



ORIGINAL RESEARCH PAPER

Psychology

HOW FEASIBLE THE BEHAVIOURAL INTERVENTIONS IN CONTROLLING THE DIABETES IN OLDER ADULTS - A TRY OUT

KEY WORDS: Behavioural Interventions, Older adults & Diabetes

Jithender Narayan,

Gayathri, A.

Padmavathamma, M.

Prof. D. Jamuna

ABSTRACT

Type 2 diabetes is predominantly, but not exclusively, a disease of the middle-aged and elderly. The diagnosis of diabetes itself is regarded as an emotionally upsetting event for many people with diabetes. Several group interventions have been designed and described, to help people to pass through the emotional turmoil they may face when confronted with a diagnosis of diabetes. A range of interventions that achieve benefits in these areas provide a base for developing versatile programs to promote healthy coping. The present study is contemplated with an objective to examine the effect of behavioural interventions to reduce the levels of blood sugar in older adults. The intervention results pertaining to diabetic sample indicated that all the interventions (Psycho education + Dietary Counseling + simple regimen of exercises + Relaxation+ Meditation) together were found to be highly effective compared to other types of interventions. A total sample of 120 diabetic male and female subjects 80 (Mean age = 65. 3 years) were enrolled for the study on interventions for diabetes. Based on the background information of individuals, intervention module covering psycho educational programmes, dietary counseling, physical exercises were provided along with Relaxation & meditation. Results revealed that majority of subjects with diabetes mellitus were benefited by these intervention sessions.

Introduction:

Global trends suggest that type 2 diabetes is an important and common public health concern that is steadily becoming more prevalent. Type 2 diabetes is predominantly, but not exclusively, a disease of the middle-aged and elderly (World Health organization, 2012). The true prevalence is difficult to judge because many cases have few or no symptoms in the early stages, and are therefore undiagnosed (Fonseca & Wall, 1995; James, Micheal & Alan, 2010). Nevertheless, it is associated with a greater mortality rate at any age, approaching twice the rate in older people of comparable age without diabetes (Bruce, Casey, Grange, Clarnette, Almeida, Ives & Davis, 2003). Several epidemiological studies on diabetes have reported differential rates of prevalence in the elderly, with the reasons cited being different in terms of not only the dates of the studies but also the diagnostic criteria and the racial groups recruited into the studies (Choi, Lee & Kim, 2002).

Diabetic, the metabolic syndrome is a precursor to such serious diseases as cardiovascular diseases and diabetes. Diabetes can aggravate the disability and delay the patients' recovery, as a consequence, leads to a higher prevalence of disability. This relation magnifies with the appearance of diabetes complications in the eye and diabetic foot, related conditions like obesity and depression or high blood pressure, (Bourdel, Helmer & Campagna, 2007; Jidong, Jong, Won, Seoung & Eun, 2012). A major health issue due to diabetes has adverse effects on the quality of life and life span (Oussama & Khatib, 2006).

The diagnosis of diabetes itself is regarded as an emotionally upsetting event for many people with diabetes. Several group interventions have been designed and described, to help people to pass through the emotional turmoil they may face when confronted with a diagnosis of diabetes. The review of research studies on interventions suggest that Medical nutritional therapy has proven to be beneficial in older adults with diabetes (Miller, Edwards & Kissling, 2002). Psychological, emotional related behavioral factors, and quality of life are important in diabetes management and are worthy of attention in their own right, and influence metabolic control. A range of interventions that achieve benefits in these areas provide a base for developing versatile programs to promote healthy coping. Susan, Engelgau and Narayan (2001) systematically reviewed the effectiveness of self-

management training in type 2 diabetes. Interventions were categorized based on educational focus (information, lifestyle behaviors, mechanical skills, and coping skills), and outcomes were classified as knowledge, attitudes, and self-care skills; lifestyle behaviors, psychological outcomes, and quality of life; glycemic control; cardiovascular disease risk factors; economic measures and health service utilization. Perceived self-efficacy was significantly associated with all self-management practices. People consulting at the health service with a more supportive system had better perceived self-efficacy and self-care behavior. Higher knowledge, attitude, and perception scores were noted among those with better self-efficacy perceptions, which was associated with better self-care behavior (Clark, Sarah & Hampson, 2001).

