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A study on complications of diabetes mellitus type 2 and its clinical manifestations in a community setup

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Abstract
Background: Diabetes is the leading cause of morbidity and mortality worldwide and the major causes for the mortality are due to complications of diabetes and it is predicted that by 2025 the number of people suffering from diabetes will increase to 190 Million. Indians are susceptible to premature onset of DM which intern lead to rapid progression of chronic vascular complications, incurring heavy burden on health care systems on India. In India majority of patients were unaware of complications occurs due to diabetes. Thus it is very important to provide the information on prevalence of complications of diabetes to patient and physician to control mortality rate due to it.
Objectives: This study was intended to obtain information on prevalence of diabetic complications in a community setup and to provide patient counselling on the same which may help to improve their overall quality of life.
Methodology: A prospective observational study was carried in and around the area of the Bengaluru through a series of a health camp. The tentative duration of the study was 6 months. Free health camps were conducted and screening of the blood glucose was provided. Data was collect based on demographic details, past and present medical history was collected in a specially designed profile forms. Individual patient counselling was provided to each participant in the language of their comfort. Feedback was collected from the participants regarding their satisfaction towards the camp and also suggestions given by then were noted as well as suitable areas of improvements which may help us to provide better service to the patient. All information leaflets containing brief information on diabetes with pictorial representation were provided and explained to the each participant in both English and Kannada.
Results: A total of 319 subjects were enrolled in the study through a series of 3 health camps, out of which are suffering from diabetes, are suffering from both diabetes and hypertension, and subjects were not diagnosed with any complications. Prevalence percentage of complications for particular factor was calculated. Prevalence percentages in diabetic subjects were also performed relative risk to know the presence of any significant relationship between complications and their particular factor (diabetes). The relative risk values for diabetes complications are for memory impairment, for CHD, for retinopathy, for cataract and for neuropathy. All values of relative risk are more than 1 and which showed that there was a significant relationship between complications and their associated factor and was then conformed by conducting chi-square tests for each complication individually and the resulted P-value showed that all complications were significantly related to disease except for retinopathy with a P-value of which doesn't shows significant relationship with the factor diabetes in our study.
Conclusion: Hence we observed higher prevalence percentage of memory impairment in diabetes and also diabetic complications were higher among all the diabetic individuals. All the diabetic complications observed need to be observed in prevention and control strategies in the study area. Also, community awareness programs need to be implemented to percolate the knowledge about the diabetic complications, the available screening facilities for their early detection treatment and care.

Keywords: Diabetes mellitus, prevalence, neuropathy, retinopathy, community setup

Introduction

Diabetes mellitus (DM), commonly referred to as diabetes, is a group of metabolic disease in which there are high blood sugar levels over a prolonged period. Symptoms of high blood sugar include frequent urination, increased thirst, and increased hunger. If left untreated, diabetes can cause many complications. Acute complications can include diabetes ketoacidosis, nonketotic hyperosmolar coma or death. Serious long term complications include coronary heart disease, neuropathy, cataract, retinopathy, memory impairment, chronic kidney failure, foot ulcers.

Prevention and treatment involved maintaining a healthy diet, regular physical exercise, a normal body weight, and avoiding use of tobacco. Control of blood pressure and maintaining proper foot care are important for people with the disease. Type 1 DM must be managed with insulin injections. Type 2 DM may be treated with medications with or without insulin. Insulin and some oral medications can cause low blood sugar. Weight loos surgery in those with obesity is sometimes an effective measure in those with type 2 DM. Gestational diabetes usually resolves after a birth of baby.

As of 2015, an estimated 415million people had diabetes worldwide, with type 2 DM making up about 90% of the cases. This represents 8.3% of the adult population, with equal rates in both women and men. As of 2014, trends suggested the rate would continue to rise. Diabetes at least doubles a person's risk of early death. People with diabetes can benefit from education about the disease and treatment, good nutrition to achieve a normal boy weight, and exercise, with goal of keeping both short term and long term blood glucose levels within acceptable bounds.

Diabetic neuropathies

Diabetic neuropathies are nerve damaging disorders associated with DM. these conditions are thought to result from diabetic micro vascular injury involving small blood vessels that supply nerves I addition to macro vascular conditions that can culminate in diabetic neuropathy.

