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Experimental Research

Trends in maternal characteristics, and maternal and neonatal outcomes of women with gestational diabetes: A study from Jordan

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) is a major health issue that poses its risk on pregnancy. It is prevalence has been globally increasing.

Aim: This study aimed to examine trends in demographic and socioeconomic characteristics, maternal BMI, behavioral factors, obstetric interventions, pregnancy complications, and maternal pre-existing medical conditions and maternal and neonatal outcomes in women with GDM in Jordan. We also aimed to equate the occurrence of emergency cesarean delivery with GDM.

Methods: The study is a part of a comprehensive national study of perinatal mortality that was conducted in Jordan. This study included all women who gave birth in the selected hospitals during the study period. Maternal and medical conditions during pregnancy and neonatal outcomes were compared among women who did not develop gestational diabetes mellitus and those who developed gestational diabetes mellitus.

Results: The overall incidence rate of gestational diabetes mellitus (GDM) was 1.2%. Women with gestational diabetes had a higher weight, and BMI, more likely to be overweight, obese, or morbidly obese and less likelihood to be underweight. A significant association was detected between previous spontaneous abortions/miscarriages, previous preterm, previous stillbirths, previous children born with birth weight less than 2500 g, and previous children born alive and died before 28 days, and the incidence of GDM. Women with GDM were at high risk for complications in pregnancy such as hypertension, preeclampsia, premature delivery and labor induction. The offspring of GDM patients were at high risk of complications such as macrosomia, stillbirth, neonatal hypoglycemia, and neonatal jaundice and admittance to the NICU.

Conclusions: The incidence of GDM was linked to several clinical factors. Women with GDM are at high risk for complications of pregnancy and at higher risk of neonatal complications.

1. Introduction

Gestational diabetes mellitus (GDM) is defined as diabetes or glucose intolerance first discovered with onset during pregnancy [1,2]. The prevalence of GDM is increasing globally [2–4], and it was found to be associated with increased risk of pregnancy complications and several adverse infants and maternal outcomes [5–7]. These include increased post-delivery complications and prenatal mortality rates and an increased risk of obesity and metabolic syndrome in the offspring [8,9].

Screening and diagnosis of GDM are important public health issues [6]. Several studies have evaluated factors that may increase the incidence of GDM, such as previous GDM, pre-gestational body mass index (BMI) ≥30 kg/m2, previous macrosomia (birth weight > 4500 g or > 90th percentile), first-degree relative with type 2 diabetes, maternal age ≥ 40 years, previous prenatal loss or death, and history of polycystic ovary syndrome. Pregnant women with any of these GDM risk factors are routinely screened for GDM at 24–28 weeks of gestation [6,8,10,11]. However, other factors, such as pre-pregnancy body mass index (BMI)

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and higher maternal age, were also found to be associated with adverse pregnancy outcomes [11,12].

Treatment of GDM improves woman's health-related quality of life, reduces serious prenatal morbidity and may also improve neonatal and maternal outcomes [1,13]. Early consultation with a diabetes educator and a dietician and self-monitoring of capillary blood glucose before and after meals are involved in GDM management. Insulin and other medication therapy may be initiated if women were unable to meet treatment targets with dietary and lifestyle modification.

The long-term risk of type 2 diabetes following a pregnancy complicated by gestational diabetes mellitus was investigated in several studies, including a retrospective cohort study in 5470 GDM patients and 783 control subjects. In this study, insulin treatment during pregnancy was found to be the strongest predictor for the long-term development of type 2 diabetes [14]. In Jordan, this is the first study to investigate the association between maternal characteristics, and maternal and neonates' outcomes of women with gestational diabetes.

2. Methods

2.1. Design and settings

The study was based on a secondary analysis of data from the comprehensive national perinatal mortality survey conducted between March 2011 and April 2012, which included 22,591 deliveries from 18 hospitals with a gestational period of >20 weeks [15]. The study was approved by the Institutional Review Board (IRB) at the Ministry of Health, Royal Medical services, private and teaching hospitals. A written informed consent was obtained from all participating women. There were 274 pregnant women with gestational diabetes compared to 22, 317 normal, uncomplicated women in the study. The study population was selected based on the following inclusion and exclusion criteria: all consenting women with gestational diabetes and >20 weeks of gestation delivering in any of the selected hospitals during the study period.

