

Audit of Sudden Deaths in the Accident and Emergency Department of a Tertiary Hospital in Trinidad and Tobago

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ABSTRACT

Objective: To determine the proportion of deaths due to confirmed myocardial infarction (CMI) and the aetiology of sudden death at the Port-of-Spain General Hospital (A&E) department for January to June 2008.

Methods: This retrospective study utilized the death register to determine the number of A&E deaths for the study period. Patients dying from MI were investigated using records to obtain ECG and post-mortem reports.

Results: During the study period, 150 patients were certified dead in the A&E department. Cardiovascular causes accounted for 42.7% (n = 64) of deaths. Confirmed MI accounted for 27.3% (n = 41) of deaths and 3.3% (n = 5) were certified by a private practitioner without post-mortem examination and were classed as unconfirmed MI. Trauma related deaths followed with 27.3% (n = 41). Deaths from firearm injury were the next most common, 19.3% (n = 29).

The mean age of patients dying from CMI was 64.1 years with a male to female ratio of 2:1. Males died from CMI on average 6.3 years before females. Mortality peaked for females in the 80 – 89-year age group while for males it was the 60 – 69-year age group. Afro-Trinidadians accounted for 58.5% (n = 24) deaths due to CMI. More CMI patients had combined DM and HTN 36.6% (n = 15) than either condition alone. Afro-Trinidadians were more likely to be hypertensive and Indo-Trinidadians, diabetic. Death on arrival was the most common presentation for MI patients, 65.9% (n = 27).

Conclusions: This study shows that the main cause of death in the A&E Department at the Port-of-Spain General Hospital was MI. Trauma related deaths followed. Men died from MI at an earlier age than women. Most MI patients were dead on arrival.

Keywords: Diabetes mellitus, emergency department, hypertension, firearm injuries, myocardial infarction

Auditoría de Muertes Súbitas en el Departamento de Accidentes y Emergencias de un Hospital Terciario en Trinidad y Tobago

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RESUMEN

Objetivo: Determinar el número de muertes por infarto del miocardio confirmado (IMC), y la etiología de la muerte súbita en el Departamento de Accidentes y Emergencias (A&E) del Hospital General de Puerto España, en el período de enero a junio de 2008.

Método: Este estudio retrospectivo utilizó el registro de defunciones para determinar las muertes en el Departamento A&E en el período estudiado. Los pacientes fallecidos a causa de infarto del miocardio fueron investigados utilizando sus historias clínicas, con el propósito de obtener sus ECG y reportes post mortem.

Resultados: Durante el periodo de estudio, 150 pacientes fueron certificados muertos en el Departamento de A&E. Las causas cardiovasculares representaron el 42.7% (n = 64) de las muertes. El IM confirmado fue la causa del 27.3% (n = 41) de las muertes, y las muertes del 3.3% (n = 5) fueron certificadas sin examen post mortem por un médico general privado, y clasificadas como debidas a IM no confirmado. Las muertes relacionadas con traumas ocuparon el siguiente lugar con 27.3% (n = 41).

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Las muertes por heridas de arma de fuego constituyeron la siguiente causa más común con un 19.3% (n = 29). La edad promedio de los pacientes que fallecieron debido a IMC fue de 64.1 años, con una proporción varón/hembra de 2:1. Los varones murieron de IMC 6.3 años antes que las hembras, como promedio. La mortalidad alcanzó el máximo para las hembras en el grupo etario de 80–89 años, mientras que para los varones fue en el grupo etario de 60 a 69 años. Los afrotrinitenses representaron el 58.5% (n = 24) de las muertes debido a IMC. Más pacientes de IMC tenían una combinación de diabetes mellitus (DM) e hipertensión arterial (HTA) para una 36.6% (n = 15), que aquellos que presentaban sólo una de estas dos condiciones. Los afrotrinitenses eran más propensos a ser hipertensos, en tanto que los indotrinenses presentaban una mayor propensión a la diabetes. La muerte al momento del arribo fue la ocurrencia más común entre los pacientes de IM, 65.9% (n = 27).

Conclusiones: Este estudio muestra que la causa principal de muerte en el Departamento A&E del Hospital General de Puerto España fue el IM, seguida de las muertes relacionadas con traumas. Los hombres murieron de IM a una edad más temprana que las mujeres. La mayoría de los pacientes con IM fallecieron a su arribo.

