SCHOOL OF HEALTH TECHNOLOGY, FUTO LECTURE SERIES
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TITLE: SUDDEN DEATH

INTRODUCTION

Sudden Death or its synonyms are generally defined as natural, unexpected death within 1 hour of the onset of symptoms. Four temporal elements should be considered in the use of this definition, that is, prodromes, onset of the terminal event, cardiac arrest, and biological death. The 1 hour definition refers to the period between onset of the terminal event, that is, acute changes in cardiovascular status, and cardiac arrest. Nonspecific prodromal symptoms, for example, chest pain, palpitations, or dyspnea, can be present during the days or weeks before a cardiac arrest. The biological legal death can occur days or weeks after the cardiac arrest, as patients can survive with irreversible brain damage and life support. In addition, when death occurs unwitnessed within 24 hours of being seen alive and functioning normally, this is also termed Sudden Death. In this report, the 1 hour definition is applied unless otherwise indicated.

Depending on the underlying cause, Sudden death can be divided into SCD, defined as SD from a cardiac cause, and SD due to non-cardiac causes, for example, intracranial haemorrhage, epilepsy, pulmonary embolism, or asthma. This subdivision is clinically relevant because cardiac causes are inherited in a significant proportion, whereas non-cardiac causes usually are not. Death in absence of a diagnosis despite autopsy is generally termed sudden unexplained death (SUD) or autopsy-negative SUD. In countries where autopsy is not mandatory in the case of SD at a young age, cases in which no autopsy is performed are considered to be SUD.

EPIDEMIOLOGY

The incidence of SD in the general population ages 20 to 75 years is 1 in 1000 individuals, which accounts for 18.5% of all deaths. In the 1 to 40 years age group, the incidence is approximately 1.3 to 8.5 per 100,000 person years. The vast majority of cases are considered to be SCD. In individuals under 35 years of age, the incidence is highest in the 0-to-5-year age group. In adults, increases with age in both sexes but is substantially less in women than in men all ages. Approximately 80% of Sudden Death events take place at home, and around half of them are witnessed. The incidence of sudden Death in young competitive athletes currently is approximately 0.4 to 0.6 per person-years.

ETIOLOGY

Atherosclerotic coronary artery disease (CAD) accounts for the large majority of cases of SD in individuals over 40 years of age, mainly men.

In younger victims, a variety of causes have been indentified in several series. Below we summarizes the causes of Sudden Death as assessed by autopsy and by cardiological and genetic assessment of the victim's first-degree relatives.

The major causes of sudden death are discussed below and can be categorised as cardiac and non-cardiac.

NON-CARDIAC CAUSES OF SUDDEN DEATH

The non-cardiac causes of Sudden Death include:

1.   **Trauma:**
     These include; deaths from blunt force, penetrating trauma, such as may be experienced in collision sports (eg subdural haematoma, cervical spine fractures etc. Road and air accidents are also inclusive.

2.   **Violence**

Many people have died suddenly from homicide or suicide through violence.

3.   **Acute Haemorrhagic Shock** (e.g ruptured aortic aneurysm, pleading peptic ulcer).

4.   **Septic Shock**- From sepsis

5.   **Sports**

Regular physical activity has several beneficial effects or health and is linked with reduced cardiovascular and all-ease mortality. However in certain circumstances, an acute bunt of exertion may cause dangerous health effects and extreme cases sudden death (the so called paradox of exercise. The so called exercise – related sudden death (ESD) which is usually referred to as an unexpected and unstressed sudden cardiac arrest occurring with 1 hour from an exercise bunt in an apparently healthy person.

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6.   **Asthma:**

This is a chronic breathing disorder characterised by recurrent attacks of breathlessness and wheezing. According to WHO (2011) estimates, 235 million suffer from asthma globally. If not properly attended to, an asthmatic attack could lead to sudden death. Although the

fundamental causes of asthma are not completely understood, the strongest risk factors for developing asthma are inhaled asthma triggers. These include:

- Indoor altergens (e.g house dustmites in bedding, carpets and stuffed furniture)
- Outdoor alter gens (such as pollens)
- Tobacco smoke and
- Chemical irritants in the link place.
- Others include extreme emotional arousal such as anger or fear and physical exercise and medications such as aspirin and non-steroid anti-inflammatory drugs.

7.   **Diabets mellitus**

Diabetes is a chronic disease that occurs either when the cancer does not produce enough insulin or when the body cannot effectively use the insulin if produces.

