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INSIGHTS INTO THE AETIOLOGY AND TEMPORAL TRENDS IN CARDIAC MORTALITY IN THE YOUNG: A 21-YEAR REVIEW OF NATIONAL AND REGISTRY DATA IN ENGLAND AND WALES

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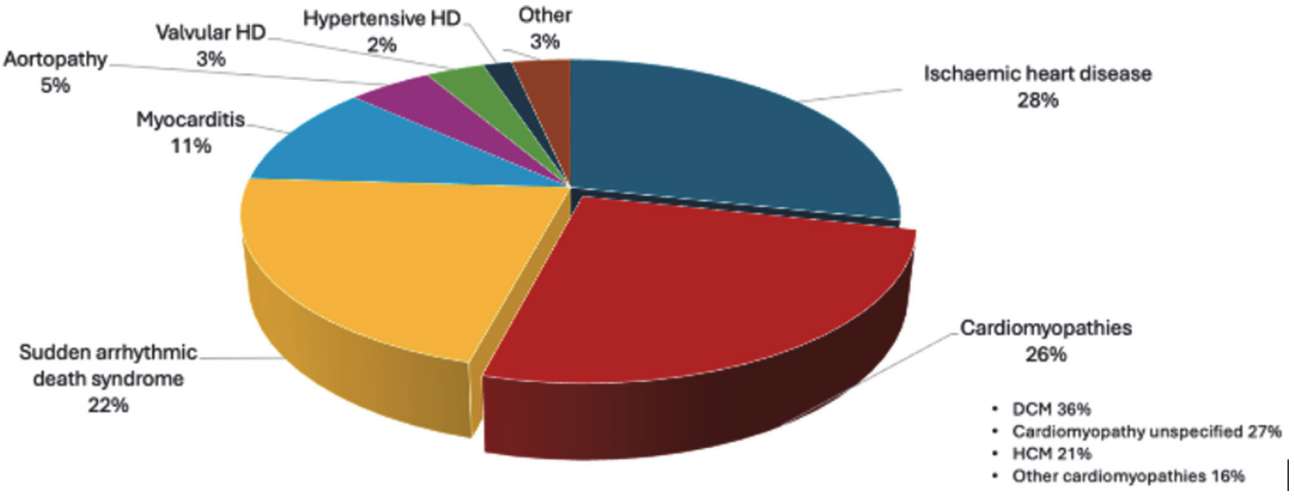
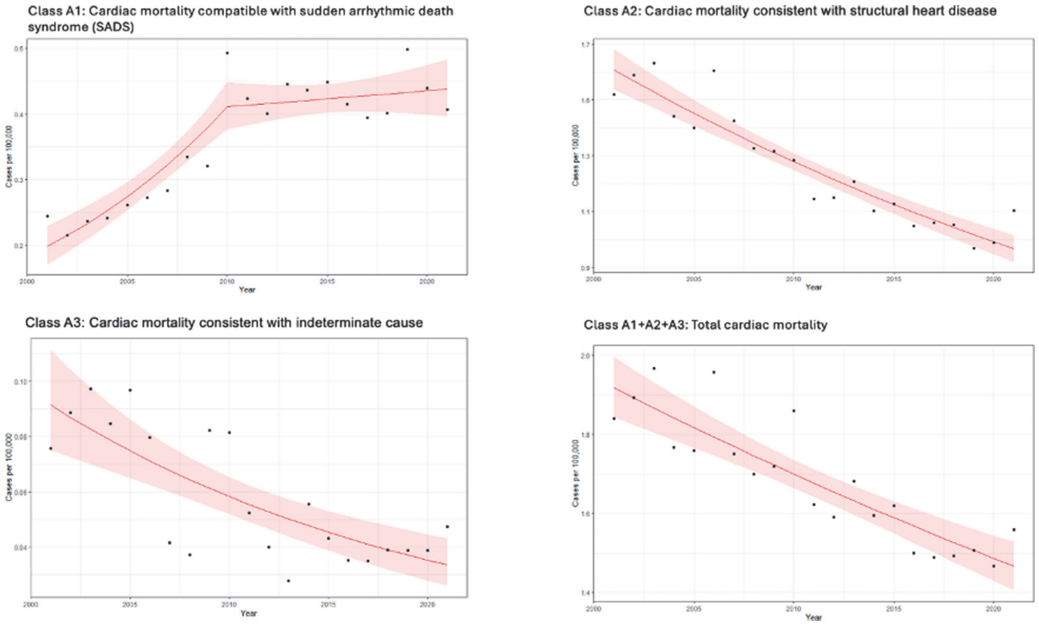
Background An accurate representation of the incidence and aetiology of cardiac and sudden cardiac death (SCD) is vital for healthcare policymakers to effectively allocate resources for preventative strategies.

