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Trends in Forceps and Vacuum Deliveries in Rajavithi Hospital from 2002 to 2009

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ABSTRACT

Objectives: To study trends in forceps and vacuum deliveries in both private and hospital cases in Rajavithi Hospital from 2002 to 2009.

Materials and Methods: Singleton, term pregnant women delivered by operative vaginal deliveries from January 1, 2002 to December 31, 2009 were included in this study. Maternal characteristics including types of delivery, private and hospital cases, complications, maternal and neonatal outcomes were compared. Trend in operative vaginal deliveries were analyzed by using linear regression analysis by SPSS version 17.0 for Window.

Results: In 2,723 cases (4.82% of total deliveries) of vaginal operative procedures, 1,808 cases (66.40%) were delivered by forceps extraction and 915 cases (36.60%) were delivered by vacuum extraction. Forceps and vacuum deliveries gradually declined since 2002. Both procedures may approach zero in 6 and 10.5 years (2016 and 2020), respectively, ($y= -0.307x+4.434$, $R2 = 0.715$ and $y = -0.114x+2.109$, $R2 = 0.554$).

In private cases, 274 cases (40.29%) and 406 cases (59.71%) had forceps and vacuum deliveries, respectively. Both procedures may approach zero in 3.20 and 7.53 years (in year 2013 and 2016), respectively. In hospital cases, there were 1,534 cases (75.08%) and 509 cases (24.92%) who had forceps and vacuum deliveries, respectively. Both procedures will approach zero in 7.24 and 10.96 years (2017 and 2020), respectively.

Conclusion: Trends in forceps and vacuum deliveries in Rajavithi Hospital are declining and may approach zero in 6 and 10.5 years, respectively. Trends in private and hospital cases are declining in a similar pattern but at different rate.

Keywords: Forceps delivery, Vacuum delivery, Private cases, hospital cases, Rajavithi Hospital, Trends

Introduction

Forceps and vacuum deliveries are important operative obstetric procedures, especially for management of prolonged second stage due to some abnormal position or maternal exhaustion. Assisted vaginal delivery is also useful for some maternal diseases, such as severe preeclampsia, heart disease, pulmonary disease and neurological disease[1]. The literature reviewed in Rajavithi Hospital since 1988-2002 showed forceps extraction rate slightly increased from 2.34% in 1988 to 5.28% in 2001 and then fell to 4.31% in 2002 whereas vacuum extraction rate gradually declined from 5.60% in 1988 to 1.84% in 2002[2]. In other countries, for examples, Czech Republic, between

the years 2002-2011, vacuum extraction rate rose from 0.11% to 2.44% of all deliveries while forceps extraction declined from 1.54% to 0.24% of all deliveries[3].

National data on all Italian deliveries in the period 1981-85 revealed that similar percentages were observed during the whole considered quinquennium for vacuum extraction, but the forceps delivery rate decreased to 0.6/100 in 1985[4]. In the United States, since 1980-1987, forceps delivery rate declined by 43% but vacuum extraction rate increased from 0.6% to 3.3%[5]. Contemporary trends in operative vaginal delivery show increasing numbers of vacuum deliveries and decreasing numbers of forceps deliveries. These trends have impact to both the American College of Obstetricians and Gynecologists and the Royal College of Obstetricians and Gynaecologists. They continue to support the use of both vacuum and forceps deliveries and strongly encourage residency programs to incorporate the teaching of these skills into their curricula[6,7]. If the trend of performing these procedures in Thailand are similar to other countries, the Royal Thai College of Obstetricians and Gynaecologists should take some actions, for example: support teaching skill or provide simulation training to the obstetric residents. In Siriraj Hospital, from 1978 to 2006, forceps extraction gradually declined from 2- 3% in 1980 to 0.5% in 2006, and vacuum extraction gradually declined from 5% in 1980 to 3% in 2006[8].

Rajavithi Hospital (RH), one of the Obstetrics and Gynaecology residency-training institutions, should have enough cases for residents to practice. If the amount of these procedures is declined, it may have impact to residency training program and may have effect the doctor's confidence for practicing these procedures. Moreover, recent studies did not classify as hospital cases and private cases. This study will show whether this trend happened only in hospital cases or also happened in private cases in Rajavithi Hospital during 2002 to 2009.

