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A Survey of Gestational Diabetes in Broken Hill

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A Survey of Gestational Diabetes in Broken Hill

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Abstract

Background

Gestational diabetes (GDM) is a common health issue in Australia, affecting around 16% of pregnancies. It is a routine to screen all pregnant women with a test known as 75g OGTT.

Interestingly, the incident rate of gestational diabetes was found to be relatively similar in terms of remoteness of the area. This survey is to determine the prevalence and characteristics of GDM in pregnant women in Broken Hill. In addition to that, the secondary objective is to study the birth outcomes of pregnancies complicated by GDM in Broken Hill.

Methodology

The clinical details of all singleton live births in the past 24 months until March 2021 were retrieved from the Obstetric database in Electronic Medical Record (EMR), and downloaded as an electronic Excel spreadsheet. IBM SPSS 24 was used to analyse and generate the statistics. After excluding cases with missing data, the final number of patients was 364.

Outcome

Among the data gathered, 28.3% had some form of diabetes. Maternal obesity had a significant effect. The caesarean section rate was higher in patients with GDM (37.9%) as compared to patients without diabetes (29.9%). Similarly, the rate of instrumental birth was higher in GDM group (8.7%) as compared to group without diabetes (6.5%). Patients without diabetes were found to have higher rate of normal vaginal delivery (63.6%) compared to patients with GDM (53.4%). Patients with GDM were noted to have higher percentage of emergency birth (14.6%) than non-diabetic patients (13.0%). Newborns of patients without diabetes had lower median weight (3350Â±688.17) as compared with patients with GDM

As for ultrasound findings, the median foetal BPD was found to be lower (84.5Â±18.22) in patients without diabetes as compared to patients with GDM (Illustration 2.2). Amongst patients with GDM, those who were on insulin control had the highest foetal BPD (91.0Â±2.83).

Conclusion

According to Australian Institute of Health and Welfare (AIHW), it was found that 1 in 7 pregnant women from 2016-2017 were being affected by gestational diabetes. An interesting outcome from this survey showed the incident rate of gestational diabetes was found to be relatively similar in terms of remoteness of the area. However, a bigger sample size would be helpful to support these findings. Nevertheless, as this is the preliminary survey, more studies need to be carried out in the future to strengthen the understanding of gestational diabetes in Broken Hill community. The ultimate aim is to achieve an improvised version of protocol in terms of management of gestational diabetes in a remote area, with a bigger population of Aboriginal and Torres Strait Islanders, such as Broken Hill.

Introduction

Background

In Australia, gestational diabetes (GDM) occurs in 10-15% of pregnancies [1]. All pregnant women, without previously diagnosed diabetes mellitus, will have to undergo a test known as 75g OGTT at around 24-28 weeks of gestation to check for their diabetes status. Women with higher risk of getting hyperglycaemia might even need to get screened earlier in their pregnancies. According to the Australasian Diabetes in Pregnancy Society (ADIPS) and the WHO recommendations, the accepted guideline in the diagnosis of GDM at any time during pregnancy is listed based on the following values [2].

(a) Fasting plasma glucose 5.1â€“6.9 mmol/l;

(b) 1-h post 75 g oral glucose load Â³10.0 mmol/l*;

(c) 2-h post 75 g oral glucose load 8.5â€“11.0 mmol/l.

GDM complicates about 15% of pregnancies, with an increasing prevalence in most populations studied.Â The Hyperglycemia and Adverse Pregnancy Outcome study (HAPO) showed findings of significant adverse maternal and fetal outcomes correlated with GDM [3].Â Although asymptomatic, it is associated with an increased risk of several complications including preeclampsia [4], fetal macrosomia [5], stillbirth [6], need for cesarean section [7], and neonatal hypoglycaemia [8]. GDM usually subsides after delivery, but later in life there is an increased risk of type 2 diabetes [9], both for mother and baby.

Objective

The primary aim of this survey is to determine the

prevalence and characteristics of GDM in women attending the antenatal clinics of Broken Hill Base Hospital. A secondary objective is to study the birth outcomes of pregnancies complicated by GDM and compare them to normal pregnancies.

