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Original Research Article

Evaluation of risk factors for gestational diabetes mellitus among women attending maternity and children's hospital in Bisha, Saudi Arabia

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ABSTRACT

Background: This study evaluated the prevalence and risk factors associated with gestational diabetes mellitus (GDM) among women attending the maternity and children's hospital in Bisha, Saudi Arabia. The goal was to identify risk factors for GDM and explore the experiences and challenges women face in managing the condition.
Methods: A cross-sectional hospital-based study of 390 females was conducted in 2024. The qualitative and quantitative study captured sociodemographic characteristics, medical history, and qualitative insights into women's experiences with GDM.
Results: The gestational diabetes rate was 16.4% among the studied group. The study identified younger age (OR=2.15, 95% CI: 1.12-4.10, p=0.021), underweight BMI (OR=3.27, 95% CI: 1.41-7.62, p=0.005), obese women (OR=1.95, 95% CI: 1.19-3.21, p=0.009), premature delivery (OR=1.65, 95% CI: 1.08-2.58, p=0.024), family history of diabetes (OR=1.74, 95% CI: 1.01-3.00, p=0.048), and hypothyroidism (OR=2.84, 95% CI: 1.67-4.81, p=0.001) as significant risk factors for GDM. Women expressed stress, lack of understanding, and an urge for better support and communication with their care providers. They also mentioned problems in adhering to dietary restrictions and coping with social interactions.
Conclusions: The research highlighted the importance of education, the role of health care guidance, and communication, to address the emotional and practical challenges that GDM faces. Addressing these areas is essential for enhancing maternal and child health outcomes.

Keywords: Bisha, Gestational diabetes mellitus, Maternal health, Risk factors, Saudi Arabia

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as the onset of hyperglycemia that occurs for the first time during pregnancy, which resolves following childbirth.[1] This affects up to 15-25% of pregnancies worldwide, with significant variations across regions and populations. GDM raises the probability of some adverse pregnancy outcomes, such as preeclampsia, the need for cesarean section, macrosomia, or neonatal hypoglycemia.[2] Several factors, such as obesity and a sedentary lifestyle, make GDM a global health challenge.[3] However, the factors leading to GDM are many and multifaceted, including genes, hormones, and environmental factors.[4] During

pregnancy, the placental hormones (human placental lactogen and progesterone) contribute to insulin resistance, a key feature of GDM [5,6] Additionally, obesity and excessive gestational weight gain are well-established risk factors, as they exacerbate insulin resistance.[7] Other factors, including advanced maternal age, family history of diabetes, and ethnicity, have also been linked to an increased risk of developing GDM.[8] The impact of GDM extends beyond the pregnancy, as it increases the risk of developing type 2 diabetes mellitus in the future for both the mother and the child.[9] The GDM needs early identification, effective management, and continued post-pregnancy monitoring for women with GDM. Early recognition and control of GDM can improve newborn outcomes and reduce complications.[10] The economic burden of GDM is substantial, with direct medical costs associated with managing GDM and its complications, as well as indirect costs related to the long-term healthcare expenses for the mother and child.[11] This research is particularly relevant given the high prevalence of GDM in Saudi Arabia, ranging from 8% to 19% in 2019. A study in the capital city of Saudi Arabia, Riyadh, also reported an alarming prevalence rate of 24%, indicating the highest frequency of GDM worldwide.[12] The demographic and health characteristics of the region are well represented in the study's sample, which is relatively young and contains a majority of Saudi nationals, many of whom are overweight and obese. Furthermore, the research context fits within the parameters of the Saudi Vision 2030, which also places a focus on health and the prevention of NCDs, including diabetes.[13] The research, therefore, recommended the formulation of goal-oriented strategies and public health efforts to improve the burden of GDM and its risks in Saudi Arabia. This study was conducted at the maternity and children's hospital (MCH) in Bisha, Saudi Arabia, and it aimed to evaluate the risk factors associated with GDM and the prevalence among 390 females attending antenatal care.