Palabras claves: Diabetes mellitus, departamento de emergencias, hipertensión, heridas por armas de fuego, infarto del miocardio

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INTRODUCTION

Every year since 1900 (except 1918), cardiovascular diseases (CVD) accounted for more deaths than any other major cause of death in the United States of America (USA) (1). Nearly 2400 Americans die of cardiovascular disease each day, an average of one death every 37 seconds. Cardiovascular disease claims approximately as many lives each year as cancer, chronic lower respiratory disorders, accidents and diabetes mellitus combined (1).

With justifiable concern about the spread of human immunodeficiency virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) and with other well-known infectious diseases such as malaria and tuberculosis (TB) still posing formidable challenges in many developing countries, it is understandable that epidemics of cardiovascular disease have insidiously established themselves without attracting global attention or local action (2). Thus, as in the developed world, cardiovascular disease has also become the leading cause of death in many developing countries and will soon attain that status in several others. The fact that 80 per cent of deaths from cardiovascular disease worldwide and 87 per cent of related disability currently occur in low-income and middle-income countries indicates the magnitude of the problem (2).

The high burden of mortality from cardiovascular causes in developing countries was estimated at 9 million in 1990 and expected to increase to 19 million by 2020. The projected increase in the proportion of all deaths that are due to cardiovascular causes from about 25% in 1990 to more than 40% in 2020, signals the advance of the epidemic (2).

The evidence presented is consistent with cardiovascular disease being a leading cause of death in developed and developing countries, including Trinidad and Tobago (1, 2). Myocardial infarction, however, is also one of the leading causes of death in emergency departments (3). Mushtaq *et al* reported in 2005 that myocardial infarction (MI) claimed 27.4% (n = 40) of 146 deaths and thus was the leading cause

of death in his Scottish emergency department (3). In 2003, the Pan American Health Organization (PAHO) and the World Health Organization (WHO) reported heart disease as the leading cause of death in Trinidad but the causes of death in Accident and Emergency (A&E) departments have not so far been examined. Risk factors for cardiac disease in Trinidadians were examined by PAHO and diabetes mellitus, a significant risk factor for cardiovascular disease worldwide, was ranked third (4–6). Thomas *et al* identified risk factors in 61 patients presenting to a major tertiary centre in Trinidad with MI. They reported that diabetes mellitus, hypertension, hyperlipidaemia and cigarette smoking were prevalent among those presenting with acute MI (7).

Clearly, cardiovascular disease and its sequelae account for a high percentage of the burden of mortality both in developed and developing nations. There has been no published data for the causes of death in emergency departments for any of the tertiary healthcare institutions in Trinidad and Tobago or the Caribbean. The aim of this study was to determine the aetiology of sudden death at the emergency department of a tertiary hospital and the proportion of deaths due to MI in that emergency department.

SUBJECT AND METHOD

Permission to conduct this retrospective study was obtained from the Ethics Committee at the Port-of-Spain General Hospital. The sample population was all patients who died in the A&E department or who were pronounced dead on arrival at the A&E department for the period January to June 2008. All deaths, following discharge from the A&E department, were excluded.

The causes of death of patients dying in the A&E were found in the hospital death register. Using the unique hospital registration number, these patient records were utilized for data extraction. The post-mortem register of the Pathology department, Port-of-Spain General Hospital was used to ob-

tain post-mortem reports. Where the above were not available, the cause of death was obtained from the office of the death registrar, Port-of-Spain.

A data collection instrument was used to collect data on name, age, gender, registration number and address for all patients dying in A&E. Co-morbidities including diabetes mellitus Type II and hypertension were recorded with established risk factors such as smoking and alcohol use in particular for patients dying from confirmed MI.

All data were kept strictly confidential and a coding system was used to protect the identity of patients. Only the researchers were allowed to see collected data in order to maintain confidentiality.

The term confirmed MI (CMI) was used where there was evidence of myocardial necrosis on post-mortem examination (8). Ischaemic heart disease referred to certification of death from MI by a licensed medical practitioner, without post-mortem examination. These patients would have had a long standing relationship with the said practitioner with significant risk factors mentioned previously. These patients were not classed as confirmed MI due to lack of anatomic, biochemical and electrocardiographic evidence.

