



IMPACT OF BEHAVIOR INTERVENTION ON DIABETIC AND HYPERTENSION ELDERLY

Gayathri, A., & Rajani, N.

Department of Psychology, SPMVV, Tirupati

Abstract

Diabetes is a prevalent condition among elderly individuals, significantly impacting their quality of life. It not only aggravates existing disabilities but also delays recovery from illnesses and injuries, leading to a higher prevalence of functional impairments and reduced independence. Managing diabetes effectively in this population is particularly challenging due to age-related factors, such as comorbidities, physical frailty, and the progressive nature of the disease. A range of interventions that achieve benefits in the particular areas. The present study with objectives to examine the interventions to reduce the levels of blood sugar findings revealed that the intervention sessions. A variety of interventions, ranging from lifestyle modifications and dietary adjustments to medication management and physical activity programs, have been developed to help improve blood sugar control and overall health outcomes in this population. The present study aimed to examine the impact of such interventions on reducing blood sugar levels in elderly patients. Findings from the study revealed that structured intervention sessions, which included education on diabetes management, personalized dietary counseling, and supervised exercise programs, were effective in improving glycemic control.

Introduction

Globally, type 2 diabetes is an important and common disease that is steadily becoming more prevalent. Type 2 diabetes is predominantly, but not exclusively, a disease of the middle aged and elderly. 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). Nonetheless, diabetes is associated with a higher mortality rate at any age, approaching twice the rate in older people of comparable age without diabetes in some studies (Bruce, Casey, Grange, Clarnette, Almeida, Ives & Davis, 2003).

Different epidemiological studies have reported varying diabetes 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). A major health issue, diabetes, has adverse effects on the quality of life and life span (Khatib, 2006). Singh and Bhattarai (2003) indicated that there are only few published reports

on population prevalence of diabetes and nationwide 36 prevalence surveys of diabetes have not been undertaken. Also found an increasing prevalence of diabetes in the country from some hospital-based surveys.

The metabolic syndrome is a disorder that is normally accompanied with central obesity, hypertension, and abnormal glucose tolerance test and lipid profile test results. This 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, and such social issues as lower education levels and lower income (Bourdel, Helmer & Campagna, 2007).

Stress has been reported as the most debilitating medical and social problem of the modern world. Stress is uniquely different from what we normally think of as a disease. It has no biological structure (a germ or a virus) nor does it lurk in dark sewers or contaminated water. Rather, it is psychosomatic in the real sense, as it is the result of how our mind and body function and interact. The extent to which the onset of type 2 diabetes is apparently in healthy individuals was predicted by burnout, a unique affective response to combined exposure to chronic stressors. Chronic burnout might be a risk factor for the onset of type 2 diabetes in apparently healthy individuals (Melamed, 2006; Liang, Wang, Lee & Tung, 2011). Physical stress or trauma are associated with glucose intolerance and induced by hormonal effects on glucose metabolism and insulin secretion and action. However, it has not been proved whether they can lead to permanent diabetes.

Type-A personality has a definite correlation with coronary heart disease. It has been proved that such individuals have less effective social support resources. Type-A women report feeling inadequately cared for and loved (Vroege & Aaronson, 1994). A meta-analysis estimated that about twice as many Type-As as other individuals suffer from coronary heart disease (Friedman, Howard, & Stephanie, 1987). Hostility, anger, emotional distress, frustration, anxiety, nervousness, negative mood and stress have also been implicated as necessary concomitants of 'workaholic' individuals to become susceptible to coronary heart disease and hypertension (Schneider et.al., 2008; Thorenson & Low, 1990).

Researchers have evidenced that it is not the stress *per se*, but the behavioral methods adopted by an individual to cope with the stress that influences his psychological and somatic well-being. Coping aims reduce stress by overcoming environmental and psychological threats. It can be understood as involving a transaction between the individual and the environment, and coping strategies vary from one situation to another. Coping styles vary from person, as do personality traits. In general, 'problem-focused coping' occurs when people believe that something can be done about the situation. If they conclude that nothing can be done, people turn to 'emotion-focused coping' (Lazarus, 1993). Personal resources and social support influence the choice of coping strategy. The type of stressful event that has occurred also influences the choice of coping. Unfortunately, there is no unanimity on the choice of coping strategies one can adopt (Aldwin, Sutton, Chiara & Spiro, 1996). Inadequate coping with stress leaves us with troublesome emotions, including depression, anxiety and anger. These emotions are not only psychologically unpleasant, but are also related to physical disease. Booth-Kewley, Friedman and Howard (1987) concluded that 'states of depression and anger and hostility seem to be implicated in a wide variety of diseases'. Such psychosomatic diseases include coronary heart disease, hypertension, headaches, asthma and ulcers.

