Paediatric Respiratory Disease

14

Key Points

- 25% of children's consultations with General Practitioners are for respiratory issues
- Acute respiratory infections (including those which are vaccine preventable) continue to be a significant burden on Irish children and Irish health services
- Congenital and perinatal respiratory diseases in terms of death and inpatient hospitalisation are most marked in those aged under 1 year of age
- Respiratory disease accounts for 31.9% of inpatient hospitalisations of those aged 0-4 years and 26.7% of those aged 0-15 years
- Asthma and cystic fibrosis are the chronic respiratory diseases which impact most on childhood

Background

Respiratory problems account for 25% of all visits of children to General Practitioners (GPs)[1]. The two chronic respiratory conditions which most commonly affect children in Ireland are asthma (see chapter 6) and cystic fibrosis (CF) (see chapter 7).

Many of the acute respiratory diseases which affect children are of an infectious nature. Many are managed at home in the community. As a number of respiratory infections are notifiable diseases (see chapter 12), national incidence trend data is available. Although the notification numbers for some of these are an underestimate of the true incidence, such as Respiratory Syncytial Virus (RSV) and influenza, they can be used to monitor trends. A number of the notifiable diseases are vaccine preventable and are included in childhood immunisation programmes. Disease notification numbers serve to monitor the effectiveness of these programmes. For other respiratory infections including pneumonia (see chapter 5), and bronchiolitis, the situation on data is as for many diseases i.e. a reliance on mortality data and hospitalisation data.

Of particular importance in childhood are congenital and perinatal respiratory problems and conditions often linked with prematurity.

Bronchiolitis is usually the result of viral inflammation of the bronchioles. RSV infection - a notifiable disease in Ireland since 2012 - is one of the most common causes of bronchiolitis. Bronchiolitis is one of the major causes of hospital admissions in infants under 1 year of age. Other causative viruses for bronchiolitis are human meta-pneumovirus, rhinovirus, adenovirus, para-influenza virus, enterovirus and influenza virus[1].

Perinatal respiratory conditions, some of which have long term consequences, include respiratory distress of newborn (ICD-10 P22), congenital pneumonia (ICD-10 P23), neonatal aspiration syndromes (ICD-10 P24), air leak syndrome originating in the perinatal period (ICD-10 P25), pulmonary haemorrhage originating in the perinatal period (ICD-10 P26), chronic respiratory disease originating in the perinatal period (ICD-10 P27) (which includes broncho-pulmonary dysplasia (BPD)) and other respiratory conditions originating in the perinatal period (ICD-10 P28).

Primary ciliary dyskinesia (Kartagener Syndrome) (included in ICD-10 J98, Q89.35) is an inherited disorder characterised by specific defects of cilia which results in ineffective clearance of mucous secretions and inhaled particles. The main pulmonary complication is bronchiectasis. The incidence of the disease is low[1]. The numbers hospitalised or who die in Ireland each year with this condition are small. It is not discussed further in this chapter.

Congenital malformations of the respiratory system (ICD-10 Q32-34) include abnormalities of the thorax, the lung, the blood supply and the airways. The effects of congenital disorders of the respiratory tract are particularly seen during the first year of life. The incidence is low[1].

Vaccinations are effective in preventing many childhood respiratory infections. Coverage of > 90/95% of children is usually required to achieve herd immunity. In 2016 the childhood immunisation programme in Ireland included, of relevance to the respiratory system, pertussis, measles, mumps, pneumococcus, H. influenza, meningococcus serogroup C and diphtheria. As noted in the chapter on Tuberculosis, BCG has not been available in Ireland since 2015.

In 2016 the immunisation uptakes at 12 and 24 months for both diphtheria (3 doses) and pertussis (3 doses) were 91% and 95%, for Hib (3 doses) 91% and 91%, for PCV2 at 24 months 91% and MMR (1 dose) 92% at 24 months[2]. There were regional variations in uptake. In addition to the childhood immunisation programme, influenza vaccination is recommended for children with specified chronic conditions. Both pertussis and influenza vaccination are recommended in pregnancy in part to protect the newborn child.