Yoga, one of the traditional Indian practices includes diaphragmatic breathing and asanas that promote physical comfort and mental composure. Yoga experts believe that some asanas exert positive effects on various endocrine glands. An ancient Chinese form of "moving meditation" Qi-gong similar to t'ai chi that combines slow diaphragmatic breathing with spiral and circular body movements (Buman, Hekler & Haskell, 2010). Some studies of relaxation techniques with and without biofeedback had mixed results. Surwit, Van Tilburg, Zucker, Caskil, Parekh, Feinglos, Edwards, Williams and Lane (2002) studied persons with type 2 diabetes for 1 year following a five-session group intervention of relaxation therapy plus diabetes education. Another study of relaxation therapy plus biofeedback demonstrated improved glycemic control that was sustained for three months and was associated with decreased depression and anxiety scores (Ginnis, Grady, Cox & Dowling, 2005).

Snoek and Skinner (2002) in their studies on the utility of short, structured, well described group interventions based on principles of cognitive behavioral therapy (CBT) tested in groups of type 1 diabetic patients in long term poor glycaemic control with an aim to assist patients in overcoming negative beliefs and attitudes toward diabetes and achieving better glycaemic control without compromising emotional well-being. In a series of seventeen studies that met criteria were identified (Markowitz, Gonzalez, Wilkinson & Safren, 2011) indicating that psychosocial interventions, particularly cognitive-behavior therapy, antidepressant medications, and collaborative care are effective in the treatment of depression in patients with diabetes. Evidence for the

efficacy of these interventions in improving glycemic control was mixed. Numerous clinical trials have shown that in high-risk subjects (particularly those with impaired glucose tolerance), type 2 diabetes can be prevented or delayed by lifestyle interventions or by various classes of medications. In these trials, primarily enrolled middle-aged participants were seemed to have more beneficial from lifestyle interventions than younger participants, but did not appear to benefit from metformin.

Preventive strategies that can be efficiently implemented in clinical settings and in the community have been developed and evaluated by Ackermann, Finch and Brizendine (2008). A range of interventions that achieve benefits in these areas provide a base for developing versatile programs to promote healthy coping among diabetic older adults. A meta-analysis of the literature of controlled studies of educational and psychosocial interventions in the treatment of diabetes mellitus yielded 93 studies of 7451 patients testing the effects of eight intervention types: didactic education, enhanced education, diet instruction, exercise instruction, self-monitoring instruction, social learning/behavior modification, counseling and relaxation training. The assumption of many such studies on intervention programmes is that stress management, psycho education, self management, physical activity, exercise and diet can help in effective management of diabetes. Some studies view that regular mind–body relaxation techniques viz., autogenic training, progressive muscle relaxation, biofeedback treatment and meditation were recommended as the key for stress management which in turn reduces diabetes. However, Indian research on yoga and relaxation reported mixed results (outcomes), but majority supported the need for life style modifications.

In addition to the psychological, sociological and spiritual interventions that assist the diabetic elderly to lead normal living, interventions within the environment changes have been highlighted in the management of diabetic. Various cognitive therapies, reminiscence therapy and supportive group therapy were associated with the promotion of health in diabetic elderly. Studies concluded that there is a dire need for appropriate interventions and maximizing the role of community member's role in providing awareness diabetes. Some other studies highlighted the need for interventions such as exercise, medical services to screen diabetes in the elderly, health education on diet and cholesterol reduction, and new psychological therapies like in health care of diabetic, health promotion activities especially in terms of promoting positive attitudes, knowledge of good diabetics and health practices. In view of the above, the present study is contemplated with an objective to examine the effect of behavioural interventions to reduce the levels of blood sugar in older adults.