Therefore, the objective of this research is to study trends in forceps and vacuum deliveries, including private and hospital cases in Rajavithi Hospital during 2002 to 2009.

Materials and Methods

This retrospective descriptive study was carried out from January 1, 2002 to December 31, 2009 at Rajavithi Hospital. Inclusion criteria included all singleton pregnant women who gave birth of viable babies. Patients who had incomplete medical record were excluded from this study. Any cases with failed forceps or vacuum extraction were also excluded because some of these cases may have some degree of cephalopelvic disproportion. The data were extracted from the computer database and obstetric annual statistic reports. Maternal characteristics including types of delivery, physicians, indications for operative delivery, maternal and neonatal outcomes were studied. All data were collected and analyzed using SPSS program version 17.0 for Windows (SPSS, Inc., Chicago, IL, USA). Linear regression analysis was performed to forecast trends. Frequency, percentage, mean ($\bar{x}$) and standard deviation were used in this study. Statistic analysis was performed using Chi-square test, Fisher's exact test and independent t-test. The p-value < 0.05 was considered statistically significant. This study was approved by the Rajavithi Hospital's Ethics Committee. Because type of operative deliveries depend on doctors who choose the operations, therefore the patients were classified as private cases (delivered by the attending staffs) and hospital cases (delivered by the obstetric residents or externs under the supervisions of on-duty staffs).

Results

Among 56,416 cases who were delivered in Rajavithi Hospital from 2002 to 2009, there were 2,723 instrumental vaginal deliveries. Of these, 1,808 cases (66.40%) were delivered by forceps extraction and 915 cases (33.60%) were delivered by vacuum extraction. Demographic data of the present study are shown in Table 1. When compare between both operative deliveries, there were significant difference in maternal age, parity, patient type and doctors who performed the operations except in those who delivered at gestational age less than 32 weeks because most doctors avoided

using vacuum in extremely preterm infants. In forceps deliveries, there were 274 private cases (15.15%) and 1,534 hospital cases (84.85%). In vacuum deliveries, there were 406 private cases (44.37%) and 509 hospital cases (55.63%). From 2002 to 2009, forceps deliveries decreased by 75.48% (from 359 to 88 cases) as vacuum deliveries decreased by 73.48% (from 181 to 48 cases). Fig. 1 shows trend of forceps deliveries which are declining and will approach zero in 2016. Trend of vacuum delivery is also declining and will approach zero in 2020. The equation in linear regression analysis of forceps ($y = -0.3077x + 4.4061$) and vacuum ($y = -0.1156x + 2.1014$) was created and also shown in this figure.

Fig. 2 and 3, in private cases, forceps deliveries rapidly declined from 4.38% in 2002 to 1.39% in 2009 ($y = -0.4161x + 4.6586$) and vacuum deliveries gradually declined from 5.16% in 2002 to 2.35% in 2009 ($y = -0.3988x + 6.1221$). In hospital cases, forceps deliveries gradually declined from 3.68% in 2002 to 1.33% in 2009 ($y = -0.2869x + 4.3711$) but vacuum extraction were slightly declined from 1.09% in 2002 to 0.57% in 2009 ($y = -0.0733x + 1.39$). Percentage of forceps deliveries in private cases and hospital cases will approach zero in 3.20 and 7.24 years, respectively. Similarly, vacuum deliveries in private cases and hospital cases will approach zero in 7.53 and 10.96 years, respectively.

The most common indication for forceps and vacuum deliveries was maternal exhaustion, 24.0% and 39.2%, respectively (Table 2 and 3). In forceps deliveries, maternal exhaustion was the most common indication in private cases and maternal disease was the most common indication in hospital cases. In vacuum deliveries, maternal exhaustion was the most common indication in private cases and prolonged second stage was the most common indication in hospital cases.

The most common maternal complication from forceps and vacuum deliveries was postpartum hemorrhage (Table 4). Maternal complications from forceps and vacuum deliveries were not significantly different in both private and hospital cases. The most common complication from forceps deliveries in newborn was facial marks (Table 5). The most common complication from vacuum deliveries in newborn was wound at scalp. In the forceps extraction group, Apgar score at 1 min was not significantly different in both private cases and hospital cases ($p=0.273$) (Table 6). In the vacuum deliveries group, Apgar score at 1 min was significantly different in both groups ($p=0.001$) but was not significantly different at 5 min ($p=0.049$). Length of stay in hospital, mean length of stay in the forceps group was 4.27 ± 2.10 days and vacuum group was 4.23 ± 1.88 days (Table 7). These was no significant difference from using forceps or vacuum deliveries in both groups ($p=0.720$).

