

HOSPITAL MORTALITY IN MYOCARDIAL INFARCTION

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The World Health Organisation (1969) reported that ischaemic heart disease has reached enormous proportions, striking more and more at younger subjects. It was claimed that in the coming years, it will result in the greatest epidemic mankind has faced unless this trend is reversed by concentrated research into its cause and prevention. A Mayo Clinic study of the Rochester population of 30,000 in which there is a 73% necropsy rate, showed that coronary heart disease was the cause of death in 4 out of 10 men and in 2 out of 10 women (Spiekerman *et al.*, 1962). In Malta deaths from ischaemic heart disease in the years 1968 and 1969 accounted for 19% of all deaths. It is moreover the general impression amongst Maltese physicians that the incidence of ischaemic heart disease is increasing.

Acute myocardial infarction is an extremely common emergency in general hospitals with a high incidence of acute medical admissions. It is now generally agreed that the introduction of coronary care units, by providing facilities for early detection of arrhythmias and emergency resuscitation, has contributed substantially to lower the hospital mortality from myocardial infarction. In the absence of such a unit, the usual hospital mortality is in the region of 30%. The purpose of this paper is to review the cases of myocardial infarction admitted into a medical unit of St. Luke's Hospital in the years 1968 and 1969 as well as to assess the factors affecting the hospital mortality in this group of patients.

Material

One hundred and thirtyfour patients with myocardial infarction were admitted into the unit. The diagnosis was considered established if (1) pathological Q waves appeared on the electrocardiogram, accompanied by an elevation in the S-T segment and a subsequent inversion in the T wave, or (2) there were changes in the S-T segment and T wave suggestive of infarction or there was bundle branch block accompanied by a significant and transient rise in the serum aspartate aminotransferase.

Most of the patients received oxygen for the first 48 hours. Pain was relieved by intramuscular injection of 100 mgm. pethidine or 15 mgm. morphine sulphate. In patients with very severe pain, intravenous morphine sulphate was sometimes resorted to. Anticoagulants were not routinely given. They were used in male patients under the age of 50 and in those patients with associated atrial fibrillation, congestive heart failure or evidence of venous thrombosis; intravenous heparin was used in the first 48 hours, whilst oral phenindione in 1968 and warfarin in 1969 were given on admission and continued for 6 weeks, the dose being adjusted to give a prothrombin ratio of 2-2.5/1. Thirtysix per cent of the patients had in fact received anticoagulants. Left ventricular failure was treated with digoxin and diuretic therapy; and in the absence of pacing facilities, steroids in doses of 60 mgm. daily were started on the development of 2nd degree heart block or complete heart block.

Results

The age and sex distribution of the patients are shown in *Table I*. The age of the patients ranged from 28 years to 82 years. There were 103 men with an average age of 58 years, whilst the mean age for the 31 women was 65 years.

TABLE I
Age & Sex of Patients

Age: (Yrs.)	Men		Women	
	1968	1969	1968	1969
20 - 30	—	1	—	—
31 - 40	3	3	—	—
41 - 50	9	14	1	1
51 - 60	16	16	2	7
61 - 70	13	16	5	4
71 - 80	3	7	5	5
80 -	—	2	1	—
Total:	44	59	14	17
Average age:	58 yrs.		65 yrs.	

As determined by the electrocardiogram, there were 67 cases of anterior infarction, two of these combined with posterior infarction. Fortythree myocardial infarcts were posterior and 24 intramural and subendocardial (*Table II*). In the whole group, there were 2 cases of acute complete heart block associated in one case with anterior infarction and in the other with posterior infarction.

TABLE II
Site of Infarction

Anterior	67
Posterior	43
Intramural & Subendocardial	24

Chest pain with or without shock was the presenting feature in 115 cases (85%). Heart failure was the presenting symptom in 15 cases and syncope in 4 (*Table III*). The patients presenting with heart failure had a mean age of 67 years as compared

TABLE III
Mode of Onset

1. Chest Pain	—	115 cases
2. Syncope	—	4 cases
3. Heart Failure	—	15 cases

TABLE IV
Incidence of previous infarction

First	—	114
Second	—	19
Third	—	1

to 60 years for the whole group. There was a history of previous myocardial infarction in 19 patients; in one instance, the episode which necessitated hospital admission was the third myocardial infarct (*Table IV*). Thirtyeight patients gave a history of hypertension. There were on the other hand 28 diabetic patients. In 2 patients, diabetes was first recognised at the time of the myocardial infarct (*Table V*).