Method:

A sample of older adults with diabetes between 60 -70 years were selected from the outpatient Registry i.e. those who were visiting TTD Central Hospital, Tirupati, for the treatment of diabetes from 2015 to 2017 September. Necessary permissions were obtained from the TTD Central Hospital (Tirupati) authorities to use their outpatient records to identify the persons. Thus, persons attending outpatient clinic of TTD Central Hospital since 2 years were identified and were subjected to blood examination for Hb A₁C level and fasting plasma blood sugar levels to identify level of diabetes. Older adults with fasting plasma glucose levels between 126 to 200 mgs / dl and Hb A₁C level between 6.5 to 7.5 were enrolled for the study.

To constitute the sample for intervention, 80 diabetic older adults in the age group of 60-70 years (mean Age = Diabetic 65.3 yrs) were identified from the main sample of 120 diabetic (mean Age = 64 years) older adults attending the TTD central hospital. This involves examining the effect of intervention strategies in 80 diabetic older adults. To enroll the subjects in Diabetic intervention sample, on the basis of inclusion / exclusion criteria subjects with in the levels of fasting plasma between 126 to 145mgs/dl and with Hb A₁C levels between 6.5 to 7 were included. The sample were divided into Experimental and Control groups by matching their age, gender, education, economic level and family history of

diabetes. As a next step, these 40 subjects in the Experimental group were further divided into four small groups with 10 subjects in each group (viz., Eg1, Eg2, Eg3, Eg4). Similar method was followed to constitute four small groups in the control group with 10 subjects in each group viz., (Cg1, Cg2, Cg3, Cg4). The sample (diabetics) in each small group in Experimental group were subjected to interventions and no such interventions to the subjects in sub groups of control group (diabetics). These clusters were identified from different locations to avoid cross communication, exchange of training inputs and so on.

An Intervention module was prepared to create awareness by highlighting that the levels of blood sugar levels can be reduced by appropriate measures e.g. through certain strategies like easy to follow dietary modifications that would help their diabetic condition; a regimen of simple exercises suitable to the person concerned to help reduce the diabetic levels in older adults; and a few measures that will pep-up their mind set.

The intervention module was prepared with the help of panel of experts viz., Physician, Dietician, and Physiotherapist / Exercise trainer, yoga specialist (Meditation and Relaxation). The importance and details of intervention were explained to the members of the Experimental groups in reducing their levels of blood sugar. Individual counseling session was also extended to each participant to understand their needs and concerns with an aim to extend help to overcome those concerns. No such interventions were given to persons in control groups.

The cost-effective diet (based on locally available food items) which was prescribed by the Nutrition specialist, was recommended to each subject in the experimental subgroup 2 (Eg2). Almost all of them followed the diet and incorporated the changes (observance through supervision by the investigating team). In addition to the above, an exercise program, which was prescribed by the Physiotherapist (Exercise trainer), was given to each subject in Eg2. All the methods viz., Psycho educational inputs, Dietary counseling, physical exercise, relaxation and meditation were given together for experimental subgroup (Eg4) of intervention sample. Each subject was made to understand psycho educational strategies and encouraged to practice Dietary Counseling, simple exercises, Relaxation and Meditation.

After completing the first training session, all the participants in the intervention were enquired about the ease and difficulties they faced during intervention session. Based on their feedback, necessary modifications were made in their training and the time for next session was fixed. Training on daily basis for a brief period about (10 - 30 min) was extended to members of the Experimental sub groups. In spite of some initial difficulties in the Intervention session, uniform testing conditions were observed for all the subjects to the maximum extent possible. After the completion of two sessions, only the physiotherapist and the Investigators (who also acted as counselors) monitored the intervention programme by supervising the clients every day and was continued for a period of eight weeks. The programme was carried out for 5 days i.e., Monday through Friday each week. When the interventions (treatments) were completed, the levels of blood sugar (fasting plasma glucose levels) were estimated in both experimental and control group subjects to evaluate the effect of interventions and without interventions.

