



Full Length Review Article

LIVING WITH DIABETES MELLITUS AS A CHRONIC ILLNESS: A REVIEW OF LITERATURE

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ABSTRACT

Diabetes mellitus is one of the chronic complex diseases which affect the physiological, social and psychological aspects of life interfering with the functional health status of clients. As a chronic disorder, diabetes mellitus is a lifelong condition. In addition, it is either incurable and/or results in pathological changes that limit normal functioning, but controllable by lifestyle changes and medication. As the disease affects all aspects of life, it disrupts patterns of personal functioning and also produces a state of psychological, social and physical imbalance. The psychosocial effects are the most common health challenges among persons living with the disease. This manuscript presents an empirical review of the experiences of individuals living with diabetes mellitus.

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INTRODUCTION

Diabetes mellitus is one of the chronic illnesses that has always been a health problem to the society (Kneck, Klang, and Fagerberg, 2011). It is a metabolic disorder affecting variety of physiologic systems, most critical of which involves impairment in glucose metabolism (Kneck, Klang, and Fagerberg, 2011). The most striking abnormality in diabetes mellitus is the development of fasting hyperglycaemia (elevated blood sugar level) (Black and Hawks, 2009). This abnormality is caused by inadequate insulin / body tissue resistance to insulin action. There are four (4) major classifications of diabetes mellitus; type 1, type 2, secondary, and gestational diabetes mellitus (Black and Hawks, 2009). Type 1 diabetes mellitus is sometimes referred to as juvenile diabetes mellitus which may occur as a result of auto immunity whereby, there is progressive destruction of beta cells due to auto immunity among susceptible individuals (Black and Hawks, 2009). Autoantibodies to islet cells destroy 80 – 90% of normal beta cell function before hyperglycaemia and other manifestations of diabetes mellitus occur. Type 1 diabetes mellitus appears when there is no more insulin secretion.

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This type of diabetes mellitus requires exogenous insulin in order to sustain the individuals' life (Black and Hawks, 2009). Type 2 diabetes mellitus also known as adult onset diabetes mellitus could occur as a result of genetic mutation which causes body tissue /resistance to insulin (body does not respond to action of insulin) (Black and Hawks, 2009). The insulin receptors are either unresponsive to action of insulin and / or the insulin secreted is inadequate. Individuals living with type 2 diabetes mellitus require oral hypoglycaemic in order to control their glucose level. Secondary diabetes mellitus is the type of diabetes mellitus that is associated with other medical conditions / treatment of conditions such as endocrinopathies (acromegally, hyperthyroidism, Cushing's syndrome), pancreatic disease (pancreatectomy, cystic fibrosis). It could also occur following the use of medication, such as thiazides, corticosteroids, phenytoin and clozapine (Black and Hawks, 2009). Gestational diabetes mellitus is the type of diabetes mellitus that occurs in pregnancy (Black and Hawks, 2009). Women with gestational diabetes mellitus are reported to be at a higher risk of developing type 2 diabetes mellitus in 5 – 10 years (Black and Hawks, 2009). This manuscript focuses on type 2 diabetes mellitus. Individuals living with diabetes mellitus tend to present with physiological symptoms which in most cases are distressing. These physiological symptoms include hyperglycemia, which is accompanied by polyuria, polydipsia, polyphagia, and weight loss (Black and Hawks, 2009). The long-term effects of these

distressing symptoms include interference with the individual's quality of life and may also result in physiological, neurological and psychological effects (Black and Hawks, 2009).

Physiological effects of living with diabetes mellitus

Adults suffering from diabetes mellitus are reported to have high prevalence of disability attributed to diabetes mellitus-related complications (Kalyani, Saudek, Bracati, and Selvin, 2010). Sinclair, Conroy and Bayer (2008) conducted a quantitative study on 403 cases and 403 controls to determine the impact diabetes mellitus on physical function among clients. Their results showed that cases living with diabetes mellitus had more comorbidities than controls and were more likely to have severe functional impairment. Health status pertaining to physical function was reduced among cases. In a multivariate model controlling for age, hypertension, cerebrovascular disease, chronic obstructive pulmonary disease and dementia, diabetes mellitus remained significantly associated with mobility limitations. The researchers concluded that adults living with diabetes mellitus had physical impairment associated with reduced health status. A comprehensive assessment and management of diabetes mellitus need to be strengthened for early detection and improved client outcomes.

