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Factors associated with early neonatal attendance to a paediatric emergency department

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ABSTRACT

Aim To examine the demographic and perinatal factors involved in the presentation of newborn babies to a paediatric emergency department (PED) and outcome following attendance.

Methods Term babies who attended the PED of the Royal Belfast Hospital for Sick Children (RBHSC) in the first 2 weeks of life, during two separate 3-month periods in summer and winter 2010–2011 were identified retrospectively from the PED electronic database. Perinatal and demographic data were also obtained on all babies born in the Royal Jubilee Maternity Hospital (RJMH) during the same time period.

Results A total of 223 attendances to the PED involving 208 babies were identified with almost equal distribution during summer and winter months. Almost two thirds (n=139, 62%) of babies presented out-of-hours. Over half of babies were self-referred by parent/carer. The most common presentation was feeding difficulty, vomiting or faltering growth, accounting for 36%. Significant factors associated with attendance to PED included birth weight <2500 g, deprivation and postnatal stay more than 2 days. Sixty-one babies (24%) presenting to PED were admitted to hospital. Significant factors for admission included age ≤48 h and presentation during the standard working day. Overall, a third of babies admitted stayed less than 24 h (34%).

Conclusions Large numbers of babies attend the PED in the first 2 weeks of life, commonly out of hours, from deprived areas and with feeding difficulties. A quarter of babies attending are admitted to hospital, with one-third discharged following an overnight stay. Services should be reevaluated, particularly in this current financial climate, in an attempt to find new models of care for these young babies.

What is already known on this topic

- Paediatric attendances to emergency departments are increasing.
- There has been significant change in postnatal care with early discharge policy for term babies from maternity units.

What this study adds

- Large numbers of newborn babies attend paediatric emergency department (PED), commonly out of hours, from deprived areas and with feeding difficulties.
- Most are discharged from PED or from hospital within 24 h.
- Although more than half were 'self-referred', health care professionals also seek reassurance of PED assessment and observation.

INTRODUCTION

Attendances at paediatric emergency departments (PED) have increased by 8% across Northern Ireland in the last 10 years,[1] in keeping with trends across the UK[2–5] with the greatest increase in children under the age of 1 year.[4] The ability to develop models of care which continue to deliver high quality services despite increasing demand relies on the identification of factors influencing PED attendance, including medical, demographic and community support.

Previous studies have highlighted the large numbers of children attending PED often following self-referral and with minor illness or injury.[5–8] The few studies specifically focusing on neonatal attendances have also identified high numbers of babies with non-acute illnesses, and that subsequent admission rates are relatively low (figure 1).[9–13]

Within the past decade the organisation of the National Health Services has undergone significant change within postnatal care and in the provision of out-of-hours emergency care. Reviews of health service provision have identified the need for increasing community support during the period of pregnancy and until 5 years of age, but it remains unclear whether recommendations have been implemented at a local level.[14–16]

This paper examines the demographic and perinatal factors associated with attendance at PED of babies within the first 2 weeks of life, which can inform service provision.

METHODS

Attendances at the PED of the Royal Belfast Hospital for Sick Children (RBHSC), during two separate 3-month periods in summer (June 2011–August 2011) and winter (November 2010–January 2011), were identified retrospectively using the PED electronic database (Ascribe Symphony, UK). Data were obtained on all babies (n=208), born at term, who attended the PED in the first 2 weeks of life.

Additional perinatal information and inpatient data were obtained from computerised medical records from the Northern Ireland Maternity System database (NIMATS) and Paediatric Inpatient Systems (PAS).

