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Prevalence of maternal health problems and adverse birth outcome in Jeddah, Saudi Arabia

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ABSTRACT

The aim of this study was to assess the prevalence of pregnancy related maternal complications and birth outcome among women in Jeddah city Saudi Arabia. This was a cross section study where convenient samples of females were approached via online electronic platform using a questionnaire. The questionnaire assessed data regarding the participants' socio-demographic and personal characteristics, reported maternal complications and adverse birth outcomes during pregnancy. The chi square test of significance and principal component factor analysis were used. Level of significance was 0.05. This study comprised 301 women with mean age of 32.71 years (SD: 10.285). The self-reported maternal health problems according to order of frequency were miscarriage (46.2%); caesarian section (30.6%); still birth 27.9%; Hypertension (25.1%); Gestational diabetes (18.3%); vaginal bleeding (13.3%); puerperal sepsis (10.3%); premature labor (9.3%); polyhydramnios (9%); and pre-eclampsia (3.3%). Adverse birth outcome was LBW (12.6%), and macrosomia (9.6%). Older age, smoking, and obesity of the pregnant mother, and family history of diabetes mellitus (DM) and gestational DM (GDM) were significantly associated with adverse pregnancy outcome. Further investigations are needed to assess factors associated with these high frequency levels of maternal health complications. Furthermore, these findings have preventive and clinical implications concerning pregnant women with a history of smoking habit and hypertension.

Keywords: Birth outcome, maternal complications, Jeddah, Saudi Arabia

1. INTRODUCTION

Maternal and fetal complications usually accompany pregnancy. Obesity, GD, pre-eclampsia, and preterm or post term deliveries are some of the reported adverse effects associated with pregnancy. Maternal health refers to the health of women during pregnancy, maternal ages 31 through 40 are associated with the highest offspring educational attainment, suggesting that

women who give birth in their 30s have more favorable characteristics than younger or older mothers (Fishman and Min, 2018; Wahabi et al., 2016). The proportion of women who smoked during pregnancy was 2.8% to 10.5% (Roustaei et al., 2020; Mumford and Lui, 2015).

Certain maternal characteristics have been linked to the development of GDM, such as obesity, GDM in earlier pregnancies, older maternal age, ethnicity and multi-parity as well as family history of diabetes (Zhang et al., 2016; Lewandowska et al., 2020). The prevalence of GDM increased from 4.6% to 8.2% in USA (Zhou et al., 2022). Mothers with a history of GDM have a high risk for abnormal glucose regulation (Zhu et al., 2017). Hypertension in pregnancy is a major challenge in antenatal practice due to its impact on obstetric and fetal outcomes. High blood pressure is a major risk factor for occurrence of complications during pregnancy and post-partum period (Fishman and Min, 2018).

Chronic hypertension, GD, preeclampsia, and eclampsia are some of the effects of high blood pressure during pregnancy (Waters et al., 2016). A pregnant woman with heart disease is liable to several complications during antenatal and postnatal periods (Koutrolou-Sotiropoulou et al., 2015). Polycystic ovaries (PCOS) are a risk for several complications during pregnancy (Yu et al., 2016). Advanced maternal age is defined as age ≥ 35 years old at the time of delivery and is considered to be among the risky pregnancies (Hilden et al., 2016; Traisisilp and Tongsong, 2015; Poon et al., 2016). Polyhydramnios is the term used to describe an excess accumulation of amniotic fluid.

It is reported to cause several complications during pregnancy (Fitzpatrick et al., 2017; Stanley et al., 2015). Maternal risk factors for hyperbilirubinemia include: Maternal diabetes, mother's age over 25 years; and toxoplasmosis, others (Syphilis, Hepatitis B), rubella, CMV, and herpes simplex, (TORCH) syndrome (Boskabadi et al., 2015; Leybovitz-Haleluya et al., 2018). Several factors increase the risk for puerperal sepsis, including young maternal age, maternal obesity, maternal DM, primigravida, presence of bacterial vaginosis, preeclampsia, post-term birth, prolonged rupture of membranes, a large number of internal examinations, meconium-stained amniotic fluid, operative vaginal delivery, manual removal of the placenta, excessive blood loss and anemia (Coomarasamy et al., 2020).

