Pregnancy and Childbirth Over the Age of 40: A Prospective Cohort Study

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SUMMARY

The age of women in childbirth is increasing globally. Older pregnant and childbearing women and their children are considered to be at a higher risk of complications. This study aimed to determine whether older women giving birth for the first time had more complications during pregnancy, delivery, and postpartum period. A secondary analysis of national perinatal data from 2013 to 2019 was made. We compared complications in different age groups (20-24, 25-29, 30-34, 35-39, and >40 years). Statistically significant differences were estimated using χ^2-test and Fisher test. Older first-time mothers (≥40 years) had a higher incidence of gestational diabetes (20.7%), preeclampsia (4.1%), and placental abnormalities than others. Cesarean section was also more common (21.1%). There were more preterm births (13.8%) and small-for-gestational-age babies (12.6%) in the group of first-time mothers aged over 40. Statistically significant differences were also found in Apgar scores at the first ($p=0.00$; $\chi^2=89.560$) and fifth minute ($p<0.001$; $\chi^2=53.262$). In physical terms, late motherhood does not offer advantages. We cannot influence the trend of postponed motherhood, but as health professionals, we have an obligation to provide women with all the information they need to make informed reproductive decisions.

KEYWORDS

Advanced age; *Complications*; *Birth*; *National data analysis*; *Preconception health promotion*

Introduction

The trend of postponing birth of the first child can be observed throughout Europe[1]. In 1995, Slovenian women had their first baby at an average age of 25, whereas in 2019, the age rose to 29.6. The number of women who decide to become pregnant after the age of 40 is also increasing. In 2008, there were 426 women, whereas in 2017, the number of pregnant Slovenian women after the age of 40 increased to

670, as reported by the National Institute of Public Health[2].

It is known that older pregnant women have more complications, starting with a higher infertility rate. After the age of 35, many couples encounter problems conceiving[3]. Sauer[4] also reports a higher abortion rate in the group of older pregnant women. In women who became pregnant before the age of thirty, the incidence was 10%-15%, whereas in women over 40, it was 25%. At the age of 45, the abortion rate was as high as 50%. The risk of anomalies also increases with age. In women before the age of 30, the rate of trisomy 21 was estimated at 1 in 1000 births, whereas in the group of women over 45, the possibility was much higher, 1 in 30 births. Similar findings have also been reported by Cherney[3].

The research found more intrauterine growth restriction (IUGR)[5], more preterm births[3,6] and small-for-gestational-age, SGA babies[7] in the group of older pregnant women. The rate of SGA babies rose with every age group (7.2% in the group 30-34 years, 8% in 35-39 years, and 9% in the group of women over 40 years).

Older women more often had high blood pressure during pregnancy[3,8] and gestational diabetes[3,6]. The incidence of placenta abruption and placenta previa was higher in the group of women over 40[9]; therefore, the risk of prenatal bleeding also increases. Ngowa *et al.*[10] report a 5.1% rate of bleeding in women over 40 and 0.5% rate in the group of women aged 20-29 when pregnant.

During labor, there is a raised risk of cesarean section and vacuum extraction if the laboring woman is over the age of 40[11]. Also, perineal injuries[12] and postpartum bleeding[13,14] are more common in this group of women. Newborn babies born to these women more often achieve lower Apgar scores[5] because of more common fetal distress during labor[12], and more of these babies are sent to neonatal intensive care units (NICU)[15].

The purpose of our study was to determine the risks of the abovementioned possible complications in a group of older pregnant women in Slovenia.

Material and Methods

By analyzing data collected in the Perinatal Information System of Slovenia, we wanted to compare the pregnancy and labor outcomes of first-time mothers who were older than 40 years at pregnancy and compare the data with the outcomes of a group of younger women who were pregnant for the first time when being 20-39 years old.

Based on the literature review, we wanted to verify the following hypotheses:

- H^1: Women over 40 have more medical complications in pregnancy than younger women.
- H^2: The incidence of cesarean section is higher in the group of women who are over the age of 40.
- H^3: Women over 40 more often have preterm labor (gestational age <37 weeks).
- H^4: Babies born to women over 40 are more likely to have SGA than babies of younger pregnant women.
- H^5: Apgar scores of newborns born to older women (1 in 5 minutes after birth) are more often lower than 7, unlike babies born to younger women.

