

CHAPTER II

REVIEW OF RELATED LITERATURE

The related review of literature were collected from physiological and medical journals and from sports and physical education articles in the area of study. The researcher also conducted computer search on physiological review CD diskette and in the internet.

Based on the review collected this chapter has been subdivided into three main subsection namely;

- a. Studies on effect of Yoga on Diabetics
- b. Studies on effect of foot reflexology

2.1 STUDIES ON YOGA AND DIABETES

Sahay (2007)ⁱ carried out a research on diabetes to assess the role of yogic practices. The science of yoga is an ancient one. It is a rich heritage of our culture. Several older books make a mention of the usefulness of yoga in the treatment of certain diseases and preservation of health in normal individuals. The effect of yogic practices on the management of diabetes has not been investigated well. We carried out well designed studies in normal individuals and those with diabetes to assess the role of yogic practices on glycaemic control, insulin kinetics, body composition exercise tolerance and various co-morbidities like hypertension and dyslipidemia. These studies were both short

term and long-term. These studies have confirmed the useful role of yoga in the control of diabetes mellitus. Fasting and postprandial blood glucose levels came down significantly. Good glycaemic status can be maintained for long periods of time. There was a lowering of drug requirement and the incidence of acute complications like infection and ketosis was significantly reduced. There were significant changes in the insulin kinetics and those of counter-regulatory hormones like cortisol. There was a decrease in free fatty acids. There was an increase in lean body mass and decrease in body fat percentage. The number of insulin receptors was also increased. There was an improvement in insulin sensitivity and decline in insulin resistance. All these suggest that yogic practices have a role even in the prevention of diabetes. There is a beneficial effect on the co-morbid conditions like hypertension and dyslipidemia.

Malhotra (2005)ⁱⁱ has done research on made a study on “The beneficial effect of yoga in diabetes.”. Twenty NIDDM subjects (mild to moderate diabetics) in the age group of 30-60 years were selected from the out patient clinic of G.T.B. hospital. They were on a 40 days yoga asana regime under the supervision of a yoga expert. 13 specific Yogasanas < or = done by Type 2 Diabetes Patients included. Surya Namaskar, Trikonasana, Tadasana, Sukhasana, Padmasana, Bhastrika Pranayama, Pashimottanasana, Ardhamatsyendrasana, Pawanmuktasana, Bhujangasana, Vajrasana, Dhanurasana and Shavasana are beneficial for diabetes mellitus. Serum insulin, plasma fasting and one hour postprandial blood glucose levels and anthropometric parameters were measured before and after yoga asanas. The results indicated

that there was a significant decrease in the fasting glucose levels from basal 208.3 +/- 20.0 to 171.7 +/- 19.5 mg/dl and one hour postprandial blood glucose levels decreased from 295.3 +/- 22.0 to 269.7 +/- 19.9 mg/dl. The exact mechanism as to how these postures and controlled breathing interact with somato endocrine mechanism affecting insulin kinetics was worked out. A significant decrease in waist-hip ratio and changes in insulin levels were also observed, suggesting a positive effect of yoga asanas on glucose utilisation and fat redistribution in NIDDM. Yogasanas may be used as an adjunct with diet and drugs in the management of Type II diabetes.

Manjunatha (2005)ⁱⁱⁱ has conducted a study to examine the hypothesis that yogasanas help in the treatment of diabetes mellitus by releasing insulin from the pancreas. Twenty healthy young volunteers (17 male, three female; age 19-31 years) participated in the study. Each volunteer performed four sets of asanas in random order for five consecutive days each with a two days gap between consecutive sets of asanas. The four sets of asanas were: (I) dhanurasana + matsyendrasana, (II) halasana + vajrasana, (III) naukasana + bhujangasana, and (IV) setubandhasana + pavanamuktasana. Blood samples were collected on fourth and fifth days of each set of asanas for measurement of glucose and insulin levels before the asanas, within 10 minutes after performing the asanas, and 30 minutes after ingestion of 75 grams. glucose, which in turn was ingested immediately after the second blood sample. A standard 75 gms. oral glucose tolerance test (OGTT) was also done before and after the study. On the days of the pre-study or post-study OGTT, no asanas were done. The serum

insulin levels after the asanas were lower ($P < 0.05$) than those before the asanas. However, the serum insulin level 0.5 h after the post-asana oral 75 grams glucose challenge was higher ($P < 0.05$) in Set IV than the 0.5 h postprandial insulin level in the pre-study OGTT; the same trend was observed in other sets as well although statistically not significant. The observations suggest that the performance of asanas led to increased sensitivity of the B cells of pancreas to the glucose signal. The increased sensitivity seems to be a sustained change resulting from a progressive long-term effect of asanas. The study is significant in that it has for the first time attempted to probe the mechanism by which yogasanas helps diabetes mellitus.

