CHAPTER 1: INTRODUCTION

1.1 DIABETES MELLITUS

Chronic state that occurs when glucose levels rise because a person's blood cannot produce enough Insulin Hormone or cannot effectively use the insulin produced is Diabetes mellitus, T2DM (IDF, 2019). T2DM, especially in Adults accounting for around 90% of all Diabetes worldwide (Lancet, 2018).

1.2 UNDERSTANDING: PATHOPHYSIOLOGY OF T2DM

T2DM is impaired carbohydrate utilization resulting from a defective or deficient insulin secretory response (McGraw, 2020)**.** The significant cause of morbidity and death in T2DM subjects is hyperglycemia and abnormalities in serum lipids which later cause micro and macrovascular complications.

1.3 T2DM AND PREDIABETES

Dyslipidemia is one of the many modifiable risk factors for stroke, coronary artery disease (CAD), and peripheral vascular disease. In diabetic dyslipidemia, lipid abnormalities may result from unbalanced metabolic states of Diabetes (i.e., hyperglycemia and insulin resistance) (Choudhari Sujit, 2018). Insulin resistance is responsible for the epidemiologic changes in average fasting glucose to impaired glucose tolerance to impaired fasting glucose (R. Kahn & Davidson, 2014)to T2DM and exists a relationship between T2DM and cardiovascular disease (R. Kahn, 2014). This dysglycaemia is Prediabetes, a primary risk factor for developing T2DM (Unwin et al., 2002). Hence, the pathogenesis of T2DM and associated elevation of cardio-metabolic risk begins much earlier than the diagnosis of T2DM (Haffner, 2006). Other health risks like cases of chronic kidney disease (CKD) are

also high in people with Prediabetes and undiagnosed Diabetes. These may benefit from the intervention meant to lower the development and/or progress of CKD and T2DM (Plantinga et al., 2010).

1.4 PREVALENCE OF T2DM AND PREDIABETES

The worldwide Prevalence of T2DM has risen dramatically over the past few decades. The Prevalence of T2DM, Prediabetes is expected to grow more rapidly because of increasing obesity and reducing physical activity levels.

TABLE 1: PREVALENCE OF DIABETES IN THE WHO SOUTH-EAST ASIA REGION (IDF, 2019)

Briefly	**2019**	**2030**
Total World Population	7.7 billion	8.6 billion
Adult Population (20-79 years)	5.0 billion	5.7 billion
Diabetes (20-79 years)		
Global Prevalence	9.3%	10.2%
Number of People with Diabetes	463.0 million	578.4 million
Number of deaths due to Diabetes	4.2 million	-
Total health expenditure for Diabetes	USD 760.3 billion	USD 824.7 billion
Impaired glucose tolerance (20 – 79 years)		
Global prevalence	7.5%	8.0%
Number of people with impaired glucose tolerance	373.9 million	453.8 million

