Original Research Article

Clinico-social parameters of diabetes among patients utilizing emergency medical services

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ABSTRACT

Background: Diabetes mellitus (DM) is increasing in its potential in developing countries. Rise in diabetic patients calling emergency medical services (EMS) is expected. It calls for thorough assessment of patients with DM utilizing EMS. In the present study, was to assess magnitude of DM among patients utilizing EMS and its clinico-social parameters.
Methods: It was hospital record based observational study of patients calling EMS delivered by a tertiary care hospital in Pune, Maharashtra, India during 1st January 2013 to 31st December 2014. Patients with incomplete records were excluded. A person with medical background was trained to extract required information from hospital records. Patients with previously diagnosed DM were considered those who were on diet, oral hypoglycemic agents or taking insulin therapy and newly diagnosed patients with DM were considered those with the value of glycemia on admission >200 mg/dl in first 24 hours. Data analysis was done using SPSS 15.0 software.
Results: 45.8% (894/1951) were Patients with DM out of that 78.19% (699/894) were known to have DM while 28.81% (195/1951) were new cases of DM. 5.1% (100/1951) patients had uncontrolled DM. DM was significantly more in >60 years age group and in urban residents (p<0.001). Patients with DM were significantly more to have breathlessness, altered sensorium and dyspnoea as major purpose to call EMS (p<0.001, <0.001 and 0.045 respectively). Other co-morbidities in the form of Hypertension, other cardiovascular abnormalities, COPD, CKD and history of CVA were significantly more among Patients with DM (p<0.001, except for COPD, p=0.027).
Conclusions: There was a high burden of patients with DM on EMS. EMS teams should be well trained to diagnose and manage such emergencies. Mass awareness of screening for DM and its proper management will help to decrease such burden.

Keywords: DM, EMS

INTRODUCTION

DM is perhaps the most challenging public health problem.[1] Worldwide, its prevalence is 387 million (8.3%), predicted to increase 592 million by 2035.[2,3] Nearly, 77% persons with DM live in low and middle income countries. India has 92 million persons with DM, second to only China.[1,3,4] The International DM Federation estimated a doubling of population with DM between 1995 and 2005, and predicted 70 million persons with DM by 2025.[5]

DM mellitus is reaching potentially epidemic proportions in India. There is 72.3% increase in prevalence of DM in urban India from 1971 to 2008.[6] The level of morbidity and mortality due to DM and its potential complications

are enormous, and pose significant healthcare burdens on both families and society. Worryingly, DM is now being shown to be associated with a spectrum of complications and to be occurring at a relatively younger age within the country.[7] There is lot of progress done in EMS systems in India.[8] Government, public private partnerships and also purely private agencies offering emergency medical services (EMS) are on increase in India.

In the circumstances, when DM mellitus is reaching potentially epidemic proportions, it is essential to study its contribution and related factors among patients utilizing EMS in India. In this study we aimed to identify magnitude of DM among patients using EMS of Deenanath Mangeshkar Hospital and Research Centre (DMHRC), their diabetic status, various presentations and clinico-social parameters including co-morbidities. It will be helpful to existing and emerging EMS systems to get insight whether any modification is needed in management plan with logistic supplies in EMS for patients with diabetes.

METHODS

It was a hospital record based observational study. Patients called and utilized EMS of DMHRC during 1st January 2013 to December 2014 were recruited in the study. DMHRC is a private tertiary care hospital run by a trust. It is situated in urban area of Pune Municipal Corporation and has 3 ALS ambulances with well-trained emergency medical technicians. Patients with incomplete records were excluded. A person with medical background was trained to extract required information from Emergency Record (ER) sheets, intensive care unit (ICU) and ward records and discharge summaries of the patient. Patients' available socio-demographic information, purpose to call EMS, past history, co-morbidities, clinical assessment on initial examination, BSL/ HBA1C(Blood sugar Level or Haemoglobin A1C) reports if done were utilized to extract desired