Singh (March 2004)^{iv} has examined on Type II diabetes and the effect of yogic exercises with objectives such as, 1. To study the effect of forty days of Yogic exercises on cardiac functions in Type II Diabetics. 2. To study the effect of forty days of Yogic exercises on blood glucose level, glycosylated hemoglobin. The present study done in twenty-four Type II DM cases provides metabolic and clinical evidence of improvement in glycaemic control and autonomic functions. These middle-aged subjects were type II diabetics on antihyperglycaemic and dietary regimen. Their baseline fasting and postprandial blood glucose and glycosylated Hb were monitored along with autonomic function studies. The expert gave these patients training in yoga asanas and they pursued those 30-40 min/day for 40 days under guidance. These asanas consisted of 13 well known postures, done in a sequence. After 40 days of yoga asanas regimen, the parameters were repeated. The results indicate that there

was significant decrease in fasting blood glucose levels from basal 190.08 +/- 18.54 in mg/dl to 141.5 +/- 16.3 in mg/dl after yoga regimen. The post prandial blood glucose levels decreased from 276.54 +/- 20.62 in mg/dl to 201.75 +/- 21.24 in mg/dl, glycosylated hemoglobin showed a decrease from 9.03 +/- 0.29% to 7.83 +/- 0.53% after yoga regimen. The pulse rate, systolic and diastolic blood pressure decreased significantly (from 86.45 +/- 2.0 to 77.65 +/- 2.5 pulse/min, from 142.0 +/- 3.9 to 126.0 +/- 3.2 mm of Hg and from 86.7 +/- 2.5 mm of Hg to 75.5 +/- 2.1 mm of Hg after yoga regimen respectively). Corrected QT interval (QTc) decreased from 0.42 +/- 0.0 to 0.40 +/- 0.0. These findings suggest that better glycaemic control and stable autonomic functions can be obtained in Type 2 DM cases with yoga asanas and pranayama. The exact mechanism as to how these postures and controlled breathing interact with somato-neuro-endocrine mechanism affecting metabolic and autonomic functions remains to be worked out.

Malhotra (2002)^v had investigated the effects on yoga. Certain yoga asanas if practiced regularly are known to have beneficial effects on human body. These yoga practices might be interacting with various, somato neuro-endocrine mechanisms to have therapeutic effects. The present study done in twenty four NIDDM patients of 30 to 60 year old, provides metabolic and clinical evidence of improvement in glycaemic control and pulmonary functions. These middle-aged subjects were type II diabetics on antihyperglycaemic and dietary regimen. Their baseline fasting and postprandial blood glucose and glycosylated Hb were monitored along with pulmonary

function studies. The experts gave these patients training in yoga asanas and were pursued 30-40 min/day for 40 days under guidance. These asanas consisted of 13 well known postures, done in a sequence. After 40 days of yoga asanas regimen, the parameters were repeated. The results indicate that there was significant decrease in fasting blood glucose levels (basal 190.08 +/- 90.8 in mg/dl to 141.5 +/- 79.8 in mg/dl). The postprandial blood glucose levels also decreased (276.54 +/- 101.0 in mg/dl to 201.75 +/- 104.1 in mg/dl), glycosylated hemoglobin showed a decrease (9.03 +/- 1.4% to 7.83 +/- 2.6%). The FEV1, FVC, PEF, MVV increased significantly (1.81 +/- 0.4 lt to 2.08 +/- 0.4 lt, 2.20 +/- 0.6 lt to 2.37 +/- 0.5 lt, 3.30 /s+1-1.0 It/s to 4.43 +/- 1.4 lt/s and 64.59 +/- 25.7 lt min to 76.28 +/- 28.1 lt/min respectively). FEV1/FVC% improved (85 +/- 0.2% to 89 +/- 0.1%). These findings suggest that better glycaemic control and pulmonary functions can be obtained in NIDDM cases with yoga asanas and pranayama. The exact mechanism as to how these postures and controlled breathing, interact with somato-neuro-endocrine mechanism affecting metabolic and pulmonary functions remains to be worked out.

Badr Aljasir (2008)^{vi} studied the effect of practicing yoga for the management of type II Diabetes was assessed in this systematic review through searching related electronic databases and the grey literature to the end of May 2007 using Ovid. All randomized controlled clinical trials (RCTs) comparing yoga practice with other type of intervention or with regular practice or both, were included regardless of language or type of publication. Each study was

assessed for quality by two independent reviewers. Mean difference was used for summarizing the effect of each study outcomes with 95% confidence intervals. Pooling of the studies did not take place due to the wide clinical variation between the studies. Publication bias was assessed by statistical methods. Five trials with 363 participants met the inclusion criteria with medium to high risk of bias and different intervention characteristics. The studies' results show improvement in outcomes among patients with diabetes type II. These improvements were mainly short term or immediate diabetes outcomes and not all were statistically significant. The results were inconclusive and not significant for the long-term outcomes. No adverse effects were reported in any of the included studies. Short-term benefits for patients with diabetes may be achieved from practicing yoga. Further research is needed in this area. Factors like quality of the trials and other methodological issues should be improved by large randomized control trials with allocation concealment to assess the effectiveness of yoga on diabetes type II. A definitive recommendation for physicians to encourage their patients to practice yoga cannot be reached at present.