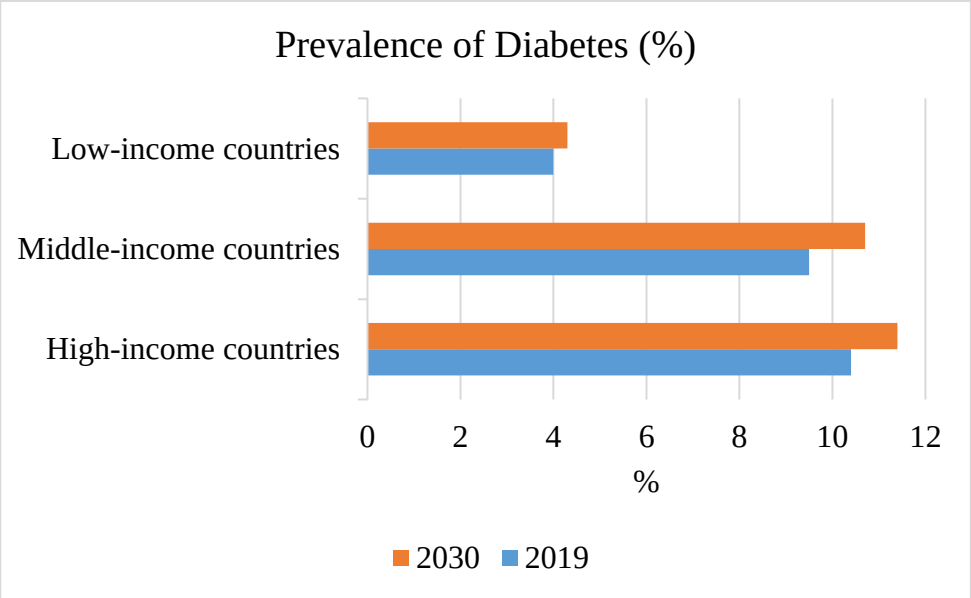

FIGURE 1: PREVALENCE OF DIABETES ACCORDING TO THE ECONOMIC STATUS OF COUNTRIES

TABLE 2 : MODIFIED DIAGNOSTIC CRITERIA FOR PREDIABETES & DIABETES (IDF, 2019)

CRITERION	**With one of the criteria below for Diabetes**	**IGT- Impaired Glucose Tolerance with two criteria below.**	**IFT- Impaired Fasting Glucose with criteria below.**	**Prediabetes**
FASTING PLASMA GLUCOSE	126 mg/dL	126 mg/dL	110 – 125 mg/dL	100-125mg/dL
TWO-HOUR PLASMA GLUCOSE after 75g oral glucose load (Oral Glucose Tolerance Test OGTT)	200 mg/dL	140 - 200 mg/dL	140 mg/dL	140-199mg/dL
HbA1c	Equivalent to 6.5%	-	-	5.7-6.4%

1.5 PREDIABETES

The diagnosis of Prediabetes is when the fasting plasma glucose is 100-125 mg/dl (5.6-6.9 mmol/l; “impaired fasting glucose” (IFG)), plasma glucose concentration is 140-199 mg/dl (7.8-11.1 mmol/l; “impaired glucose tolerance” (IGT)) 2 hours after a 75 g oral glucose tolerance test (OGTT), *and/or* A1c 5.7-6.4% (ADA,2019). The terms ‘prediabetes’ and ‘non-diabetic hyperglycemia’ (Health England, 2015) ‘intermediate hyperglycemia’ are used as alternatives. Fasting is 8 hours with no calories (Table2)

Global prevalence is 9.3% of T2DM, and the Number of people 463.0 million is slated to 10.2%, and the number of people with Diabetes 578.4 million in 2030. For India, it is 77 million with an 8.9% Prevalence (20-79 Age group) (see Table 1, Figure 1) (IDF,2019)

A complex interaction of further factors that include life expectancy, socioeconomic status, wealth, access to healthcare services, levels of education, exposure to disease/public health awareness initiatives, and regional levels of obesity influence prevalence rates (Anjana et al., 2015). . ICMR-Indian council of medical research India (2008-2015) showed overall prevalence of 7.3% in 15 states of India, Bihar 4.3% to 10% in Punjab.(Anjana et al., 2017)

1.6 PREDIABETES TO T2DM

In 3-5 years, Prediabetes will progress to overt T2DM in approximately 25%, and 70% of individuals with Prediabetes will develop T2DM within their lifetime (Hostalek, 2019; Tabák et al., 2012). In a meta-analysis of 20 studies, 13% of mothers with gestational Diabetes developed T2DM after pregnancy compared to 1% without gestational Diabetes

(Bellamy et al., 2009). 5-10% will develop T2DM in one year, 25% within five years (Gupta et al., 2003).

Evidence from repeat measures of glucose levels, insulin sensitivity, and insulin secretion, the development of T2DM from Impaired Glucose Tolerance is a continuous process (Tabák et al., 2009). Insulin resistance starts years before diabetes development and decreased beta-cell function is already present in the prediabetic stage (Abdul-Ghani et al., 2006).

T2DM is a chronic disease whose long-term implications contribute to poor quality of life and significantly increase healthcare expenditure. Prediabetes may be reversible by implementing lifestyle modification programs, adopting a healthier diet, and increasing physical activity levels (IDF, 2019). 1:3 Americans have Prediabetes, and that 90% are unaware of their condition, this is commonly quoted statistics, but we don't know if there is any other countries study to compare. Global prevalence in the current and future with this review is assessed (CDC, 2011).

1.7 PATHOPHYSIOLOGY OF T2DM

Diabetes mellitus is a pan metabolic disorder characterized by chronic/sustained hyperglycemia. A syndrome rather than a disease entity. The condition evolves slowly and remains subclinical for variable periods estimated as several years. Two factors are responsible for the metabolic disarray that constitutes Diabetes:

i. Impaired Insulin action/sensitivity, i.e., insulin resistance (IR)
ii. β-cells defect: insulin secretory dysfunction.

