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Introduction

Diabetic Mellitus is failure of the endocrine system to regulate blood glucose levels. Prevalence of diabetes among Saudi Arabia's population is among the highest around the world, with approximately 2 million people diagnosed with the disease by 2010 and 3.8 million in 2014. As shown in Figure 1 [1].

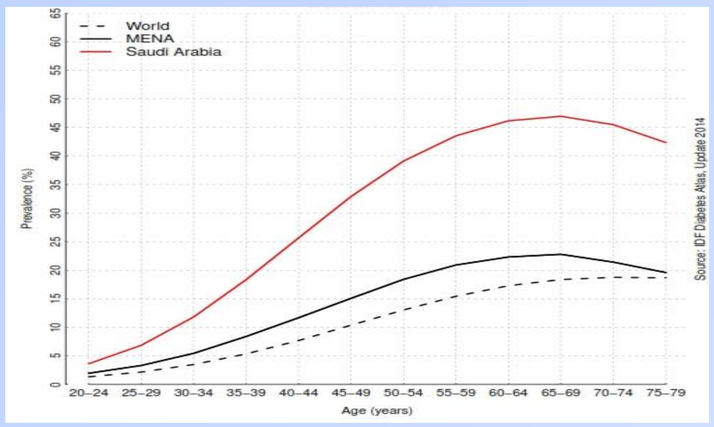

Figure 1: prevalence of diabetic in adults by age, 2014 in Saudi Arabia

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FOOT PATHOLOGIES CAN NEGATIVELY INFLUENCE FOOT FUNCTION, CONSEQUENTLY IMPAIRING GAIT DURING DAILY ACTIVITY, AND SEVERELY IMPACTING AN INDIVIDUAL'S QUALITY OF LIFE. THESE PATHOLOGIES ARE OFTEN PAINFUL AND CORRESPOND TO HIGH OR ABNORMAL PLANTAR PRESSURE, WHICH CAN RESULT IN ASYMMETRY IN THE PRESSURE DISTRIBUTION BETWEEN THE TWO FEET [2]. MOTOR NEUROPATHY AFFECTS THE MUSCLES, ALTERING THE DISTRIBUTION OF FORCES DURING WALKING AND CAUSING REACTIVE THICKENING OF SKIN (CALLUS) AT SITES OF ABNORMAL LOAD, THE CALLUS MAY LEAD TO BREAKDOWN OF SKIN AND SUBCUTANEOUS TISSUE, RESULTING IN A NEUROPATHIC ULCER. THE RISK OF A DIABETIC PERSON DEVELOPING A FOOT ULCER IS AS HIGH AS 25% [3].

Methods

Two groups Diabetic type 2 (28 men) with age 51.1 ±12.3 year, weight 89 ± 14.6 kg and Height 171.4 ± 8.2 cm and Non-Diabetic (28 men) with age 36.6 ±12.9 year, weight 88.8 ± 23 kg and Height 169.2 ± 18.1 cm. Male subjects were selected randomly in King Abdullah walking center, after removing their shoes and socks each subject height and weight were measured using mechanical scale. Dynamic plantar pressure, force, and contact area were measured using a portable platform NOVEL AT -4 (Figure 2). Every subject was informed about persuaders 'Ethical', head looking straight, the subjects were asked to walk in straight line without targeting the pressure platform, the purpose of this study was to examine whether time spent in physical activities (Walking for 30 minutes) using appropriate shoes has a significant impact on the plantar pressure in both diabetic and non-diabetic subjects. The time spent on physical activities was monitored to ensure that all subjects spent 30 minutes in walking activities. By applying the statistical methods such as the mean, standard deviation and percentages and paired t-test.

The mean peak plantar pressure before and after the exercises was compared using paired t-test.

A t-test was performed at α = 0.05 to test null hypothesis Ho: The mean peak plantar pressure is the same before and after physical activity of both right and left foot against the alternative hypothesis Ha: The mean peak plantar pressure is higher after physical activity than before physical activities for diabetic subject both feet.

Figure 2: Platform system.

Result

The results of plantar pressures were available for 28 Non- Diabetic subjects and 28 Diabetic subjects as shown in Table1

Variable	Non-Diabetic	Diabetic
Age (years)	36.6	51.1
Height (cm)	169.2	171.4
weight (Kg)	88.8	89
SD	69.1	62.3

Table 1: Demographic data (age, height, weight and Standard Deviation (SD)).

Peak plantar pressure before and after physical activities (walking for 30 min) was measured as represented in Table 2, 3.

