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Prevalence of Musculoskeletal Disorders in Type 2 Diabetes Mellitus

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Abstract

Type II diabetes is characterized by decreased insulin secretion or insulin resistance in the body. It is the most commonly occurring type that affects obese persons or who have family history of diabetes. Several musculoskeletal disorders are associated with type 2 diabetes. This study was intended to check the prevalence of musculoskeletal disorders in type 2 diabetes mellitus. For this purpose, a descriptive cross-sectional study was conducted in the general population of Abbottabad. A total of 250 subjects of age group 30-90 years. Participants were asked to fill a self-administered questionnaire containing demographics and other questions which included levels of hyperglycemia, pain and its common site, muscle cramps and abnormal sensations. Other questions were about difficulty in getting in and out of chair, opening medicine bottle or jar, bending or kneeling, walking and problems with dressing, eating, bathing or other personal care. All these questions were answered on a 5 points scale. The study employed convenient sampling technique and data was further analyzed using SPSS version 20. According to the results; all patients experienced pain. 24% had no difficulty getting in and out of chair and 4.4% were unable to do. 42.8% participants had no difficulty in opening bottle or jar while 1.6% are unable to do. 13.2% participants had no difficulty in bending or kneeling and 8.4% patients were unable to bend or kneel. 44.8% participants had no difficulty in walking, only 1.6% patients were unable to walk. 19.6% participants were not at all bothered by back problem and 5.6% were extremely bothered by back problem. 45.2% participants were not at all bothered by problems with dressing, eating, bathing or other personal care and 1.2% were extremely bothered. 32.4% were not at all bothered by pain and stiffness and only 2% were extremely bothered. Thus, it was concluded that MSK disorders among diabetics result in pain and disability. Most of the patients were suffering from low back pain and were unable to bend or kneel.

Keywords Type 2 Diabetes Mellitus, Prevalence, Musculoskeletal Disorders.

1. Introduction

Type II diabetes is characterized by decreased insulin secretion or insulin resistance in the body. This type comprises 80% to 90% of all cases of DM. It is the most commonly occurring type that affects obese persons or those who have a family history of diabetes. It is most common in women than in men (1).

Several musculoskeletal disorders are associated with diabetes. These disorders depend on age and duration of diabetes. Diagnosis is based on clinical as well as radiological examination (2). Diabetes Mellitus causes changes in articular and peri-articular structures. Musculoskeletal disorders in diabetes are divided into three categories:

(1) Disorders that cause complications of diabetes, for example, decreased joint mobility or diabetic arthropathy, stiff hand syndrome and muscular infarction.

(2) Incidence of increased disorders among people with diabetes, for example, Dupuytren's disease, adhesive capsulitis, neuropathic arthropathy, osteopenia, polymyositis, flexor tenosynovitis, septic

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arthritis, acute proximal neuropathy, proximal motor neuropathy and diffuse idiopathic skeletal hyperostosis (DISH) syndrome.
(3) Disorders that have a possible association with diabetes but are not proven, for example, osteoarthritis and carpal tunnel syndrome (3).
Body-weight programs and exercises improve metabolic control more than exercise alone. Lifestyle modification combined with aerobic exercise shows effectiveness in managing metabolic control. Although studies have shown the positive effect of resistance training on hyperglycemia and metabolic control.. However, in moderately obese and sedentary type II diabetics, circuit-type resistance training seems more appropriate. Aerobic exercise is considered best for type II DM. Several studies have shown the effect of exercise on insulin sensitivity and control of hyperglycemia. In some published studies, the author suggests an optimal exercise program for type II diabetics. This program includes cardiorespiratory fitness, endurance and strength training programs. It involves a combination of resistance training and aerobic exercises (4).

2. Methodology

2.1. Study Design

A descriptive and cross-sectional study was carried out on a general population of Abbottabad. A convenient sampling technique was used to draw the sample size. Inclusion criteria for participants were (a) Patients with Type II Diabetes, (b) age above 30 years, and (c) both genders. The exclusion criteria for samples were (a) type I diabetics, (2) patients with MSK impairments due to congenital disabilities and trauma, and (3) participants with an age below 30 years.