We used a quantitative method, with secondary analysis of data gathered in a prospective cohort from 2013 to 2019. The National Perinatal Database system collects data on the outcomes of all births in Slovenia in 14 maternity hospitals. We compared birth outcomes of primiparas over 40 (F=1385) and younger primiparas (F=64048), who were divided into more age groups (20-24, 25-29, 30-34, and 35-39 years).

Statistical analysis

Anonymous data were analyzed using the IBM SPSS, version 26.0 software[16]. Descriptive statistics were used for demographic data. To determine statistically significant differences among the groups of women of different ages, we used the χ^2-test or Fisher test ($p<0.005$) with contingency tables (for independent variables).

Results

The study included 65,433 women who gave birth to the first child from 2013 to 2019 in Slovenian hospitals. Women were divided into different groups according to age at the time of delivery. Most of them were aged 25-29 years (F=26.422; 40.4%), followed by the 30-34 (F=19583; 29.9%), 20-24 (F=11181; 17.1%), 35-39 (F=6862; 10.5%) and over 40 (F=1385: 2.1%) groups.

Table 1. Complications in pregnancy – comparison among maternal age groups

Complication in pregnancy		Age (years)					p	χ^2
		20-24	25-29	30-34	35-39	≥40		
IUGR	F	583	1195	1014	378	84	0.000*	22.112
	%	5.2	4.5	5.2	5.5	6.1		
Preeclampsia	F	277	523	421	202	57	0.000*	48.957
	%	2.5	2.0	2.1	2.9	4.1		
Gestational diabetes	F	949	2678	2473	1057	287	0.000*	393.706
	%	8.5	10.1	12.6	15.4	20.7		
Placenta abruption	F	66	174	152	69	18	0.001*	18.785
	%	0.6	0.7	0.8	1.0	1.3		
Placenta previa	F	8	47	80	40	13	0.000*	80.692
	%	0.1	0.2	0.4	0.6	0.9		
Termination°	F	697	1636	1629	787	216	0.000*	453.812
	%	6.2	6.2	8.3	11.5	15.6		
PPI	F	404	883	686	298	52	0.003*	16.362
	%	3.6	3.3	3.5	4.3	3.8		
Polyhydramnion	F	54	124	102	31	6	0.926	0.892
	%	0.5	0.5	0.5	0.5	0.4		
Oligohydramnion	F	154	372	275	107	14	0.595	2.781
	%	1.4	1.4	1.4	1.6	1.0		

IUGR = intrauterine growth restriction; °termination of pregnancy due to medical diagnosis (>22 gestational weeks); PPI = *partus praetemporaneus imminens*; F=frequency; p=statistical significance ($p<0.05$) is marked with *

Complications in pre-pregnancy and pregnancy

Table 1 summarizes the incidence of different pregnancy complications, as the literature review recounts.

Statistically significantly more older women had a diagnosis of IUGR (p=0.000; χ^2=22.112). Most cases were documented in the group of women over 40 years of age (6.1%). This was followed by the group of women aged between 35 and 39 (5.5%). Fewer cases of IUGR were diagnosed in the group of women who were 25-29 years old (4.5%), followed by the group of women aged 20-24 and 30-34. More detailed data are shown in Table 1. We also calculated differences in the 20-39 and ≥40 age groups; however, the difference was not statistically significant (p=0.059; χ^2=3.570).

In contrast, statistically significant differences were found in the occurrence of preeclampsia (p<0.001; χ^2=48.957), with most cases being documented in the oldest group of pregnant women (4.1%). Similarly, statistically significant differences were also found for gestational diabetes (p<0.001; χ^2=393.706), the incidence of which rose with age group from 8.5% in the group of youngest pregnant women to one-fifth of cases in the oldest group (20.7%).

Placenta previa and placental abruption also showed statistically significant differences between the age groups. The frequency of these complications increased with age.

The differences in the occurrence of the need to terminate pregnancy after the 22nd week due to medical reasons were also statistically significant (p<0.001; χ^2=453.812). Proportion increased from 6.2% in the 20-24 and 25-29 age groups to 15.6% in women over 40.

Statistically significant differences were also observed in the case of *partus praetemporaneus imminens* (PPI) (p=0.003; χ^2=16.362); however, this complication was not most frequent in the group of pregnant women over 40, but in the group of women aged 35-39 (4.3%). It was least common in the 25-29 age group (3.3%). In that case, we also compared the 20-39 and ≥40 age groups; however, these differences were not statistically significant (p=0.678; χ^2=0.173).