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Citation, Country	Study group	Study type	Outcome	Key results
Sacchetti et al (1997) New Jersey, USA	2094 infants between 2 and 10 days of age	Retrospective chart review	Determine whether early discharge of babies from postnatal ward was associated with an increase in PED attendance	Early discharge of babies was not associated with an increase in ED attendance Overall admission rate -10.3% Majority of attendances were for minor medical problems or educational problems
Millar et al (2000) Calgary, Canada	559 infants, less than 8 days of age	Retrospective chart review	Determine profile of early neonatal visits to the PED. Examine the influence of maternal factors and length of postpartum hospital stay on PED visits.	Overall admission rate -33% Most common presenting problems -jaundice, breathing difficulty and irritability Most common diagnoses -normal physiology, jaundice, feeding problems, possible sepsis. Self-referred patients were at significantly lower risk of serious illness. Self-referral was increased with maternal age <21 years, single marital status, primiparity and no prenatal classes attended
Kennedy et al (2004) Halifax, Canada	142 infants, less than 14 days of age	Prospective survey	Determine acuteness of presenting problem.	49% infants presented with nonacute problems. Significant factors primiparous and maternal age<25 years Non-significant factors Infants discharged less than 48 hours of age compared to those discharged more than 48 hours.
Assandri et al (2005) Montevideo, Uruguay	943 infants, 2-28 days	Retrospective chart review	Determine prevalence of neonatal admissions	Overall admission rate - 29.3% Most common diagnoses - respiratory (42.6%), fever without source (17%).
Hendry et al (2005) Bristol, UK	465 children under the age of 13 years	Prospective questionnaire based survey	Determine factors associated with attendance at PED	Majority of children presented with minor illness of injury (triage category 4) 48% had contacted a GP prior to attending Factors associated with attendance - deprivation , no or one sibling
Downing et al (2006) West Midlands, UK	365 695 children under the age of 16 years (subgroup < 1 year)	Retrospective data review	Determine diagnoses and outcome of attendance and variation with age.	Overall admission rate - 11.5%. 24.2% under the age of 1 year.Most common diagnoses - Non-classifiable diagnosis, respiratory, gastrointestinal conditions and head injury . 5% had no abnormality detected.
Calado et al (2009)Faro, Portugal	540 infants, aged < 2days	Retrospective chart review	Determine profile of early neonatal attendances to PED.	Overall admission rate - 13% . Most common presenting problems - jaundice, excessive crying, and rash. Most common diagnoses -non-apparent disease, infant colic, and physiological jaundice. 17.2% referred by primary physicians Factors associated with admission: Newborns with referral, < 37 weeks of gestation low birth weight less than 2500 g.
Gill et al (2013) Oxford, UK	Children <15 years	Population-based study (based on analysis of Hospital Episode Statistics and population estimates)	Trends in rates of emergency admission to hospital	Emergency admission rate for children increased by 28% in the past decade, to 81 per 1000 in 2010. Particularly in under 5 age group Twofold increase in short-term admissions of <1 day.

Figure 1 Review of studies of paediatric attendances at Emergency Departments

Perinatal and demographic data were also obtained on all babies born in the Royal Jubilee Maternity Hospital (RJMH) during the same time period using NIMATS (box 1).

Statistical methods

Differences between groups were analysed for statistical significance using 2×2 tables. OR and relative risk were calculated. The accepted p value for significance was <0.05.

RESULTS

A total of 223 attendances to the PED involving 208 babies were identified with almost equal distribution during summer and winter months.

One hundred and seventy-six babies (85%) presenting to PED during these time periods were born in the RJMH, Belfast. During the same period 2589 term births occurred giving an estimated prevalence of 7%.

Presentation

Almost two thirds (n=139, 62%) of babies presented out-of-hours. Over half of babies (n=140, 63%) were self-referred by parent/carer, 30 (13%) were referred by community midwives, 42 (19%) referred by general practitioner (GP) and other sources (n=11, 5%). Self-referrals occurred significantly more out-of-hours (OR 3.5 p<0.05).

Presenting problems

The most common presentation was feeding difficulty, vomiting or faltering growth (n=80, 36%). Breathing difficulty accounted for an additional 42 (18%), crying 14 (6%), rash 14 (6%) and jaundice 13 (6%), with no significant seasonal variation.

Factors associated with attendance at PED

Characteristics of babies attending PED were compared to all babies born at term within the Trust during the same time periods. Significant factors included birth weight <2500 g, deprivation ranking ≤89 and a postnatal stay more than 2 days (table 1).

