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Faculteit Geneeskunde en Levenswetenschappen
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master in de biomedische wetenschappen

Masterthesis

Prevalence of pregnancies complicated by gestational diabetes mellitus in the context of changed diagnosis criteria, retrospective study

Anneleen Massot

Scriptie ingediend tot het behalen van de graad van master in de biomedische wetenschappen, afstudeerrichting klinische biomedische wetenschappen

PROMOTOR :

dr. Ine LOWYCK

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2022
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Prevalence of pregnancies complicated by gestational diabetes mellitus in the context of changed diagnosis criteria, retrospective study.

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*Running title: *The prevalence of pregnancies complicated by gestational diabetes mellitus.*

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ABSTRACT

Worldwide, 14.2% of pregnant women develop gestational diabetes mellitus (GDM). For Flanders, 8.1% of the pregnant population will develop this complication. This is an increase of 5.1% over 10 years. No exact cause of this increase is defined yet, but it can be assumed that this can be a result of the stricter diagnostic criteria after November 2019 or because of changes in maternal demographics over the years. This study aims to evaluate the prevalence of GDM in the Ziekenhuis Oost-Limburg (ZOL, Genk) and to investigate possible causes (changes in diagnostic criteria vs. changes in maternal demographics). All patients diagnosed with GDM in ZOL between January 2013 and December 2022 were analyzed. The prevalence of GDM has increased in the past 10 years from 2.98% to 9.54% in ZOL, Genk. Of the 718 (3.46% of the pregnant women) patients diagnosed since January 2017, 183 patients were diagnosed before and 535 were diagnosed after the change in diagnostic criteria (G1 =0.88% vs G2 = 2.58%, p<0.001). After comparing demographic characteristics between the different years, no significant impact was shown, only for the gestational age at diagnosis (p<0.001). We establish no direct relationship or significant difference between maternal age or prenatal BMI and the likelihood of developing GDM. For ZOL, there can be concluded that the increase in gestational diabetes is due to stricter diagnosis criteria. However, the change of these criteria does not affect birth outcomes in terms of gestational age at delivery, birth weight and Apgar score.

INTRODUCTION

One of the most common disorders during pregnancy is gestational diabetes mellitus (GDM). Worldwide, 14.2% of pregnant women develop. In Flanders, this is a percentage of 8.1%. During pregnancy, the body may have a temporarily decreased response to insulin. Under normal circumstances, the body adapts to control this decreased response and will produce more insulin. In the case of GDM, a lot of sugar continues to circulate in the bloodstream because the body will not adapt. As a result, a higher glucose value is shown during pregnancy (1, 2). The Study Centre for Perinatal Epidemiology (SPE) shows that the number of diabetes cases in Flanders has been increasing in recent years. When 3 cases for 100 deliveries were diagnosed with GDM in 2012, this was 8.1 cases for 100 deliveries in 2021 (3-6). Globally, the prevalence of GDM also increased during the past few decades. This upward trend can depend on the change of diagnostic criteria, but also on the change of demographics of pregnant women. Although this gives us new insights into diagnosing and treating GDM.

Complications for mothers and neonates

One of the complications of GDM is that newborns are often born with a birthweight >p90, making delivery more difficult (ex. Shoulder dystocia, a higher risk of c-sections, etc.). The mother also can develop pre-eclampsia or polyhydramnios during pregnancy. Other additional complications can arise after delivery, such as the baby's blood sugar level being too low or a risk that the mother will develop high blood pressure or type 2 diabetes (2, 3, 5, 7-9).

Diagnostic criteria

Screening GDM before 2019

The original criteria for GDM screening were designed to identify GDM patients at increased risk of perinatal complications. After the Hyperglycemia and Venous Pregnancy Outcomes study (HAPO), there is concluded that maternal glycaemia values are related to perinatal complications. Therefore, it is important to screen for GDM (10, 11).

The screening is based on 2 tests (**Figure 1**) and is assessed according to the Carpenter-Couston criteria (12). First, the O'Sullivan test (GCT test) is performed as a screening glucose challenge test. Pregnant women between 24 and 28 weeks of pregnancy are asked to drink a 50 g glucose solution within 5 minutes. Exactly 1 hour after drinking a sugar solution, a blood sample is taken to determine the glucose levels. If the O'Sullivan test value is greater than 140 mg/dL, an Oral Glucose Tolerance Test (OGTT) is performed. The patient will be pricked sober and within 5 minutes they drink a 100g glucose solution. After this, a blood sample is taken after 1 hour, 2 hours and 3 hours to determine the glucose values. If the values exceed 95 mg/dL (fasting), 180 mg/dL (after 1 hour), 155 mg/dL (2 hours) or 140 mg/dL (3 hours), a diagnosis of GDM is made (8, 11).

In patients characterized by risk factors such as obesity, an OGTT is performed immediately at 24 weeks of pregnancy. If the patient has had a previous pregnancy with a diagnosis of GDM, early prenatal screening is performed to diagnose patients with a Fasting Plasma Glucose (FPG) greater than 126 mg/dL as having GDM. FPG is tested by the patient's plasma glucose level measured after they have fasted for 8 to 12 hours (10, 11).

Screening GDM after 2019

From 2019, screening in Flanders will be uniform with the guideline of The International Association of Diabetes and Pregnancy Study Group (IADPSG) (13). This is by adding the screening at the first prenatal contact and using new cut-off values as a result of the "Belgian diabetes in pregnancy study (BEDIP-N) (**Figure 1**) (14). In addition to the diagnosis of GDM, the timely diagnosis of undiagnosed and pre-existing diabetes during pregnancy is imperative as these women also have an increased risk of complications and birth abnormalities (6, 15).

IADPSG recommends screening for existing yet unknown diabetes at the first prenatal visits in pregnancy. This is mainly performed in high-risk populations described below. By adjusting the screening strategy, the chances for women to receive timely diagnosis and treatment for GDM will increase (15, 16).

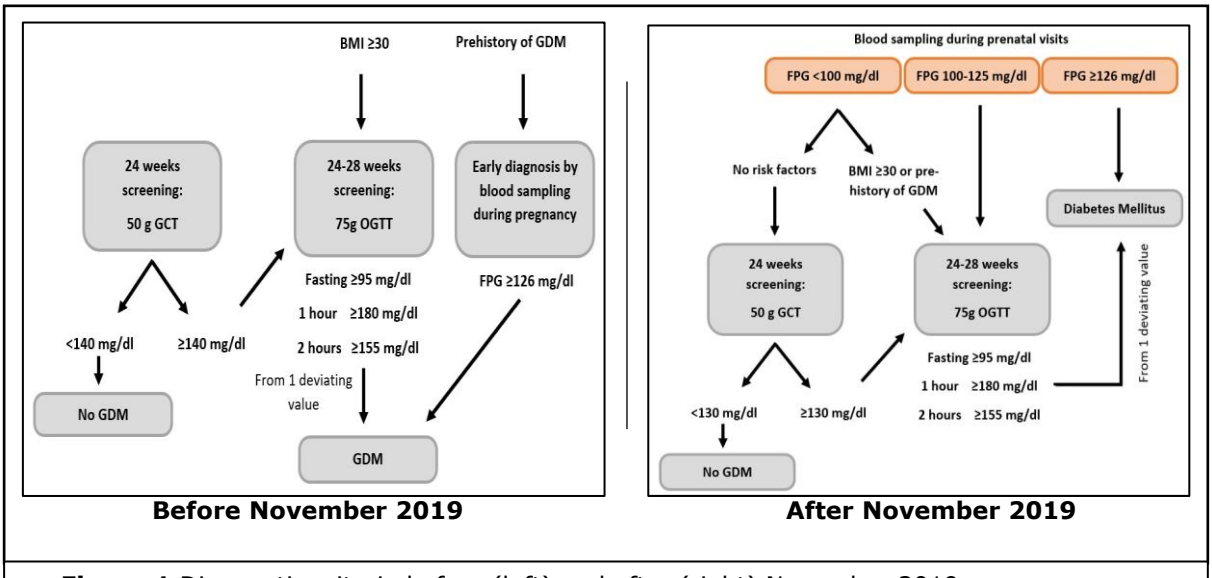

Figure 1 Diagnostic criteria before (left) and after (right) November 2019.