2.2. Sample Size

A sample size of 250 participants was deemed appropriate, calculated using the Raosoft online sample size calculator.

2.3. Ethical Considerations

The study was approved by the ethical review board of the Women's Institute of Rehabilitation Sciences, Abbottabad. Informed written consent was obtained from all participants willing to participate.

2.4. Data Collection Procedure

All the diabetic patients were screened. After finding their suitability per inclusion and exclusion criteria, they were requested to participate in the study. Informed written consent was taken from the subjects. The primary questionnaire was implicated to them. The questionnaire contained close-ended questions. Data was successfully sought from 250 subjects.

2.5. Data Analysis

The data was entered and analyzed through SPSS version 20. Frequencies and percentages were calculated to determine the prevalence of musculoskeletal impairments in patients with type II diabetes mellitus. The bar charts, pie charts and tables were categorized for each variable. The association was found out by using the chi-square test in which the P-value of 0.05 depicted an insignificant correlation.

3. Study Findings

Table 1 shows the distribution of participants concerning their ages. Group 1 (30-50 years), Group 2 (51-70 years), and Group 3 (71-90 years) and their respective percentages were 32%, 55.2% and 12.8%. Table 2 shows the gender of the participants. 101 were males, and 149 were females. Fig 1 shows the age of diagnosis of patients with type 2 DM. Out of 250 subjects, 29.60% were included in Group 1 (30-40 years), 32.40% were in Group 2 (41-50 years), 24% were in Group 3 (51-60 years) and 14% in group 4 (61-70 years).
Fig. 2 shows the level of hyperglycemia in different groups; Group 1 (150-250 mg/dl), Group 2 (251-400 mg/dl) and Group 3 (above 400 mg/dl). 51.2% of participants were in group 1, 42.4% in group 2 and 6.4% in group 3. Fig. 3 shows that 33.6% of participants exercise regularly and 66.4% didn't. Fig. 4 shows that all participants experienced pain in their bodies. Fig. 5 shows that 65.2% of diabetics had abnormal sensations in their bodies, while 34.8% of patients had no abnormal sensations. Table No 3 shows that 41.6% people with diabetes had muscle cramps, and 58.4% had not reported any muscle cramps. Table 4 shows three groups of patients having a common site of pain. 28% of participants experienced pain in the upper limb, 47.6% in the lower limb and 24.4% in spine (mainly lower back). Fig 6 shows that 34% of diabetics reported fractures and 66% of diabetics had not experienced any fracture.

Fig. 7 shows the distribution of participants who had difficulty getting in and out of the chair, while 24% had no difficulty 30.4% had a little difficulty, 27.20% had moderate difficulty, 14% had very difficult and 4.4% were unable to get in and out of the chair. Fig 8 shows diabetics who had difficulty opening medicine bottles. 42.8% had no difficulty, 34% had a little difficulty, 14.4% had moderate difficulty, 7.2% had very difficulty and 1.6% were unable to do this. Fig 9 shows diabetics who had difficulty bending or kneeling. 13.2% had no difficulty, 30.4% had a little difficulty, 29.2% had moderate difficulty, 18.8% found it very difficult and 8.4% were unable to bend or kneel.

Fig. 10 shows participants who had difficulty walking. 44.8% had no difficulty 25.2% had a little difficulty, 13.6% had moderate difficulty, 14.8% found it very difficult to walk and 1.6% were unable to walk. Fig. 11 shows participants who had back pain. 19.6% were not bothered by back problem, 34.8% were a little bothered, 23.6% were moderately bothered, 16.4% were very bothered and 5.6% were extremely bothered. Table 5 shows participants bothered by eating, dressing, bathing or other personal hygiene. 45.2% were not bothered, 30.8% were a little bothered, 15.6% were moderately bothered, 7.2% were very bothered, and 1.2% were extremely bothered. The table shows 6 distributions of subjects bothered by pain and stiffness. 32.4% were not at all bothered, 36% were a little bothered, 14.8% were moderately bothered, 14.8% were very bothered and 2 % were extremely bothered.

