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The incidence and aetiology of epistaxis in infants: a population-based study

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ABSTRACT

Objective: To estimate the incidence and describe the aetiology of epistaxis in infants.

Design: Population-based study including a retrospective hospital admission database analysis and a postal questionnaire to clinicians.

Setting: Wales, United Kingdom.

Methods: Cases of epistaxis over a 6-year period (1999–2004) were identified from the Patient Episode Dataset for Wales (PEDW) and validated using clinical information to calculate the population-based incidence and ascertain the causes of epistaxis in infants in Wales.

Results: 36 confirmed cases were identified over the 6-year period giving an estimated annual incidence of epistaxis of 19.3 (95% CI 14.0 to 26.7) per 100 000 infants. The median age at admission was 12 weeks (interquartile range 4–33) (min 1 week, max 49 weeks). 23 of the infants had a recognised cause for their epistaxis (trauma (five), coagulation disorder (four), congenital anomaly (two), acute rhinitis or coryza (11), abusive smothering event (one)). No cause for the epistaxis was identified for 13 cases. Coagulation disorder was excluded in seven of these 13 infants but in the other six no attempt was made to exclude this disorder. Child abuse was suspected but excluded in four of the 13 cases.

Conclusion: Hospital admission for epistaxis is a rare event. In the majority of cases in this study a simple explanation was available and proven physical abuse was rare. A bleeding disorder should always be considered and, if additional evidence suggests physical abuse, this must be excluded.

There have been few population-based epidemiological studies of epistaxis in children.^{1–7} A comprehensive literature search (table 1) confirmed that most published studies have been on case series of patients attending emergency departments or ENT clinics without a detailed age breakdown or reported denominator of the population concerned (table 2). Some studies were of highly selected populations such as children presenting to the haematological service.³ This has made it difficult to define the aetiology and incidence of epistaxis during childhood.

In particular, there is very little information on the problem in infants. A recent study from the Lothian region in Scotland confirmed that epistaxis was a rare presentation to accident and emergency departments or hospital in children under 2 years of age.⁷ In that study, 16 cases were identified over a 10-year period, of which eight were associated with trauma, four thrombocytopenia, two apparent life-threatening events and two

What is already known on this topic

- ▶ Little is known about the incidence and aetiology of epistaxis in infancy.
- ▶ It has been hypothesised that epistaxis is associated with inflicted injury in this age group.

What this study adds

- ▶ Epistaxis requiring hospital admission is rare in infancy with an annual incidence of <1 in 5000.
- ▶ Differential diagnoses includes non-specific spontaneous epistaxis, coryzal illness/rhinitis, trauma, coagulopathy, craniofacial malformation and physical abuse from suffocation.

upper respiratory tract infection. Review of previous and subsequent history by three independent paediatricians suggested that seven cases of “accidental” injury might have been caused by abuse.⁷

Several studies have reported an association between epistaxis and apparent life threatening events, sudden infant deaths or smothering events (table 3).^{8–13} This has led authors to conclude that nasal haemorrhage in infancy is associated with deliberate suffocation.^{8–10} However, these studies were not designed to investigate the likelihood of deliberate suffocation as a diagnosis when a baby presents with epistaxis. The literature also includes two case series linking epistaxis with physical conditions in the nose: hereditary haemorrhagic telangiectasia¹⁴ and allergic rhinitis.¹⁵

We carried out a population-based study in Wales to define the incidence and aetiology of epistaxis in infants who are admitted to hospital.

METHODS

We identified all children under the age of 1 year who were admitted to hospitals in Wales with epistaxis between 1 January 1999 and 31 December 2004, from the Patient Episode Database for Wales (PEDW). PEDW was implemented in April 1991 by Health Solutions Wales (HSW) on behalf of the Welsh Assembly Government and the National Health Service (NHS) in Wales. PEDW data are collated, managed and maintained by HSW, and include records based on episodes of care under each consultant. Epistaxis was defined using ICD-10 code R04.0 (Epistaxis: haemorrhage from the

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Table 1 Literature search

Key questions: What are the causes of epistaxis in children? Is there an association between epistaxis and apparent life threatening events in children?