Discussion

In this study, the percentage of forceps and vacuum deliveries were 4.82% of total deliveries while those of the United States of America, was 10%[9] in 1996. Trends of forceps and vacuum deliveries in Rajavithi Hospital are declining similar to Siriraj Hospital[8]. This result is similar to a study of Zahniser et al[5] who reported that rate of forceps delivery declined by 43% from 1980-1987.

Trends of forceps and vacuum deliveries in this study is gradually declined. In the near future, percentage of forceps and vacuum deliveries will approach zero in 6 and 10.5 years (2016 and 2020), respectively. Recent studies[3,6] described trends of operative deliveries in percentage but did not forecast the trend in form of mathematic equation. In this study, different from previous studies, linear regression analysis model, which related to a dependent variable to an independent variable in the form of linear equation was used. Moreover, this measure expresses the degree or strength of the linear relationship by r^2 (coefficient of determination). Fig. 2 shows trend of forceps deliveries declines as an equation ($y = -0.3077x + 4.4061$). The coefficient of determination (r^2) = 0.7258. This degree of strength (r^2) which is near 1.0 indicates that this regression line fits the data well. It shows the possibility of trends of the operative procedures. However, there are also multiple factors for obstetricians to choose the procedure such as

obstetrician's competency, gestational ages, estimated fetal weight, social events, such as workshop on operative vaginal delivery or lawsuit against doctor[10]. Limitation of this study is that it is a retrospective study which can not control or collect factors that may involve the results. So, further study should be a prospective study to collect more factors and consider more powerful method of forecasting, such as multiple regressions.

Although forceps and vacuum deliveries have benefits to the patients because they can reduce the unnecessary need for surgical intervention and the risks from surgery (e.g. risks related to anesthesia or surgical procedure) and reduce cost of referral system. A reduction in major abdominal surgery implies faster maternal recovery. Absence of uterine scar also reduces the risk for future pregnancies[11]. However, complications from operative vaginal deliveries such as third, fourth perineal tear, vaginal and periuretral laceration[12], neonatal traumas such as wound at scalp, facial mark, cephalhematoma or intracranial hemorrhage should be considered. Competency of the operators may be an important factor that effects the decision making of obstetricians. In this study, the rate of neonatal trauma from operative vaginal deliveries, such as scalp trauma, facial marked was 18.38%. When compare to another study, Caughey et al reported that the rate of cephalhematoma was 4.5% in forceps compared with 14.8% in vacuum extraction (p-value <0.001) and the rate of third- or fourth-degree perineal tear was higher in forceps 36.9% compared with 26.8% in vacuum extraction[13].

In the residency training aspect, it has been reported that 60% of residency training programs in the United States revealed less than 10% of their total deliveries were performed by forceps and vacuum extraction[14]. In Rajavithi Hospital, percentage of forceps and vacuum deliveries had decreased during the study periods. This may have an impact to the clinical skill of the obstetric residents. This study showed that not only the residents but also the staffs performed less operative vaginal deliveries. This should have some impact to the competency of the next generation obstetricians. In one study, about half of the graduates did not feel that they were competent to perform forceps delivery. Perceived competency affected future operative delivery plans[15]. Therefore, further study should involve in the competency of obstetric residents to perform operative vaginal deliveries. This study may be useful for future management of the obstetric training program. Solt et al reported that there is an association between increasing resident forceps use and impact of proactive faculty. After appointment of the specific teaching attending, forceps deliveries increased by 59%[16]. Special training program from Royal Thai College of Obstetricians and Gynaecologists for improving operative vaginal delivery skill should also be considered.

Conclusion

Trends in forceps and vacuum deliveries are declining in Rajavithi Hospital and may approach zero in 6 and 10.5 years, respectively. Trends in private and hospital cases are declining in a similar pattern but at different rate.