Table 7 shows cross tabulation between levels of hyperglycemia and muscle cramps. Among participants (51.2%) who had hyperglycemia level 150-250 mg/dl, 17.2% had muscle cramps, and 34% had no muscle cramps. Among people with diabetes (42.4%) who had hyperglycemia level 251-400 mg/dl, 19.6% of subjects had muscle cramps and 22.8% had no muscle cramps. Among subjects (6.4%) who had hyperglycemia above 400 mg/dl, 4.8% had muscle cramps and 1.6% had no muscle cramps.

Table 8 shows a cross table between the level of hyperglycemia and difficulty in walking. Results show 44.8% of subjects had no difficulty at all in walking. Among them, 27.2% had hyperglycemia 150 – 250 mg/dl, 17.2% had hyperglycemia level 251-400 mg/dl and 0.4% had hyperglycemia level above 400 mg/dl. Among 25.2% of subjects who had a little difficulty in walking, 13.6% had a hyperglycemia level of 150 – 250 mg/dl, 10.4% had a hyperglycemia level of 251-400 mg/dl and 1.2% had hyperglycemia level above 400 mg/dl. Among 13.6% of subjects who had moderate difficulty walking; 5.2% had hyperglycemia 150 – 250 mg/dl, 6% had hyperglycemia level 251-400 mg/dl and 2.4% had hyperglycemia level above 400 mg/dl. 14.8% of subjects had very much difficulty in walking. Among them, 5.2% had hyperglycemia 150 – 250 mg/dl, 8% had hyperglycemia level 251-400 mg/dl and 1.6% had hyperglycemia level above 400 mg/dl. 1.6% of subjects were unable to walk. Among them, 0.8% had hyperglycemia level 251-400 mg/dl, and 0.8% had hyperglycemia levels above 400 mg/dl.

Pearson Chi-Square test.1 was applied to show an association between the level of hyperglycemia and a common site of pain. The p value obtained was .245, which revealed no significant association. Another association was found between the level of hyperglycemia and difficulty getting in and out of a chair employing the Pearson Chi-Square test.2. P-value obtained was .000, which was less than .05. It is concluded that there is a significant association between the level of hyperglycemia and difficulty getting in and out of the chair.

Table 1: Age distribution of subjects

Age of subjects	Frequency	Percentage
30-50 years	80	32.0
51-70 years	138	55.2
71-90 years	32	12.8
Total	250	100

Table 2: Gender distribution of participants

Gender of participants	Frequency	Percentage
Male	101	40.4
Female	149	59.6
Total	250	100