Risk groups for which prenatal screening is performed are (10, 15):

- Patients previously diagnosed with GDM
- Patients who had a large baby with a weight of 4.5 Kg from a previous pregnancy.
- Patients with obesity. (BMI >30kg/m3)
- Patient with a parent, brother, or sister with diabetes.
- Patients of Mediterranean, South Asian, African, Caribbean, Middle Eastern, and Hispanic ethnicity.

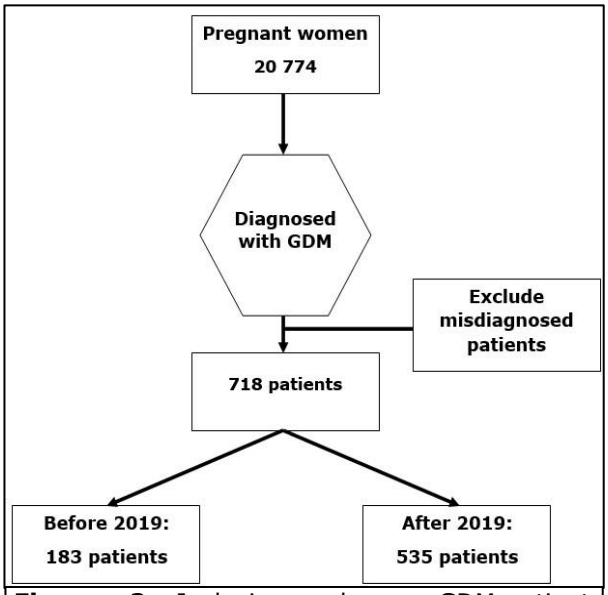

Figure 2 Inclusion scheme GDM-patients between 2017 and 2022.

The central aim of the study is to evaluate the prevalence of gestational diabetes mellitus in the Oost-Limburg Hospital (ZOL, Genk).
Our research question is: "Is there an increased prevalence in pregnant patients diagnosed with gestational diabetes mellitus in ZOL and is this possible trend a result of the changing demographics (such as a higher maternal age, higher prenatal BMI, etc.) of the pregnant women, or as a result of the changed diagnosis guidelines?"
The endpoint of this study is to look at the prevalence of patients with GDM in the ZOL Hospital before and after November 2019. A secondary endpoint is to evaluate the influence of evolution on demographics like age, prenatal BMI, parity, mode of conception and the presence of multiple births. There is a correlation between IVF/hormonal fertilization and developing GDM. As a tertiary endpoint, there is more insight gained into pregnancy outcomes for mothers and neonates over the past years in terms of gestational age, type of delivery, birth weight and Apgar score. Results before and after the change of diagnostic guidelines are assessed.

MATERIAL AND METHODS

Study design – This retrospective study is divided in 2 parts. The first part involves the research of global numbers from the GDM population between January 2013 and December 2022. Part 2 contains investigating the influence of demographic changes. Therefore, data on 292 GDM patients (N_{2017}=50 (17.1%), N_{2018}=50 (17.1%), N_{2019}=50 (17.1%), N_{2020}=50 (17.1%), N_{2021}= 50 (17.1%), N_{2022}=42 (14.4%)) over the past 6 years in ZOL, starting in January 2017 is involved.

Study population **-** Data was included of patients who were diagnosed between January 2017 till December 2022 in the ZOL-Hospital, using the following inclusion criteria:

- Pregnant women
- Diagnosed with gestational diabetes mellitus.
  - According to the guidelines applicable for 2019:
    - GCT >140 mg/dl
    - OGTT >95 mg/dL (fasting), >180 mg/dL (after 1 hour) or >155 mg/dL (2 hours).
  - According to the guidelines applicable after 2019:
    - FPG >126 mg/dl
    - GCT >130 mg/dl
    - OGTT >95 mg/dL (fasting), >180 mg/dL (after 1 hour) or >155 mg/dL (2 hours).
- More than 24 weeks gestational age

This study consists of retrospective data that is collected from the data platform HIX. The study recruitment for part 2 is shown in **Figure 2**.
All study procedures were approved by the central ethical committee of Ziekenhuis Oost-Limburg and the local ethical committee of Hasselt University.

Data collection **–** Data on demographics, and maternal and neonatal outcomes after delivery will be collected from the electronic patient files recorded in ZOL, Genk.
Maternal demographic data contains age, prenatal BMI, gestational age at diagnosis and

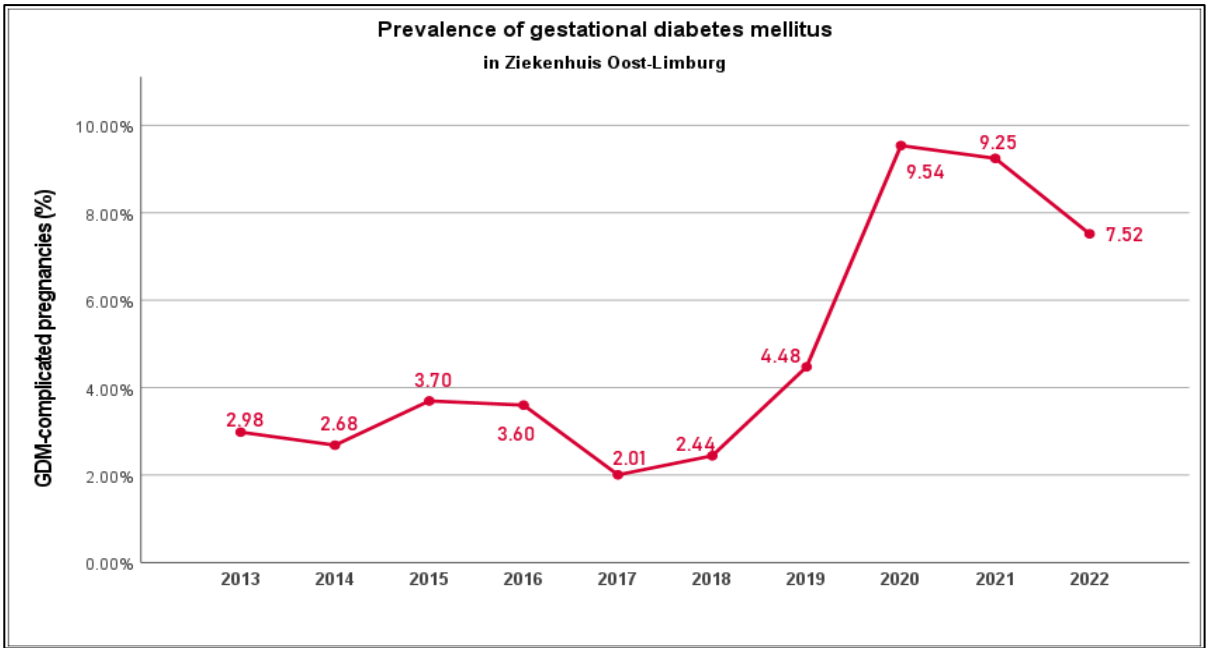

Figure 3 Prevalence (%) of gestational diabetes mellitus in ZOL Genk from 2013 till 2022.
This prevalence is counted on the number of pregnancies that were followed in ZOL, Genk (N_{2013}= 2213, N_{2014}=2161 , N_{2015}=2056 , N_{2016}=2083 , N_{2017}=2044 , N_{2018}=2048 , N_{2019}=2055 , N_{2020}= 1971 , N_{2021}=2055 , N_{2022}=2088).

delivery, type of delivery and weight gain during the pregnancy. In addition, information about the pregnancy is also collected, such as parity and whether a singleton or multiple births are present. Data on the neonate will only contain the birthweight and Apgar-score.