Table 1. Demographic data

Characteristics	Forceps (N=1,808)		Total (N=915)		Total (N=2,723)		p
	n	percent	n	percent	N	percent	
Age (Year)							< 0.001*
Mean ± SD	26.46 ± 5.93		28.07 ± 5.74		27.00 ± 5.92		
< 20	221	12.22	63	6.88	284	10.43	<0.001*
20 – 35	1,447	80.03	765	83.61	2,212	81.23	
>35	140	7.75	87	9.51	227	8.34	
Gestational age (week)							< 0.001*
Mean ± SD	38.70 ± 1.86		39.00 ± 1.51		38.80 ± 1.75		
< 32	11	0.61	1	0.11	12	0.44	= 0.001*
32 – 36	149	8.24	45	4.92	194	7.12	
≥ 37	1,648	91.15	869	94.97	2,517	92.44	
Parity							0.013**
0	1341	74.17	634	69.29	1975	72.53	
1-3	459	25.39	279	30.49	738	27.10	
≥ 4	8	0.44	2	0.22	10	0.37	
Patient type							< 0.001**
Private	274	15.15	406	44.37	680	24.97	
Hospital	1534	84.85	509	55.63	2043	75.03	
Deliver by							< 0.001**
Staff	274	15.15	406	44.37	680	24.97	
Resident	1344	74.34	473	51.69	1817	66.73	
Extern	190	10.51	36	3.94	226	8.30	

* = p-value from Chi-Square, ** = p-value from independent t-test

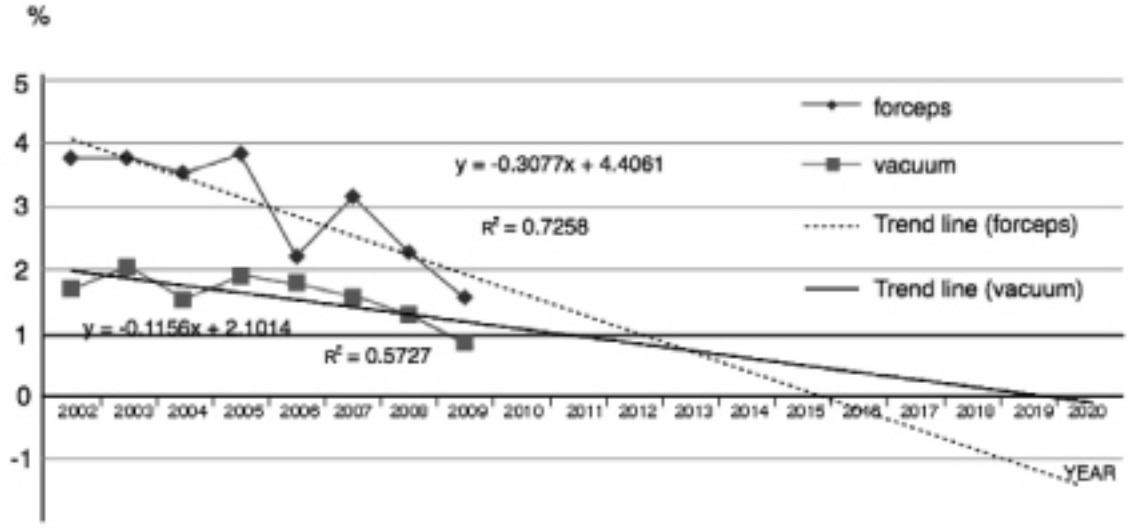

Fig.1. Trends in forceps and vacuum deliveries in Rajavithi Hospital from 2002 to 2009