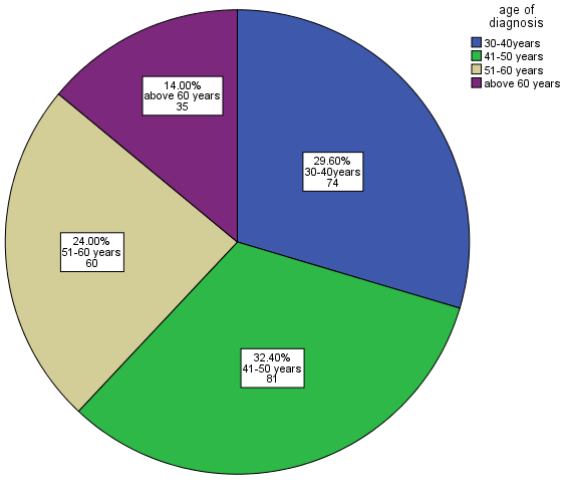

Figure 1: Age of diagnosis

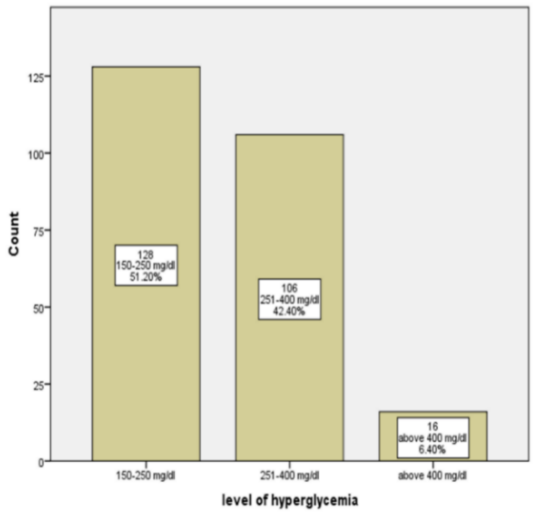

Figure 2: Level of hyperglycemia

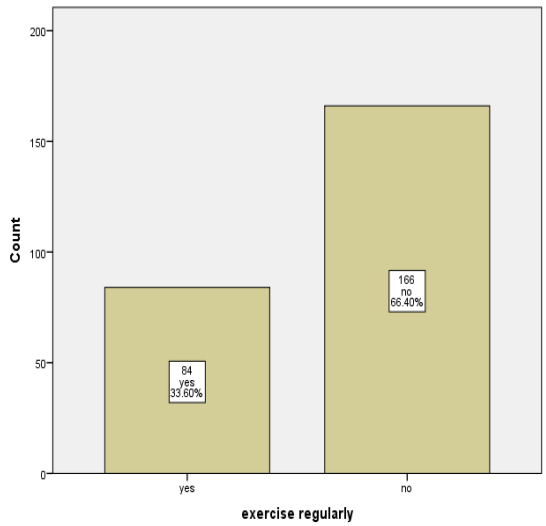

Figure 3: Exercise regularly

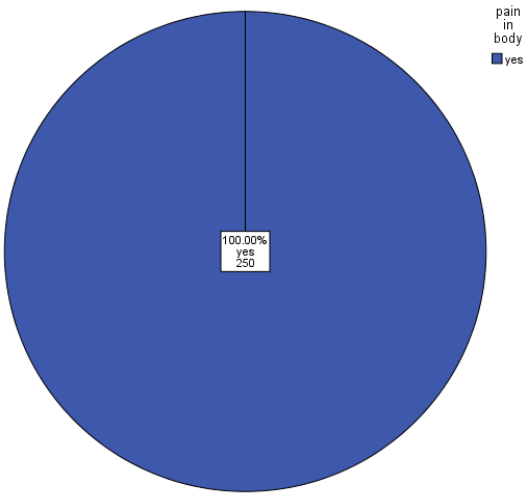

Figure 4: Pain in body

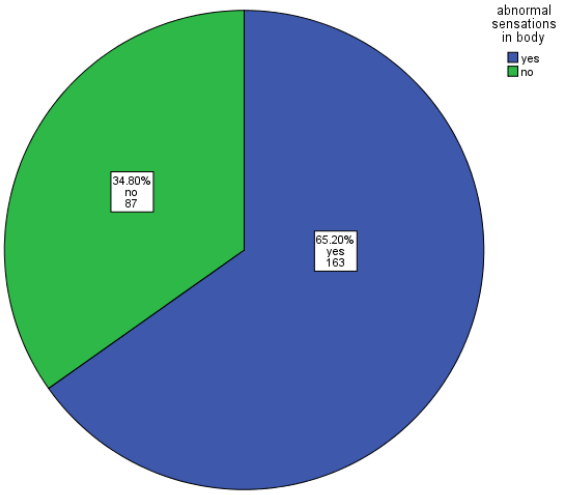

Figure 5: Abnormal sensations in body

Table 3: Muscle cramps

Muscle cramps	Frequency	Percentage
Yes	104	41.6
No	146	58.4
Total	250	100

Table 4: Common site of pain

Common site of pain	Frequency	Percentage
Upper limb	70	28
Lower limb	119	47.6
Spine	61	24.4
Total	250	100

