



## Musculoskeletal Disorders, Obesity among Type II Diabetic Mellitus and Physiotherapy – A Cross Sectional Analysis

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### Abstract

As globally increasing diabetic population with an early onset is associated with obesity and musculoskeletal disorders. India, being the diabetic capital, diabetic core with major focus on musculoskeletal disorders such as lowback ache, osteoarthritis, neck and shoulder ailments remain unfocussed.

**This original research aims at** 1. Analyzing the prevalence of musculoskeletal disorders among diabetic subjects 2. Evaluate the rate of obesity and 3. To overview various physical therapeutic means of treating MSD related disorders among Type II diabetic

**Materials and Methodology:** 300 known type II diabetic subjects of both sex of all age groups were recruited from Chennai were evaluated analyzed for BMI, WC, Lowback ache, osteoarthritis knee, shoulder and neck ailments. This study was conducted during the period of 2013-2016 where special diabetic camps were organized.

**The results** were analyzed, tabulated using due statistical means. 22% low backache, 20% with osteoarthritis knee, 18% shoulder and neck ailments with male at 54% and mean BMI of 27.5 kg/m<sup>2</sup>.

**Conclusion:** an evaluation of MSD among type II diabetic mellitus, a non focused area in diabetic care was given an insight in this original research report for further planning prevention and improve QOL of diabetic subjects.

**Keywords:** Lowback Ache, Osteoarthritis, Quality of Life, Musculoskeletal Disorders, Body Mass Index.

### Introduction

Diabetic mellitus being a chronic metabolic disorder can affect various systems of human body, hence influences on functioning of different organs including brain, heart, kidney, circulatory and musculoskeletal tissues. As with micro angiopathy associated with diabetes, causing

diminished blood flow interferes with metabolism of nerves, muscles and bones, hence causing pain, diminished physical activities and a drop in quality of life. With modern life style with sedentary nature, erratic food habits and low physical activity adding up to obesity, with impact of obesity, diabetes and modern life style,

Musculo skeletal complaints such as pain, restriction of mobility, difficulty for daily routines, as evidenced with an increase in low back ache, osteoarthritis of knee, cervical spondylosis globally. Disability due to musculoskeletal disorders have increased by 45% from 1990 to 2010 in particular osteoarthritis which is expected to continue to rise. With an increasingly obese, sedentary and ageing population (VOS et al 2012). Focus on understanding of disease mechanisms (Hancock et al 2011) and there is a strong need for better understanding of more specific factors, such as life style occupational and biological factors in order to improve diagnostic and therapeutic strategies and develop evidence based preventive measures (Sánchez 2014)

People with diabetes have more outpatient visits, use more medications, have a higher probability of being hospitalized and are more likely to require emergency and long term care than people without the disease, in the US people with diabetes spent 2.5 times for medical care than people without the condition (ADA 2015) and global annual health expenditure for diabetes in 2010 was between \$ 376 million to \$ 672 billion USD which accounts for 12% of the world's total health expenditure that year (ADA 2015).

Type II diabetes, with an asymptomatic phase between the actual onset of diabetic hyperglycemia and clinical diagnosis, which may last to at least 4-7 years and 30-50% cases of type II diabetes patients remained undiagnosed. This leads to the development of chronic complications which remain the chief problems in diabetic care, and which cause a lack of fitness to work, disability and premature death (Spijkerman et al 2003). Diabetes associated vascular alterations include anatomic, structural and functional changes leading to multi organ dysfunction (Rahman et al 2007). The goal of treatment in type II diabetes is to achieve and maintain optimal blood glucose, lipid and blood pressure levels to prevent or delay chronic complications of diabetes (ADA 2010). Diet and physical activity are

control to the management and prevention of type II diabetes as they help to treat associated above said factors, aid in weight loss and maintenance (Colberg et al 2003).