Incidence

Table 12.1 in Chapter 12 shows the incidence of notifiable diseases of respiratory significance for the decade 2007-2016. Table 14.1 below shows the 2016 data as it relates to the paediatric population.

Table 14.1. Respiratory infectious diseases (notifiable): Paediatrics Age Group: 2016

2016	Total: All ages	0-4 yrs % of total	5-9 yrs % of total	10-14 yrs % of total
*RSV	2690	2349 (87.3%)	35 (1.3%)	22 (0.8%)
**Streptococcus pneumonia (invasive)	381	42 (11%)	10 (2.6%)	<5
Haemophilus Influenza (Invasive)	58	11 (18.9%)	<5	<5
Influenza	4764	851 (17.7%)	461 (9.7%)	169 (3.5%)
Tuberculosis	315	<5	5 (1.6%)	8 (2.5%)
Pertussis	213	112 (52.6%)	18 (8.5%)	12 (5.6%)
Measles	43	14 (32.6%)	8 (18.6%)	<5

Source: HPSC 2016 Annual Epidemiological Report. Health Protection Surveillance Centre (HPSC). HPSC (2017) [2] **RSV made notifiable in 2012 **EARSS pathogens not recorded on CIDR with the exception of Streptococcus pneumonia (figures since 1/7/15 refer only to confirmed cases).*

Table 14.2. Deaths from Respiratory Perinatal and Congenital causes 2007-2015

	2007-2009	2010-2012	2013-2015
Respiratory distress of newborn (P22)	17	6	13
Congenital Pneumonia (P23)	6	9	9
Neonatal aspiration syndromes (P24)	<5	<5	<5
Air leak syndrome originating in the perinatal period (P25)	<5	<5	<5
Pulmonary Haemorrhage originating in the perinatal period (P26)	<5	7	7
Chronic Respiratory disease originating in the perinatal period (P27)	6	<5	<5
Other respiratory conditions originating in the perinatal period (P28)	16	24	6
Congenital malformation of trachea and bronchus (Q32)	5	<5	<5
Congenital malformation of the lung (Q33)	11	7	9
Other congenital malformation of the respiratory system (Q34)	0	<5	<5

Source: Central Statistics Office (CSO) Vital Statistics[3]

Of the 470 paediatric (0-14years) confirmed cases of influenza in the 2016/2017 season, 268 (57%) were hospitalised (Note: table 14.1 above refers to calendar year 2016). Over 69% (185) of the latter were aged 0-4 years with 27% (74) aged less than 1 year of age. Of the hospitalised cases, 49 % had a risk factor, which most commonly was chronic respiratory disease. The majority of those hospitalised who had an underlying risk were unvaccinated (88%)[2]. For pneumonia and acute lower respiratory infection (unspecified) see chapter 5.

Prevalence

For the chronic respiratory diseases of childhood such as asthma and cystic fibrosis, prevalence is the measure of interest. See chapters for Asthma (chapter 6) and Cystic Fibrosis (chapter 7).

Mortality

In Ireland the number of children who die each year from a respiratory disease is relatively small. In terms of the notifiable and vaccine preventable respiratory diseases (chapter 12) where deaths occurred in recent years in the paediatric age group, they were less than 5 in number. They are not discussed further here.

As deaths from perinatal causes (ICD-10 P22-P28) and congenital malformations of the respiratory system (ICD-10 Q32-34) were relatively few, deaths in three year periods (2007-2015) are shown in the table above. All of those with perinatal codes died under 1 year of age. All but 5 of those with congenital malformations codes who died were under 1 year of age.

In terms of deaths aged under 15 years of age from what are termed Diseases of the Respiratory system (ICD 10: J00-J99), deaths have been combined into 3 year periods for 2007-2015 plus provisional 2016 data as a single year as shown overleaf.

