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*Original Research Article*

**PREVALENCE OF DIABETIC COMPLICATIONS IN AN URBAN DISTRICT OF JHANG (PUNJAB) PAKISTAN**

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**ABSTRACT**

The diabetic complications have become a world health problem. They prevail throughout the world but their percentages differ in different areas due to cultural influences. Therefore, we have determined prevalence of complications of diabetes in the rural population of district Jhang (Pakistan). For this purpose, a performa was developed and information was collected from two hundred and ten (210) diabetic patients about their age, sex, height, socioeconomic status, educational status, type of diabetes, duration of diabetes, age at diagnosis, blood pressure and blood sugar levels (fasting and random) and the symptoms of diabetes. Mainly the complications were compared with different variables or risk factors like diet, type of diabetes, obesity, sugar levels and uncontrolled diet. Retinopathy, carbuncles, pregnancy and hypertension complications in both sexes had non-significant ( $P>0.05$ ) relationship with controlled diet but significant ( $P<0.05$ ) with uncontrolled diet. Nephropathy and neuropathy showed significant relationship with controlled diet and non-significant with uncontrolled diet. Retinopathy, neuropathy and gangrene in both sexes were highly significantly ( $P<0.001$ ) related with both types of diabetes. Pregnancy complications were also highly significantly related with obesity and random sugar levels and all other complications were non-significantly different from obesity and random as well as fasting sugar levels. Logistic regression model on the whole data showed that age, diet, diagnosis age and random sugar levels were significantly related with the prevalence of diabetic complications. While weight, blood pressure and fasting sugar levels had no relationship with the complications.

**Key words:** Diabetes, diabetic complications, retinopathy, nephropathy, gangrene.

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## INTRODUCTION

Dramatic increase in the prevalence of diabetes and its related complications has provided the need for prediction of some preventive and prophylactic measures (Kausar *et al*; 2000). Main objective of these measures is to normalize biological abnormalities, which are frequently associated with diabetic complications (Monnier and Aignon; 1999). The type I i.e. insulin dependant diabetes mellitus (IDDM) complications are found in less than 10% of 1<sup>st</sup> degree relatives and in case of type 2 i.e. non-insulin dependant diabetes mellitus (NIDDM) and its related complications, there are 90% chances of occurrence in identical twins (Kumar and Clark; 1998). It has been established that glucose control is vital in the control of diabetes and its related complications (Skyler; 1996). Diabetic nephropathy has been described as a common micro-vascular complication of diabetes that can result in end stage renal failure disease (ESRD) necessitating long term dialysis or the kidney transplantation (Gordois *et al*; 2004). It has been also described as a main cause of morbidity and mortality in patients with type I diabetes and in adults persistent micro-albuminuria is the best marker of consequent risk for its development. Hypertension is a further risk factor that accelerates the progression of micro- and macro-vascular complications (Wan *et al*; 2003). Peripheral neuropathies have been described in patients with primary and secondary (type I and type II) diabetes of diverse causes, suggesting a common etiologic mechanism based on chronic hyperglycaemia. Neuropathies were characterized by a progressive loss of nerve fibers that can be assessed non-invasively by several tests of nerve functions, including electrophysiology, quantization sensory testing, and autonomic function testing. Pathologically numerous changes have been demonstrated in both myelinated and un-myelinated fibers, although Schwann cells changes may be the primary pathological change (Emad and Soliman; 2001). Diabetic retinopathy (DR) in the way of macular edema has been summarized as the commonest cause of blindness. Blindness is the most feared complication of diabetes but also preventable, mostly in the age group of 30-74 years. DR is due to micro-angiopathy affecting the retinal pre-capillary arterioles, capillaries and venules. Detection of earliest signs is essential for treatment strategies (Grassi; 2003). Diabetic foot is due to diabetic neuropathy, macro-angiopathy or combination of both. Triggering factors were exogenous trauma by tight shoes, foreign bodies and insufficient care, combined with foot deformity. Pathogenic factors included decreased collagen deposition, loss of adipose tissues and occurrence of edema (Stiegler; 2004). Gestational diabetes mellitus (GDM) is any degree of glucose intolerance with onset or 1<sup>st</sup> recognition during pregnancy. Prevalence of GDM was 5-7% and it was associated with long term complication in mothers and infants. In infants macrosomia, hypocalcaemia, hyperbilirubinaemia, respiratory distress and foetal hypoglycaemia were common (Kautzky; 2003). Pakistan is a developing country and its people have less awareness about their health and are unaware of problems and hazards caused by diabetes and its related complications. Therefore, a study was undertaken to survey as to how many of the complications of diabetes are affecting the local rural population.