METHODS

Study design and setting

This is a hospital-based cross-sectional study of females who attended the MCH in Bisha, Saudi Arabia 2024.

Participants

The study included 390 females who were either diagnosed with GDM or were at risk of developing the condition. The inclusion criteria were based on females at the reproductive age of 18-55 years at risk of developing GDM.

Sampling and sample size

A sample size was calculated as follows:

$$n = \frac{Z^2 p * q}{d^2}$$

Herewith, n is the sample size, z is the average standard deviation, where z=1.96, p is the probability of an event's occurrence, q=1-p is the probability of non-occurrence, and d is the percentage error expressed in decimals, which is 0.05%.

$$n = \frac{1.96 * 1.96 * 0.5 * 0.5}{0.05 * 0.05}$$

n=385.

Data collection

The survey focused on collecting quantitative and qualitative data. A structured questionnaire was developed to address all the stated objectives adequately. We obtained permission to use the datasheet from a previous study.[14] Two experts approved the questionnaire for face validation. To ensure the validity of the questionnaire, we piloted the survey with 15 participants. The survey was clear, no questions were changed, and the average time to answer the questionnaire was 3 to 5 minutes. The data collection instrument contains 23 questions distributed in three sections. The first section includes demographic data, patient and family history, and 12 general data questions. The second section was for mothers or pregnant females, consisting of 11 multiple-choice questions about the risk factors of GDM. A final section was added to address women's experiences with the diagnosis, management, and the impact of GDM on their daily lives. The data was collected through direct interviews to reduce language and communication challenges by well-trained students in the MCH.

Variables

Research has identified several variables that contribute to increasing the risk of GDM. These factors include age, nationality, body mass index (BMI), family history of diabetes, previous history of pre-diabetes or diabetes itself, polycystic ovary syndrome (PCOS), hypertension, thyroid disease, heart disease, asthma, history of preeclampsia, obstetrics history, and smoking status.

Statistical analysis

The analysis was done by STATA BE, version 18. Descriptive statistics and regression analysis were employed. Qualitative data were analyzed using content analysis, coded based on themes reflecting women's perspectives and emotions.

Ethical concerns

The IRB was from the University of Bisha (Ref No. UB-RELOC H-06-BH 087/1203.24, Date. January 29, 2024). Women provided informed consent, and confidentiality was ensured.

RESULTS

Quantitative result

This study investigated risk factors associated with GDM among 390 females attending the MCH in Bisha, Saudi Arabia in 2024. The analysis focused on identifying potential risk factors for GDM.

Table 1: Socio-demographic features.

Socio-demographic features	Frequency	%
Age (years)		
18-24	47	12.1
25-34	185	47.4
35-44	126	32.3
45-54	32	8.2
Nationality		
Saudi	377	96.7
Non Saudi	13	3.3
BMI		
less than 18.5	4	1.0
18.5-24.9 normal	96	24.6
25-29.9 overweight	159	40.8
30.0 above obese	131	33.6

The study found that 62 (16.4%) of the 390 participants had been diagnosed with GDM.

Table 1 shows the sociodemographic characteristics. Interestingly, most respondents (47.4%, n=185) are in the 25-34 age group. The second largest group, 32.3% (n=126), belongs to the 35-44 age category.

Participants aged 18-24 comprise 12.1% (n=47), while those aged 45-54 constitute 8.2% (n=32). Regarding nationality, a significant majority of the sample is Saudi, representing 96.7% (n=377), whereas non-Saudi nationals account for 3.3% (n=13) of the participants. The BMI distribution shows that 40.8% (n=159) of individuals are overweight, making it the most prevalent BMI category. This is followed by the obese category, which includes 33.6% (n=131) of the participants. Those within the normal weight range account for 24.6% (n=96), while underweight individuals are the least represented, at 1.0% (n=4).

Table 2 shows that the study included 390 participants, revealing a significant prevalence of certain risk factors associated with gestational diabetes mellitus (GDM). A large proportion (83.6%, n=326) reported never having been diagnosed with pre-diabetes, while 16.4% (n=64) had a previous pre-diabetes diagnosis. A substantial majority (95.1%, n=371) reported no history of diabetes, with only 4.9% (n=19) having a diabetes diagnosis. Polycystic ovary syndrome (PCOS) was present in 32.8% (n=128) of participants.

