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Linear association between maternal age and need of medical interventions at delivery in primiparae: a cohort of 21,235 singleton births

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Abstract

Objectives—We sought to investigate the potential association between maternal age and the need for active obstetrical intervention intrapartum in primiparas.

Study design—Observational study over 14 years (2001–2014) of all consecutive primiparous singleton births having delivered at the Centre Hospitalier Universitaire Hospitalier Sud Reunion's maternity (French overseas department, Indian Ocean).

Results—Of the 21,235 singleton primiparous births, there were three significant linear associations between maternal age from 12 years of age to 42 +(all χ^2 for linear trend, $p < .0001$) (a) vaginal deliveries without any medical intervention, (b) rate of cesarean sections, and (c) rate of operative vaginal procedures. These three linear associations persisted when controlling for maternal obesity (±30 kg/m^2), "heavy babies" (>3.5 kg), and ethnicity. Using maternal age remained significantly an independent risk factor ($p < .0001$), after controlling for the major confounders: maternal BMI, maternal height, birthweight ≥3500 g, $p < .0001$.

Conclusions—Increasing maternal age has a linear association with vaginal deliveries without any medical intervention, rate of cesarean sections, and rate of operative vaginal procedures. These associations are independent of maternal BMI and maternal height. We currently do not have a

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specific explanation why younger women appear to be protected from requiring intrapartum obstetric intervention. Nevertheless, these strong facts deserve acknowledgement and further research.

Keywords

Primiparae; epidemiology; maternal age; birthing; cesarean delivery

Introduction

Based on several studies in primiparous adolescent pregnancies (<18 years of age) [1,2], we previously found that adolescents clearly have a superior birthing outcome (predominantly considering the rate of caesarean sections) compared with their slightly older but still young counterparts (18–29 years). In Reunion island (French overseas department in the Indian Ocean), 4% of deliveries are from adolescents (<18 years), representing 11% of all primiparous deliveries [3]. From a global perspective, girls between 15 and 19 years still give birth to around 16 million babies each year, representing around 11% of births worldwide [4]. “Pregnancy among adolescents is not associated with worse maternal outcomes, but is associated with worse perinatal outcomes” [4] is now an accepted consensus [5–9] in the medical literature, but adolescent pregnancies are still considered rather with a kind of universal reprobation in medical literature in developed countries [10]. We started these studies convinced by the common dogma that adolescent typically have complicated births [10], and we were in fact surprised of the findings indicating lower birth dystocia in adolescents [1,2]. In our experience, the preceding paradigm should rather be: “Pregnancy among adolescents is associated with very good maternal outcomes”. The second set of surprises is the purpose of this paper. The purpose of the current study is to evaluate if there is an association between maternal age and uncomplicated physiologic birthing for the most difficult situation: primiparity.

Materials and methods

The hospital records of all women delivered at the maternity of the University South Reunion Island (ap. 4300 births per year) between 1 January 2001 and 31 December 2014 were abstracted in standardized fashion using an electronic database (data entry made during the period by trained physicians or midwives). All data were entered into an electronic epidemiological perinatal database which contained information on obstetrical risk factors, description of mode of delivery and neonatal outcomes. Dystocic delivery was defined as delivery requiring active obstetrical intervention including caesarean section (C-section), and/or operative vaginal delivery.

As participants in the French national health care system, all pregnant women in Reunion Island have their prenatal visits, biological and echographical examinations, and anthropological characteristics recorded in their maternity booklet.

In the general analysis (see Figure 1), the two exclusion criteria were: multiple births and multiparae.

Epidemiological data were analysed with the software EPI-INFO 7.1.5 (2008, CDC, OMS, Atlanta, GA), EPIDATA 3.0 and EPIDATA Analysis V2.2.2.183 (Lauristen, Bruus, Mayatt, Denmark; & Brighton Health, UK). Analysis consisted of the χ^2 for linear trend calculated with the OpenEpi303 software (Rolling School of Public Health, Emory University, Atlanta, GA).

To validate the independent association of maternal age and other confounding factors on dystocic deliveries, a multiple regression logistic was used. Variables associated with "dystocic births" (i.e. need of any active obstetrical interventions, vaginal operative delivery, C-sections) in univariate analysis, with a p value below 0.1 or known to be associated with the outcome in the literature were included in the model. A stepwise backward strategy was then applied to obtain the final model. The goodness of fit was assessed using the Hosmer–Lemeshow test. A p value below .05 was considered significant. All analyses were performed using MedCalc software (version 12.3.0; MedCalc Software's, Ostend, Belgium).