TABLE V
Associated Diseases

I Hypertension

30 out of 103 male patients
8 out of 31 female patients

II Diabetes Mellitus

16 male patients
14 female patients

One of each sex diagnosed at time of infarction.

The time of admission into hospital after the onset of chest pain was worked out in 111 patients. Thirtyone per cent of the patients were in hospital within 6 hours of the onset of pain whilst 74% were admitted within 24 hours (*Table VI*). Two patients developed myocardial infarction in hospital whilst receiving treatment for other conditions.

The monthly distribution of cases admitted to the unit as shown in *Fig. 1*. The highest admission rate occurred from May to July. The mortality rate for the period or admission to hospital was 19.4%. The time of death in the 26 pa-

TABLE VI
Time of admission after onset of pain

Time (hrs.)	No.
0 - 6 hrs.	34
7 - 12 hrs.	25
13 - 24 hrs.	24
25 - 48 hrs.	14
48 hrs. +	14

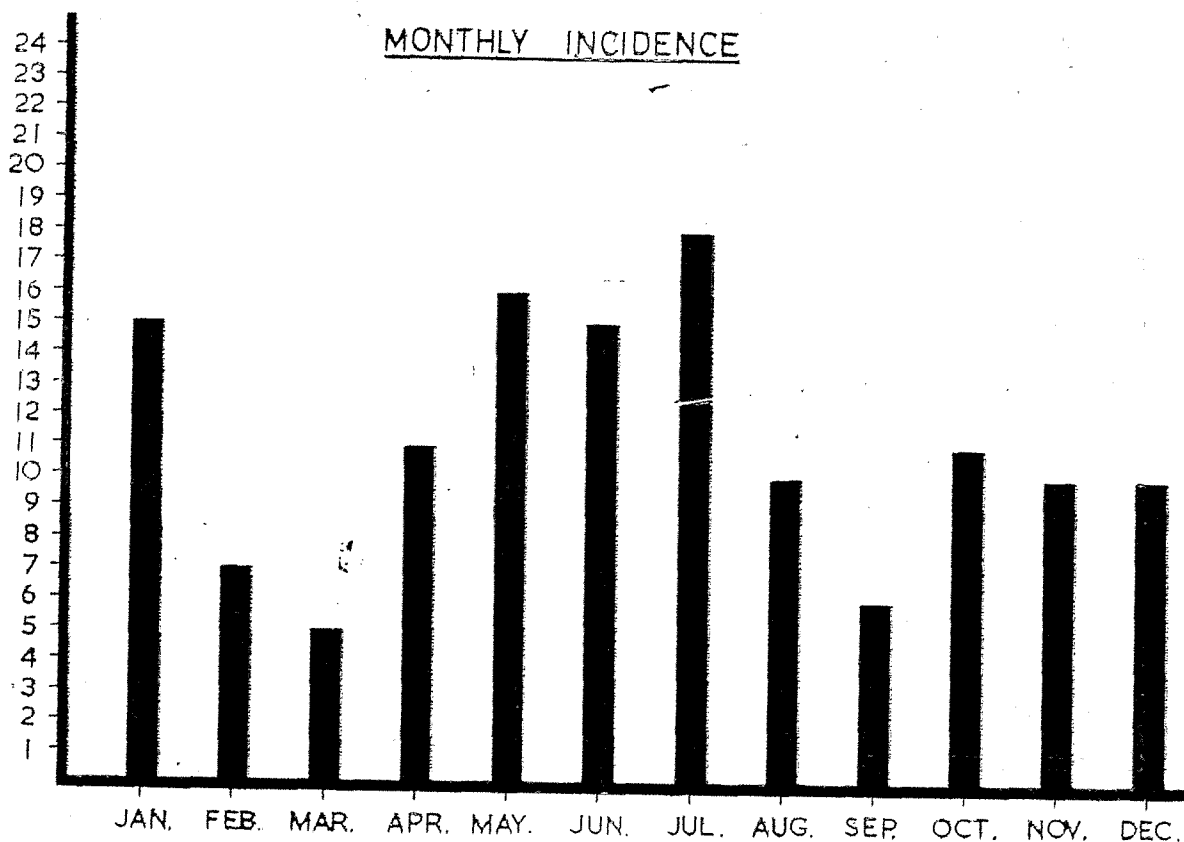
tients is shown in *Fig. II*. Nine of the 26 deaths occurred within the first 24 hours and by 48 hours 15 deaths had taken place with an additional 6 deaths during the remainder of the first week. The average age of the 18 fatal male cases (mortality 17.5%) was 61 years compared to 68 years for the 8 female patients (mortality 26%).