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.

Diabetes poses a major life stress that requires considerable physical, emotional, and psychological accommodation and coping. Mind-body therapies have drawn significant interest for their potential to assist in managing stress and adaptation to chronic illness. Despres, Lamarche, Mauriege, Cantin, Gilles, Dagenais, Moorjani, Paul and Lupien (1996) study highlights the research on Mindfulness – Based Stress Reduction to improve health and well

being of individuals with diabetes. Susan, et al., (2002) compared the effects of music-assisted relaxation and imagery, administered via compact disc recording (MARI CD) without therapeutic intervention, to the effects of music therapy (MT), facilitated by a board-certified music therapist, on selected health outcomes of patients enrolled in diabetes self-management education/training (DSME/T).

There is conflicting evidence regarding the utility of stress management training in the treatment of diabetes. A few studies that have shown a therapeutic effect of stress management have used time-intensive individual therapy. Unfortunately, widespread use of such interventions is not practical. Investigation by Richard, Surwit, Tilburg, Zucker, Cynthia, Caskill, Parekh, Feinglos, Edwards, Williams and Lane (2002) tested to determine whether a cost-effective, group-based stress management training program can improve glucose metabolism in patients with type 2 diabetes and to determine whether a particular subset of patients is more likely to get positive results.

Yoga is a traditional Indian practice that includes diaphragmatic breathing and asanas (body postures that promote physical comfort and mental composure). Yoga experts believe that some asanas exert positive effects on various endocrine glands. Qi-gong is an ancient Chinese form of “moving meditation” similar to t'ai chi that combines slow diaphragmatic breathing with spiral and circular body movements (Buman, Hekler & Haskell, 2010).

Studies of relaxation techniques with and without biofeedback had mixed results. Surwit, Van Tilburg, Zucker, Caskil, Parekh, Feinglos, Edwards, Williams & Lane (2002) studied 108 subjects 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 3 months and was associated with decreased depression and anxiety scores (Ginnis, Grady, Cox & Dowling 2005).

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: (1) didactic education, (2) enhanced education, (3) diet instruction, (4) exercise instruction, (5) self-monitoring instruction, (6) social learning/behavior modification, (7) counseling, and (8) relaxation training. Several groups have recommended dietary guidelines for diabetes in older patients, but there is a little objective

data to support these recommendations.

Studies on interventions suggested that use of interventions in managing the diabetes and hypertension in the elderly were highlighted in many studies. The significance of interventions in the management of diabetes and hypertension reduction through psycho education, stress management techniques, self management methodology, healthy lifestyle, diet, exercise, medical care assistance, modification of the environment and changes in psychosocial adaptations was reported in several studies. The assumption of many of these intervention programmes is that stress management, psycho education, self management, physical activity and exercise, diet can help in effective management of diabetes and hypertension reduction. 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 hypertension and diabetes. In addition to the psychological, sociological and spiritual interventions that assist the diabetic and hypertensive elderly to lead normal living, interventions within the environment changes have been highlighted in management of diabetic and hypertension. Various cognitive therapies, reminiscence therapy and supportive group therapy were associated with the promotion of health in diabetic and hypertensive elderly. Studies concluded that there is a dire need for appropriate interventions and maximizing the role of community member's role in providing awareness of diabetes and hypertension.

OBJECTIVES

1. To plan and execute psychological interventions to reduce levels of blood sugar /blood pressure in a select sample of older adults.
2. To examine the effect of psychological interventions to reduce the levels of blood sugar / levels of blood pressure (each as a separate outcome variable) in older adults.