Diabetes mellitus and disability

Kalyani, Saudek, Bracati and Selvin (2010) reported that adults living with diabetes mellitus had 2-3 times increased odds of disability. The results also showed that comorbidities such as cardiovascular diseases, and obesity were mostly common and had negative impact on the health status of clients. The study revealed that the prevalence of disability among clients living with diabetes mellitus was attributed to comorbidities. However, Chaturvedi (2007) found that not only cardiovascular disease but also nephropathy, neuropathy and retinopathy were major complications that contributed to the high morbidity and mortality rates in clients living with diabetes mellitus. Aggressive management of these comorbidities could reduce risk of disability in clients living with diabetes mellitus.

Diabetes mellitus and cardiovascular disease

Cardiovascular disease (CVD) is a major cause of poor of life, disability, and mortality among adults living with diabetes mellitus (Cigolle, Blaum and Halter, 2009). This finding is supported by Srikanth and Deedwania (2011) who reported that the majority of individuals living with diabetes mellitus died from CVD and related complications. The investigators revealed that the odds of CVD was 2- 4 folds greater in clients living with diabetes mellitus. Furthermore, a study by Lahoz-Rallo, Blanc-Ciria, Marin-Andrede, Mendez-Segovia, Maratella-Rogriguez, Quintero-Dominguez, et al, (2007) revealed that cardiovascular disorders in clients living with diabetes mellitus were major complication with 50% affected by hypertension, 23% coronary heart disease and 16% affected by stroke. The authors concluded that more specific health interventions were needed to reduce the risk of cardiovascular disease among clients living with diabetes mellitus.

Diabetes mellitus and diabetic nephropathy

The onset of diabetes mellitus is insidious before the actual diagnosis is made. According to Lee and Sum (2011) the availability of effective therapy for diabetic nephropathy has led to the recommendations that all clients suffering from diabetes mellitus be screened for micro-albuminuria annually. However, the prevalence of micro-albuminuria continues to increase in the elderly people living with diabetes mellitus because renal impairment is frequently related to aging in older patients. On the other hand, Zheng and Chen (2011) asserted that diabetic nephropathy often led to end-stage renal failure which often caused death in clients suffering from diabetes mellitus. The researchers found that higher proportions of individuals with type 2 diabetes mellitus had micro and macro albuminuria shortly after diagnoses of diabetes mellitus. The study findings revealed that 20-40% of clients living with type 2 diabetes mellitus had microalbuminuria which progressed to overt nephropathy, 20% of the participants had progressed to end-stage renal disease and were already on dialysis. The investigators recommended an establishment of specific policies on early screening of clients living with diabetes mellitus to reduce the risk of morbidity and mortality rates related to renal complications.

Diabetes mellitus and diabetic neuropathy

Diabetic neuropathy is the most common diabetic complication resulting in ulceration and lower limb amputation. According to The Consensus-Based Practical Guidelines for the Treatment and Prevention of Diabetic Foot (2008), foot complications are among the most serious and costly complications among individuals living with diabetes mellitus. It is estimated that every 30 seconds globally a lower limb or part of it is amputated due to diabetes mellitus. Amputation of all or part of a lower limb is usually preceded by a foot ulcer. Moreover, Edward, Vincent, Chang and Feldman (2008) also found that foot problems are an important cause of morbidity in clients living with diabetes mellitus and the risk was much higher in older clients. This implies that elderly clients require frequent special screening and attention. Manschot, Biessels, Rutten, Kessels, Glipsen and Kappelle (2007) conducted a study on peripheral and neurological complications in type 2 diabetes mellitus. Their results showed that 38% of cases had neuropathy and only 12% among controls had neuropathy. They also found that the majority of clients with neuropathy were severely impaired with regard to general physical quality of life. It was concluded that diabetic neuropathy among adults living with diabetes mellitus generated significant reductions in the clients' quality of life.

