

The Prevalence and the Associated Factors of Cutaneous Manifestations in Chinese Patients with Type II Diabetes Mellitus in a Primary Care Diabetes Clinic in Hong Kong

Sze Wai YEUNG*, Pang Fai CHAN, Kit Ping Loretta LAI, Kai Lim CHOW, Ming Lam TSANG, David Vai Kiong CHAO

Department of Family Medicine and Primary Health Care, Kowloon East Cluster, Hong Kong

*Corresponding author: Sze Wai YEUNG, Department of Family Medicine and Primary Health Care, Kowloon East Cluster, Hong Kong, E-mail: ysw476@ha.org.hk

Received: 17 May, 2018 | Accepted: 16 Jul, 2018 | Published: 20 Jul, 2018

Citation: Yeung SW, Chan PF, Lai KPL, Chow KL, Tsang ML, et al. (2018) The Prevalence and the Associated Factors of Cutaneous Manifestations in Chinese Patients With Type II Diabetes Mellitus in a Primary Care Diabetes Clinic in Hong Kong. *J Diab Res Ther* 4(1): dx.doi.org/10.16966/2380-5544.136

Copyright: © 2018 Yeung SW, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Studies suggested that cutaneous manifestations in diabetes patients were prevalent (62.5% to 88.3%). Acute metabolic derangements and chronic complications were postulated to cause many skin diseases in diabetes patients. Most of the skin diseases can be prevented and cured if detected and treated early. However, the local prevalence data was insufficient. It is important to raise the awareness of primary care physicians on these under-investigated conditions through this study.

Objectives

- (1) To evaluate the prevalence of cutaneous manifestations in Chinese patients with type II diabetes mellitus in a primary care diabetes clinic.
- (2) To study the associated factors of these cutaneous manifestations.

Methodology: This was a cross-sectional study carried out in a diabetes clinic in primary care. All Chinese patients who attended the clinic from 13th July 2017 to 23th November 2017 were recruited. For patients agreed to participate in the study, detailed skin history, physical examination, investigations and treatment would be offered accordingly. Clinical findings were documented in a consultation template. Relevant demographic data and latest clinical parameters were retrieved from computerized medical records.

Results: 271 patients were recruited. 52.8% of the subjects were male. The mean duration of diabetes history was 13.5 years. The mean Glycated Haemoglobin (HbA1c) level was 8.0%. 32.5% of patients were put on insulin. 74.9% of patients were overweight or obese. The prevalence of cutaneous manifestations was 59.4%. The most common groups of skin diseases were skin infections (43.6%), other skin diseases not known to be associated with diabetes such as atopic eczema and seborrheic keratosis (29.4%) and skin diseases associated with diabetes such as acanthosis nigricans, diabetic dermopathy and diabetic thick skin (24.6%). Fungal skin infections and xerosis were the two most common diagnoses. Male gender and higher Body Mass Index (BMI) were found to be statistically significant risk factors of skin diseases with OR 1.79 (CI 1.08-2.96) and OR 1.08 (CI 1.02-1.16) respectively.

Conclusion: Skin diseases were prevalent in Chinese diabetes patients. Male gender and higher BMI were the main associated risk factors. Weight control may be important to prevent some skin diseases in diabetes patients.

Keywords: Prevalence; Cutaneous manifestations; Chinese; Diabetes; Primary care

Introduction

Diabetes mellitus is a very prevalent chronic non-communicable disease which greatly burdens the health care system worldwide. It was estimated that 422 million adults had diabetes in 2014 worldwide [1]. Approximately 3.7 million deaths were caused by diabetes or its related complications in 2012. Among the deaths, forty-three percent occurred before the age of 70 years [1]. It was estimated that diabetes

mellitus will be the seventh leading cause of death in 2030 [2]. The prevalence of diabetes in adults aged 20 to 79 in 2015 in Hong Kong was 10.2% [3]. More than 251,000 of the diabetes patients were followed up in the Government funded primary care General Out-patient Clinics in Hong Kong in 2015 [4].

Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein

metabolism due to defect in insulin secretion, insulin action or both [5]. It adversely affects many systems and organs and gives rise to various microvascular and macrovascular complications. It was postulated that the acute metabolic derangements and the chronic degenerative complications were the underlying causes of many skin diseases in diabetes patients [6]. Other postulated pathogenesis include abnormal carbohydrate metabolism, altered metabolic pathways, atherosclerosis, microangiopathy, neuron degeneration, and impaired host mechanisms. However, the exact mechanism of many diabetes-associated cutaneous diseases remains unknown [6].

Cutaneous manifestations of diabetes can be largely classified into 4 main categories, namely skin lesions associated with diabetes, infections, and cutaneous manifestations due to diabetes complications and skin reactions due to diabetic treatment. Cutaneous manifestations are common in diabetes patients. Previous studies showed that 51.1% to 88.3% of diabetes patients were diagnosed with at least one skin disorder [6-12]. Infections and skin lesions associated with diabetes were two most common groups of skin diseases being diagnosed in diabetes patients from the overseas studies. Bacterial and fungal infections were prevalent in diabetes patients. Xerosis, diabetic dermatopathy and pruritus were common examples of skin manifestations associated with diabetes [6-18]. However, the data about the prevalence of skin manifestations in Chinese diabetes patients and in our locality is lacking.

Although the skin manifestations are usually not life-threatening, early recognition may have diagnostic and prognostic value in patients with diabetes [19]. It was shown from some overseas studies that patients with acanthosis nigricans and acrochordons were found to be have increased risk of diabetes [20,21]. An overseas study has reported positive correlation between the incidence of skin diseases in diabetes patients and the following conditions including longer duration of disease, suboptimal control of diabetes, hypertension and other diabetic complications such as coronary artery disease, peripheral vascular disease, peripheral neuropathy, diabetic retinopathy and nephropathy [9]. However, related information was very limited in Chinese population. Earlier diagnosis of diabetes mellitus and detection of diabetic complications may be possible if these diabetes-related dermatological conditions can be noticed early by primary care physicians. Therefore, it is important that the primary care physicians can raise their awareness on these under-investigated conditions through this study.

The objectives of this study were to evaluate the prevalence of cutaneous manifestations in Chinese patients with type II diabetes mellitus in a primary care diabetes clinic and to study the associated factors of these cutaneous manifestations.

Methodology

Study design

This was a cross-sectional study carried out in the Family Medicine Diabetes Clinic in one of the General Out-patient Clinics in Hong Kong. The clinic aims to provide clinical care for patients with suboptimal diabetes control while on maximum doses of first line oral anti-diabetic agents. All patients who met the inclusion criteria and attended the clinic from 13th July 2017 to 23th November 2017 were recruited. The inclusion and exclusion criteria were illustrated in figure 1. Informed written consents from the patients were obtained during consultation by the attending family medicine specialists. All the attending family physicians have received post-graduate training in dermatology. This study was approved by the Hospital Authority Kowloon Central Cluster/Kowloon East Cluster Research Ethics Committee/Institutional Review Board.

S.No	Criteria
1	Inclusion criteria
	- All Chinese patients being followed up in the diabetes clinic
	- Patients agree to give informed consent
2	Exclusion criteria
	- Non-Chinese patients
	- Patients refuse to give informed consent
	- Patients with conditions affecting their mental capacity in giving consent

Figure 1: Inclusion and exclusion criteria

Procedure

Detailed skin history was obtained for patients who agreed to participate in the study in the participating Family Medicine Diabetes Clinic. For patients with active skin complaints, physical examination was performed. Diagnoses were made clinically by the attending family physicians with reference to a detail review guidance note of the skin manifestations associated with diabetes. Clinical photos would be taken with written consent and reviewed by experienced family medicine specialists if clinical diagnosis could not be made during the consultation. Referral to Dermatologists would be made if clinically indicated. All findings and clinical diagnoses were documented in the computerized medical record of individual patient. A consultation template was designed to facilitate the attending family physicians to document the skin findings.

Data were collected by reviewing the computerized medical records of the subjects. Demographic data including age, sex and duration of diabetes, the latest clinical parameters including systolic blood pressure, diastolic blood pressure, body mass index (BMI), glycated haemoglobin (HbA1c) level, lipid profile (triglyceride level, non-HDL-cholesterol level and LDL-cholesterol level), use of insulin, presence of hypertension, coronary artery disease, presence of proteinuria (no proteinuria, microalbuminuria or macroalbuminuria), estimated Glomerular Filtration Rate (eGFR), presence of peripheral vascular disease and presence of peripheral neuropathy and the clinical diagnoses of the skin diseases were recorded.