Hypotheses pertaining to the effect of various types of Interventions and levels of blood sugar / blood pressure (each as a outcome variable)

- a. Levels of fasting plasma glucose would differ significantly in pre and post intervention phases in Experimental sub groups treated with Psycho educational strategies, Dietary counseling plus simple regimen of exercises, Relaxation and Meditation (each considered separately).
- b. Levels of blood pressure would differ significantly in pre and post intervention phases in experimental groups treated with Psychoeducational strategies, Dietary Counseling plus simple regimen of exercises, Relaxation and Meditation (each considered separately).
- c. Experimental groups and control groups would differ significantly on levels of fasting plasma glucose in Pre and Post intervention phases, when all the methods of interventions are given together.

Method:

The study is an attempt to examine the effect of psychological interventions in a sample of older adults with diabetes and hypertension between 60 -70 years. For purposes of the present study, the sample selection was made from the outpatient register for treatment of diabetes and / or hypertension., 120 Diabetic and 120 Hypertensive older adults in the age range of 60 to 70 years were identified to constitute the main sample for the

study. The following are the inclusion and exclusion criteria to select the sample of older adults with diabetes and hypertension.

Persons diagnosed with diabetes at least since 2 years and persons diagnosed with hypertension at least since 2 years and attending outpatient clinic were identified. They 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. Similarly persons who were attending outpatient clinic for the treatment of hypertension were again examined through ambulatory blood pressure in resting position was recorded for 3 times and an average of blood pressure (systolic / diastolic) was taken as the criteria of identifying hypertension (Stage I) for the present study. Subjects with level of blood pressure in the range of 140 to 159 mm Hg (systolic) and values between 90 mm Hg and 99 mm Hg (diastolic) were enrolled for the main study sample in 60-70 years (Mean Age= 66.3yrs) by applying the inclusion and exclusion criteria described in the section on selection of sample (4.1.1).

To constitute the sample for intervention, 80 diabetic and 80 hypertensive older adults, in the age group of 60-70 years (Mean Age = Diabetic 65.3 yrs; Hypertensive = 64.7 years) were identified from the main sample of 120 diabetic (Mean Age = 64 years) and 120 hypertensive (Mean Age = 64.6 yrs) older adults. This involves examining the effect of intervention strategies in 80 diabetic and 80 hypertensive older adults. To enroll the subjects in Diabetic intervention sample, 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 in both the groups (Experimental and Control) were matched on their age, gender, education and economic level. 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 (Cg1, Cg2, Cg3, Cg4).

The subjects (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.

The Intervention Package

To make old age healthy and active it does not just happen. It requires planning. As Paul Insel and Walton Rota stated “what you are aiming for now will influence who you are in your 50’s, 60’s, 70’s and 80’s. Research evidence shows that one can prevent, and even reverse the effects of some degeneration through good health habits which are profoundly related to health in later years. Improving health habits, specifically concerning diet, smoking, exercise, can make a profound difference at any age. Needless to say, however, the earlier one begins, the better off he / she will be (Pollock, Wilmore & Fox, 1978).

Exercise refers to both mental and physical health. It increases resistance to disease and provides a healthy outlet for stress. As a result, those who exercise regularly outlive their more sedentary peers. According to Rosenfeld (2001) exercise can hold off many of the functional failings of aging, the loss of bone strength and muscle mass. Overall energy, stamina, agility, aerobic and cardiac capacity remain higher in exercises than in

the sedentary adults; the same is true to hold healthy levels of blood pressure, sugar, and cholesterol, not to mention mental outlook (Porterfield & St. Pierre, 1992). Because exercise is so stimulating, it often helps to sustain our ability to make decisions spontaneously. It is to note that exercise is the closest thing we have, to a magic anti-aging pill and the fountain of youth. It slows the aging process and lessens the chances of disease (Porterfield & St. Pierre, 1992).

In view of the foregoing, an Intervention module was considered with the following objectives:

1. To create awareness that the levels of blood sugar / blood pressure levels can be reduced by appropriate measures e.g. exercise, diet and an appropriate mind set.
2. To suggest easy to follow dietary modifications that would help their diabetic hypertensive condition.
3. To suggest a regimen of simple exercises suitable to the person concerned to help reduce the diabetic hypertensive levels in older adults.
4. To suggest a few measures that will pep-up their mind set.
5. To evaluate the efficacy of these interventions in reducing levels of blood sugar levels of blood pressure.

After the selection of participants for the intervention programme, with the help of panel of experts viz., Physician, Dietician, and Physiotherapist / Exercise trainer / yoga specialist (Meditation and Relaxation), the investigator explained the importance and details of intervention 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 to extend help to overcome those concerns.