Aim We aimed to report on the incidence and causes of cardiac and SCD among individuals under the age of 35 years in England and Wales over a 21-year period (2001 to 2021), with a focus on identifying any temporal trends in mortality.

Methods Annual mortality data from the Office for National Statistics (ONS) pertaining to cardiovascular (CV) and possible CV deaths in individuals under the age of 35 years were analyzed using International Classification of Diseases-10 (ICD-10) codes. Deaths were categorized into four classes: A1- definitive cardiac deaths without identifiable structural heart disease



Abstract 2 Figure 1 Causes of cardiac death in the young expressed as % of total number of definite cardiac deaths (A1+A2+A3). DCM: dilated cardiomyopathy; HCM: hypertrophic cardiomyopathy; HD, heart disease



Abstract 2 Figure 2 Incidence rates for Class A1, A2, A3: modelled using Poisson log-linear model. The number of cases in each class was utilised as the response variable and the mid-year population as an offset. Time since 2001 was considered the independent variable. The solid red line represents the model output, and the respective 95% confidence intervals either side demonstrated by the shaded area. The black dots correlate with absolute mortality counts

(consistent with sudden arrhythmic death syndrome, SADS); A2- definitive cardiac deaths with identified structural heart disease; A3- definitive cardiac deaths with an indeterminate cause; and B- potential cardiac deaths. Incidence rates were computed based on ONS census data of the annual resident population. Additionally, insights were gleaned from the Cardiac Risk in the Young Centre for Cardiac Pathology (CRYCCP) nationwide registry, where each case underwent evaluation by an expert cardiac pathologist.

Results The mean annual number of definitive cardiac deaths (classes A1+A2+A3) was 414 (SD 27.4), resulting in an incidence of young cardiac and SCD of 1.68/100,000 individuals/year. Ischaemic heart disease (28.4%), cardiomyopathies (25.9%), and SADS (21.8%) were the most prevalent cardiac conditions (figure 1). Cardiomyopathies and SADS related mortality peaked in the 10-to-19 age group, while ischaemic heart disease peaked in the 30-to-35 age group. A mean of 573 (SD 76.6) possible cardiac deaths (class B) occurred, these primarily included ill-defined/unspecified causes (33.5%), epilepsy (32.4%), sudden infant death syndrome (24.2%), and drowning (7%). Both definitive and possible cardiac deaths showed a male preponderance (male to female ratios of 2.3:1 and 1.6:1, respectively).

A declining trend in cardiac mortality was observed with a 1.3% (95% CI: 1.0%-1.7%) incidence rate reduction per year over the 21-year time period ($p<0.001$) (figure 2). This was associated with a 2.5% annual incidence rate reduction for deaths attributed to structural heart disease ($p<0.001$), but an 8.5% annual incidence rate increase for deaths attributed to SADS ($p<0.001$). The shift in the cause of mortality correlated with increasing numbers of deaths referred to the CRYCCP where an expert cardiac pathologist diagnosed SADS in over 52% of cases.

Conclusions Over 21 years in England and Wales, national datasets suggest the incidence of young cardiac and SCD is 1.68/100,000/year, with a small but appreciable declining mortality trend. The rise in SADS rates and contemporaneous decline in deaths attributed to structural heart disease may signify increased awareness and accessibility to expert cardiac pathologists. Furthermore, ensuring accurate mortality coding is crucial for thoroughly assessing first-degree family members in cases of suspected inherited cardiac conditions.