Previous studies that have evaluated perinatal outcomes in subsequent pregnancies have shown mixed results with some, but not all studies showing increased rates of preterm birth, gestational diabetes, hypertensive disorders, small for gestational age birth weight, intrauterine fetal demise, and perinatal loss (Field and Murphy, 2015; Dempsey et al., 2015). The present study was conducted to investigate the occurrence of maternal complication and adverse birth outcomes in pregnancies among females in Jeddah city Saudi Arabia.

2. METHODOLOGY

It was a cross-sectional study; the sampling method was a non-probability convenient one. Data were collected on females in Jeddah city, through electronic platform using Google form during the period December 2022 thru February the 28th, 2023. Sample size was determined using G*power software, where $\alpha = 0.05$, Power = 0.95 effect size = 0.3, and degree of freedom = 5. The minimal sample size required was 277 subjects. A predesigned questionnaire (2) was used to collect the data on the females.

It provided information on: 1- Socio-demographic and personal characteristics such as age, educational level, occupation, and smoking habit, and smoking in the family; family size and number of male and female children as well as weight and height. 2- Clinical personal morbid history e.g., DM, cardiovascular disease, hypertension and polycystic ovaries. 3- Family history of DM, and GDM. 4- History of pregnancies with complicated maternal health problems e.g., Miscarriage, GDM, Vaginal bleeding, caesarian section, polyhydramnios, hypertensive disorders, pre-eclampsia or eclampsia, puerperal sepsis, admission to ICU before or after labor, if GD continued after pregnancy. 5- History of adverse birth outcome e.g., still birth, LBW, macrosomia, fetus with low blood sugar level, fetus with jaundice, fetus was put on respirator or was incubated.

The SPSS software (IBM version 25) was used. Data were typed onto SPSS files and were checked for typing errors. The Chi square test of significance, and principal component factor analysis was used, with Vari-Max rotation, and communalities equal to 1, and eigenvalues were one or greater. Thus 13 factors out of the 42 factors were considered. The loading of the variables on the different factors were considered significant if it were 0.3 or more. The level of significance for this study was 0.05.

3. RESULTS

This study comprised 301 females with mean age of 32.71 (SD: 10.285) years. About two thirds of the female had higher education (61.8%), although majority of the females are house wives (64.5%). Less than one fifth of the females were smokers (17.9%), although almost half of them lived in houses where a member is smoker (48.2%). Half of the females lived in owned houses (53.5%).

Increased age was associated with decreased education level and with being non-working where p values were less than 0.05 (Table 1).

Table 1 Distribution of studied subjects according to socio-demographic characteristics and age

Variables	Categories	Age in years				Total		X2 (p-value)
		≤30		>30		No	%	
		No	%	No	%			
Education	< University	42	28.4	73	47.7	115	38.2	11.911 (0.001)
	University or more	106	71.6	80	52.3	186	61.8	
Occupation	I don't work	99	66.9	95	62.1	194	64.5	6.034 (0.049)
	A hand worker	13	8.8	28	18.3	41	13.6	
	Medical section	36	24.3	30	19.6	66	21.9	
Smoking habits	Smoker	18	12.2	36	23.5	54	17.9	6.603 (0.010)
	Non smoker	130	87.8	117	76.5	247	82.1	
History of smoking in the family	Yes	63	42.6	82	53.6	145	48.2	3.664 (0.056)
	No	85	57.4	71	46.4	156	51.8	
Accommodation type	Owned	78	52.7	83	54.2	161	53.5	0.072 (.788)
	Rented	70	47.3	70	45.8	140	46.5	

About two thirds of the females (62.1%) had positive family history of DM. However, about one third of the females (37.2%) had positive family history of GD. GD was reported by 18.3% of the females (Figure 1).