Insulin sensitivity and β-cells function are modulated by hereditary(genetic) and environmental factors (Scheen, 2003).

1.8 GLUCOSE HOMEOSTASIS AND INSULIN RESISTANCE

Homeostasis is a body's tendency to maintain the equilibrium of different internal systems by using various biochemical and physical processes. Glucose homeostasis to maintain a healthy blood glucose level depends on the balance and interactions of two hormones — insulin and glucagon (Röder et al., 2016).

Insulin resistance in muscle and liver and β-cell failure represent the core pathophysiologic defects in T2DM. β-cell failure starts very early, was not understood earlier. Fat cell by lipolysis, Gastrointestinal tract by incretin resistance or deficiency, α-cell with hyperglucagonemia, kidney with increased reabsorption and brain with insulin resistance, and the muscle, liver, and β-cell (triumvirate) form eight players as an ominous octet. Eight factors play essential roles in developing glucose intolerance in T2DM (Abdul-Ghani et al., 2006).

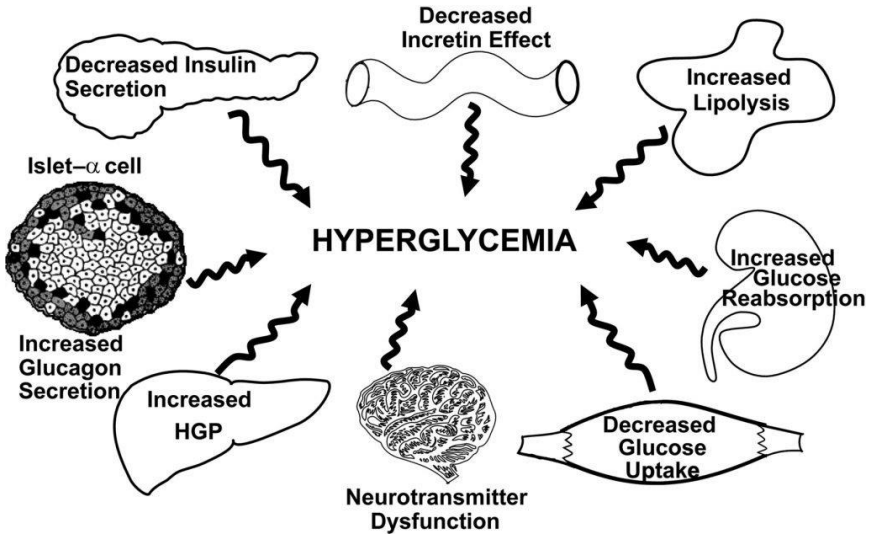

FIGURE 2: OMINOUS OCTET (REF. ABDUL –GHANI ET AL., 2006)

1.9 PATHOGENESIS OF β CELL FAILURE

1.9.1 PREDIABETES

Individuals with IGT are maximally or near maximally insulin resistant have lost 80% of their β cell function, and they have an approximate 10% incidence of diabetic retinopathy. From a Pathophysiology view and clinical Point, these pre-diabetic individuals with IGT tend to have T2DM (Abdul-Ghani et al., 2006; Tabák et al., 2012).

1.9.2 AGE

Advancing age plays a vital role in the progressive β cell failure that characterizes T2DM. Studies (Chang & Halter, 2003) have demonstrated a progressive age-related decline in β cell function.

1.9.3 GENES

Studies in first-degree relatives of T2DM parents and twins have shown β Cell failure, which is vital for the genetic basis of the β cell dysfunction (Vauhkonen et al., 1998).

1.9.4 INSULIN RESISTANCE

Insulin resistance, with an increased demand on the β-cell, has to hyper secrete insulin; this plays an essential role in the progressive β-cell failure of T2DM (Kahn, 2003).

1.9.5 LIPOTOXICITY

Raised plasma-free fatty acid (FFA) levels affect insulin secretion, termed lipotoxicity (Unger, 1995). For minor as 48 hours, if Plasma FFA has Physiological elevation, it impairs insulin secretion in genetically predisposed individuals. Lifestyle variations such as increased physical activity and decreased carbohydrate intake are associated with enhanced insulin sensitivity (Goodyear, 1998).