*there is no established criteria for the diagnosis of diabetes mellitus in pregnancy based on the 1-h post-load value

Methods

The clinical details of all singleton live births in the past 24 months until March 2021 were retrieved from the Obstetric database in Electronic Medical Record (EMR), and downloaded as an electronic Excel spreadsheet. We included data such as maternal characteristics (age, parity, weight, height, gestational age at delivery, presence of GDM, whether delivery was elective or emergency, the indication for the elective delivery) and fetal characteristics (fetal biparietal diameter (BPD), fetal head circumference (HC), fetal abdominal circumference (FC), fetal femur length (FL) and newborn birth weight. We entered the data from the case records anonymously in an electronic spreadsheet (MS Excel), and stored in password-protected computers. IBM SPSS 24 was used to analyse and generate the statistics. Inclusion criteria for candidates included all singleton live births from 2019 till March 2021. The initial sample size was 400. There were missing data on patientsâ€™ diabetic statuses as some patients might have missed their hospital antenatal clinic appointments or they might not be on par with the community antenatal follow up. After excluding cases with missing data, the final number of patients was 364.

Outcome

The total number of candidates included in this survey from 2019 to March 2021 was 364 women. Of these, 28.3% had some form of diabetes. About 18.7% had GDM which was controlled by diet only; 8.5% had GDM controlled by oral hypoglycaemics. A minority of cases had GDM controlled by insulin. A small subgroup had pre-existing T2DM (Illustration 1.1). In terms of their age ranges, the median age for non-diabetic patients was 28 years old. Median age for patients with GDM ranged from 29 to 35 years old, depending on the type of diabetes (Illustration 1.2).

Illustration 1.1 Diabetes status of pregnancy from 2019-March 2021 in Broken Hill Hospital

Diabetes status	Frequency	Percentage
No diabetes	261	71.7
GDM on diet control	68	18.7
GDM on oral hypoglycaemic	31	0.09
GDM on insulin	2	0.01
Pre-existing T2DM	2	0.01

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Illustration 1.2 Percentile of maternal age (years)

Diabetes status	Median	Interquartile range
No diabetes	28	8
GDM on diet control	29	6
GDM on oral hypoglycaemic	30	9
GDM on insulin	35	nil
Pre-existing T2DM	31	nil

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Maternal obesity had a significant effect. Patients without diabetes had lower BMI values in the 25%, 50% and 75% percentile, as compared to patients with GDM (Illustration 1.3). No significant differences were noted in the length of pregnancy between cases with and without GDM (Illustration 1.4). According to Illustration 1.5, the caesarean section rate was higher in patients with GDM (37.9%) as compared to patients without diabetes (29.9%). Similarly, the rate of instrumental birth was higher in GDM group (8.7%) as compared to group without diabetes (6.5%). Patients without diabetes were found to have higher rate of normal vaginal delivery (63.6%) compared to patients with GDM (53.4%).Â

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Illustration 1.3 BMI in subgroups of GDM (kg/m2)

Diabetes status	25% percentile	50% percentile	75% percentile
No diabetes	21.8	25	29.1
GDM on diet control	23.6	28.7	33.5
GDM on oral hypoglycaemic	26.4	31.5	36.1
GDM on insulin	38.8	39.8	nil
Pre-existing T2DM	22.3	31.8	nil

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Illustration 1.4 Percentile of gestation age (weeks)

Diabetes status	25% percentile	50% percentile	75% percentile
No diabetes	38.4	39.3	40.2
GDM on diet control	38.4	39.1	39.9
GDM on oral hypoglycaemic	38.6	39.3	39.6
GDM on insulin	36.1	37.6	nil
Pre-existing T2DM	39.1	39.3	nil