Analysis – The statistical analysis was done using the IBM SPSS version 28.0 statistical program. The statistical analysis entails comparisons between different groups in different years using a post-hoc chi-square test at a significance level of 0.05.
Non-parametric data is presented as a median value. Differences in maternal continuous and categorical characteristics are tested with a Kruskal Wallis test and a chi-square test. The Chi-square test is also used to compare frequencies. A two-tailed P-value <0.05 is considered statistically significant.

RESULTS

Prevalence of GDM - The documented prevalence of GDM-complicated pregnancies in **Figure 3** varies between 2012 and 2022, ranging from 2.98% to 9.54% in an upward trend. The prevalence showed an upward trend and was significantly higher since 2020 (P<0.001). However, it is remarkable that 2022 had a decreased prevalence. This decrease was not expected and is contradictory to the numbers in the report of SPE.

Table 1 Mean values of characteristics of GDM-complicated pregnancies between 2017 and 2022.

	All n±SD (n=292)	2017 n±SD (n=42)	2018 n±SD (n=50)	2019 n±SD (n=50)	2020 n±SD (n=50)	2021 n±SD (n=50)	2022 n±SD (n=50)	*p* <0.05
Age (Years)	31 ±5.2	33 ±4.13	32 ±6.19	34 ± 5.52	29 ±4.69	31 ±5.0	31 ±5.39	*0.148*
Prenatal BMI	27.2 ±5.6	26.2 ±4.96	27.7 ±5.41	28.23 ±5.86	27.3 ±6.97	27.4 ±5.11	26.8 ±5.11	*0.796*
Gestational age at diagnosis	27 ±3.1	28.4 ±2.6	29.2 ±2.8	28.7 ±2.4	25.8 ±1.6	26.2 ±2.1	26.1 ±4.3	***<0.001***
Gestational age at delivery (weeks)	38.5 ±2.78	39.1 ±2.5	38.5 ±1.3	39 ± 9.5	38.4 ±1.3	38.4 ±5.1	38.5 ±2.8	0.607
Weight gain	9.0±6.96	9.5 ±4.93	8 ±10.01	10 ± 6.57	9 ±5.53	9.5 ±7.79	7.0 ± 5.73	0.717
Neonatal weight	3.2±0.56	3.26 ±0.65	3.27 ±0.49	3.19 ± 0.50	3.29 ±0.54	3.38 ±0.48	3.13 ±0.65	0.145

***BMI: Body Mass Index**

Comparison of demographic characteristics - In total, 292 GDM-complicated pregnancies were included in this study. The pregnant women aged 18 or older were diagnosed and included in the ZOL hospital in Genk. As described in **Table 1**, there is a comparison made between the different years from 2017 to 2022. A significant difference in gestational age at diagnosis occurs in pregnant women (P<0.001). In **Table 2**, all groups were comparable in terms of probability (P>0.05). Pregnant women are diagnosed with GDM much earlier in pregnancy since 2020 compared to years before, regardless of the pregnant woman's age or BMI. classes of BMI. The mean value of prenatal BMI also remains approximately constant (27.2 ± 5.6) (**Supplemental 2**).

Comparison of pregnancy profile – Characteristics such as parity, mode of conception and whether there is a multiple pregnancies were statistically evaluated. The parity, mode of conception and whether multiple pregnancies are present, do not influence the development of GDM. These demographic characteristics haven't changed little over the past years. (**Supplemental 3**, **Supplemental 4** and **Supplemental 5**)

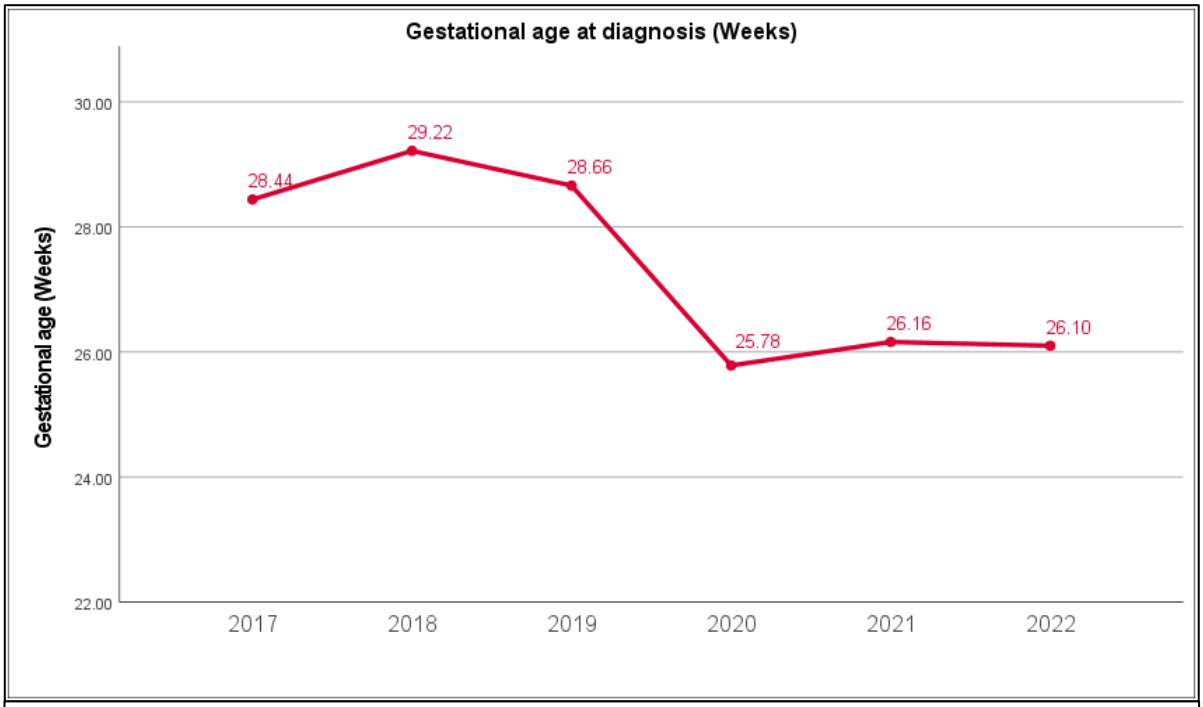

Figure 4 Comparison gestational age at diagnosis between 2017 and 2022 (<0.001).

Advanced maternal age has been related to an increased risk of complications like GDM. Even though the group of women who become pregnant between the ages of 35 and 39 years old describe a slight increase in the past years according to the chi-square post-hoc test (>0.05). From 2017 to 2022, this increasement isn't significant and has remained relatively constant over the years (**Supplemental 1**). The prenatal BMI is often used in risk factor screening for GDM. The risk of gestational diabetes increases with increasing BMI. Conversely, we can also look at the distribution between underweight, overweight and obesity within the GDM population and whether this has changed since 2017. We note that over the past 6 years, there is no clear trend in the different

Comparison of gestational age at diagnosis – Women with GDM were early diagnosed in their pregnancy in 2020 compared to years before. Most women who are diagnosed after the end of 2019 had an average gestational age of 26 years old (SD=2.6 years). This average is significantly lower than the average before the end of 2019 (<0.001) (**Figure 4**)

Comparison of birth outcomes - Since 2017 the gestational age at delivery of GDM-complicated pregnancies is not significantly different compared to the past years. The average gestational age at delivery of women with GDM is 38.5 (±SD=2.78) (**Supplemental 6**).