Sample size

Sample size calculation was not necessary in this study since all patients attended the diabetes clinic within the study period were included.

Statistical analysis

All statistical analyses were done with IBM SPSS version 21.0. Proportions were presented by percentages. Continuous data with normal distribution were presented by mean with standard deviations. Logistic regression was used for comparison of the categorical variables. Level of statistical significance was considered as P<0.05.

Results

There were a total of 271 patients recruited. The mean age of subjects was 62.5. 52.8% of the subjects were male. The mean duration of occurrence of diabetes was 13.5 years. The mean HbA1c level was 8.0%. 32.5% of patients were put on insulin. Only 13.7% of patients had HbA1c level below 7%. Majority of patients had LDL-cholesterol level controlled to target i.e., LDL-cholesterol level below

2.6 mmol/L. 74.9% of patients were overweight or obese. Diabetic complications namely, proteinuria (42.8%), peripheral neuropathy (4.1%), peripheral vascular disease (0.4%) and diabetic retinopathy (57.6%), were observed in significant proportion of the subjects. The prevalence of cutaneous manifestations was 59.4%. Male gender and body mass index (BMI) were found to be statistically significant risk factors of skin diseases with an odd ratio 1.79 (CI 1.08-2.96) and an odd ratio 1.08 (CI 1.02-1.16) respectively. The most common groups of skin diseases were skin infections (43.6%), other skin diseases not known to be associated with diabetes such as atopic eczema and seborrheic keratosis (29.4%) and skin diseases associated with diabetes such as acanthosis nigricans, diabetic dermopathy and diabetic thick skin (24.6%). Fungal skin infections and xerosis were the two most common diagnoses among all the subjects with skin diseases. The demographic data and frequencies of systemic diseases and cutaneous manifestations of the subjects were summarized in tables 1 and 2 respectively.

Discussion

In our study, skin manifestations were found to be common in diabetes patients. More than half of the subjects had at least one dermatological disease which was comparable with the results of some overseas studies [6-12]. Skin infections and xerosis were the most common groups of skin diseases identified in the study and this was compatible with the results in some overseas studies [7-12]. It was postulated that poor microcirculation and decreased immune

Table 1: Demographic data and frequencies of systemic diseases

Total no. of subjects	271	SD
Mean age	62.5	9.3
Male (%)	52.8	
Mean duration of diabetes (years)	13.5	7.0
Insulin therapy (%)	32.5	
Mean SBP* (mm Hg)	126	13
Mean DBP* (mm Hg)	69	9
BP* to target (<130/80) (%)	63.5	
Mean BMI* kg/m ²	25.5	4.0
Obesity (%)	51.3	
Overweight (%)	23.6	
Profile of tests (Biochemistry) of diabetes mellitus		
Mean HbA1c* %	8.07	
HbA1c to target <7% (%)	13.7	
eGFR* ml/min/1.73 m ² (%)		
- ≥ 90	33.6	1.2
- 60-89	47.2	
- 30-59	17.5	
- <30	1.5	
Profile of tests (lipid) of diabetes mellitus		
LDL* to target <2.6mol/L (%)	91.5	
Microalbuminuria (%)	35.1	
Macroalbuminuria (%)	7.7	
No albuminuria (%)	57.2	
Hypertension (%)	84.1	
Peripheral vascular disease (%)	0.4	
Diabetic retinopathy (%)	57.6	
Peripheral neuropathy (%)	4.1	
Coronary artery disease (%)	5.2	

*HbA1c: Glycosylated haemoglobin; BMI: Body Mass Index; BP: Blood Pressure; DBP: Diastolic Blood Pressure; eGFR: Estimated Glomerular Filtration Rate; LDL: Low Density Lipoprotein; SBP: Systolic Blood Pressure

