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Obstetric neonatal brachial plexus and facial nerve injuries: A 17 years single tertiary maternity hospital experience

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ABSTRACT

Objectives: To establish the incidence of obstetric neonatal brachial plexus and facial nerve injuries in a tertiary maternity hospital in the United Kingdom and to identify associated risk factors with an emphasis on the time of delivery.

Study Design: From our hospital electronic data bases we identified all live births born between 2000 and 2016 and those neonates who sustained a nerve injury during delivery. We performed a logistic regression analysis linking “facial nerve injury” and “brachial plexus injury” with variables for which we had complete cohort data including “breech”, “gestation”, “sex”, “birthweight”, “day of week”, “time of delivery”, “method of delivery”, “singleton/multiple deliveries” and “number of deliveries per day”. Significance level was set at 5%.

Results: We identified 87,461 live births of which 29 had sustained a facial nerve and 45 a brachial plexus injury. Logistic regression showed a significant positive association between “facial nerve injury” and “forceps delivery” (95% CI: 25–1398), “Ventouse delivery” (95% CI: 1.7–207) and “emergency Caesarean section” (95% CI: 1.7–148) and between “brachial plexus injury “and “birthweight” (95% CI: 1.001–1.003), “forceps delivery” (95% CI: 3.4–14) and “Ventouse delivery” (95% CI: 2.5–13). There was no increased risk for weekend and out of hours deliveries. All babies with a nerve injury made a full recovery.

Conclusions: Our obstetric neonatal nerve injury rate (0.085%) was low with our brachial plexus injury rate (0.051%) being about one third of a historical rate from Ireland (0.15%) and half of the rate recently reported from the United States (0.12%) which could be linked to our staff dealing with many high risk pregnancies. Neonatal birth injury data should be included as a clinical safety marker for delivery units.

Introduction

Obstetric neonatal brachial plexus injury (ONBPI) is a potentially serious injury which can result in permanent disability with residual shoulder weakness, contracture or joint deformity in up to 34% of affected children [1]. The few publications on obstetric neonatal facial nerve injury (ONFNI) indicate that the vast majority of neonates make a full recovery [2,3]. Murphy et al [4] reported a high association between the rate of maternal and neonatal trauma and instrumental deliveries being performed by inexperienced staff. Ameh et al [5] reported that there is strong literature evidence that improved clinical practice results in improved neonatal outcomes. Despite this, data on neonatal trauma are not collected as part of the quality assessment of maternity units by the Care Quality Commission in the United Kingdom (UK) [6,7].

The current incidences of ONBPP and ONFNP in the UK are unknown. In 1976 Bennett and Harold [8] reported on 21 infants who had sustained a brachial plexus injury to 24 arms from 34,299 live births born in a single maternity unit between 1960 and 1974. No associated birth fracture was seen but one patient also had a facial nerve palsy. Eighteen arms fully recovered.

Evans-Jones et al [9] reported in 2003 that the newborn brachial plexus palsy rate in the UK and Republic of Ireland (RI) was the same for both countries at 0.042% for the period April 1998 to March 1999. The authors stated they had surveyed 776,618 live births. However, data were obtained by the British Paediatric Surveillance Unit (BPSU) by sending out reporting cards during the 1998–1999 time frame, asking consultant paediatricians to

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voluntarily report neonatal nerve injuries. The response rate was 93%. In contrast, Donnelly et al [10] reported in 2002 that the neonatal brachial plexus rate was 0.15% (54 live births) at the National Maternity Hospital in Dublin (RI) based on the clinical examination of 35,796 babies born between 1994–1998, ie 3.6 times higher than that reported by Evans-Jones et al.[9]

In the United States (U.S.) the Kids' Inpatient Database (KID) [11] was set up in 1997 based on administrative data created by community hospitals purely for billing purposes. Every 3 years KID captures 10% of uncomplicated and 80% of complicated births from a one year period of the administrative data. The number of contributing community hospitals increased from 2521 in 1997 to 4200 in 2012 hospitals out of a total of 5262 U.S. community hospitals [12].