Table 2 Comparison of demographic characteristics of GDM-patients between 2017 and 2022

		All n(%) (n=292)	**2017 n(%)** (n=42)	**2018 n(%)** (n=50)	**2019 n(%)** (n=50)	**2020 n(%)** (n=50)	**2021 n(%)** (n=50)	**2022 n(%)** (n=50)	***P*** *<0.05*
Age (Categories)									0.164
	<= 20 years	2 (0.7%)	0	2 (4.0%)	0	0	0	0	
	21 – 34 years	211 (72.3%)	34 (81%)	33 (66%)	35 (70%)	40 (80%)	35 (70%)	34 (68%)	
	35 – 39 years	62 (21.2%)	8 (19.0%)	10 (20%)	11 (22%)	7 (14%)	11 (22%)	15 (30%)	
	>= 40 years	17 (5.8%)	0	10 (5%)	8 (4%)	3 (6%)	4 (8%)	1 (2%)	
Prenatal BMI* (categories)									0.930
	Underweight (<18.5 kg/m^2)	4 (1.4%)	0.0%	0.0%	1 (2%)	1 (2%)	1 (2%)	1 (2%)	
	Normal weight (18.5 -25 kg/m^2)	99 (34%)	14 (33.3%)	14 (28%)	17 (34%)	16 (32%)	19 (38%)	19 (38%)	
	Overweight (25-30 kg/m^2)	86 (29.5%)	17 (40.5%)	17 (34%)	12 (24%)	12 (24%)	14 (28%)	14 (28%)	
	Obese class I (30-35 kg/m^2)	71 (24.3%)	8 (19.0%)	13 (26%)	14 (28%)	14 (28%)	11 (22%)	11 (22%)	
	Obese class II (35-40 kg/m^2)	26 (8.9%)	3 (7.1%)	5 (10%)	4 (8%)	4 (8%)	5 (10%)	5 (10%)	
	Obese class III (>40 kg/m^2)	6 (2.0%)	0.0%	1 (2%)	2 (4%)	3 (6%)	0.0%	0.0%	
Mode of conception									0.327
	Spontaneous	235 (80.5%)	36 (85.7%)	38 (76%)	37 (74%)	45 (90%)	39 (78%)	40 (80%)	
	Assisted	57 (19.5%)	6 (14.3%)	12 (24%)	13 (26%)	5 (10%)	11 (22%)	10 (20%)	
Parity									0.863
	Primipara	161 (55.1%)	25 (59.5%)	26 (52%)	29 (58%)	25 (50%)	26 (52%)	30 (60%)	
	Multipara	131 (44.9%)	17 (40.5%)	24 (48%)	21 (42%)	25 (50%)	24 (48%)	20 (40%)	
Singleton vs multiple pregnancies									0.690
	Single	282 (96.6%)	41 (97.6%)	48 (96%)	48 (96%)	50 (100%)	48 (96%)	47 (94%)	
	Multiple	10 (3.4%)	1 (2.4%)	2 (4%)	2 (4%)	0.0%	2 (4%)	3 (6%)	
Mode of delivery		(n=286)	(n=41)	(n=49)	(n=49)	(n=48)	(n=49)	(n=50)	0.638
	Vaginal	198 (69.2%)	28 (68.3%)	36 (73.5%)	36 (73.5%)	32 (66.7%)	36 (73.5%)	30 (60%)	
	Sectional	88 (30.7%)	13 (31.7%)	13 (26.5%)	13 (26.5%)	16 (33.3%)	13 (26.5%)	20 (40%)	
Apgar-score		(n=280)	(n=41)	(n=48)	(n=47)	(n=47)	(n=49)	(n=48)	0.067
	<5	1 (0.4%)	0	0	0	0	0	1 (2.0%)	
	5-7	8 (2.85%)	0	2 (4.2%)	1 (2.1%)	0	1 (2.0%)	4 (10.2%)	
	>7	271 (96.79%)	41 (100%)	46 (95.8%)	46 (97.9%)	47 (100%)	48 (98.0%)	43 (87.8%)	

*** BMI: Body Mass Index**

The number of GDM patients requiring a C-section has also remained the same over the years (30.7%) (**Supplemental 7**).
It is noticeable that pregnant women gain an average of 9 kg (SD=6.96) during their pregnancy. In 2022, this weight dropped, but there was no significant difference noticeable over the years (**Supplemental 8**). Neonatal weight has also not changed significantly over the years (**Supplemental 9**).
Otherwise, it was examined whether tightening the diagnosis criteria affects the evolution in the neonate's Apgar score (**Supplemental 10**). Since 2017, there is no significant difference in the Apgar-score. In 96.79% of cases, the Apgar score is above 7 after 5 minutes.

DISCUSSION

The PREGEDIM study is the first study to investigate the prevalence of GDM in the ZOL-hospital over ten years. It also is the first study that will investigate the cause of the possible increasing trend of GDM-prevalence. We hypothesized that there is an increase in the prevalence of GDM-patients. Second, we hypothesized that this increasement is possibly caused by the change in diagnostic criteria or change in demographics in the last six years. Our last hypothesis is that the change in diagnostic criteria influences the birth outcomes of GDM-pregnancies. The overall goal of this project is to evaluate the count of GDM- patients in ZOL Genk and understand the cause of the increasement and the influence of tightening diagnosis of GDM-patients on birth outcomes. Understanding the circumstances will benefit to provide the care path of GDM-patients.

Prevalence of GDM - Our data confirmed an increasing prevalence of GDM in the ZOL-hospital in Genk and was in line with our hypothesis. The prevalence between the years was different from each other and more specified the prevalence in 2020 (9.54%) was significantly higher than the prevalence in 2019 (4.48%). The findings in other studies also describe the increasing prevalence in European and non-European countries (8, 17). It should be noted that our study includes a heterogeneous population and that only patients of the ZOL-hospital are included. GDM is one of the most common endocrinologic complications during pregnancy. Over the years, GDM has become a public health concern. In other European countries, like Norway, the prevalence of GDM was 3-8%. The increasing prevalence can be due to migration from other ethnicities (17, 18).
According to other studies in non-European countries, the prevalence was higher than in the Western European population (19, 20).
The increasing trend of prevalence continues in other European countries like Belgium. The SPE records all results of pregnancies in Flanders annually in a report (21). Because it is known that diagnosis criteria changed since November 2019 in the ZOL-hospital, our study evaluated the prevalence of GDM-patients in the ZOL-hospital and confirmed a significant increasing trend. Furthermore, some significant findings were made about the effect of the changed diagnosis criteria and changes in maternal demographics on the increasing trend. In our study, an increasing trend has been found from 2.98% (2012) to 9.54% (2020). Between 2019 and 2020 there is a significant difference of 5.06% ($P<0.001$). However, the prevalence in 2022 showed a decrease. This decrease may be due to the covid-19 pandemic, but cannot be explained with certainty and is contradictory to the data on prevalence according the report of SPE.

Comparison of demographic characteristics – After including 292 GDM-complicated pregnancies in our study, the statistical measurements on the prenatal demographics do not show any significant difference. This means that prenatal demographics have no significant influence on the increasing prevalence of GDM.
Our study does not show the relationship between maternal age and GDM. The report of SPE shows that maternal age has increased by 0.6% since 2017 (21). Our study shows that the average age of GDM patients quite remains the same. There is also found that most GDM-patients have an age between 21 and 34 years old (72,5%). The population in this age category remained quite constant but the older population from 35-40 years old increased by 11% since 2017.
Overweight and obesity are commonly seen as risk factors for developing gestational diabetes mellitus. In our study was seen that more than 50% of women with GDM belong to the overweight or obese group. According to the SPE report, the obesity class and overweight class have both increased by 1.8% since 2017 (21). However, in our study is no significant difference found in the past six years.

Gestational weight gain (GWG) is also compared and has not changed significantly since 2017 in the ZOL-hospital.