Table 14.3. Deaths: Respiratory system (J00-99) Age < 15 years. 2007-2016

Age category	2007-2009	2010-2012	2013-2015	2016*
0-14 years	14	13	18	9
0-4 years	8	5	10	5
5-14years	6	8	8	<5

*Source: Public Health Information System (PHIS)[4] * Provisional data for 2016*

Table 14.4. Prevalence of respiratory medication use in the GMS population, 2016, age 0-15 years

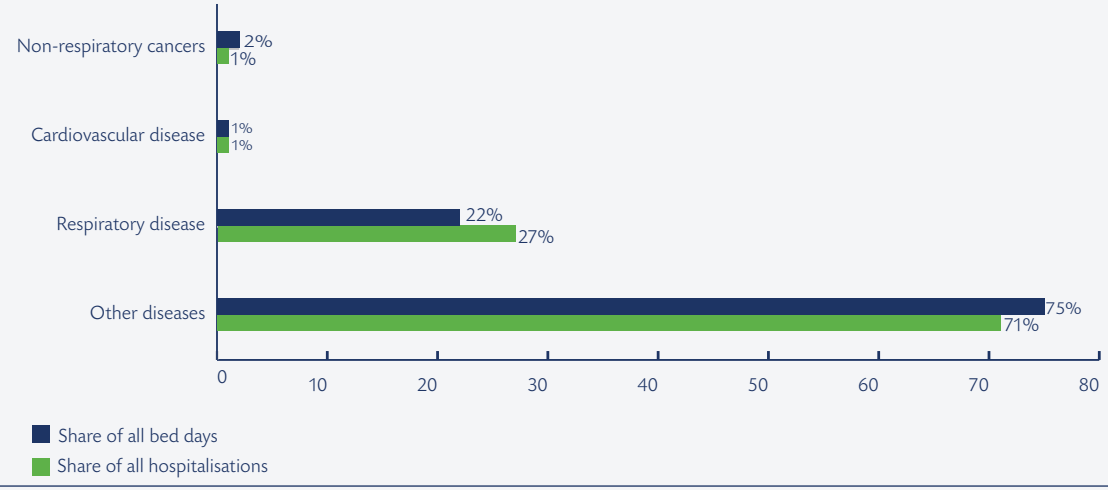
	Population with GMS coverage		Estimate of prevalence of respiratory medication use (%)			
	Male %	Female %	Male %	95% CI	Female%	95% CI
0-4yrs	28%	27%	26.4%	26.0 to 26.8	21.4%	21.0 to 21.8
5-11yrs	35%	35%	22.6%	22.3 to 22.8	17.2%	17.0 to 17.5
12-15yrs	29%	29%	21.7%	21.3 to 22.1	17.3%	16.9 to 17.7

Source: Hurley, E (2018). An analysis of medication use for respiratory disease amongst those with GMS eligibility (2015 - 2016) - a focus on Chronic Obstructive Pulmonary Disease (COPD)[5].

Figure 14.1. Inpatient hospitalisations with a primary diagnosis of bronchiolitis, or perinatal and congenital respiratory conditions, 2009-2016