As physical therapists increasingly become first line providers of treatment for musculoskeletal and movement disorders in people with diabetes, it will be important for clinicians to be keenly aware of the underlying vascular deficits associated with diabetes, even they are not the reasons for referral (Cad et al 2008) additionally physical therapists will play an important role in the care of the people with diabetes because of the interventions provided with therapeutic exercises which can assist in alleviating symptoms slow the metabolic progression to overt type II diabetic mellitus, and reduce morbidity and mortality associated with these complications (Davey Smith et al 2005)

#### **This original research study aims at**

1. Analyse the prevalence of low back ache, osteoarthritis knee, cervical spondylosis and other MSD among diabetic subjects.
2. To highlight the significance of physiotherapy role in prophylactic and therapeutic

#### **Materials & Methodology**

Following ethical committee clearance, special diabetic camps were conducted between 2013-2016 in Chennai. Subjects were then recruited among the participants after confirming that they were diagnosed and duly getting treated by physician. 300 type II diabetic subjects of both sex of all age group were screened for obesity and musculoskeletal ailments by qualified physiotherapists.

#### **Inclusion Criteria**

Men and women of both sex of all ages of any age group, known type II diabetic and getting continued physicians prescribed drug therapy  
Exclusion Criteria: Type I diabetes, undiagnosed diabetic subjects  
Study Design: With a sample size of 300 known type II diabetic subjects,

convenient sampling and an cross sectional analytical study.

The data were recorded, results were analyzed with statistical means and mentioned as in the table: 1 below

Gender %		Years	BMI Kg/m <sup>2</sup>	WC cm	LBA%	OA%	Neck & Arm %	Others	NO MSD
M	54	31-40 – 21%	27.5	99.45	18	22	20	7	33%
F	46	41-50 – 38%							
		51-60 – 41%							

Note: X others include poly arthralgia, Plantar Fasciitis etc

## Discussion

Although regular physical activity may prevent or delay diabetes and its complications (Balducci et al 2006) most people with type II diabetes are not active (Moroto et al 2007) but Asian Indians are genetically predetermined for physical activity (Ramachandran 2006) with inference to above table displaying results of this study the following hypothetical questions arises:

- 1) Does obesity be associated with musculoskeletal ailments in diabetic mellitus?
- 2) Impact of these musculoskeletal disorders on diabetic subjects with their QOL?
- 3) Impact of physical therapy on obesity and diabetic management?

Type II diabetes results from a combination of the inability of muscle cells to respond to insulin secretion. Genetic and environmental factors are strongly implicated in the development of type II diabetes, through the exact genetic effects are complex and not clearly defined but risk increases with age, obesity and physical inactivity (ADA 2010). Many people with type II diabetes can achieve BG control by following a nutritious meal plan and exercise program, (losing excess weight, implementing necessary self care behaviors and taking oral medications) (Sheri Colberg et al 2010). An RCT of 1 hour daily moderate aerobic exercises alone with fat loss as equivalent to caloric restriction, with resultant greater insulin action (Ross et al 2000). In observational studies (Rose et al 2004) individuals who successfully

maintained large weight during loss during at least a year typically engaged in moderate to vigorous exercises of 7 hours/ week (Donnelly et al 2009). musculoskeletal disorders are second most common cause of disability worldwide ailments (Hoy et al 2014) low back pain being the most frequent condition (Hoy et al 2014) of musculoskeletal disorders related. There is the potential for better management by implementing effective health promoting actions (Bunch Binder et al 2001). As in this study where with mean BMI of 27.5 kg/m<sup>2</sup> and 99.45 waist circumference high prevalence of obesity, which not only affects their diabetic related complication but also MSD hence weight loss based exercises are highly recommended to combat obesity and MSD as in line which above researches.

While USA will spend 52% of global expenditure, India. The country with largest population living with diabetes spend an estimated \$ 2.8 billion or 1% of the world expenditure on diabetes. Lowback ache involves huge economic twice health care system, as on lumbar discectomy (Common Surgical Management of Low Back Ache) alone costs to \$ 300 million annually (Schoenfield and Weiner 2010).Lowback ache (Saloman et al 2010) leading disability contributor (Lim et al 2010) and cause reduction in the QOL (Gratchel et al 2007) resistance and flexibility exercises twice a week improves QOL with strong evidence (Blair et al 2011). Osteoarthritis, most common joint disorder which increases due to obesity and among an ageing population causing pain and functional disability. Where strong