Comparison of pregnancy profile - Previous studies conclude an increased risk for GDM in artificially conceived pregnancies. This may be indirectly a side-effect of IVF-therapy on the body fat accumulation or from the therapy itself. This association still is not completely described or understood (22). According to the SPE report, the number of pregnant women relying on IVF or other artificial fertilization increased from 5% in 2017 to 5.6% in 2021 (21).
Our study showed that the population relying on artificial fertilization increased from 14, 3% in 2017 to 20% in 2022. This increase has no statistically significant influence on the percentage of GDM patients. The decreasing percentage of IVF-patients in 2020 can be possibly due to the impact of the Covid-19 epidemic. According to statistical tests, multiple pregnancies also have no significant influence on the increasing trend of GDM prevalence.

Comparison of gestational age at diagnosis - The 2019 Flemish consensus on GDM recommends universal screening for GDM by measuring fasting plasma glucose (FPG) at first prenatal contact. The consensus recommends in women with impaired FPG, but also obese women and women with a history of GDM, screening with an OGTT of 75g after 24 weeks. For other women, they recommend using a two-step universal screening strategy with a GCT of 50 g at 24 weeks followed by an OGTT of 75 g when GCT ≥ 130 mg/dL using the IADPSG criteria for GDM. The new diagnostic criteria include early screening for GDM in all pregnancies. These tests will occur around 24 weeks. Since 2020, the gestational age at diagnosis is significantly lower than before ($P<0.001$). Since this reduction will not be seen significantly until 2020, it is assumed that this is caused by the change in diagnosis criteria since November 2019.

Comparison of birth outcomes - According to our hypothesis we want to evaluate the effect of the changing diagnostic criteria on the gestational age at delivery and the neonatal birth weight. Because the treatment of GDM starts earlier in pregnancy, there is a chance this would have a positive effect on birth outcomes. This is an insight that must be acquired to gain new insights about providing the care pathway for GDM-patients.
However, our study shows that no significant impact is noted for gestational age (M=38.5 ± 2.78) at delivery, neonatal weight (M3.2± 0.56) and Apgar-score (96.79%). As gestational diabetes treatment starts earlier and earlier in pregnancy, we expect a significant decrease in weight gain of GDM mothers during pregnancy. The weight gain of the mother appears to be inconsistent with our hypothesis. There is no significant decreasing trend of weight gain during pregnancy of GDM-mothers.

Limitations and strengths- However, data was used from 2013-2022 for the prevalence analysis and from 2017- 2022 for the analysis of the influence of the demographic characteristics, there was more comparable data necessary. According to the timeframe, there was only used data from 50 patients instead of all data for the demographic analysis. Because lack of information in patient files, ethnicity could not be included in the analysis although this also can be a significant cause of the increasing prevalence.
On the other hand, our research will be fundamental to new information about the follow-up protocol for pregnant women. As a result, new insights were created about the prevalence of GDM in the ZOL-hospital, but also about the impact of changing the guidelines on diagnosis in November 2019. From this, further research can be developed into the impact of ethnicity on the rise in prevalence. Because the impact on birth weight and gestational age was investigated and did not shown significantly changes despite the tightening of the diagnosis criteria, there also can be developed research on over-medicalization or there can be concluded that a change is needed in the follow-up method itself.

Recommendations - Before the change of guidelines, many patients with GDM were missed in diagnosis. There can be concluded that the characteristics of pregnant women with GDM have changed little over the past six years but without significant differences. Since no research has been conducted into the influence of ethnicity on the increasing trend of GDM prevalence, further research into the distribution of the patient population is certainly needed. Since the influence of the change of guidelines has little influence on the

normalization of birth outcomes such as birth weight and gestational age, we can ask ourselves whether the stricter criteria will lead to over-medicalization. Despite staff shortages and high workloads, more patients are being diagnosed without effect on birth outcomes. This means that research would be needed into patient adherence and possible adjustments in the follow-up method such as adding telemonitoring would be necessary to increase adherence and reduce workload.

CONCLUSION

The increased prevalence of GDM is also visible in ZOL hospital since 2013. However, the significant increase in 2020 is likely caused by the change in diagnostic criteria in November 2019. This furthered the importance of screening for GDM in pregnant women at about 24 weeks. The demographic information examined did not directly and significantly influence the prevalence increasement of GDM in the past six years. However, the influence of ethnicity has not yet been examined. This could be an explanation for the gradual increase starting in 2013. The impact of the tightened diagnosis criteria on pregnancy is also not significantly demonstrable in this study. This can require a larger amount of comparable data. Investigating such an impact will improve both pregnancy and fetal outcomes in GDM patients.