Diabetes mellitus and diabetic retinopathy

Diabetic retinopathy is the leading cause of new cases of blindness among adults living with diabetes mellitus. Data has revealed that the prevalence of retinopathy increases progressively with increasing duration of diabetes mellitus (Lee and Sum, 2011). According to Lee and Sum (2011), cataract and glaucoma are the most common retinopathy complications in elderly clients living with diabetes mellitus. Their results showed that cataract was more than twice

(38.4%) as common in people over the age of 65 years with diabetes mellitus compared with non-diabetic (16.6%) clients, while glaucoma was 11.2% among individuals with diabetes mellitus and 3.8% among non-diabetics. The investigators concluded that both cataract and glaucoma were leading disabilities of diabetic retinopathy among people living with diabetes mellitus. Regular eye examination in clients living with diabetes mellitus is therefore essential because poor vision could lead to social isolation, increased risk of accidents, impaired ability to self-monitor blood glucose and measure insulin doses.

Social effects in living with diabetes mellitus

According to Zhang, Chan and Chen, (2007) diabetes mellitus is a devastating chronic progressive disease associated with multiple long terms social effects which alter the client's wellbeing and social life. These social aspects include change of identity, change in sexuality and social relationships.

Change of identity

Diabetes mellitus like other chronic illnesses could change ones identity resulting to anxiety and low self-esteem. Persons living with diabetes mellitus could label themselves as abnormal persons different from other persons. Rogers (1959) in his Theory of Person-Centred Approach stated that when experiences are incorporated into the individual's self-image, the experiences become part of what Rogers called 'self'. Self is the sense of personal identity represented within the phenomenal field; in this case the disorder, diabetes mellitus. Olshansky, Sacco, Fitzgerald, Zickmund, Hess, Bryce, et al, (2008) explored experiences of living with diabetes mellitus as a disease. In the study a theme, 'normalizing an identity as a person with diabetes' emerged. The findings revealed that individuals living with diabetes mellitus struggled with becoming persons living with diabetes mellitus rather than a diabetic person. Understanding diabetes mellitus as a disease, could assist those living with diabetes mellitus begin to view themselves as not different from others, allowing them to interact with others more easily and to have a positive attitude towards the disease they are living with. Despite being diagnosed with diabetes mellitus people still want to be treated as the same persons as before. Johansson, Ekebergh and Dahlberg, (2008) found that falling ill from diabetes mellitus was a fight not to become one's illness. In their study a phenomenology approach was used with seven participants diagnosed with diabetes mellitus. Their results showed that an initial feeling of bodily imbalance could be denied or given a natural explanation, but gave rise to a suspicion that something was wrong. They concluded that, more caring focus was needed to be directed to the process of "falling ill". The focus on the process of falling ill is useful in increasing the understanding of clients. Thus, these clients' needs could be met in a way that lessens their suffering and facilitates their adaptation to the disorder.

Sexual relationships

People living with diabetes mellitus often encounter long-term challenges on sexual issues (Penckofer, et al, 2007). Diabetes Mellitus has been long considered a major cause of sexual

dysfunction among people living with the illness. Both type 1 and type 2 diabetes mellitus have been recognised as major risk factors for impaired sexual function, primarily erectile dysfunction in men (Bhasin, Enzlin, Coviello and Basson, 2007). Burke, Jacobson, McGree, Nehra, Roberts, Girman, et al, (2007), revealed that individuals especially men, living with diabetes mellitus had significantly greater dysfunction in sexual domains including sexual drive, ejaculatory function, erectile dysfunction, and sexual satisfaction. They found that erectile dysfunction was the most common dysfunction amongst the sexual domains. Consistent with research Burke et al, (2007); Rosen, Wing, Schneider, Wadden, Foster and West, et al. (2009) reported that erectile dysfunction was more common among men living with diabetes mellitus. The researchers revealed that with the presence of more than one disease and diabetes mellitus-related complications among men living with diabetes mellitus, sexual dysfunction was aggravated. Women living with diabetes mellitus are also not spared from these experiences of decreased sexual function. Diabetes mellitus could affect women's sexual function through vascular changes in the urogenital tissues impacting negatively on genital lubrication and neuropathy-mediated alterations in genital arousal response (Copeland, Brown, Creasman, Van Den Eeden, Subak, Thom, Ferrara and Huang, 2012). According to a study by Ali, Al-Hajem, Khader, Shegem, and Ajlouni, (2008) the prevalence of sexual dysfunction among women living with diabetes mellitus aged 50 years or older was found to be 59.6% compared to 45.6% among non-diabetic women.

