

Myocardial infarction and thrombolysis: a comparison of the Indian and European populations on a coronary care unit

ABSTRACT—We reviewed the ward admission notes of 211 Indian and 192 European patients admitted over a period of 12 months to a coronary care unit. More Indian patients had myocardial infarctions (34% vs 27%, $p < 0.05$); they were more likely to have diabetes mellitus (47% vs 14%, $p < 0.001$), but less likely to smoke (19% vs 67%, $p < 0.001$). Fewer Indian patients were treated with thrombolysis (49% vs 80%, $p < 0.001$), late presentation being the principal reason (62% vs 40%, $p < 0.05$). The referral rates for exercise stress testing and cardiac catheterisation were not significantly lower for Indian patients. The Indian patient admitted into a coronary care unit is more likely to have had a myocardial infarction and yet less likely to receive care comparable to that of his European counterpart.

Patients from the Indian subcontinent are at greater risk from ischaemic heart disease [1–5] and diabetes mellitus [6,7] than their European counterparts. Concern has arisen over the number of Indian patients referred for coronary catheterisation, with a recent study showing significant delay in referral [8]. We reviewed the Indian patients admitted to our coronary care unit (CCU) to see if they over-represented inpatients with myocardial infarction (MI) and whether they received comparable treatment (in particular thrombolysis).

Method

We performed a retrospective analysis of Indian and European patients admitted over a period of 12 months using the ward admissions book of the CCU at a university teaching hospital (but without an accident and emergency department). The following details were documented from the patients' notes: age; gen-

der; risk factors; admission blood glucose; location of MI; time to peak creatine kinase rise; whether the history was 'typical' or not; whether thrombolysis was given; the reason for non-thrombolysis; complications; rate of referral for exercise tolerance test (ETT) and coronary catheterisation; and mortality.

An MI was defined as evolving electrocardiographic (ECG) changes with ST elevation, and a threefold elevation in creatine kinase. A typical history was defined as a constant, crushing, central chest pain radiating to the arms or jaw, with associated sweating, nausea or vomiting.

At the time of the study, the indication for thrombolysis (usually streptokinase) was chest pain of less than six hours' duration, or the presence of continuing pain at admission suggestive of an evolving MI (however long the pain had been present).

The statistical significance of differences was assessed with the chi-squared test with Yates's correction.

Results

We assessed 211 Indian and 192 European patients. In both groups 65% were men. Mean age of the Indian patient was four years younger, but this was statistically not significant.

Table 1 shows the proportion of patients who had had an MI. There were significantly more Indian patients (72 (34%) vs 51 (27%), $p < 0.05$).

Table 2 shows the diagnoses of the other patients. The main finding was that the Indian patient was more likely to be diagnosed as having non-specific/non-cardiac chest pain (22% vs 6%, $p < 0.001$). The European patient was four times as likely to be admitted with atrial fibrillation (16% vs 4%, $p < 0.001$).

Table 3 shows the risk factors for ischaemic heart disease. Almost half the Indian group had diabetes mellitus, significantly more than the other group of patients (47% vs 14%, $p < 0.001$); and the female Indian patient was nearly twice as likely as her male counterpart to have diabetes mellitus (73% vs 38%, $p < 0.001$).

The European patient was much more likely to have a history of smoking (67% vs 19%, $p < 0.001$); however, there was no difference in the prevalence of hyperlipidaemia.

Table 4 lists the characteristics of the MIs in both groups. Fewer Indian patients were treated with

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Table 1. Patients with myocardial infarctions

	Indian patients			Non-Indian patients		
	Men	Women	Total	Men	Women	Total
Total number	137* (65)	74 (35)	211	125 (65)	67 (35)	192
MIs	53 (39)	19 (26)	72 (34)	38 (30)	13 (19)	51 (27)†
Non-MIs	84 (61)	55 (74)	139 (66)	87 (70)	54 (81)	141 (73) ns

*Percentages within parentheses (to nearest integer)

† $p < 0.05$

ns = not significant

Table 2. Diagnoses of non-MI patients

	Indian patients			Non-Indian patients		
	Men	Women	Total	Men	Women	Total
Atrial fibrillation	4 (5)*	2 (4)	6 (4)	12 (14)	10 (19)	22 (16)**
Angina	30 (36)	24 (44)	54 (39)	31 (36)	22 (41)	53 (38) ns
Cardiac failure	6 (7)	2 (4)	8 (6)	10 (11)	1 (2)	11 (8) ns
Non-specific/ non-cardiac pain	18 (21)	13 (24)	31 (22)	4 (5)	4 (7)	8 (6)**
Musculo-skeletal pain	9 (11)	4 (7)	13 (9)	8 (9)	2 (3)	10 (7) ns
Arrhythmias ††	9 (11)	3 (5)	12 (9)	8 (9)	6 (11)	14 (10) ns
Pericarditis	2 (2)	0	2 (1)	5 (6)	1 (2)	6 (4) ns
Pulmonary embolism	0	2 (4)	2 (1)	1 (1)	2 (4)	3 (2) ns
Pneumonia	0	1 (2)	1 (0.5)	5 (6)	2 (4)	7 (5)†
Gastrointestinal	4 (5)	4 (7)	8 (6)	1 (1)	2 (4)	3 (2)†
Others	2 (2)	0	2 (1)	2 (2)	1 (2)	3 (2) ns