DeFrancesco et al analysed the KID data sets from 1997 to 2012 which hold data for about 8.5% of live births born during this period and extrapolated that the brachial plexus birth palsy rate in the United States had dropped from 0.17% in 1997 to 0.09% in 2012 with shoulder dystocia being the highest risk factor. [13]

The purpose of our study was to establish the current incidences of ONBPI and ONFNI in our hospital which provides specialist services in high risk obstetrics, fetal and maternal medicine for our region and to identify associated risk factors and trends.

Methods

We conducted a retrospective cohort study reviewing our hospital record data bases to

identify all live births born in our hospital over a 17 years period from 1st January 2000 until 31st December 2016. We then identified all live births coded for a brachial plexus and/or facial nerve injury and reviewed their medical records to confirm the diagnosis and to obtain outcome data. Data on birthweight, in utero baby position (breech or no breech), mode of delivery (spontaneous delivery, emergency Caesarean section, elective Caesarean section, forceps and Ventouse delivery), day (Monday to Sunday) and time of delivery (6 time groups: 8.00–11.59; 12.00–15.59; 16.00–19.59; 20.00–23.59; 24.00-3.59; 4.00–7.59), number of deliveries per day (3 groups: up to 8 live births per day; 9–16; ≥17 live births per day), sex, single or multiple births and gestational age were collected for our complete cohort of live births. Fifty-eight neonates without a nerve injury were excluded from the analysis because of missing data for birthweight and/or gestation. RStudio (version 3.5.1) was used to perform a multiple logistic regression analysis (glm function) to test if any of our 9 independent variables had a significant effect (p set as 5%) on the binary dependent variables "Facial nerve injury" and "Brachial plexus injury" and to calculate odds ratios and confidence

Table 1
Live births, breech positions, multiple deliveries, delivery modes (1=spontaneous; 2=emergency Caesarean section; 3=elective Caesarean section; 4=Forceps; 5=Ventouse), Brachial plexus (B) and Facial nerve injuries (F) and delivery modes for nerve injury patients per year.