The findings also showed that women living with diabetes mellitus had more sexual dysfunction related to desire, arousal, lubrication and orgasm compared to non-diabetic women. This shows that diabetes mellitus poses a serious threat to people living with diabetes as far as sexual function is concerned. Doruk, Akbay, Cayan, Bozlu and Acar (2005), also investigated the effects of diabetes mellitus on female sexual function. A total of 127 participants with both type 1 and type 2 diabetic mellitus participated in the study. The results showed that sexual dysfunction was 42% among subjects with type 2 diabetes mellitus, 71% among those with type 1 diabetes mellitus and 37% in controls. Notable, sexual desire, arousal, lubrication was higher among participants with type 2 compared to those with type 1 diabetes mellitus. These findings call for reconsideration of on-going counselling on sexual issues as these could disrupt family relations.

Psychological effects of living with diabetes mellitus

According to Zhang, Chan and Chen (2007) diabetes mellitus is a devastating chronic progressive disease associated with multiple long terms psychological effects which often disturb the client's well-being and social life. The psychosocial effects include anxiety, uncertainty, feelings of fear, and distress.

Anxiety and uncertainty

People living with diabetes mellitus often experience psychological issues related to their condition. According to Zhang, Chan and Chen (2007) anxiety symptoms in clients living with diabetes mellitus were found to be associated with: worrying about the disease process; social/family crisis related

to the disease; worrying about declining body/physical function; and negative coping styles. These symptoms reflect that perceived stress from disease, coping styles, and social support are the independent determinants of anxiety and depressive symptoms among clients living with type 2 diabetes mellitus. Collins, Reynolds and Hudson (2008) examined the experiences of adult individuals who were living with diabetes mellitus. A qualitative design was used with 22 participants. The themes that emerged were: emotional response; looking for an understanding; learning to live with diabetes mellitus; and limiting the impact of diagnosis. The investigators concluded that shock, anxiety, uncertainty and relief were the most health challenges faced by the adults living with diabetes mellitus. This shows that adequate education and psychosocial support are needed not only at the time of diagnosis with diabetes mellitus but throughout the course of the disease process to alleviate the negative effects.

Consistent with Collins, Reynolds and Hudson (2008); Penckofer, Ferrans, Velsor-Friedrich and Savoy (2007) reported that people living with type 2 diabetes mellitus experienced feelings of depression, anxiety and anger. Forty one (41) women living with type 2 diabetes mellitus participated in the study. The purpose of the study was to understand the feelings of depression, anxiety and anger experienced by women living with type 2 diabetes mellitus and the impact these feelings had on their overall quality of life. Their results generated themes which were: struggling with the changing health situation; encountering challenges in relationships with self, family, and others; worrying about the present and future; bearing multiple responsibilities for self and others; and choosing to take a break. Furthermore, the findings showed that women living with diabetes mellitus expressed feelings of depression, anxiety, and anger, which were primarily related to suffering from diabetes mellitus as well as managing the multiple responsibilities of being a caregiver. These findings suggest that health care providers should assess the psychological wellbeing of people living with type 2 diabetes mellitus when developing plans of care to facilitate client coping with the illness.

Diabetes mellitus self-management

Persons living with diabetes mellitus in collaboration with health care providers have to make day-to-day decisions about how to manage their illness (Carbone, Rosal, Torres, Goins, and Bermudez, 2007). Effective management of diabetes mellitus involves the person diagnosed with the illness, family members and health care team. McCorkle, Ercolano, Lazeby, Schulman-Green, Schilling, Lorigand and Wagner (2011), defined self-management, as the ability to manage symptoms and consequences of living with a chronic condition, such as diabetes mellitus. The majority of clinicians and researchers advocate that clients need to be advised on skills of self-management to become capacitated and responsible for self-management (George and Thomas, 2010). Carbone, et al, (2007) conducted a qualitative study on diabetes self-management interventions among 37 participants. The results showed that knowledge deficit and negative attitude regarding diabetes mellitus self-management were common among clients. In addition, strong religious faith and support from medical practitioners were key facilitators to self-management.