Non-diabetic Avg PPP "R" (Mpa)			Non-diabetic Avg PPP "L" (Mpa)		
after	before	Differ.	after	before	Differ.
520	375	-145	590	340	-250
365	355	-010	510	465	-045
295	340	045	295	340	045
415	330	-085	440	435	-005
370	295	-075	435	350	-085
395	520	125	360	355	-005
355	320	-035	345	305	-040
335	415	080	310	265	-045
390	495	105	505	480	-025
445	465	020	620	650	030
290	360	070	425	425	000
415	555	140	410	330	-080
300	280	-020	290	355	065
530	280	200	730	745	015
320	380	060	290	350	060
390	310	-080	325	380	055
245	250	005	230	245	015
480	455	-025	490	395	-095
325	255	-070	345	265	-080
620	515	-105	575	535	-040
380	450	070	470	480	010
405	295	-110	425	405	-020
245	370	125	370	375	005
355	470	115	295	330	035
310	300	-010	325	350	025
520	510	-010	565	535	-030
220	250	030	260	305	045
260	300	040	270	275	005

Table 2: mean peak plantar pressure for each subject of non-diabetic (both right and left).

diabetic Avg PPP "R" (Mpa)			diabetic Avg PPP "L" (Mpa)		
after	before	Differ.	after	before	Differ.
395	550	155	350	315	-035
435	365	-070	640	495	-145
520	425	-095	745	700	-045
460	565	105	355	580	205
705	680	-025	480	475	-005
570	440	-130	505	600	095
270	260	-010	310	280	-030
320	275	-045	330	380	050
275	320	045	395	370	-025
515	555	040	670	680	010
525	380	-145	415	510	095
320	338	018	385	500	115
375	350	-025	520	500	-020
410	565	155	375	435	060
605	620	015	400	305	-095
245	355	110	230	335	105
400	280	-120	250	285	035
385	455	070	450	515	065
575	515	-060	620	535	-085
550	465	-085	645	500	-145
475	450	-025	550	435	-115
510	425	-085	590	640	050
320	345	025	320	335	015
535	580	045	610	480	-130
380	305	-075	525	658	133
440	395	-045	325	295	-030
390	360	-030	350	280	-070
335	245	-090	310	385	075

Table 3: mean peak plantar pressure for each subject of diabetic (both right and left).

Discussion

As shown in Table 4 we found that: In Pair 1 (Non Diabetic Left before and after walking) the t_{CRIT} = 1.703288 which is greater than t_{STAT} value (1.253928). According to this we accept the null hypothesis (Ho). In pair 2 (Non Diabetic Right before and after walking) the t_{CRIT} = 1.703288 which is greater than t_{STAT} (-0.4957).

In pair 3 (Diabetic Left before and after walking) the t_{CRIT} = 1.703288 which is greater than t_{STAT} value (0.25543). According to this we accept the null hypothesis (Ho). In pair 4 (Diabetic Right before and after walking) the t_{CRIT} =1.703288 which is greater than t_{STAT} value (0.850589). According to this we accept the null hypothesis (Ho). The study was the first to investigate the correlation between peak plantar pressure generated after physical activity (walking for 30 minutes) and the plantar pressure immediately before starting the walking Activity.

The results obtained compared with others results of the study of Relationship between plantar pressures, physical activity and sedentariness among preschool children which investigated the significant and moderate correlations suggest potentially robust relationships between peak plantar pressures and the physical activity measures [4]. A moderate increase in the plantar pressure during walking. In this study, there was no significant difference between the mean peak plantar pressure before starting the physical activities and after 30 minutes of walking, which may be attributed in part to subject using appropriate foot ware during waking.

Paired (Dependent) T-test				
		Obs.	t_{CRIT}	t_{STAT}
Pair 1	Non Diabetic Left after walking	28	1.70	1.25
Pair 2	Non Diabetic Right after walking	28	1.70	-0.49
Pair 3	Diabetic Left after walking	28	1.70	0.25
Pair 4	Diabetic Right after walking	28	1.70	0.85

Table 4: the data presented are: Observations (Obs.), t-critical (t_{CRIT}) one tail and t_{STAT}.

Conclusion

This paper aimed at investigating the effect of physical activities (Walking) on the plantar pressure in both diabetic and non-diabetic subjects, by assessing the foot plantar pressure before and after physical activities (Walking) for 56 subjects. Two groups Diabetic type 2 (28 men) with age 51.1 ±12.3 year and Non-Diabetic (28 men) with age 36.6 ±12.9 year, who had no disability that would affect their foot structure or physical activity before and after walking exercise for 30 minutes. As they walked across AT- 4 pressure platform NOVEL e-med system to measure the plantar pressure of both feet, and the mean values were used. The mean values of before and after walking were compared by applying paired t-test. The t-test analysis results for diabetic and non-diabetic subjects plantar pressure before and after walking did not show statistically significant difference between the two, which indicates that there is no significant impact of walking on the plantar pressure of both diabetic and non - diabetic subjects.

References

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