Year	Live Births	Number of Facial nerve (F) and Brachial plexus injuries (B)	Breech	Multiple deliveries	Delivery modes: 1-5 (% in brackets)	Delivery modes (M) for facial nerve (F) and brachial plexus injury (B)
2000	4472	Total: 2. 2xF	110	169	1 = 2568 (57.4); 2 = 719 (16); 3 = 441 (9.9); 4 = 311 (7); 5 = 433 (9.7)	1xFM1, 1xFM4
2001	4434	Total: 1. 1xB	128	143	1 = 2631 (59.3); 2 = 708 (16); 3 = 469 (10.6); 4 = 295 (6.7); 5 = 330 (7.4)	1xBM1
2002	4465	Total: 4. 1xF, 3xB	150	116	1 = 2606 (58.4); 2 = 724 (16.2); 3 = 503 (11.3); 4 = 237 (5.3); 5 = 395 (8.8)	1xFM2, 1xBM1, 1xBM4, 1xBM5
2003	4676	Total: 5. 1xF, 4xB	197	168	1 = 2693 (57.6); 2 = 657 (14); 3 = 640 (13.7); 4 = 233 (5); 5 = 453 (9.7)	1xFM4, 3xBM1, 1xBM5
2004	4761	Total: 3. 1xF, 2xB	217	188	1 = 2727 (57.3); 2 = 557 (11.7); 3 = 782 (16.4); 4 = 248 (5.2); 5 = 447 (9.4)	1xFM1, 2xBM5
2005	4830	Total: 4. 4xB	235	166	1 = 2758 (57.1); 2 = 554 (11.5); 3 = 817 (16.9); 4 = 271 (5.6); 5 = 430 (8.9)	2xBM1, 1xBM4, 1xBM5
2006	4896	Total: 3. 3xB	272	203	1 = 2776 (56.7); 2 = 669 (13.7); 3 = 878 (17.9); 4 = 250 (5.1); 5 = 323 (6.6)	1xBM1, 1xBM4, 1xBM5
2007	5057	Total: 2. 2xB	228	215	1 = 2965 (58.6); 2 = 642 (12.7); 3 = 789 (15.6); 4 = 277 (5.5); 5 = 384 (7.6)	1xBM1, 1xBM4
2008	5427	Total: 3. 3xB	259	202	1 = 3190 (58.8); 2 = 690 (12.7); 3 = 853 (15.7); 4 = 357 (6.6); 5 = 336 (6.2)	2xBM1, 1xBM5
2009	5344	Total: 3. 2xF 1xB	215	205	1 = 3070 (57.4); 2 = 706 (13.2); 3 = 854 (16); 4 = 327 (6.1); 5 = 388 (7.3)	1xFM4, 1xFM5, 1xBM4
2010	5587	Total: 2. 2xB	242	212	1 = 3235 (57.9); 2 = 698 (12.5); 3 = 900 (16.1); 4 = 449 (8); 5 = 305 (5.5)	1xBM1, 1xBM2
2011	5592	Total: 1. 1xB	292	284	1 = 3138 (56.1); 2 = 795 (14.2); 3 = 891 (15.9); 4 = 527 (9.4); 5 = 241 (4.3)	1xBM4
2012	5656	Total: 4. 2xF, 2xB	267	207	1 = 3291 (58.2); 2 = 696 (12.3); 3 = 927 (16.4); 4 = 516 (9.1); 5 = 226 (4)	2xFM4, 2xBM4
2013	5715	Total: 12. 5xF, 7xB	275	233	1 = 3446 (60.3); 2 = 705 (12.3); 3 = 922 (16.1); 4 = 453 (7.9); 5 = 189 (3.3)	5xFM4, 1xBM1, 1xBM2, 4xBM4, 1xBM5
2014	5683	Total: 7. 5xF, 2xB	245	230	1 = 3415 (60.1); 2 = 717 (12.6); 3 = 866 (15.2); 4 = 504 (8.9); 5 = 181 (3.2)	5xFM4, 1xBM1, 1xBM4
2015	5448	Total: 11. 6xF, 5xB	303	173	1 = 3337 (61.2); 2 = 755 (13.9); 3 = 670 (12.3); 4 = 466 (8.5); 5 = 220 (4)	1xFM2, 5xFM4, 3xBM1, 1xBM2, 1xBM5
2016	5418	Total: 7. 4xF, 3xB	295	206	1 = 3211 (59.3); 2 = 805 (14.9); 3 = 687 (12.7); 4 = 437 (8.1); 5 = 279 (5.1)	1xFM2, 2xFM4, 1xFM5, 1xBM2, 2xBM4
Total	87,461	Total: 74. 29xF, 45xB	3930	3320	1 = 51,056 (58.4); 2 = 11,797 (13.5); 3 = 12,888 (14.7); 4 = 6159 (7); 5 = 5561 (6.4)	2xFM1, 3xFM2, 22xFM4, 2xFM5, 17xBM1, 4xBM2, 15xBM4, 9xBM5

intervals. We defined our Null-hypothesis as there being no significant correlation between either of the two dependent variables and the individual independent variables. We accepted the Null-hypothesis if p was $\geq$5% and rejected it if p was <5% (significant correlation). As part of the logistic regression calculation RStudio calculates parameter coefficients/estimates which indicate the direction of a significant correlation. The coefficient is positive if a variable increases and negative if it decreases the risk of the outcome variable happening. Data on shoulder dystocia could not be included in the statistical analysis because the information was missing for a large number of our live births.

The study was approved by our institutional review board (Ref: PRN 6319).