Illustration Â 1.5 Frequency of mode of delivery in GDM and non- diabetic

Diabetes status	Frequency	Normal vaginal birth	InstrumentalÂ birth	Caeserean section
No diabetes	Count	166	17	78
	% within Diabetes status	63.60%	6.50%	29.90%
	% within Mode of Delivery	75.10%	65.40%	66.70%
GDM/Pre-existing T2DM	Count	55	9	39
	% within Diabetes status	53.40%	8.70%	37.90%
	% within Mode of Delivery	24.90%	34.60%	33.30%

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Additionally, patients without diabetes were reported to have slightly higher Â rate of elective birth (87.0%) as compared to patients with GDM (85.4%). On the other hand, patients with GDM were noted to have higher percentage of emergency birth (14.6%) than non-diabetic patients (13.0%) (Illustration 1.6). Parity was note clearly linked to GDM (Illustration 1.7).Â

Illustration 1.6 Frequencies of elective/emergency birth in different diabetes status

Diabetes status	Frequency	Elective	Emergency	Total
No diabetes	Count	227	34	261
	% within Diabetes status	87.00%	13.00%	100.00%
GDM/Pre-existing T2DM	Count	88	15	103
	% within Diabetes status	85.40%	14.60%	100.00%

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Illustration 1.7 Frequencies of parity in different diabetes status

Diabetes status	Frequency	Primipara	Multipara	Total
No diabetes	Count	108	153	261
	% within Diabetes status	41.40%	58.60%	100.00%
GDM/Pre-existing T2DM	Count	39	64	103
	% within Diabetes status	37.90%	62.10%	100.00%

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Some differences were noted in neonatal outcomes. Newborns of patients without diabetes had lower median weight (3350Â±688.17) as compared with patients with GDM (Illustration 2.1). However, it was noted that newborns of patients with GDM on insulin had lowest median weight (3248Â±632.15). As for ultrasound findings, the median foetal BPD was found to be lower (84.5Â±18.22) in patients without diabetes as compared to patients with GDM (Illustration 2.2). Amongst patients with GDM, those who were on insulin control had the highest foetal BPD (91.0Â±2.83).Â

In patients without diabetes, the foetal HC was found to be lower (median 308Â±63.15) as compared to patients with GDM. Amongst patients with GDM, those using oral hypoglycemics had the highest median HC (318Â±14.62) (Illustration 2.3). Similarly, patients without diabetes had the lowest median for foetal ultrasound AC (304Â±75.34) (Illustration 2.4), while highest median was reported in patients with GDM on insulin (326.5Â±20.51). Interestingly, for foetal ultrasound FL, patients with pre-existing T2DM were found to have the lowest median (63.0Â±9.90), while patients with GDM on oral hypoglycemics control had the highest median (68.0Â±7.54) (Illustration 2.5).

Illustration 2.1 Percentile of newborn weight (g)

Diabetes status	Median	Standard Deviation
No diabetes	3350.0	688.17
GDM on diet control	3445.0	388.07
GDM on oral hypoglycaemic	3565.0	481.82
GDM on insulin	3248.0	632.15
Pre-existing T2DM	3545.0	7.07

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Illustration 2.2 Percentile of foetal USS BPD (mm)

Diabetes status	Median	Standard Deviation
No diabetes	84.5	18.22
GDM on diet control	89.0	4.91
GDM on oral hypoglycaemic	89.0	4.48
GDM on insulin	91.0	2.83
Pre-existing T2DM	89.0	12.73

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Illustration 2.3 Percentile of foetal USS HC (mm)

Diabetes status	Median	Standard Deviation
No diabetes	308.0	63.15
GDM on diet control	317.5	18.58
GDM on oral hypoglycaemic	318.0	14.62
GDM on insulin	316.5	13.44
Pre-existing T2DM	317.0	14.14

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Illustration 2.4 Percentile of foetal USS AC (mm)

Diabetes status	Median	Standard Deviation
No diabetes	304.0	75.34
GDM on diet control	323.0	23.78
GDM on oral hypoglycaemic	325.0	26.40
GDM on insulin	326.5	20.51
Pre-existing T2DM	311.0	9.90

Illustration 2.5 Percentile of foetal USS FL (mm)