A critical factor in the emergence of metabolic diseases is obesity. Adipose tissue modulates metabolism by releasing NEFA (Non-esterified fatty acids) and glycerol, hormones including leptin, adiponectin, and proinflammatory cytokines. The production of many of these products increases in obesity.

1.9.6 MUSCLE

Skeletal muscle is the primary site of glucose uptake in the postprandial state in humans; 80% of glucose uptake occurs in skeletal muscle (Thiebaud et al., 1982).

1.10 PHYSIOLOGICAL MECHANISMS IN STRESS

People judge a particular situation differently based on previous experience, psychological factors, and social influences. The Autonomic Nervous system has two distinct branches: the parasympathetic (PNS) and the sympathetic nervous system (SNS). The sympathetic nervous system sympathizes with the whole system to bring about all the necessary physiological changes to cope with stressful situations (Nagaratna, 2002).

To maintain balance, i.e., Homeostasis. Sympathetic and parasympathetic nerves have opposite functions. During stress stimulated HPA Cortisol has an immunosuppressive impact hence plays a role in the regulation of immune and inflammatory processes.

1.11 INFLAMMATION IN RESPONSE TO PSYCHOLOGICAL STRESS

Psychological stress also can provoke inflammatory responses, even in the absence of tissue damage and infection. (Wilson et al., 2018) INFLAMMATION AND THE PARASYMPATHETIC NERVOUS SYSTEM

The Vagus nerve parasympathetic system serves as a set of brakes on inflammatory responses. Convincing Experimental evidence: directly stimulating the Vagus nerve

decreases inflammatory responses and may even effectively treat some inflammatory diseases.(Liezmann et al., 2012; Pavlov, 2012)

1.12 CHRONIC STRESS, INFLAMMATION, AND IMMUNE SYSTEM (PSYCHONEUROIMMUNOLOGY)

Central nervous system action initiated in response to a threat affects the entire body by involving three different bodily systems: the autonomic nervous system (ANS), the neuroendocrine system, and the immune system (Kiecolt-Glaser et al., 2002). This involvement is Psychoneuroimmunology. Understanding when the event is stressful triggers cognitive and affective responses, inducing sympathetic nervous system and endocrine changes, and finally impair immune function. In the early stages of chronic stressors, consistently high cortisol levels cause leukocytes to get desensitized to Cortisol's effects (Rohleder, 2014). This reduces Cortisol's ability to counteract inflammation. In immune system response, inflammation is core to infection and wound, increasing response to psychosocial stress. Production of proinflammatory cytokines influences cardiovascular disease, osteoporosis, T2DM, certain cancers, Alzheimer's disease, frailty, functional decline, and periodontal disease. Other conditions can stimulate negative emotions and stressful experiences (Kiecolt-Glaser et al., 2002).

1.13 SYSTEM-SPECIFIC DEREGULATION: CHRONIC INFLAMMATION AND ATHEROSCLEROSIS

Chronic Inflammation spurs atherogenesis, the process of forming plaque in the arteries resulting in atherosclerosis. This inflammation also contributes to a heightened risk for coronary heart disease, stroke, and T2DM (Chin et al., 2013; Lundervik et al., 2014; Ma et al., 2015).

1.14 COMPLEMENTARY AND AITERNATIVE MEDICINE(CAM) PRATICES AND SURVEY KNOWLEDGE, ATTITUDE, AND PRACTICE OF YOGA (KAPY).

World Health Organization, WHO Current 'global action plan on physical activity,' stresses being active for health and wellness (WHO, 2020). Health has roots in physical, mental, social, and spiritual wellness (Dhar et al., 2011). Hence in public health delivery, it is critical to have provision for an evidence-based integration of alternative approaches for the benefit of people. This by analyze health-seeking behavior based on the knowledge–practice gap in the population. Knowledge–practice gap is a failure of the public to adopt the existing practices despite the knowledge that it promotes an individual's health. Treatment for holistic health includes western and traditional forms as IM-Integrative medicine. IM has shown varying acceptability, and there is a need for a national survey for understanding the knowledge–practice gap in popular health promotion activities such as yoga, especially if it has its origin there. For example, a Hong Kong study found that 40% of people turned to Traditional Chinese Medicine (TCM) as a second option (Wai et al., 2016).