Table 2. Complications during delivery – comparison among maternal age groups

Birth complication		Age (years)					p	χ2
		20-24	25-29	30-34	35-39	≥40		
Preterm birthΦ	F	737	1888	1661	782	191	0.000*	232.012
	%	6.6	7.1	8.5	11.4	13.8		
Cesarean section	F	1905	5250	4784	2197	599	0.000*	1035.659
	%	17.0	19.9	24.4	32.0	43.2		
Vacuum extraction and forceps	F	487	1268	1021	370	85	0.001*	19.594
	%	4.4	4.8	5.2	5.4	6.1		
Episiotomy	F	4184	9908	7247	2353	425	0.000*	48.483
	%	37.4	37.5	37.0	34.3	30.7		

Φbirth before 37th week of gestation; F = frequency; p = statistical significance (p<0.05) is marked with *

Table 3. Postpartum complications – comparison among age groups

Postpartum complication		Age (years)					p	χ^2
		20-24	25-29	30-34	35-39	≥40		
Atony	F	275	623	448	136	52	0.102	7.728
	%	2.5	2.4	2.3	2.0	3.0		
Hemorrhage – perineal injuries	F	84	222	136	64	16	0.118	7.361
	%	0.8	0.8	0.7	0.9	1.2		
Hemorrhage in 4th stage of labor	F	341	909	809	330	86	0.000*	73.818
	%	3.0	3.4	4.1	4.8	6.2		

F = frequency; p = statistical significance (p<0.05) is marked with *

The incidence of other complications was lower in the group of older pregnant women (Table 1).

Complications at birth

The age of the woman also affects birth complications, as shown in Table 2.

Preterm birth was statistically significantly (p<0.001; χ^2=232.012) more often in the group of women aged over 40 (13.8%). The incidence was lower with each lower age group and reached 6.6% in the youngest group (20-24 years).

Statistically significant differences were recorded in the necessity of cesarean section (p<0.001; χ^2=1035.659) and vacuum extraction (p=0.001; χ^2=19.594); women over 40 needed these obstetric interventions more often.

The need of episiotomy also varied statistically significantly among age groups (p<0.001; χ^2=48.483); however, it was not most common in older women, but in the group of women aged 25-29 (37.5%), followed by the youngest group (37.4%). In the case of episiotomy, we also compared differences between the last two age groups (20-39 and ≥40 years) and recorded statistically significant differences (p=0.000; χ^2=23.158) (Table 2).

Postnatal complications

We also evaluated the incidence of postnatal complications, shown in Table 3. Even though the rates of atonic uterus were slightly higher in laboring women over 40, differences among age groups were not statistically significant (p=0.102; χ^2=7.728). There were no statistically significant differences in hemorrhage due to perineal injuries either. However, overall rates of bleeding in the 4th stage of labor differed statistically significantly among age groups (p<0.001; χ^2=73.818) (Table 3).

Newborn outcomes

We compared neonatal outcomes in terms of complications among women of different ages at delivery (Table 4). SGA newborns were more often born to women who were over 40 when giving birth (12.6%) than to women in the 25-29 age group,

where the frequency was lowest (6.9%). Differences among age groups were statistically significant (p<0.001; χ^2=135.254).

Statistically significant differences were also found in Apgar scores after 1 minute (p<0.001; χ^2=89.560) and 5 minutes (p<0.001; χ^2=53.262). More detailed data are presented in Table 4. In both cases, newborns of older mothers scored lower. This is closely connected to fetal distress, the need of resuscitation and need of transfer to NICU. Also, in these three parameters, differences were statistically significant. The incidence of fetal distress was rising with each age group, being by 3% higher in the oldest group as compared to the youngest age group (p<0.001; χ^2=54.557). Newborns of mothers in the oldest group needed resuscitation more often (these rates rose from 5.9% to 10.3%) (p<0.001; χ^2=96.165). Babies born to mothers aged ≥40 required acceptance to NICU almost three times more often than babies born to mothers in the 20-24 age group (p<0.001; χ^2=253.052). Women in the oldest age group also faced with *mors fetus in utero* most frequently; differences among age groups were statistically significant (p=0.023; χ^2=11.366).