Final diagnosis

The most common final diagnoses were feeding difficulties (n=76, 36%), respiratory tract infection (14%), jaundice (10%), with infection implicated in 26% of final diagnoses. 'Normal baby' was the diagnosis in 25 (10%); and a further 14 babies (6%) had benign neonatal variant. Professionals referred half of these diagnoses (GP 25%, midwife 25%).

There was no significant difference between seasons. All four babies with injury had a head injury following an accident at home. The two babies diagnosed with poisoning had carbon monoxide poisoning. Nine babies were subsequently diagnosed with sepsis. These babies presented with feeding difficulties (2), diarrhoea (1), pyrexia (1), breathing difficulty (1), crying (2) and rash (1).

Outcome following attendance

Sixty-one babies (24%) presenting to PED were admitted to hospital. Significant factors for admission included presentation ≤48 h of age and during the standard working day. Source of referral, birth weight, form of delivery, type of feeding, parity of mother, length of postnatal ward stay and deprivation score were not significant factors. Admission rates were higher in summer months compared to winter months (28% vs 22%), but not statistically significant (table 2).

The presenting problem was not a significant factor in predicting admission. The largest proportion of babies admitted

Box 1 Demographic and perinatal factors in term babies presenting to paediatric emergency department (PED) within first 2 weeks of life

Presentation
Time of presentation: standard working day (Monday—Friday 0800-1759 and out-of-hours (Monday—Friday 1800-0759, weekend and bank holiday).
Age at presentation: ≤48 h, >2–≤5 days and >6–≤14 days.
Source of referral: parent/carer, midwife, general practitioner, health visitor, other hospital or planned review.
Presenting problems: problems recorded on triage were subdivided into 12 categories.

1. Vomiting (without diarrhoea, or feeding difficulty or failure to thrive, or both
2. Diarrhoea with or without vomiting
3. Pyrexia
4. Fit (including apnoea ,jerking)
5. Breathing difficulty
6. Crying
7. Jaundice
8. Rash
9. Constipation
10. Ingestion with or without poisoning
11. Injury
12. Other

When baby presented with more than one symptom, the more serious one was documented. For example, breathing difficulty over diarrhoea.
Perinatal factors
Birth weight: <2500 g and ≥2500 g
Form of delivery: normal vaginal delivery, Assisted (forceps/vacuum), Caesarean section.
Type of feeding: exclusively breastfeeding, formula, or both.
Time to discharge from postnatal ward in days.
Parity: primigravida or parous
Demographic factors
Deprivation: deprivation ranking was applied from postcodes using the Northern Ireland Deprivation Measure, published in May 2010 by NI Statistics Agency. It uses 52 indicators (eg, Employment, Health, Education) to rank 890 super output areas (SOAs) in Northern Ireland. SOAs with ranks of 89 or less are in the top 10% of the most deprived SOAs in NI.[17]
Outcome
Outcome following attendance: admission, discharge with follow-up appointment, discharge without follow-up
Length of admission: ≤24 and >24 h
Final diagnosis: following discharge from PED/inpatient admission. Coded computer diagnoses were categorised into 13 groups. Feeding difficulties included gastro-oesophageal reflux, choking episode related to feed, overfeeding and faltering growth. Benign neonatal variants included urate in the nappy, erythema toxicum and acrocyanosis.

presented with fit (57%), followed by rash (43%) and crying (40%). No baby presenting with diarrhoea, injury or jaundice was admitted.

Overall, a third of babies admitted were discharged within 24 h (34%). The proportion of babies with early discharge was significantly higher in summer compared to winter (43% vs 22%, OR −2.67 p=0.003). Of those babies discharged within 24 h, one third (n=7) had a respiratory tract infection, and a third had feeding difficulties (n=6).

Length of admission ranged from <24 h to 24 days. Babies admitted longer than 2 weeks had feeding difficulties, complex medical problems and bronchiolitis.