Table 2: Distribution by factors associated with gestational diabetes mellitus.

Associated variables	Frequency n=390	%
Ever been diagnosed with a pre-diabetes stage before		
No	326	83.6
Yes	64	16.4
Have diabetes		
No	371	95.1
Yes	19	4.9
Diagnosed with PCOS		
No	262	67.2
Yes	128	32.8
Hypertension		
No	374	95.9
Yes	16	4.1
Thyroid disease		
No	362	92.8
Yes	28	7.2
Heart disease		
No	387	99.2
Yes	3	0.8
Liver disease		
No	389	99.7
Yes	1	0.3
Kidney disease		
No	356	91.3
Yes	34	8.7
Hypertension during pregnancy (preeclampsia)		
No	356	91.3
Yes	34	8.7
vaginal delivery		
No	220	56.4
Yes	170	43.6
You had birth by cesarean section		
No	378	96.9
Yes	12	3.1
Had a miscarriage before		
No	253	64.9
Yes	137	35.1
Ever given birth to a dead baby		
No	347	89.0
Yes	43	11.0
Have a history of premature delivery before 37 weeks		
No	307	78.7
Yes	83	21.3
Born a child with a birth deformity (teratogenic)		
Normal birth	345	88.5
Atrophy of the brain	4	1.0
Down syndrome	2	0.5
No child before	34	8.7
Ht disease	1	0.3
Celiac disease	1	0.3
Williams syndrome	1	0.3
Hydrocephalus	2	0.5
Smoke cigarettes		
Yes	8	2.1
No	382	97.9

Table 3: The association between gestational and non-gestational women.

Variables	Gestational diabetes	No gestational diabetes	Test statistics χ^2	P value
Age (years)				
Less than or equal to 30	20	149	4.55	0.033
Greater than 30	44	177		
Nationality				
Saudi	62	315	0.010	0.919
Non Saudi	2	11		
BMI				
Less than 18.5	0	4	8.29	0.04
18.5-24.9 normal	11	85		
25-29.9 overweight	22	137		
30.0 above obese	31	100		
Any relative diagnosed with diabetes				
No	11	69	0.519	0.471
Yes	53	257		
Diagnosed with PCOS				
No	38	224	2.115	0.146
Yes	26	102		
Hypertension				
No	61	313	0.067	0.796
Yes	3	13		
Hypohyroid disease				
No	56	314	8.552	0.003
Yes	8	12		
Hyperthyroid disease				
No	59	313	1.78	0.182
Yes	5	13		
Heart disease				
No	63	324	0.631	0.427
Yes	1	2		
Asthma disease				
No	60	314		
Yes	4	12	0.897	0.343
Hypertension during pregnancy (preeclampsia)				
No	59	297	0.079	0.779
Yes	5	29		
Vaginal delivery				
No	41	179		
Yes	23	147	1.82	0.177
You were born by cesarean section				
No	60	318	2.59	0.108
Yes	4	8		
Had a miscarriage before				
No	38	215	1.02	0.314
Yes	26	111		
Ever given birth to a dead baby				
No	58	289	0.213	0.645
Yes	6	37		
Have a history of preterm delivery before 37 weeks				
No	49	258	0.212	0.645
Yes	15	68		

Significant $p<0.05$.

Table 4: Logistic regression analysis for factors associated with gestational diabetes.