Conflict of Interest None

3 INCIDENCE AND PREDICTORS OF SUDDEN CARDIAC DEATH IN DILATED CARDIOMYOPATHY WITH IMPROVED EJECTION FRACTION

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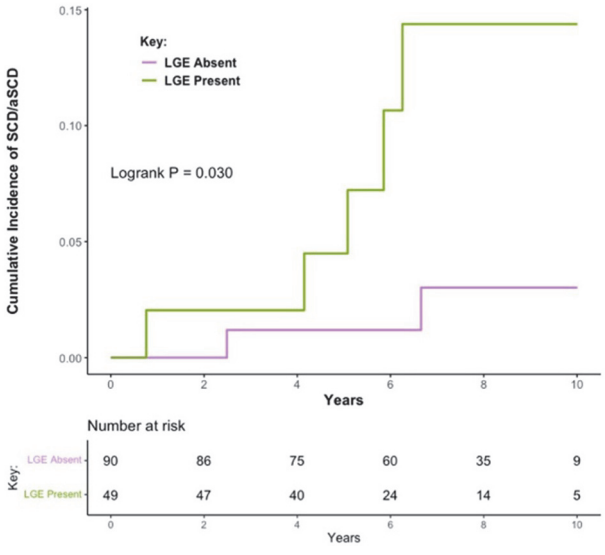
Introduction Many patients with dilated cardiomyopathy (DCM) undergo improvement in left ventricular ejection fraction (LVEF). Although DCM with improved LVEF (DCMimpEF) is associated with favourable clinical outcomes, cases of sudden cardiac death (SCD) have been reported in this population. Myocardial fibrosis, detected by late gadolinium enhancement (LGE) on cardiovascular magnetic resonance (CMR) is associated with SCD in patients with DCM with impaired systolic function, including those with mildly reduced LVEF; whether this association exists in patients with DCMimpEF has not been specifically evaluated. We sought to identify the incidence and determinants of SCD events in patients with DCMimpEF.

Methods This was a prospective observational cohort study of patients with DCM referred for a CMR. Inclusion criterion was a confirmed diagnosis of DCM with a previously recorded LVEF <40% that had subsequently improved to LVEF ≥40% on the study enrolment CMR. Patients underwent long-term clinical follow up. The primary endpoint was a composite of SCD or aborted SCD (aSCD). aSCD was defined as either an appropriate ICD shock for a ventricular arrhythmia, or a non-fatal episode of ventricular fibrillation (VF) or spontaneous sustained ventricular tachycardia (VT) causing hemodynamic compromise and requiring cardioversion. All potential arrhythmic events were reviewed by a panel of experienced cardiologists, including a cardiologist with expertise in implantable cardiac devices. Adjudicators were blinded to clinical and CMR data. Cumulative incidence curves were fitted using Kaplan-Meier method and compared using log-rank test. The association between patient characteristics and the primary endpoint was examined using univariable Cox proportional hazard modelling.

Results The study cohort comprised 141 patients with DCMimpEF (63.8% male, median age 56 years [interquartile range 44–64], median improved LVEF at enrolment 48% [44–52]). Most patients were NYHA class 1 or 2 (87%). A high proportion were treated with ACE inhibitors or angiotensin receptor blockers (88%) and beta blockers (75%); a modest proportion were treated with mineralocorticoid receptor antagonists (36%). Late gadolinium enhancement was present in 49/141 patients (35%). Over a median follow up of 7.8 years, 7 patients (5%) experienced SCD events. This included 3 patients who survived resuscitated VF/VT cardiac arrests and 4 patients who had appropriate ICD shocks for VT/VF. The



Abstract 3 Figure 1 Cumulative incidence curve for sudden cardiac death or aborted sudden cardiac death among patients with dilated cardiomyopathy with improved ejection fraction stratified by the presence of late gadolinium enhancement on cardiovascular magnetic resonance