information. Patients with previously diagnosed DM were considered those who were on diet, oral hypoglycaemic agents or taking insulin therapy. Newly diagnosed DM patients were considered those with the value of glycemia on admission above 200 mg/dl in first 24 hours who were not known previously to be diabetic.[9] Uncontrolled diabetes was defined by hospital conventions as Hypoglycemia among diabetic patients or hyperglycemia with or without complications like hyperosmolarity, diabetic ketoacidosis or hyperosmolar hyperglycemic non-ketotic coma. Co-morbidities like Chronic kidney disease (CKD), cardiovascular abnormalities including hypertension (CVS) were noted from documentation of past history of the patient.

Data were entered in Microsoft excel spreadsheet and imported in SPSS data editor for further analysis. Frequencies, proportions were enlisted for baseline characteristics. To test associations with DM, appropriate tests were used for qualitative variables and student's t test was used for quantiatative variables.

RESULTS

Hospital's EMS received 2375 calls in the study period. Out of which 187 have to be referred to other EMS because of unavailability of ambulances. 237 cases were excluded because of incomplete information. We analysed total 1951 patients utilizing hospital's EMS services.

Baseline characteristics of the EMS patients

56.3% (1099/ 1951) calls were received during 2013 and 43.7% (852/1951) were received during 2014. As shown in Table 1, majority (94.5%) of patients were from urban areas of Pune and within 15 kilometers of radius from the DMHRC. 37.6% (733/1951) were females, 62.4% (1218/1951) were males. Majority, (1928/1951) were Hindus.

Table 1: Some socio-demographic characteristics.

Characteristics		DM	No DM	Total	P value
Gender	Female	353 (48.2)	379 (51.8)	732 (100)	0.172
	Male	541 (44.4)	677 (55.6)	1218 (100)	
Age	>60 years	707 (58.8)	495 (41.2)	1202 (100)	<0.001
	<60 years	186 (24.9)	562 (75.1)		
Religion	Hindu	884 (45.9)	1044 (54.1)	1928 (100)	
	Muslims	7 (41.2)	10 (58.8)	17 (100)	
	Christians	2 (66.67)	1 (33.3)	3 (100)	
	Buddhist	1 (33.3)	2 (66.67)	3 (100)	
Residence	Urban	873 (46.79)	993 (53.21)	1866 (100)	P<0.001
	Rural	21 (24.71)	64 (75.29)	85 (100)	
Resident of Pune	Yes	865 (46.4)	999 (53.6)	1864 (100)	
Non-resident of Pune	No	29 (33.33)	58 (66.67)	79 (100)	

*P value is specified wherever appropriate.

Table 2: Chief complaints of patients with DM and non-Patients with DM.

Chief complaints		DM	No DM	Total	P value	OR
CVS related (Sweating, chest pain and / or palpitations)	Yes	111 (49.8)	112 (50.2)	223 (100)	0.208	
	No	783 (45.3)	945 (54.7)	1728 (100)		
Breathlessness	Yes	262 (54.4)	220 (45.6)	482 (100)	<0.001*	1.263 (1.142-1.397)
	No	632 (43.0)	837 (57.0)	1469 (100)		
GIT Related	Yes	110 (45.6)	131 (54.4)	240 (100)	0.952	
	No	785 (45.8)	926 (54.2)	1711 (100)		
Altered sensorium	Yes	429 (53.6)	372 (46.4)	801 (100)	<0.001*	1.325 (1.204- 1.457)
	No	465 (40.4)	685 (59.6)	1150 (100)		
Sudden Headache	Yes	2 (13.3)	13 (86.7)	15 (100)	0.012**	0.289 (0.080- 1.052)
	No	892 (46.1)	1044 (53.9)	1936 (100)		
High grade fever	Yes	72 (38.9)	113 (61.1)	185 (100)	0.048**	0.836 (0.693- 1.008)
	No	822 (46.5)	944 (53.5)	1766 (100)		
Seizures	Yes	55 (40.1)	82 (59.9)	137 (100)	0.167	
	No	839 (46.3)	975 (53.7)	1814 (100)		
GUT related	Yes	34 (52.3)	31 (47.7)	65 (100)	0.286	
	No	860 (45.6)	1026 (54.4)	1886 (100)		
Dyspnoea	Yes	50 (56.2)	39 (43.8)	89 (100)	0.045*	1.239 (1.025-1.499)
	No	844 (45.3)	1018 (54.7)	1862 (100)		

*Odds ratio (OR) is specified when association is significant.