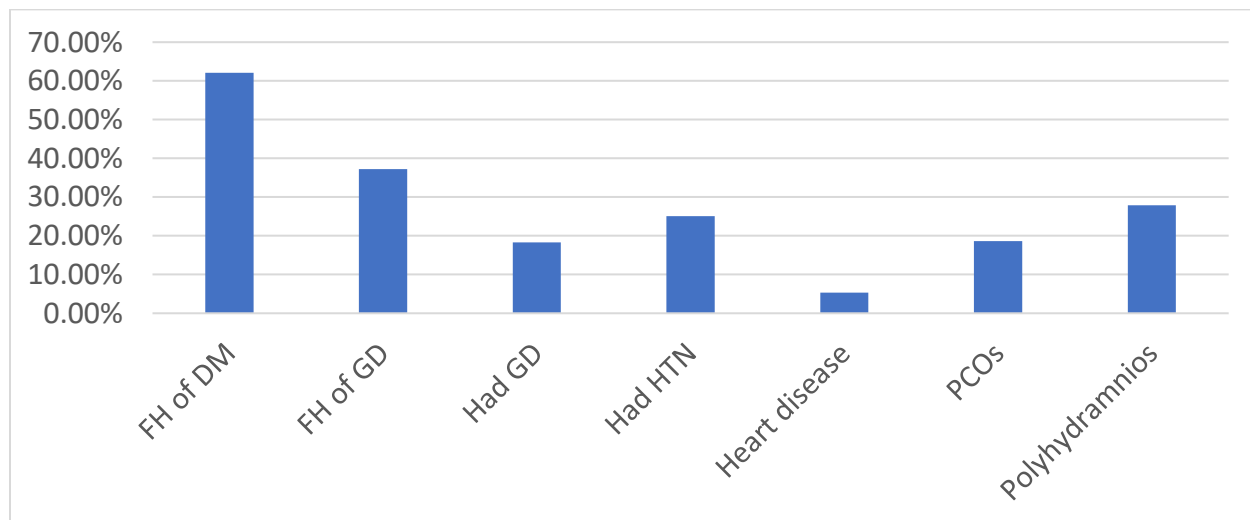


Figure 1 Studied subjects by Personal morbid history in the antenatal period

It was significantly more common among those older than 30 years old ($p < 0.000$). About 10% of the females had GD continued as DM after birth, and this was also significantly more common among the older ladies. Hypertension, polycystic ovaries and heart disease were reported by the studied females (25.1%, 18.6% and 5.3% respectively). These morbidities were not related to age (Table 2).

About one third of the ladies (30.6%) had caesarian section before. This was significantly more common among those older than 30 years. Increased amniotic fluid during pregnancy (9%), still birth (27.9%), and premature labor (9.3%) were reported by the studied females. About 10% of the females gave birth to babies heavier than 4 Kgs, while 12% of the females gave birth to babies weighing less than 2.5 Kgs. All these abnormalities were significantly higher among those older than 30 years where the p values were < 0.05 (Table 3).

Table 2 Distribution of studied subjects according to maternal morbid history and age

Variable	Categories	Age in years				Total		X2 (p-value)
		≤ 30		> 30		No	%	
		No	%	No	%			
Family History of DM	Yes	85	56.4	102	66.6	187	62.1	2.726 (.099)
	No	63	42.6	51	33.3	114	37.9	
Family History of GD	Yes	48	32.4	64	41.8	112	37.2	2.844 (.092)
	No	100	67.6	89	58.2	189	62.8	
Suffered from GD	Yes	15	10.1	40	26.1	55	18.3	12.91 (0.000)
	No	133	89	113	73.9	246	81.7	
Continue of GD after delivery	Yes	5	5.5	18	17.6	23	11.9	6.766 (.009)
	No	86	94.5	84	82.4	170	88.1	
Suffer from Hypertension	Yes	38	27.3	34	23.0	72	25.1	.727 (.394)
	No	101	72.7	114	77.0	215	74.9	
Suffer from Heart Disease	Yes	7	4.7	9	5.9	16	5.3	.199 (.656)
	No	141	95.3	144	94.1	285	94.7	
History of polycystic ovaries	Yes	24	16.2	32	20.9	56	18.6	1.097 (.295)
	No	124	83.8	121	79.1	245	81.4	