Insulin is a hormone that regulates blood sugar. Raised blood sugar, is a common effect of uncontrolled diabetes and overtime leads to serious damage to many body systems and it could lead to sudden death from heart disease stroke. Hypoglycaemia also increases the risk of sudden death in patients with advanced cardiovascular disease. It also causes death from cerebral damage.

In 203,347 million people worldwide had diabetes and an estimated 3.4 million people died from consequences of high fasting blood sugar and more than 80% of diabetes death occurs in low and middle-income countries.

8.   **Others** include epilepsy, Anaphylaxix, Poisoning

CARDIOVASCULAR CAUSES OF SUDDEN DEATH

Many cardiovascular diseases can cause sudden cardiac death (SCD) either through an arrhythmic mechanism (electrical SCD) or by compromising the mechanical function of the heart (mechanical SCD) these disorders may affect the coronary arteries, the myocardium. The cardiac valves, the conducting system the aorta or the pulmonary artery, the integrity of which is essential for a regular heart function. WHO estimates that more than 17.3 people died of cardiovascular diseases such as heart attack or stroke in 2008.Four out of five of

these deaths occurred in low and middle-income countries and men and women were equally affected.

The cardiovascular causes of sudden death can be due to the following:-

1. **<u>Hypertension</u>**

High blood pressure is one of the most important presentable causes of premature death worldwide. High blood pressure is defined a systolic blood pressure above 140 mmHg and/or a diastolic blood pressure above 90mmHg. In people aged up 56 years both systolic and Diastolic blood pressure are associated with cardiovascular risk such as stroke. Above this age systolic blood pressure is a far more important prediction. Blood pressure usually rises with age, except where such intake is low, physical activity is high and obesity largely absent.

2. **<u>Stroke</u>**

Strokes are caused by disruption of the blood supply to the brain. This may result from either blockage or rupture of a blood vessel. The risk factors of stroke include High Blood Pressure and Heart rhythm disorder.

3. **<u>Congenital Heart Disease</u>**

Malformations of heart structures existing at birth may be caused by genetic factors or by adverse exposures during pregnancy. Examples are holes in the heart, abnormal values and abnormal chambers. The risk factors to congenital heart disease include maternal alcohol use, medicines, used by the expectant mother maternal infections such as rubella, for maternal nutrition (low intake of relate) and dose blood relationship between parents.

4. **Aortic Aneurysm**

This is dilatation and rupture of the aortic. The risk factors include Advancing age, long standing high blood pressure, congenital heart disorders syphilis and other infections and inflammatory disorders.

5. **Deep Venous Thrombosis (DVT) & Pulmonary Embolism**

Blood clots in the leg veins, which can dislodge and move to the heart and lungs. The risk factors include; surgery, obesity, cancer, previous episode of DVT, recent child birth, use of oral contraceptive, long periods of immobility for example while travelling.

RISK FACTORS TO SUDDEN DEATH FROM CARDIOVASCULAR DISEASES

This can be categorized as followed:

Major modifiable risk factors:

- *High Blood Pressure*

  Is the major risk for heart attack and the most important risk factor for stroke.

- *Abnormal blood lipids*

  High total cholesterol, LDL-cholesterol and triglyceride levels, and low levels of HDL-cholesterol increase risk of coronary heart disease and ischaemic stroke

- *Tobacco use*

  Increases risks of cardiovascular disease, especially in people who started young, and heavy smokers. Passive smoking is an additional risk.

- *Physical inactivity*

  Increase risk of disease and stroke by 50%

- *Obesity*

  Major risk for coronary heart disease and diabetes.

- *Unhealthy diets*

  Low fruits and vegetable intake is estimated to cause about 31% of coronary heart disease and 11% of stroke worldwide; high saturated fat intake increases the risk of heart diseases and stroke through its effect on blood lipids and thrombosis.

- *Diabetes mellitus*

  Major risk for coronary heart disease and stroke.

Other modifiable risk factors;

- *Low socioeconomic status (SES)*

  There is consistent inverse relationship with risk of heart disease and stroke.

- *Mental Ill-Health*

  Depression is associated with an increased risk of coronary heart disease.

- *Psychosocial stress*

  Chronic life stress, social isolation and anxiety increase the risk of heart disease and stroke.