Databases searched: Medline, Embase, and Cinahl, the Science Citation Index and the Social Science Citation Index from 1970 to February 2008

Keywords

1. bleeding from the nose.mp.	19. (Sudden Infant Death Syndrome or sudden infant death).mp.
2. nose bleed:.mp.	20. unnatural death.mp.
3. nosebleed:.mp.	21. (Munchausen Syndrome by Proxy or Munchausen by Proxy Syndrome).mp.
4. (nasal haemorrhage or nasal hemorrhage).mp.	22. (Munchausen syndrome or Munchausen by proxy or Factitious Disorder by Proxy).mp.
5. Epistaxis/or epistaxis.mp.	23. (SIDS or SID).mp.
6. nasal bleed:.mp.	24. Child homicide.mp.
7. intra-alveolar hemorrhag:.mp.	25. covert homicide.mp.
8. intra-alveolar haemorrhag:.mp.	26. child murder.mp.
9. oral bleeding.mp.	27. physical abuse.mp.
10. (ornasal haemorrhage: or oronasal hemorrhage:).mp.	28. or/13–27
11. Epistaxis/or oronasal hemorrhage.mp. or Airway Obstruction/	29. (baby or babies).mp.
12. or/1–11	30. Baby/
13. child abuse.mp.	31. Infant/
14. suffocat:.mp.	32. infant:.mp.
15. smother:.mp.	33. young child:.mp.
16. asphyxia.mp.	34. or/29–33
17. Infanticide.mp.	35. 12 and 28 and 34
18. (Acute Life Threatening Event or ALTE).mp	36. limit 35 to yr = "2006–2008"

nose, nosebleed). For each individual patient with any mention of this diagnostic code, data on date of admission, age and sex were extracted by HSW. Each case was anonymised and made available to the research team for analysis.

The diagnosis of epistaxis was retrospectively validated using a letter and a questionnaire sent to the clinician who had been

responsible for the care of the infant at the time of the admission. This clinician (consultant paediatrician, ENT surgeon or haematologist) was identified by a member of HSW (EE). The letter identified the patient to the clinician, but these personal identifiers were not included on the questionnaire. The clinician was asked to complete the questionnaire about the patient identified in the letter and return the questionnaire to the other members of the team (JRS and AK). Members of the team who analysed the returned questionnaires did not receive any personal information relating to the patients. The questionnaire asked for confirmation of the diagnosis of epistaxis, the age of the infant on admission, clinical history and details of any history of trauma or coagulation disorders and whether or not abuse was considered in the differential diagnosis. We calculated incidence rates based on the overall infant population at risk. Age-appropriate denominators were estimated using published birth data for Wales.¹⁶ 95% Confidence intervals were calculated using the binomial distribution. The clinical histories provided in the returned questionnaires were reviewed and summarised by two paediatricians and an ENT surgeon (JRS, AK, AT). Ethics approval for this study was obtained from the Multi-Centre Research Ethics Committee for Wales.

RESULTS

During the 6-year study period, we identified 44 individual infants who had 52 admissions between them to Welsh hospitals and were treated for epistaxis. Of these 44 infants, the R04.0 code was in first position for 28 infants, second position for five, third position for 10 and fourth position for one infant. The response rate to the questionnaires was 91% (40/44 individual infants). The diagnosis of epistaxis was confirmed in 36 infants (41 admissions) giving an annual incidence of 19.3 (95% CI 14.0 to 26.7) per 100 000 infants. In the four cases where epistaxis was not confirmed as the

Table 2 Summary of studies on epistaxis in childhood

Authors (year)	Type of study	Country	Study population denominator	Number of children	Age	Causes
Tomkinson <i>et al</i> (1997) ¹	All age population-based series of hospital admissions	Wales	6885	140	<5 years	Only limited information on children
Garcia Callejo <i>et al</i> (1998) ²	Case series of hospital presentations	Spain	Not given	58	Not stated	3/39 cases of mild epistaxis had coagulation disorder compared with 11/19 severe cases
Sandoval <i>et al</i> (2002) ³	Case series of referrals to a haematology clinic	USA	Not given	178	15–219 months	One third of the series had a recognisable coagulation disorder
Makura <i>et al</i> (2002) ⁴	Case series from the emergency department of a large children's hospital	England	Not given	88	Not stated	85 no cause found. 3 had coagulation disorder. 17 had associated URTI
Brown and Berkowitz (2004) ⁵	Case series of hospital admissions to an otolaryngology service in a tertiary paediatric hospital	Australia	Not given	14	1.9–18.3 years	4 associated URTI. 7 no trigger identified. 1 case trauma. 6 referred to haematology with abnormal clotting screen but no coagulation disorder confirmed
Pallin <i>et al</i> (2005) ⁶	Representative sample of emergency departments in the USA	US	4 503 000	701 692	All ages	Incidence of epistaxis for children under 10 years was 4 per 1000 ED visits. Only limited information on children. 17% of whole series were traumatic
McIntosh <i>et al</i> (2007) ⁷	Population-based study of hospital admissions and emergency departments in children aged <2 years	Scotland		16	<2 years	8 cases associated with trauma. 4 cases thrombocytopaenia. 2 with URTI

ED, emergency department; URTI, upper respiratory tract infection.