Table 2: Frequencies of skin manifestations

	N (%)
Subjects with skin diseases	161 (59.4)
1. Skin diseases associated with diabetes	52 (24.6)
- Acanthosis nigricans	2 (0.9)
- Diabetic dermopathy	3 (1.4)
- Psoriasis	5 (2.4)
- Scleroderma diabeticorum	2 (0.9)
- Xerosis	40 (19.0)
2. Infections	92 (43.6)
- Cutaneous wart	1 (0.47)
- Genital candidiasis	1 (0.47)
- Onychomycosis	24 (11.4)
- Tinea capitis	1 (0.47)
- Tinea corporis	3 (1.4)
- Tinea cruris	5 (2.4)
- Tinea manuum	1 (0.47)
- Tinea pedis	55 (26.1)
- Wound infection	1 (0.47)
3. Skin reactions due to diabetes treatment	5 (2.4)
- Allergic reaction to insulin	1 (0.47)
- Lipodystrophy	4 (1.9)
4. Cutaneous manifestations due to diabetes complications	0
5. Other skin diseases	62 (29.4)
- Atopic eczema	7 (3.3)
- Contact dermatitis	8 (3.8)
- Idiopathic guttate hypomelanosis	5 (2.4)
- Lichen simplex chronicus	4 (1.9)
- Photoageing hyperpigmentation	3 (1.4)
- Seborrheic dermatitis	3 (1.4)
- Seborrheic keratosis	5 (2.4)
- Stasis eczema	3 (1.4)
- Urticaria	5 (2.4)
- Others	19 (9.0)

response due to underlying microvascular and macrovascular complications of diabetes such as peripheral vascular disease and peripheral neuropathy could render diabetes patients more vulnerable to infections [22]. Diabetes patients were shown to have a reduced hydration state of the stratum corneum and decreased sebaceous gland activity. Therefore, they are more prone to have xerosis [12]. This result had an important clinical implication to daily practice since an early detection and possible prompt treatment of these prevalent conditions can avoid the emergence of serious complications including diabetic foot ulcer, necrotizing fasciitis and ultimate leg amputation.

Concerning the associated factors of skin manifestations, higher BMI was found to be a risk factor for having skin manifestations in our study. Similar finding was demonstrated in another study [9]. Some recent studies have revealed the relationship between obesity and skin diseases. It was postulated that obesity may lead to a change in the composition of adipose tissue which in turn lead to an increase in recruitment of macrophages and secretion of cytokines and a decrease in cytokine clearance; therefore, it may worsen certain skin conditions including eczema and psoriasis. Obesity is also associated with some alterations in the epidermal structure; as a result it may cause skin barrier dysfunction and lead to an increased risk in developing atopic diseases including atopic eczema. It was also proposed that obesity could lead to lymphatic dysfunction which might result in a prolonged inflammatory response in skin [12,23].

Male gender was another statistically significant risk factor found in our study, though this result was not substantiated in other overseas

studies [8-10]. The high prevalence of skin infections in this study might be accountable for this since male was more commonly affected by skin infections when compared with female [24]. An underlying complicated mechanism between sex hormones and epidermal and dermal thickness, immune system function, skin surface pH, etc., was implicated [25].

On the other hand, association of the presence of skin manifestations with the duration of diabetes, control of diabetes and the presence of other systemic diseases or complications could not be demonstrated in our study. This could be due to firstly the relatively small sample size of our study. Secondly, the majority of the recruited subjects had a suboptimal control of diabetes since they were all referred from the General Out-patient Clinics for titration of diabetic treatment. Therefore, this result could not be generalized to diabetes patients with optimal control. Thirdly, some of the skin conditions were possibly under-reported because of their intermittent and relatively asymptomatic nature such as skin tags, diabetic dermopathy, diabetic bullae, etc.

Conclusion

Skin manifestations were prevalent in Chinese diabetes patients. Male gender and higher BMI were the associated risk factors. Weight control may be important to prevent some skin diseases in diabetes patients. Further studies involving patients with different range of diabetes control are needed to further investigate for other possible associated factors with skin manifestations in diabetes patients.