Table 4. Neonatal outcomes – comparison among age groups

Neonatal complication		Age group (years)					p	χ^2
		20-24	25-29	30-34	35-39	≥40		
SGA	F	804	1850	1731	688	185	0.000*	135.254
	%	7.1	6.9	8.6	9.6	12.6		
Apgar score 1st minute (<7)	F	371	931	857	372	95	0.000*	89.560
	%	3.3	3.5	4.3	5.2	6.5		
Apgar score 5th minute (<7)	F	158	358	341	160	44	0.000*	53.262
	%	1.4	1.3	1.7	2.2	3.0		
Fetal distress	F	522	1345	1085	459	107	0.000*	54.557
	%	4.7	5.1	5.5	6.7	7.7		
Resuscitation	F	669	1781	1552	626	151	0.000*	96.165
	%	5.9	6.6	7.7	8.8	10.3		
NICU	F	415	1062	1033	526	139	0.000*	253.052
	%	3.7	4.0	5.1	7.4	9.5		
Mors fetus in utero	F	69	134	119	53	15	0.023*	11.366
	%	0.6	0.5	0.6	0.7	1.0		

SGA = small for gestational age; NICU – acceptance to Neonatal Intensive Care Unit; F = frequency; p = statistical significance (p<0.05) is marked with *

Discussion

We tried to assess medical risk of pregnancy, delivery and postpartum complications in women over 40 and their infants. We tested five hypotheses. We can confirm the first hypothesis stating that women over 40 have more medical complications in pregnancy than younger women. The women aged >40 had a higher risk of eight out of ten tested medical conditions. The data showed a higher incidence of preeclampsia, gestational diabetes, abruption of placenta and placenta previa, and IUGR. Our data also confirmed the findings of other studies, i.e., a statistically higher incidence of gestational diabetes in older women described by several authors[5,6,11,14,17], similarly as for preeclampsia[17,18]. However, one study found different results; Jahromi and Husseini[18] did not detect statistically significant differences in the group of primiparas over 40 and those of the 20-30 age group, although the incidence was still higher with advanced maternal age. Placental disorders are also more often present in pregnancies of older women[12,18]. Çetin *et al.*[12] found the rate of placenta previa in the group of women over 40 to be four times higher than in our study. The only risk parameters that were not confirmed by our findings were amniotic disorders. Women over 40 had fewer cases of oligohydramnion and polyhydramnion than younger women.

The literature search revealed a greater need of cesarean section in older women[11,14,17,18], as confirmed by our findings. Therefore, we can confirm our second hypothesis. We did not include women younger than 20 years in our study. However, a study by Çetin *et al.*[12] warns that women younger than 18 can be even at a greater risk of cesarean section than those over 40.

Third hypothesis claimed that women over 40 had a greater risk of labor before gestational age of 37 weeks, and was established on findings of other studies[5,7,11,18]. There was only one study that did not confirm a statistically significant difference in the occurrence of premature birth in older women[17]; however, even in this case, the rate of delivery before gestational age of 37 weeks was higher in a group of women after the age of 35. In the case of premature birth, some studies[12,19] revealed a higher risk in adolescent mothers. Our focus was not on this group of women, so we cannot compare these results. Yogev *et al.*[11] also found that older women had higher rates of births between 34 and 37 weeks of gestation, which means even greater immaturity of the baby, which may put them at risk.

All other measured parameters in Table 2 (need of cesarean section, vacuum extraction, and episiotomy) were also significantly higher in the group of women who were more than 40 years old when in labor. However, these measures are indicators of the obstetric management style. Obstetrician decisions might differ due to awareness of maternal age and preference of risk avoidance, as also suggested by other authors[20]. Additionally, postpartum hemorrhages can result from labor management, especially with the use of oxytocin for augmentation and induction, as suggested by Khirredine *et al.*[21]. We did not observe the rates of labor induction and stimulation; therefore, we cannot conclude that higher rates of postpartum bleeding in the group of women after 40 were a result of greater use of synthetic oxytocin. This is a major limitation of our study. Further analysis should be done to confirm or disprove that.