DISCUSSION

The RBHSC is the only dedicated paediatric hospital and PED in Northern Ireland. It provides general hospital care for approximately 65 000 children living in Belfast as well as tertiary paediatric services for children in Northern Ireland. There is a rapid response clinic but no short-stay admission facility. The PED currently has around 33 000 new attendances a year. RJMH is one of two maternity hospitals within the Belfast Trust, delivering approximately 5000 of the 6500 babies born within the Trust each year.

Large numbers of young babies are attending PED. The exact prevalence is impossible to ascertain given current information technology but we estimate that more than 1 in 15 babies born at term in Belfast present to PED within the first 2 weeks of life and one quarter are admitted following attendance. Of babies attending, 80% are either discharged from PED or discharged from hospital within 24 h, raising the question of appropriateness of current service provision.

These findings are not new but despite recognition of high-level demand for healthcare in the first few weeks of life, current organisation of services means that many healthy babies or those with non-acute illnesses present to PED.

Better understanding of factors contributing to presentation of these babies to hospital may allow the development of alternate models of care and more targeted use of health service resources. Delayed discharge from postnatal wards was the most significant factor in predicting attendance at PED. Even though some of these babies remained in the maternity unit for maternal reasons, it does appear that as a group these babies should be identified for closer follow-up in the immediate postnatal period with implications for allocation of resources including training of community nursing and medical practitioners.

Given the prevalence of feeding problems it is apparent that parents of newborn babies, even if not a first baby, seek professional advice, over and beyond that routinely provided. Breast feeding rates in Northern Ireland are among the lowest in the UK[18] but type of feeding, via breast or bottle, was not a significant factor in attendance at PED or outcome following attendance. Additional support from health care providers in the immediate postnatal period, when feeding routines are being established, has the potential to prevent PED attendance and may improve prevalence of breastfeeding.[19]

It is unclear whether the implementation of the early discharge policy from maternity units across the UK included enhanced community support for newborn babies and their carers. Savings in postnatal care may well have implications for cost to hospital paediatric services, in particular to PED resources. Our data suggest that support is lacking, or perceived by carers to be inadequate. Although self-referrals were higher 'out-of-hours' they still accounted for half of babies seen during the working day. Parents do cite difficulty in accessing primary care services but further studies are needed to determine actual attempts to make contact as opposed to reported.

Deprivation was also a significant factor in attendance at PED and has been recognised in previous studies involving children.[20 21] Targeted community support has been shown to reduce PED use by children from deprived communities, by

Table 1 Comparison of perinatal factors of babies attending PED with all babies born at term in RJMH

	Attending PED N=223	RJMH data N=2589	OR (95% CIs)	RR (95% CIs)	p Value
Birth weight	N=220	N=2582	2.46 (1.05 to 5.57)	2.21 (1.04 to 4.15)	0.037
<2500 g	8 (4%)	39 (2%)			
>2500 g	212 (96%)	2543 (98%)			
Form of delivery	N=218	N=2589	0.93 (0.69 to 1.24)	0.93 (0.713 to 1.2)	0.653
Assisted or c/s	89 (41%)	1104 (43%)			
NSVD	129 (59%)	1485 (57%)			
Feeding	N=218	N=2566	0.87 (0.63 to 1.20)	0.88 (0.65 to 1.18)	0.425
Breast	61 (28%)	791 (31%)			
Not exclusively breast	157 (72%)	1775 (69%)			
Deprivation score	N=222	N=2583	1.75 (1.3 to 2.35)	1.67 (1.28 to 2.17)	<0.001
89 or less	87 (39%)	694 (27%)			
Greater than 89	135 (61%)	1889 (73%)			
Parity	N=226	N=2588	1.17 (0.88 to 1.57)	1.16 (0.88 to 1.51)	0.304
Primigravida	90 (42%)	985 (38%)			
Parous	125 (58%)	1603 (62%)			
Time to discharge from PNW	N=197	N=2542	0.56 (0.41 to 0.75)	0.58 (0.44 to 0.77)	<0.001
<2 days	101 (51%)	1661 (65%)			
>2 days	96 (49%)	881 (35%)			

PED, paediatric emergency department; PNW, postnatal ward; RJMH, Royal Jubilee Maternity Hospital; RR, relative risk.

developing and strengthening support networks and signposting appropriate services.[22]

Babies referred to PED by professionals were no more likely to be admitted than self-referrals and suggests a lack of confidence among primary care services in managing problems in newborn babies, including benign normal variants. In the UK less than half of GP trainees rotate through acute paediatrics with implications for their competence in treating young babies.[23] At the same time, there is increasing public and professional awareness of adverse outcomes associated with missed diagnoses in acutely unwell children[24] which impacts on clinical practice.