Table 3 Studies (case-control, cross-sectional and case series) linking nasal bleeding in infancy with deliberate suffocation

Authors (year)	Type of study	Country	No patients	Comments
Southall <i>et al</i> (1997) ⁸	Case-control study of ALTEs	UK	30 patients with deliberate suffocation. 46 controls with medical causes	9 of suffocation patients had nasal bleeding compared to 0 controls. This was significant at the $p<0.001$ level
Becroft <i>et al</i> (2001) ⁹	Cross-sectional study of nasal bleeding associated with SIDS	NZ	365 SIDS cases whose parents were interviewed	60 (15%) had nasal haemorrhage. Authors conclude that smothering is a possible common factor, although is unlikely to be the cause in most cases presenting as SIDS
Becroft and Lockett (1997) ¹⁰	Case series of children cared for by two women who had been convicted in court of murder and manslaughter	NZ	2 pairs of siblings and 10 other children under the same care	Bleeding from mouth or nose was observed during 6 of 10 previous ALTEs suffered by these children and 3 unrelated infants in the same care. The authors say that "external hemorrhage is well described in imposed infant suffocation"
Meadow (1999) ¹¹	Personal cases series of infant deaths	UK	81 cases	27 had bleeding around the face
Krous <i>et al</i> (2001) ¹²	Case series of sudden infant death	USA	406 cases	28 (7%) had nasal or oral bleeding. 14 were considered by the authors to be probably due to CPR. The authors state that the other 14 cases included 10 SIDS, two accidental suffocations and two were undetermined
Truman and Ayoub (2002) ¹³	Case series of children who had recurrent ALTEs	USA	138 cases	12 patients had facial bleeding

ALTE, apparent life threatening event; CPR, cardiopulmonary resuscitation; SIDS, sudden infant death syndrome.

diagnosis, the actual diagnosis in three infants was blocked nose, bronchiolitis and urinary retention. In the fourth infant, the clinician confirmed that there was no epistaxis but no further information was given about the reason for admission. During the 6-year study period the estimated population at risk was 186 000 infants aged less than 1 year. Data on age were available for 36 babies. The median age at admission for epistaxis was 12 weeks (IQR 4–33) (min 1 week, max 49 weeks). Nineteen of the 36 infants were male (53%). Most of the infants in our study had minor episodes of epistaxis that resolved without treatment.

Table 4 Age and sex distribution and associated cause of epistaxis in 36 infants admitted to hospital

Age (weeks)	Male	Female
0–8	10 Trauma (1), no cause (6), acute rhinitis or coryza (2), smothering event (1)	4 Coagulation disorder (1), no cause (1), acute rhinitis or coryza (2)
9–16		3 No cause (1), acute rhinitis or coryza (2)
17–24	1 Trauma	1 No cause
25–32	3 Coagulation disorder (1), congenital malformation (1), acute rhinitis or coryza (1)	2 Acute rhinitis or coryza (2)
33–40	1 No cause	6 Trauma (2), no cause (2), congenital malformation (1), acute rhinitis or coryza (1)
>40	4 Trauma (1), coagulation disorder (1), no cause (1), acute rhinitis or coryza (1)	1 Coagulation disorder

Twenty three of the infants had a recognised cause for their epistaxis; these are shown by age and sex group in table 4. For five children the epistaxis was attributable to trauma. These infants were aged 8, 22, 36, 36 and 47 weeks and fell out of a car seat, from a baby chair, a sofa, a bed and down a couple of stairs, respectively. The children who fell from a car seat or baby chair had an associated bruise to the forehead and the child who fell from the sofa had a slight tear of the labial frenum. The referring paediatricians were not concerned about inflicted trauma in any of these cases.

One baby had hypoxic-ischaemic changes on a brain MRI scan and was recognised as a case of child abuse due to smothering within the child protection process.

There were 11 cases of coryzal illness or rhinitis, four infants with coagulation disorder and two children who had congenital disorders (facial haemangioma and post-cleft palate repair).

