

## Teenage Pregnancies: Obstetric and Neonatal Outcomes at a Danish Regional Hospital

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### Abstract

**Objective:** The aim of our study was to investigate whether Danish teenage pregnancies were associated with increased risks of adverse maternal, obstetrical and neonatal outcomes.

**Study design:** A retrospective case control study. All nulliparous singleton pregnant teenagers  $\leq 19$  years ( $n=134$ ) and randomly selected nulliparous women ( $n=268$ ) aged 20-39 with singleton pregnancy, who gave birth at the Regional Hospital of Randers from 2008 to 2012 were included. Statistical comparisons by independent t-test were applied to continuous data, while Chi-square test was used to examine for differences in frequency data. We calculated Odds ratio (OR), 95% confidence intervals (CI) and p values  $<0.05$  was considered significant.

**Results:** The prevalence of teenage pregnancy in our study was 1.8%. Smoking during pregnancy was significantly higher among pregnant teenagers (46%) versus non-teenagers (9%).

There was a significantly higher prevalence of spontaneous vaginal delivery in teenage pregnancies (81%) compared to controls (65%). The prevalence of caesarean section was significantly lower in the study group (6.7%) than in the control group (19%). Third and fourth degree perineal tears and postpartum hemorrhage were significantly less in the study group than in the control group (0.8% vs 6.4% and 16% vs 25.4% respectively). There was no statistically significant association between teenage pregnancies and increased rates of antenatal complications including, preeclampsia, eclampsia and gestational diabetes mellitus. There was no statistical significant difference of the neonatal outcomes; LBW, Apgar score and arterial cord pH between groups.

**Conclusion :** Teenage pregnancies in our setting seem not to be associated with increased risks of adverse maternal, obstetrical and neonatal outcomes. This is probably due to high-quality maternity and neonatal care that is available for teenage pregnancies in Denmark.

**Keywords:** Teenage pregnancy; Obstetric complications; Mode of delivery; perinatal outcome, Neonatal outcome, Caesarean section; Vaginal delivery

### Introduction

Teenage pregnancy is a pregnancy in females under 20 years of age at the end of pregnancy. According to the World Health Organization guideline from 2011, about 16 million adolescent girls between 15 and 19 years of age give birth each year, which is accounting for roughly 11% of all births worldwide. Almost 95% of these births occur in developing countries [1].

The prevalence of teenage pregnancy ending in delivery varies widely between countries. The highest prevalence of teenage pregnancy in the world is in sub-Saharan Africa with a proportion of 174 teenage births per 1000 women (174/1000) [2]. Despite recent trends in the huge reduction of teenage pregnancy, teenager birth proportions in the United States (34/1000) remain high [2]. The lowest occurrences of teenage pregnancy ending in delivery are in Switzerland (2/1000), Japan (4/1000) and Hong Kong (4/1000) [2].

The overall trend in Europe since 1970 has been a decrease in the number of births among this age group. However, Central European data showed still high teenager birth rates. According to the German National Institute of Vital Statistics, 34 of 1,000 births in Germany occurred among women younger than 20 years of age [3]. Romania and Bulgaria have some of the highest teenage birth rates in Eastern Europe with a rate of 35 and 47 teenage births per 1000 women, respectively. Furthermore, a relatively high percentage of teenage pregnancy is seen in the UK (21/1000) and Portugal (13/1000) [2]. The prevalence of

teenage deliveries is 5/1000 in Denmark [2]. An average 873 children per year are born to adolescent mothers in Denmark [4].

Despite of improving trends in modern obstetrics, teenage pregnancies are still on the rise and there is no conclusive evidence regarding the outcome of these. Several studies have found that teenage pregnancies are associated with increased risks of adverse obstetric and neonatal outcomes, such as preterm labor, low birth weight, fetal growth retardation, stillbirth and obstetric complications [5-18]. In contrast, some of the authors have stated that there is no increased risk in teenage pregnancies after controlling for confounding variables [19-21] and others have stated that the risks persist even after adjusting for confounders [22].

To the best of our knowledge, obstetric and neonatal outcome of Danish teenage pregnancies have not previously been investigated. Therefore, the aim of our study was to investigate whether Danish

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teenage pregnancies were associated with increased risks of adverse maternal, obstetrical and neonatal outcomes.

## Methods and Materials

This was a retrospective case control study using hospital records of all nulliparous singleton pregnant teenagers defined  $\leq 19$  years old at the time of delivery giving birth at the Regional Hospital of Randers from January 2008 to January 2012. Randomly selected nulliparous women aged 20-39 with singleton pregnancy were included as a control group. All women in the control group gave birth on the same days as the teenagers by the same team of midwives and obstetricians. By this matching we adjusted for possible differences in the management of labor and delivery.