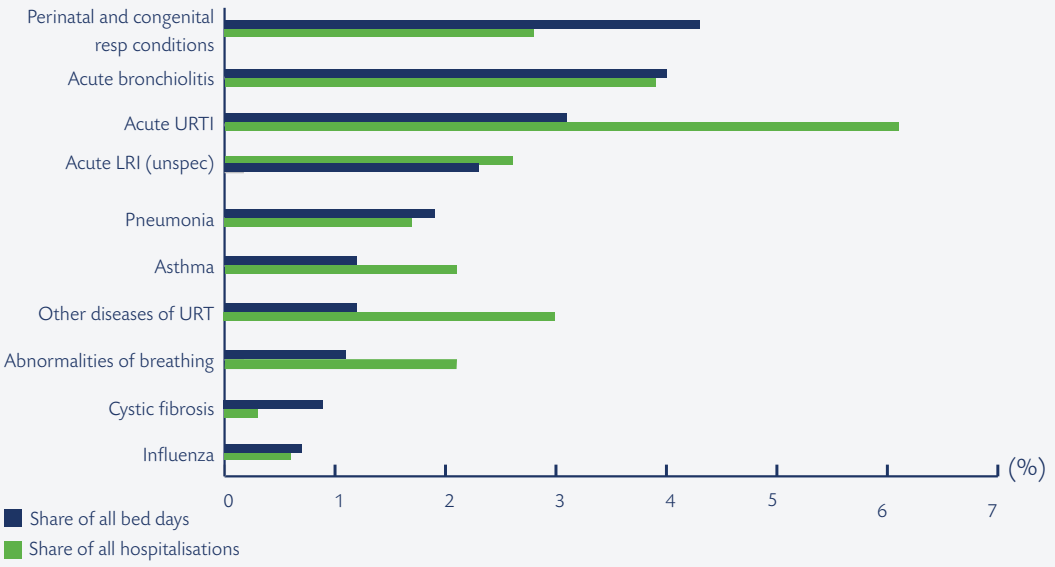
Source: HIPE 2009-2016. All hospitals reporting data to HIPE. Note: ICD 10 codes used for "perinatal and congenital respiratory conditions" are detailed in the section on Background.

Figure 14.2. Percentage of inpatient hospitalisations by disease group, 2016 (0-15 years)



Source: HIPE 2016. All hospitals reporting data to HIPE

Figure 14.3. Percentage of inpatient hospitalisations by respiratory condition, 2016 (0-15 years)



Source: HIPE 2016. All hospitals reporting data to HIPE

Impact on Health Services

Data on many respiratory paediatric diseases are not available at national level for children with full medical cards, those with GP only cards or those who are private patients. This is also true for those who attend GP out of hours services, those who attend Emergency Departments and those who attend hospital Outpatient Departments for their respiratory condition. Inpatient or day case data is only available from HIPE reporting publicly funded hospitals. The majority of acute respiratory infections in children are dealt with in the community.

Respiratory medication use

In terms of respiratory medication use, of children with a full GMS card for the entire calendar year, over one fifth of boys filled at least one prescription for a respiratory medication in 2016. For females the figure was slightly less (see table 14.4)[5].

Impact on Hospitals

Figure 14.1 above shows trends in inpatient hospitalisations over the years 2009-2016 for both bronchiolitis and perinatal and congenital respiratory conditions. In 2016, all hospitalisations for perinatal and congenital respiratory conditions were in those aged 0-15 years and similarly, 99% of those with acute bronchiolitis. Figure 14.1 shows evidence of an increasing impact of acute bronchiolitis during this period.

Looking at the inpatient hospitalisation data for 2016 alone, 26.7% of all hospitalisations for children (0-15 years) were for respiratory disease (this excludes most acute infectious notifiable and/or vaccine preventable diseases) accounting for 21.7% of all inpatient bed days for that age group (see figure 14.2 and table 14.5). The figures for those aged just 0-4 years was 31.9% and 23.0% respectively.

The impact of specific respiratory diseases is shown in table 14.5 and figure 14.3. For discussion of specific respiratory diseases such as asthma, CF, pneumonia see relevant chapters.

In 2016, respiratory disease accounted for 32% of inpatient hospitalisations and 23% of inpatient bed days among those aged 0-4 years as shown in figure 14.4.