Results

We identified 87,461 live births, 42,552 girls and 44,909 boys. Twentynine babies had

sustained a facial nerve injury and 45 a brachial plexus palsy during delivery. Two babies with an ONBPP had a clavicle fracture and two a humeral shaft fracture on the same side. A 5th baby had a humeral shaft fracture on the opposite side of the ONBPP. No live birth sustained a facial nerve and a brachial plexus injury. In 19 babies the brachial plexus injury was on the right and in 25 on the left side. No side was recorded for one. The facial nerve injury was on the right side in 19 and on the left side in 7. No side was recorded for 3. All nerve injuries, except one, were diagnosed before discharge home. One facial nerve injury was not diagnosed until 6 weeks after delivery. All nerve injuries fully recovered. One baby with a brachial plexus injury was referred to a peripheral nerve injury unit but made a full recovery without intervention. Twentyfive patients with ONBPI (55.6%) and one patient with ONFNI (3.4%) had shoulder dystocia. We do not have complete data on shoulder dystocia for our sample frame so this was excluded from the logistic regression analysis. Both babies with a humeral fracture and ONBPI had shoulder dystocia but only one of the two babies with a clavicle fracture and ONBPI had shoulder dystocia.

Modes of delivery, breech and singleton/multiple deliveries per year are listed in Table 1 and live births per day and time block in Table 2.

The number of deliveries was fairly evenly distributed over the 6 time blocks. There were fewer deliveries on Saturdays and Sundays. On most days there were between 9 and 16 babies: $\leq$8 (2836), 9–16 (54,009) and $\geq$ 17 (30,616) babies. Mean birth weight for babies with a facial nerve injury was 3449 g (Median: 3470 g. Range: 2535 g–4290 g. SD: 447 g) and with a brachial plexus palsy 4034 g (Median:4035. Range: 2724 g–4990 g. SD: 506 g) [Mean birth weight for babies without nerve injury: 3367 g. Median: 3415 g. Range: 410 g–5680 g. SD: 615 g].Mean gestational age for babies with a facial nerve injury was 39 weeks (Median: 39 weeks.

Range: 37–42 weeks. SD: 1.45 weeks) and with brachial plexus palsy 40 weeks (Median: 40 weeks. Range: 37–42 weeks. SD: 1 week) [Mean gestational age for babies without nerve injury: 39 weeks. Median: 39 weeks. Range: 17–46 weeks. SD: 2.2 weeks].

Logistic regression analysis showed a significant positive association between the binary dependent variable "Facial nerve injury" and "Forceps delivery" ($p < 0.001$), "Ventouse delivery" ($p < 0.001$) and "Emergency Caesarean section" ($p < 0.02$) and a significant positive association between "Brachial plexus injury" and "Forceps delivery" ($p < 0.001$), "Ventouse delivery" ($p < 0.001$″ and "Birthweight" ($p < 0.001$). The parameter coefficients were positive for all significant independent variables (Table 3).

Comment

Our 120 bed maternity hospital provides a local and regional service for all women with high risk pregnancies. We identified a low obstetric neonatal facial nerve injury rate of 0.033% and a low brachial plexus injury rate of 0.051% for all live births born during the 17 years study period. There was no increased injury risk for deliveries on weekends and/or out of hours time blocks (16.00 to 8.00). The few studies of the incidences for obstetric neonatal facial nerve injuries report this to be between 0.035% and 0.39% [2,14,15]. Data from the UK are not available. Falco and Eriksson [14] reviewed 66 of 81 babies with ONFNI and reported that 59 had made a complete and 7 an incomplete recovery. Seventyfour of 81 were associated with forceps delivery. Al Tawil et al[2] identified forceps delivery and primiparity as risk factors with 1 of 29 children having suffered a permanent facial weakness. Twentytwo of our 29 babies with an ONFNI were delivered by forceps. All made a full recovery.

There are few data for ONBPI from the UK. A single hospital cohort study from 1976[8] reported an incidence of 0.061% for affected live births (18 unilateral and 3 bilateral

injuries). Abzug et al [16] and DeFrancesco et al [13] reported on the epidemiology of brachial plexus birth palsy (BPBP) for the whole of the United States based on the same KID data sets, stating that the incidence reduced from 0.17% in 1997 to 0.09% in 2012, coinciding with an increase in the rate of Caesarean deliveries from 19.89% to 34%, an increase in twin and multiple births from 2.53% to 3.14%, a decrease of exceptionally large babies (>4500 g) from 0.55% to 0.24% and a decrease of forceps deliveries from 0.2% to 0.05%. Shoulder dystocia was the strongest risk factor. Hypoxia was also identified as a risk factor [13]. It was hypothesised that this results in hypotonia making shoulders more vulnerable to displacement [13,16]. Fiftyfive percent of babies with a BPBP did

Table 2
Total number of facial nerve (F) and brachial plexus (B) injuries (1st number) and live births (2nd number) for each day of the week and time blocks for the period 2000 to 2016.

