Diabetes Mellitus in a Malaysian Teaching Hospital: Prevalence of Diabetes Mellitus and Frequency of Testing for Hypercholesterolaemia, Proteinuria and HbA1c.

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Summary

We examined the prevalence of diabetes among inpatients in our hospital, the relationship of the diagnoses on admission to diabetes, and the frequency of testing for HbA1c as a marker of long-term glycaemic control, proteinuria, and hypercholesterolaemia. In addition, patients with raised laboratory plasma glucose without a known history of diabetes mellitus, were studied to see if there had been further evaluation. The overall prevalence of diabetes in our hospital was 25.3% with the highest prevalence found (37.8%) on medical wards. 10.5 % of admissions were due directly to diabetes and a further 58.9% of patients were admitted with illnesses which were significantly related to diabetes. Overall testing rates for HbA1c, proteinuria and hypercholesterolaemia were less than ideal (51.6, 73.4 and 45.5% respectively). Less than 50% of patients without previously diagnosed diabetes but with high plasma glucose values had further evaluation for diabetes. In conclusion, this study has detected a high overall prevalence of diabetes among inpatients in an urban Malaysian hospital. Rates of testing for HbA1c, proteinuria and hypercholesterolaemia, are disappointingly low, as is further evaluation of patients without known diabetes, but with elevated glucose values. More effective measures to improve the delivery of inpatient diabetes care are needed.

Key Words: Diabetes mellitus, Prevalence, Inpatients, Proteinuria, Hypercholesterolaemia, HbA, Glycosylated, Adult

Introduction

The overall prevalence of diabetes mellitus in Malaysia is reported to be between 10.5 to 14%, based on studies of predominantly rural subjects[1,2]. The 1992 Singapore National Health Survey reported an age-standardised prevalence of diabetes of 8.4%[3], with approximately half previously undiagnosed and a doubling in prevalence rates among the Chinese when compared with a similar survey in 1984.

Inpatient prevalence data for diabetes has not been previously reported for Malaysia. It is known that conventional methods of data collection (e.g. ICD codes) lack accuracy and often underestimate the number of inpatients with diabetes, and the relationship of these admissions to diabetes[4]. Patients with diabetes use a disproportionately high level of hospital resources [5], and an accurate picture of the burden of diabetes on the health service is important for long-term resource planning.

This study was designed to answer the following questions:
1. What is the prevalence of diabetes mellitus among inpatients in our hospital?
2. Was the admission related directly or indirectly to diabetes?
3. Were the patients with diabetes screened for proteinuria and hypercholesterolaemia, and was long term glycaemic control examined by measurement of HbA$_{1c}$?
4. Were patients without a history of diabetes, but with raised plasma glucose results assessed further to establish a diagnosis and thus further care?

Materials and Methods

The study was conducted in the University of Malaya Medical Centre, Kuala Lumpur. It is a large, urban, teaching hospital serving as a secondary and tertiary referral centre in a densely populated area of Peninsular Malaysia.

During a 5-day period (8 - 12 January 2001), all inpatient wards with the exception of the obstetric labour ward (16 beds) and psychiatry wards (40 beds) were visited by the study team. Each ward was visited once only, so as to provide a 'snapshot' view of diabetes prevalence during the period chosen. All inpatient medical and nursing notes were reviewed and data was collected on a printed survey sheet. Clarification was occasionally sought from medical and nursing staff if information recorded in the clinical notes was unclear. The study team did not initiate any change in patient management. Information collected during the ward visit included basic

demographic data (e.g. name and age), the presence of known diabetes mellitus and admission diagnoses.

We examined the relationship of the admission diagnoses with diabetes among patients with known diabetes. Admissions for stabilisation of blood glucose, diabetic ketoacidosis, and hypoglycaemia were classified as directly related to diabetes. We classified a second group of admissions as being significantly related to diabetes. This included admissions for infections, large vessel disease (cardiovascular, cerebrovascular, and peripheral vascular diseases), foot ulcers and diabetic retinopathy in which the diabetic state and its control played a significant role in either the aetiology or the prognosis of the diagnosed condition. All other admissions were deemed unrelated to diabetes (e.g. fractures and malignancy).