DM among EMS patients

45.8% (894/1951) were Patients with DM out of which 78.19% (699/894) were known cases of DM while 28.81% (195/1951) cases DM was detected during transport by EMS or later on while investigations in ICU/ wards (Figure 1).
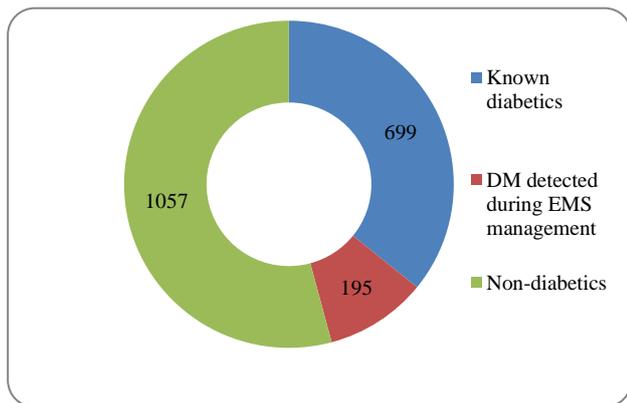
to 53.78 years (+ 24.721). DM was significantly more in >60 years age group and in urban residents (p<0.001) (Figure 1, Table 1). Similarly, there was increasing trend in the proportion of Patients with DM in each age group as age increased. (Table 2, Among patients with diabetes urban residents were significantly more than rural residents (Figure 2).
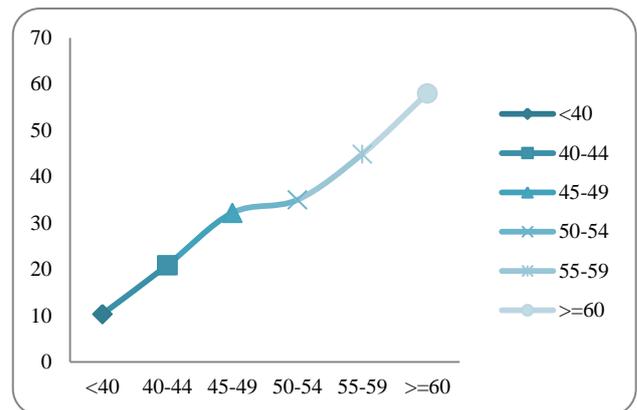

Figure 1: Distribution of study subjects according to DM status.

Figure 2: Percentage of patients with DM in different age groups.

Some socio-demographic characteristics of Patients with DM and non-Patients with DM

Subjects with DM were older than those without DM. Mean age of Patients with DM was 69.75 (+14.169) years while in -Patients without DM it was significantly lower

Uncontrolled DM

5.1% (100/1951) patients had definitive diagnosis of uncontrolled DM. 96/100 were known cases while 4/100 were diagnosed while investigations in EMS/ICU/ wards. Majority, 82/100, of them had altered sensorium as a

purpose to call EMS (p<0.001). 7/100 had BSL >300mg/dl, 66/100 had BSL <70 mg/dl, 6/100 had metabolic disturbances. 9/100 patients had DKA, 70/100

presented with hypoglycemia while none with hyperosmolar hyperglycemic non-ketotic coma (HONK).

Table 3: Other co-Morbidities in Patients with DM EMS patients.