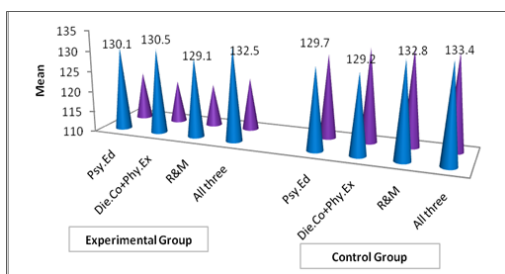
Results & Discussion
Levels of Fasting Plasma Blood Sugar Levels in Pre and Post Intervention Sessions in Experimental and Control Group Older Adults

S.No	Experimental Group (N = 40)	Control Group (N = 40)		t value	p value
		Pre Mean (SD)	Post Mean (SD)		
1.	Psy. Ed Eg1 (N=10)	130.10(240)	121.50(211)	11.35**	Cg1 (N=10) 129.70(362) 130.30(291) 1.38@

2.	Die. Co +Phy. Ex.	Eg2 (N=10)	130.50(36)	120.25(303)	7.12*	Cg2 (N=10)	129.20(383)	132.50(232)	1.64 @
3.	R &M	Eg3 (N=10)	129.10(291)	120.20(303)	8.10*	Cg3 (N=10)	132.80(249)	133.20(181)	1.31@
4.	All three	Eg4 (N=10)	132.50(232)	122.70(211)	9.29*	Cg4 (N=10)	133.40(171)	133.00(181)	1.18@
*P<0.01; @ Not Significant									
Psy.Ed: Psycho Educational Inputs; Die. Co + Phy. Ex: Dietary Counseling + Physical Exercise; R&M: Relaxation & Meditation; All three (Psy.Ed + Die. Cou+ Phy.Ex. + R &M)									

The results (Table 1) suggest that the magnitude of mean difference between pre and post interventions i.e. in the levels of fasting plasma blood glucose is high (9.8) and is significant in Experimental group 4 (Eg₄), where all types of interventions were administered viz., Psycho-education, Dietary Counseling along with simple regimen of physical exercises, Relaxation and Meditation together. The second highest mean difference (which is significant) between pre and post interventions (9.25) in the levels of blood sugar was found in the Experimental group 2 (Eg₂), where Dietary Interventions through individual and group counseling along with a simple regimen of physical exercises were administered. Next, the mean differences between pre and post interventions (8.90) in the levels of blood sugar was noticed in Experimental group 3 (Eg₃), where Relaxation and Meditation strategies were administered. Compared to other three experimental subgroups, the magnitude of mean difference was found to be low (8.60) in Experimental Group 1 (Eg₁), where only Psycho-educational inputs were given through Individual and Group counseling sessions. The aforementioned results suggest that there is a significant reduction in the levels of plasma blood sugar in all the Experimental Groups (Eg₁, to Eg₄) after exposing the sample to various types of interventions (Eg₁ – Psycho-education, Eg₂ - Dietary intervention plus simple regimen of exercises; Eg₃ – Relaxation and Meditation; Eg₄ – all the types together). The mean differences between pre and post interventions in the subgroups of control group (Cg₁ to Cg₄) were found to be not significant. The mean levels of blood sugar in post intervention phase shows slight increase in almost all subgroups of control group. Thus, the significant quantum of reduction in all Experimental sub groups after exposing to various behavioural strategies highlighted the efficacy of interventions.

Levels of Fasting Plasma Blood Sugar in Pre and Post Intervention Sessions of Experimental and Control Groups in 60 – 70 Year Older Adults



Psy.Ed: Psycho Educational Inputs; Die. Co + Phy. Ex: Dietary Counseling + Physical Exercise; R&M: Relaxation & Meditation; All three (Psy.Ed + Die. Cou + Phy.Ex. + R &M)

As there are very few studies in India, an effort in the present study on a small sample to plan and execute interventions, clearly demonstrated the feasibility of interventions in reducing the levels of fasting plasma blood glucose. Whilst medical treatments are important, long-term outcomes are also influenced by choices that people with diabetes make about diet, physical activity and other health-related behaviours. These choices will in part reflect knowledge about their condition and their ability to monitor it. It is

therefore necessary for patient education to incorporate both information giving/awareness raising, mainly to enable initial management of diabetes but should also be a daily practice to meet the variable needs of the individual and match life events. The intervention results pertaining to diabetic sample indicated that all the interventions (Psycho education + Dietary Counseling + simple regimen of exercises + Relaxation+ Meditation) together were found to be highly effective compared to other types of interventions. The second best was found to be dietary plus simple regimen of physical exercises. The present research on interventions for diabetes was supported by many researches on diabetics (eg., Anderson et al., 2001; Bijlani et al., 2004; Clark, Sarah & Hampson, 2001; Khatri et al., 2007; Fox et al., 2005; Miller et al., 2002; Susan et al., 2002).