2.2. Study implementation and tool

Information was obtained for each consenting woman and her newborn by interviews and abstracting information from medical records. The educated midwives interviewed women using a standardized questionnaire in these hospitals. Information collected included socio-demographic factors, obstetric history, current pregnancy diseases such as gestational diabetes, antenatal care, delivery mode, delivery complications, newborn status (dead or alive), Apgar score and birth weight. Gestational age was measured as the time between the date of delivery of the fetus or infant and the first day of the last normal menstrual period of the mother and was documented in the research questionnaires based on what the practitioners indicated as per both ultrasound and the last menstrual period [16].

Additional information was also collected at admission and discharge based on a physical examination by the midwife and the obstetrician. Pediatric nurses and neonatologists at these hospitals have collected data on the newborn. The research instrument included the questionnaire for the interview as well as a report sheet to be performed by the midwife and the pediatric nurse under the supervision of the obstetrician and the neonatologist who had to sign all data forms. A 2-day workshop was held to train the entire study team, and in each of the participating hospitals, a 1-day pilot study was conducted. The pilot study results were not included in the findings of the study and the research [17].

2.3. Definitions of variables

Gestational diabetes mellitus (GDM) is defined as diabetes or glucose intolerance that was initially discovered during pregnancy. In the first 28 days of life, neonatal death is defined as the death of a living child. The NNMR was measured as the number of deaths per 1000 live births during the first 28 completed days of life. A baby born with a weight of <2500 g has been known as an LBW infant. A baby born with a weight of >4500 g has been considered macrosomia; a premature baby has been identified as a baby born before 37 weeks of pregnancy. Stillbirth was defined as any fetus born without a heartbeat, breathing, pulsation of the umbilical cord or definite movement of voluntary muscles.

2.4. Statistical analysis

Categorical variables were represented by frequencies and percentages using acceptable statistical methods, and numerical variables were defined using the mean ± standard deviation. Simple descriptive statistics have been calculated, such as media and interquartile ranges. Statistical analysis was carried out using version 23 of the Social Sciences Statistical System (SPSS). In the GDM and non-GDM categories, the rates of e different pregnancy outcomes were estimated, and risks are described as unadjusted and adjusted odds ratios (OR) with confidence intervals of 95% (CI). Significant differences were considered at $P < 0.05$.

3. Results

3.1. Participants' characteristics

Results were based on 22,591 women who gave birth in the 18 selected hospitals during the study period were included in the study. The socio-demographic, anthropometric, clinical, previous obstetric and relevant characteristics of women are presented in Table 1. Women aged between 14 and 55 years and about 86.4% of women were housewife, 41.6% had family income >350 JDs, 2% were illiterate, 45.7% had completed their high school education, and 24.2% were primiparous. Of all women, 4.8% had a previous history of premature deliveries, 6.4% had a previous history of LBW deliveries, 18.1% reported a history of CS, 3% had a history of neonatal death, and 2.5% had a history of stillbirth.

3.2. Incidence of gestational diabetes

The overall incidence of GDM was 1.2%. Table 2 shows the incidence rate of gestational diabetes according to socio-demographic, obstetric, and clinical characteristics. Incidence differed significantly according to age, BMI, region, health sector, number of fetuses, and gestational age. The highest rate was for women who were morbidly obese (5.8%). The incidence of GDM was higher in women who gave birth in teaching hospitals (1.8%), reflecting the fact that women with gestational diabetes were more likely to be referred to teaching hospitals. Mothers with multiple births had a higher rate of gestational diabetes (1.6%) compared to women with singletons (1.2%).

3.3. Maternal characteristics

In the GDM group, the mean maternal age was 32.65 ± 6.38 (±SD) compared to 27.79 ± 5.91 (mean ± SD) years in the comparison group ($P = 0.06$). The mean of pre-gestational weight was higher in the GDM group compared to the comparison group (72.64 KG vs 64.07 KG, $P \leq 0.001$). No difference in height was observed between the groups (161.39 cm vs 161.38 cm ($P = 0.633$). The mean pre-pregnancy body mass index of the GDM group was significantly higher than that of the comparison group (27.84 ± 4.82 kg/m2 vs 24.59 ± 4.06 kg/m2, $P \leq 0.001$). Almost 2.4% of women reported smoking at least one cigarette daily in the GDM group versus 3.3% in the comparison group ($P = 0.04$). All comparisons are shown in Table 3.