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evidence supports exercises and weight loss in the management of osteoarthritis (Svege et al 2013). QOL can be influenced by medical interventions, psycho social factors, maintaining a good glycemic control, life style changes and other co existing medical conditions (Rubin et al 1999) and QOL was reflected by good glycemic control with lowering of 1% hba<sub>1c</sub> (Testa et al 1998) Systematic reviews reveal that existing treatment for musculoskeletal disorders have only small effects at best, with interventions biological, psychological or social approaches (Pincus et al 2013). As reflected in the table this study subjects between 41-60 years were 79% peak productive part of life were found to be diabetic, hence an active life with physical activities, life style modification was highly emphasized to improve participants QOL

Evidence supporting recommendations of preventive measures such as weight loss (Hench et al 2013) and exercise for low back pain (Choi et al 2010). Osteoarthritis is the common joint disorder causing pain and functional disability. The burden due to osteoarthritis is anticipated to further increase due to obesity and an ageing population (VOS et al 2010) with low grade inflammation underlying pathogenic mechanisms are not fully understood and currently there is no curative treatment management mostly depends on symptom state and the use of non pharmacological and pharmacological therapy with joint replacement as the treatment end point (Beren Baum 2013). Strong evidence supports exercise and weight loss for the management of osteoarthritis (Nelson et al 2013). The most successful programs for long term weight control have involved combinations of diet, exercise and behavior modification (Wing et al 2002) as 150 minutes / week of brisk walking are usually insufficient for major weight loss (Boule et al 2001) as obese and older people frequently have difficulty performing sufficient exercise to create a large energy deficit and can easily counter balance expenditures by eating more (Wing et al 2002). As shown in table of results 67% of this

study subjects have some form of MSD, thus reducing their QOL however with due exercises and modification of their living pattern with diet, regular walking, specific exercises the chances for disability and dependence associated with MSD and diabetics can best be prevented as evidenced with the above studies.

The maintenance of normal BG at rest and during exercise depends largely on the coordination of the sympathetic and endocrine systems (Sui et al 2008) contracting muscles increase uptake of BG, although BG levels are usually maintained by glucose production via liver glycolysis and gluconeogenesis and mobilization of free fatty acids (Wahren et al 2007), however fuel use is influenced by intensity and duration of physical activity (Bajpeyi et al 2009) with increasing exercise intensity, there is a greater reliance on carbohydrate as long as sufficient amounts are available in muscle or blood (Kang et al 1996). During early phase of exercise, glycogen provides the bulk of the fuel for working muscles, as glycogen stores become depleted, muscles increase their uptake and use of circulating BG along with free fatty acids released from adipose tissue (Bergman et al 1999) intra muscular lipid stores are more readily used during longer duration activities and recoveries (Pruchnic et al 2004). Glucose production also shifts from hepatic glycogenolysis to enhanced gluconeogenesis as duration increases (Wahren et al 2007)

#### Critical Analysis of this Study

- 1) Being a cross sectional and analytical study no specific intervention was used here
- 2) Analysis of neuropathy, balance and visual involvement were not done
- 3) This report was of single one time contact with subjects
- 4) Confirmatory diabetic status (hba<sub>1c</sub>) depends on various laboratory values and different diabetologist prescription (Which were not Uniform)

5) Level of uniform physical exertion, diet, occupation and other related details were not reported in this study which is of significant to diabetes and musculoskeletal disorders

**Limitations of this Study** was being an observational and no physiotherapeutic intervention were used and further follow up is required, evaluatory means such as NMRI, X-ray, Biothesiometry, nerve conduction study, bone scan, Doppler study of peripheral vascularity weight loss, life style modifications are further recommended as continuation of this original Indian diabetic research report.

### Conclusion

There exist a great need for epidemiological life style changes such as weight loss and physical activity. Also to focus on understanding the biological mechanisms, translation of clinical findings from basic science to clinical applications such as future preventive, diagnostic and therapeutic strategies. This will enable us to understand the impact of a wide range of determinants and risk factors for the development of different musculoskeletal disorders from early to old age, help us to plan and develop affordable strategies in order to respond to the growing disease burden and NCDS. An analysis of musculoskeletal disorders among type II diabetic mellitus gives an insight for the need to develop various preventive and therapeutic strategies. With the huge economic impact on health care and influencing quality of life of the subjects involved, this study gets more significant

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