Rashmi vyas (2008)^{vii} assessed the effect of raja yoga meditation of Brahmakumaris which is very simple to practice, on serum lipids in normal Indian women. 49 normal female volunteers were the subjects. They were divided into pre – menopausal (n = 23) and post –menopausal (n=26) groups. They were further divided into non- meditators (who had never done any kind of meditation), short – term meditators (meditation for more than 5 years). Lipid

profile was assessed using their respective reagent sets. Serum cholesterol, triglyceride and low-density lipoprotein – cholesterol in non – meditators were significantly more in post – menopausal women as compared to pre-menopausal women. Serum cholesterol and low density lipoprotein cholesterol were significantly lowered in both short and long term meditators as compared to non – meditators in post – menopausal women. No significant difference was observed in lipid profile in pre - menopausal women. Raja yoga meditation lowered serum cholesterol and low – density lipoprotein – cholesterol in post – menopausal women thus reducing the risk of coronary artery disease in them.

Amitha (2009)^{viii} reported that diabetes is a metabolic disorder, which has become a major health challenge worldwide. South East Asian countries have a highest burden of diabetes. In India the prevalence of diabetes is rising rapidly especially in the urban population because of increasing obesity and reduced physical activity. An objective of this study is to evaluate the effect of Yoga-nidra on blood glucose level in diabetic patients. This study was conducted on 41, middle aged, type-II diabetic patients, who were on oral hypoglycemic alone. These patients were divided into two groups: (a) 20 patients on oral hyperglycemic with yoga- nidra and (B) 21 were on oral hypoglycemic alone. Yoga-nidra practiced for 30 minutes daily up to 90 days, parameters were recorded every, 30th day. Results of this study showed that most of the symptoms were subsided ($p < 0.004$, significant), and fall of mean blood glucose level was significant after 3-month of Yoga-nidra. This fall was 21.3mg/dl, $P < 0.007$, (from 159 ± 12.27 to 137.7 ± 23.15), in fasting and 17.95

mg/dl, $P=0.02$, (from 255.45 ± 16.85 to 237.5 ± 30.54) in post prandial glucose level. Results of this study suggest that subjects on Yoga-nidra with drug regimen had better control in their fluctuating blood glucose and symptoms associated with diabetes, compared to those were on oral hypoglycaemics alone.

Gore (1988)^{ix} investigated the beneficial effect of yoga training on six out of nine diabetics in respect of fasting and post-prandial blood sugar level, sugar in urine, glucose tolerance and medication. Avoidance of exertion and emphasis on relaxation and tranquilization were the main objectives of yoga training and practice.

Sahay (1988)^x has done research on blood sugar levels of diabetic patients. He found that fasting and post lunch blood sugar levels of diabetics came down significantly. The patients developed a sense of well being within 10 days, with lowering of the dosage of drugs and diminished incidence of acute complications like infections and ketosis. There were significant changes in the 'Insulin kinetics' and those of counter regulatory hormones like cortisol. The follow-up study was conducted for two to seven years revealed normalization of the periodic blood sugar values and hypoglycemia.

Jain SC, et.al. (1993)^{xi} undertook a research on "A study of response pattern of non-insulin dependent diabetics to yoga therapy." They reported that changes in blood glucose and glucose tolerance by oral glucose tolerance test (OGTT) after 40 days of yoga therapy in 149 non-insulin-dependent diabetics (NIDDM) were investigated. The response to yoga in these subjects was

categorized according to a severity scale index (SSI) based on area index total (AIT) under OGTT curve. One hundred and four patients showed a fair to good response to the yoga therapy. There was a significant reduction in hyperglycemia and AIT with decrease in oral hypoglycemia and AIT with decrease in oral hypoglycemic drugs required for maintenance of normoglycemia. It is concluded that yoga, a simple and economical therapy, may be considered a beneficial adjuvant for NIDDM patients.

Sharma R, et.al. (2008)^{xii} in their study, “Effect of yoga based lifestyle intervention on subjective well-being”, selected normal healthy individuals and subjects having hypertension, coronary artery disease, diabetes mellitus or a variety of other illnesses were included in the study. The outcome measures were 'subjective well being inventory' (SUBI) scores, taken on the first and last day of the course. The inventory consists of questions related to one's feelings and attitude about various areas of life, such as happiness, achievement and interpersonal relationship. There was significant improvement in the subjective well being scores of the 77 subjects within a period of 10 days as compared to controls. These observations suggest that a short lifestyle modification and stress management educational program leads to remarkable improvement in the subjective well being scores of the subjects and can therefore make an appreciable contribution to primary prevention as well as management of lifestyle diseases.

Chaipanont S. (2008)^{xiii} studied “Hypoglycemic effect of sitting breathing meditation exercise on type 2 diabetes at Wat Khae Nok Primary Health Center in Nonthaburi province.” To evaluate the hypoglycemic effect of Somporn Kantaradusdi-Triamchaisri technique 1 (SKT1) of sitting breathing meditation exercise on type 2 diabetic patients. This quasi experiment study was performed on type 2 diabetic patients at Wat Khae Nok primary health center from April to May 2007 for a two-week period every Tuesday of the week (3 visits). At the first visit, the patients were educated about diabetes self care after breakfast. At the second and third visit, the participants were trained to practice SKT1 as intervention after breakfast. Post prandial plasma glucose and blood pressure before and after the intervention were recorded. The present study showed that SKT1 practice in type 2 diabetic patients had a post prandial hypoglycemic effect and a slight reduction to systolic and diastolic blood pressure.