In 13 infants, the final diagnosis was non-specific epistaxis. There were no child protection concerns raised in nine cases. Concern about the baby's social circumstances were evident in four cases, but after consideration by the paediatric team child abuse was excluded: in one case there was associated domestic violence, one child was already on the child protection register, one mother had alcohol problems, and in one case there was an accusation of shaking which was excluded after a child protection enquiry. Coagulation disorder was excluded in seven of these 13 infants; there was no evidence of definite upper respiratory tract infections in any of this group.

DISCUSSION

Epistaxis requiring admission to hospital in infants less than a year old seems to be a rare event with an annual incidence of one in 5200 infants. This figure is comparable to that found in Scotland (1 in 6400).⁷ More minor episodes not needing admission to hospital may of course be more common. In the majority of cases the cause of the epistaxis was non-specific, with no additional worrying features, or was due to acute

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rhinitis or coryza. A minority of cases were due to falls in the domestic setting or cranio-facial abnormality. Coagulation disorder was found in four cases in our study but was not excluded in six of the 13 infants without a clear diagnosis. We believe that this is an important differential diagnosis and all infants with epistaxis should have coagulation disorder excluded.

Child abuse concerns were raised in five cases. One case was a confirmed smothering event within the child protection process and the other four cases were investigated and no definite abuse found. In the study of McIntosh *et al*,⁷ a review of the previous and subsequent history of their 16 cases suggested that seven of eight cases of "accidental" injury might have been caused by abuse.

The main strength of this study is the use of routinely collected population-based data on admissions to hospital which were then validated using clinical information by the responsible clinician. The data source, PEDW, is continuously maintained and quality assured by HSW. Following retrospective validation of the diagnosis, we were able to estimate a population-based incidence of admission to hospital with epistaxis in infants. The main limitation of the study is the possibility of recall bias arising from the retrospective completion of the questionnaires by the clinician, in some cases several years after the admission. Although 6 years of aggregated data were available, the number of cases recorded was small, resulting in a lack of precision around our estimate of incidence. Furthermore, we may have missed infants who had epistaxis as a cause of admission but were not correctly coded. Finally, the incidence of epistaxis may vary with the geography and sociodemography of the study population, but apart from the age-sex breakdown of cases we were not able to investigate this further.

There are no published data on the incidence of epistaxis in the community, epistaxis presenting to primary care or emergency departments or epistaxis referred to the outpatient settings of either paediatrics or ENT. Our findings cannot be extrapolated to epistaxis occurring in these environments or to epistaxis in general.

Epistaxis sufficient to elicit a hospital admission is clearly a rare event in infancy and a challenging topic to study. The question as to whether there is an association between epistaxis as a presenting symptom and physical abuse remains controversial. We examined data from two previous studies undertaken by our research group^{17 18} to look for epistaxis associated with confirmed cases of physical abuse. The populations studied in each of these studies were not comparable to the present study.

First, a population-based study of serious physical abuse (infanticide, inflicted head injury, internal abdominal injury, suffocation, fracture, burn or scald, adult bite) in 69 infants in Wales over a 2-year period did not identify any cases of epistaxis.¹⁷ Second, there were also no recorded cases of associated epistaxis in a study of 90 children under the age of 2 admitted to hospital with a subdural haematoma; 66 of these cases had suffered from non-accidental head injury.¹⁸ On the other hand, in a study of deaths from Office for National Statistics (ONS) notifications of all children less than 15 years of age¹⁹ who had died as a result of choking/aspiration (60), suffocation (29) or strangulation (11) in England and Wales during the years 1990 and 1991, we did find evidence of associated epistaxis in four of 100 cases. Two of these cases were

babies under 2 months of age where the cause of death was asphyxia due to overlying (one was a 5-year-old where intentional smothering was admitted). These studies provide complementary data; the populations are highly selected groups and not directly comparable with our present study. The studies were not designed to investigate the likelihood of child abuse when a baby presents with epistaxis but reflect the prevalence of epistaxis in known cases of severe abuse or suffocation.

Our findings suggest that there is a differential diagnostic profile of epistaxis in infancy which includes spontaneous nasal haemorrhage for no obvious cause, nasal haemorrhage from coagulopathy and accidental trauma. Child abuse was considered in 5/36 cases and confirmed in 1/36 where there was co-existing inflicted brain injury.

All cases of epistaxis in infants should have a full and expert assessment to exclude bleeding disorders. In most cases there will be a benign (minor trauma or upper respiratory tract infection) or no explanation, but physical abuse should be considered in this vulnerable age group, especially if there are additional worrying features in the history or clinical presentation.

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