Six weeks after the ward visit, we searched the hospital laboratory system for plasma glucose requests in all patients surveyed. We also searched for requests for HbA$_{1c}$, total cholesterol and urine protein analysis among patients with known diabetes mellitus on admission. If there was a result for HbA$_{1c}$ available in the 3 months preceding the date of admission, or results for serum cholesterol and urine protein in the 6 months preceding the date of admission, these results were considered as concurrent with the admission.

The clinical notes of patients in whom raised plasma glucose was recorded (arbitrarily defined as over 7.0 mmol/l) were examined to determine if these patients had a prior history of diabetes not recorded on the original ward survey. If there was no previous history of diabetes, we examined the clinical notes to determine if action had been taken in the form of further glucose testing or referral to the diabetes team.

Descriptive statistics were utilized with the help of the statistical program SPSS 10.0 for Windows (SPSS Inc., IL, USA).

Table I: Prevalence of diabetes by specialty

	Medicine	Surgery	Orthopaedics	O&G	Paediatrics	All
Total number of patients	185	88	72	72	74	491
Number of patients with diabetes	70	19	16	17	2	124
Prevalence of diabetes (%)	37.8	21.6	22.2	23.6	2.7	25.3

Note: Medicine includes intensive care unit (ICU) beds; surgery includes ENT, ophthalmology, neurosurgery, cardiothoracic surgery, plastic surgery and cardiac ICU beds.

Key: O&G - obstetrics and gynaecology

Table II: Prevalence (%) of diabetes mellitus among inpatients by age group and sex.

Age Group (years)		Male		Female
	n	Prevalence (%)	n	Prevalence (%)
10 - 19	29	3.4	15	6.7
20 - 20	25	8.0	39	15.4
30 - 39	25	0.0	39	35.9
40 - 49	26	23.1	32	15.6
50 - 59	34	52.9	37	35.1
60 - 69	31	54.8	26	65.4
70 - 79	20	35.0	28	32.1
80 - 89	8	37.5	13	30.8
90 - 100	1	0.0	3	33.3

Note: All inpatients with diabetes were over age 10 years

Table III: Frequency (%) of testing for HbA_{1c}, urine protein and serum total cholesterol in inpatients with diabetes by specialty.

	Medicine (n=70)	Surgery) (n=19)	Orthopaedics (n=16)	O&G (n=17)	Paediatrics (n=2)	All (n=124)
HbA_{1c}	51.4	42.1	37.5	70.6	100.0	51.6
Urine protein	72.9	78.9	62.5	76.5	100.0	73.4
Cholesterol	65.7	21.1	25.0	0.0	100.0	45.5

Results

During the study period, information was collected on a total of 491 inpatients (median age 43.5 years, range 2 days - 92.7 years; male 47.3%). Based on information recorded in the clinical notes, the overall prevalence of diabetes in all inpatients was 25.3%. The prevalence of diabetes was highest on the medical specialty wards and lowest on the paediatric wards (see Table I for details). Table II summarises the prevalence of diabetes by age and sex.

Among inpatients with diabetes (n=124), 10.5 % of admissions were due directly to diabetes. The majority of the patients in this group (7/13) were admitted for stabilization of glycaemic control either in association with pregnancy or marked osmotic symptoms. In a further 58.9% of inpatients with diabetes, glycaemic control was judged to be a significant factor in the pathogenesis or prognosis of the admission diagnoses.

Among all patients with known diabetes, only 51.6% had current HbA_{1c} results available on the hospital laboratory results system. A current result for total serum cholesterol and urine protein was available for 45.2 and 73.4% respectively. Patients on orthopaedic wards (n=16) were least likely to have their HbA_{1c} and urine protein measured (37.5 and 62.5% respectively) whilst patients on surgical wards (n=19) were least likely to have their serum cholesterol measured (21.1%). Table III summarises the frequency of requests for the 3 tests by the different medical specialties.

A laboratory plasma glucose result was available during the recorded admission in 64.3% of inpatients without diabetes (236/367). The proportion of patients with a laboratory plasma glucose result was greater among patients over age 40 years (81.8%). Forty two patients (17.8%) had a plasma glucose result of over 7 mmol/l. The clinical records for 8 of these patients were not available for review. Review of the clinical records of the other 34 patients with elevated plasma glucose showed no evidence of any attempt to refute or confirm a diagnosis of diabetes mellitus in 19 of the 34 patients.