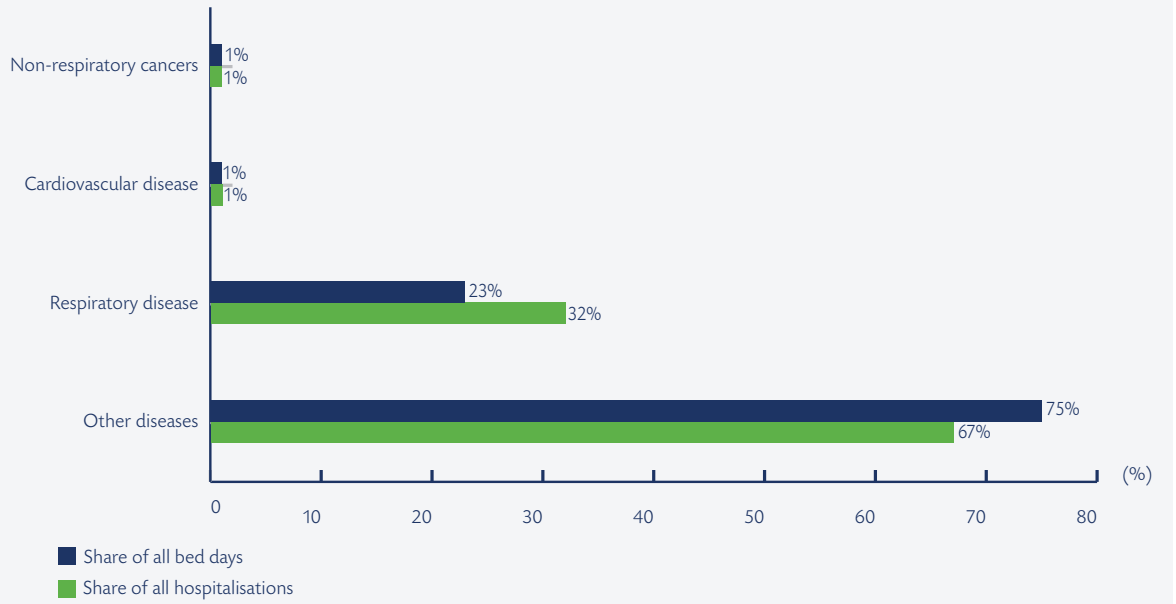
The specific respiratory conditions and their bed day usage for those aged 0-4 years are shown in figure 14.5 and table 14.6.

Table 14.5. Inpatient hospitalisations and bed days, 2016 (0-15 years)

	Hospitalisations		Bed Days	
	Number	Share of all hospitalisations	Number	Share of all bed days
All causes	87,749		294,701	
Respiratory disease	23,422	26.7%	64,078	21.7%
Cardiovascular disease	1,128	1.3%	3,539	1.2%
Non-respiratory cancers	1,218	1.4%	5,768	2.0%
Other diseases	61,981	70.6%	221,316	75.1%
Respiratory disease	**Number**	**Share of resp hospitalisations**	**Number**	**Share of resp bed days**
Acute URTI	5,324	22.7%	9,018	14.1%
Acute bronchiolitis	3,445	14.7%	11,820	18.4%
Other diseases of URT	2,659	11.4%	3,404	5.3%
Perinatal and congenital resp conditions	2,468	10.5%	12,652	19.7%
Acute lower respiratory infection	2,325	9.9%	6,725	10.5%
Asthma	1,885	8.0%	3,599	5.6%
Abnormalities of breathing	1,848	7.9%	3,277	5.1%
Pneumonia	1,508	6.4%	5,717	8.9%
Sleep apnoea	588	2.5%	789	1.2%
Influenza	496	2.1%	1,953	3.0%
Cystic fibrosis	300	1.3%	2,666	4.2%
Cough	224	1.0%	356	0.6%
Other diseases of the respiratory system	125	0.5%	438	0.7%
COPD	50	0.2%	190	0.3%
Acute bronchitis	41	0.2%	111	0.2%
Pneumonitis due to solids and liquids	38	0.2%	376	0.6%
Other diseases of the pleura	23	0.1%	105	0.2%
Suppurative and necrotic conditions of LRT	23	0.1%	259	0.4%
Tuberculosis	19	0.1%	108	0.2%
Respiratory failure	11	0.0%	275	0.4%
Idiopathic pulmonary fibrosis	7	0.0%	26	0.0%
Postprocedural respiratory disorders, not elsewhere classified	7	0.0%	115	0.2%
Pulmonary vascular diseases (excl embolism)	<5	0.0%	89	0.1%
Lung diseases due to external agents (excl pneumonitis due to solids & liquids)	<5	0.0%	8	0.0%
Sarcoidosis	<5	0.0%	<5	0.0%