2.2 STUDIES ON EFFECT OF FOOT REFLEXOLOGY

Reflexology produces a variety of physical changes in the body. Overall relaxation is evident, which in itself is beneficial for health and well-being. Reflexology has also been shown to improve circulation and assist in the removal of waste products from the body. The increase in blood flow also enables vital nutrients to reach the cells of the body, which greatly improves oxygenation. The pressure and physical contact of reflexology offers many of the same benefits as other forms of massage therapy.

The exact way reflexology works is unknown, but a number of theories exist to explain its benefits. One primary theory is that reflexology works by sending a calming message to the central nervous system by way of the peripheral nerves in the hands and feet. This message signals the body to adjust its tension level, enhancing relaxation and increasing blood flow. A second theory suggests that the stimulation resulting from a reflexology session releases endorphins and monoamines; two compounds that work to control pain and induce relaxation. A third theory, called the Zone Theory, indicates reflexology works in a similar manner to acupuncture. This theory suggests that the body is divided into 10 vertical zones, and that every muscle and organ in the body can be stimulated by working on the corresponding zone point in the hands and feet.

Kelli Cooper A Foot reflexologist, in his book *Alternative Treatment for Foot Care in Diabetes* states that: “Diabetes causes a host of complications, one of which is decreased circulation. This can lead to problems with the feet, including neuropathy (nerve damage) and even amputation. Controlling blood sugar and taking certain measures to address foot care directly are imperative”.

The University of Maryland Medical Centre, the Mayo Clinic and Dr. Andrew Weil, an avid supporter of alternative medicine, offer several suggestions concerning natural treatments for diabetes. Discuss any supplements with your doctor before using them. Consulting with a practitioner experienced in alternative medicine is a great way to design a natural treatment strategy.

(Shizuko Yamamoto, Patrick Mc Carty (1999)^{xiv}

1. Diabetes is one of the most common causes of neuropathy in the feet. Acupuncture and reflexology have proven helpful as courses of treatment. Acupuncture, a form of treatment in traditional Chinese medicine, seeks to correct imbalances with the use of thin needles placed in certain parts of the body. The practitioner might then move them around or stimulate them with gentle heat or electricity. This is supposed to correct the energy imbalances that contributed to the problem. Reflexology involves stimulating certain parts of the feet and legs with the fingers. This can help relieve pain. (Shizuko Yamamoto, Patrick Mc Carty (1999))

2. Alpha-lipoic acid and the B vitamins are essential to nerve health. Dr. Weil recommends starting off with 200 mg of alpha-lipoic acid daily and generally increasing to 1,000 mg daily over the course of a couple of months. You can get all the B vitamins in their proper amounts by taking a B-vitamin complex pill once a day. (Shizuko Yamamoto, Patrick Mc Carty (1999))

3. Certain herbs, like GTF chromium, bitter melon, prickly pear cactus, gymnema, American ginseng and cinnamon, may control blood sugar. A physician experienced in using natural supplements can suggest the appropriate dosages. Consider taking a fiber supplement as well if you are not getting adequate amounts in your diet. (Shizuko Yamamoto, Patrick Mc Carty (1999))

4. Clean your feet every day with lukewarm water and gentle soap. Dry thoroughly, particularly between the toes. Keep your feet moisturized with lanolin lotion or other types of cream. See your doctor if you notice any cracks

in your skin. Do not walk around barefoot. Do not allow your feet to become too hot or cold. Always wear socks with your shoes. Do not wear sandals or shoes with open toes or shoes that are too tight or would impair circulation like high heels or shoes with pointy toes. Wear socks and stockings that extend half an inch longer than your longest toe. Stay away from nylon, stretch socks and socks with elastic bands.(Shizuko Yamamoto, Patrick Mc Carty (1999)

Reflexology increases the circulation of blood and lymph, facilitating the transport of oxygen and other nutrients into the body's tissues. Improved circulation allows for more efficient uptake of insulin by the cells. Circulation is often impaired in people with diabetes due to the damaging effects of elevated blood sugar levels on the cells of the body.(Shizuko Yamamoto, Patrick Mc Carty (1999)

Reflexology works directly with the muscles (myo) and connective tissues (fascia) in the body, helping to facilitate greater mobility in the body. This is especially important for people with diabetes, because elevated blood sugar causes a thickening of connective tissue, which affects the mobility and elasticity of the myofascial system. This may be experienced as stiffness in the muscles, tendons, and ligaments or as a decreased range of motion in the joints.

Reflexology Foot Massage can give a wonderful psychological boost to someone who is living with diabetes and striving to balance all the factors involved in maintaining a healthy lifestyle—proper nutrition, adequate exercise, blood glucose monitoring, appropriate use of medicines, and stress

management. Massage therapy contributes an important piece to my diabetes regimen of care.

Dalal K et al. (2014)^{xv} evaluated the efficacy of foot reflexology. This health science works on the hypothesis that the dysfunctional states of body parts could be identified by observing certain skin features and be rectified by stimulating certain specific areas mapped on feet. Subjects (N = 58) with diagnosed diabetic neuropathy were randomly distributed into reflexology and control groups in which both group patients were treated with ongoing pharmacological drugs. Reflexology group patients were additionally treated holistically with the hypothesis that this therapy would bring homeostasis among body organ functions. This was a caregiver-based study with a follow-up period of 6 months. The outcome measures were pain reduction, glycemic control, nerve conductivity, and thermal and vibration sensitivities. The skin features leading to the detection of the abnormal functional states of body parts were also recorded and analyzed. Reflexology group showed more improvements in all outcome measures than those of control subjects with statistical significance. This study exhibited the efficient utility of reflexology therapy integrated with conventional medicines in managing diabetic neuropathy.