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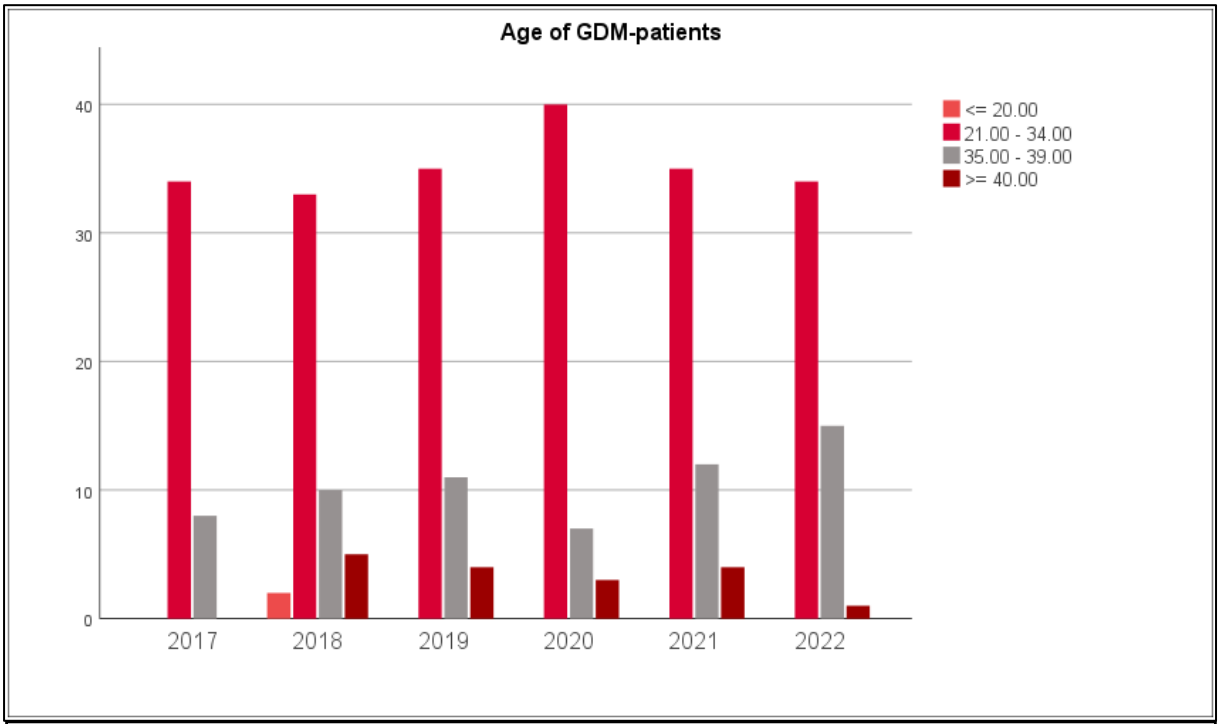
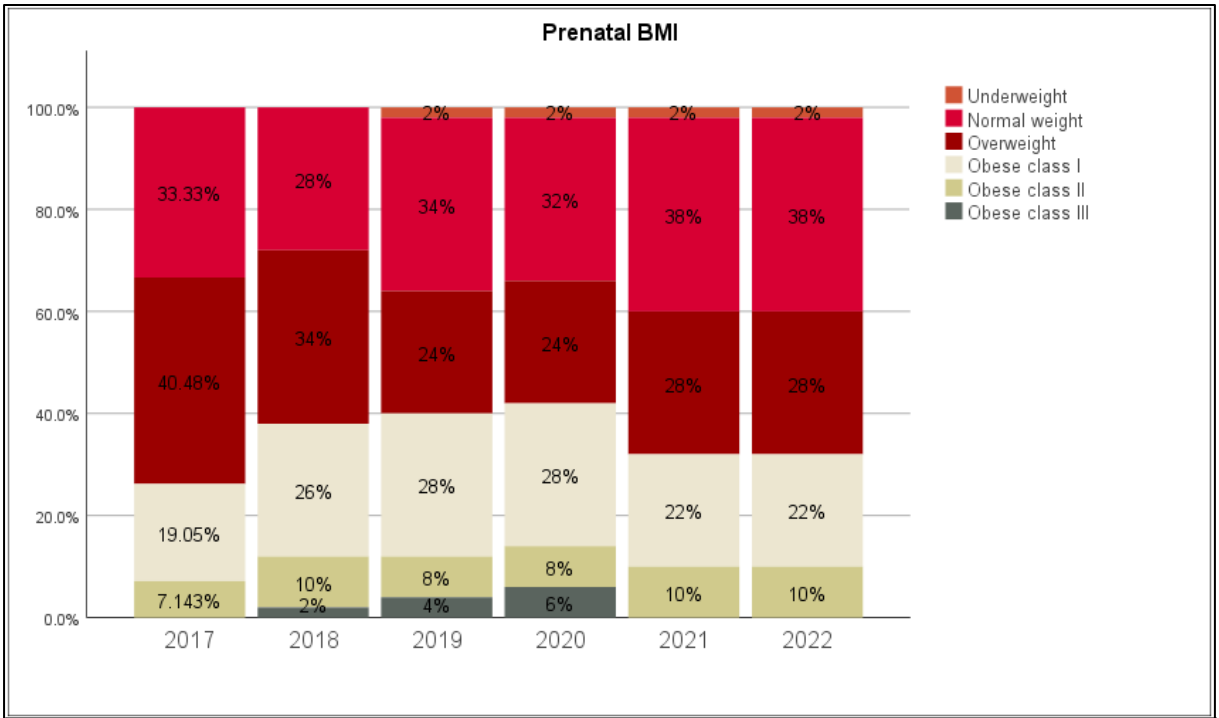
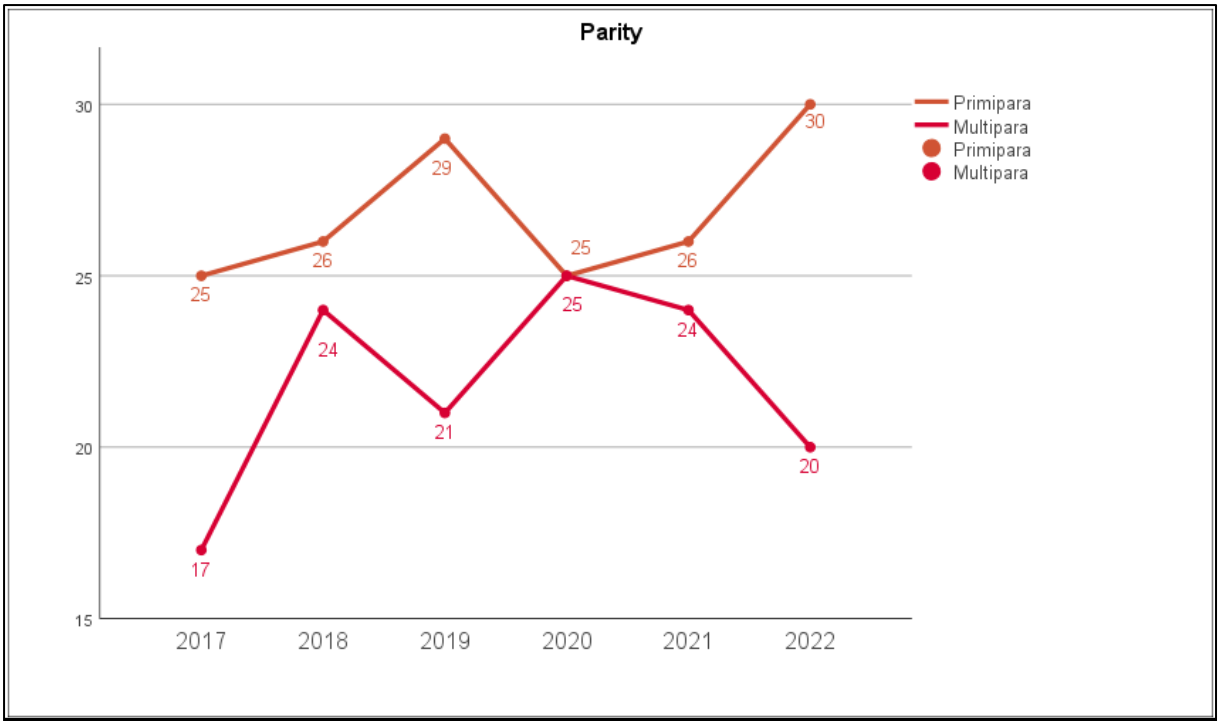
SUPPLEMENTAL INFORMATION



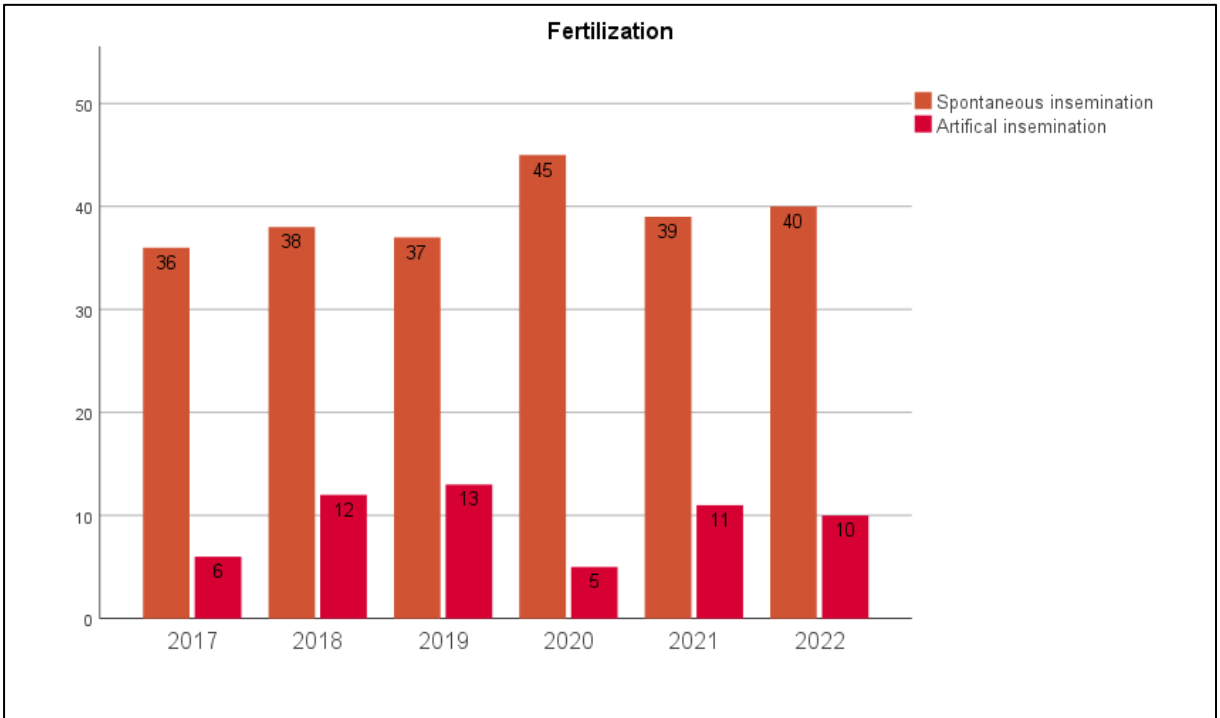
Supplemental 1 Comparison of maternal age from 2017 till 2022