Similarly, a Taiwan-based study depicted a very low prevalence of TCM among children with asthma, with almost all parents opting for Western medicine (Ma et al., 2015). Another mind-body technique, Tai chi/Qigong practice, was reported to have a lifetime prevalence of 3.1% in the U.S.A (Cramer et al., 2016). 2000-2010 a Ten-year Australian data across the country reported a prevalence rate at 3%,0.6%, and 19.2 %, respectively, for yoga, Pilates, Tai chi, Qigong, and other fitness activities (Vergeer et al., 2017).

In contrast, in Japan, 84% of the physicians use Kampo (Traditional Japanese medicine) and practice acupuncture (TCM), accepted across 103 countries, with 29 countries having regulators for acupuncture in the world (WHO, 2020). The study calls for integrating

TCM/CAM with modern medicine for universal health coverage (UHC). The WHO also brings traditional/complementary medicine into national policies to achieve UHC (WHO, 2020).

As India struggles under the burden of T2DM and rising non-communicable diseases, the integration of cost-effective traditional systems, CAM with the conventional medical approaches, under the AYUSH is essential to promote total health (Fan, 2017). National Health Interview Survey at the Centre for Disease Control and Prevention in the United States has highlighted the prevalence of such approaches. The study recognized yoga as one of the seven most frequently used complementary health approaches (CHA) among adults aged 65 or older. Further to conclude that 29.2% (11.7 million) of the more aging adult population used any of these seven CHAs (Rhee et al., 2018). In a cross-sectional survey, the characteristics of yoga practitioners in India, like studies previously undertaken in the U.S.A. and Australia, found that yoga practitioners in India are predominantly males. The chief reason to practice yoga is physical fitness (Telles et al., 2017) and not ailment prevention. Evidence-based yoga plays a pivotal role in altering the physiology and pathology of the body. Specific yoga practices in these studies demonstrated (a) that abdominal stretching *āasana*s (postures) may help pancreatic cells to rejuvenate and regenerate, helpful to T2DM patients (Husein et al., 2017), (b) *prāṇayam* (breathing exercises), and (c) meditation regulating the hypothalamic-pituitary-adrenal axis, resulting in decreased cortisol levels, heart rate and heart rate variability (Balaji et al., 2012; Pascoe et al., 2017). The summer's longest day of the year in the northern hemisphere,21 June, is celebrated as the (IDY) International Day of Yoga. AYUSH Ministry, India, devised a Common yoga Protocol (CYP) to promote positive health. CYP included loosening

exercises followed by sitting, standing and supine postures combined with breathing exercises and meditation (*CYP*, 2021).

The current study design estimates the state of knowledge, **a**ttitude, and **p**ractice of yoga (KAP-Y) for T2DM prevention and management. Study results constitute the first-ever structured report of KAP yoga in Asia.

1.15 SURVEY-BARRIERS AND BENEFITS OF YOGA PRACTICES IN URBAN AND RURAL

With the rapidly increasing yoga practitioners in the West, yoga has become an essential form of health-promoting and fitness activity in these countries. The prevalence of yoga among the adult population has increased from 5.1% in 2002 to 9.5% in 2012 in U.S.A. (Clarke et al., 2002) with social support (Barnes et al., 2002). The number of yoga practitioners is on the rise in India, with the rediscovery of its health benefits (Telles et al., 2017). Some challenges posed in accepting yoga in a broader context are some contemporaries still view yoga as a religious practice (Cook-Cottone et al., 2017). Chitta vrtti nirodha is "mastery over the modifications of the mind" Ancient Indians developed this, is necessary to lead a healthy lifestyle, as per yoga. Physical Postures include *Surya namaskār* salutation to the Sun, a chronologically arranged set of postures, *Āasana*s that involve effortless maintenance in the final stretched posture; *Prāṇayam* regulated breathing, relaxation techniques, and meditation (Martha, 2014). Yoga Practices Integration into the mainstream health practices remains challenging as there is incomplete and insufficient information about the community's perception of its benefits and barriers to health.