Retinopathy

Retinopathy is any damage to the retina of the eyes, which may cause vision impairment. Retinopathy often refers to retinal vascular disease, or damage to the retina caused by abdominal blood flow. Age related macular degeneration is technically included under the umbrella term retinopathy frequently; retinopathy is an ocular manifestation of systemic disease as seen in diabetes or hypertension. Diabetes is the most common cause of retinopathy.

Cataract

Cataract is a clouding of the lens in the eye which leads to a decrease in vision. Cataracts often develop slowly and can affect 1 or both eyes. Symptoms may include faded colours, blurry vision, and halos around light, trouble with bright lights and trouble seeing at night. This may result in trouble driving, reading or recognizing faces. Poor vision caused by cataracts may also result in an increased risk of falling and depression. Cataracts are the cause of half of blindness and 33% of visual impairment worldwide. Risk factors include diabetes, smoking tobacco, prolonged exposure to sunlight and alcohol.

Coronary heart disease

Coronary heart disease (CHD), plaque forms with in the arteries of the heart, explains the National heart, lung and blood institute. The plaque reduces the oxygen in the blood and causes additional heart problems, such as heart attack or blood clot. Pressure or pain in the chest, back, abdomen, neck or upper extremities; an increase in pain during physical activity; and weakness are symptoms of coronary heart disease. Symptoms vary by gender, age and previous health conditions. Some people do not experience any condition another common name for CHD is coronary artery disease. Risk factors include: high blood pressure, smoking, diabetes, lack of exercise, obesity, high blood cholesterol, poor diet, and excessive alcohol.

Objectives of the study

Primary objectives

- To monitor and document various complications in diabetic patients in a community setup.
- To study prevalence of various diabetic complications in around the area of Bengaluru.

Secondary objectives

- To clarify patient's doubts and provide counselling regarding the complications and their life style modifications like diet and exercise which may help to improve their overall quality of life.

Materials and methods

Study design

An observational study.

Table 1: List of instruments used

S. No.	Instrument	Manufacturer
1	Diabetes screening machine, piercing needles and soft clix	Accu- check
2	Digital weighing machine	Samso

Table 2: List of materials used

S. No.	Materials
1	Registration forms
2	Patient ID cards
3	Data collection forms
4	Diabetes awareness pamphlets in English and Kannada
5	Informed patient consent forms
6	Feedback forms

Conduction of camps

A total of 3 health camps were conducted over the period of 6 months. The first health camp was conducted at PES College of Pharmacy, Srinagar, Bengaluru-50, the second camp was conducted at Vivekananda Park, Girinagar and the third camp was conducted at PES College of Pharmacy, Srinagar. For advertising over 200 pamphlets were designed which included the details of the camp-date, timings, venue and the services to be provided to the patients. Pamphlets were issued to all the volunteers and were distributed in and around the area where the camps were being conducted which mainly includes parks, pharmacies, bus-stops, restaurants, coffee/tea stalls and other places where the crowd was huge. To attract more number of subjects, free health camp flex banners were designed and arranged at different places. All the activities were performed 3-4 days prior to conduction of the camps. Prior permission was obtained from the regulatory authorities of study site.

Venue

The venue was set up to provide the best and satisfactory service to patients. Chairs, counters, weighting area, mineral water and placards were arranged. Separate counter were arranged each for blood glucose monitoring, data collection, patient counselling, informed consent along with collection of feed-back. Patient's information leaflets were distributed to all the participants in their language of their choice. Volunteers were to provide assistance in English, Hindi, Kannada and Telugu. Essential tools. Like cotton, band-aids, spirit, hand gloves, dustbins for disposal of used needles and other tools were arranged prior to initiation of the camp. Volunteers were also trained to assist the patients towards

further counters for ensuring smooth functioning of health camp.

Inclusion criteria
All diabetic patients.

Exclusion criteria
Patients who are not willing to participate.

Registration
Registration of the patient's was done at the registration desk made available at the entrance of the venue where the demographic details like Name, age, sex, weight, contact information of the patient were recorded by the volunteers in the identity cards provided to each of them, and were further guided to the waiting area to provide ample time for their heart rate to normalize as they have been indulged in physical activity like walking to reach the venue.

Data collection
At the completion of screening, patients were guided to the next corresponding desk by the volunteers for the data collection. The data collection forms were specifically designed to note details on past and present medical history, co-morbid conditions, family histories and presence of any other unusual symptoms pertaining to pre-existing and existing complications and signed consent by the patient.