*Percentage of total non-MI patients within parentheses

† $p < 0.02$

** $p < 0.001$

††Arrhythmias include Stokes Adams attacks, supra-ventricular tachycardia, ventricular tachycardia, bradyarrhythmias, and complete heart block

ns = not significant

Table 3. Risk factors for myocardial infarction

	Indian patients			Non-Indian patients		
	Men	Women	Total	Men	Women	Total
MIs	53	19	72	38	13	51
Mean age (years)	61	64	62.5 (33–78)*	63	70	66.5 (35–93)
Diabetes mellitus	20 (38)†	14 (73)	34 (47)	5 (13)	2 (15)	7 (14)**
Smoking history	14 (26)	0	14 (19)	26 (68)	8 (62)	34 (67)**
Hypertension	16 (30)	5 (26)	21 (29)	11 (29)	5 (38)	16 (31) ns
Hyperlipidaemia	0	1 (5)	1 (1)	1 (3)	0	1 (2) ns

*Age range (years)

†Percentage of total MI patients within parentheses

** $p < 0.001$

ns = not significant

Table 4. Characteristics of myocardial infarction

	Indian patients			Non-Indian patients		
	Men	Women	Total	Men	Women	Total
MIs	53	19	72	38	13	51
Typical history	23 (43)*	9 (47)	32 (44)	27 (71)	7 (54)	34 (67)**
Location:						
Anterior MI	30 (57)	10 (53)	40 (56)	18 (47)	9 (69)	27 (53) ns
Inferior MI	23 (43)	9 (47)	32 (44)	20 (53)	4 (31)	24 (47) ns
Time to peak CK elevation:						
24 hours	42 (79)	11 (58)	53 (74)	27 (71)	10 (77)	37 (73) ns
48 hours	4 (8)	6 (32)	10 (14)	6 (16)	1 (8)	7 (14) ns
72 hours	7 (13)	2 (11)	9 (13)	5 (13)	2 (15)	7 (14) ns
Glucose > 8 mmol/L	26 (49)	10 (53)	36 (50)	16 (42)	8 (61)	24 (47) ns
Treated with thrombolysis	28 (53)	7 (37)	35 (49)	31 (82)	10 (77)	41 (80)††
Reason for non-thrombolysis:						
Too late	15 (6)***	8 (67)	23 (62)	4 (57)	0	4 (40)†
Contraindications	6 (24)	2 (17)	8 (22)	3 (43)	2 (67)	5 (50)**
Missed diagnosis	4 (16)	2 (17)	6 (16)	0	1 (33)	1 (10)ns

*Percentage of total MI patients within parentheses

† $p < 0.05$

** $p < 0.02$

†† $p < 0.001$

*** % of non-thrombolysed patients within parentheses

ns = not significant

thrombolysis (49% vs 80%, $p < 0.001$), a large proportion of the non-thrombolysed group presenting too late for treatment (62% vs 40%, $p < 0.05$). The principal reasons for non-thrombolysis in the European group were specific contraindications (50% vs 22%, $p < 0.02$). Indian patients were also more likely to have an atypical history (56% vs 34%, $p < 0.01$). There were no differences between the groups regarding the location of the MI, time to reach peak CK elevation, and hyperglycaemia on admission.

Table 5 shows the complications and referral rates for the patients with MIs. A larger proportion of Indian patients had post-infarct arrhythmias and died, and fewer were referred for ETT and coronary catheterisation, but none of these differences reached statistical significance.

Table 6 demonstrates a comparison of atypical and typical histories for patients who had had an MI. Patients with a typical history, whether Indian or European, were more likely to be treated with thrombolysis (but not to statistical significance); however, an Indian was less likely to have thrombolysis than his European counterparts, whether he had a typical or atypical history (60% vs 88%, $p < 0.001$, and 40% vs 65%, $p < 0.02$). Diabetes mellitus contributed towards an

atypical history in the European but not the Indian patient (35% vs 3%, $p < 0.001$, and 40% vs 56%, ns). Of the Indian patients who presented too late for thrombolysis, as many had a typical history as an atypical history.

Discussion

The Indian patient is more likely to have had an MI than a European patient admitted to the same CCU, and yet only half (49%) were treated with thrombolysis, compared with most Europeans (80%).