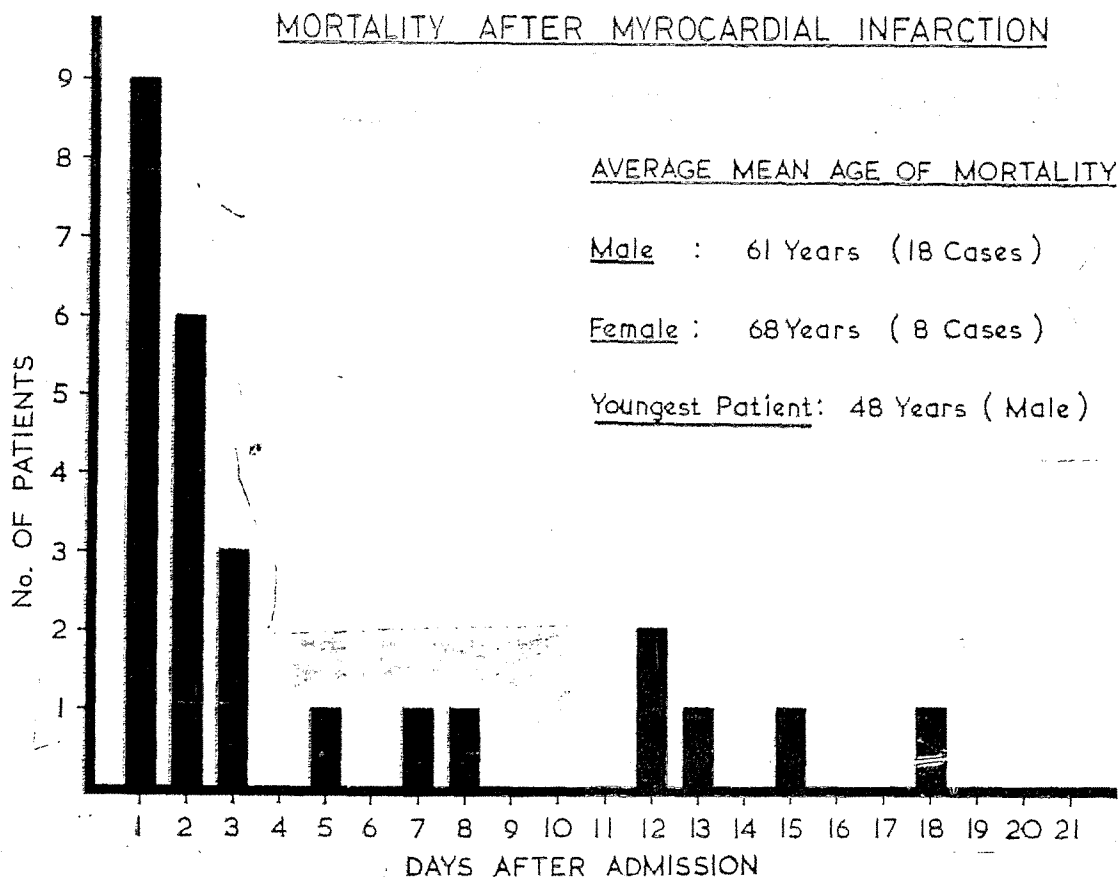
Discussion

A number of factors influence the prognosis in myocardial infarction. It has long been realised that such factors

as shock, heart failure, arrhythmias, previous infarction, diabetes mellitus and hypertension as well as the age and sex of the patients influence the prognosis. (Honey and Truelove, 1957). It has been established that diabetes mellitus is prevalent in Malta and that it is of the obese middle-age onset type (Zammit Maempel, 1965). A recognised feature of ischaemic heart disease is the unusually high proportion of women affected. This is reflected in the fact that 45% of the female patients as compared to 15.5% of the males were diabetic. It has moreover been suggested that among diabetics with long-standing disease, a higher prevalence of ischaemic heart disease exists in late onset mild diabetics than in early onset insulin dependent subjects who had attained the same age group (Weaver *et al.*, 1970).