The following covariates were included as possible confounders in this analysis: maternal obesity (±30 kg/m^2) and "heavy newborns" (>3500 g). We included these variables and calculated the χ^2 for trend (Mantel extension), the odds ratios for each exposure level compared with the first exposure level. In our adjusted model, we tested maternal obesity, as obesity by itself is a strong risk factor for caesarean sections [11]. We did not test for smoking as the incidence in our pregnant population is globally of 12% and 13% in adolescents.

Results

There were 58,056 deliveries (life births plus stillbirths) > 21 weeks gestation at the South Reunion maternity during this 14 year period. After exclusion of multiple births (1139 pregnancies), and multiparae, the study population consisted of 21,235 primiparae.

Table 1 and Figure 1 depict the rate of spontaneous vaginal deliveries, caesarean sections and need of vaginal operative medical interventions for all women and C-sections for the subgroups of obese women (30 kg/m^2+) and those delivering "heavy babies" (>3500 g). In all cases, there were significant χ^2s for linear trend associated with maternal ages in primiparas, $p < .0001$.

The multiple logistic regression model used to validate the independent association of maternal age and other confounding factors for "dystocic deliveries" (0 = eutocic deliveries, 1 = dystocic) demonstrated that maternal BMI (OR 1.04, each increment of BMI enhances the risk by 4%) and birthweight ≥3500 g (discrete 0–1) increases the risk (OR = 1.59, enhances the risk by 59%) (Table 2). Maternal height (negative coefficient) was found to be protective (height as a continuous variable, OR = 0.96, for each increment in centimeter of height, the dystocic risk diminishes by 4%). Controlling for all other factors, maternal age was found to be an independent factor (coefficient 1.08, increment of 8% per increment of 1 year, with age used as a continuous variable).

Having maternal age confirmed as an independent factor (Table 2), we sought to test the linearity of this association by the χ^2 for linear trend (Table 3). Table 3 represents the overall

calculation of the χ^2 for linear trend for the entire cohort (N = 21,235 singleton primiparous pregnancies) for (a) vaginal deliveries without medical help and (b) caesarean section. All χ^2 for linear trend were $p < .001$. (d) In order to make the adjusted χ^2 for linear trend for possible confounders (maternal obesity −30 kg/m^2+− and “heavy babies” 3500 g+−), it was necessary to delete the 18 girls aged 12–13 years (final cohort of 21,217 primiparas). Results of the adjusted χ^2 for these two criteria (maternal obesity, heavy babies) are similar to the crude OR for trend ($p < .0001$) calculated for all parturients: 784 versus 576. Similarly, to include ethnicity in the model, it was necessary to delete the 12–15 age group.

Tables 4 and 5 describe the medical practice over the study period and by categories of ages, and some demographic characteristics. During the 14 year period, the protocols have been relatively constant: C-section rates around 16–18% in primiparae, induced deliveries around 22–23%, rate of epidural anesthesia in vaginal deliveries around 70–80%.

The obesity rate (30 kg/m^2+, pre-pregnancy weight) has also been constant at about 11–12%.

Table 5 demonstrates that women from European origin (mainland France) were underrepresented in young ages, while being overrepresented in older ages in particular women in the >30 years category of age.

In the French obstetrical practice, midwives are always in front line and responsible for each delivery. As such it is always a midwife's decision to call in when active obstetrical active intervention is needed (operative vaginal, caesarean section). Table 4 demonstrates that 60–62% of all the deliveries are performed uniquely by midwives. Table 5 demonstrates the rise of presence of obstetricians with maternal ages, being called for the need of active interventions.

The decision of induction of labour is always taken by an obstetrician, but this does not mean that the obstetrician will be present at birth. Induction of deliveries was more common in older primiparae notably after 30 years, but quite clearly increased in women >35 years. However, it does not seem that the rate of C-section due to failed induction is highly overrepresented in older ages (see Table 6).

Table 6 depicts the main indications of C-section by categories of age. Elective C-sections (e.g. breech presentation, preeclampsia) were a minority. In the majority of cases, indications were made after a trial of labour.

Table 7 presents an overview of all adverse maternal or fetal outcomes associated with maternal ages. The rate of perinatal mortality, early preterms (<33 weeks), and fetal malformations follow *U* curves *plus or minus* flat with the greatest risks at both extreme of ages. Concerning post-partum hemorrhage, there was no significant differences between different maternal ages in this cohort.