The diet, which was prescribed by the Nutrition specialist, which was cost - effective (based on locally available food items, was recommended to each subject in the experimental subgroup 2 (Eg2) and sub group (Eg6) . Almost all of them followed the diet and incorporated the changes (observance through supervision by the investigator).

All the methods viz., Psycho educational inputs, Dietary counseling, physical exercise, relaxation and meditation were given together for experimental subgroup of intervention sample Eg4 in diabetes and for Eg8 in Hypertension 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 - 20 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.

Once two sessions were completed, only the physiotherapist and the Investigator (who also acted as counselor) monitored the intervention programme by monitoring the clients every day. This 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). The control group subjects were also examined for their levels of blood sugar to record the post intervention evaluation without intervention. Executions of interventions are shown in pictures.

For purposes of parsimony only subjects in the range of 126 to 149mgs / dl fasting plasma glucose levels and subjects in the range of 140-149mmHg systolic blood pressure and of 90-95 mmHg as diastolic levels were included in the intervention stage to examine the effect of various psychological interventions (non-pharmacological). As mentioned in the preceding paragraphs, the experimental group was subjected to interventions and no such interventions were given to those subjects in control group. The baseline levels of fasting plasma glucose were recorded at the beginning of interventions and the same has been considered as pre-test levels of blood sugars.

Levels of Fasting Plasma Blood Sugar in Pre and Post Sessions in Experimental and Control Groups in 60-70 year Older Adults

S.No	Experimental Group (N = 40)					Control Group (N = 40)			
	Intervention Type		Pre Mean (SD)	Post Mean (SD)	t value		Pre Mean (SD)	Post Mean (SD)	t value
1.	Psy. Ed	Eg ₁ (N=10)	130.00 (2.40)	121.70 (2.11)	11.35**	Cg ₁ (N=10)	128.70 (3.62)	130.30 (2.91)	1.38 @
2.	Die. Co +Phy. Ex.	Eg ₂ (N=10)	130.80 (3.36)	120.55 (3.03)	7.12**	Cg ₂ (N=10)	129.70 (3.83)	132.50 (2.32)	1.64 @
3.	R &M	Eg ₃ (N=10)	130.30 (2.91)	120.50 (3.03)	8.10**	Cg ₃ (N=10)	132.80 (2.49)	133.20 (1.81)	1.31@
4.	All three	Eg ₄ (N=10)	132.50 (2.32)	121.70 (2.11)	9.29**	Cg ₄ (N=10)	133.40 (1.71)	133.80 (1.81)	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)									

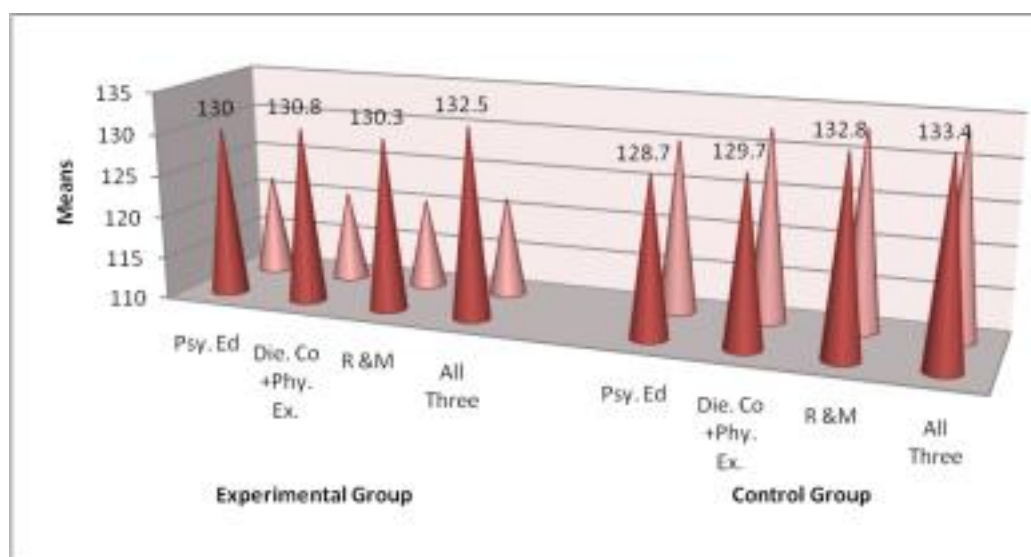
Considering the details in Table-14, the magnitude of mean difference between pre and post interventions i.e. in the levels of fasting plasma blood glucose is high (10.8) in