As Diabetes prevention program (DPP) research group (2002) highlighted, three interventions such as standard lifestyle modifications and dosages of metformin (Glucophage) with an objective to achieve and maintain a weight reduction through a healthy low-calorie, low-fat diet and to engage in physical activity of moderate intensity, such as brisk walking for at least 150 minutes per week to prevent diabetes. The outcome of present research is not similar to the above DPP in demonstrating the efficacy of interventions. In the present study, culturally sensitive, flexible and individualized interventions with individual sessions and group sessions were designed to reinforce the behavioural change. The outcome of this sort of intervention studies demonstrated that life style intervention along with metformin were two highly effective means of delaying or preventing type 2 diabetes along with greater weight loss and greater in leisure physical activity than did participants assigned to receive only metformin or placebo. To some extent this observation is true with the findings of the present study.

The researches in the review indicated that Medical – nutritional Therapy has proven to be beneficial in older adults with diabetes. However, recommendations should take into account the individual's culture, preferences and personal goals and abilities. It is recommended that when nutritional needs are not being met with usual intake, additional interventions may include encouraging smaller more frequent meals, fortifying usual foods, changing food texture or adding liquid nutrition supplements (either regular or diabetic specific) between meals. It is also reported that interventions that work in some societies may not work in others, because of one's social, economic and cultural forces influence diet and exercise. This is more so in Indian subcontinent, where there is great regional and social diversity in lifestyle patterns, and where diabetes is especially frequent in certain social groups in certain regions. Most of the researches in the review of literature state that psychological, emotional related behavioral factors and quality of life are important in diabetes management. Thus, the outcome of the present study on interventions for diabetes is worth of attention and provides a base for planning and designing versatile programs to promote healthy and active aging.

Similar to the outcome of the present study on interventions, plenty of studies reported effectiveness of self – management training in type 2 diabetes especially on educational focus such as information, life style behaviors, and coping skills. Most of these outcomes were reported in terms of change in knowledge, attitudes, self care skills, life style behaviors, psychological outcomes and quality of life. Available evidence supports the effectiveness of self-management training in type 2 diabetes, particularly in short term. Results of the present study also reiterates the same.

The efficacy of life style interventions in the present study is similar to the outcome of Diabetes Prevention Program (DPP). Some studies (eg., Fox, Buckloh, Smith, Wysocki, & Mauras, 2005) reported that lifestyle intervention was least effective in those 25 to 44 years of age. Diabetes research group (2002) state that a 58% reduction in the incidence rate of diabetes (weight maintenance + 150 minutes of physical activity similar in intensity to brisk walking) in older adults.

In the Indian setting, three observational studies using multi – modality yoga interventions observed positive improvements in glycemic control, promoting the investigators to conclude that the physiological mechanism should be explored further (Singh et al., 2004; Bijlani & Vempati, 2005; Malhotra et al., 2005; Khatri et al., 2007). The Vedic intervention was found to be significantly associated with decreased HbA1C only in participants whose baseline HbA1C was 6.5 (Elder et al., 2006). Thus, yoga, a traditional indigenous Indian practice which includes diaphragmatic breathing and asanas, believe that some asanas exert positive effects on various endocrine glands (Buman et al, 2010). Intervention package in the present study do not include yoga as an intervention strategy, but can be added in future research to examine its role in the reduction of HbA1C levels.

Some other studies (eg., Weyer et al., 1999; Rosenthal & Oprail, 2000; Khatri et al., 2007) in their interventions with general health education plus aerobic exercises, plus relaxation therapy showed small but similar improvements in HbA1C. Researches (eg., Khatri et al., 2007; Rosenzweig et al., 2007; Rosenthal & Oprail, 2000; Weyer et al., 1999) on relaxation techniques with and without biofeedback showed mixed results with type 2 diabetes for one year with five follow-up sessions of Relaxation therapy plus diabetes education. However some studies failed to show an improvement in HbA1C despite improvement in fasting plasma blood glucose levels (Ginnis et al., 2005; Suriwit et al, 2002; Stenstrom et al., 2003). In such outcomes, thorough understanding of intervening factors like stress, other comorbidities, family culture, individual's social and economic status need to be analysed to draw certain insights to know why interventions are not effective.