Diabetes status	Median	Standard Deviation
No diabetes	65.5	15.88
GDM on diet control	68.0	4.41
GDM on oral hypoglycaemic	68.0	7.54
GDM on insulin	65.0	4.24
Pre-existing T2DM	63.0	9.90

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Discussion

Discussion

This survey indicates that the incidence of GDM in the Broken Hill district at 28% of pregnant mothers is much higher than the national average. Broken Hill Hospital is a major rural referral hospital that provides inpatient and outpatient services to the community within Far West Local Health Network (FWLHN). According to the 2006 census data, in this area about 8.7% of the population is Aboriginal. It is a unique health network with the highest percentage of Aboriginal people in the state of NSW [10]. Looking into Broken Hill LGA, the total birth rate from 2001 till 2019 has been decreasing steadily [11]. There could be multifactorial reasons as of why the total birth rate has been dropping over the years. For instance, migration, which is the most volatile component that affects population changes, has been seen amongst the community in Broken Hill, and the highest net loss was to Mildura, Victoria [12].

Following the Australian Diabetes in Pregnancy Society (ADIPS) Consensus Guidelines in Testing and Diagnosis of Gestational Diabetes Mellitus during 2016, the reported rate of gestational diabetes in Australia rose from 7.5% in 2014 to 13.5% in 2018 [13]. According to Australian Institute of Health and Welfare (AIHW), it was found that 1 in 7 pregnant women from 2016-2017 were being affected by gestational diabetes [14]. Interestingly, the incident rate of gestational diabetes was found to be relatively similar in terms of remoteness of the area.

There are many risk factors that would increase the vulnerability of pregnant mothers to get gestational diabetes. One important risk factor is ethnicity. Data from AIHW showed that Aboriginal and Torres Strait Islander mothers have 1.3 times higher incident rate in getting gestational diabetes compared to non-aboriginal mothers [14]. Looking into Broken Hill, there is a significant proportion of the community who are of Aboriginal and Torres Strait Islander, thus it could be suggested that the high prevalence of gestational diabetes in Broken Hill Hospital could be due to high rates of indigenous ethnicity.

In Australia, another important risk factor for gestational diabetes is high BMI [15]. Among pregnant women who had gestational diabetes in 2017, 25% of them were overweight while 20% of them were obese [16]. Similarly, maternal BMI showed a significant role in increasing the prevalence of gestational diabetes in Broken Hill.

Another important consideration in a rural setting is socio-economical background. It was found that

pregnant mothers from a lower socio-economical background have 1.6 times higher risk of gestational diabetes [14]. Looking at Broken Hill Community, the lower socioeconomic status amongst the rural population could be an important risk factor that might have silently contributed to the prevalence of gestational diabetes.

Nonetheless, as there is no previous clinical audit involving gestational diabetes in Broken Hill, it acts as a preliminary study. Another limitation of this clinical audit is the small sample size, which makes it difficult to generate findings of more significance. Furthermore, Broken Hill LGA has its unique population with the most aboriginal community, so the distribution of the data could be slightly different to the community in other parts of NSW. Further studies will be beneficial in understanding about modifiable and non-modifiable risk factors associated with gestational diabetes in Broken Hill. Nevertheless, it is undeniable that there are many risk factors that contribute to significant cases of gestational diabetes amongst pregnant mothers in Broken Hill. Therefore, it would be beneficial to consider improvising guidelines of LHD in diagnosing gestational diabetes. One suggestion is that all pregnant mothers should be screened for gestational diabetes in the earlier stage of their pregnancies, so that earlier management could be implemented in their pregnancies for better maternal and foetal outcome.Â

Conclusion

As this is the preliminary survey, more studies need to be carried out in the future to strengthen the understanding of gestational diabetes in Broken Hill community. Nevertheless, gestational diabetes is an important health issue in pregnancy that needs to be addressed in order to formulate a more wholesome and comprehensive care for both the mother and the fetus. Given the high incidence, it would be justified to adopt a policy whereby early screening for GDM is carried out on all women, rather than just those with risk factors.

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