Figure 2 shows the age distribution of this cohort of primiparas with a peak of our primiparous parturients at the age of 19.

Discussion

In this report, a 14 year population-based study based on Reunion Island, with prospectively collected data concerning singleton primiparous women, we have demonstrated that younger women had better vaginal deliveries, less caesarean section and also less vaginal operative births (forceps, spatules, ventouse) than their older counterparts. These findings are in line with data published by Blomberg et al. in a recent Swedish Nationwide study on 798,000 primiparae [12]. Blomberg et al. reported that adolescent pregnancies (<17 years, *N* = 2392, 17–19 years, N = 29,816 representing 4.0% of their primiparous deliveries) also had more spontaneous vaginal deliveries and less operative interventions.

Reunion island (a French overseas Department in the Indian ocean) has 890,000 inhabitants, with 14,000 births per year. The population is composed of approximately 45% of people from African origin, 10% of Europeans (coming from mainland France), 25% of people from Indian origin, 3% from Chinese origin, and the rest of Creoles (mixed population). The Centre Hospitalier Universitaire Sud-Reunion's maternity (Level 3, European standards of care) is the only public hospital in the southern part of Reunion Island. It serves the whole population of the area, and with 4300 births per year, represents 80–82% of all births in the South of the island, the remaining occurring in a single private clinic in the area (level 1) [3]. In Reunion, women continue to have their first child at a young age (mean age of primiparae is 23 years, but the peak of the curve is at 19 years of age, Figure 2). On Reunion island, women have a good prenatal follow-up (an average of 8.4 prenatal visits and four ultrasound examinations), and have access, like in Sweden, to free medical care through the French National Social Security system.

In this study, the focus was not only on young adolescents, but looking at all maternal ages we found three striking linear trends (χ^2 for trend <0.001) between maternal age and, (a) vaginal deliveries with-out any medical intervention, “natural birthing”, (b) rate of C-sections, but also strikingly, and (c) a surprising linear progressive rate of operative vaginal procedures (vacuum, forceps, spatules, Table 1, Figure 1), similar to the Swedish cohort [12]. The linear association for “natural birthing” persisted when controlling for maternal obesity (≥30 kg/m^2), “heavy babies” (≥3500 g), and European ethnic origin (Table 3). Summarized in Table 7, our data are in line with the literature: young adolescent primiparas deliver better than young adults, but at the cost of worse neonatal outcomes [1,2,4–10,12]. It is of note, however, that, in our experience, as well as other reports, adolescents do not have a higher rate of post-partum haemorrhage compared with older women [4–9,12]. The linearity for C-sections rates with advancing maternal age is also clear in the result tables of a recent Nationwide study in the USA (4 million births) [13], confirming the Swedish data [12] but both authors did not emphasized this fact, and did not test it by specific calculation [12,13]. Another recent study on 26,000 nulliparas in Washington state, USA, looked especially at very young adolescents 11–14 years and found also better birthing as compared with older adolescents or young mothers in their twenties [5]. Similar results are reported in a recent study in Thailand where 298 early adolescents (15 years or less) are compared with 4456 late adolescents and 29,023 adults [14].

We currently do not have a specific understanding of why younger women appear to be protected from having a birth with major dystocia. In this study, we confirm like other authors a decreased risk of cesarean delivery in young adolescents [4–9,12–14], without clear explanations. The two main hypotheses found in the literature are possible factors which could include intrinsic biologic causes such as uterine contractility and physical endurance in young women, and also a kind of medical bias such as practice patterns in obstetricians hesitating to perform caesareans deliveries regarding the impact on future reproductive outcomes. These debates have been recently synthesized by Torvie et al. [5]. Advancing age is associated with impaired uterine contractility, and we hypothesize, like Blomberg et al that these facts may be caused by biological factors [12]. However, for "natural birthing", as well as for spontaneous breech presentation at term [15], younger maternal ages could had been advantageous in the human species in times when the expectancy of life was 35 years (hunter-gatherers, 10,000 years ago), and also when modern obstetrics (notably the safety of caesarean sections, i.e. until the 1950s), and even the profession of trained midwives did not existed (before the seventeenth century).

One potential bias of this cohort is not to have included the 18–20% of women delivering in the single private clinic of the area (level 1), but we considered that it was more pertinent to keep the hospital settings (level 3) only as it permitted to have a coherent practice patterns of deliveries and common protocols (in 2014 the C-sections rate was 22% in the private clinic versus 16.4% in the public hospital). However, with more than 80% of the population of the South of Reunion island covered (and having also all the complicated pregnancies, being the only level 3 maternity of the area), we feel that this potential bias is low. We have not tested post-partum maternal sepsis (endometritis. etc.), as these items have not been included in our perinatal database.

