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Prevalence of infective endocarditis in children

SHORT REPORT

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BACKGROUND

Endocarditis is a severe infection of the endocardium and heart valves. Congenital heart defects, which affect around 1 % of all children, currently constitute the principal risk factor in children. This study investigates the prevalence of paediatric endocarditis in Norway, and surveys the proportion of patients with endocarditis who also had heart defects.

MATERIAL AND METHOD

All children born in Norway in the period 1998–2015 with diagnostic codes for endocarditis in the Norwegian Patient Registry in the period 2011–15 were included in the study.

RESULTS

A total of 30 children less than 18 years of age were registered with the diagnostic code for endocarditis in Norway in 2011–15. The estimated prevalence of endocarditis was 0.5 per 100 000 children per year. Altogether 20 out of 30 (67 %) of the children with endocarditis also had congenital heart defects.

INTERPRETATION

The prevalence of paediatric endocarditis in Norway was low. Most patients with endocarditis also had congenital heart defects. Endocarditis ought therefore to be considered in cases of children with heart defects and signs of infection.

Main message

The total prevalence of endocarditis in children (0–17 years) in Norway in the period 2011–15 was 0.5 per 100 000 children

Sixty-seven per cent of all children with endocarditis had congenital heart defects

Infective endocarditis is a bacterial or fungal infection that affects the inner lining of the heart (endocardium) and heart valves (1). Approximately 1 % of live-born children are affected by a congenital heart defect, which is the principal risk factor for paediatric endocarditis (2, 3). The prevalence of endocarditis in patients with heart disease has previously been estimated at 15–140 times higher than in the general population (4), but few population-based studies are available. Endocarditis is a rare but serious paediatric disease. We have recently published national data which showed that 3 out of 36 (8 %) children with congenital heart defects and endocarditis died during the period 1994–2016 (5).

Based on data from the Norwegian Patient Registry, we wished to investigate the prevalence of paediatric endocarditis in Norway in the period 2011–15 and determine the proportion of children with endocarditis who had congenital heart defects.

Material and method

All children born between 1998 and 2015 with diagnostic codes for endocarditis in connection with all hospitalisations from 2011 to 2015 recorded in the Norwegian Patient Registry were included in this study. The ICD-10 diagnostic codes I33, I38 and I39 were used to identify patients with endocarditis (6). Information on year of birth and sex, as well as year of hospitalisation and diagnostic codes for congenital heart disease (Q20–Q26) for all hospitalisations in the period, were available from the Norwegian Patient Registry. The population base in Norway for the age group 0–17 years in the period was retrieved from Statistics Norway's statistics bank (7), and the number of children with heart defects born in the same period was estimated based on our previous study of children with congenital heart defects (5).

Continuous variables are presented as a median (interquartile range) and categorical variables with number and proportion as a percentage. Differences between groups are analysed using the chi-square test. Change in prevalence over time is analysed in a log-linear model with the aid of Joinpoint Regression Program version 4.6 (SEER software, National Cancer Institute, USA) and is presented as a yearly percentage change, with 95 % confidence interval (CI).

Other data are analysed in the statistics program STATA version 15 (StataCorp LLC, College Station, TX, USA). A p-value of less than 0.05 was considered to be statistically significant.

The study has been approved by the Regional Committees for Medical and Health Research Ethics South-East (2016/899).

Results

In the period 2011–15, an average of 1 121 252 children in the age group 0–17 years lived in Norway. Among these, diagnostic codes for endocarditis were registered in the context of hospitalisations in 30 unique patients. The number

of patients with endocarditis varied from 0 to 9 per year, but we found no statistically significant change over time (yearly change = −1.1 % (CI −31.9 to 43.4), p = 0.9). Total prevalence of endocarditis is estimated at 0.5 per 100 000 children (0–17 years) per year in the period. The prevalence of endocarditis in different age groups is presented in Figure 1. Median age for endocarditis was 10.5 years (interquartile range 4–13). There were more boys (n = 21) than girls (n = 9) with endocarditis in the period (p = 0.04).