Table 3 Distribution of studied subjects according to fetal outcome and age

Variable	Categories	Age in years				Total		X2 (p-value)
		≤30		>30		No	%	
		No	%	No	%			
Birth Status	Normal delivery	118	79.7	91	59.5	209	69.4	14.539 (.000)
	Caesarean section	30	20.3	62	40.5	92	30.6	
Polyhydramnios	Yes	5	3.4	22	14.4	27	9.0	14.527 (.001)
	No	91	61.5	69	45.1	160	53.2	
	DK	52	35.1	62	40.5	114	37.9	
Still birth	Yes	28	18.9	56	36.6	84	27.9	11.691 (.001)
	No	120	81.8	97	63.4	217	72.1	
Premature baby	Yes	11	7.4	17	11.1	28	9.3	1.207 (.272)
	No	137	92.6	136	88.9	273	90.7	
Weight of the baby at birth	Normal	120	81.1	114	74.5	234	77.7	1.881 (.390)
	> 4kg	12	8.1	17	11.1	29	9.6	
	< 2.5kg	16	10.8	22	14.4	38	12.6	

Only 2% of the females produced babies with low blood sugar. About two thirds of the ladies reported that they born fetuses were having jaundice. A small proportion reported that their produced baby was placed on respiration (12%), and 30.9% reported that their produced babies were incubated. Preeclampsia was reported by 3.3% of the females, while vaginal bleeding was reported by 13.3% of the females. Puerperal sepsis was reported by 10.3% of the females. History of recurrent miscarriage was reported by 10% of the ladies, while history of miscarriage was reported by 46.2% of the ladies. Those who reported admission to ICU because of pregnancy were 7% of the ladies (Figure 2). Age was an important determinant factor in these morbidities (Table 4).

Suffering from GD was significantly loaded on factor 1 (weight=0.907), and was significantly associated with having family history of GD (weight=.619), continue as DM after delivery (weight=.639), and significantly associated with having hypertension and heart disease (weights=0.33, and 0.38 respectively). Ladies wit history of GD were more likely to suffer from polycystic ovaries and recurrent miscarriage (weights=0.6 and 0.85 respectively). They were more likely to give stillbirth and vaginal bleeding (weights = 0.39, and 0.46 respectively). Suffering from pre-eclampsia had high loading on factor 2 (weight=0.809), and was significantly associated with producing premature baby (weight=.755), and producing a 4 kg heavy baby (weight=.0535).