3.4. Risk factors of gestational diabetes

Clinical risks for GDM are shown in Table 4. Maternal age of >30 y,

Table 1
The socio-demographic, anthropometric, clinical characteristics, previous obstetric and relevant characteristic of women.

Variable	Frequency	%
Age	1392	6.2%
<20	17678	78.3%
20–35	3498	15.5%
>35		
BMI category	844	4%
Underweight	9338	43.9%
Normal weight	8934	42%
Overweight	1717	8.1%
Obese morbidly obese	416	2%
Income	13136	58.4%
≤350	9364	41.6%
>350		
Education of the mother	7144	31.8%
<12	10275	45.7%
12–14	5071	22.5%
>14		
Occupation	19437	86.4%
Housewife	3062	13.6%
Employee		
Region	7657	33.9%
North	12531	55.5%
Middle	2403	10.6%
South		
Sector	6807	30.1%
Private	10545	46.7%
Public	4354	19.3%
Military	885	3.9%
Teaching		
Number of fetuses	21313	94.3%
Single	1278	5.7%
Multiple		
Gestational age	413	1.8%
≤ 31	1490	7%
32–36	20679	92%
≥37		
Number of pregnancies	5453	24.2%
1	4761	21.1%
2	3821	16.9%
3	2958	13.1%
4	5575	24.7%
≥5		
History of C-section	4074	18.1%
Yes	18483	81.9%
No		
History of preeclampsia	310	1.4%
Yes	22267	98.6%
No		
History of preterm delivery	1091	4.8%
Yes	21466	95.2%
No		
History of LBW	1437	6.4%
Yes	21120	93.6%
No		
History of neonatal death	675	3%
Yes	21882	97%
No		
History of stillbirth yes	568	2.5%
No	21989	97.5%

obesity and previous spontaneous abortions/miscarriages were significantly higher in the GDM group as opposed to the comparison group (71.5% vs. 36.7%), (29.2% vs. 9.8%), and (40.9% vs. 26.5%, respectively, P ≤ 0.001). Previous preterm, previous stillbirths, previous children with birth weight <2500 g and previous children born alive and died before 28 days also tended to occur more often in the GDM group (12.8% vs 7.9%, 7.7% vs 2.5%, 10.3% vs 6.3%, 6.2% vs 3.0%, respectively, P ≤ 0.001).

4. Maternal and delivery outcomes

Table 5 shows the incidence of adverse maternal outcomes. The

Table 2
Incidence of gestational diabetes according to socio-demographic, obstetric, and clinical characteristics.

Variable	Gestational diabetes	
	Yes	No
Age	6 (0.4%)	1386 (99.6%)
14–19	30 (0.5%)	5976 (99.5%)
20–24	42 (0.6%)	6740 (99.4%)
25–29	75 (1.5%)	4815 (98.5%)
30–34	122(3.5%)	3377(96.5%)
>35		
BMI category	1(0.1%)	843 (99.9%)
Underweight	73(0.6%)	11723(99.4%)
Normal weight	103(1.6%)	6373(98.4%)
Overweight	49(2.8%)	1668(97.2%)
Obese morbidly obese	24(5.8%)	392(94.2%)
Region	83 (1.1%)	7574 (98.9%)
North	173 (1.4%)	12358 (98.6%)
Middle	18 (0.7%)	2385 (99.3%)
South		
Sector	103 (1.5%)	6704 (98.5%)
Private	121 (1%)	10424 (99%)
Public	34 (0.8%)	4320 (99.2%)
Military	16 (1.8%)	869 (98.2%)
Teaching		
Number of fetuses	253 (1.2%)	21060 (98.8%)
Single	21 (1.6%)	1257 (98.4%)
Multiple		
Gestational age	3 (0.7%)	410 (99.3%)
≤ 31	30 (2%)	1460 (98%)
32–36	241 (1.2%)	20438 (9.8%)
≥ 37		
Number of pregnancies	27 (0.5%)	5426 (99.5%)
1	47 (1.0%)	4714 (99%)
2	33 (0.9%)	3788 (99.1%)
3	45 (1.5%)	2913 (98.5%)
4	122 (2.2%)	5453 (97.8%)
≥5		

Table 3
Comparison of baseline characteristics between the gestational diabetes (GDM) versus Non-GDM groups.