References

- World Health Organization (2016) Global Report of Diabetes.
- Mathers CD, Loncar D (2006) Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med* 3: e442.
- International Diabetes Federation (2015) Belgium: International Diabetes Federation.
- Wong KW, Ho SY, Chao DV (2012) Quality of diabetes care in public primary care clinics in Hong Kong. *Fam Pract* 29: 196-202.
- World Health Organisation (1999) Definition, diagnosis and classification of diabetes mellitus and its complications: report of a WHO consultation. Part 1, Diagnosis and classification of diabetes mellitus.
- Goyal A, Raina S, Kaushal SS, Mahajan V, Sharma NL (2010) Pattern of cutaneous manifestations in diabetes mellitus. *Indian J Dermatol* 55: 39-41.
- Demirseren DD, Emre S, Akoglu G, Arpacı D, Arman A, et al. (2014) Relationship between skin diseases and extracutaneous complications of diabetes mellitus: clinical analysis of 750 patients. *Am J Clin Dermatol* 15: 65-70.
- Timshina DK, Thappa DM, Agrawal A (2012) A clinical study of dermatoses in diabetes to establish its markers. *Indian J Dermatol* 57: 20-25.
- Bhat YJ, Gupta V, Kudiyar RP (2006) Cutaneous Manifestations of Diabetes Mellitus. *Int J Diab Dev Ctries* 26: 152-155.
- Ahmed K, Muhammad Z, Qayum I (2009) Prevalence of cutaneous manifestations of diabetes mellitus. *J Ayub Med Coll Abbottabad* 21: 76-79.
- Pavlovic MD, Milenkovic T, Dinic M, Misovic M, Dakovic D, et al. (2007) The prevalence of cutaneous manifestations in young patients with type 1 diabetes. *Diabetes Care* 30: 1964-1967.
- de Macedo GM, Nunes S, Barreto T (2016) Skin disorders in diabetes mellitus: an epidemiology and physiopathology review. *Diabetol Metab Syndr* 8: 63.
- Verma GC, Jain SC, Vyas S, Saluja M, Nyati A, et al. (2013) Prevalence of Cutaneous Manifestations of Diabetes Mellitus. *IOSR-J Dent Med Sci* 11: 41-47.
- Wang YR, Margolis D (2006) The prevalence of diagnosed cutaneous manifestations during ambulatory diabetes visits in the United States, 1998-2002. *Dermatology* 212: 229-234.
- Tseng HW, Ger LP, Liang CK, Liou HH, Lam HC (2015) High prevalence of cutaneous manifestations in the elderly with diabetes mellitus: an institution-based cross-sectional study in Taiwan. *J Eur Acad Dermatol Venereol* 29: 1631-1635.
- Kataria U, Chhillar D, Kumar H, Chhikara P (2015) Cutaneous manifestations of diabetes mellitus in controlled and uncontrolled state. *IAIM* 2: 90-93.
- Sanad EM, Elfangary MM, Sorour NE, ElNemisy NM (2013) Skin manifestations in Egyptian diabetic patients: a case series study. *Egypt J Dermatol Venereol* 33: 56-62.
- Morgan AJ, Schwartz RA (2008) Diabetic dermopathy: A subtle sign with grave implications. *J Am Acad Dermatol* 58: 447-451.
- Duff M, Demidova O, Blackburn S, Shubrook J (2015) Cutaneous manifestations of diabetes mellitus. *Clin Diabetes* 33: 40-48.
- Kong AS, Williams RL, Rhyne R, Urias-Sandoval V, Cardinali G, et al. (2010) Acanthosis Nigricans: high prevalence and association with diabetes in a practice-based research network consortium—a PRImary care Multi-Ethnic network (PRIME Net) study. *J Am Board Fam Med* 23: 476-485.
- Shah R, Jindal A, Patel N (2014) Acrochordons as a cutaneous sign of metabolic syndrome: a case-control study. *Ann Med Health Sci Res* 4: 202-205.
- Hattem SV, Bootsma AH, Thio HB (2008) Skin manifestations of diabetes. *Cleve Clin J Med* 75: 772-787.
- Yosipovitch G, DeVore A, Dawn A (2007) Obesity and the skin: skin physiology and skin manifestations of obesity. *J Am Acad Dermatol* 56: 901-916.
- Chen W, Mempel M, Traidl-Hofmann C, Al Khusaei S, Ring J (2010) Gender aspects in skin diseases. *J Eur Acad Dermatol Venereol* 24: 1378-1385.
- Dao H Jr, Kazin RA (2007) Gender differences in skin: a review of the literature. *Gen Med* 4: 308-328.