Conclusions

In our cohort of mainly African/Creole women in the Indian Ocean, where women still have their first child at young ages, the rate of vaginal deliveries without any medical intervention is over 80% before 18 years of age, compared with around 45% after 40 years. What was unexpected is that this linearity is homogeneous and constant, with a striking highly significant linear trend for each category of ages.

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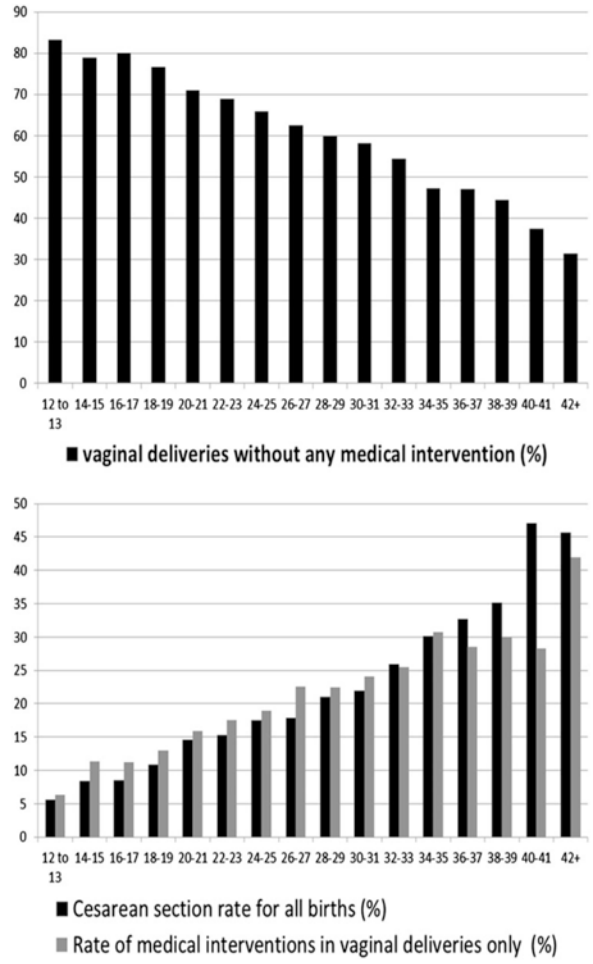

Figure 1.

Birthing without any medical intervention (vaginal extraction or caesarean section) by maternal ages, all births $N = 21,235$. Rate of medical intervention at birth by maternal ages (1) caesarean section for all singleton births $N = 21,235$. (2) Rate of medical intervention in vaginal deliveries only, $N = 17,427$.

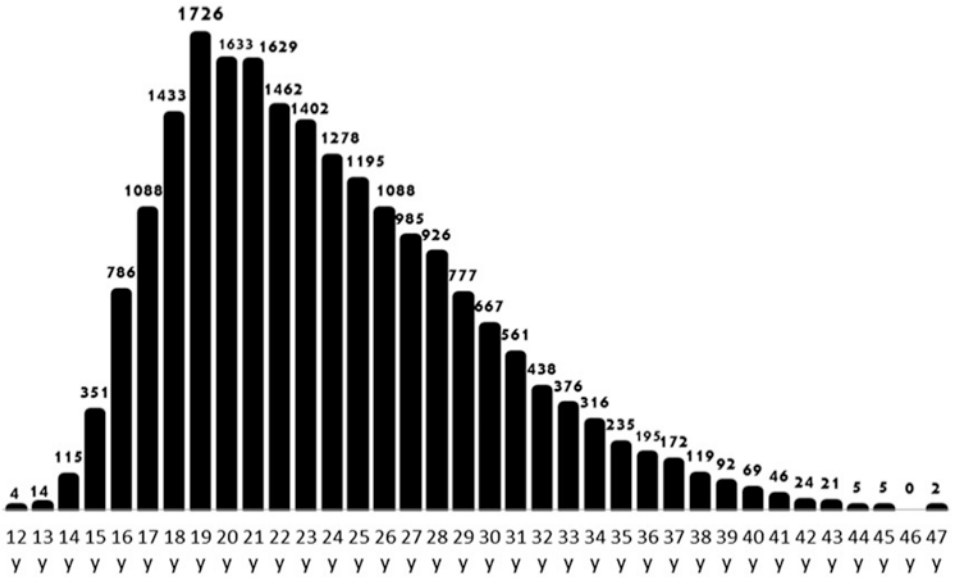

Figure 2.
Distribution of primiparous maternal ages at Sud-Réunion's maternity 2001–2014.