Bagheri-Nesami M et al. (2014)^{xvi} examined the effects of foot reflexology massage on anxiety in patients following CABG surgery. In this randomized controlled trial, 80 patients who met the inclusion criteria were

conveniently sampled and randomly allocated to the experimental and control groups after they were matched on age and gender. On the days following surgery, the experimental group received foot reflexology massage on their left foot 20 min a day for 4 days, while the control group was given a gentle foot rub with oil for one minute. Anxiety was measured using the short-form of the Spielberger State-Trait Anxiety Inventory and the Visual Analogue Scale-Anxiety. Both measurement instruments confirmed a significant decrease in anxiety following the foot reflexology massage. The significant decrease in anxiety in the experimental group following the foot reflexology massage supports the use of this complementary therapy technique for the relief of anxiety.

Moyle W et al. (2014)^{xvii} compared the effect of foot massage (intervention) and quiet presence (control) on agitation and mood in people with dementia. Five long-term care facilities in Brisbane, Australia. The primary outcome was the Cohen-Mansfield Agitation Inventory (CMAI) and the secondary outcome was the Observed Emotion Rating Scale (OERS). The screening and data collection research assistants, families, and care staff were blinded to participant allocation. Participants of the study were 55 long-term care residents aged 74-103 years (mean age 86.5), with moderate to severe dementia and a history of agitated behaviour according to the Pittsburgh Agitation Scale. A computer-program randomised participants to 10-min foot massage (intervention) or quiet presence (control), every weekday for 3 weeks. A carry-over effect was identified in the data, and so the data was

treated as a parallel groups RCT. The mean total CMAI increased in both groups (reflecting an increase in agitation) with this increase greater in the quiet presence group than the foot massage group ($p=0.03$). There was a trend towards a difference on OERS General Alertness, with a positive change in alertness for participants in the foot massage group (indicating reduced alertness) and a negative change for participants in the quiet presence group (indicating increased alertness) ($F(1,51)=3.88$, $p=0.05$, partial $\eta^2=0.07$). The findings highlight the need for further research on the specific conditions under which massage might promote relaxation and improve mood for people with dementia. The unfamiliar research assistants and variations in usual activity may have contributed to the increase in agitation and this needs further research.

Moyle W et al. (2014)^{xviii} compared the effect of foot massage (FM) versus a control activity (quiet presence, QP) on physiological stress response (i.e., blood pressure [BP] and heart rate [HR]) in people living with moderate-to-severe dementia in long-term-care settings. Fifty-three residents were randomized to intervention (10-minute FM) or control group (QP). While the FM group experienced a greater reduction in HR than the control group, these reductions were not significantly different between groups ($p=0.83$; see Table 1), or across time ($p=0.46$). Both groups experienced a reduction in systolic BP and diastolic BP, while the mean reduction in systolic BP was greater for those in the FM group. While the findings do not provide strong support for FM, the finding that both conditions allowed the person with dementia to rest in the

presence of another human being is of importance in the care of people with dementia. The close presence of another person may in fact promote relaxation and therefore improve BP and HR measures.

Dalal K et al. (2013)^{xix} explored the scientific basis of reflexology techniques, elucidation of the surface and subsurface features of reflexology areas (RAs) is crucial. In this study, the subcutaneous features of RAs related to the lumbar vertebrae were evaluated by swept source-optical coherence tomography (SS-OCT) in subjects with and without low back pain (LBP). Methods. Volunteers without LBP (n = 6 (male : female = 1 : 1)) and subjects with LBP (n = 15 (male : female = 2 : 3)) were clinically examined in terms of skin colour (visual perception), localised tenderness (visual analogue scale) and structural as well as optical attributes as per SS-OCT. From each subject, 6 optical tomograms were recorded from equidistant transverse planes along the longitudinal axis of the RAs, and from each tomogram, 25 different spatial locations were considered for recording SS-OCT image attributes. The images were analysed with respect to the optical intensity distributions and thicknesses of different skin layers by using AxioVision Rel. 4.8.2 software. The SS-OCT images could be categorised into 4 pathological grades (i.e., 0, 1, 2, and 3) according to distinctness in the visible skin layers. Results. Three specific grades for abnormalities in SS-OCT images were identified considering gradual loss of distinctness and increase in luminosity of skin layers. Almost 90.05% subjects were of mixed type having predominance in certain grades. Conclusion. The skin SS-OCT system demonstrated a definite association of the

surface features of healthy/unhealthy RAs with cutaneous features and the clinical status of the lumbar vertebrae.

