Paediatric Wheezy Admissions at and around School Holiday Periods

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Abstract

Objective: To study the influence of school holidays on paediatric admissions with wheezing.

Design, setting and patients: Retrospective analysis of all admissions due to wheeze in the paediatric age group. Regional hospital catering for all such admissions, subdivided by age group.

Outcome measures: Comparison of hospitalisations due to wheezing before, during and after school holiday periods.

Results: Summated admissions showed an increase in admissions over the Christmas period for preschool children, and a decrease for school age children. In Easter and at the start of the summer holidays, admissions decreased in all age groups, except for the late school age group which showed increased admissions in April-May. After the summer holidays, a rise in admissions was noted for all ages.

Conclusions: Our findings support the multiphenotypic theory for the precipitation of wheezy attacks, with a changeover from a predominantly viral respiratory trigger to a more atopic form of the disease at around 10 years of age. Prophylaxis during school periods is especially important, and advice leading to prophylaxis dose reduction in the benign summer months should be accompanied by advice to restart adequate prophylaxis medication prior to restarting school.

Keywords

asthma; seasons epidemiology; school holidays

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Introduction

In a previous study, we showed a seasonal variation in wheezing admissions for both children and adults in Malta.[1] Some studies have shown that school holidays may influence such admissions, probably due to the known viral triggers that account for a substantial proportion of such attacks in childhood.[2]

Malta is a small central Mediterranean island which is served by one acute general hospital. Hence, the country provides a suitable setting for studies on hospitalisations for wheezing. An ISAAC study recently conducted in Malta[3] showed that despite widespread use of inhaled prophylactic steroids,[4] 28% of children had experienced wheezing.

Need for hospitalisation during wheezy attacks is an indicator that the attack is severe, and may be due to a first severe episode, or to failure of prophylaxis. Admission results not only in the attendant morbidity of hospitalisation, for the child and family, and concomitant costs, but also in school absence.[5]

This study was carried out to address variations in paediatric hospital admissions with a diagnosis of asthma or wheezy bronchitis, for both preschool and school aged groups, for the periods just prior to school holidays, during holidays, and just after such holidays. The aim of this study was to obtain variations in admissions at and around different holiday periods, for different age groups, and to correlate these variations with known patterns of viral respiratory disease.

Methods

Patients and population

The catchment area for this study was the island of Malta, which has a warmly temperate climate, and a captive paediatric population of about 80,000 children (<14 years of age). The country is served by one regional hospital, catering for all acute admissions. Such admissions are recorded in a central database and diagnoses are coded using the International Classification of Disease system. All paediatric admissions (aged <14 years) with a diagnosis of asthma or wheezy bronchitis were extracted from this database for the period when such data was available i.e. January 1994-April 2000. Admissions were divided into the following age groups: <1 year (infants), 1-4 years (preschool), 4-10 years (early school age) and 11-14 years (late school age). No other data was available, such as family history or other atopic manifestations.

Although the 1-4 year age group was defined as 'preschool', it must be borne in mind that some of the older children in this group will already be attending kindergarten or actual school. Moreover, for all ages within this group, a minority of children

will be attending child care centres.

Time periods

Holidays included in this study were from Easter 1994 to Christmas 2000. Holidays considered were those during Christmas, Easter and summer. The midterm holidays were not included in this study due to their brief nature and the short incubation period (12-48 hours) for the vast majority of viral respiratory infections.

Exact dates for holiday periods (including weekends immediately abutting on such periods) were obtained from the Malta Education Department for the years under study.

Wheezy admissions during the Christmas and Easter holiday periods were extracted from the hospital database. Admissions during periods of time of exactly the same length, just before and just after the Christmas and Easter holidays, were also obtained.

Due to the length of the summer holidays, this period was not considered as one whole. Admissions during the first two weeks of the summer holidays were obtained, and compared with admissions during the two week period just before the summer holidays. Similarly, admissions during the last two weeks of the summer holidays were obtained, and compared with admissions in the two week period just after the summer holidays. This compared the effects of starting school and of leaving school.

For these four periods (Christmas, Easter, early summer and late summer), admissions were summated over the years under study, and calculated as admissions per week by age group (Table 1). Data is also displayed as percentage variation in wheezy admissions, for each period (Figure 1).

Results

Overall

During the period January 1994-April 2000, there were a total of 3957 paediatric wheezy admissions. Summated number of admissions by age group, during holiday periods and the periods just before and after are shown in table one, along with the respective rates per week. A graphic representation is shown in Figure 1, where over each of the four periods, percentage variations in admissions were calculated.