Families were found to both facilitate and impede self-management practices. This implies that programs tailored for clients living with diabetes mellitus must be developed in order to improve self-management skills and practices. George and Thomas (2010) in a study on the experiences of self-management among persons living with diabetes mellitus came out with four themes which were: your body will let you know; I thought I was fine, but I wasn't; the only way out is to die; and you just go on. These findings suggested that self-management was neglected. This also implies that when managing diabetes mellitus, the disease should be viewed from the client's perspective as the focus becomes problem solving of issues arising from self-management of one's own regimen rather than adhering to doctor's orders.

Lunaberg and Thrakul (2011) conducted a study focusing on how Thai people living with type 2 diabetes mellitus practiced self-management. A descriptive qualitative study was used with a sample of 30 male and female participants. The themes that emerged from the data were: culture influences diabetes mellitus control; struggle for disease control; family support; and economy. The investigators concluded that cultural traditions, family, economy and the social environment should be taken into account in the management of diabetes mellitus. This will help people living with diabetes mellitus to cope with the disorder by being empowered about it. According to Al-Khawalder, Al-Hassan and Froelicher, (2011) self-management in diabetes mellitus requires a complex and demanding behavioural skill from the client. The investigators described self-management in diabetes mellitus as those activities that include lifestyle changes, treatment adherence, physical activity and dietary modification.

Lifestyle changes

Lifestyle changes among individuals living with diabetes mellitus play a major role in the prevention and control of diabetes mellitus and related complications. According to Malpass, Andrews and Turner (2009), sedentary lifestyle and obesity increase the prevalence of type 2 diabetes mellitus among the adult population. In harmony with Malpass, Andrews and Turner (2009), Hu, and Tuomilehto (2007) found that lifestyle factors, such as physical activity, diet, self-monitoring, and screening influenced the development, progression, and subsequent complications of type 2 diabetes mellitus. However, lifestyle changes can be challenging amongst clients living with diabetes mellitus probably because of negative attitudes towards change. Thus, people living with diabetes mellitus need reliable self-management skills and practices to control the disorder (Al-Khawalder, Al-Hassan and Froelicher, 2011).

Adherence to treatment

It has been revealed that self-management of type 2 diabetes mellitus is challenging and often requires adherence to complex treatment regime (Al-Khawalder, Al-Hassan and Froelicher, 2011). Despite the advent of effectiveness drug therapy in the control of diabetes mellitus, poor client adherence results in disease complications (Kalsekar, Sheehan and Peak, (2007). Walker and Caban (2006) reported that poor medication adherence was implicated as a major factor in poor

glycaemic control. However, socio-demographic and medical factors were also reported as predictors of poor adherence to drug therapy. It was suggested that understanding clients' beliefs about the disease and its management may represent an opportunity for improving diabetes mellitus medication adherence. Mann, Ponieman, Leventhal, and Halm (2009) had similar research findings with Walker and Caban (2006), which revealed that poor medication adherence was related to the client's beliefs and experiences. This was concluded after investigating clients' medication beliefs and experiences associated with poor medication adherence among people living with diabetes mellitus. Moreover, the investigators reported that poor medication adherence was related to: believing you have diabetes mellitus only when your sugar level is high; saying there was no need to take medicine when the glucose was normal; worrying about side-effects of diabetes mellitus control medication; lack of self-confidence in controlling diabetes mellitus; and feeling that it is challenging to take medication.

These findings suggest that conflicting beliefs among clients about medication for disease control results in poor adherence. These negative beliefs are logical targets for educational interventions to improve diabetes mellitus self-management. According to Hauber, Mohamed, Johnson, and Farley (2009), glucose control is the most important medication feature in adherence. Thus, poor adherence to medication in clients with type 2 diabetes mellitus could result to complications such as medication-related weight gain and cardiovascular risk. Education on diabetes mellitus could play a major role in increasing knowledge, improving skills and in developing attitude that would lead to improved medication adherence. Successful education does not only impart knowledge but also empowers and motivates individuals to apply knowledge and skills in problem-solving and self-management.