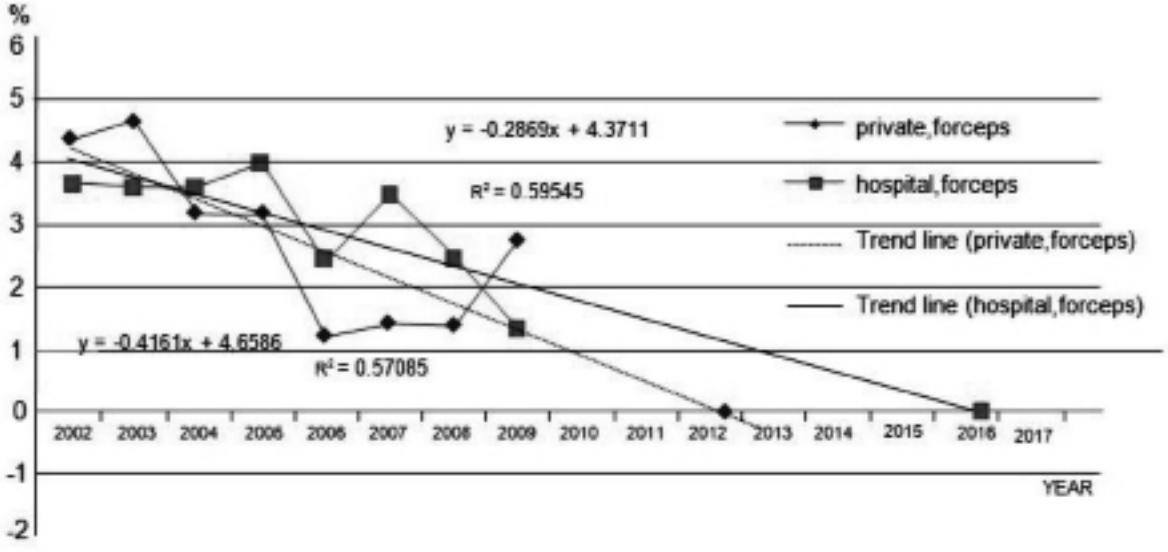

Fig. 2. Trends in forceps deliveries in private and hospital cases in Rajavithi Hospital from 2002 to 2009.

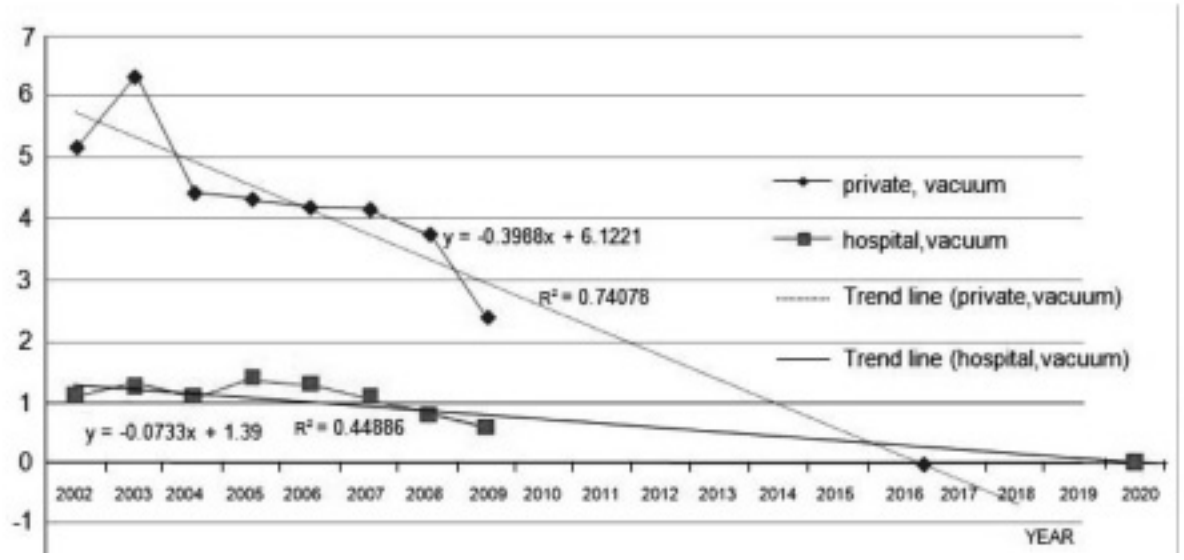

Fig.3. Trends in vacuum deliveries in private and hospital cases in Rajavithi Hospital from 2002 to 2009.

Table 2. The indications of forceps delivery in private cases and hospital cases

Indication	Private cases N=274		Hospital cases N=1,534		Total N=1,808		p
	n	%	n	%	N	%	
Prolonged 2nd stage	20	7.33%	238	15.63%	258	14.37%	< 0.001*
Non-reassuring status	9	3.30%	230	15.10%	239	13.31%	< 0.001*
Maternal exhaustion	123	45.05%	308	20.22%	431	24.00%	< 0.001*
OPP/OT	15	5.49%	36	2.36%	51	2.84%	0.004*
Fetal distress	17	6.23%	65	4.27%	82	4.57%	0.153
Meconium	3	1.10%	62	4.07%	65	3.62%	0.015
Prophylactic	73	26.74%	263	17.27%	336	18.71%	< 0.001*
Maternal disease	13	4.8%	321	21.08%	334	18.6%	< 0.001*

p-value from Chi-Square test

Table 3. The indications of vacuum extraction in private cases and hospital cases