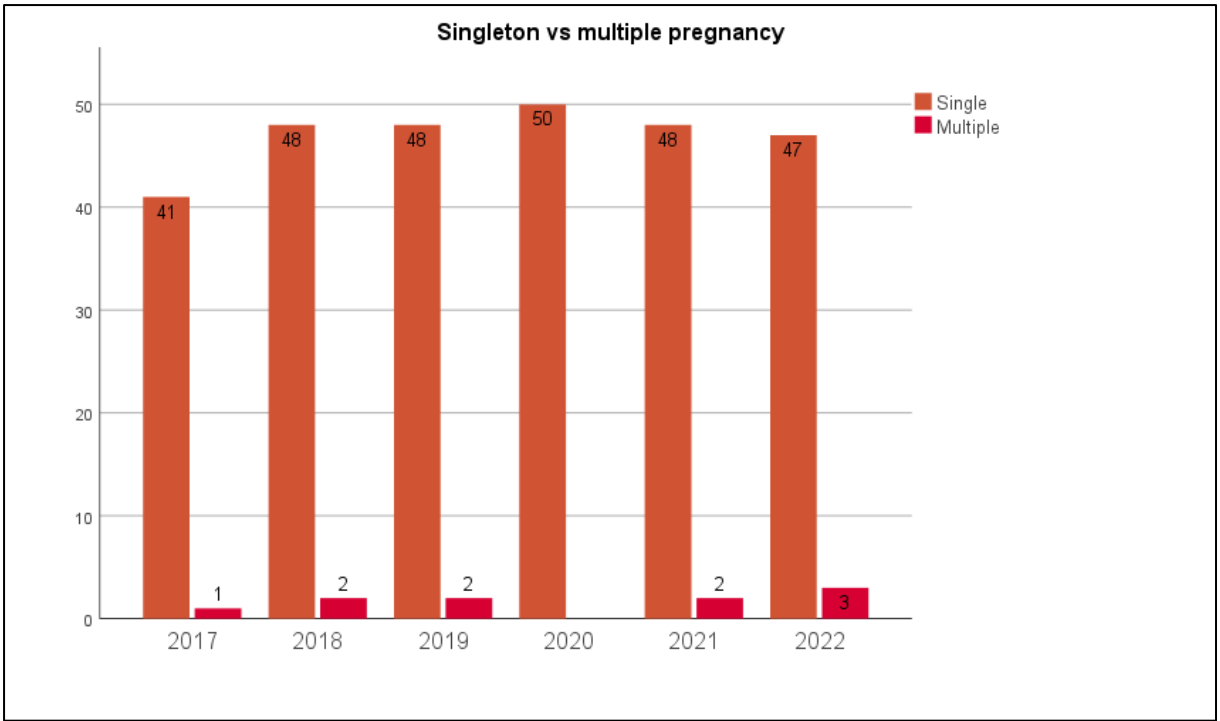
Supplemental 2 Comparison of prenatal BMI from 2017 till 2022.



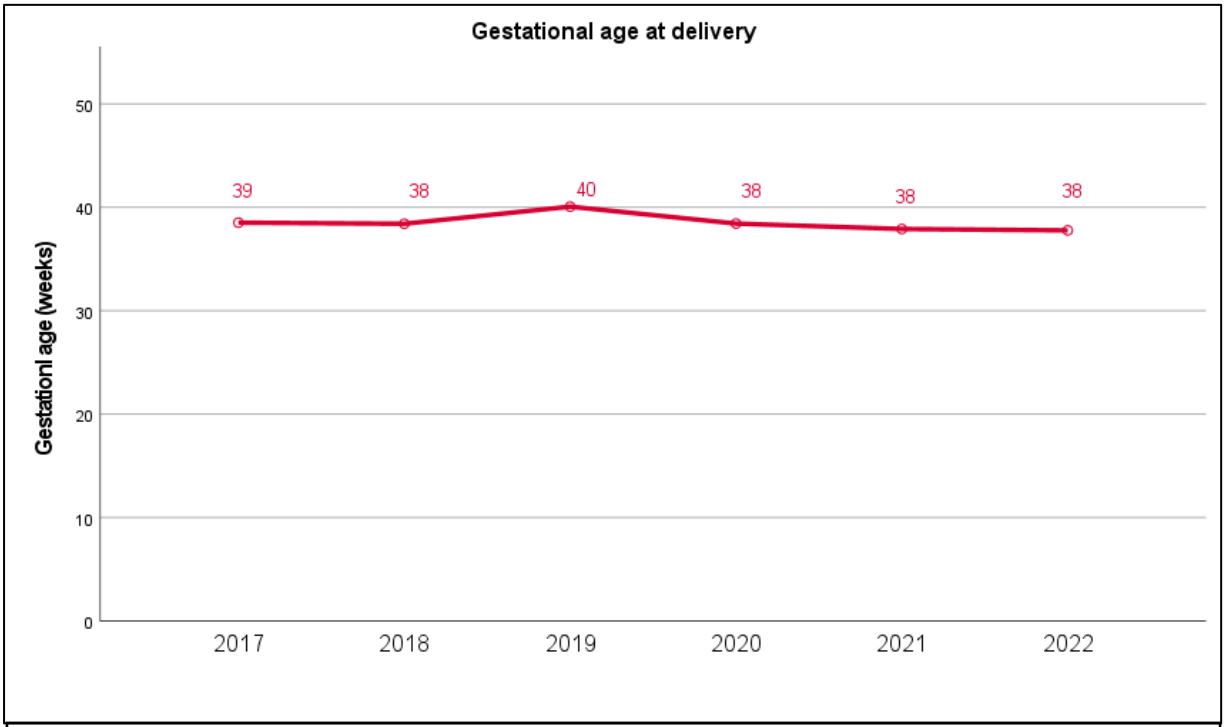
Supplemental 3 Comparison parity from 2017 till 2022.