Approval from the institutional review board was obtained before data collection. The following data were retrieved from hospital records; maternal age, pre-pregnant maternal body mass index (BMI), gestational age, use of tobacco and the antenatal complications including, preeclampsia, eclampsia and gestational diabetes mellitus. BMI was calculated from the patient's reported height and pre-pregnancy weight. Gestational age was determined from prenatal records. In cases of uncertain last menstruation, gestational age was determined from the earliest ultrasonography.

The primary outcome was mode of delivery (spontaneous vaginal deliveries, vacuum extraction and caesarean deliveries). Caesarean delivery was analyzed according to elective and emergency delivery defined as a decision-delivery time of less than 60 min.

Secondary outcomes included gestational age at delivery, mode of onset of delivery, duration of different stages of labor, epidural analgesia, degree of perineal tears defined as grade 1, 2, 3 and 4 tears and postpartum hemorrhage were analyzed.

The following neonatal outcomes such as fetal weight, Apgar score at 5 min and arterial cord pH were evaluated.

Statistical analysis of data was performed with Stata 11.2 (StataCorp. 2009. Stata Statistical Software: Release 11. College Station, TX: StataCorp LP). Data are presented as number and percent, mean and one standard deviation (SD) or median and interquartile range (IQR). Comparison of study and control groups was accomplished by means of logistic regression analyses for categorical data or by Fisher's exact test if expected cell counts were small. The overall differences between groups were tested by likelihood ratio tests while odds ratios (OR) and 95% confidence intervals (CI) are presented for each category. Continuous responses were compared by linear regression using likelihood ratio test. In every case two-sided tests and a significance level of 5% was applied.

## Results

The total number of deliveries during the study period was 8300 in our hospital. Of these, 1.8% (n=152) were teenagers aged  $\leq 19$ . The number of teenage pregnancies decreased during the study period from 2.2% in 2008 to 1.6% in 2011.

A total of 18 teenage pregnancies were excluded from the study due to multiparity (n=10), twin pregnancies (n=2) and incomplete data (n=6). Finally, a total of 134 teenage pregnancies were included in the present study (Figure 1).

The median age of the pregnant teenager was 18 years (14-19) at the time of delivery. The two youngest teenagers were 14 and 15 years old (Figure 2). Age distribution in the control group is shown in Figure 3.

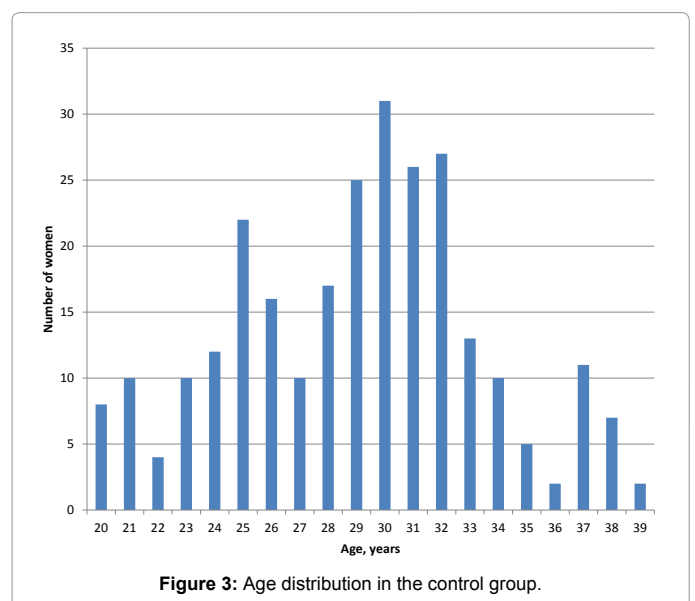
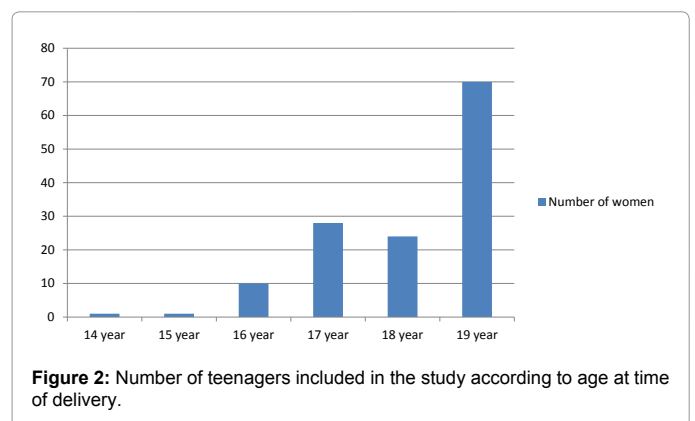
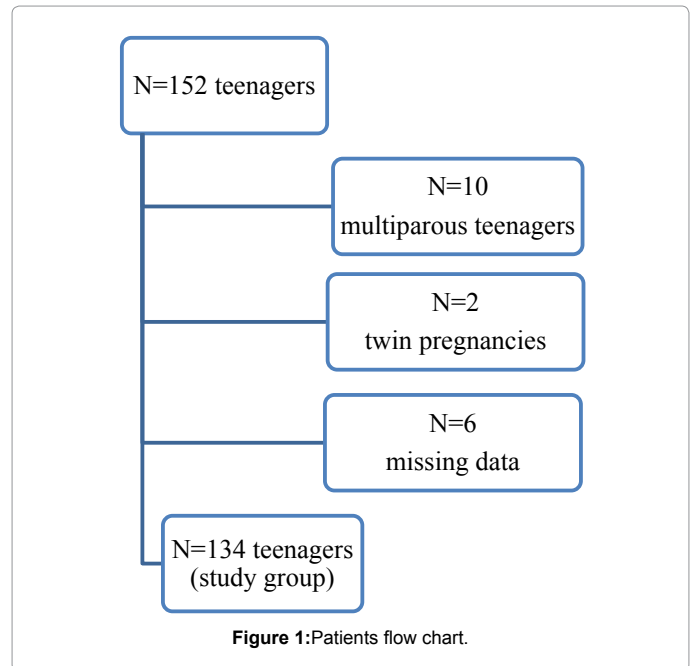