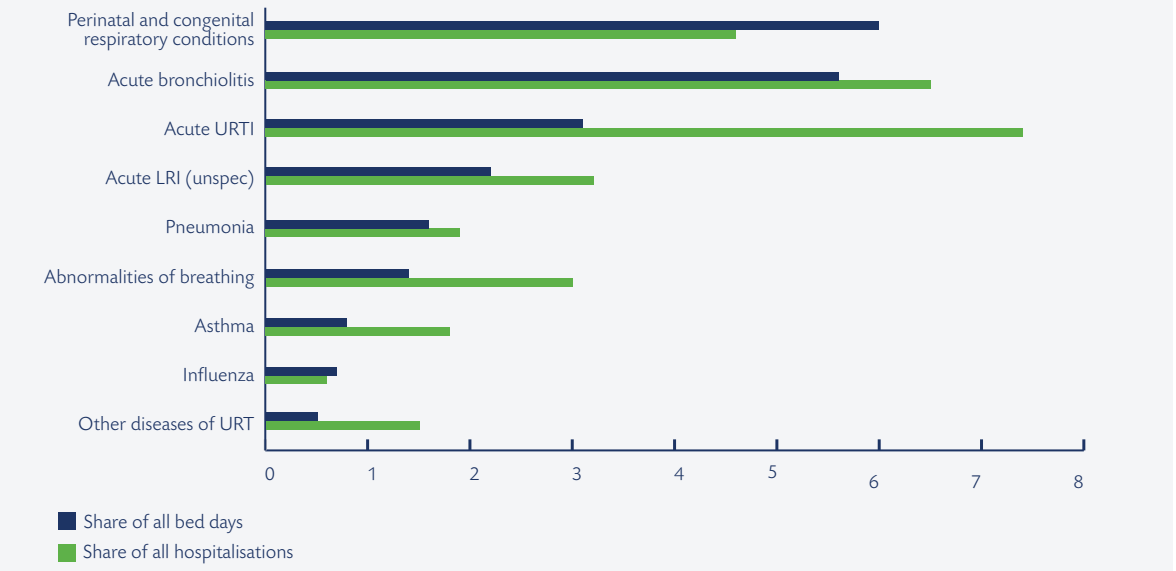
Source: HIPE 2016. All hospitals reporting data to HIPE

Figure 14.4. Percentage of inpatient hospitalisations by disease group, 2016 (0-4) years



Source: HIPE 2016. All hospitals reporting data to HIPE

Figure 14.5. Percentage of inpatient hospitalisations by respiratory condition, 2016 (0-4 years)



Source: HIPE 2016. All hospitals reporting data to HIPE

Table 14.6. inpatient hospitalisations and bed days, 2016 (0-4 years inclusive)