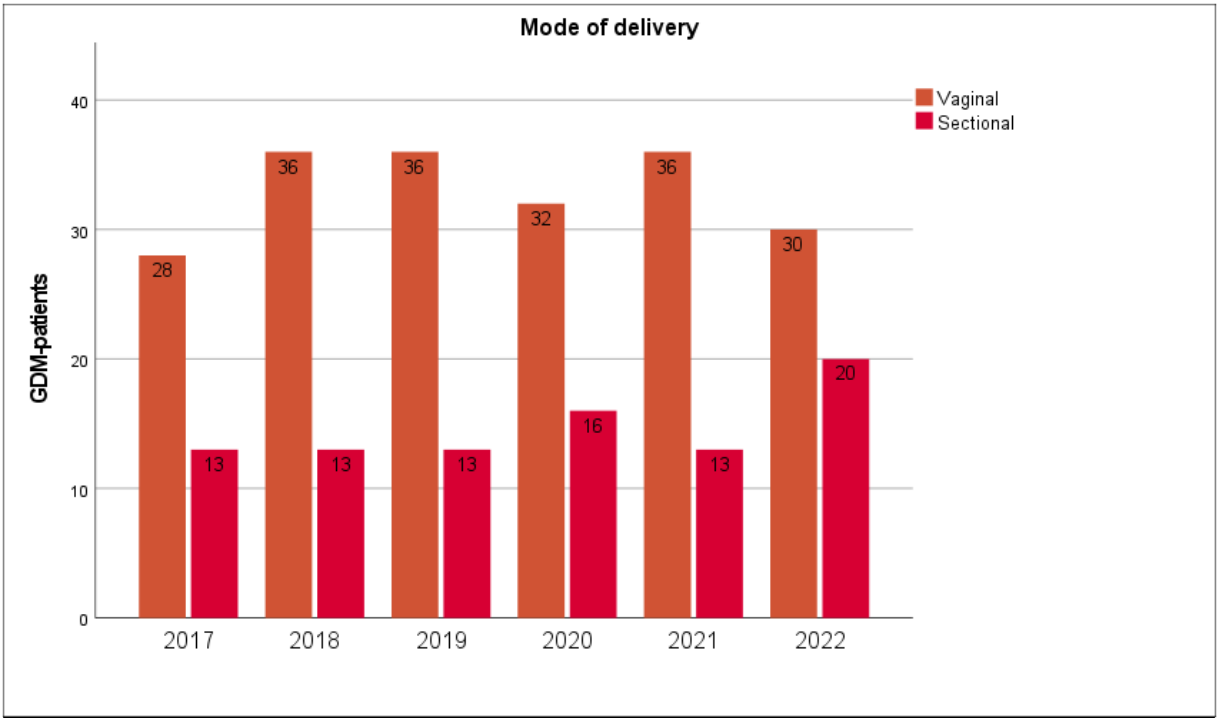
Supplemental 4 Comparison mode of conception from 2017 till 2022



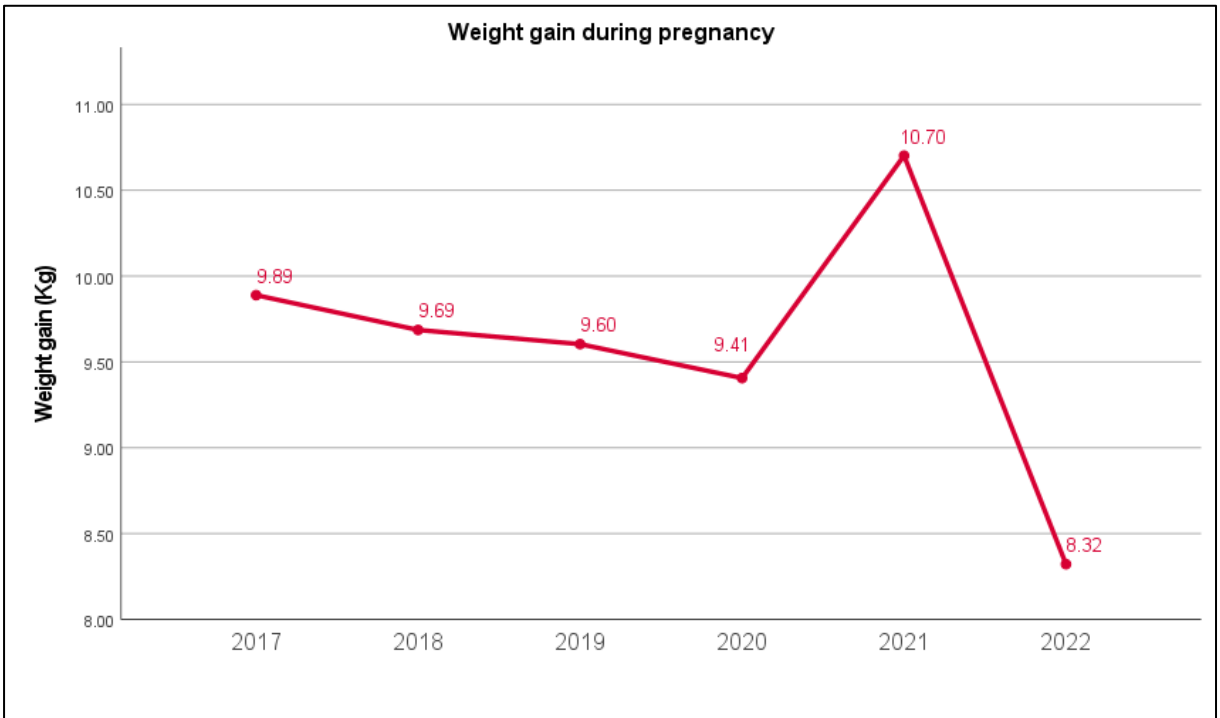
Supplemental 5 Comparison of multiple births from 2017 till 2022.



Supplemental 6 Comparison gestational age at delivery from 2017 till 2022.

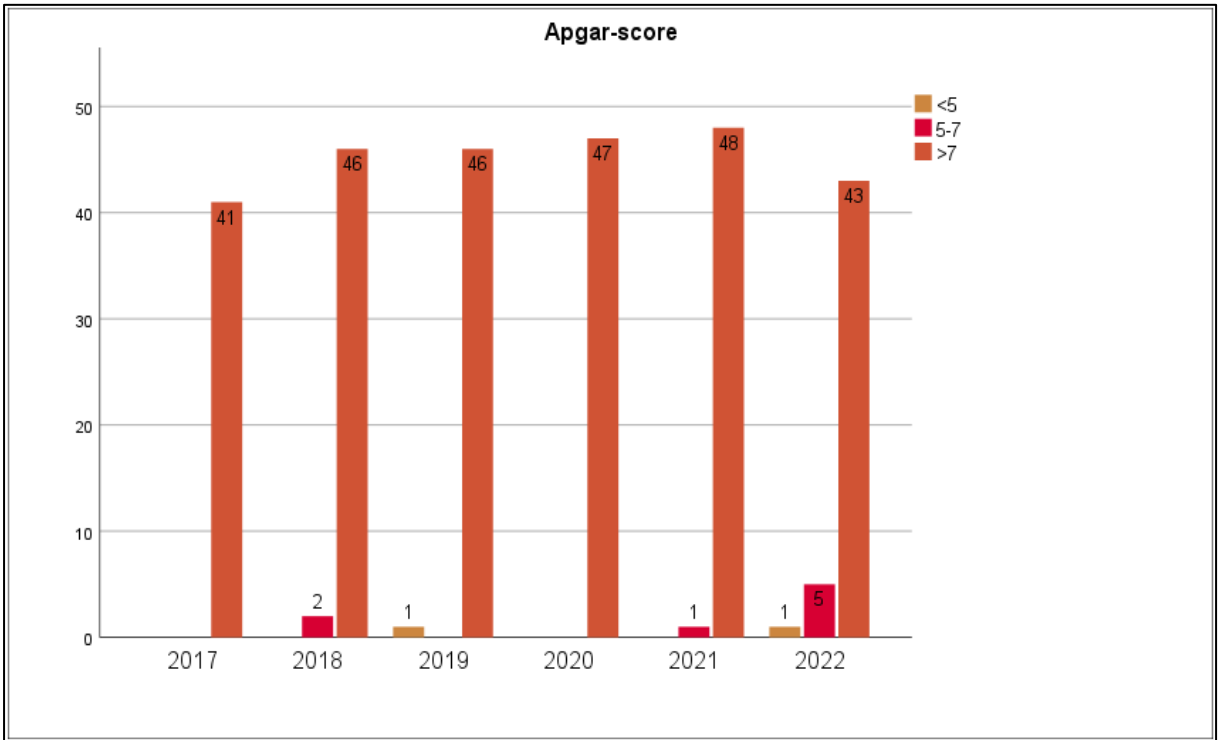


Supplemental 7 Comparison mode of delivery from 2017 till 2022.



Supplemental 8 Comparison of weight gain during pregnancy from 2017 till 2022.

Supplemental 9 Comparison of the neonatal weight of GDM-babies from 2017 till 2022.



Supplemental 10 Comparison of the neonatal Apgar-score of GDM-babies from 2017 till 2022.