Table 1 shows maternal demographic data and antenatal complications in the study and control group. There was no significant difference in BMI between the groups though compared to the controls, a larger proportion of the teenagers were underweight (<18.5) and a smaller proportion heavily overweight (>30).

There was no statistically significant association between teenage pregnancies and the proportions of antenatal complications including, preeclampsia, eclampsia and gestational diabetes mellitus. Smoking during pregnancy was significantly more frequent among pregnant teenagers (46%) versus non-teenagers (9%) (OR 8.4, 95% CI 4.9-14.3, p<0.0001).

There was no difference in the proportion of labor induction between the groups (Table 2), but the modes of delivery were significantly different (Table 2). The prevalence of spontaneous delivery was higher (80.6%) in the teenagers group whereas the occurrence of caesarean section was lower (6.7%). The use of vacuum extraction was on the same level in both groups (Table 2). The indications for vacuum extraction and caesarean delivery are listed in the Table 3. Suspected fetal distress was the most common indication for vacuum extraction and emergency caesarean delivery in the teenagers group. Indications were not significantly different between groups, though. However, failure to progress was the most common indication for emergency caesarean delivery in non-teenagers.

Perineal tears and postpartum hemorrhage more than 500 ml were significantly less frequent in the teenagers groups than non-teenagers (52.8% vs 78.8% and 16.0% vs 25.4%, respectively). Notably, third and fourth degree tears were seen only once in teenagers (Table 2).

There was no difference in the proportion of preterm delivery rate (gestational age of before 37 completed weeks) between the two groups (5.4% vs 6.3%, respectively (Table 1). Neonatal outcome is charted in

Variables	Study group	Control group	OR (95% CI)	p-value
	(≤ 19 year)	(20-39 year)		
	n=134	n=268		
Median pre-pregnant BMI (kg/m <sup>2</sup> ) (IQR)	22 (20-26)	23 (21-27)		
<b>BMI n (%)</b>				
<18,5	12 (9.6%)	10 (3.8 %)		0.15
≥ 18,5-<25	69 (55.2%)	155 (58.5%)		
≥ 25- ≤ 30	27 (21.6%)	57 (21.5%)		
>30	17 (13.6%)	43 (16.2%)		
Missing	9	3		
Smokers, n (%)	62 (46.3%)	25 (9.3%)	8.4 (4.9-14.3)	<0,0001
Mean gestational age (days) (SD)	278 (12.2)	278 (14.6)		0.97
<b>Gestational age (weeks)</b>				
>40	64 (49.6%)	135 (50.4%)	0.9 (0.6-1.5)	0.91
≥ 37-≤40	58 (45.0%)	116 (43.3%)	1	
<37	7 (5.4%)	17 (6.3%)	0.8 (0.3-2.1)	
Missing	5	0		
Gestational diabetes n (%)	0 (0%)	4 (1.5%)		0.31†
Preeclampsia n (%)	3 (2.2%)	3 (1.1%)		0.40†
Episiotomi n (%)	6 (4.5%)	14 (5.2%)		0.81†

Percentages are proportions of non-missing observations.  
†p-value from Fisher's exact test.