Table 1

Birthing in primiparae by age categories (vaginal deliveries, medical interventions, cesarean sections).

Maternal ages	12–13 *N* = 18	14–15 *N* = 466	16–17 *N* = 1874	18–19 *N* = 3159	20-21 *N* = 3262	22–23 *N* = 2864	24–25 *N* = 2473	26–27 W = 2073	28–29 W = 1703	30–31 W = 1228	32–33 *N* = 814	34–35 *N* = 551	36–37 *N* = 367	38–39 *N* = 211	40–41 *N* = 115	42+ *N* = 57	TOTAL *N* = 21,235	Chi^2 for linear trend	*r* correlation coefficient r^2 coef. of determination	*p* Value
Cesarean section Babies 3500 g+ *N* = 3700 (%)	0/2 (0)	3/63 (4.8)	32/297 (10.8)	64/471 (13.6)	107/573 (18.7)	110/544 (20.2)	111/468 (23.7)	89/369 (24.1)	79/310 (25.5)	55/230 (23.9)	41/141 (29.1)	36/101 (35.6)	31/70 (44.3)	16/41 (39.0)	11/15 (73.3)	3/5 (60.0)	788/3700 (21.3)	112	$r = -0.91$ $r^2 = 0.83$	<.001
Vaginal breech *N* = 212	0	5	12	25	27	29	26	22	26	18	6	9	4	2	1	0	–	–	–	–
Cesarean section All women *N* = 21,235 (%)	1 (5.6)	39 (8.4)	159 (8.5)	340 (10.8)	475 (14.6)	437 (15.3)	432 (17.5)	370 (17.8)	358 (21.0)	269 (21.9)	211 (25.9)	166 (30.1)	120 (32.7)	74 (35.1)	54 (47.0)	26 (45.6)	3531 (16.6)	578	$r = 0.96$ $r^2 = 0.94$	<.001
Spontaneous vaginal deliveries All women *N* = 21,235 (%)	16 (88.8)	375 (80.4)	1514 (80.7)	2433 (77.0)	2322 (71.2)	1978 (69.1)	1635 (66.1)	1302 (62.8)	1025 (60.1)	714 (58.1)	445 (54.7)	261 (47.4)	174 (47.4)	95 (45.0)	43 (37.4)	18 (31.5)	14,285 (67.3)	774	$r = -0.99$ $r^2 = 0.98$	<.001
Rate of medical intervention in vaginal deliv. (%) *N* = 17,427[a]	1/16 (6.3)	47/415 (11.3)	189/1689 (11.2)	361/2780 (13.0)	438/2754 (15.9)	420/2393 (17.6)	380/2012 (18.9)	379/1676 (22.6)	294/1314 (22.4)	227/940 (24.1)	152/596 (25.5)	115/375 (30.7)	69/242 (28.5)	40/134 (29.9)	17/60 (28.3)	13/31 (41.9)	3142 (18.0)	289	$r = -0.96$ $r^2 = 0.92$	<.001
Cesarean section Obese women (30 kg/m^2+) *N* = 2189 (%)	0 (0)	1/14 (7.1)	22/98 (22.4)	51/263 (19.4)	85/647 (24.5)	78/372 (21.0)	87/312 (27.9)	65/249 (26.1)	56/179 (31.3)	41/129 (31.8)	29/82 (35.4)	24/58 (41.4)	16/38 (42.1)	13/28 (46.4)	12/14 (85.7)	4/6 (66.6)	584/2189 (26.7)	96	$r = -0.87$ $r^2 = 0.77$	<.001

[a]Vacuum, forceps, spatules.

Table 2

Multiple logistic regression model to validate the independent association of maternal age and other confounding factors for “dystocic deliveries” (needing active medical help, C-section, vaginal operative). Maternal BMI, macrosomia increases the risk. Maternal height (negative coefficient) is protective. Controlling for all the other factors, maternal age is still an independent factor (coefficient 0.08, increment of 8% per 1 increment of 1 year, age as a continuous variable).