Indication	Private cases N=406		Hospital cases N=509		Total N=915		p
	n	%	n	%	N	%	
Prolonged 2nd stage	17	4.19%	158	31.04%	175	19.13%	< 0.001*
Non-reassuring status	17	4.19%	85	16.69%	102	11.14%	< 0.001*
Maternal exhaustion	202	50.25%	157	30.85%	359	39.23%	< 0.001*
OPP/OT	31	7.71%	6	1.18%	37	4.05%	< 0.001*
Fetal distress	2	0.49%	22	4.33%	24	2.62%	< 0.001*
Meconium -stained Amniotic Fluid	7	1.73%	7	1.38%	14	1.53%	0.658
Prophylactic	119	29.31%	30	5.89%	149	16.29%	< 0.001*
Maternal disease (eg. hypertension, heart diseases)	11	2.70%	44	8.64%	55	6.01%	< 0.001*

* p-value from Chi-Square test

OPP: occiput persistent posterior, OT: occiput transverse

Table 4. The maternal complications from forceps and vacuum delivery in private and hospital cases

Complication	F/E						p
	Private cases N=274		Hospital cases N=1,534		Total N=1,808		
	n	%	n	%	N	%	
3rd or 4th degree perineal tear	19	6.9%	65	4.2%	84	4.6%	0.052
Postpartum hemorrhage	11	4.0%	98	6.4%	109	7.1%	0.127
Complication	**V/E**						**p**
	Private cases N=406		Hospital cases N=509		Total N=915		
	n	%	n	%	N	%	
3rd or 4th degree perineal tear	9	2.2%	11	2.2%	20	2.2%	0.954
Postpartum hemorrhage	15	3.7%	28	5.5%	43	4.7%	0.200

p-value from Chi-Square test

Table 5. The neonatal complications from forceps and vacuum delivery in private and hospital cases

Complication	F/E						p
	Private N=274		Hospital N=1,534		Total N=1,808		
	n	%	n	%	N	%	
Wound at scalp	0	0.00%	2	0.1%	2	0.1%	-
Facial marks	59	21.5%	301	19.6%	360	19.9%	0.475
Refer to NICU	1	0.4%	22	1.4%	23	1.3%	0.145

Complication	V/E						p
	Private N=406		Hospital N=509		Total N=915		
	n	%	n	%	N	%	
Wound at scalp	50	12.3%	76	14.9%	126	13.8%	0.254
Refer to NICU	4	0.9%	15	2.9%	19	2.1%	0.039

p-value from Chi-Square test

Table 6. Apgar score in newborn who were delivered by forceps and vacuum extraction

Forceps extraction

Apgar score	1 min				p	5 min				p
	Private cases		Hospital cases			Private cases		Hospital cases		
	n	%	n	%		n	%	n	%	
					0.273					-
7-10	268	97.81%	1473	96.34%		273	100.00%	1,514	99.02%	
4-6	6	2.19%	44	2.88%		0	0.00%	13	0.85%	
0-3	0	0.00%	12	0.78%		0	0.00%	2	0.13%	

Vacuum extraction

Apgar score	1 min				p	5 min				p
	Private cases		Hospital cases			Private cases		Hospital cases		
	n	%	n	%		n	%	n	%	
					0.001*					0.049
7-10	390	96.30%	456	89.59%		403	99.75%	501	98.43%	
4-6	14	3.46%	49	9.63%		1	0.25%	8	1.57%	
0-3	1	0.25%	4	0.78%		0	0.00%	0	0.00%	

p-value from Chi-Square test

Table 7. The length of stay in hospital in forceps and vacuum deliveries

Length of stay	Forceps (N=1,808)		Vacuum (N=915)		Total (N=2,723)		p
	n	%	n	%	N	%	0.720
Mean ± SD	4.27 ± 2.10		4.23 ± 1.88		4.26 ± 2.03		
Median (range)	4 (1-34)		4 (1-25)		4 (1-34)		
1 – 3	405	41.58%	202	40.56%	607	41.24%	
4 – 6	481	49.38%	250	50.21%	731	49.66%	
7 – 9	63	6.47%	41	8.23%	104	7.07%	
> 10	25	2.57%	5	1.00%	30	2.03%	

p-value from Chi-Square test

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แนวโน้มการทำคลอดด้วยคีมและเครื่องดูดสุญญากาศในโรงพยาบาลราชวิถี ตั้งแต่ปี พ.ศ.2545-2552