RESULTS

During the study period, 150 patients were certified dead in the A&E department. Cardiovascular (n = 64) and trauma-related deaths (n = 41) occurred most commonly. Cardiovascular deaths including MI and other conditions pertaining to that system are listed in Table 1. Figure 1 shows the distribution of deaths for the study period. January had the highest number (n = 33) and May the least (n = 22). There was a mean of 25 (Min 22 Max 33) deaths per month. Deaths due to confirmed MI accounted for 27.3% (n = 41) of deaths in A&E. The number of confirmed MIs per month remained relatively constant with a mean of 6.83 per month. For five of the six months, the number of confirmed MI deaths exceeded that of firearm deaths. Ischaemic heart disease accounted for 3.3% (n = 5) of deaths in A&E. After MI, the next common cause of cardiovascular deaths recorded was cardiac failure. Table 1 shows other causes of death including respiratory causes (11.3% n = 17), sepsis (5.3% n = 8) and cancer-related deaths (3.3% n = 5).

Table 2 illustrates demographic data, clinical presentation and risk factors for the 41 deaths due to confirmed MI. It also shows that the male:female ratio exceeds 2:1 and that men died 6.3 years earlier than women from confirmed MI. Figure 2 shows the later peak in female mortality due to confirmed MI. Female mortality peaks much later, in the 80–89-year age group as compared to the 60–69-year age group for males. Total mortality of males and females however followed a similar pattern to that of males as they were greater in number.

Figure 3 shows that Afro-Trinidadians accounted for 58.5% (n = 24) of deaths due to confirmed MI. Table 3 shows that for both ethnicities, approximately 50% of pa-

Table 1: Primary cause of death on death certificate for 150 patients dying in A&E

Primary Cause of Death	No of Patients	%
Cardiovascular (n = 64), (42.7%)		
Confirmed myocardial infarction	41	27.3
Ischemic heart disease	5	3.3
Left ventricular failure/congestive cardiac failure	10	6.7
Cerebrovascular accident	3	2.0
Ruptured abdominal aortic aneurysm	3	2.0
Cardiac tamponade	1	0.7
Dilated cardiomyopathy	1	0.7
Trauma Secondary to (n = 41), (27.3%)		
Gunshot	29	19.3
Motor vehicle accident	7	4.7
Stab wounds	5	3.3
Respiratory (n = 17), (11.3%)		
Pulmonary embolism	9	6.0
Aspiration pneumonia	5	3.3
Bronchopneumonia	2	1.3
Pulmonary haemorrhage	1	0.7
Sepsis (n = 8), (5.3%)		
Pyelonephritis	4	2.7
Peritonitis	3	2.0
Meningitis	1	0.7
Carcinoma (n = 5), (3.3%)		
Esophagus	1	0.7
Lung	1	0.7
Breast	1	0.7
Rectum	1	0.7
Lymphoma	1	0.7
Unknown (n = 4), (2.7%)	4	2.7
Gastrointestinal (n = 2), (1.3%)		
Bleeding peptic ulcer	1	0.7
Hepatic abscess	1	0.7
Other (n = 9), (6.0%)		
Anaphylaxis	1	0.7
Drowning	3	2.0
Toxin ingestion	1	0.7
Cerebral haemorrhage	1	0.7
Diabetes mellitus	1	0.7
Stillbirth	1	0.7
Hypoglycaemia	1	0.7
Total	150	100

tients had diabetes and hypertension occurring together. A greater proportion of Afro-Trinidadians had hypertension alone while a greater proportion of East Indians had diabetes mellitus alone. More East Indians had co-morbidity with diabetes mellitus and hypertension. Unknown and other ethnicities accounted for only 9.8% (n = 4) of confirmed MI patients.

The majority of patients were brought in dead to this facility accounting for 65.9% (n = 27) of confirmed MI cases. Another 12.2% (n = 5) were dead within 20 minutes. The combination of the symptoms, chest pain and shortness of breath accounted for twice the number of either symptom alone (n = 4, 9.8%). This is illustrated in Fig. 4.

In a minority of cases, 2.67% (n = 4), death certificates and post-mortem reports were not available. Consequently,

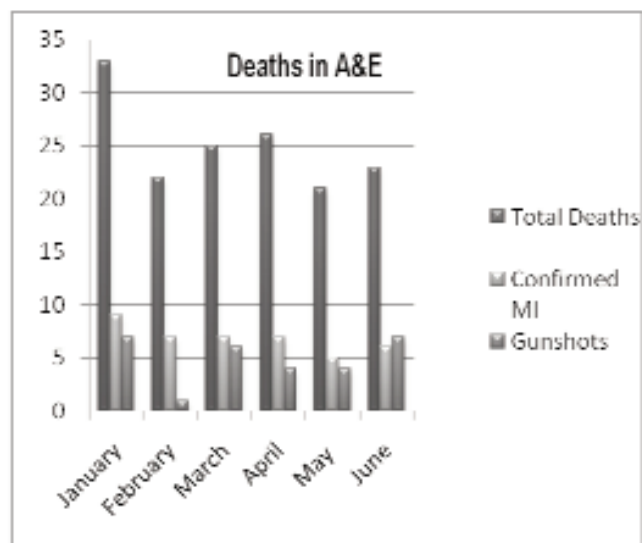


Fig. 1: Bar chart comparing distribution of total, confirmed MI and firearm deaths for the study period.