There are several reasons for this. The most important is late referral. The frequency of the atypical history (56% vs 33%, $p < 0.01$) might be thought to be the obvious explanation for this, but as many of the late presentation group had typical as atypical histories (61% vs 63%, ns). The sequence of events leading to admission often was not documented, and we could not ascertain whether diagnoses were being missed in the community (and hence patients referred late), or the Indian community had a different threshold for calling for help when one of its members has an MI.

The difference between typical and atypical pain has previously been documented [5]. In Indians this is not

Table 5. Complications and referral rates for myocardial infarction

	Indian patients			Non-Indian patients		
	Men	Women	Total	Men	Women	Total
Left ventricular failure	23 (43)*	11 (58)	34 (47)	16 (42)	7 (54)	23 (45) ns
Ventricular septal defect	1 (2)	0	1 (1)	0	0	0 ns
Arrhythmia	12 (23)	2 (11)	14 (19)	5 (13)	1 (8)	6 (12) ns
Angina	1 (2)	1 (5)	2 (3)	1 (3)	0	1 (2) ns
Pericarditis	3 (6)	0	3 (4)	2 (5)	0	2 (4) ns
Death	10 (19)	3 (16)	13 (18)	4 (11)	2 (15)	6 (12) ns
Referral rate:						
ETT	17 (32)	2 (11)	19 (26)	18 (47)	2 (15)	20 (39) ns
Cardiac catheterisation	11 (21)	3 (16)	14 (19)	10 (26)	4 (31)	14 (28) ns

*Percentage of total MI patients within parentheses

ns = not significant

Table 6. Comparison of atypical and typical histories for patients with myocardial infarction

	Indian patients			Non-Indian patients		
	Atypical history	Typical history	Difference	Atypical history	Typical history	Difference
Total number	40	32	ns	17	34	
Diabetes mellitus	16 (40)*	18 (56)	ns	6 (35)	1 (3)	$p < 0.001$
Smoking history	9 (23)	12 (38)	ns	11 (64)	23 (60)	ns
Location:						
Anterior MI	24 (60)	16 (50)	ns	9 (53)	18 (52)	ns
Interior MI	16 (40)	16 (50)	ns	8 (47)	16 (48)	ns
Time to peak CK elevation:						
24 hours	29 (73)	24 (75)	ns	12 (71)	25 (74)	ns
48 hours	7 (18)	3 (10)	ns	3 (18)	4 (11)	ns
72 hours	4 (10)	5 (16)	ns	2 (12)	5 (17)	ns
Thrombolysis	16 (40)	19 (60)	ns	11 (65)	30 (88)	ns
Non-thrombolysis	24 (60)	13 (41)	$p < 0.05$	6 (35)	4 (12)	$p < 0.001$
Reason for non-thrombolysis:						
Too late	15 (63)†	8 (61)	ns	3 (50)	1 (25)	ns
Contraindications	4 (17)	4 (31)	ns	2 (40)	3 (75)	ns
Missed diagnosis	5 (21)	1 (10)	ns	1 (10)	0	ns

*Percentage of total population with either atypical or typical history (within parentheses)

†Percentage of non-thrombolysed patients within parentheses

ns = not significant

due to diabetes as more of them with diabetes gave a typical history than an atypical one (56% vs 40%, ns); this contrasts with the European group where diabetes contributes towards an atypical history. We looked for any association with an atypical history to aid the general practitioner or hospital doctor to diagnose an MI

in an Indian patient (Table 6), but the only significant difference was the non-thrombolysis rate. We found no helpful factors in the Indian group, but diabetes mellitus was an important guide in the atypical presentation of the European patient.

It was not surprising that there were diverse diag-

noses at discharge from CCU, and it is noteworthy that the Indian patient is almost four times as likely to have a diagnosis of non-specific/non-cardiac pain: this may represent communication difficulties causing the diagnosis to be missed. The higher rate of diabetes mellitus and lower rate of smoking have been shown previously, but the greater prevalence of atrial fibrillation among Europeans was surprising, particularly as they have a lower incidence of ischaemic heart disease.

The non-statistical differences of increased arrhythmias and deaths and fewer referrals for ETT and coronary catheterisation may indicate that a larger study may be necessary to confirm these differences. The former two differences may reflect non-thrombolysis, but the latter two suggest inequalities in health care.

The findings of this study are disturbing. The Indian patient with an MI is more likely to have diabetes mellitus, present with an atypical history, be referred late to CCU, and is less likely to be treated with thrombolysis. Health education of the Indian community may be beneficial in encouraging them to present earlier with chest pain (25% with a typical history of an MI presented after six hours, compared with 3% of the European group), and the medical practitioner needs to watch out for the Asian patient with chest pain, particularly if he has diabetes mellitus.

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