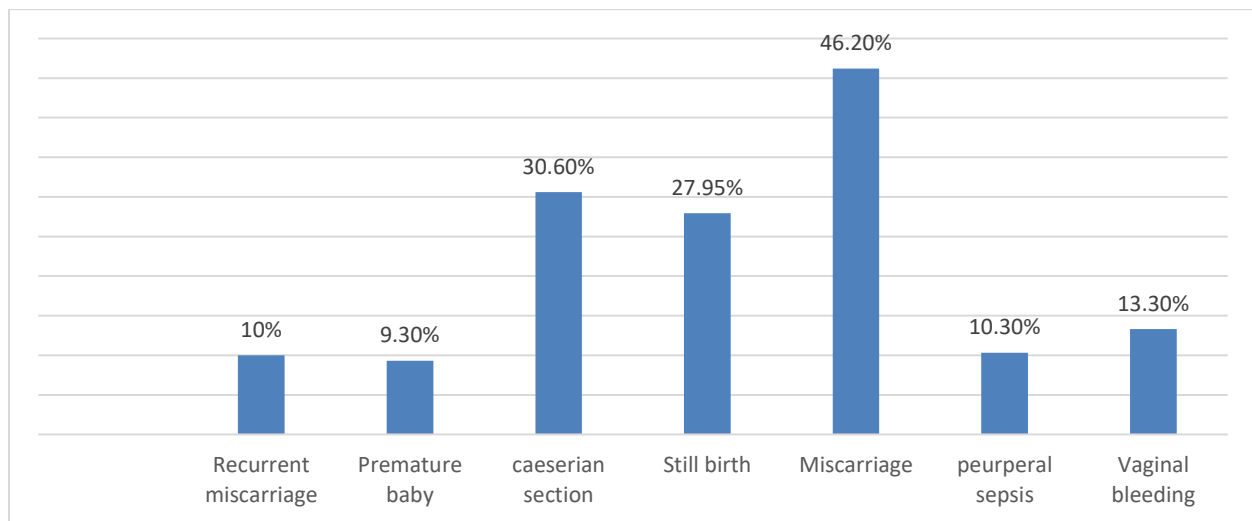


Figure 2 Pregnancy related complications among the studied women

Table 4 Distribution of studied subjects according to maternal complication and age

Variable	Categories	Age in years				Total		X2 (p-value)
		≤ 30		> 30		No	%	
		No	%	No	%			
Baby with low blood sugar	Yes	3	2.0	3	2.0	6	2.0	1.102 (.576)
	No	127	85.8	137	89.5	264	87.7	
	DK	18	12.2	13	8.5	31	10.3	
Baby with jaundice	Yes	46	31.1	64	41.8	110	36.5	3.748 (0.053)
	No	102	68.9	89	58.2	191	63.5	
Fetus placed on respiration	Yes	16	10.8	22	14.4	38	12.6	2.596 (.273)
	No	122	82.4	126	82.4	248	82.4	
	DK	10	6.8	5	3.3	15	5.0	
Fetus incubated	Yes	28	18.9	65	42.5	93	30.9	19.566 (.000)
	No	120	81.1	88	57.5	208	69.1	
Pre-eclampsia	Yes	7	4.7	3	2.0	10	3.3	1.796 (.180)
	No	141	95.3	150	98.0	291	96.7	
Vaginal bleeding	Yes	11	7.4	29	19.0	40	13.3	8.667 (0.003)
	No	137	92.6	124	81.0	261	86.7	
History of puerperal sepsis	No	1	0.7	0	0.0	1	0.3	2.519 (.472)
	Yes	17	11.5	14	9.2	31	10.3	
	DK	130	87.8	139	90.9	269	89.3	
History of Recurrent miscarriage	Yes	8	5.4	22	14.4	30	10.0	6.751 (.009)
	No	140	94.6	131	85.6	271	90.0	
History of miscarriage	Yes	63	42.6	75	49.7	139	46.2	1.528 (.216)
	No	85	57.4	77	50.3	160	53.8	
Admission to ICU antenatal or postpartum	Yes	12	8.1	9	5.9	21	7.0	.574 (.449)
	No	136	91.9	144	94.1	280	93.0	

These ladies were significantly suffering from puerperal sepsis (weight=0.39) and were admitted to the ICU (weight=0.796). Had Cesarean section was significantly loaded on factor 4 (weight=0.750). It was significantly associated with history of miscarriage (weight=-0.414), with increased age (weight=0.449), and increase weight and height (weights=0.897, and 0.624 respectively). It was more common among the Saudis (weight=-0.451). Smoking was more common among the Saudi ladies (weight=0.884) and it has significant association with premature baby and vaginal bleeding (weights=0.3 and 0.31 respectively) (Table 5).