Table 1: *Number of admissions and rates, for each of the four periods under study, by age*

Christmas Holidays	**(n)**			**(rate/week)**		
Age group (years)	**Before**	**During**	**After**	**Before**	**During**	**After**
<1	33	60	70	2.5	4.5	5.3
1-4	67	87	65	5	6.5	4.9
5-9	20	15	10	1.5	1.1	0.8
10-14	15	9	10	1.1	0.7	0.8
Total	135	171	155			

Easter Holidays	**(n)**			**(rate/week)**		
Age group (years)	**Before**	**During**	**After**	**Before**	**During**	**After**
<1	57	45	46	6.2	4.9	5
1-4	44	38	26	4.8	4.2	2.8
5-9	13	6	12	1.4	0.7	1.3
10-14	7	7	16	0.8	0.8	1.8
Total	121	96	100			

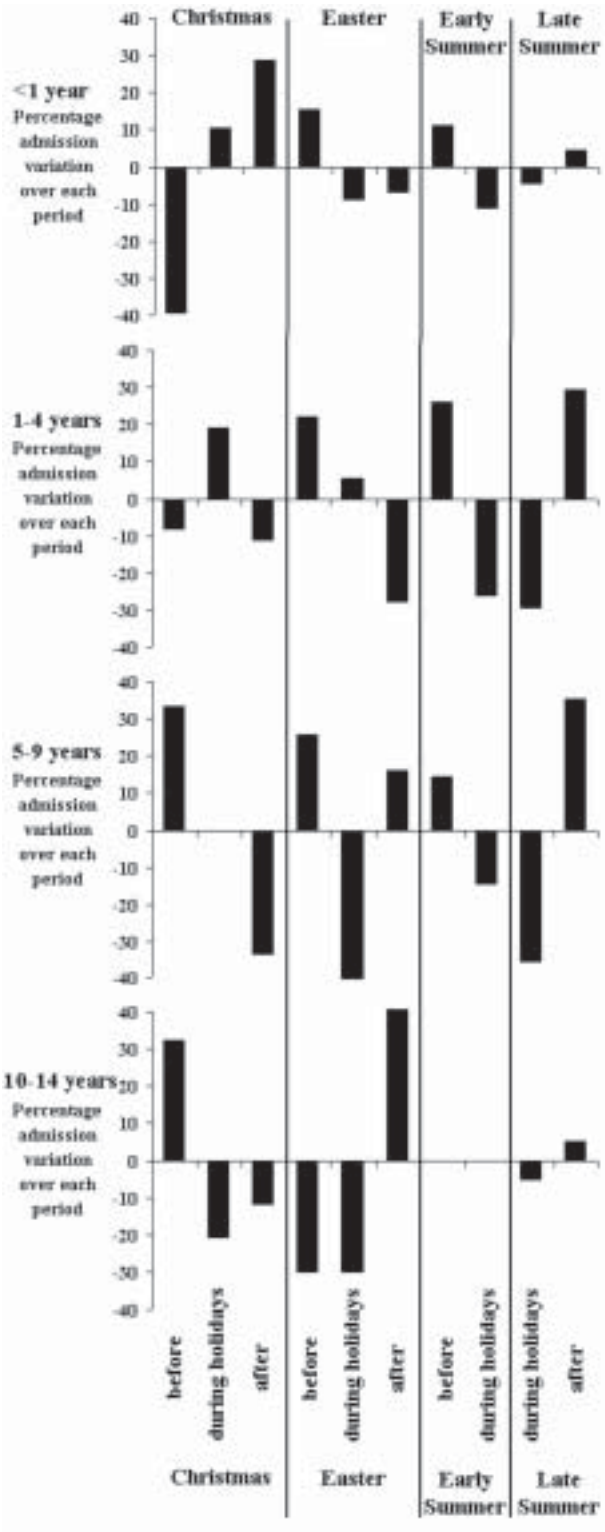
Summer Holidays	**(n)**		**(rate/week)**	
Age group (years)	**Before**	**During**	**Before**	**During**
<1	20	16	1.7	1.3
1-4	34	20	2.8	1.7
5-9	8	6	0.7	0.5
10-14	4	4	0.3	0.3
Total	66	46		

Summer Holidays	**(n)**		**(rate/week)**	
Age group (years)	**End**	**After**	**End**	**After**
<1	11	12	0.9	1
1-4	24	44	2	3.7
5-9	11	23	0.9	1.9
10-14	9	10	0.8	0.8
Total	55	89		

Christmas

Over the Christmas period, admissions increased in the infant and preschool age groups. Conversely, for the school age groups, admissions decreased (Figure 1).

Figure 1: *Percentage change in admissions, by age, calculated separately, for each of the four periods under study*



Easter

In the Easter period, admissions decreased in the infant and preschool age group, with the trend continuing after the holidays. For the early school age group, admissions decreased during the holidays, and increased after. The late school age group showed no decrease in admission in the holiday period, with a rise just after the holiday period (Figure 1).

Summer

All age groups except for the late school age group showed a drop in admissions on starting the summer holidays. This change was maximal in the early school age group. Conversely, all age groups showed a rise in admission rates on ending the summer holidays, and this change was maximal in the preschool- and early school age groups (Figure 1).

Unfortunately, despite summation of admissions over a seven year period, the differences did not reach statistical significance.