Moyle W et al. (2013)^{xx} explored effectiveness of foot massage for care staff working with older people with dementia in long-term care facilities. This was a pilot, parallel group, randomized controlled trial aimed at exploring feasibility for a larger randomized controlled trial. Nineteen staff, providing direct care to residents with dementia and regularly working \geq two day-shifts a week, from one long-term care facility in Queensland (Australia), were randomized into either a foot massage intervention (n=9) or a silent resting control (n=10). Each respective session lasted for 10-min, and participants could receive up to three sessions a week, during their allocated shift, over four-weeks. At pre- and post-intervention, participants were assessed on self-report outcome measures that rated mood state and experiences of working with people with dementia. Immediately before and after each intervention/control session, participants had their blood pressure and anxiety measured. An Intention To Treat framework was applied to the analyses. Individual qualitative interviews were also undertaken to explore participants' perceptions of the intervention. The results indicate the feasibility of undertaking such a study in terms of: recruitment; the intervention; timing of intervention; and completion rates. A change in the intervention indicated the importance of a quiet, restful environment when undertaking a relaxation intervention. For the psychological measures, although there were trends indicating improvement in mood there was no significant difference between

groups when comparing their pre- and post- scores. There were significant differences between groups for diastolic blood pressure ($p= 0.04$, partial $\eta^2=0.22$) and anxiety ($p= 0.02$, partial $\eta^2=0.31$), with the foot massage group experiencing greatest decreases immediately after the session. The qualitative interviews suggest the foot massage was well tolerated and although taking staff away from their work resulted in some participants feeling guilty about taking time out, a 10-min foot massage was feasible during a working shift. This pilot trial provides data to support the feasibility of the study in terms of recruitment and consent, the intervention and completion rates. Although the outcome data should be treated with caution, the pilot demonstrated the foot massage intervention showed trends in improved mood, reduced anxiety and lower blood pressure in long-term care staff working with older people with dementia. A larger study is needed to build on these promising, but preliminary, findings.

Simonnet K. (2012)^{xxi} reported that massages, following the foot reflexology method, were given to patients in a nursing home suffering from Alzheimer's disease or related disorders. A methodical assessment, on a small sample of patients, showed a significant reduction in neuropsychiatric manifestations, opening up new perspectives for non-medication based therapy for the care of elderly dependent people.

Kim JO and Kim IS. (2012)^{xxii} examined the effects of aroma self-foot reflexology massage on stress and immune responses and fatigue in

middle-aged women in rural areas. The study was a nonequivalent control group pre-post test design. The participants were 52 middle-aged women from rural areas of which 26 were assigned to the experimental group and 26 to the control group. Data were collected from July to September, 2011 and analyzed using SPSS Win 17.0 version program. The intervention was conducted 3 times a week for six weeks. There were significant differences in reported perceived stress, systolic blood pressure, diastolic blood pressure and fatigue between the two groups. However, the issue of salivary cortisol and immune response were not significant. Aroma self-foot reflexology massage can be utilized as an effective intervention for perceived stress, systolic blood pressure, diastolic blood pressure and fatigue in middle-aged woman in rural areas.

Lu WA et al. (2011)^{xxiii} investigated the effect of foot reflexology (FR) on the autonomic nervous modulation in patients with coronary artery disease (CAD) by using heart rate variability analysis. Seventeen people with angiographically patent coronary arteries and 20 patients with CAD scheduled for coronary artery bypass graft surgery were recruited as the control and CAD groups, respectively. The normalized high-frequency power (nHFP) was used as the index of vagal modulation and the normalized very low-frequency power (nVLFP) as the index of vagal withdrawal and renin-angiotensin modulation. In both control and CAD groups, the nHFP was increased significantly whereas the nVLFP was decreased significantly 30 and 60 minutes after FR, as compared with those before FR. The systolic, diastolic, mean arterial, and pulse pressures were significantly decreased after FR in both groups of participants.

In the CAD group, the percentage change in heart rate 30 and 60 minutes after FR was smaller than that in the control, and the percentage change in nVLF 60 minutes after FR was smaller than that in the control. In conclusion, a higher vagal modulation, lower sympathetic modulation, and lower blood pressure can be observed following 60 minutes of FR in both controls and CAD patients. The magnitude of change in the autonomic nervous modulation in CAD patients was slightly smaller than that in the controls. FR may be used as an efficient adjunct to the therapeutic regimen to increase the vagal modulation and decrease blood pressure in both healthy people and CAD patients.

Lee J et al. (2011)^{xxiv} evaluated the effectiveness of foot reflexology on fatigue, sleep and pain. A systematic review and meta-analysis were conducted. Electronic database and manual searches were conducted on all published studies reporting the effects of foot reflexology on fatigue, sleep, and pain. Forty four studies were eligible including 15 studies associated with fatigue, 18 with sleep, and 11 with pain. The effects of foot reflexology were analyzed using Comprehensive Meta-Analysis Version 2.0. The homogeneity and the fail-safe N were calculated. Moreover, a funnel plot was used to assess publication bias. The effects on fatigue, sleep, and pain were not homogeneous and ranged from 0.63 to 5.29, 0.01 to 3.22, and 0.43 to 2.67, respectively. The weighted averages for fatigue, sleep, and pain were 1.43, 1.19, and 1.35, respectively. No publication bias was detected as evaluated by fail-safe N. Foot reflexology had a larger effect on fatigue and sleep and a smaller effect on pain. This meta-analysis indicates that foot reflexology is a useful nursing

intervention to relieve fatigue and to promote sleep. Further studies are needed to evaluate the effects of foot reflexology on outcome variables other than fatigue, sleep and pain.