Characteristics	GDM group (N = 274)	Non-GDM group (N = 22317)	P value
Mean age ± SD (y)	32.65 ± 6.386	27.79 ± 5.915	0.060
Age >35 y	121(44.2%)	3377(15.1%)	
Mean BMI ± SD (kg/m2)	27.84 ± 4.824	24.59 ± 4.067	≤0.001
BMI category	1(0.4%)	843 (4%)	≤0.001
Underweight	73(29.2%)	11723(55.8%)	
Normal weight	103(41.2%)	6373(30.3%)	
Overweight	49(19.6%)	1668(7.9%)	
Obese	24(9.6%)	392(1.9%)	
Morbidly obese			
Mean pre-gestational weight	72.64	64.07	≤0.001
Mean height	161.39	161.38	0.633
Smoking state	6(2.4%)	733(3.3%)	0.040

BMI = body mass index; SD = standard deviation.

mean gestational age was similar GDM group versus the comparison group (P = 0.244). Hypertensive disorders, preterm delivery, cesarean section, induction of labor and hospitalization during pregnancy were significantly higher in the GDM group versus the comparison group. On the other hand, the rate of the vaginal delivery was significantly lower in the GDM group versus the comparison group (P ≤ 0.001).

4.1. Neonatal outcomes

The offspring of GDM patients were delivered at an earlier

Table 4
Comparison of Clinical risks for GDM between the gestational diabetes (GDM) versus Non-GDM groups.

Risk factors	GDM group (N = 274)	Non-GDM group (N = 22317)	P value
Previous Children born with birth weight less than 2500 g	29 (10.6%)	1408(6.3%)	<0.001
Previous Children born alive and died before 28 days	17(6.2%)	658(3%)	<0.001
Previous Stillbirths	21(7.7%)	547(2.5%)	<0.001
Previous spontaneous abortions/ miscarriages	112(40.9%)	5912(26.5%)	<0.001
Obesity	73(29.2%)	2060(9.8%)	<0.001
Previous Preterm	35(12.8%)	1767(7.9%)	<0.001

Table 5
Comparison of maternal and delivery outcomes between the gestational diabetes (GDM) versus Non-GDM groups.

Maternal and delivery results	GBM group (N = 274)	Non-GDM group (N = 22317)	P value
Pregnancy-induced hypertension	55(20.1%)	1082(4.9%)	≤0.001
Mean GA at delivery ± SD (week)	38.07 ± 1.845	38.64 ± 2.196	0.244
Preterm delivery	32(11.7%)	1647(7.5%)	≤0.001
The onset of the labor	53(19.7%)	3529(16%)	≤0.001
•Induction of labor	120 (44.6%)	15221 (69.2%)	
•Spontaneous	96 (35.7%)	3261 (14.8%)	
•Planned C-section			
Vaginal delivery	111(40.7%)	15614(70.2%)	≤0.001
•Vacuum used	6 (5.4%)	1102 (7.1%)	0.167
•Foul-smelling amniotic fluid	2 (1.8%)	179 (1.1%)	0.200
•Meconial amniotic fluid	5 (4.5%)	661 (4.2%)	0.079
Type of C-section	172(59.3%)	6591(29.5%)	<0.001
•Planed C-section	111 (68.5%)	3663 (55.6%)	
•Emergency cesarean section			
Hospitalization during pregnancy	51 (31.5%)	2928 (44.4%)	≤0.001
	60 (21.9%)	1474(6.6%)	≤0.001
•Hypertension	8 (13.3%)	135 (9.2%)	0.038
•Preterm delivery	9 (15%)	315 (21.4%)	0.009
•Preeclampsia	6 (10%)	40 (2.7%)	≤0.001
•Other			
Diseases during the current pregnancy	58 (21.2%)	3809 (17.1%)	0.001
	6 (2.2%)	394 (1.8%)	0.293
•Anemia	51 (18.6%)	4041 (18.1%)	0.675
•Fever	14 (5.1%)	296 (1.3%)	≤0.001
•UTI within two weeks of delivery			
•Preeclampsia			

gestational age than the comparison group, but these infants had a significantly higher incidence of macrosomia (5.1% vs 0.6%). Babies of GDM mothers tended to be heavier than babies in the comparison group (3268.33 ± 672.91 vs 3105.87 ± 582.35, P ≤ 0.001, Table 6). The incidence of neonatal hypoglycemia was higher in the GDM group versus the comparison group (2.0% vs 0.3%, P ≤ 0.001). About, 26.3% of babies delivered by GDM mothers were admitted to the neonatal unit compared to 7.5% of the comparison group. Stillbirth, congenital malformations, and breathing difficulties were more likely in the GDM group (3.6% vs 1.1%, 2.2% vs 1.2%, 3.2% vs 2%, respectively). Finally, neonatal jaundice and severe jaundice with phototherapy were higher incidences in the gestational group.