Table 2 Comparison of factors of babies discharged from PED with babies admitted to hospital

	Admitted N=61	Not admitted N=162	OR (95% CIs)	RR (95% CIs)	p Value
Presentation					
Age	N=61	N=162	2.47 (1.03 to 5.91)	1.81 (1.02 to 2.83)	0.041
<48 h	13 (21%)	16 (10%)			
>48 h	48 (79%)	146 (90%)			
Referral source	N=60	N=164	1.09 (0.57 to 2.11)	1.07 (0.66 to 1.70)	0.898
Professional	23 (38%)	58 (35%)			
Parent/Carer	37 (62%)	102 (65%)			
Out of hours	N=60	N=163	4.80 (2.26 to 10.23)	2.7 (1.74 to 4.00)	<0.001
Standard working day	24 (40%)	20 (12%)			
Out of hours (evening/night/week end/bank holiday)	36 (60%)	144 (88%)			
Perinatal Factors					
Birth weight	N=60	N=160	0.37 (0.02 to 3.1)	0.450 (0.02 to 2.00)	0.581
<2500 g	1 (4%)	7 (4%)			
>2500 g	59 (96%)	153 (96%)			
Form of delivery	N=60	N=158	0.95 (0.5 to 1.8)	0.96 (0.59 to 1.53)	1
Assisted or c/s	24 (40%)	65 (41%)			
NSVD	36 (60%)	93 (59%)			
Feeding	N=60	N=158	1.77 (0.90 to 3.5)	1.49 (0.92 to 33.33)	0.111
Breast	22 (37%)	39 (25%)			
Not excl breast	38 (63%)	119 (75%)			
Parity	N=58	N=157	1.91 (0.99 to 3.67)	1.60 (1.0 to 2.55)	0.052
Primigravida	31 (53%)	59 (38%)			
Parous	27 (47%)	98 (62%)			
Length of PNW stay	N=56	N=141	1.26 (0.65 to 2.45)	1.18 (0.73 to 1.92)	0.571
<2 days	31 (55%)	70 (49%)			
>2 days	25 (45%)	71 (51%)			
Demographic factors					
Deprivation score	N=61	N=161	1.11 (0.58 to 2.11)	1.08 (0.67 to 1.7)	0.855
89 or less	25 (41%)	62 (39%)			
Greater than 89	36 (59%)	99 (61%)			

PED, paediatric emergency department; PNW, postnatal ward; RR, relative risk.

Most babies were discharged from PED. We identified certain presenting problems, jaundice and diarrhoea, as unlikely to require admission and potentially amenable to alternate approaches to management. However one quarter of babies were admitted, albeit for a short time, and it seems that PED staff, as well as parents and primary care professionals seek reassurance of a period of observation. Admission rates were higher in summer, but early discharge was also higher in summer and almost certainly to do with bed availability, rather than level of sickness.

CONCLUSION

Large numbers of babies attend the PED in the first 2 weeks of life, commonly out of hours, from deprived areas and with feeding difficulties. A quarter of babies attending are admitted to hospital, where one-third is discharged following an overnight stay.

Expectant parents need better information on establishing feeding routines in newborn babies and on normal variants, and also accessible sources of support and advice, in the early weeks following birth. Primary care professionals need more paediatric experience during training, both in normal infant behaviours but also in recognising symptoms and signs of acute illness. Current postnatal discharge policies may need revised, or at least supported by post discharge community services. It is important that these results are fed back to primary healthcare teams and commissioners so ensure that newborn babies receive timely, safe and appropriate care.

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