	Multiple logistic regression for vaginal delivery in primiparas			
	Coefficient	**Odds ratio**	**95% CI**	***p***
Maternal BMI	0.04	1.04	[1.03–1.04]	<.0001
Maternal height	−0.04	0.96	[0.96–0.97]	<.0001
Birthweight ≥3500 g	0.46	1.59	[1.47–1.71]	<.0001
Maternal age	0.08	1.08	[1.07–1.08]	<.0001
Constant	2.90	–	–	–

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Table 3

χ^2 for linear trend calculations. (1) Crude odd ratios for spontaneous vaginal deliveries (without any medical help) and caesarean section rates by maternal ages. (2) Adjusted odds ratios with two models.

Maternal ages	Crude odds ratio rate of vaginal deliveries without medical help All primiparas *N* = 21,235	Crude odds ratio cesarean section rate All primiparas *N* = 21,235	Crude odds ratio cesarean section rate primiparas Beginning 14 years *N* = 21,217	1st model adjusted for two criteria odds ratio C-section Beginning 14 years *N* = 21,217	Crude odds ratio cesarean section rate primiparas Beginning 16 years *N* = 20,751	2nd model adjusted for three criteria odds ratio C-section Beginning 16 years *N* = 20,751
12–13	1.00 (reference)	1.00 (reference)	–	–	–	–
14–15	0.75	1.55	1.00 (reference)	1.00 (reference)	–	–
16–17	0.80	1.57	1.01	1.17	1.00 (reference)	1.00 (reference)
18–19	0.65	2.05	1.32	1.48	1.3	1.23
20–21	0.49	2.90	1.87	2.05	1.84	1.70
22–23	0.44	3.06	1.97	2.21	1.94	1.89
24–25	0.39	3.60	2.31	2.64	2.28	2.29
26–27	0.33	3.70	2.38	2.70	2.34	2.26
28–29	0.30	4.52	2.91	3.25	2.87	2.65
30–31	0.28	4.77	3.07	3.38	3.03	2.69
32–33	0.24	5.95	3.83	4.23	3.77	3.47
34–35	0.18	7.33	4.72	5.30	4.65	4.13
36–37	0.18	8.26	5.32	6.18	5.24	4.86
38–39	0.16	9.18	5.91	6.68	5.83	5.34
40–41	0.12	15.04	9.70	12.4	9.55	10.26
42+	0.09	14.25	9.18	10.6	9.05	8.2
p for linear trend	<.000001	<.000001	<.000001	<.000001	<.000001	<.000001
χ^2 for linear trend	774	578	576	784	549	788

(1) First adjusted model: caesarean section rates by maternal ages, χ^2 for linear trend adjusted for maternal obesity (±30 kg/m^2, yes/no), And “heavy” newborns (±3500 g, yes/no). Beginning at 14 years.

(2) Second adjusted model: caesarean section rates by maternal ages χ^2 for linear trend adjusted for maternal obesity (±30 kg/m^2, yes/no), “heavy” newborns (±3500 g, yes/no), and European origin (yes/no). Beginning at 16 years.

Table 4

Evolution of practice for primiparous deliveries in South Reunion university's maternity over the study period.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Rate of C-sections Primips (%)	18.4	17.2	18.0	16.3	15.9	16.2	19.6	15.9	15.4	15.8	14.7	17.5	16.8	15.3	
Rate of induced deliveries (%)	25.7	23.8	23.8	22.0	22.8	24.4	23.8	22.9	22.7	22.0	22.1	20.9	23.9	25.2	
Presence of obstetrician at birth (%)[a]	–	–	–	–	38.5	37.3	39.3	35.6	38.1	44.1	37.0	40.0	39.9	42.6	
Vaginal operative (%)															
Vacuum	8.9	6.2	7.0	9.6	13.9	13.6	14.7	13.3	14.8	18.8	14.8	15.3	17.3	16.6	13.4
Forceps	5.8	3.3	3.4	3.5	2.6	2.5	2.3	3.2	2.6	1.3	0.9	1.3	0.8	1.6	2.5
Spatules	1.7	3.3	2.8	1.8	1.6	0.8	0.4	0.5	0.8	2.5	2.2	2.6	2.6	3.5	1.9
% of Vaginal deliveries	16.4%	12.8%	13.2%	14.9%	18.1%	16.9%	17.4%	17.0%	14.8%	22.6%	17.9%	19.2%	20.7%	21.7%	17.8%
N = 17,704	*N* = 1090	*N* = 1170	*N* = 1164	*N* = 1241	*N* = 1223	*N* = 1296	*N* = 1275	*N* = 1325	*N* = 1320	*N* = 1272	*N* = 1289	*N* = 1320	*N* = 1307	*N* = 1412	*N* = 17,704
Epidural anesthesia (vaginal deliveries) (%)	648/1090 (59.4)	794/1170 (67.9)	833/1164 (71.5)	906/1241 (73.0)	884/1223 (71.9)	987/1296 (76.2)	961/1274 (75.4)	1037/1325 (78.3)	1046/1320 (79.2)	1036/1272 (81.4)	1084/1289 (84.0)	1112/1320 (84.2)	1106/1306 (84.6)	1225/1409 (86.9)	13,659/17,699 (77.1)

[a]Recorded in the database since 2005 only.