9

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 between pre and post interventions (10.3) 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 (9.80) in the levels of blood sugar was noticed in Experimental group 3 (Eg₃), which was given Relaxation and Meditation strategies. Compared to other three experimental subgroups, compared to the above the magnitude of mean difference was found to be low (8.30) in Experimental Group 1 (Eg₁), where only Psycho-educational inputs were given through Individual and Group counseling sessions. Thus, the aforementioned results suggest that there is a significant reduction in the levels of 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 the Experimental subgroups after exposing to psychological strategies highlighted the efficacy of interventions.

Levels of Fasting Plasma Blood sugar in Pre and post 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)

Thus, the intervention results accepts the hypothesis **Levels of fasting plasma glucose would differ significantly in pre and post intervention phases in Experimental sub groups treated with Psycho educational strategies, Dietary Counseling plus simple regimen of exercises, Relaxation and Meditation (each considered separately)**. As reported earlier in this chapter, the aim of the present study is merely to demonstrate that such non pharmacological (non-clinical) interventions are feasible to control i.e., to reduce the levels of fasting plasma glucose in older adults. 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 efficacy 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 / hypertension 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 / hypertension but should also be on-going to meet the variable needs of the individual and match life events.

The role of interventions viz., psycho educational inputs on diabetes / hypertension, dietary counseling along with a simple regimen of exercises, relaxation and meditation independently and together were found to be effective in the present study in reducing the levels of fasting blood sugar and blood pressure 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 intervention. The second best was found to be dietary plus simple regimen of physical exercises. The research outcome on intervention for diabetes was supported by many researches on diabetics (eg., Anderson et al., 2001; Bijlani et al., 2004; Clark & Haupson, 2001; Khatri et al., 2007; Fox et al., 2005; Miller et al., 2002; Noris et al., 2001; Pierre et al., 1996; Susan et al., 2002; Singh et al.,).

Diabetes prevention program 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

11

engage in physical activity of moderate intensity, such as brisk walking for at least 150 minutes per week to prevent diabetes. The outcome is not similar in demonstrating the efficacy of interventions. 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.

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 observation.

The efficacy of life style interventions in the present study is similar to the outcome of the Diabetes Prevention Program (DPP). Some studies (eg., Larry. Fox, Lisa. Buckloh, Shiela. Smith, &Nelly Mauras, 2005) reported that lifestyle intervention was least effective in those 25 to 44 years of age. Life style intervention was effective compared with placebo in both men and women, but more so in men. 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).

It was noted that mild-body therapies such as Meditation, Yoga, Qi-gong and other relaxation techniques were used for diabetics as a means of decreasing stress-related hypoglycemia. These therapies were found to facilitate attainment of a physiological state that counteracts the physiological and emotional stress

response and activates neuroendocrine and sympathetic system. As Mathur et al., (2007); Katri et al., (2007); and Tsujiuchi et al., (2002) reported, circulating catecholamines and glucocorticoids affect the structure and function of a variety of tissues and induce inflammatory cytokines that lead to increased glucagon production and decrease uptake and disposal of glucose in peripheral muscles. Cytokines, primarily

12

interleukin have been strongly implicated in oxidative stress and inflammatory processes which in turn lead to insulin resistance and vascular complications.

Thus, despite various limitations in 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 individual and group counseling sessions with an aim to impart psycho educational inputs of diabetes / Hypertension , physical activity strategies (regimen of physical exercises), culture specific dietary counseling and feedback were administered to examine its efficacy.

References:

- 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., Casey, G.P., Grange, V., Clarnette, 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.

- 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.
- Oussama, M.N., & Khatib (2006). Guidelines for the prevention, management and care of diabetes mellitus, *WHO Library Cataloguing in Publication Data* ,46,234-238.
- Rosenthal, T., & Oprail, S. (2000). Hypertension in women. *Journal of Human Hypertension*, 2000, 14, 691–704.
- 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.
- 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.
- Surwit, 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.
- World-Health-Organization (2012). *Global Health Risks Summary Tables*. In. Geneva, Switzerland: Health Statistics & Informatics Department.