Thus, despite certain limitations in terms of sample size, methodology and sample characteristics, research evidence supports the effectiveness of self-management education in individuals with diabetes, especially in the short-term. Present study results on interventions for diabetic adults support the above observation. In the present study an individual and group counseling sessions imparting psycho educational inputs of diabetes, physical activity strategies (regimen of physical exercises), culture specific dietary counseling, meditation and relaxation were found to be effective in managing levels of diabetes.

References:

1. Ackermann, R.T., Finch, E.A., Brizendine, E., & Van Rossum. (2008). Translating the Diabetes Prevention Program into the community: The deploy pilot study. *American Journal of Prev Med*, 35,357–363.
2. Anderson, R. Frudland, K., Clouse, R., & Lustman, P.J. (2001). The prevalence of comorbid depression in adults with diabetes: a meta analysis. *Diabetes care*, 24: 1069-1078.
3. Bijlani, R.L. & Vempati, R.P. (2005). A brief but comprehensive lifestyle education programme based on yoga reduces risk factors for cardiovascular disease and diabetes mellitus. *Journal of Alternative Complement Med.*; 11(2): 267 – 74.
4. Bourdel-Marchasson, I., Helmer, C., & Fagot-Campagna, A. (2007). Disability & quality of life in elderly people with diabetes. *Diabetes & Metabolism*, 33, 66-74. Bruce, D. G
5. Casey, G.P., Grange, V., Clarinette, R.C., Almeida, O.P., Foster, J.K., Ives, F.J. & Davis, T.M. (2003). Cognitive impairment, physical disability & depressive symptoms in older diabetic patients: the Fremantle Cognition in Diabetes Study. *Diabetes Res Clinical Practice*, 61(1), 59-67.
6. Buman, M.P., Hekler, E.B., & Haskell, W.L. (2010). Objective light-intensity physical activity associations with rated health in older adults. *American Journal of Epidemiology*, 172, 1155–1165.
7. Buman, M.P., Hekler, E.B., & Haskell, W.L. (2010). Objective light-intensity physical activity associations with rated health in older adults. *American Journal of Epidemiology*, 172, 1155–1165.
8. Choi, K.M., Lee, J., & Kim, D.R. (2002). Comparison of ADA & WHO criteria for the diagnosis of diabetes in elderly Koreans. *Diabetic Medicine*, 19, 853–857. Clark
9. Marie, Sarah, E., & Hampson. (2001). Implementing a psychological intervention to improve lifestyle self-management in patients with Type 2 diabetes. *Patient Education & Counseling*, 42 (3), 247–256.
10. Elder C, Aickin M, Bauer V, et al.(2006)Randomized trial of a whole-system ayurvedic protocol for type 2 diabetes. *Alternative Therapy Health Medicine.*;12(5):24-30.
11. Fonseca, V., & Wall, J. (1995). Diet & diabetes in the elderly. *Clinics in Geriatric Medicine*, 4, 613-624.
12. Fox, L.A., Buckloh, L.M., Smith, S.D., Wysocki, T., Mauras, N. (2005). A randomized controlled trial of insulin pump therapy in young children with type 1 diabetes. *Diabetes care*, 28(6): 1277-81.
13. James, A., Blumenthal, Michael A. Babyak, & Alan Hinderliter. (2010). The Effects Of The Dash Diet Alone and In Combination With Exercise and Caloric Restriction On Insulin Sensitivity & Lipids. *Hypertension*, 55(5), 1199-1205. Jidong, Sung., Jong-Min Woo, Won Kim, Seoung-Kyeon Lim, & Eun-Joo Chung
14. (2012). The Effect of Cognitive Behavior Therapy-Based “Forest Therapy” Program on Blood Pressure, Salivary Cortisol Level, and Quality of Life in Elderly Hypertensive