**Table 1:** Characteristics of study and control groups.

Variables	Study group	Control group	OR (95% CI)	p-value
	(≤ 19 year)	(20-39 year)		
	n=134	n=268		
Spontaneous labor, n (%)	107 (79.8%)	216 (80.5%)	1.2 (0.7-2.1)	0.46
Induced labor, n (%)	27 (20.1%)	51 (19.0%)	1.1 (0.6-1.9)	0.79
<b>Mode of delivery, n (%)</b>				
- Normal vaginal	108 (80.6%)	175 (65.3%)	1	0,001
- Vacuum extraction	17 (12.7 %)	42 (15.7%)	0.7 (0.4-1.2)	
- Caesarean section	9 (6.7%)	51 (19.0%)	0.3 (0.1-0.6)	
<b>Caesarean section</b>				
- Elective	n=9	n=51		1.00†
- Emergency Caesarean section	3 (33.3%)	16 (31.4%)		
- Emergency Caesarean section	6 (66.7%)	35 (68.6%)		
Epidural, n (%)	50 (37.3%)	113 (42.2%)	0.8 (0.5-1.3)	0.35
<b>Perineal tear, n (%)<sup>a</sup></b>				
- None	66 (52.8%)	171 (78.8%)	0.3 (0.2-0.5)	<0.0001
- Grade 1	59 (47.2%)	46 (21.2)		
- Grade 2	27 (21.6%)	58 (21.6%)		
- Grade 3	38 (30.4%)	96 (35.8%)		
- Grade 4	1 (0.8%)	13 (4.9%)		
Postpartum hemorrhage ≥ 500 ml, n (%)	20 (16.0%)	67 (25.4%)	0.6 (0.3-1.0)	0.037
Missing	9	2		

†Fisher's exact test.

<sup>a</sup>Perineal tear was calculated for the women with a vaginal delivery only.

**Table 2:** Mode of delivery and complications.

Table 4. There was no statistical significant difference of the neonatal outcomes including fetal birth weight, LBW, Apgar score and arterial cord pH between groups (Table 4). However, the mean fetal birth weight was significantly lower in the teenagers group.

## Discussion

In this study, we found that Danish teenage pregnancies in our setting were not to be associated with increased risks of adverse maternal, obstetrical and neonatal outcomes. The prevalence of teenage pregnancies in our study was 1.8%, which is low compared to the figures worldwide, even Europe, but quite similar according to other Nordic countries [23]. Proper education, greater public awareness and high levels of contraceptive use could explain the lower proportion of teenage pregnancies in Denmark.

The findings of our study differ from the other studies reported increased occurrence of caesarean or instrument assisted vaginal deliveries in teenage pregnancies [5,16] or no statistical significant difference regarding the mode of delivery [8]. Our study, demonstrates that pregnant teenagers were significantly more likely to have normally spontaneous vaginal delivery than the non-teenager pregnant women. It has been described different possible explanation to higher odds for normal vaginal delivery in teenager pregnant women such as a better myometrial function, greater connective tissue elasticity and lower cervical compliance [12]. Furthermore, it has been suggested

Variables	Study group	Control group	p-value
	(≤ 19 year)	(20-39 year)	
	n=134	n=268	
Indication of vacuum extraction	n=17	n= 42	0.12
-suspected fetal distress	15 (88.2%)	25 (59.5%)	
-prolonged second stage	1 (5.9%)	12 (28.6%)	
-poor maternal effort	1 (5.9%)	5 (11.9%)	
Indication of elective caesarean section	n=3	n=16	1
-breech presentation	1 (33.33%)	4 (25%)	
-maternal request	1 (33.3%)	7 (43.8%)	
-intrauterine growth retardation	1 (33.3%)	3 (18.8%)	
-after previous uterine operation	0	2 (12.5%)	0.094
Indication of emergency caesarean section	n=6	n=35	
-suspected fetal distress	5 (83.3%)	11 (31.4%)	
-failed vacuum delivery	1 (16.7%)	4 (11.4%)	
-suspected placental detachment	0	1 (2.9%)	
-failure to progress	0	16 (45.7%)	
-breech presentation	0	3 (8.6%)	