Physical activity

Engaging in physical activities in people living with diabetes mellitus has an influence in the blood glucose level. According to Zeqiri, Ylliand, Zeqiri, (2007) engaging in physical activity reduced blood sugar level in clients with the diabetes mellitus. Physical activity could decrease insulin resistance, assist with weight loss, improve blood glucose control. In their study they found that clients engaged in activity programmes, had their blood sugar levels reduced to 25.4mg/dl in males and 18.0mg/dl among females. However, people living with diabetes experience challenges with physical activities. Lawton, Ahmad, Hanna, Douglas and Hallowell, (2006) found that lack of time interwoven with cultural norms and social expectations were stumbling blocks to the engagement in physical activity. Health problems which could make physical activity difficult were also reported to hinder progress in changing lifestyle. This suggests that education on diabetes could play a role in physical activity promotion. Increasing physical activity could act as a gateway behaviour; a behaviour that would produce positive effects in other behaviours. Health promoters may need to work with, rather than against, cultural norms and individual perceptions. A culturally sensitive approach is recommended, which will identify and capitalise on the kinds of activities clients already perform in their everyday lives.

Dietary modification

Some people living with diabetes mellitus find it challenging to change their diet increasing the risk of developing diabetes mellitus-related complication. Nutritional therapy is an essential component of successful diabetes mellitus management (Miller, Gutschall and Mitchell, 2009). Kontogianni, Liatis, Grammatikou, Perrea, et al, (2011) evaluated the impact on dietary habits of 191 participants living with type 2 diabetes mellitus. The results showed that participating in dietary change such as reducing the whole fat dairies and processed meat consumption, had decreased body weight. They concluded that counselling on dietary changes had health benefits. Malpass, Andrews and Turner, (2009) explored diabetes patient's experiences of making diet modification in order to increase life style changes. Their findings suggested that providing dietary change information encouraged patients to use the skill to aid in disease management. Most patients found undertaking multiple lifestyle changes including dietary modification helpful. Health care professionals, public health messages and health care system should strongly encourage healthy nutritional habits during daily life to prevent overweight and obesity.

Summary and conclusion

Diabetes mellitus is a chronic medical disorder that negatively impacts on the physical, social and psychological wellbeing of individuals living with the disease. It is imperative that individuals living with diabetes mellitus be screened regularly so that diabetes mellitus related complications could be detected early for improved client outcomes. Diabetes mellitus could be prevented/ controlled through lifestyle changes and medication.

REFERENCES

- Ali, R. M., Al-Hajen, R. M., Khader, Y. S., Shegem, J., and Ajlouni, K. M. 2008. Sexual dysfunction in Jordanian Diabetic women. *Diabetes Care*, 31(8), 1580-1581.
- Al-Khawaldeh, O. A., Al-Hassan, M. A., and Froelicher, E. S. 2011. Self-efficacy, self-management and glycemic control in adults with Type 2 diabetes mellitus. *Journal of Diabetes and its Complications*, Article on Press.
- Bhasin, P. S., Enzlin, P., Coviello, A., and Basson, R. 2007. Sexual dysfunction in men and women with endocrine disorders. *The Lancet*, 369 (9561), 597- 611.
- Black, J. M., and Hawks, J. H 2009. *Medical-Surgical Nursing:clinical management of positive outcome* (8th Edition).St. Louis: Saunders Elsevier.
- Burke, J. P., Jacobson, D. J., McGree, M. E., Nehra, A., Roberts, R. O., Girman, C. J., Lieber, M. M., and Jacobson, S. J. 2007. Diabetes and sexual dysfunction; results from the Olmsted County study of urinary symptoms and health status among men. *Adult Urology*, 177(4), 1438- 1447.
- Carbone, E.T., Rosal, M.C., Torres, M. I., Goins, K. V., and Bermudez, O. I. 2007. Diabetes self-management: perspective of Latino patients and their health care providers. *Patient Education and Counselling*, 66(2), 202-210.