5. Discussion

In this study, we investigated the association between GDM and pre- and during pregnancy maternal characteristics. We hypothesized that there is a correlation between maternal characteristics such as weight,

Table 6
Comparison of neonatal outcomes between the gestational diabetes (GDM) versus Non-GDM groups.

Neonatal outcomes	GDM group (N = 274)	Non-GDM group (N = 22317)	P value
Mean birth weight ± SD (g)	3268.3394 ± 672.91210	3105.8708 ± 582.35982	≤0.001
•Macrosomia (birth weight > 4500 g)	14 (5.1%)	136 (0.6%)	
•Small infant < 2500 g	29 (10.6%)	2196 (9.8%)	
Baby status	254 (92.7%)	21569 (96.7%)	≤0.001
•Discharged alive	6 (2.2%)	134 (0.6%)	
•Transferred to another hospital	13 (4.7%)	550 (2.5%)	
•Died in the hospital	1 (0.4%)	63 (0.3%)	
•Still admitted			
Stillbirth	10 (3.6%)	250 (1.1%)	0.351
Apgar <7 at five mint	4 (1.6%)	504 (2.3%)	≤0.001
Neonatal jaundice	41 (15.8%)	1395 (6.4%)	≤0.001
Severe jaundice with phototherapy	14 (5.4%)	598 (2.7%)	≤0.001
Metabolic disorders	5 (2%)	54 (0.3%)	0.009
Hypoglycemia	8 (3.2%)	427 (2%)	≤0.001
Breathing difficulties	32 (12.2%)	1647 (7.5%)	≤0.001
Preterm infant	69 (26.3%)	1663 (7.6%)	0.002
NICU admission	6 (2.2%)	259 (1.2%)	
Congenital malformations			

height, BMI, age and smoking, and the incidence of GDM. Current results showed that among GDM patients, the mean of maternal age tended to be higher. In accordance, previous studies indicated increases in GDM prevalence with age, and indicated advanced maternal age as risk factors for GDM [4,18,19].

Women with gestational diabetes had a higher weight, and BMI. They were more likely to be overweight, obese, or morbidly obese and less likely to be underweight. This is consistent with previous studies that showed an association between higher BMI and GDM [20]. No difference in the mean height was observed in relation to GDM. However, previous studies that showed an association between shorter maternal height and GDM [20–22]. Current results also showed no association between smoking state and the incidence of GDM, which is consistent with studies by Wendland et al. (2008) and Galtier, (2010).

A significant association was found in this study between previous spontaneous abortions/miscarriages, previous preterm, previous stillbirths, previous children born with birth weight less than 2500 g, and previous children born alive and died before 28 days and the incidence of GDM, which is consistent with findings of a number of previous studies from populations different than the one studied [9,12,14].

Current study showed that women with GDM are at high risk for pregnancy complication such as hypertension, preeclampsia. In one retrospective study of 143 GDM women, pregnancy-induced hypertension was more frequent among pregnant women with GDM than control pregnant women [23]. Tobias et al. (2011) showed that women with GDM are at significantly increased risk of developing hypertension later in life independent of other known risk factors. Consistent with current findings, the exposure to GDM in these studies was associated with a 26% increased risk of hypertension. Moreover, another study found that women with GDM were at increased risk of developing pregnancy-induced hypertension than those with normal glucose tolerance [18]. Yet, other studies have failed in showing such association e.g. Ref. [24].

The current study showed a high risk for the development of preeclampsia in women with GDM. Furthermore, the incidence of preeclampsia was higher during pregnancy in the GDM group versus the comparison group (5.2% vs 1.3%). This result is consistent with previous studies, which showed that GDM was an independent risk factor for preeclampsia [25], and Women with GDM are at high risk of developing preeclampsia [7,18,26]. The frequency of preterm delivery tended to be

higher in the gestational diabetes group. This is consistent with findings of previous studies that showed women with GDM were at increased risk of developing preterm labor than those with normal glucose tolerance [18], and the rate of preterm delivery and SGA was high in underweight BMI and inadequate gestational weight gain women with gestational diabetes [7]. Yet, some studies failed in finding an association between GDM and the preterm delivery, although, the frequency of preterm delivery tented to be higher in the groups of women with GDM [23,26].