Table 5

Demographic origins and different factors by categories of maternal ages in primiparas.

Maternal ages	12–13 *N* = 18	14–15 *N* = 466	16–17 *N* = 1874	18–19 *N* = 3159	20–21 *N* = 3262	22–23 *N* = 2864	24–25 *N* = 2473	26–27 *N* = 2073	28–29 *N* = 1703	30–31 *N* = 1228	32–33 *N* = 814	34–35 *N* = 551	36–37 *N* = 367	38–39 *N* = 211	40–41 *N* = 115	42+ *N* = 57	Total *N* = 21,235
Maternal origin																	
Reunion	88.9	93.5	92.2	90.8	90.5	88.3	86.5	81.6	75.9	69.8	67.2	68.4	63.1	64.0	68.7	66.6	84.4
Europe	0	0.6	2.0	4.1	4.1	6.1	7.7	13.7	17.8	22.8	24.5	24.5	26.5	24.2	20.9	19.2	9.7
Others[b] (%)	11.1	5.9	5.9	5.1	5.4	5.6	5.8	4.7	6.3	7.4	8.3	7.1	10.4	11.8	10.4	14.2	5.9
Induced deliveries (%)	11.1	17.2	17.9	20.9	22.5	22.4	22.2	24.7	24.2	28.3	29.6	29.4	33.8	36.5	36.5	40.3	23.3
Obstetrician's presence at birth[a] (%)	3/13 (23.1)	85/324 (26.2)	346/1319 (26.2)	663/2305 (28.8)	841/2408 (34.9)	796/2077 (38.3)	752/1832 (41.0)	685/1513 (45.3)	585/1251 (46.8)	449/942 (47.7)	317/626 (50.6)	240/402 (59.7)	171/286 (59.8)	110/169 (65.1)	65/96 (67.7)	35/47 (74.5)	6143/15,610 (39.4)
Obesity (≥30 kg/m^2) (%)	0/15 (0)	14/418 (3.3)	98/1753 (5.6)	263/3013 (8.7)	347/3143 (11.0)	372/2787 (13.3)	312/2390 (13.1)	249/2005 (12.4)	179/1674 (10.7)	129/1194 (10.8)	82/797 (10.3)	58/537 (10.8)	38/356 (10.7)	28/202 (13.9)	14/113 (12.4)	6/56 (10.7)	2189/20,453 (10.7)
Epidural anesthesia (vaginal del) (%)	3/15 (20)	315/427 (73.7)	1259/1714 (73.4)	2120/2819 (75.2)	2151/2785 (77.2)	1878/2427 (77.3)	1588/2040 (77.8)	1336/1703 (78.4)	1078/1345 (80.1)	762/958 (79.5)	480/603 (79.6)	299/385 (77.7)	196/247 (79.3)	106/137 (77.4)	49/61 (80.3)	20/25 (80)	13,659/17,699 (77.2)
Cesarean sections Europeans	0/0 (0)	0/3 (0)	1/38 (2.6)	8/128 (6.3)	15/132 (11.4)	16/175 (9.1)	23/189 (12.2)	35/284 (12.3)	39/303 (12.9)	38/280 (13.6)	43/199 (21.6)	25/135 (18.5)	23/97 (23.7)	14/51 (27.5)	9/24 (37.5)	3/11 (27.3)	292/2049 (14.3)

[a] Recorded in the database since 2005 only.

[b] Others: Mayotte, Comores, Madagascar, Mauritius, other.

Table 6

Main indications of cesarean sections in primiparae by maternal ages.

