Introduction. There is a lack of data regarding efficacy of cardiovascular (CV) screening programs including ECG when applied in young children, for early detection of unrecognized genetic conditions associated with high risk for sudden cardiac death (SCD). We evaluated the performance of a CV screening program, including 12-lead ECG recording, when applied in selected populations of Mediterranean children.

Methods

• A CV screening program for primary schools, approved by Ministry of Education and Health Region authorities, was preliminary applied in a sample of primary schools of a Mediterranean island (Crete) in selected geographical isolated areas with presumably increased SCD incidence. Participation was voluntary, following informed written parental consent at local health stations.

• After completion of a standardized history questionnaire by parents, children underwent clinical evaluation (dynamic heart auscultation, weight, height and BP measurement) as well as 12-lead ECG recording. A stepwise referral pattern was established, including pediatric cardiology evaluation and molecular DNA confirmatory testing, whenever the possibility of inherited arrhythmogenic CV disease was increased.

Results

• 220 primary school children, (84 male, 116 female), median age 11.4yrs (range 7.5-12yrs) have been evaluated during two years (2014-15).

• 22 children (10%) had an indication for further diagnostic or lifestyle modification for CV risk factors, including ECG abnormalities (n=9), abnormal heart auscultation (n=7) and adiposity/hypertension (n=6). Fig. 1

• ECG abnormalities included WPW (n=1), VES (n=2), probable LVH (n=2), and QTc prolongation (n=2) both boys, with QTc 475 and QTc 490 (Fig. 2), respectively

• Children with ECG abnormalities underwent further evaluation including ambulatory ECG monitoring and regular follow up.

• Family ECG screening was positive in one child with prolonged QTc (490ms, wide T wave), including his father (QTc=460) and one sister (QTc=490). Fig. 3

• Further molecular DNA testing was negative in the first child, while it revealed a novel KCNH2 heterozygous mutation (NP_000229.1:p.Ser606Tyr) in the child and affected family members in the second case. Fig. 4

• In silico analysis using Polyphen-2 and SIFT suggested that the Ser606Tyr mutation might be harmful. The family was advised to receive β-blocker prophylactic treatment.

Conclusions

Genetic testing in certain cases multiplies the value of ECG screening due to genetic family screening and the identification of normal mutation carriers in the family.

A stepwise approach from ECG screening to molecular diagnostics can detect and genetically characterize subclinical cases of inherited CV disease, associated with arrhythmogenic SCD also in pediatrics.

Authors declare that there is no conflict of interest. The study has been approved by the Greek Ministry of Education and the 7th Health Region of Crete.