## MATERIALS AND METHODS

Complications like retinopathy, nephropathy, peripheral neuropathy, gangrene and during pregnancy complications were seen in two hundred and ten patients of age 5-85 years. Out of these patients 97 were males and 113 were females. Information was obtained from different

hospitals from the villages of Bagh, Wasu, Hassu-Blail, Atthara-Hazari, Rodu-Sultan, Shah Jevna, Kot Khan, Chinniot, Rubhwa and Thal and private clinics of Dr. Razia Afzal, Dr. Riaz Dub, Dr. Nighat, Dr. Balqees, Dr. Hanif, Dr. Samina Bhatti, Dr. Misbah, Dr. Mohsin Maghyana, Dr. Naseem Ansari and Dr. Mussarat Hussain. Most of the patients were uneducated and taking uncontrolled diet and were taking either insulin or oral hypoglycaemic drugs alone or both as the treatment. 71% males and females had inherited diabetes and 29% uninherited diabetes and 48.2% of both male and female were taking controlled diet and 51.8% uncontrolled diet. An interviewing schedule was developed for the pre-testing of the patients to ensure the accuracy and workability. Each patient was attended individually. To study prevalence of the diabetic complications following two types of examinations were applied; 1) clinical examination and 2) general physical examinations. During the judgment of prevailed complications, patient's socio-economic status, occupation, education urban-rural areas, duration of disease or complication, age, sex, age at which the disease was diagnosed. Obesity, blood pressure, type of diseases, blood sugars (fasting and random) and the diet they were taking and specially type of treatment.

To know prevailing complications, following clinical examinations and measurements were taken; age, height and weight with reference to age, height, weight, blood pressure, obesity measurements, mid upper arm circumference, triceps skin fold thickness, measurement of blood sugar level, assessment of diet taken, low energy weight reducing diets, weight maintenance diets, family history, type of treatment. The general and physical examinations include general appearance, posture and attitude, name, age, address, occupation and socioeconomic status and history of present illness. The data were analyzed by using statistical methods; especially logistic regression model and results were discussed (Berkson, 1944).

## **RESULTS**

The results about diabetic complications of two hundred and ten (210) patients were obtained. Among 98 males and 112 females, 69 were of IDDM (Type I) and 141 were of NIDDM (Type II). 110 were taking uncontrolled diet, 100 were taking controlled diet. 88 were illiterate, 21 were matriculates, 10 were highly educated, 98 were from lower class and 11 were from upper class. Sixty three (63) were having not any family history, 147 were having family history. There were 148 non-obese patients and 62 were obese. So totally 179 patients were suffering from complications and 31 were not suffering from direct complication of the disease.

It is clear from Table 1 that diagnosis age of disease and random sugar level had no relationship with height. Patient's fasting sugar level was not found related with weight of the treated patients. Duration of diabetes mellitus and height had also no relationship with the age of onset of diabetes. Random and fasting sugar levels were also not dependant on high and low blood pressures and height. Similarly, Table 4 shows that weight, diagnosis age, duration of diabetes, high and low blood pressure was highly significantly related to age. Weight, duration of diabetes mellitus and low blood pressure were highly significantly related to height. Types of diabetes were found highly significantly ( $P < 0.001$ ) related with occupation of the patients and fasting sugar levels while non-significantly with all other factors like sex, education, status, family history, obesity, complications and random sugar levels. Obesity was found non-significantly related with all risk factors as with sex, education, status, occupation, family history, type-I & II complications. Diet was found highly significantly related with occupation, family history, random sugar levels and complications and non-significant relationship with status, both types of

diabetes, obesity and fasting sugar levels. The symptoms of diabetic complications were polyuria (60 out of 210), recurrent infections (59 out of 210), polydipsia (35 out of 210), loss of weight (21 out of 210), nocturia (18 out of 210) and polyphagia (17 out of 210).

**Table 1: Correlation between different risk factors of diabetes mellitus**

Correlation	Age	Height	Weight	Age at Diagnosis	Duration of diabetes	High blood pressure	Low blood pressure	Random sugar level	Fasting sugar level
Age	1.0000	0.297	.1232*	.8617**	.4120*	.1599**	.1573**	.0064**	.0424
Height	.0297	1.0000	.4296**	-.0464	.1691	.1032	.1564**	.0900	.0064
Weight	.1232*	.4296**	1.000	.0414	.2036**	.2678**	.2558**	.0191	-0.441
Diagnosis age	.8617**	-.0464	.0414	1.0000	-0.105	.1189*	.0793	.0614	.0296
Duration of diabetes	.4120**	.1691**	.2036**	-0.105	1.0000	.1174*	.1721**	.0057	.0323*
High blood pressure	.1599**	.1032	.2678**	.1189*	.1174*	1.000	.7907**	-.0753	-.1239
Low blood pressure	.1573**	.1564**	.2558**	.0793	.1721**	.7907**	1.000	-0.294	-0.619**
Random sugar level	.0064**	.0900	.0191	.0614	.0057	-.0753	-0.294	1.000	.6351**
Fasting sugar level	.0424	.0064	-0.441	.0296	.0323*	-.1239	-0.619**	.6351**	1.0000

