-2748.
14. Magistretti, P. J., & Pellerin, L. (1996). Cellular mechanisms of brain energy metabolism. Relevance to functional brain imaging and to neurodegenerative disorders. *Annals of the New York Academy of Sciences, 777*, 380–387.
15. Ostrosky-Solis, F., Mendoza, V. U., &Ardila, A. (2001).Neuropsychological Profile of Patients with Primary Systemic Hypertension. *International Journal of Neuroscience*, *11*, 159–172.
16. Ryan, C. M., & Geckle, M. (2000). Why is learning and memory dysfunction in type 2 diabetes limited to older adults? *Diabetes Metab Res Rev, 16,* 308–315.

17. Ryan, C., & Becker, D. (1999). Hypoglycemia in children with type 1 diabetes mellitus: risk factors, cognitive function, and management. *Endocrinol Metab Clin North Am, 28:* 883–900.

18. Ryan, C., Longstreet, C., & Morrow, L. (1985). The effects of diabetes mellitus on the school attendance and school achievement of adolescents. *Child: Care, Health, and Development. 11,* 229–240.

19. Ryan, C., Vega, A., & Drash, A. (1985). Cognitive deficits in adolescents who developed diabetes early in life. *Pediatr, 75,* 921–927.

20. Ryan, C., Vega, A., Longstreet, C., & Drash, A. (1984). Neuropsychological changes in adolescents with insulin-independent diabetes. *J Consult Clin Psychol, 52,* 335–342.

21. Sarfo, J. O., & Mate-Kole (2014). Type 2 Diabetes Mellitus, Depression and Neuropsychological Profiles Among Adults in Ghana**.** *European Journal of Medicine. 1 (1),* 44-51.

22. Schulingkamp, R. J., Pagano, T. C., Hung, D., & Raffa, R. B. (2000). Insulin receptors and insulin action in the brain: Review and clinical implications. *Neuroscience and Biobehavioral Reviews, 24*(8), 855–872.

23. Van Harten, B., de Leeuw, F. E., Weinstein, H. C., Scheltens, P., & Biessels, G. J. (2006). Brain imaging in patients with diabetes: A systematic review. *Diabetes Care, 29,* 2539-2548.

24. Weinger, K. & Jacobson, A. M. (1998). Cognitive impairment in patients with type 1 (insulin-dependent) Diabetes Mellitus. *Central Nervous System Drugs,* 9, 233-252.

25. World Health Organisation (WHO) & International Diabetes Federation (IDF) (2006). *Definition and Diagnosis of Diabetes Mellitus and Intermediate Hyperglycaemia*. Geneva: WHO. Available from url: http://www.who.int/diabetes/ publications/Definition%20and%20diagnosis %20of%20 diabetes_new.pdf. Date retrieved: 22/03/2013.