Atkinson et al. conducted a Qualitative study that reported lack of time, interest, awareness, motivation, and education as common barriers for *yoga* in a general population (Atkinson, 2009). yoga in 26 post-stroke adults reported whole-body benefits, the return of connection, and feeling healthy in Mind; the perceived barriers included physical limitations due to stroke, cognitive challenges, environmental access, and financial constraints (Harris et al., 2019). People doing yoga with chronic lower back pain had mixed perceptions (potential barriers). A proper clarification about what yoga is, how it can be helpful, and what one requires one to do physically may help better to promote its use (Martha, 2015). A pilot trial in people with depression and chronic pain has shown. yoga improves the quality of work (Schmid et al., 2019). The intervention group received a yoga-based lifestyle program for chronic low back pain short duration randomized control trial with one week of exercise as control. Results showed improvement in the yoga group with a reduction in pain disability and improved spinal flexibility better than exercise (Tekur et al., 2008).

Growing acceptance of Integrative medicine across the world impacts its perception and practice. The personal experience of health professionals and their willingness to prescribe *yoga* as an adjunct therapy to their patients depends on their acceptance and whether they perform yoga or not (Sulenes et al., 2015). Perceivance by community and employer has a strong bearing on the benefits and barriers of yoga. With multiple published studies from India and elsewhere about perceptions of benefits and hindrances related to the Practice of yoga (Kabiri, 2018), there are no studies from all zones of India. Hence, studying this perception through a nationwide cross-sectional survey on yoga-based lifestyle modifications planned to prevent and manage Prediabetes and T2DM.

1.16 PERCEIVED STRESS LEVEL AND DEPRESSION IN PREDIABETES AND DIABETES -CALL FOR ACTION.

T2DM is a chronic metabolic disorder with significant morbidity, mortality, and healthcare spending. Several modifiable attributes to increased risk of T2DM are environmental factors, including obesity, physical inactivity, diet quality, smoking, hypertension, and (Agte, 2004; Atkinson, 2009; BaldwinMC, 1999; Brems et al., 2015; Dayananda et al., 2014; Kabiri et al., 2018; Yesudian et al., 2014) hyperlipidemia (Murea et al., 2012). However, despite efforts to combat these factors, T2DM incidence continues to rise. The above fact indicates a need to identify additional contributing factors and develop new public health strategies to combat the disease. Psychological stress is a risk factor for chronic conditions, including T2DM. Kelly et al. reported that stress-related factors (such as stressful workplace or traumatic life events, depression, type A personality, and mental health problems) are associated with the development of T2DM. These connections between T2DM and stress, physical inactivity, dietary changes, and unhealthy lifestyle conditions appears to hold for Indian as well (Sendhilkumar et al., 2017). As understood by underlying biological pathways, stressors may activate the hypothalamic-pituitary-adrenal (HPA) axis, resulting in the release of various insulin counter-regulatory hormones such as adrenaline and Cortisol (Kelly, 2015). The increased genetic susceptibility of the Indian population to Prediabetes and T2DM provides an excellent opportunity for delineating the role of stress. Prediabetes, a precursor to T2DM, is becoming more common and is estimated to affect 33.9% of the adult U.S. population. The role of stress in Prediabetes is vital to understand its association with progression to T2DM. Previous studies have examined stress levels, but no nationwide data describes stress levels in patients with Prediabetes and T2DM.

1.17 RISK FACTORS FOR TYPE 2 DIABETES

T2DM is a combination of genetic and environmental factors. Several risk factors contribute to the cause of T2DM. Some of these are non-modifiable, and some are modifiable risk factors (Yesudian et al., 2014).

1.18 NON-MODIFIABLE RISK FACTORS FOR T2DM

1.18.1 FAMILY HISTORY

Family members, i.e., blood relatives with Diabetes, increase the risk of developing T2DM. (Ramachandran et al., 2006)

1.18.2 ETHNICITY

Inevitable descent like south Asian, African, African-Caribbean, African American, Latino/ Hispanic in the USA, Asian-Americans, those with Native American or Pacific Islander have greater chances of developing Diabetes. (Ramachandran et al., 2006).

1.18.3 AGE

T2DM starts in middle-aged adults, frequently after 45 years, and the incidence increases as the age advance. Health care providers are diagnosing more children and adolescents with T2DM (Chen et al., 2012). A study among adults above 18 prevalence of diagnosed T2DM in the USA increased from 5.1% (1997) to 9.1% (2012) (CDC 2013).