**Table-2: Percentage Prevalence of diabetic complications**

Complications	Number of patients	Percentage
Neuropathy	80	38.09%
Retinopathy	63	30%
Nephropathy	62	29.52%
Gangrene	46	21.9%
Pregnancy Complications	27	12.9%
Carbuncles	19	9%
Hypertension	13	6.2%

**Table-3: Regression Coefficient values of different variables.**

Variables	Regression Coefficient values
Age	0.3467**
	0.0259
Diet	1.3605**
Duration of Diabetes mellitus	0.1222*
High blood pressure	0.0364
Low blood pressure	0.0640
Random blood sugar	0.0068*
Fasting Sugar	1.3946

Backward method of logistic regression model showed that the regression coefficient values of different variables were either highly significantly related or non-significantly related with the prevalence of diabetic complication as shown in Table-3. The obese males were found at first

position then loss of weight, polydipsia, nocturia, polyphagia and lastly recurrent infections. In obese females, polyuria was followed by polydipsia, polyphagia, nocturia, loss of weight and then recurrent infections. The non-obese males had relationship with diabetic symptoms in the following order; recurrent infections, polyphagia, nocturia, polydipsia, loss of weight and polyuria. However, in non-obese females recurrent infections, loss of weight, polyphagia, nocturia, polydipsia and polyuria were found.

## DISCUSSION

Diabetes mellitus has been taken as one of the most prevailing disease through recent surveys. Some of the complications related with diabetes have caused death directly or indirectly (Wolever *et al*; 2003). In a study, it has been reported that among 100 patients, percentage of prevailing complications were as follows: 31% patients were suffering from vision problems, 81 with hypertension, 20% were suffering from upper & lower limb and foot problem, 40% were suffering from neuropathy, 26% were suffering from kidney problems, 15% females had suffered different complications during pregnancy (Torangatti and Naik, 2000). According to them, the most prevailing complication in India was neuropathy as 40% of them were suffering from neuropathy in local population. The present study has also showed the neuropathy as the most prevailing complication (29.52%). Secondly, the above said workers found retinopathy (31%) and in our research retinopathy was also second most prevailing complication. At third position they recorded that 26% population were suffering from nephropathy while in finding 29.52% of local population was suffering from nephropathy. At fourth position, upper limb; lower limb and foot problems (gangrene) were found by these workers in 20% population but in our cases gangrene was found in 21.9% patients. They also found that 15% females were suffering from pregnancy complications and in our population, the percentage was 12.9%. Lastly, they have reported that 8% of the patients were hypertensive while in our patients it was 6.2%. Therefore, it can be concluded that Pakistani and Indian populations suffer from the diabetic complications at approximately the same percentages.

The present results have showed that males and females had non-significant relationship with controlled diet and highly significant with uncontrolled diet. Richter *et al* (2004) have reported that retinal abnormalities were significantly affecting males and females and were not related with the controlled diet. Astrup (2001) has discussed that increase of diabetic complications can be attributed with obesity because when a female is obese, risk of developing diabetic complications are increased to about 80-85%. In the present study, it was observed that 14 obese females suffered from pregnancy complications like congenital abnormalities, still births, abortions, overweight babies, underweight babies and miscarriages. There was highly significant relationship between obesity and pregnancy complications. In a study (Curiel, 1998), it was observed that high blood glucose level has neurotoxic effect on nerves and due to this effect, patients may feel dizziness, constipation, diarrhea, vomiting or even heart attack. These effects on nerves can be prevented with controlled diet to some extent. Our study has showed that diabetic neuropathy is significantly related with controlled diet in both sexes but obesity, random sugar levels and fasting sugar levels were found not significantly related with neuropathy. After adjustment of systolic blood pressure, duration of diabetes, stage of complication at baselines, kidney abnormalities with respect of different risk factors were found in 32% population (Seles *et al*; 1991). In our population, 29.52% patients were found suffering from nephropathy. Risk factor like controlled diet was found significantly related with nephropathy but obesity, types of

diabetes, random sugar levels and fasting sugar levels were found non-significantly related with nephropathy. Smith *et al* (1982) have reported gangrene and observed that out of 241 patients, 20% patients had lost the blood supply to their end body parts like upper limb, lower limb, fingers and feet. Percentage decrease was 18.9% in patients on proper treatment. In our study 21.9% patients were suffering from gangrene and were found highly significantly related with controlled diet, obesity, types of diabetes, random sugar levels and fasting sugar levels had non-significant affect on gangrene.

It is conceivable from data discussed that in this survey the most prevalent complications of diabetes have been found to be neuropathy (38.09%), retinopathy (30%), nephropathy (29.5%), gangrene (21.9%), pregnancy complications (12.9%), carbuncles (9%) and hypertension (6.2%). Further research would be, however, needed to determine the factors that led to so high percentage of diabetic complications, especially that of neuropathy. May be uncontrolled diets and improper treatment schedules in this urban population might have contributed to so high prevalence of diabetic complications. It is recommended that diabetic patients should be advised to be very much caring and punctual about their medication or treatment, diet and exercise.

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