- Chaturvedi, N. 2007. The burden of diabetes and its complications: trends and implications for intervention. *Diabetes Research and Clinical Practice*, 76(3), S3-S12.
- Cigolle, C. T., Blaum, C. S., and Halter, J. B. 2009. Diabetes and cardiovascular prevention in older adults. *Clinics and Geriatric Medicine*, 25(4), 607-641.
- Collins, S., and Reynolds, F. and Hudson. 2008. Experiences of adults with CF in adapting to the diagnosis of diabetes and a second chronic illness. *Journal of Advanced Nursing*, 64(5), 478-487.
- Copeland, K. L., Brown, J. S., Creasman, J. M., Van Den Eeden, S. K., Subak, L. L., Thom, D. T., Ferrara, A., and Huang, A. J. 2012. Diabetes mellitus and sexual function in middle-aged and older women. *Obstetrics and Gynecology*; 120:331-40) DOI: 10.1097/AOG.0b013e31825ec5faVOL. 120, NO. 2, PART 1
- Doruk, H., Akbay, E., Cayan, S., Bozlu, M., and Acar, D. 2005. Effect of diabetes mellitus on female sexual function and risk factors. *System Biology in Reproductive Medicine*, 51(1), 1-6.
- Edward, J. C., Vincent, A. M., Chang, H. T., and Feldman, E. L. 2008. Diabetic neuropathy and mechanism to management. *Pharmacology and Therapeutics*, 120, 1-34.
- George, S. R., and Thomas, S. P. 2010. Lived experiences of diabetes among older, rural people. *Journal of Advanced Nursing*, 66(5), 1092-1100.
- Hauber, A. B., Mohamed, A. F., Johnson, F. R., and Farley, H. 2009. Education and psychological aspects treatment preferences and medication adherence of people with Type 2 diabetes using oral glucose-lowering agents. *Diabetic Medicine*, 26(4), 416-424.
- Hu, G., and Tuomilehto, J. 2007. Lifestyle and outcome amongst patients with Type 2 diabetes. *International Congress Series*, 1303, 160-171.
- Johannson, K., Ekebergh, M., and Dahlberg, K. 2008. A lifeworld phenomenological study of the experience of falling ill with diabetes. *An International Journal of Nursing Studies*, 46, 197 – 203.
- Kalsekar, I., Sheehan, C., and Peak, A. 2007. Utilization patterns and medication adherence in patients with type 2 diabetes. *Research in Social and Administrative Pharmacy*, 3, 378- 391.
- Kalyani, R. R., Saudek, C. D., Brancati, F. F., and Selvin, E. (2010). Association of diabetes, comorbidities and AC1 with functional disability in older adults. *Diabetes Care*, 33(5), 1055-1060.
- Kneck, A., Klang, B., and Fagerberg, I. 2011. Learning to live with illness: experiences of persons with recent diagnoses of diabetes mellitus. *Scandinavian Journal of Caring Sciences*, 25(3), 558-566.
- Kontogianni, M. D., Liatis, S., Grammatikou, S., Perrea, D., Katsilambros, N., and Makrilakis, K. 2011. Changes in dietary habits and their association with metabolic makers after a non-intensive, community based life style intervention to prevent T2DM in Greece. *Diabetes Research and Clinical Practice*, 95, 207-214.
- Lahoz-Rallo, B., Blanco-Gonzalez, M., Casas-Ciria, I., Marin-Andrede, J. A., Mendez-Segovia, J. C., Moratella-Rodriguez, G., Quintereo-Dominguez, R., Ramirez-Raya, M., Guerrero-Pinedo, J. M., and Aguilar-Diosdado, M. 2007. Cardiovascular risk in subjects with T2DM in a population in Southern Spain. *Diabetes Research and Clinical Practice*, 74, 436-444.
- Lawton, J., Ahmad, N., Hanna, L., Douglas, M., and Hallowell, N. 2006. 'I can't do any serious exercise': barriers to physical activity amongst people of Pakistani and Indian origin with Type 2 Diabetes. *Health Education Research*, 21(1): 43-54.