1.18.4 HISTORY OF GESTATIONAL DIABETES

Women delivering a baby over 9 lbs. (4kg) with gestational Diabetes during pregnancy have an increased risk of T2DM in a lifetime. (Khalsa et al., 2012). In a meta-analysis of 20 studies, 13% of mothers with gestational Diabetes developed T2DM after pregnancy compared to 1% without gestational Diabetes (Bellamy et al., 2009).

1.19 MODIFIABLE RISK FACTORS FOR TYPE 2 DIABETES

Healthy changes reduce risk and help delay the development of Diabetes, and improve their overall quality of life.

1.19.1 OVERWEIGHT/OBESITY

Around 50 % of men and 70 % of women who have Diabetes are obese. For Prediabetes, losing 5-7 % of body weight can reduce the risk by 50%, which further improves losing the excess weight and moves towards optimal body weight (Klonoff et al., 2008). Weight loss of one kilogram showed a 16% reduction in risk for T2DM with changes in diet and activity. (Hamman et al., 2006). Accumulation of excess fat is associated with increased insulin resistance and glycolysis. Hence dysregulation of metabolism is an essential factor in the pathology of T2DM.

1.19.2 PHYSICAL INACTIVITY

As per WHO Global recommendations, 1 in 4 adults, and 3 in 4 adolescents (aged 11–17 years), do not currently meet for physical activity. In some counties, levels of inactivity can be as high as 70% because of urbanization, changing patterns of transportation, and increased technology use (WHO, 2018). Physical inactivity is a top modifiable risk factor for Prediabetes and T2DM. Physical activity of Moderate intensity aerobic 150 minutes per week or 90 minutes per week of vigorous-intensity aerobic physical exercise or a combination of the two improves health, minimizing risks of T2DM and cardiovascular disease (Colberg et al., 2010). Physical inactivity reduces energy turnover, contributing to increased gluconeogenesis, decreased glucose uptake at the tissues, and increased adiposity (Rinaldi et al., 2006).

1.19.3 ABNORMAL CHOLESTEROL (LIPID) LEVELS

Low HDL levels (high-density lipoprotein) and high levels of triglycerides increase the risk for Prediabetes and T2DM. These abnormalities can also increase the risk of cardiovascular disease. Hence one needs to have a healthy eating plan, aerobic physical activity, and a healthy weight that can help correct these lipid abnormalities (Chen et al., 2012).In other studies, patients with T2DM have a 15% increased risk of all-cause mortality compared with those without Diabetes with cardiovascular disease (CVD) as the most significant cause of morbidity and mortality associated with T2DM (Gaede et al., 2003).

1.19.4 HIGH BLOOD PRESSURE (HYPERTENSION)

High blood pressure for a long-standing period can cause damage to the CVS (cardiovascular system), and untreated high blood pressure has the link to the development of T2DM (Barker et al., 1993).

1.20 LIFESTYLE INTERVENTION AND STRESS, T2DM

Epidemiological studies have shown Lifestyle interventions are cost effective in prevention and management of T2DM.53 systematic review studies brought focus to lifestyle interventions which include dietary modification and exercise to reduce incidence of T2DM. (Figure 7 page 34) China's Da Qing T2DM Prevention study showed that regular physical activity and dietary changes reduce diabetes incidence by 51% in 6 year period and in 20 years follow up, by 43%.For prediabetes D-CLIP (Diabetes Community lifestyle improvement Programme) bought reduction by 32%.Conventional management of T2DM doesn't treat psychological factors such as stress, anxiety, depression, which substantially contributes in T2DM development and progression

In lifestyle intervention comprehensive -physical, mental, social, and emotional wellbeing is expected. Yoga encompass approach with cleansing technique, physical yoga postures

(Asana), breathing (Sullivan et al., 2018)practices(prāṇāeyama), relaxing technique (śavāsana), meditation, emotion culture with fiber rich vegetarian(sātvik) diet. Yoga comprises exercise and stress reduction as major component.(Kumar et al., 2016; Robinson Monroe, 1992) Multiple evidence based yoga studies offer improved glycemic control, nerve conduction velocity, lipid profile improvement, insulin sensitivity, weight reduction, improved cognition and cardiovascular autonomic functions.(Chaya et al., 2008). In addition, subjective measure as less fatigue, sound sleep, reduced medication score and better quality of life. But few studies on integrating yoga for prediabetes to reduce T2DM risk.(NCD Risk Factor Collaboration (NCD-RisC), 2016; WHO, 2020a)