Patient counselling
Post data collection, they were guided to the patient counselling desk where the volunteers (trained by us), counselled the patients. Patients counselling was provided individually to every patient in different languages such as English, Hindi, Kannada, Telugu languages according to the comfort of the patients. The patients were educated regarding

- Blood glucose
- Risk factors for various diabetic complications
- Preventive measures
- Life style modifications

Patients were also counselled about various topic which may improve their overall quality of life like

- Medication adherence
- Exercise and dietary advice
- Life style modifications
- Social habits which acts as prevailing factors for diabetes and their complications

Also, the patient's doubts regarding the same were clarified by our trained volunteers in their respective languages.
For better convenience of the patients, specially designed pamphlets/brochures containing basic and necessary details about diabetes their respective complications, dietary advice and life style modifications were handed to them. Also, pictures were added to further simplify the details improve better understanding for those who are not adequately educated.

Feedback collection
As the final step feedback was collected covering important aspects of camp, level of satisfaction and areas of interest and improvement. The main objective was providing more benefit and convenience to the patient's as the primary goal of our study performed was to provide direct service to the patient.

Results

Table 3: Total population details

Total number of health camps conducted	3
Total number of subjects enrolled for the camp	263
Total number of subjects detected with Diabetes	93
Total number of subjects detected with Diabetes and Hypertension	126
Total number of subjects without any disease	139

Table 4: Prevalence of complications in diabetic compared to that in non-diabetic patients

Complications	Prevalence in diabetic	Prevalence in non-diabetic
Memory impairment	50	14
Cataract	4	1
Retinopathy	31	47
CHD	5	1
Neuropathy	3	1

Prevalence percentage

Table 5: Diabetes-percentage prevalence

Complications	Prevalence %
Memory impairment	19
Cataract	11.8
Retinopathy	1.52
CHD	2
Neuropathy	1.14

Table 6: Relative risk

Complications	Relative risk
Memory impairment	5.3
Cataract	1.33
Retinopathy	0.16
CHD	0.132
Neuropathy	0.218

Table 7: Result of chi-square test

Complications	P value
Memory impairment	0.0001
Cataract	0.2451
Retinopathy	0.0411
CHD	0.0030
Neuropathy	0.4060

Area of interest
Follow up, life style modifications and counselling.

Areas of improvement as suggested by patients
Regular camps with a monthly frequency.

Discussion
We conducted a series of 3 health camps over a period of 6 months and the total number of subjects enrolled for camp was 319. Out of 319 subjects who were included in the study, we observed that 112 subjects were suffering with diabetes, 43 subjects were identified to have both hypertension and diabetes and 77 subjects were disease free. The present study showed a significant association in prevalence of complications of DM.
The prevalence of associated diabetic complications has been shown in Table 5. Among the diabetics the prevalence of memory impairment, cataract, retinopathy, CHD and

neuropathy were, the prevalence of memory impairment (19%) was higher among all diabetic patients who participated in the study.

In south India, a similar high prevalence of CHD (30.3%) among the diabetes was revealed by Ramachandran *et al*., around 17.2% of diabetes had cataract as a complication in the study (Mohan V *et al*.) carried out in southern India. Rema M *et al*., reported a retinopathy prevalence of 34.1% among diabetes in south India. Relative risk was calculated for all complications and the complications were found to be significantly related with the disease (DM).

Chi-square test was performed individually for each complication for the confirmation of the relation between a specific complication and the disease. P value of all complications show that they are significantly related with the particular factors (DM) accept for the complication retinopathy whose P value is and accepts null hypothesis in definitely and shows that there is no significant relation with diabetes in our study.

If P value is </= 0.05 then reject null hypothesis and accepts alternate hypothesis

If P value is </= 0.01 then it is highly significant and rejects null hypothesis

If P value is >/=0.05 then accepts null hypothesis

Where Null hypothesis states that there is no relation between a particular complication (e.g.: retinopathy) and its associated factor (diabetes).

Conclusion

The study provides data on prevalence of diabetic complications from a community based setup. The prevalence of memory impairment, cataract, CHD, retinopathy was higher among diabetic patients in and around the area of Bengaluru, India. Patient counselling were provided regarding the various complications and their life style modifications like diet and exercise which may help to improve the overall quality life of patient. All the complications observed need to be addressed in prevention and control strategies in the study area. Also, community awareness programs need to be implemented to percolate the knowledge about the diabetic complications, the available screening facilities for their early detection, treatment and care in the rural population. Research is also needed to develop evidence based practices through primary health care for the adequate management of diabetes and their associated complications.

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