- Lee, K. M., and Sum, W. M. 2011. Prevalence of diabetic retinopathy in patients with diabetes mellitus. *Clinical Experimental Optometry*, 94(4), 371-375.
- Lunaberg, P. C., and Thrakul, S. 2011. Type 2 diabetes: how do Thai Buddhist people with diabetes practice self-management? *Journal of Advanced Nursing*, 68 (3), 550-558.
- Malpass, A., Andrews, R., Turner, K., M. 2009. Patient Perception, Preference and Participation with Type 2 Diabetes experiences of making multiple lifestyle changes: A qualitative study. *Patient Education and Counselling*, 74, 258-263.
- Mann, D. M., Ponieman, D., Leventhal, H., and Halm, E. A. 2009. Predictors of adherence to diabetes medications: the role of disease and medications belief. *Journal of Behavioral Medication*, 32(3), 278-284.
- Manschot, S. M., Biessels, G. J., Rutten, G. E., Kessels, R. C., Glispen, W. H., and Kappelle, L. J. 2007. Peripheral and central neurologic complications in type 2 diabetes. *Journal of Neurological Sciences*, 264, 157-162.
- McCorkle, R., Ercolano, E., Lazenby, M., Schulman-Green, D., Schilling, L. S., Lorig, K. and Wagner, E. H. 2011. Cancer. *A Cancer Journal for Clinicians*, 61(1).
- Miller, C. K., Gutschall, M. D., and Mitchell, D. C. 2009. Change in food choices following a glycemic load intervention in adults with type 2 diabetes mellitus. *Journal of American Association*, 109, 319-324.
- Olshansky, E., Sacco, D., Fitzgerald, K., Zickmund, S., Hess, R., Bryce, C., McTigue, K., and Fischer, G. 2008. Living with diabetes: normalizing the process of managing diabetes. *The Diabetes Educator*, 34(6), 1004-1012.
- Penkofer, S., Ferrans, C. E., Velsor-Friedrich, B., and Savoy, S. 2007. The psychological impact of living with diabetes: women day to day experiences. *The Diabetes Educator*, 33(4), 680-690.
- Rogers, C. R. 1959. A theory of Therapy, Personality and Interpersonal Relationships as Developed in the Client-centred Framework. *Psychology: a study of a science*, 3, 185- 256.
- Rosen, R. C., Wing, R. R., Schneider, S., Wadden, T. A., Foster, G. D., West, D. S., Kitachbi, A. E., Brancati, F. L., Maschak-Carey, B. J., Bahson, J. L., Lewis, C. E. and Gendrano, I. N. 2009. Erectile dysfunction in type 2 diabetic men: relationship to exercise fitness and cardiovascular risk factors. *Journal of Sexual Medicine*, 6, 1414-1422.
- Sinclair, A. J., Conroy, S. P and Bayer, A. J. 2008. Impact of diabetes on physical function in older people. *Diabetes Care*, 31 (2), 233-235.
- Srikanth, S., and Deedwania, P. 2011. Primary and secondary prevention strategy for cardiovascular disease in diabetes mellitus. *Cardiology Clinics*, 29 (1), 47-70.
- The Consensus-Based Practical Guidelines for the Treatment and Prevention of Diabetic Foot 2008. Retrieved from <http://www.iwgdf.org/index.php?option=com>.

- Walker, E., and Caban, A. 2006. A systematic review of research on culturally relevant issues for Hispanics in diabetes. *The Diabetes Educator*, 32, 584.
- Zeqiri, S., Ylli, A., and Zeqiri, N. 2007. The effect of physical activity in glycaemia in patients with diabetes. *Medical ARH*, 61(3), 146-149.
- Zhang, C., Chen, Y., and Chen, W. 2007. Association of psychosocial factors with anxiety and depression symptoms in Chinese patients with type 2 diabetes. *Diabetes Research and Clinical Practice*, 79 (3), 523-530.
- Zheng, W., and Cheng, L. 2011. Factor analysis of diabetic nephropathy in Chinese patients. *Diabetes and Metabolic Syndrome Clinical Research and Reviews*, 5, 130-136.