- Patients, *Journal of Hypertension*, 34 (1), 1-7.
15. Khatri, D., Mathur, K.C., Gahlot, S., Jain, S., & Agrawal, R.P. (2007). Effects of yoga & meditation on clinical & biochemical parameters of metabolic syndrome. *The Journal of Diabetes Res Clinical Practice*, 78, 9–10.
16. Malhotra, V., Singh, S., Tandon, O.P., & Sharma, S.B. (2005). The beneficial effect of yoga in diabetes. *Nepal Med Coll J*, 7, 145–147. Markowitz, S.M
17. Gonzalez, J.S., Wilkinson, J.L., & Safren, S.A. (2011). Review of treating depression in diabetes: emerging findings. *The Journal of Psychosomatics*, 52(1), 1-18.
18. McGinnis, R.A., McGrady, A., Cox, S.A., & Grower-Dowling, K.A. (2005) Biofeedback-assisted relaxation in type 2 diabetes. *Diabetes Care*. 28(9) : 2145-2149.
19. Miller, C.K.E.L., Edwards, L., & Kissling, G. (2002). Nutrition education improves metabolic outcomes among older adults with diabetes mellitus: Results from a randomized controlled trial. *Prev Med*, (34), 252–259.
20. Oussama, M.N., & Khatib (2006). Guidelines for the prevention, management and care of diabetes mellitus, WHO Library Cataloguing in Publication Data ,46,234-238.
21. Rosenthal, T., & Oprail, S. (2000). Hypertension in women. *Journal of Human Hypertension*, 2000, 14, 691–704.
22. Rosenzweig S., Reibel, D.K., Greeson, J.M., Edman, J.S., Jasser, S.A., McMearty, K.D., & Goldstein, B.J. (2007). Mindfulness-based stress reduction is associated with improved glycemic control in type 2 diabetes mellitus: a pilot study. *Alternative therapies in Health Medicine* 13, 36–38.
23. Singh, S., Malhotra, V., Singh, K.P., Madhu, S.V., & Tandon, O.P. (2004). Role of yoga in modifying certain cardiovascular functions in type 2 diabetic patients. *Journal of the Association of Physicians of India*, 52, 203–206.
24. Snoek, F.J., & Skinner, T.C. (2002). Psychological counseling in problematic diabetes: does it help? *Diabetic Medicine: a journal of the British Diabetic Association*, 19, 265–273.
25. Stenstorm, U., Goth, A., Carlsson, C., & Anderson, P. (2003). Stress management training as related to glycemic control and mood in adults with type 1 diabetes mellitus. *Diabetes Research and Clinical practice*, 147 – 152.
26. Suriwit, R.S., van Tilburg, M.A.L., Zucker, N., McCaskill, C.C., Parekh, P., Feinglos, M.N., Edwards, C.L., Williams, P., & Lane, J.D. (2002). Stress management improves long-term glycemic control in type 2 diabetes. *Diabetes Care*, 25, 30–34. Susan L Norris
27. Michael, M., Engelgau, K.M., & Venkat Narayan, (2001). Effectiveness of Self-Management Training in Type 2 Diabetes A systematic review of randomized controlled trials. *Diabetes Care*, 23 (5), 61-587. Susan, L., Norris
28. Phyllis, J., Nichols, Carl, J., Caspersen, Russell, E., Glasgow, Michael, M., Engelgau, Leonard Jack, J.r., George Isham, Susan, R., Snyder, Vilma, G., rander-Kulis, Sanford Garfield, Peter Briss, David, & are McCulloch, (2002). The effectiveness of disease & case management for people with diabetes: Task Force on Community Preventive Services. *American Journal of Preventive Medicine*, 22(4), 15–38.
29. Weyer, C., Bogardus, C., Mott, D.M., & Pratley, R.E. (1999). The natural history of insulin secretory dysfunction and insulin resistance in the pathogenesis of type 2 diabetes mellitus. *Journal of Clinical Investigation.*, 104: 787–794.
30. World-Health-Organization (2012). Global Health Risks Summary Tables. In. Geneva, Switzerland: Health Statistics & Informatics Department.