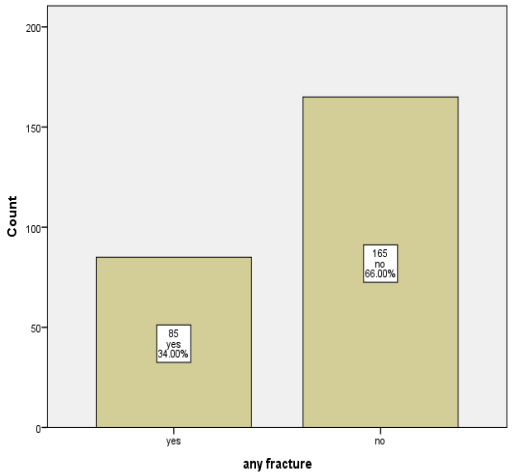

Figure 6: Any fracture

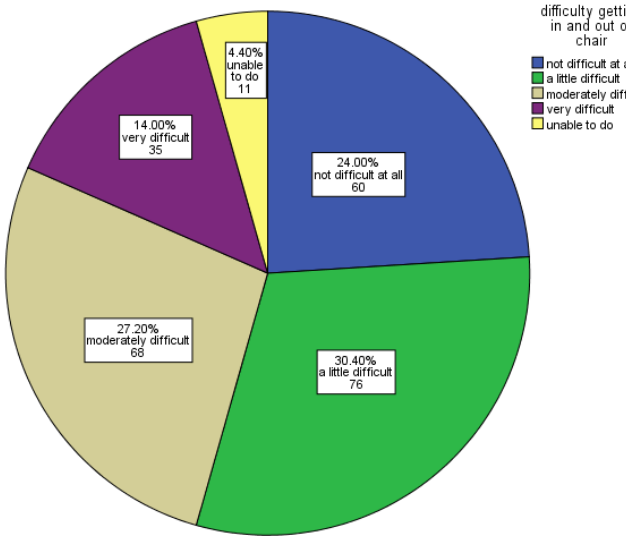

Figure 7: Difficulty in getting in and out of chair

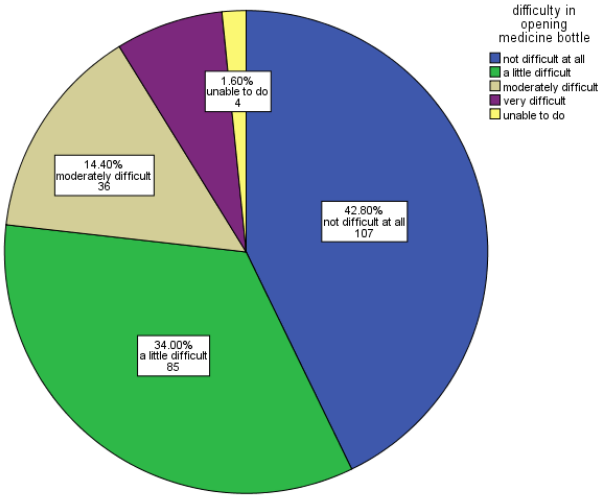

Figure 8: Difficulty in opening medicine bottle

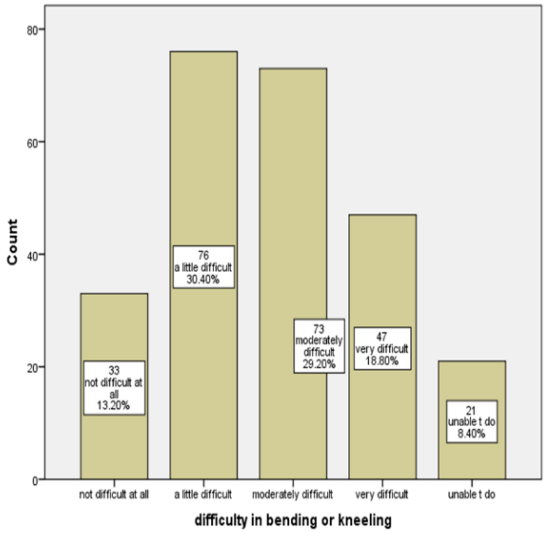

Figure 9: Difficulty in bending or kneeling

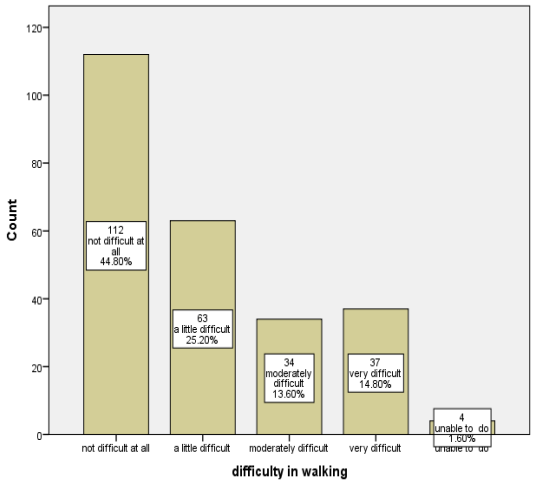

Figure 10: Difficulty in walking

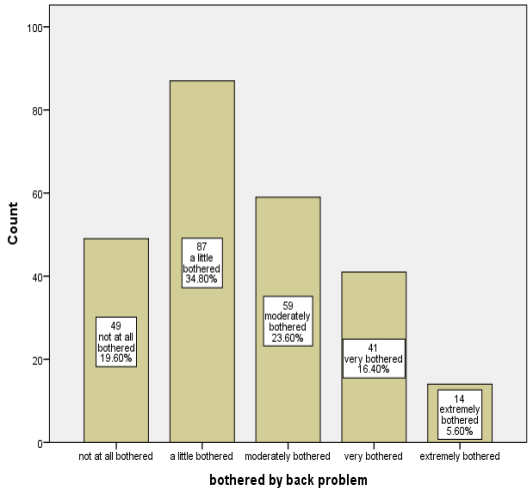

Figure 11: Bothered by back pain

Table 5: Bothered by eating, dressing, bathing or other personal hygiene

Bothered by eating, dressing, bathing or other personal hygiene	Frequency	Percentage
Not at all bothered	113	45.2
A little bothered	77	30.8
Moderately bothered	39	15.6
Very bothered	18	7.2
Extremely bothered	3	1.2
Total	250	100

Table 6: Bothered by pain and stiffness

Bothered by pain and stiffness	Frequency	Percentage
Not at all bothered	81	32.4