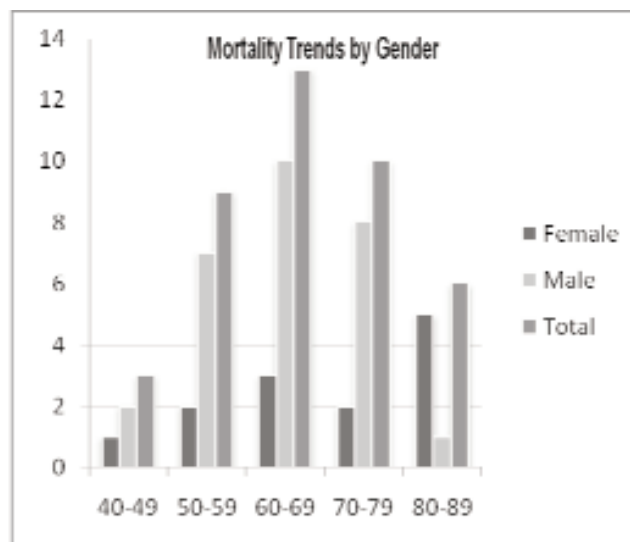


Fig. 2: Bar chart showing gender based mortality trends for all age ranges for patients dying of CMI in A&E.

Table 2: Summary of variables studied in 41 confirmed MI patients dying in A&E

Variable	Male (n = 28)	Female (n = 13)	Total Confirmed MI (n = 41)
Age (yrs)			
Average (Range)	63.3 (40–86), (n = 28)	69.5 (47–84), (n = 13)	65.2 (40–86), (n = 41)
Most common age range	60–69	80–89	60–69
Male to Female Ratio	—	—	2.15:1
Ethnicity			
Afro-Trinidadian	53.6% (n = 15)	69.2% (n = 9)	58.5% (n = 24)
East Indian	42.7% (n = 12)	7.7% (n = 1)	31.7% (n = 13)
Other	3.6% (n = 1)	7.7% (n = 1)	4.9% (n = 2)
Unknown	0.0% (n = 0)	15.4% (n = 2)	4.9% (n = 2)
Clinical Presentation			
Dead on arrival	64.3% (n = 18)	69.2% (n = 9)	65.9% (n = 27)
Dead within 20 minutes	14.3% (n = 4)	7.7% (n = 1)	12.2% (n = 5)
Chest pain	7.1% (n = 2)	0.0% (n = 0)	4.9% (n = 2)
SOB	3.6% (n = 1)	7.7% (n = 1)	4.9% (n = 2)
Chest Pain + SOB	10.7% (n = 3)	7.7% (n = 1)	9.8% (n = 4)
Chest Pain + Decreased consciousness	0.0% (n = 0)	7.7% (n = 1)	2.4% (n = 1)
Risk Factors			
DM	21.5% (n = 6)	0.0% (n = 0)	14.6% (n = 6)
HTN	21.5% (n = 6)	15.4% (n = 2)	19.5% (n = 8)
DM + HTN	28.6% (n = 8)	53.9% (n = 7)	36.6% (n = 15)
Unknown	28.6% (n = 8)	23.0% (n = 3)	26.8% (n = 11)
Previous CVA	10.7% (n = 3)	7.7% (n = 1)	9.8% (n = 4)
Old MI	7.1% (n = 2)	0.0% (n = 0)	4.9% (n = 2)
Coexistent Heart failure	14.3% (n = 4)	15.4% (n = 2)	14.6% (n = 6)
Alcohol	10.7% (n = 3)	0.0% (n = 0)	7.3% (n = 3)
Smoking	7.1% (n = 2)	0.0% (n = 0)	4.9% (n = 2)

DM = Diabetes Mellitus, HTN = Hypertension, DM + HTN = Diabetes mellitus and Hypertension