	08.00-11.59	12.00-15.59	16.00-19.59	20.00-23.59	24.00-03.59	04.00-7.59
Monday 12580	0 / 2803	Bx1, Fx1 / 2124	Fx1 / 1732	Bx1, Fx1 / 1916	Bx3 / 2056	Bx1, Fx1 / 1949
Tuesday 12808	Fx1 / 1851	0 / 2941	Bx4 / 2195	Bx1, Fx1 / 1896	Fx1 / 2004	Bx1 / 1921
Wednesday 13042	0 / 2985	Fx1, Bx2 / 2234	Bx1, Fx1 / 1844	Bx1, Fx1 / 1985	Bx2, Fx1/ 2055	0 / 1939
Thursday 13912	Bx3 / 2758	Fx1 / 2915	Bx1, Fx1 / 2226	Bx1 / 1958	Bx2, Fx1 / 2130	Bx1, Fx2 / 1925
Friday 12975	Fx1, Bx2 / 2925	Fx2 / 2239	Bx2 / 1786	Fx1, Bx2 / 1956	Fx1 / 2150	Bx2 / 1919
Saturday 11178	Bx1 / 1693	Bx1 / 1734	Fx2 / 1773	0 / 1880	Fx1 / 2137	Bx2, Fx1 / 1961
Sunday 10966	Bx3 / 1771	Fx1, Bx2 / 1707	Bx1 / 1756	Fx2 / 1856	0 / 2011	Fx1, Bx1 / 1865

Table 3
p-values (significance level 0.05), odds ratios and confidence intervals for association between the dependent variables 'Facial Nerve Injury' and 'Brachial Plexus Injury' and the independent variables. 'Mode of delivery' has 5 levels, 'Time of delivery' 6 levels (4 -h blocks), 'Day of delivery' 7 levels and 'Life births delivered on the day' 3 levels. No values are listed for 'Spontaneous Delivery', 'Time: 08.00–11.59', 'Monday' and '1-8 Live Births/day' because the null hypothesis was that there was no difference between these levels and their corresponding group levels. PC: parameter coefficients (estimate) indicate the direction of the association in case it is significant. A confidence interval '0.00-Inf' indicates that this is a zero-event group.

Independent Variable	p-value ONFNI	p-value ONBPI	Odds Ratio		95% Confidence Interval	
			ONFNI	ONBPI	ONFNI	ONBPI
Forceps Delivery	<0.001 PC: +5.2	<0.001 PC: +1.92	187	6.81	25.24-1398	3.38-13.7
Ventouse Delivery	<0.02 PC: +2.9	<0.001 PC: +1.73	18.7	5.65	1.69-207	2.50-12.8
Emergency Caesarean	<0.02 PC: +2.8	0.76	15.7	1.17	1.66-148	0.43-3.21
Elective Caesarean	0.99	0.98	1.1 e-06	0.0018	0.00-Inf	0.00-Inf
Birthweight	0.95	<0.001 PC: +0.0024	0.99	1.002	0.999-1.008	1.001-1.003
Gestation	0.85	0.35	1.02	3.25	0.79-1.327	0.68-1.15
Breech	0.25	0.99	3.87	0.0046	0.38-38	0.00-Inf
Sex	0.82	0.12	0.92	2.28	0.438-1.92	0.34-1.12
Time 12.00-15.59	0.19	0.47	2.92	2.51	0.59-14.5	0.24-1.92
Time 16.00-19.59	0.29	0.87	2.41	1.08	0.46-12.5	0.44-2.67
Time 20.00-23.59	0.18	0.41	2.99	2.37	0.60-14.9	0.23-1.82
Time 24.00-03.59	0.28	0.51	2.47	2.68	0.48-12.8	0.26-1.92
Time 04.00-07.59	0.27	0.63	2.5	2.90	0.48-12.9	0.30-2.05
Tuesday	0.8	0.54	0.82	1.43	0.18-3.68	0.45-4.54
Wednesday	0.96	0.75	1.04	1.21	0.25-4.15	0.37-3.99
Thursday	0.65	0.36	1.36	1.68	0.36-5.08	0.55-5.18
Friday	0.71	0.38	1.28	1.65	0.34-4.79	0.54-5.08
Saturday	0.98	0.95	1.02	3.52	0.25-4.11	0.27-3.34
Sunday	0.99	0.63	1.005	1.33	0.25-4.06	0.42-4.25
Singleton/Multiple Deliveries	0.99	0.99	8.77e06	528	0.00-Inf	0.00-Inf
9-16 Live Births/day	0.99	0.64	1.33e07	1.62	0.00-Inf	0.22-11.9
≥17 Live Births/day	0.99	0.86	1.02e07	1.21	0.00-Inf	0.155-9.4