A little bothered	90	36
Moderately bothered	37	14.8
Very bothered	37	14.8
Extremely bothered	5	2
Total	250	100

Table 7: Cross tabulation: Level of hyperglycemia and muscle cramps

Level of hyperglycemia	Muscle cramps		Total
	Yes	No	
150-250 mg/dl	43 (17.2%)	85 (34%)	128 (51.2%)
251-400 mg/dl	49 (19.6%)	57 (22.8%)	106 (42.4%)
Above 400 mg/dl	12 (4.8%)	4 (1.6%)	16 (6.4%)
Total	104 (41.6%)	146 (58.4%)	250 (100%)

Table 8: Cross tabulation: Level of hyperglycemia and difficulty in walking

Difficulty in walking	Level of hyperglycemia			Total
	150-250 mg/dl	251-400 mg/dl	Above 400 mg/dl	
Not difficult at all	68 (27.2%)	43 (17.2%)	1 (0.4%)	112 (44.8%)
A little difficult	34 (13.6%)	26 (10.4%)	3 (1.2%)	63 (25.2%)
Moderately difficult	13 (5.2%)	15 (6%)	6 (2.4%)	34 (13.6%)
Very difficult	13 (5.2%)	20 (8%)	4 (1.6%)	37 (14.8%)
Unable to do	0 (0%)	2 (0.8%)	2 (0.8%)	4 (1.6%)
Total	128 (51.2%)	106 (42.4%)	16 (6.4%)	250 (100%)