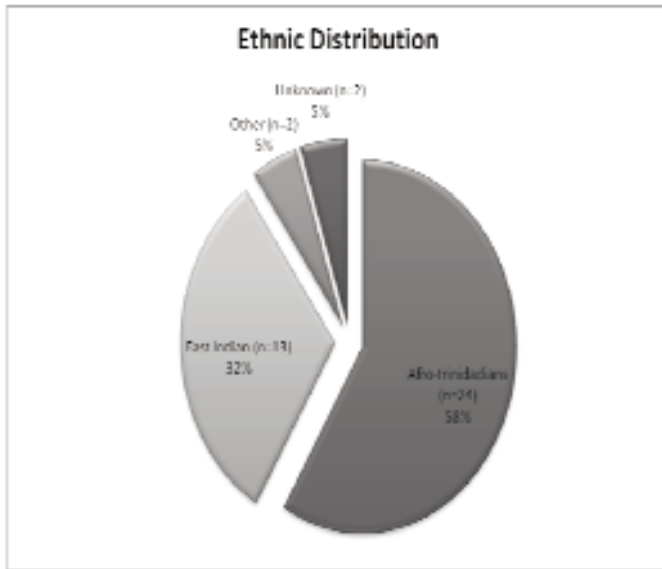


Fig. 3: Pie chart showing ethnic distribution of 41 patients dying of confirmed MI in A&E.

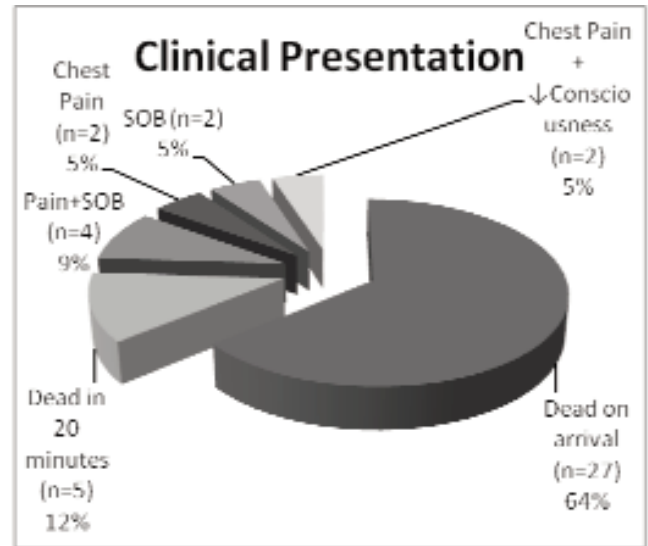


Fig. 4: Pie chart showing the breakdown of different clinical presentations of deaths due to confirmed MI in A&E.

Table 3: Risk factor distribution by ethnicity for 41 confirmed MI patients

Risk Factor Ethnicity	Afro-Trinidadian	East Indian	Other	Unknown
DM	8.3% (n = 2)	30.8% (n = 4)	50.0% (n = 1)	0.0% (n = 0)
HTN	29.2% (n = 7)	7.7% (n = 1)	0.0% (n = 0)	0.0% (n = 0)
DM+HTN	33.3% (n = 8)	38.5% (n = 5)	50.0% (n = 1)	50.0% (n = 1)
Unknown	29.1% (n = 7)	23.1% (n = 3)	0.0% (n = 0)	50.0% (n = 1)
Total	100% (n = 24)	100% (n = 13)	100% (n = 2)	100% (n = 2)

DM = Diabetes Mellitus, HTN = Hypertension, DM + HTN = Diabetes mellitus and Hypertension

the hospital death register was the only record of these patients' demise. Otherwise case records, death certificates and post-mortem reports were readily available and complete.

DISCUSSION

Accident and Emergency departments are at the interface of community and hospital medicine. Although the A&E department in Port-of-Spain General Hospital is one of the busiest in Trinidad, serving 33% of the population (9), the leading cause of deaths in the A&E department is unknown. This is the first study to examine deaths in an A&E department in Trinidad and Tobago.

Cardiovascular causes claimed most lives in A&E departments. Confirmed myocardial infarction was responsible for most deaths as a single disease entity. Deaths from confirmed MI was twice as common in males as females and males died more than six years earlier from confirmed MI

than females. This study illustrated that mortality trends for confirmed MI show male deaths peaked twenty years before females, and in deaths due to confirmed MI, diabetes mellitus was more common in East Indians while hypertension was more common in Afro-Trinidadians. More deaths were associated with combined diabetes mellitus and hypertension than either one alone. Most confirmed MI patients died prior to arrival to our facility. Traumatic causes of death followed confirmed MI as the leading cause of death in this centre. Traumatic death due to firearm injury was most common.