Discussion

Prospective studies have shown that there are at least three phenotypes leading to wheezy episodes in childhood.[6,7] One phenotype manifests due to atopy in older school aged children. A second phenotype manifests as transient wheezing in the preschool period, and many such episodes are associated with viral infections. A third phenotype may also be precipitated by respiratory tract infections at school age, independently of atopy, with a possibly more benign prognosis.[8] It has long been known that viral infections, mostly due to rhinoviruses, are associated with about half of all wheezy episodes in childhood, with the percentage rising to 64% in severe episodes requiring steroids.[2] Respiratory syncitial virus has also been shown to play a role in wheezy episodes, being isolated in approximately a quarter of attacks.[9] However, such infections occur *de novo* and wheezy children have not been shown to have a higher respiratory viral carriage rate than non-wheezy children.[10]

In this study, we consider only the more severe end of the spectrum, where children actually needed admission to hospital due to the severity of a wheezy attack. Whether a severe attack of wheeze occurs inside or outside a holiday period should therefore not influence the decision regarding admission, by Emergency and Admitting doctor, parents or indeed, the child. Hence, a potential source of bias is averted.

Christmas

Malta is a Roman-Catholic country, where Christmas is celebrated with parties for children which are organised by both schools and families. During this period, Christmas is also celebrated with formal and informal dinner parties for family and friends, which gather from all over the Island. Hence, all age groups continue to be exposed to a large number of adults and other children in enclosed spaces, and consequently to respiratory viral infections. There is indeed a rise in admissions over the Christmas period in the pre-school age groups, especially in infants, and this may be due to exposure not only to rhinovirus but also to respiratory syncitial virus to which this age group is the most susceptible. It is probably during this annual holiday period that the preschool age groups are most exposed to large groups of children of all ages, and adults, and

hence to viral respiratory infections. Indeed, it has been shown that by the age of two years, 95% of children will have encountered the respiratory syncitial virus.[11]

However, admissions in the school age groups decline after the end of the school term, and this may be actual reduction in exposure to viral infections from aggregations of family and friends, when compared to exposure from school.

Easter

Easter in Malta is a more sombre time of the year, with social mixing at family level only, and there are naturally no parties. In the late school age group, the onset of the Easter holidays did not affect admission rates, while return to school brought about a rise in admissions in the April-May period. We attribute this to the more atopic nature of wheezing in this age group, with the inherent seasonal wheezy pattern[1] overriding the holiday effect. This post holiday rise is also seen, to a lesser extent, in the early school-age group, and may be due to the same reasons. In the three under 10 years age groups, a drop in admission rates is noted with the onset of the holidays, and this is again attributed to reduced exposure to viral infections. This deduction is made more likely by the fact that the greatest decline in admission rates was in the early school age group, which is the group most newly exposed to viral infections, followed by the preschool age group and the infants. Although the majority of the latter two groups do not attend school, they are likely to be exposed to respiratory tract infections from older children, particularly siblings.

Early summer

All but the late school age group exhibited a decline in the admission rates. Once again, the greatest change is seen in the early school age group and the same arguments as above apply.

Late summer

The converse is seen, with a rise in admission rates across all age groups, again especially in the early school age group, and this is mostly likely attributable to reexposure to viral respiratory tract infections.

Over the holiday periods, admission with wheezy attacks exhibit unique patterns for different age groups. The early school age group is most affected, with reductions in admission rates during holidays, and this is attributed to the ongoing exposure to viral respiratory tract infections in these children who have not yet built up sufficient protective levels of immunity. The pattern in the preschool groups is similar in the Easter and summer periods, and a contributing factor may be reduction of carriage of viral infections from schools to homes by older siblings. However, for the preschool age group, the admission pattern is markedly different in Christmas, where it peaks during this holiday period. The late school age group exhibits a more adult pattern overall, but still shows a reduction in admissions over the Christmas period.

Our findings are consistent with the theory that a viral trigger is responsible for the majority of severe wheezy attacks, particularly under 10 years of age. However, eczema in children has also been shown to improve in holiday periods, and one study showed that in Great Britain, the improvement correlated with wheezy symptoms and with the holidays being spent in a southerly location, with deterioration in symptoms if holidays were spent in the north of the country and within two weeks of return to home.[12] Eczema is unlikely to be precipitated by viral respiratory infections, and other allergens also play a role. Our findings also support the multiphenotypic nature of wheezy attacks, with a changeover from a predominantly viral respiratory trigger to a more atopic form of the disease at around 10 years of age. These results are suggestive but speculative in that the study was retrospective and no viral studies were carried out. Moreover, cold weather, exposure to cigarette smoke and to furnishings harbouring house dust mite in enclosed spaces may all be additional confounding factors.

Conclusions

This study shows that in the school age group, the importance of prophylaxis during school periods should be reinforced, and any reduction or suspension of prophylactic inhaled steroids over the benign summer months should be linked with strong rejoinders to resume adequate treatment prior to the end of the holidays in order to avoid unnecessary admissions. There is a drop in hospitalisation for wheeze during school holidays, followed by a sudden increase on restarting school. For this reason, a low threshold for early and aggressive treatment of wheezy episodes after holidays may also be effective in reducing admissions.

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