Moyle W et al. (2011)^{xxv} explored the effects of foot massage on agitated behaviours in older people with dementia living in long-term care. Seventeen men and 5 women (mean age 84.7 years), with a diagnosis of dementia and a history of clinically significant agitation, received a 10-minute foot massage each day for 14 days. The short form of the Cohen-Mansfield Agitation Inventory (CMAI-SF) and the Revised Memory and Behavior Problems Checklist (RMBPC) were completed at baseline, post-test and 2-weeks follow up. CMAI-SF and RMBPC scores were significantly reduced at post-test and remained significantly lower than baseline at follow up. This study provides preliminary evidence suggesting that limited short-duration foot massage reduces agitation and related behavioural problems in people with dementia, and that these behaviour changes are maintained after the massage ceases. A randomised controlled trial is required to confirm these findings.

Lee YM. (2011)^{xxvi} evaluated the effects of self-foot reflexology on stress (perceived stress, urine cortisol level, and serum cortisol level), fatigue, skin temperature and immune response in female undergraduate students. The research design was a nonequivalent control group pretest-post test design. Participants were 60 university students: 30 in the experiment group and 30 in

the control group. The period of this study was from April to June 2010. The program was performed for 1 hr a session, three times a week for 6 weeks. The data were analyzed using the SPSS/WIN 17.0 program. The results showed that self-foot reflexology was effective in reducing perceived stress and fatigue, and raised skin temperature in female undergraduate students. But cortisol levels and immune response were not statistically significant different. The results of this study indicate that self-foot reflexology is an effective nursing intervention in reducing perceived stress and fatigue and, in improving skin temperature. Therefore, it is recommended that this be used in clinical practice as an effective nursing intervention for in female undergraduate students.

Jang SH and , Kim KH. (2009)^{xxvii} examined the effects of self-foot reflexology on stress, fatigue and blood circulation in premenopausal middle-aged women. A quasi-experimental nonequivalent control group, pretest-posttest design was used. Participants were 59 premenopausal, middle-aged women in their 40s and 60s living in G city: 30 in the experiment group and 29 in the control group. Data were collected from May to August 2008. Self-foot reflexology was performed three times a week for 6 weeks for 40 min at each session. The results showed that self-foot reflexology was effective in reducing perceived stress and fatigue and helped blood circulation in premenopausal middle-aged women. Self-foot reflexology may be an effective nursing intervention in reducing perceived stress and fatigue and in improving blood circulation.

Ernst E. (2009)^{xxviii} evaluated the evidence for and against the effectiveness of reflexology for treating any medical condition. Six electronic databases were searched from their inception to February 2009 to identify all relevant randomised controlled trials (RCTs). No language restrictions were applied. RCTs of reflexology delivered by trained reflexologists to patients with specific medical conditions. Condition studied, study design and controls, primary outcome measures, follow-up, and main results were extracted. 18 RCTs met all the inclusion criteria. The studies examined a range of conditions: anovulation, asthma, back pain, dementia, diabetes, cancer, foot oedema in pregnancy, headache, irritable bowel syndrome, menopause, multiple sclerosis, the postoperative state and premenstrual syndrome. There were > 1 studies for asthma, the postoperative state, cancer palliation and multiple sclerosis. Five RCTs yielded positive results. Methodological quality was evaluated using the Jadad scale. The methodological quality was often poor, and sample sizes were generally low. Most higher-quality trials did not generate positive findings. The best evidence available to date does not demonstrate convincingly that reflexology is an effective treatment for any medical condition.

Li CY et al. (2011)^{xxix} examined the effectiveness of using foot reflexology to improve sleep quality in postpartum women. 65 postpartum women reporting poor quality of sleep were recruited from July 2007 to December 2007. participants were assigned randomly to either an intervention or a control group. Participants in both groups received the same care except for reflexology therapy. The intervention group received a single

30-minute foot reflexology session at the same time each evening for five consecutive days. Sessions were administered by a certified nurse reflexologist.

MEASURES AND FINDINGS: the outcome measure was the Pittsburgh sleep quality index (PSQI), and this was performed at baseline and post test. Mean PQSI scores for both groups declined over time between baseline and post test. Using a generalised estimation equation to control several confounding variables, the changes in mean PSQI were found to be significantly lower in the intervention group ($\beta=-2.24$, standard error=0.38, $p<0.001$) than in the control group an intervention involving foot reflexology in the postnatal period significantly improved the quality of sleep.

Kao Fredrick (1975)^{xxx} reported a case study on his mom who suffered blood sugar exceeded the normal level for quite a while. Along with her prescription, her doctor advised her not to consume food with high glucose such as white bread, cake, potato, or white rice. Three times a day she needed to check her urine in order to ensure her blood sugar is under control. The reflexologist, suggested my mom to work on foot reflexology at home with Foot Roller at least 2 to 3 times a day, before meals and 45 minutes after meals. At the beginning my mom had temporary side effects such as nausea, frequent urination, and excessive thirst.. The second week, the glucose-testing strip showed her blood sugar had dramatically gone down and the doctor found her blood sugar has dropped down to a normal level.