Table 5 Principal component factor analysis for the whole variables

Rotated Component Matrix													
	Component												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Age	-.277	.033	.488	.449	.203	-.312	.020	.019	.027	.304	.195	-.065	-.135
Nationality	.191	-.110	-.009	-.451	-.386	.193	.274	.391	.035	.274	-.095	-.206	-.039
Occupation	.191	-.235	.023	-.273	.179	-.275	.000	.336	.177	.118	.457	.104	.337
Height	-.134	-.032	.169	.624	.404	-.077	.307	.042	.162	.052	-.106	-.215	.153
Weight	-.116	.051	.064	.897	-.008	-.040	.057	-.012	.071	.060	-.119	-.156	.084
Family size	.102	-.346	.519	.077	.422	-.071	-.332	.332	.099	-.048	.077	-.041	-.003
Numbers of Children	-.380	.088	.438	-.025	-.126	-.543	-.056	.135	-.276	-.166	-.238	.023	-.030
Numbers of male children	-.046	.025	.882	-.033	.018	-.077	.122	-.046	-.006	-.219	.024	.048	.185
Numbers of Female children	-.015	.161	.216	.025	.145	-.042	-.080	-.104	-.009	.023	.092	-.043	.868
Smoking Habits	.198	.174	.100	.078	-.079	.110	-.481	.581	-.129	-.179	.028	-.228	.325
Smoking family member	-.143	.003	-.035	.044	.040	-.148	.075	.884	-.005	-.060	-.155	.031	-.165
Family History of diabetes	.217	-.416	-.292	.128	-.290	-.102	.408	.009	.133	.029	-.182	.296	.094
Family History of gestational diabetes	.619	-.024	-.047	-.277	-.118	-.004	.070	.115	.035	.032	.155	.027	.206
Suffered from gestational diabetes	.907	.023	-.075	-.038	.027	.048	-.112	-.016	.094	-.028	.027	-.030	.035
Continue of gestational diabetes after delivery	.639	-.062	-.432	.085	.057	.165	.059	-.177	.066	.297	.020	.084	.067
Hypertension	.329	-.161	.085	.055	-.008	.147	-.057	-.111	.767	-.003	.091	.148	-.201
Suffer from Heart Disease	.383	-.040	-.248	-.019	.067	.052	-.103	-.171	.090	.715	-.014	-.006	.062
History of miscarriage	.104	.161	.145	-.414	.375	.007	.067	-.207	-.249	-.202	-.236	.322	.296
Months of miscarriage	-.218	-.264	-.047	.326	-.301	.018	-.169	.084	-.236	.621	.236	.006	-.113
History of recurrent miscarriage	.601	.242	-.157	.167	-.036	.160	.068	.032	.090	-.204	-.387	.130	.040
weight of the baby more than 4 kg	-.004	.535	-.129	.151	.150	.077	.102	-.075	.676	.137	.031	.008	.063
History of the polycystic ovaries	.852	-.015	.071	-.149	.151	-.113	-.124	-.026	.085	.111	.042	-.123	-.261
Cesarean section	.026	-.310	-.194	.750	-.123	-.092	-.100	-.061	.141	.037	.264	.031	-.130
Increase of amniotic fluid	-.010	.072	-.161	-.132	-.163	.848	.067	-.113	.118	-.005	-.094	-.027	-.100
Still birth	.391	.167	.386	-.156	.197	-.043	.344	.020	-.349	-.411	.085	.105	-.089
Prematurely baby	.055	.755	-.017	-.061	.238	-.018	-.163	.250	.072	-.121	.072	.282	.057
Baby with Jaundice	-.024	.039	-.101	-.197	.030	.029	.133	.029	.058	-.016	-.093	.850	-.057
Fetus placed on respirators	-.138	.059	.019	.031	-.045	.261	.840	.129	.119	-.174	.053	.084	-.100

Fetus remained in incubator	.057	.208	-.320	-.272	.274	.623	.291	.031	.003	.171	.147	.119	.000
Pre-eclampsia	-.050	.809	.075	.002	-.203	.298	.247	-.133	.019	-.006	-.057	.113	-.078
vaginal bleeding	.458	.287	-.307	-.262	.154	-.039	.090	.032	.173	-.364	.154	.380	-.054
History of puerperal sepsis	-.046	.390	.300	.111	.155	.393	-.346	.106	.190	.095	-.051	.439	.258
Admission care unit while antenatal or postpartum	.125	.796	.022	-.143	-.129	-.051	-.030	.094	-.067	-.160	-.051	-.199	.267

4. DISCUSSION

The present study revealed that increased age above 30 years or older was associated with increased occurrence of pregnancy related complications. This was in line with findings from previous studies (Fishman and Min, 2018; Wahabi et al., 2016). Smoking among Saudi females and exposure to passive smoking is higher than in females elsewhere (Roustaei et al., 2020; Mumford and Lui, 2015). Exposure to smoking predisposes the women to suffer from vaginal bleeding and to produce premature babies. Family history of having DM make the females 5 times more likely to develop GDM, also family history of GDM was associated with the occurrence of GDM (Zhang et al., 2016; Lewandowska et al., 2020).