Hospital mortality from myocardial infarction, irrespective of the presence or absence of coronary care facilities, is in-





fluenced by such factors as the average age of the hospital coronary patient population and the speed of admission. The effect of age grouping in mortality has been recognised (Honey and Truelove, 1957). As a matter of fact, the mortality of some American county hospitals (Griffith *et al.*, 1962) with a relatively older group of patients was higher than that in the Veteran hospitals (Beard *et al.*, 1960) where the patients are younger. This rise in mortality with increasing age is demonstrable in this study.

Another important factor is the time of admission after onset of symptoms. A high proportion of patients admitted during the first few hours of the illness, when the risk of death is greatest, will increase the overall mortality, whereas admitting patients several hours after infarction produces a lower mortality during the period of admission (Lown *et al.*, 1967).

Indeed 40% of deaths from acute myocardial infarction occur within 1 hour of the onset of symptoms (McNally and Pemberton, 1963); whilst in men of middle-age and younger, 63% of deaths occur within 1 hour (Bainton and Peterson, 1963). In Edinburgh, the mortality of cases admitted after 12 hours was 11% as compared to 19% in those admitted within 4 hours (Lawrie *et al.*, 1967). This is reasonable for cardiac arrhythmias, which are most frequent soon after the infarct, and are a common cause of death within a few hours of the myocardial infarct. In fact Stock *et al.*, (1967) found an overall incidence of arrhythmias in 76% of patients. Indeed it was the appreciation of the high incidence of arrhythmias during the first 48 hours of myocardial infarction and the improved techniques of resuscitation that led to the creation of coronary care units. There is no doubt that the main contribution of

these units to the lowering of the hospital mortality from myocardial infarction from 30% to an average of 15-18%, has been the prevention of the arrhythmic deaths.

The mortality from myocardial infarction in various hospitals prior to the establishment of coronary care units has varied from 26% to 52% (Honey and True-love, 1957; Beard *et al.*, 1960; Griffith *et al.*, 1962; Brown *et al.*, 1963; Restieaux *et al.*, 1967; Norris *et al.*, 1968; Herndorn, 1969; Hofvendahl *et al.*, 1969; Bloomfield *et al.*, 1970). The mortality in the present series was 19.4%. This wide range of difference in mortality must surely reflect differences in the age of patients and speed of admission into hospital rather than differences in the standard treatment. In Hofvendahl's series, where the hospital mortality was 35%, the average age of male and female patients was 67 years and 71 years respectively as compared to 58 years for Maltese male patients and 65 years for Maltese female patients. Moreover 55% of the Swedish patients were in hospital within 6 hours of onset of symptoms as compared to 31% of the Maltese patients.

All studies on myocardial infarction have confirmed the fact that most of the hospital deaths occur in the first 48 hours. In the present series, 34.6% of all deaths occurred in the first 24 hours; this is very similar to the figure of 31% found by Norris *et al.*, (1968) in New Zealand. Results of attempted resuscitation in cases of cardiac arrest after myocardial infarction in general medical wards are poor when compared to ones obtained in coronary care units. Survival rates in general medical wards have varied from 5% to 10% (Nachlas and Miller, 1965; Stennler, 1965; McNicol, 1966); in the present study it was 5%. However in coronary care units, there is a 40% to 54% survival rate (Julian *et al.*, 1964; Day, 1965). Wherever coronary care units have been introduced, the mortality from acute myocardial infarction has been halved. Moreover in Belfast since mobile coronary care units have been introduced in order to put myocardial infarction patients as quickly as possible under coronary unit facilities, the

mortality has fallen to 11% (Pantridge, 1970).