Jeong IS. (2006)^{xxxii} investigated the effect of self-foot reflexology on peripheral blood circulation, peripheral neuropathy and to determine the feasibility of self-foot reflexology as a nursing intervention. This was non equivalent control pretest-posttest study with 76 patients with type 2 diabetes mellitus (aged between 40-79) recruited from public health centre's in Busan city. Intervention was a 6 week self-foot reflexology, and outcome variables were peripheral blood circulation and peripheral neuropathy (tactile response to monofilament, intensity of symptoms of peripheral neuropathy). ANCOVA was used to do the statistical analysis. A .05 significance level was set for evaluating the effects of self-foot reflexology. The self-foot reflexology was relatively effective not only in reducing peripheral neuropathy (especially tingling sensation and pain) but also in improving ability to sense the 10-g force monofilament. Conclusion: Even though self-foot reflexology was not effective in improving peripheral circulation, it had good effect on improving peripheral neuropathy. Therefore self-foot reflexology can be used as a nursing intervention program for promoting foot care for patients with DM patients.

Kim KS (2003)^{xxxiii} studied the effect of foot reflexology on vital signs, general fatigue, foot fatigue, mood, and blood glucose levels in noninsulin dependent patients. The Research design of this study was nonequivalent control group quasi-experimental design. 18 patients were assigned to the experimental group, 24 patients to the control group. The data were obtained diabetic patients with ambulatory endocrine outpatients' clinic patients from 40 years old to 70 years old. Experimental groups received foot reflex massage for

30 minutes three times/week every other days, and Control groups did not received foot reflex massage. The dependent variables were blood pressure, pulse rate. Visual analogue scale for general fatigue, foot fatigue, mood and blood sugar levels. Data were analyzed with chi2test, T-test and repeated measure ANOVA at .05 level of significance. There was significant difference in the pulse rate, general fatigue, foot fatigue and mood according to group and time between pre and post foot reflexology. But this research did not prove to decrease blood sugar levels. Foot reflexology can improve pulse rate, general and foot fatigue, and mood status in diabetic patients. So, further research need to explore the effect of decreasing of blood sugar levels.

Nancy Stephenson and Erma Sylvester (1960)^{xxxiii} documented that Reflexology is 93% effective as found in a year-long analysis of 168 studies from twenty-three countries. The analysis is the focus of the newly released Evidence-Based Reflexology Series by Barbara and Kevin Kunz. The key to success with reflexology, as documented by Kunz and Kunz, is the frequency and duration with which it is applied. Evidence-Based Reflexology presents both results and how much technique application has been found to positively impact 78 physical and mental conditions. This breakthrough study documents research-based evidence sufficient to state that: Reflexology can be an effective complement in the treatment of certain conditions. Research demonstrates reflexology's measurable effects and how they can be adjusted to suit the situation. With the appropriate amount of reflexology work, specific physical and mental conditions can be positively affected. In addition, physiologic

measures that indicate an organ's normal functioning can be positively impacted.

Evidence-Based Reflexology examines reflexology research documenting how long and how often technique is applied to obtain specific results. This is important to: Reflexology Treatment for Diabetics. Reflexology is known to be of special use to those suffering from diabetic conditions; a diabetic's major concern can sometimes start and end at the feet. Symptoms of diabetes can be poor circulation and numbness in the feet with more serious conditions that may develop over time. A recent patient of mine who suffers from diabetes began to feel a long gone sensation in her toes after a few sessions and has become a regular who looks forward to the treatment and results each and every time. Foot Reflexology can be very beneficial for people with Diabetes. With numbness feet can be easily injured without awareness of foot pain. When the feet go numb, Foot Reflexology helps bring the feeling and circulation back.

According to Ariel Talmor, Reflexology diabetes massage is simple to do and has no side effects. It has many benefits not only in controlling blood glucose, but to overall body system. For diabetic patients reflexology is very much helpful to lower their quantity of medicine they take to control blood glucose. Is Diabetes reflexology safe? People with recent or healing fractures, unhealed wounds or active gout affecting the foot should avoid reflexology. If you have osteoarthritis affecting the ankle or foot or severe circulation problems

in the legs or feet, seek medical consultation before starting reflexology, Diabetes yoga Acupressure diabetes healing, Reflexology diabetes massage, regular application of pressure on the reflex-zones and pressure points of the feet could become part of a natural foot care regime. Regular foot reflexology treatments assist with health maintenance as well as when there is illness, imbalance or foot pain. It is my pleasure to write about what I consider a truly simple, yet effective modality. Foot reflexology is considered by some to be just about a foot massage. This article will be a description of my professional journey, with an intention to educate and explain foot reflexology. (Houston, F.M. Duke (1974)^{xxxiv}

2.3 SUMMARY OF RELATED LITERATURE

The review of related literature presented in this chapter can be summarised that researches have proved that yogic practices contribute in different ways for the management of diabetics and influencing biochemical and physiological variables. In the same way foot reflexology contributes for the controlling blood glucose and beneficially contributes for certain psychological variables. The reviews proved that there was further scope for research to find out whether foot reflexology and selected yogic practices have significant influences on selected biochemical, physiological and psychological variables among people with diabetics, hence this study was made. Based on the experience gained through review of related literature, the investigator formulated suitable methodology for this study, which is presented in Chapter III.

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