Maternal ages	12–13 *N* =1	14–15 *N* = 39	16–17 *N* =159	18–19 *N* = 340	20–21 *N* = 475	22–23 *N* = 437	24–25 *N* = 432	26–27 *N* =370	28–29 *N* = 358	30–31 *N* = 269	32–33 *N* = 211	34–35 *N* =166	36–37 *N*=120	38–39 *N* = 74	40–41 *N* = 54	42+ *N* = 26
Abnormal fetal monitoring	1 (100)	14 (35.9)	63 (39.6)	130 (38.2)	198 (41.7)	154 (35.2)	150 (34.8)	148 (40.0)	134 (37.4)	102 (37.9)	74 (35.1)	61 (36.7)	41 (34.1)	18 (24.3)	16 (29.6)	6 (23.1)
Stagnation of labour	0	4 (10.2)	18 (11.3)	36 (10.6)	63 (13.3)	65 (14.8)	54 (12.5)	48 (13.0)	47 (13.1)	25 (9.3)	18 (8.5)	18 (10.8)	14 (11.7)	8 (10.8)	9 (16.7)	1 (3.8)
Stagnation after induced delivery	0	3 (7.7)	22 (13.8)	56 (16.5)	68 (14.3)	70 (16.0)	74 (17.1)	57 (15.4)	57 (15.9)	42 (15.6)	39 (18.5)	26 (15.7)	25 (20.8)	16 (21.6)	6 (11.1)	8 (30.8)
Breech presentation	0	7 (17.9)	22 (13.8)	46 (13.5)	52 (10.9)	48 (11.0)	46 (10.6)	41 (11.1)	50 (14.0)	43 (16.0)	25 (11.8)	18 (10.8)	14 (11.7)	9 (12.2)	4 (7.4)	3 (11.5)
preeclampsia	0	5 (12.8)	9 (5.7)	19 (5.6)	29 (6.1)	20 (4.6)	33 (7.6)	20 (5.4)	19 (5.3)	16 (5.9)	13 (6.2)	12 (7.2)	8 (6.7)	6 (8.1)	3 (5.6)	3 (11.5)
Placenta praevia	0	0	0	3 (0.9)	4 (0.8)	8 (1.8)	7 (1.6)	9 (2.4)	9 (2.5)	10 (3.7)	7 (3.3)	6 (3.6)	5 (4.2)	3 (4.1)	1 (1.9)	0
Other	0	6 (15.5)	25 (15.7)	50 (14.8)	61 (12.9)	72 (16.5)	68 (15.8)	47 (12.7)	42 (11.7)	31 (11.6)	35 (16.6)	25 (15.1)	13 (10.8)	14 (18.9)	15 (27.7)[a]	5 (19.3)

[a]Six medical maternal indications, three macrosomia, one sga, two fibromes praevia.

Table 7

Evaluations of maternal or fetal poor outcomes by maternal ages in our population.

Maternal ages	12–13 *N* = 18	14–15 *N* = 466	16–17 *N* =1874	18–19 *N* = 3159	20–21 *N* = 3262	22–23 *N* = 2864	24–25 *N* = 2473	26–27 *N* = 2073	28–29 *N* =1703	30–31 *N* =1228	32–33 *N* = 814	34–35 *N* =551	36–37 *N* = 367	38–39 *N* = 211	40–41 *N* = 115	42+ *N* = 57	Total *N* = 21,235
Rate of early preterms <33 weeks (%)	3 (16.7)	35 (7.5)	102 (5.4)	106 (3.4)	110 (3.4)	96 (3.4)	94 (3.8)	82 (4.0)	57 (3.3)	43 (3.5)	34 (4.2)	23 (4.2)	21 (5.7)	20 (9.5)	6 (5.2)	4 (7.0)	836 (3.9)
Fetal malformations (%)	1 (5.6)	18 (3.9)	50 (2.7)	79 (2.5)	97 (3.0)	87 (3.0)	66 (2.7)	59 (2.8)	54 (3.2)	35 (2.9)	29 (3.6)	19 (3.4)	19 (5.2)	9 (4.3)	12 (10.4)	4 (7.0)	638 (3.0)
Perinatal mortality $\%_0$	1 (56)	17 (36)	53 (28)	50 (16)	68 (21)	50 (17)	40 (16)	44 (21)	33 (19)	24 (20)	14 (17)	12 (22)	9 (25)	16 (76)	3 (26)	2 (35)	436 (21)
Postpartum (%) Hemorrhage[a]	0/13 (0)	11/324 (3.4)	42/1318 (3.2)	72/2303 (3.1)	77/2401 (3.2)	69/2075 (3.3)	58/1832 (3.2)	46/1507 (3.1)	37/1249 (3.0)	31/941 (3.3)	21/626 (3.4)	8/402 (2.0)	10/284 (3.5)	8/169 (4.7)	0/95 (0)	2/45 (4.4)	493/15,586 (3.2)

[a]Postpartum hemorrhage recorded in the database only since 2005.