	Hospitalisations		Bed days	
	Number	Share of all hospitalisations	Number	Share of all bed days
All causes	53,025		211,091	
Respiratory disease	16,893	31.9%	48,620	23.0%
Cardiovascular disease	292	0.6%	1,844	0.9%
Non-respiratory cancers	564	1.1%	2,805	1.3%
Other diseases	35,276	66.5%	157,822	74.8%
Respiratory disease	**Number**	**Share of resp hospitalisations**	**Number**	**Share of resp bed days**
Acute URTI	3,933	23.3%	6,639	13.7%
Acute bronchiolitis	3,431	20.3%	11,746	24.2%
Perinatal and congenital respiratory conditions	2,465	14.6%	12,644	26.0%
Acute lower respiratory infection (unspec)	1,689	10.0%	4,657	9.6%
Abnormalities of breathing	1,585	9.4%	2,850	5.9%
Pneumonia	1,009	6.0%	3,395	7.0%
Asthma	929	5.5%	1,644	3.4%
Other diseases of URT	806	4.8%	1,103	2.3%
Influenza	340	2.0%	1,442	3.0%
Sleep apnoea	277	1.6%	424	0.9%
Cough	163	1.0%	271	0.6%
Other diseases of the respiratory system	82	0.5%	289	0.6%
Cystic fibrosis	43	0.3%	336	0.7%
COPD	32	0.2%	73	0.2%
Acute bronchitis	32	0.2%	87	0.2%
Pneumonitis due to solids and liquids	20	0.1%	278	0.6%
Suppurative and necrotic conditions of the lower respiratory tract	19	0.1%	205	0.4%
Tuberculosis	9	0.1%	36	0.1%
Respiratory failure	9	0.1%	246	0.5%
Other diseases of the pleura	6	0.0%	34	0.1%
Idiopathic pulmonary fibrosis	6	0.0%	25	0.1%
Postprocedural respiratory disorders, not elsewhere classified	5	0.0%	110	0.2%
Pulmonary vascular diseases (other than pulmonary embolism)	<5	0.0%	84	0.2%
Lung diseases due to external agents (excl pneumonitis due to solids & liquids)	<5	0.0%	<5	0.0%

Source: HIPE 2016. All hospitals reporting data to HIPE

International Comparisons

The most frequent reason for children consulting a general practitioner in the Netherlands (in 2001) was respiratory morbidity, accounting for about 25% of all consultations by children[1]. Comparable national figures are not available in Ireland but it is unlikely to be less.

International prevalence studies of bronchiolitis show that up to 50% of infants are infected by RSV by their first birthday and almost 100% by 2 years of age[1]. Bronchiolitis is one of the most common causes of admission to hospital in the first 12 months of life[1]. As evidenced earlier in this chapter, it accounted for over 20% (20.3%) of respiratory inpatient hospitalisation of 0-4 year olds in Ireland in 2016.

In 2011 the WHO European region showed a hospital admission rate for perinatal respiratory disorders in a range from 245.2 to 11,344.2 per 100 000 among those aged under 1 year of age[1]. This did not include Irish data. In the same year, the WHO European region reported a range in the mortality rate for perinatal respiratory disorders in infants under 1 year of age (rate per 100 000) of 9.65 (Sweden) to 817.61(Kyrgyzstan)[1]. The Irish rate was 20.41[1].

Global variation in Community Acquired Pneumonia (CAP) prevalence and mortality, results from factors such as malnutrition, over-crowding, low birth weight, pre-existing HIV infection, and childhood immunisation programmes [1]. In industrialised countries like Ireland, the incidence of community-acquired pneumonia (CAP) in children is about 0.05 episodes per child-year, with an extremely low risk of mortality in otherwise healthy children[1]. As evidenced in this chapter, in Ireland in 2016, pneumonia accounted for 1.9% of all inpatient hospitalisations in 0-4 year olds and 1.7% in 0-15 year olds.

Globally, pneumonia accounts for 13% of childhood deaths[6]. Mortality rates for pneumonia in children (age-standardised rate per 100 000, aged under 15 years of age) varied considerably within Europe in 2011 ranging from 0.00 to 50.131. The Irish figure at that time was 0.11[1].

In the 2015 Global Burden of Disease study, 12.1% of deaths in those aged under 5 years of age were due to lower respiratory infections[6]. In that age group, pneumococcal pneumonia and haemophilus influenza caused 65% of the deaths due to lower respiratory infections[7].

As evident from above, many childhood respiratory diseases have high morbidity and mortality in childhood. In addition, they can have effects which can persist into adulthood.

References

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