PAHO and the WHO have determined cardiovascular diseases to be the leading causes of death in Trinidad and Tobago (4, 5). PAHO has reported that ischaemic heart disease was the number one cause of death in 2001 accounting for 16.7% (n = 1631) of deaths. This was followed by diabetes mellitus which led to 13.7% (n = 1340) of deaths (4). This study shows that cardiovascular deaths accounted for more than half of sudden deaths for the study period.

Death due to injury by firearm injuries was second to MI as the leading cause of death in A&E. This is consistent with predictions from the World Bank data collected for the period 1999–2003 which showed increasing firearm injuries during this period (10). Our study supported these findings with 19.3% of deaths in A&E due to firearm injuries alone. World bank data also showed that sharp injuries were more common than blunt injuries (10). This, however, was not mirrored in this study. Our findings suggest that admissions due to intentional injuries in this A&E department are significant and not unlike what pertains in another Caribbean A&E Department (11).

Death due to sepsis was the fourth most common cause. Pyelonephritis was most common in this group (2.7%). These patients had co-morbid diabetes mellitus Type II which is an established risk factor for pyelonephritis (12). For deaths due to confirmed MI, there were twice as many males as females consistent with epidemiological studies showing that male gender is associated with an increased risk for MI (13). In addition, men died from MI at an earlier age than women, by an average of 6.3 years, consistent with findings from the Interheart Study (6). As in the Framingham study, we found a 20-year difference in the peak incidence of deaths due to MI between men and women (13, 14). It is generally believed that the later age of MI in women is due to the protective effects of oestrogens (6) though other factors such as diet and smoking may also be important. The majority of cases of MI were of African origin accounting for 58.5% of cases. East Indians followed with 34.7%. The present study showed that 62.5% of Afro-Trinidadians who died had hypertension while the majority of East Indians, 69.2% had diabetes mellitus. This correlates with previous evidence from the Trinidadian community of St James where East Indians were shown to be at increased risk of diabetes mellitus (16).

More patients dying from confirmed MI were found to have co-existent diabetes mellitus and hypertension than either one alone. Hypertension is a common co-morbidity in persons with diabetes mellitus, and its prevalence increases with advancing age. Both diabetes mellitus and hypertension are independent risk factors for development, in older persons, of coronary artery disease, ischaemic stroke, peripheral arterial disease and of congestive heart failure (16). Clearly, risk factors for different ethnicities in a cosmopolitan society are comparable to trends in the literature. Although the results are similar to those of major epidemiological studies, this study addressed sudden deaths from MI-related and not all MI-related deaths.

Very little on risk factors, other than diabetes and hypertension, was recorded in the A&E notes. Risk factors such as smoking and alcohol use were only recorded in a minority (12.2%) of cases. Thorough evaluation of risk factors is essential as differential diagnoses must be taken into account. As stated above 'ischaemic symptoms' may not be due to MI or even related to the cardiovascular system (8).

Unfortunately, more than half of the patients (58.5%), with death due to MI, were dead prior to arrival to the A&E department. A further 12.2% died within 20 minutes. The reason for this high proportion of deaths prior to arrival may be poor education of the population. Perhaps high risk patients should be advised that chest pain not relieved by GTN requires immediate medical attention. Another explanation could be prolonged response time of health personnel which could result in increased mortality as this increases for every 30 minutes that ST segment elevation is not recognized or not treated (8). One recommendation that can solve this problem is hospital-ambulance communication. Pre-hospital thrombolysis is not a feature of emergency care in Trinidad and perhaps this requires further consideration. Paramedic personnel, having an ECG tracing on pick-up, can perhaps fax or *email* this to a hospital-based emergency unit. Thus, if thrombolysis is indicated, it can be administered before the patient reaches hospital. The ACC/AHA guidelines suggest that pre-hospital thrombolysis would save a greater number of lives (18).

This study had some obvious limitations. In four deaths, medical records could not be located nor could a record be found at the office of the registrar of deaths in Port-of-Spain. Documentation of these names in the hospital death register was therefore the only evidence of their demise. Most patients were dead on arrival at the A&E Department and did not have ECG tracings available. Thus conclusive statements could not be made about any relation between ECG findings and post-mortem findings. Additionally, the length of the study period was not sufficient to generalize the findings to persons outside the studied sample.

This study demonstrates that cardiovascular disease, in particular MI, is the number one cause of sudden death at the A&E department of the Port-of-Spain General Hospital. Myocardial infarction, in particular, claimed most lives. Deaths due to firearm injury followed MI as the leading cause of death.

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