not have a risk factor. The KID data sets for this period hold only data for about 8.5% of all live births and no data for the remaining 91.5%. The data do not differentiate between emergency and elective Caesarean sections. Wen et al [17] reported on trends in maternal and neonatal trauma based on all non-breech singleton live births born in Washington State between 2004 and 2013 (732818, 1.78% of all live births born in the United States during this period) using the Birth Event Record Database (BERD). The Caesarean delivery rate increased from 24.76% to 26.24% and the rates for forceps/Vacuum delivery reduced from 0.9/6.06% to 0.65/ 4.12%. The nerve injury rate for forceps deliveries increased from 0.353% to 0.777% but the total nerve injury rate between 2004 and 2013 remained unchanged at about 0.11%. The rate of fractures reduced from 0.235% to 0.197% but the decline was only seen in live births delivered by spontaneous vaginal delivery (from 0.283% to 0.219%). The rate of live births with weight ≥4500 g also remained static at 1.75% for 2004–2006, 1.6% for 2007–2010 and 1.7% for 2011-2013. There are huge differences between the data reported by Wen et al [17] and those reported by Abzug et al [16] and DeFrancesco et al [13] with the former reporting a 12 times higher forceps delivery rate, a 7 times higher rate of exceptionally large babies born and a 23% lower rate of Caesarean sections for 2012 than the latter two studies. Wen et al' [17] graphical depiction of the annual rates for neonatal nerve injuries show that the data fluctuate around a horizontal mean of about 1.1% over the 2004 to 2013 period but using their data for nerve injuries for 2006, 2009 and 2012, which are sample years for the KID data base, the impression is a decline in the nerve injury rate from about 0.13% in 2006 to 0.1% in 2012 which coincides with that reported by Abzug et al [16] and DeFrancesco et al [13].

This raises doubts on the reliability of basing conclusions on annual changes if data are only collected every 3 years.

Our data are from a single hospital. Fig. 1 show the trends for Caesarean sections and instrumental deliveries. The combined rate for instrumental deliveries and Caesarean

sections mirror each other. Forceps deliveries increased overall during our study period which was offset by a decline in Ventouse deliveries. The annual nerve injury rates do not reflect the increases/decreases of the Caesarean section and instrumented delivery rates.

We identified a mean of 4.4 obstetric neonatal nerve injuries (ONNI) per year for the whole period but noted a difference between the rates for 2000 to 2012 and 2013 to 2016. The rate for the former period was 2.85 ONNI per year (combined mean incidence: 0.056%. ONBPI mean incidence: 0.043%) which increased to a mean of 9.25 ONNI per year (mean combined incidence: 0.166%. ONBPI mean incidence: 0.076%) for the latter period. Inglis et al [18] reported that training of maternity staff reduced the ONPBI injury rate in vaginal deliveries from 0.4% to 0.14% and after shoulder dystocia from 30% to 10.67%. Ameh et al[5] identified that staff training, adherence to protocols, communication, team working and resuscitation technique reduce trauma after shoulder dystocia and neonatal hypothermia and hypoxia. Hypoxia has been cited as a risk factor for ONBPI [13]. We cannot explain the increase of our nerve injury rate over the last 4 years of our study from our data but this coincides with midwife shortages in our hospital and an increase in our obstetric neonatal fracture rate for the same period from a mean of 3.2 to a mean of 6 per year. The Care Quality Commission inspected our hospital 3 times between April 2015 and September 2016 citing substantial midwife shortages and poor compliance in medical staffing: 'staffing shortages within the delivery suite were seen each day . . . ' [19]. The Royal College of Midwifes raised a nationwide concern highlighting that NHS England has an estimated shortage