Table 9: Pearson Chi-Square test 1- level of hyperglycemia * common site of pain

Chi-Square Test between Level of Hyperglycemia and Common Site of Pain	Value	Df	Asymp. Sig. (2- sided)
Pearson Chi-Square	5.437	4	.245

Table 10: Pearson Chi-Square Test 2- level of hyperglycemia * difficulty getting in and out of chair

Chi-Square Test between level of hyperglycemia and difficulty getting in and out of chair	Value	df	Asymp. Sig. (2- sided)
Pearson Chi-Square	30.365	4	.000

4. Discussion

According to the results of this study, all patients were suffering from pain. So it can be concluded that MSK pain was more common in type 2 diabetics than any other disorder. The rheumatological manifestations were more common among females.

Roy A. (2013) conducted a study on 100 participants (N=100). In his study, he concluded that diabetic patients who have musculoskeletal disorders were 76% and 24% of patients don't have these disorders. The mean age of 100 participants was 45.19 years. Among 100 diabetic patients, 75% suffered from musculoskeletal disorders and the 25% were pain-free. The severity of pain was such that 2% of patients had mild pain, 67% had moderate pain and 7% had severe pain. The pattern of musculoskeletal disorders was that 8% of patients had swelling, 2% had stiff joints, 10% had muscle weakness, arthritis was present in 5% of patients, tendinitis in 5% of diabetics, frozen shoulder in 8% and movement limitations in 38% diabetics. Results of the diagnosed musculoskeletal problems were that 8% were suffering from frozen shoulder, 11% had osteoarthritis, 8% had rheumatoid arthritis, 1% had ankylosing spondylitis, 4% had carpal tunnel syndrome, neck pain was present in 27% patients, 8% had other musculoskeletal problems and 24% had no problem (2). In this study, out of 250 subjects, 40.40% (101) were males and 50.60% (149) were females. All patients were suffering from pain, the most common pain site was lower limbs (47.6%). 163 (65.20%) people with diabetes had abnormal body sensations while 104 (41.6%) patients had muscle cramps. About 70 (28%) patients experienced pain in the upper limb. 119 (47.6%) patients had pain in the lower limb, and 61 (24.4%) patients had pain in the spine (mainly low back pain). 85 (34%) diabetic patients in the study population had fractures. 107 (42.8%) patients found no difficulty in opening the medicine bottle, 85 (34%) had a little difficulty, 36 (14.4%) found it moderately difficult, 18 (7.2%) found it very difficult to open the medicine bottle and 4 (1.6%) were unable to do. So, the results of this study support the above-mentioned study in that MSK impairments are common in patients with type II DM.

Venkataravanappa VK and Huchappa AS. (2015) conducted a study on 32 people with diabetes in the age group of 61 to 70 years and 16 nondiabetics with age group of 41 to 50 years. The mean age of peoplw with diabetes was 57.59±10.44 years, and that of non-diabetics was 52.40±10.36 years. Among diabetic participants, 61% were males, and 39% were females. 50% of males and 50% of females were among 50 nondiabetics. 37% of diabetics had the disease for 1-5 years. The mean disease duration was 7±6.99 years. Thirty-one diabetics (31%) and 8 (16%) nondiabetics were diagnosed with rheumatological disorders (P=0.048). The most common manifestation is arthritis of shoulder seen in 55% of the 31 patients with type II diabetes. Among 31 diabetics, 16 were suffering from adhesive capsulitis, 6 had osteoarthritis of the knee, 3 with DISH, 3 had CTS and 1 with Charcot joint of the ankle. 2 had adhesive capsulitis, 5 had osteoarthritis and 1 had CTS among 8 non-diabetics. Cheiroarthropathy, flexor tenosynovitis and Dupuytren's contracture were not diagnosed in any patient. Rheumatological disorders were more prevalent in diabetic females (43.6%) than in males (23%) but more common in non-diabetic females (statistically insignificant P=0.123). The prevalence of rheumatological manifestations was more common in the age group of 51-60 years among people with diabetes while 51 to 60 years among non-diabetics (5).