Studies from different parts of the world have demonstrated the value of coronary care units for acute myocardial infarction in hospital patients; and there is no doubt that our mortality would have been lower had such facilities been available. However an interesting development has been the suggestion by Mather (1970) that mortality from myocardial infarction in patients treated at home may not be higher than in those treated in hospital. In fact, his mortality for patients treated at home was 11%. He went on to suggest that home care was suitable for many patients. However hospital care would always be needed for those patients with arrhythmias and those where home care is not possible. In view of the cost involved in treating *all* patients with myocardial infarction in coronary care units, it is very important that the Bristol findings be confirmed by further studies. Malta with its small size and stable population, is an ideal setting not only for establishing an ischaemic heart disease register but also for a comparative study of the value of home and hospital care in acute myocardial infarction.

References

- BAINTON, C.R., PETERSON, D.R. (1963). *New Eng J. Med.*, 268, 569.
- BEARD, O.W., HIPP, H.R., ROBINS, M., TAYLOR, J.S., EBERT, R.V. and BERAN, L.G. (1960). *Am. J. Med.*, 28, 871.
- BLOOMFIELD, D.K., SLOKA, J., VOSSLER, S. and EDELSTEIN, J. (1970). *Chest*, 57, 224.
- BROWN, K.W.G., MACMILLAN, R.L., FORBATH, N., MELGRANO, F. and SCOTT, J.W. (1963). *Lancet*, 2, 349.
- DAY, H.W. (1965). *Amer. J. Cardiol.*, 15, 51.
- GRIFFITH, G.C., LEAK, D., and HEDGE, B. (1962). *Ann. Int. Med.*, 57, 254.
- HERNDORN, R.F. and SMALLEY, P. (1969). *Illinois Medical Journal*, 136, 60.
- HOFVENDAHL, S., LOBENIUS, P., LUNDMAN, T., and WESTER, P.O. (1969). *Lakaetigningen*, 66, 2602.
- HONEY, G.E. and TRUELOVE, S.C. (1957). *Lancet*, 1, 1155.
- JULIAN, D.G., VALENTINE, P.A., MILLER, G.G. (1964) *Amer. J. Med.*, 37, 915.
- LAWRIE, D.M., GREENWOOD, T.W., GODDARD, M.,

- HARVEY, M.B., DONALD, K.W., JULIAN, D.G., and OLIVER, M.F. (1967) *Lancet.*, 2, 109.
- LOWN, B., FAKHRO, A.M., HOOD, W.B., and THORN, G.W. (1967). *J.A.M.A.*, 199, 188.
- MATHER, M.G. (1970). *Brit. med. J.*, 2, 231.
- MCNEILLY, R.H. and PEMBERTON, J. (1963). *Brit. med. J.*, 2, 139.
- MCNICOL, M.W. (1966). *Practitioner*, 196, 209.
- NACHLAS, M.M. and MILLER, D.I. (1965). *Am. Heart J.*, 69, 448.
- NORRIS, R.M., BENSLEY, K.E., CAUGHEY, D.E. and SCOTT, P.J. (1968). *Brit. med. J.*, 2, 143.
- PANTRIDGE, J.F. (1970). *Chest*, 58, 229.
- RESTIEAUX, N., BRAY, C., BULLARD, H., MURRAY, M., ROBINSON, J., BRIGDEN, W. and McDONALD, L. (1967). *Lancet*, 1, 1285.
- STOCK, E., GOBLE, A. and SLOMAN, G. (1967). *Brit. med. J.* 2, 719.
- SPIEKERMAN, R.E., BRANDENBURG, J.T., ARCHER, R.W.P. and EDWARDS, J.E. (1962). *Circulation*, 25, 57.
- STEMMLER, E.J. (1965). *Ann. intern. Med.*, 63, 613.
- WEAVER, J.A., BHATIA, S.K., BOYLE, D., HADDEN, D.R., and MONTGOMERY, D.A.D. (1970). *Lancet*, 1, 783.
- W.H.O. (1969). Executive Board, Bulletin International Society of Cardiology, No. 119, p. 1.
- ZAMMIT MAEMPEL, J.V. (1965). *Lancet*, 2, 1157.