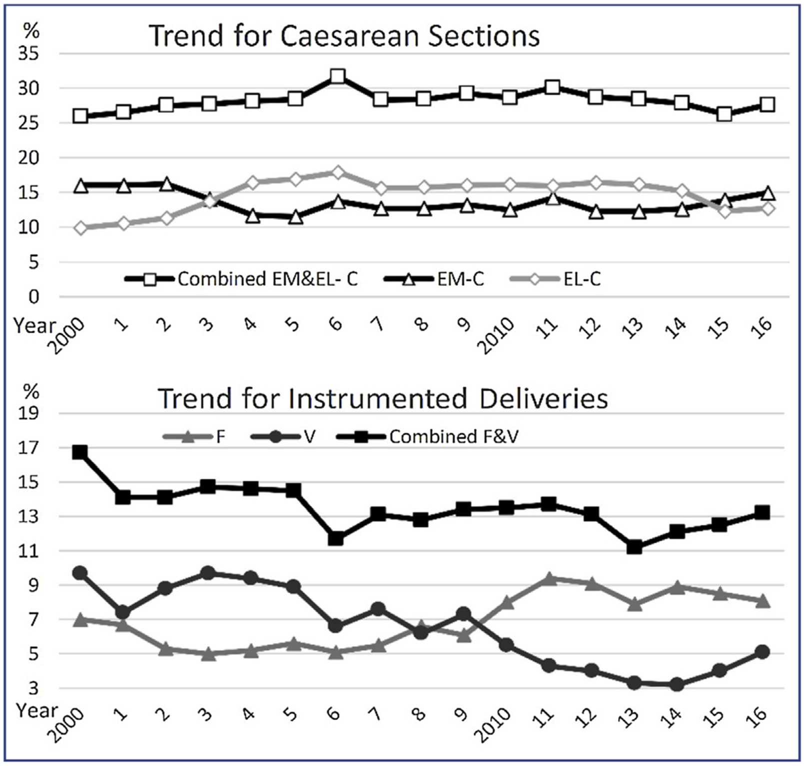

Fig. 1. Percentage of live births born by Caesarean section and instrumented delivery per year. F: Forceps delivery. V: Ventouse delivery. EM-C: emergency Caesarean section. EL-C: elective Caesarean section.

of 3500 full-time midwifes which has remained unchanged since 2016 [20]. Our ONNI rates were low in comparison with other studies despite the increase over the last 4 study years with our ONFNI rate being comparable to the lower end of published rates[2] and our ONBPI rate being less than half of that based on the KID data sets. [13,16] Gandhi et al [21] reported an 8.7 times higher clavicle fracture rate for the United States (0.26%) than hour rate for clavicle fractures diagnosed in hospital (0.03%). The rate of recovery from ONNI/permanent injuries could also be an indicator for the level of training in the use of forceps and Ventouse instruments.

The NHS has written a long term plan to reduce stillbirths, maternal and neonatal mortality and serious brain injury but the plan does not mention any other neonatal trauma [22,23]. We feel that it is important to include non-fatal neonatal trauma as part of the quality assessments of maternity units which could be helpful to identify development needs such as staff training and staffing levels which in turn could contribute to the national drive to reduce stillbirths. These data are not routinely collected in the UK at present. The low level of neonatal injury rates in our population may reflect the availability of obstetric consultant support and that our maternity staff deal with a lot of high risk pregnancies.

Declaration of Competing Interest

We have nothing to disclose. There is no conflict of interest.

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