

### Normal limits for heart rate in children using 24-hour ambulatory electrocardiography

Siurana J.M., Retamozo C., Isla R., Akel G., Ventura P.S.  
Nens Hospital Foundation. Barcelona. Spain

Background: Knowing the heart rate (HR) appropriate to age is a very important factor for the first screening of cardiac pathology. Several studies provide many patients less than 1 year or adolescents while in our study we analyse HR in all range ages, specially between 3 to 16 years.

Objective: The aim of this study is to establish the normal limits for HR in the paediatric age, using 24-hour ambulatory electrocardiography (AECG), in children without underlying pathology.

Methods: 1211 healthy children, aged between 0 and 18 years, have been examined by AECG. In this study, we specifically analysed 931 subjects with structurally normal hearts and without arrhythmias diagnosed during the AECG recording. Patients were not receiving medication, and did the usual physical activity. Off-line analysis was performed with Mars 8.0 SP3 General Electric. The parameters analysed were age, sex, mean and minimal HR.

Results: All subjects were in sinus rhythm. The subjects were divided by age groups, according to the natural year of birth. We registered patients in all age groups, but most of them were between 3 and 16 years, with at least 20 patients in each group. ANOVA's test showed a significant difference ( $p < 0,01$ ) between HR of each age group. 54% were males and 46% females. The main indications to perform the AECG were: vagal symptoms (31,1%), chest paint (25,1%), palpitations (16,4%). The results for mean and minimal HR were expressed as average and confidence interval for each age group. T-test showed a significant difference between genders, in minimal HR from 9 years and in mean HR from 14 years ( $p < 0,05$ ), being lower in males.

Conclusions: With our study we have shown that mean and minimal HR decrease with age, being more evident from 14 years. We have also proved a significant difference between genders especially during adolescence. This is one of the paediatric studies published so far with the largest number of patients, particularly in school age.

Figure: Relationship between average HR and age. Blue values represent male sex and red values female sex. Note the decrease in HR with age and difference between genders.