Discussion

We found an overall prevalence of diabetes mellitus of 25.3% among our hospital inpatients, with a prevalence of 37.8% on medical specialty wards. As expected, in patients aged 50 - 70 years, the prevalence among inpatients rises to approximately 50%. Our figures demonstrate a higher prevalence of diabetes in females rather than males between the ages of 20 - 40 years, due to admissions with diabetes mellitus in pregnancy. In the majority of patients with diabetes (69.4%), diabetes was directly or significantly related to the admission diagnoses.

Our study did not examine the day to day management of inpatients with diabetes, but we examined the frequency of testing for HbA_{1c}, total serum cholesterol and urinary protein. Some patients may have had the same investigations done at other clinics and hospitals, and may have provided the current results to the clinicians caring for them, but clinical experience suggests that only a minority of patients have these results to hand. These 3 important factors heavily influence morbidity and mortality in diabetes, and the low rate of testing (other than in paediatric patients) is disappointing, especially among medical patients. We accept that in some patients these investigations may not have been appropriate due to the nature and severity of their illness (e.g. terminal cancer, life threatening traumatic injury), but a review of the recorded admission diagnoses would suggest that this is only true in a small minority of patients.

Specialists outside medicine and paediatrics, may contend that it is not their responsibility to screen patients for diabetic complications and overall glycaemic control, but these patients represent a major group on their wards (see Table I) and in many cases, good diabetes care influences prognosis. For many patients in Malaysia, outpatient diabetes care is fragmented with

intermittent clinic attendance at varying clinics, and an inpatient admission is a valuable opportunity to screen all patients with diabetes for complications and overall glycaemic control, with subsequent treatment, education, and specialty follow-up if required.

Our study also indicates that in many instances when an abnormal plasma glucose level is recorded, no comment is entered in the clinical notes or action taken to clarify the possible diagnosis of diabetes mellitus. We searched the clinical records of this particular group of patients with care, for clinical comment, evidence of bedside glucose monitoring, repeat laboratory plasma glucose requests or outpatient arrangements for glucose tests after discharge and full recovery. It may be argued that the study cut-off value for raised plasma glucose is too low at 7.0 mmol/l. A clinician may justifiably judge that with stress, illness and meals, an untimed laboratory plasma glucose level of over 7 mmol/l does not indicate diabetes. Ideally this should be noted in the clinical record. However, in some patients, further investigation may lead to the diagnosis of diabetes mellitus or the pre-diabetic stages of impaired fasting glucose and impaired glucose tolerance. Plans should be made to test fasting plasma glucose or perform an oral glucose tolerance test at a later stage, as the influence of illness, and untimed and unregulated food is difficult to ascertain.

This study has a number of inherent limitations. The study was designed to provide a 'snapshot' of diabetes prevalence in our hospital and collection of patient information was done over a limited period of time with a single visit to each ward. We accept that this may have been an atypical week but the period chosen did not coincide with any major public holidays or national events. Day to day management of patients was not examined, and additionally some patients may have been referred to the diabetes clinic on discharge with the assumption that a detailed evaluation would be carried out there.

We believe, however, that our results indicate that there is a clear need for improvement in our evaluation of patients with diabetes (or possible diabetes) during their inpatient stay. This might be achieved with:
1. Better continuing education of both medical and nursing staff,
2. The appointment of a 'link' nurse on each ward with a special interest in diabetes care who could provide support to the ward's medical and nursing staff and contact the diabetes care team if required, and/or
3. The appointment of a diabetes nurse advisor to oversee the diabetes management of all inpatients with diabetes in the hospital with expertise and experience to advise junior medical and nursing staff. This intervention in particular has been demonstrated to contribute to significant reductions in length of stay [6], improved control, and reduced rates of recurrent hospitalisation [7].

In conclusion, this study has detected a high overall prevalence of diabetes among inpatients in an urban Malaysian hospital across all specialties other than paediatrics. As many admissions are caused by or related to diabetes, good diabetes care is essential. Rates of testing for HbA_{1c}, proteinuria and hypercholesterolaemia, are in all specialties, disappointingly low. Effective measures to improve inpatient diabetes care are needed and should be evaluated.

Acknowledgements

ORIGINAL ARTICLE

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