Other co-morbidities		DM	No DM	Total	P value	OR
Hypertension	Yes	576 (68.0)	271 (32.0)	847 (100)	<0.001*	2.361 (2.129- 2.619)
	No	318 (28.8)	786 (71.2)	1104 (100)		
Cardiovascular abnormalities	Yes	289 (69.1)	129 (30.9)	418 (100)	<0.001*	1.752 (1.602- 1.915)
	No	605 (39.5)	928 (60.5)	1533 (100)		
COPD	Yes	56 (56.6)	43 (43.4)	99 (100)	0.027*	1.251 (1.045- 1.497)
	No	837 (45.2)	1014 (54.8)	1851 (100)		
Asthma	Yes	25 (52.1)	23 (47.9)	48 (100)	0.380	1.140 (0.865- 1.502)
	No	869 (45.7)	1033 (54.3)	1902 (100)		
CVA	Yes	66 (62.9)	39 (37.1)	105 (100)	<0.001*	1.401 (1.2-1.637)
	No	828 (44.9)	1018 (55.1)	1846 (100)		
CKD	Yes	48 (69.56)	21 (30.44)	69 (100)	<0.001*	1.547 (1.313- 1.822)
	No	846 (44.98)	1035 (55.02)	1881 (100)		
Hormonal disorders (Graves disease, hyper or hypothyroidism)	Yes	21	19	40 (100)	0.481 (LR)	
	No	873 (45.7)	1038 (54.3)	1911 (100)		
Psychiatric disorders	Yes	3 (60.0)	2 (40.0)	5 (100)	0.359	
	No	891 (45.8)	1055 (54.2)	1946 (100)		
Malignancy	Yes	55 (38.7)	87 (61.3)	142 (100)	0.078	
	No	839 (46.4)	970 (53.6)	1809 (100)		
Neurological disorders	Yes	59 (49.6)	60 (50.4)	119 (100)	0.392	
	No	833 (45.5)	996 (54.5)	1829 (100)		
Infectious diseases	Yes	25 (46.3)	29 (53.7)	54 (100)	0.944	
	No	869 (45.8)	1028 (54.2)	1897 (100)		

*Odds ratio (OR) is specified when association is significant.

Chief complaints of Patients with DM and without DM

Significantly more Patients with DM had breathlessness (54.4% vs 43%), altered sensorium (53.6% vs 40.4%) and dyspnoea (56.2% vs 45.3%) (p<0.001, <0.001 and 0.045 respectively) (Table 2).

Other Co- Morbidities in Patients with DM

Other co-morbidities in the form of Hypertension, other cardiovascular abnormalities (define), COPD, CKD and history of CVA were significantly more among Patients with DM (p<0.001, except for COPD, p=0.027) (Table 3).

DISCUSSION

Prevalence of DM in India in general population that reported 18.6% in 1991 and it increased by 72.3% in urban India from 1971 to 2008.[6] Recent studies from urban areas report it upto 30-50%.[10,11] Present study reports prevalence of DM as 45.8% among EMS patients. Significantly more (p<0.001) population was from urban

area as hospital is situated at the centre of affluent area of the city which is at greater risk of DM due to major lifestyle changes, migration , inadequate awareness.[12]

In present study 64.38% (1256/1951) EMS patients were >60 years old. We noted greatest number of EMS patients with DM were also >60 years (81.64%, 729/ 893). It was followed by 40-59 year age group (14.562%, 130/893). It may be because of the fact that this age group has already more prevalence of DM and is more prone for emergencies or to call EMS for transport.