อภิธาน พวงศรีเจริญ, วิชชุลดา เชาว์นาม

วัตถุประสงค์ *: เพื่อศึกษาแนวโน้มของการทำคลอดด้วยคีม และเครื่องดูดสุญญากาศในกลุ่มที่ฝากพิเศษ และกลุ่มที่ไม่ได้ฝากพิเศษในโรงพยาบาลราชวิถีตั้งแต่ปี พ.ศ.2545-2552*

วัสดุและวิธีการ *: หญิงตั้งครรภ์เดี่ยวครบกำหนดที่มาคลอดที่โรงพยาบาลราชวิถี โดยใช้หัตถการช่วยคลอดทางช่องคลอดตั้งแต่วันที่ 1 มกราคม พ.ศ.2545 ถึงวันที่ 31 ธันวาคม พ.ศ.2552 ได้รวบรวมเข้ามาในการศึกษานี้ นำลักษณะของมารดา ได้แก่ ชนิดของการคลอด ชนิดของคนไข้ ภาวะแทรกซ้อน และผลลัพธ์ของมารดาและทารกมาเปรียบเทียบ วิเคราะห์แนวโน้มของการทำคลอดโดย linear regression analysis โดยโปรแกรม SPSS version 17.0 for window*

ผลการศึกษา *: ในหญิงตั้งครรภ์ที่ได้รับการทำคลอดด้วยหัตถการ 2,723 ราย (คิดเป็นร้อยละ 4.82 ของการคลอดทางช่องคลอดทั้งหมด) พบว่ามีการทำคลอดด้วยคีม 1,808 ราย (ร้อยละ 66.4) และเครื่องดูดสุญญากาศ 915 ราย (ร้อยละ 36.6) การทำคลอดด้วยคีมและเครื่องดูดสุญญากาศมีแนวโน้มลดลงอย่างช้าๆ ทั้งสองหัตถการจะหมดไปในอีก 6 ปี (ปี พ.ศ.2559) และ 10.5 ปี (ปี พ.ศ.2563) ตามลำดับ (y=-0.307x+4.434, R2=0.715 and y=-0.114x+2.109, R2=0.554) กลุ่มหญิงตั้งครรภ์ที่ฝากพิเศษ พบว่าได้รับการทำคลอดด้วยคีม 274 ราย (คิดเป็นร้อยละ 40.29) และทำคลอดด้วยเครื่องดูดสุญญากาศ 406 ราย (คิดเป็นร้อยละ 59.71) ทั้งสองหัตถการ จะหมดไปในอีก 3.20 ปี (ปี พ.ศ.2556) และอีก 7.53 ปี (ปี พ.ศ.2559) ตามลำดับ กลุ่มหญิงตั้งครรภ์ที่ไม่ได้ฝากพิเศษ พบว่าได้รับ การทำคลอดด้วยคีม 1,534 ราย (คิดเป็นร้อยละ 75.08) และทำคลอดด้วยเครื่องดูดสุญญากาศ 509 ราย (คิดเป็นร้อยละ 24.92) ทั้งสองหัตถการจะหายไปในอีก 7.24 ปี (ปี พ.ศ.2560) และอีก 10.96 ปี (ปี พ.ศ.2563) ตามลำดับ*

สรุป *: แนวโน้มของการทำคลอดทางช่องคลอดด้วยคีม และเครื่องดูดสุญญากาศที่โรงพยาบาลราชวิถี กำลังลดลงและการทำหัตถการทั้งสองอย่างนี้อาจจะหายไปในอีก 6 และ 10.5 ปี ตามลำดับ ทั้งในกลุ่มหญิงตั้งครรภ์ที่ฝากพิเศษและไม่ได้ฝากพิเศษต่างมีแนวโน้มลดลงเช่นเดียวกัน เพียงแต่อัตราการลดลงต่างกัน*