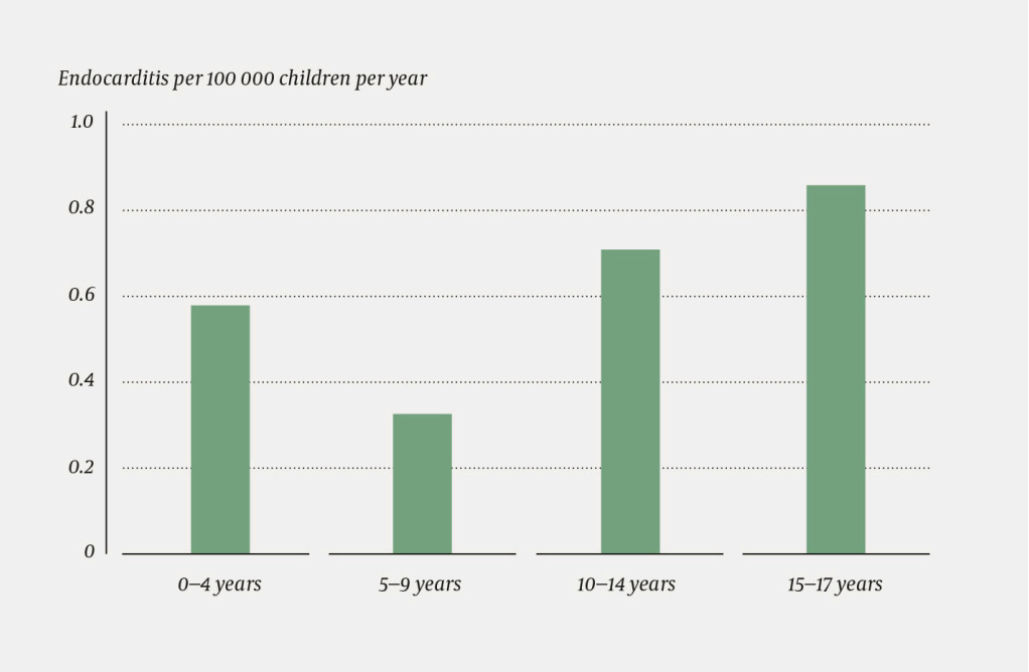

Figure 1 Prevalence of endocarditis in different age groups in the period 2011–15.

Altogether 20 (67 %) of the patients with endocarditis had also received a diagnosis of congenital heart disease. Based on our previous study (5) we estimated the number of children with congenital heart disease in the same period to be 13 100. This gives a prevalence of endocarditis of 0.18 and 30.5 per 100 000 children without and with heart disease per year, respectively. Thus the prevalence of endocarditis in children with heart defects was almost 170 times higher than in children without heart defects. Of the patients with heart defects, 14 had a severe defect. The various diagnoses for congenital heart defects are shown in Table 1.

Table 1

Different types of congenital heart defects in patients (0–17 years) with endocarditis in the period 2011–15.

Type of heart defect	Number of patients
Severe congenital heart defect	14
Tetralogy of Fallot	4
Transposition of the great arteries	3
Aortic stenosis	3
Pulmonary atresia/stenosis	2

Type of heart defect	Number of patients
Mitral stenosis	1
Coarctation of the aorta	1
Non-severe congenital heart defect	6
Ventricular septal defect	3
Atrial septal defect	1
Minor valve defect	1
Patent ductus arteriosus	1

Discussion

In this study, which included all children born in Norway in the period 1998–2015, the total prevalence of endocarditis in the years 2011–15 was relatively low, and most children with endocarditis had a congenital heart defect in addition.

Few studies of endocarditis in children are available. The estimated prevalence in this study is consistent with the findings in a recently published study from the United States (8). Both in the American study and in our previous study of endocarditis in children with congenital heart defects in Norway in 1994–2016, the prevalence remained stable over time (5).

Congenital heart defects have also previously been shown to represent a major risk factor for endocarditis, particularly severe heart defects that often consist of several defects and frequently require extensive cardiac surgery, including the use of artificial materials (4, 5, 9, 10). We have previously shown that approximately three-quarters of the endocarditis cases in children with congenital heart defects occurred within one year after cardiac surgery or cardiac catheterisation (5).

Symptoms, findings and disease course for endocarditis may vary. The diagnosis requires a combination of anamnesis, findings from clinical examination, blood culture and echocardiogram (1). Fever was the most frequent symptom in our previous study. Blood culture was positive for most patients, and many had visible vegetations revealed by echocardiogram (5).

Endocarditis is a severe condition associated with serious complications and high mortality, also in children (5). The rate of complications is higher in patients with heart defects than in patients without such defects (5, 9).

This study represents a complete population of children, but it also contains several weaknesses. We have only had access to de-identified, restricted data from the Norwegian Patient Registry for a short period of time. We have had no opportunity to check or supplement information from patient records, and

hence the prevalence of endocarditis has probably been overestimated. Nor have we obtained precise figures for the number of children with congenital heart defects in the period.

In summary, this study shows a low prevalence of endocarditis in children. The majority of patients with endocarditis had a congenital heart defect. Notwithstanding this, in our opinion it is important to consider endocarditis as a possible diagnosis when symptoms are unclear, especially in children with severe congenital heart defects.

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