In view of increasing number of elderly in India, EMS systems should expect increasing number of elderly that too with DM to call them for emergency transport and treatment. But, younger age group is also on increase for the same due to shift in age of onset of DM to younger age groups especially in developing countries. Asian Indian phenotype and peculiar genetic composition are the major predisposing factors for this shift.[13] Epidemiological transition, economic boom, physical inactivity, trendy dietary patterns and environmental factors also add to this risk.[14] In the coming decade,

scenario of DM will be worsened and the greatest numbers of people with DM are expected between 40 and 59 years of age.[15]

The WHO-ICMR national NCD risk factor surveillance study reported an overall frequency of self-reported DM of 4.5% with urban population scoring higher (7.3%), over the rural areas (3.1%).[16] In this study, sample drawn was from general population. As it was hospital based study, we noted much higher self-reporting of DM. 78.19% (699/894) Patients with DM reported DM but 28.81% (195/1951) Patients with DM did not. These patients would have been diagnosed much earlier if screened for DM as bulk (72.31%, 141/195) of them was in the age group of > 60 years.

Because of ongoing microvascular and macrovascular damages, Patients with DM have variety of severe as well as chronic complications that contribute to decrease in life expectancy. Co-morbid conditions like heart disease, stroke, kidney failure, blindness are common in Patients with DM, hypertension is the commonest.[17] Joshi SR reported 60% of Patients with DM had Hypertension, 30% had CKD in urban parts of Chennai.[10,18] We found 64.43% Patients with DM had Hypertension, 5.37% had CKD. Accordingly, significant symptoms were noted among Patients with DM as breath lessness (54.4% vs 43%), altered sensorium (53.6% vs 40.4%) and dyspnoea (56.2% vs 45.3%) (p<0.001, <0.001 and 0.045 respectively) (Table 2).

Other co-morbidity that was significantly more in EMS patients with DM than patients with no DM' was COPD. Incidence of COPD and type 2 DM increase with age. COPD was significantly associated with Patients with DM in our study also, but not asthma (Table 2). Nurses' health study carried out on 30-55 year old nurses (1988-1966) reported COPD may be a risk factor for developing type 2 DM but not asthma. It may be due to differences in the inflammation and cytokine profile between COPD and asthma. Increasing evidence now points toward a role of proinflammatory cytokines such as C-reactive protein (CRP), interleukin (IL)-6, and tumor necrosis factor (TNF)-α in the pathogenesis of insulin resistance and type 2 DM that are increased in COPD, but not in asthma specially CRP.[19,20]

DM to be one of the seven major controllable risk factors for cardiovascular disease. American Heart Association reports 68% elderly with DM have some form of heart disease; and 16% die of stroke. 21 Cardiovascular abnormalities and history of CVA were significantly more (p<0.001) in EMS patients with DM. As though our sample was not restricted to elderly, cardio-vascular abnormalities were lower (32.33%) than what AHA reports (68%). Similarly, much lower proportion (7.38%) than expected had history of CVA.

5.1% of EMS patients with DM had uncontrolled DM and obviously majority of them had altered sensorium as

main purpose to call EMS. Identification and management of such emergency in DM is important to prevent mortality. Diabetic ketoacidosis, hyperosmolar hyperglycemic state and hypoglycemia are the three major life-threatening complications encountered in patients with DM.[22] The patient with altered mental status and high blood sugar typically need administering fluids and, in the EMS patient, establishing an intravenous line and administering a bolus (250cc or 500cc are common amounts) of normal saline is utmost important.[23] 4/100 patients with uncontrolled DM did not give history of DM emphasizes importance of simple investigation like BSL during EMS.

CONCLUSION

As it was hospital record based study we could not get detail history about DM in terms of duration, management, adherence to medications and diet, periodically done blood sugar levels. All these factors, influence presentation and outcome of present episode of emergency. A separate study design is needed to study these factors.

In view of epidemic potential of DM, much higher and increasing proportion of patients calling EMS is expected to have DM and related complications. Study is also helpful for agencies providing EMS services particularly for the management of patients with DM. Installing DM assessment during the call, maintaining blood sugar measuring devices in functional status, initiation of the other investigations and treatment for hypo/hyperglycemia and metabolic abnormalities during transportation and to keep eye on logistic supplies are important aspects of preparedness to handle patients with DM by EMS. Emergency medical teams should be adequately trained to identify and start management of such emergencies with a standard protocol to be followed.

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