- *Alcohol use*

  One to two drinks per day may lead to a 30% reduction in heart disease, but heavy drinking damages the heart muscle.

- *Use of certain medication*

  Some oral contraceptives and hormone replacement therapy increase risk of heart disease.

- *Lipoprotein(a)*

  Increase risk of heart attacks especially in presence of high LDL-cholesterol.

Non-modifiable risk factors

- *Advancing age*

  Most powerful independent risk factor for cardiovascular disease, risk of stroke doubles every decade after age 55.

- *Heredity or family history*

  Increased risk if a first-degree blood relative has had coronary heart disease or stroke before the age of 55 years (for a male relative) or 65 years (for a female relative).

- *Gender*

  Higher rates of coronary heart disease among men compared with women (premenopausal age(; risk of stroke is similar for men and women.

- E*thnicity or race*

  Increased stroke noted for blacks, some Hispanic American, Chinese, and Japanese populations. Increased cardiovascular disease deaths noted for South Asians and American Blacks in comparison with Whites.

"Novel" risk factors

- *Inflammation*

  Several inflammatory markers are associated with increased cardiovascular risk, e.g. elevated C-reactive protein (CRP).

- *Abnormal blood coagulation*

  Elevated blood levels of fibrinogen and other markers of blood clotting increase the risk of cardiovascular complications.

PREVENTION AND CONTROL OF SUDDEN DEATH

Some of the prevention and control measures include:

- Health education to promote choices, Schools for example provide ideal venue for health education, schools programmes must also lead by example by making healthy food available, providing exercise facilities, prohibiting to … use of all school events and helping students and staff lose weight.

- Increasing taxes on alcohol and cigarettes to reduce use

- Providing weakling's in urban areas to promote walking and physical …

- Providing recreational facilities for physical activity

- Promoting sporting activities like football

- Organizing music competitions

- Provide nutritional information on food contents.

- Periodic medical screening for heart diseases, providing and equipping health facilities to tackle emergencies e.g provision of Automated External Detribillators (AEDs)

- Training the citizenry to be able to carry out cardiopulmonary emergency and in the use of (AEDs).

SCREENING STRATEGIES TO PREVENT SUDDEN DEATH

As sudden death at 40 years of age is a result of inherited cardiac disease in a significant number of cases, an alternative approach is to optimize the cardiological and genetic assessment in relatives of a newly diagnosed patient with an inherited cardiac disease, or of a young sudden death victim. This approach appears to be a promising alternative because of the autosomal inheritance pattern of most inherited cardiac disease, implying that first-degree relatives have a 50% a prior likelihood of being affected.

Autopsy is able to reveal the cause of death in more than 80% of cases. In the case or SCD caused by an inherited cardiac disease or SUD, surviving first-degree relatives of the SD

victim are advised to have cardiological and genetic examination. If a non-inherited cardiac disease at autopsy is identified, relatives can be reassured accordingly.

Comprehensive cardiological and genetic assessment of first-degree relatives is ideally performed by a multidisciplinary team including cardiologists, clinical geneticists, genetic counsellors, and psychosocial workers.

The assessment starts with genetic counselling before testing, which emphasizes the advantages (for example, the possible measure to prevent SCD when an inherited cardiac disease is diagnosed) and disadvantages (for example, difficulties in getting life insurance). Subsequently, detailed medical information on the proband and the attending first-degree relatives is obtained, as well as a family history including a 3-generation pedigree and a baseline ECG is made. Further steps depend on the information collected.

When autopsy of a SD victim reveals a certain inherited cardiac disease, first-degree relatives are examined with a focus on that specific disease. When a pathogenic mutation is identified in the SD victim, the first-degree relatives can be predicatively systematically tested for carriership, also known as a cascade screening.

Conclusion:

The occurrence of a sudden death is usually a traumatic experience for relatives and loved ones. The majority of these deaths as have been found are of cardiac origin.

Above 35 years of age, the majority of causes are due to the thickening and fat deposits in the coronary blood vessels supplying the heart itself with blood. Below 30 years, sudden deaths from cardiac origin are due to structural defects in the heart that are sometimes largely hereditary.

Sudden deaths are largely preventable through leading healthy lifestyles and going for regular medical checks and screening.

In all of these, how most pathetic it is sometimes that it happens when some of the victims are performing their conjugal responsibilities and unfortunately in the course of being randy.

May God continue to guide us all aright and grant us long life. Amen

Thank you