Mohan G. et.al (2014) conducted a study on 100 people with diabetes (49 males and 51 females) and 100 age and gender-matched controls (61 males and 39 females). The mean duration was 88+/-4 years and the mean age was 57.72=/-10 years. Musculoskeletal manifestations were observed in 49 cases and 26 controls. Diabetic cheiroarthropathy was diagnosed in 32 diabetics and 17 control, osteoarthritis in 18 diabetics and 26 non-diabetics, CTS in 15 diabetics and 3 controls, Dupuytren's contracture in 13 cases and 3 control, adhesive capsulitis in 12 diabetics and flexor tenosynovitis in 8 cases and 1 control, DISH in 6 diabetics and 1 control and neuropathic joint in 6 diabetics and 0 control.

The difference in both groups was statistically insignificant. Fifty diabetic patients marked pain sites, out of which 32 patients had musculoskeletal manifestations. Patients in the control group marked pain sites. Out of which, 20 patients had musculoskeletal manifestations. The pain site was the knee in most of the cases. On the pain scale, 0 was considered as 'no pain', 1-3 showed 'mild pain' and > 6 as 'severe pain'. 50% of patients reported that they had moderate to severe pain. Significant correlation were found between manifestations and vascular complications like nephropathy and retinopathy. Diabetic cheiroarthropathy had a significant correlation with nephropathy and retinopathy. Twenty-six diabetic patients out of 32 with diabetic cheiroarthropathy had retinopathy, and 21 had nephropathy (P =0.002) (6). In this study, 60 (24%)

patients had no difficulty in getting in and out of the chair, 76 (30.4%) had a little difficulty, 68 (27.2%) had moderate difficulty, 35 (14%) had very difficult and only 11 (4.4%) patients were unable getting in and out of the chair. This study shows that 107 (42.8%) patients found no difficulty in opening the medicine bottle, 85 (34%) had a little difficulty, 36 (14.4%) found it moderately difficult, 18 (7.2%) found it very difficult to open medicine bottle and 4 (1.6%) were unable to do. 33 (13.2%) patients had no difficulty in bending or kneeling, 73 (29.2%) had moderate difficulty, 47 (18.8%) found it very, difficult and 21 (8.4%) patients were unable to bend or kneel. 112 (44.8%) patients had no difficulty in walking, 63 (25.2%) had a little difficulty, 34 (13.6%) found walking moderately difficult, 37 (14.8%) found it very difficult to walk and only 4 (1.6%) patients were unable to walk. So the results of this study are consistent with the above-mentioned study, such that patients with DM type II suffer from joint and muscle pain leading to rheumatologically manifestations.

5. Conclusion and Recommendations

Based on study findings, it has been concluded that the prevalence of MSK disorders was common in all subjects suffering from type II DM. Females were affected more. The most common site of pain was the lower limbs. Most of the diabetic subjects had moderate difficulty in getting in and out of the chair. Difficulty in opening medicine bottle and difficulty in walking was not reported by most of the diabetic subjects included in this study. Most of the patients with DM type II could perform eating, dressing, bathing and other personal hygiene activities without being bothered. Subjects with high levels of hyperglycemia had more difficulty in performing daily activities. Therefore, in order to prevent and treat these disorders, it is important to control glucose level, perform physiotherapy exercises which can be achieved through diabetes awareness campaigns and seminars.

Conflict of Interest There is no conflict of interest.

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