The spontaneous onset of labor tended to be less in the gestational diabetes group than the comparison (44.6% vs 69.2%), and the rates of induction of labor were significantly different between groups (19.3 vs 15.8%). Conflicting results were found for the association between GDM and the risk of induction of labor. The GDM group had a higher frequency of induction of labor (61% vs 24%) [23,26]. However; other studies have failed in finding such association [24]. The rate of emergency cesarean section was less in gestational diabetes group (31.5% vs 44.4%) that is contrary to previous studies reported an increase in the cesarean delivery rate among GDM women compared with that in normal pregnant women(7, 18, 24, 26). Recent studies identified a C-section rate among women with this condition as high as 35% [27]. The study of Boriboonhirunsarn and Waiyanikorn (2016) found a strong association between emergency caesarean section and the incidence of GDM with a significant increase in emergency cesarean section in both treated and non-treated women. Other studies found that the treatment of gestational diabetes reduces the rate of emergency caesarean section [1,13].

In this study, the offspring of GDM patients were delivered at an earlier gestational age than the comparison group, but these infants had a significantly higher incidence of macrosomia. The GDM group babies tended to be heavier than babies in the non-GDM group. Consistent with current findings, several studies have found that the incidence of macrosomia in offspring is significantly higher for women with GDM [7,18,23,24,26,28]. One retrospective study conducted on 220 patients with GDM who were diagnosed and treated at a hospital in Saudi Arabia, found that neonates born to women with GDM had a significantly higher mean birth weight than babies born of mothers from the control group. The neonates were also large for gestational age (LGA) babies compared with the neonates born to mothers from the control group.

Current result showed an increase in the incidence of stillbirth, neonatal hypoglycemia, and admitted to the neonatal intensive care unit (NICU). This is consistent with previous studies that found an association between these neonatal outcomes and gestational diabetes [23,26,29]. The current study agrees with previous studies that failed in finding an association between GDM and the low APGAR scores at five mint [7,18,23,26]. The current study showed an association between prerenal death, and congenital malformation that is contrary to previous studies, that did not show such an association [23,26]. Current result showed an association between neonatal Jaundice and GDM, that agrees with previous prospective cohort study findings revealed that they are at increased risk of hyperbilirubinemia and jaundice among offspring of GDM mothers [18]. On the other hand, previous studies did not show an association between GDM and neonatal jaundice [23,24,26]. This study showed a correlation between the presence of GDM and other clinical factors such as advanced maternal age, obesity, previous spontaneous abortions/miscarriages, previous preterm, previous stillbirths, previous children born with birth weight less than 2500 g, and previous children born alive and died before 28 days. Additionally, women with GDM were at high risk for pregnancy complications such as hypertension, preeclampsia, preterm delivery, induction of labor, and cesarean delivery. Furthermore, women with GDM were found to be at higher risk for a neonatal complication such as macrosomia, stillbirth, and neonatal hypoglycemia, between jaundice, prerenal death, and congenital malformation and admitted to NICU.

6. Limitations

The current study has some limitations. For example, the study is a secondary analysis from a bigger data set. Thus, the data used in this study was collected within the context another bigger national study. Moreover, the current study did not investigate the effect of GDM treatment on maternal and neonatal characteristics. Future studies should address these points.

7. Conclusion

The incidence of GDM was linked to several clinical factors. Women with GDM are at high risk for complications of pregnancy and at higher risk of neonatal complications.

Ethical approval

Ethical approval for conducting the study was obtained from the institutional review board of Jordan University of Science and Technology (reference code 252/2018).

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Conflicts of interest

The authors declare no conflict of interest.
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Consent

Written informed consents were obtained from all study participants.

Code availability

N/A.
Provenance and peer review.
Not commissioned, externally peer reviewed.

Author statement

Reema Karasneh: Study concept and design, data collection, data analysis or interpretation, writing the paper.

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Yousef Khader: Data collection, data analysis or interpretation, writing the paper.

Mohammad Nusair: Study concept and design, data interpretation, writing the paper.

Availability of data and material

Data is available via contacting the corresponding author.

Registration of research studies

Research Registry.
Identifying number is: researchregistry6800.

Guarantor

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