This was in line with findings from the present study. About one third of the females in the present study (37%) developed GDM. This was higher than reported results in USA (Zhou et al., 2022). This is in line with findings from the present study where 10% of the females with GDM continued to have DM after birth. Hypertension in pregnancy has a major concern in antenatal practice (Fishman and Min, 2018). Hypertension was common among the females in the present study (25.1%). Heart disease is associated with maternal mortality and morbidity in the antenatal and postnatal periods (Koutrolou-Sotiropoulou et al., 2015).

In the present study 5% of the females reported the presence of heart diseases. The presence of PCOS during pregnancy increased the occurrence of maternal complications (Yu et al., 2016). This is in line with findings from the present study where 18.6% of the females reported having PCOs. It was significantly associated with occurrence of GDM. In the present study, about one third of the females produced their fetuses by caesarian section. This was significantly more associated with increased age. This is in line with previous study (Hilden et al., 2016).

Polyhydramnios is associated with poor pregnancy outcomes. The reported prevalence of polyhydramnios ranges from 0.2 to 1.6% of all pregnancies (Traisrisilp and Tongsong, 2015). This is not in line with findings from the present study where polyhydramnios was encountered in 9% of the females. Previous study demonstrated close relationship between advanced age and pregnancy complications such as placenta Previa, intra-uterine growth restriction or fetal demise, GD, hypertension, and caesarean delivery (Poon et al., 2016; Fitzpatrick et al., 2017; Stanley et al., 2015). This was in line with findings from the present study.

Maternal DM is associated with several adverse obstetric risks including malformations, macrosomia, and neonatal metabolic disorders and neonatal respiratory (Boskabadi et al., 2015; Leybovitz-Haleluya et al., 2018). This is in line with findings from the present study where 12% of the ladies reported that their produced babies were placed on respiration, and 30.9% reported that their produced babies were incubated, and 7% reported that they were admitted to ICU because of pregnancy. Pre-eclampsia was reported by 3.3% of the females mainly in the older age group. This was in line with previous study (Coomarasamy et al., 2020).

The present research revealed that vaginal bleeding was reported by 13.3% of the females and was significantly associated with having GDM, PCOs, hypertension and heart disease and miscarriages. This is in line with findings from previous studies (Field and Murphy, 2015; Dempsey et al., 2015). Maternal sepsis is a life-threatening condition with organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or in the postpartum period (Bonet et al., 2017). In the present study, puerperal sepsis was reported by 10% of the females. Miscarriage was reported by 46% of the females and those with repeated miscarriage were 10%. This was in line with findings from previous study (Rouzi et al., 2020). Thus, increased maternal age, obesity and having family history of DM or GDM are significant determinants of occurrence of pregnancy related complications.

Limitations

There are some limitations to this study: As this study is cross-sectional, the causal relationship remains unknown, and we do not know if the effects of these variables will persist in the long term. It is also a nonprobability convenient sample, and its generalization to the population may be defective; however, it is an exploratory study.

5. CONCLUSION AND RECOMMENDATIONS

Pregnancy related complications are common among the women in Jeddah city, Saudi Arabia. Preventive and promotional measures should be implemented in antenatal health care services to address the determinants of these adverse pregnancy outcomes.

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Author Contributions

FG contributed to study design, analyzing data and writing the first original draft. SM, NA, BJ, RA, and AS contributed to collecting data, and writing the draft. All authors agreed to the published version of the manuscript.

Ethical approval

The study was approved by the Medical Ethics Committee of Ibsina National College for medical studies (Ethical approval code: No. H-07-09062021)

Informed consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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