The last two hypotheses focused on the risks of higher maternal age for newborns. The literature review revealed[5,7,17] that babies of older pregnant women are often SGA (less than 10th percentile)[22]. In concordance to that, we also formulated our fourth hypothesis. Despite the small proportion of SGA newborns, we found statistically significant differences and can confirm the hypothesis. Mohsin *et al.*[19] also found the risk of SGA in mothers who were less than 20 years old; this group was not in our research focus, although this can be an important direction for future studies. Jahromi and Husseini[18] had different parameters in their study; they looked for difference among age groups according to the proportion of low birth weight (less

than 2500 g). Their study found more babies with low birth weights in the group of women over 40; however, we cannot compare their findings to ours.

The second hypothesis stated that babies born to women aged ≥40 at the time of childbirth had more often <7 Apgar scores recorded compared to babies born to younger mothers. The statement was suggested by the results of a similar study[5]. Our findings confirmed this; Apgar scores less than 7 were more frequent in the group of mothers who were 40 or over, and it was recorded at 1st and 5th minute following birth. Jahromi and Husseini[18] found only statistically significant differences among age groups in 5th minute Apgar. However, the rate of babies who scored less than 7 was higher after the 1st minute assessment in the group of children born to older women. In addition to the risk of lower Apgar scores in the group of babies born to women older than 40 years, Çetin *et al.*[12] also found the risk of lower Apgar scores in babies born to women under 19 years of age.

To our knowledge, this study was the first to analyze pregnancy and delivery outcomes of Slovenian primiparas after the age of 40. The advantage of the study was the study sample. However, a major limitation was that some parameters may be high in older women who are already considered high-risk due to their age and due to the way pregnancy and childbirth were managed. Further studies should also analyze data on multiparous women aged 40 years and older and compare the results.

Conclusions

We examined the rates of complications during pregnancy, delivery, and postpartum in mother and child in relation to maternal age in a sample of all Slovenian women giving birth in the 2013-2019 period. Women giving birth after the age of 40 were more likely to have problems with conception, had more risks in pregnancy, during delivery and in the immediate postpartum period, and their newborns were more often SGA, in distress, scored less than 7 on the Apgar scale, and had to be resuscitated and transferred to NICU. Our findings confirm foreign studies.

Implications for practice

From this study results, it can be concluded that postponing pregnancy and birth of the first child brings no physical benefits. It would be interesting to analyze the potential psychological and social effects. Further studies should focus on why women postpone their decision to have children. We suggest a qualitative approach to investigate these issues. One reason could also be that women are not aware of all the possible complications that advanced maternal age brings for them and the baby. This lack of knowledge could be addressed by proactively promoting the benefits of earlier pregnancy. ■

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SAŽETAK

Trudnoća i rađanje nakon 40. godine: prospektivno kohortno istraživanje

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Žene rađaju djecu u sve kasnijoj dobi. Smatra se da starije trudnice i rodilje te njihova djeca imaju viši rizik od komplikacija. Cilj ovog istraživanja bio je utvrditi imaju li žene koje prvi put rađaju u starijoj dobi više komplikacija tijekom trudnoće, porođaja i nakon porođaja. Provedena je sekundarna analiza nacionalnih perinatalnih podataka od 2013. do 2019. godine. Usporedili smo komplikacije u različitim dobnim skupinama (20-24, 25-29, 30-34, 35-39 i >40 godina). Statistički značajne razlike procijenjene su primjenom χ^2-testa i Fisherova testa. Žene koje su prvi put postale majke u starijoj dobi (≥40 godina) imale su višu incidenciju gestacijskog dijabetesa (20,7%), preeklampsije (4,1%) i poremećaja placente u odnosu na druge dobne skupine. Carski rez je također bio češći (21,1%). U skupini žena koje su prvi put rodile u dobi iznad 40 godina bilo je više prijevremenih porođaja (13,8%) i novorođenčadi male za gestacijsku dob (12,6%). Statistički značajne razlike nađene su također u rezultatima Apgar u prvoj minuti ($p=0,00$; $\chi^2=89,560$) i petoj minuti ($p<0,001$; $\chi^2=53,262$). Kasno majčinstvo ne nudi ni fizikalne pogodnosti. Ne možemo utjecati na sklonost ka odgođenom majčinstvu, ali kao zdravstvena struka moramo ženama pružiti sve informacije koje trebaju kako bi donijele obaviještene reproduktivne odluke.

KLJUČNE RIJEČI

Starija dob; *Komplikacije*; *Rađanje*; *Analiza nacionalnih podataka*; *Promicanje zdravlja prije začeća*