**Table 3:** Indications for vacuum and caesarean deliveries according to age group.

Variables	Study group	Control group	OR (9% CI)	p-value
	(≤19 year)	(20-39 year)		
	n=134	n=268		
Mean fetal birth weight, g (SD)	3317 (549)	3443 (584)		0.038
Missing	0	2		
Low Birth Weight (<2500 g), n (%)	10 (7.5%)	15 (5.6%)	1.3 (0.6-3.1)	0.48
Missing	0	2		
Arterial cord pH, n (%)				0.6
≥ 7.20	95 (79.8%)	205 (82%)		
≥ 7,10-<7,20	20 (16.8%)	34 (13.6%)		
<7,10	4 (3.4%)	11 (4.4%)		
Missing data	15	18		
Apgar, n	0	0		
<7Missing data	2	1		

**Table 4:** Neonatal outcome.

that obstetricians and midwives might be more patient to avoid delivering a teenage woman by caesarean [6,12] and might be reluctant to perform elective caesarean section on teenagers [14]. The higher proportions of normal vaginal delivery in teenage pregnancies may also be explained by a higher prevalence of LBW babies in teenage pregnancies as demonstrated in the previous studies [9,11,14]. On the other hand, Moerman et al. [24] described that teenagers have immature birth canal, which may have significance for obstetric risks and suggested that the smaller teenage pelvis can be considered to imply a higher risk of caesarean delivery. However, the common belief that teenage pregnant are at increased risk for fetopelvic disproportion, as a consequence of incomplete development and thereby at increased risk of caesarean delivery was not supported by the present study. The prevalence of 12.7% for instrument assisted vaginal deliveries in the teenage pregnancies were not significantly different from the control group (15.7%).

Many studies have shown that prematurity is a more common feature in teenage pregnancies [5,6,8,9,11-16,18], while other studies

[17,20,21] could not confirm this. Vienne et al. [17] confirmed increased risk of prematurity and LBW with younger maternal age, but after adjusting for confounding variables, these associations were not significant. Poor antenatal care, late recognition of pregnancy and complications or subclinical genital infection, which may be more common in teenage pregnant, could explain increased risk of preterm labor [8,11]. However, our study could not confirm the increased risk of preterm labor in teenage mothers described in the previous studies.

Smoking during pregnancy has decreased in Denmark, from 30% in the first half of 1990 to 9.7% in 2010 [23]. Previous studies have demonstrated that cigarette smoking leads to LBW, increased perinatal and neonatal morbidity and mortality [10,25,26]. Some authors could not rule out the possible adverse effects of smoking such a preterm delivery [10,12]. Furthermore, it has been shown that smoking during pregnancy can lead to obesity of the child during teenage years [25]. Yan et al. [27] found that mothers who stopped smoking during the third month of pregnancy or the end of the first trimester had infants of the same weight as those from nonsmokers. This evidence could be used to encourage more pregnant women to stop or reduce smoking intensity timely by the end of the first trimester. In our setting, smoking among pregnant teenager seems to be a big problem and it needs more attention to prevention. Almost half of the teenagers included in the present study were smoking during pregnancy (46.3%) and this was a significantly much higher proportion than among non-teenagers (9.3%). Babies born to teenagers had significantly lower mean birth weight.

Maternal anemia has been reported as one of the most common antenatal complication in teenage pregnancies [9,11,16-18]. However, significantly lower prevalence of anemia in teenage pregnancies has also been described [7]. In Denmark, all pregnant women are offered routinely supplement iron and vitamins to avoid maternal anemia. It is, however, uncommon to routinely measure hemoglobin levels during pregnancy in Denmark and this measure was therefore not available in the present study.

We found no significant difference in Apgar score, arterial cord pH and need for neonatal intensive care. In contrast, some authors describe an even lower risk for neonatal complications for teenage pregnancies except for the risk for prematurity [6], most likely because of the high quality of antenatal, delivery and neonatal care. But in the developing countries, Apgar score has been found to be significantly lower (less than 7) in babies born to teenage mothers compared with the non-teenagers, probably because teenage pregnant women were less likely to utilize health services and had delayed or no antenatal visit during pregnancy [5,8,16].

The strength of this study is needed to be addressed. To the best of our knowledge, this is the first study concerning obstetric and neonatal outcome of Danish teenage pregnancies.

The limitations of this study are that it is a hospital record-based retrospective study. Thus, it may not be a real reflection of all community. It was not evaluated whether teenage pregnant women attended all the antenatal care provided by general practitioner and midwife or at hospital.

In conclusion, teenage pregnancies in our setting seem not to be associated with increased risks of adverse maternal, obstetrical and neonatal outcomes. This is probably due to high-quality maternity and neonatal care that is available for teenage pregnancies in Denmark. Attention should be paid to reduce the high levels of smoking during pregnancy in teenager pregnant women.

## Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper. There is no financial relationship with any organisations.

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