Variables	Odds ratio (OR)	95% confidence interval (CI)	P value
Age (≤30 versus >30)	2.15	1.12-4.10	0.021
Nationality (Saudi versus Non-Saudi)	0.88	0.55-1.41	0.635
BMI (≤18.5 versus 18.5 - 24.9 versus 25-29.9 versus ≥30)			
≤18.5	3.27	1.41-7.62	0.005
18.5-24.9	1.12	0.69-1.82	0.647
25-29.9	1.48	0.91-2.40	0.118
≥30	1.95	1.19-3.21	0.009
Any relative diagnosed with diabetes (yes versus no)	1.74	1.01-3.00	0.048
Diagnosed with PCOS (yes versus no)	1.22	0.77-1.94	0.382
Hypertension (yes versus no)	1.09	0.64-1.86	0.721
Hypothyroid disease (yes versus no)	2.84	1.67-4.81	0.001
Hyperthyroid disease (yes versus no)	1.15	0.67-1.97	0.598
Heart disease (yes versus no)	0.92	0.51-1.67	0.784
Asthma (yes versus no)	0.87	0.48-1.58	0.673
Preeclampsia (yes versus no)	1.32	0.78-2.24	0.289
Vaginal delivery (yes versus no)	1.05	0.71-1.56	0.792
Cesarean section (yes versus no)	0.98	0.52-1.84	0.947
Miscarriage history (yes versus no)	1.18	0.77-1.81	0.425
Stillbirth (yes versus no)	1.42	0.81-2.49	0.211
Premature delivery (yes versus no)	1.67	1.08-2.58	0.024

Regarding other chronic diseases, 95.9% (n=374) reported no history of hypertension, 92.8% (n=362) reported no thyroid disease, 99.2% (n=387) reported no heart disease, 99.7% (n=389) reported no liver disease, 91.3% (n=356) reported no kidney disease, and 91.3% (n=356) reported no history of preeclampsia. Vaginal delivery was reported by 49.3% (n=170) of participants. A small percentage (0.5%, n=12) reported having a previous cesarean section. A significant proportion (35.1%, n=137) had experienced a miscarriage, while 89% (n=347) reported never having given birth to a stillborn baby.

A notable 21.3% (n=83) reported a history of preterm delivery before 37 weeks. Most participants (88.5%, n=345) reported having a normal birth. Other birth deformities were reported in a small number of cases: atrophy of the brain (1.0%, n=4), Down syndrome (0.5%, n=2), no child before (8.7%, n=34), heart disease (0.3%, n=1), celiac disease (0.3%, n=1), Williams syndrome (0.3%, n=1), and hydrocephalus (0.5%, n=2). About 2.1% (n=8) reported primary or secondary smoking history.

Table 3 examines the association between women with gestational diabetes and those without, analyzing various demographic and medical factors. A significant association ($p<0.05$) was found between gestational diabetes and some variables. Women younger than or equal to 30 years old were more likely to be diagnosed with gestational diabetes ($\chi^2=4.55$, $p=0.033$) compared to women older than 30. Participants with hypothyroidism were significantly more likely to have gestational diabetes ($\chi^2=8.552$, $p=0.003$). Women with a BMI of 25.0-29.9 and above were likelier to have gestational diabetes than those in other BMI categories ($\chi^2=8.29$, $p=0.04$), and the same significant result was shown with those with underweight. While the majority of participants with gestational diabetes were Saudi (n=62), a small number of non-Saudi participants (n=2) were also diagnosed.

Table 4 shows the regression analysis that was conducted to investigate the association between various factors and the risk of gestational diabetes, highlighting several significant associations. Women younger than or equal to 30 years old were significantly more likely to be diagnosed with gestational diabetes (OR=2.15, 95% CI: 1.12-4.10, p=0.021). A significant association was found between BMI and gestational diabetes risk. Underweight women (BMI≤18.5 and ≥30) had a significantly higher risk when compared to the normal weight range (OR=3.27, 95% CI: 1.41-7.62, p=0.005) and (OR=1.95, 95% CI: 1.19-3.21, p=0.009). The risk also increased for obese women (OR=1.95, 95% CI: 1.19-3.21, p=0.009), although not reaching statistical significance for overweight women. Women with a family history are at a higher risk of developing GDM (OR=1.74, 95% CI: 1.01-3.00, p=0.048). Participants with hypothyroidism were significantly more likely to have gestational diabetes (OR=2.84, 95% CI: 1.67-4.81, p=0.001), premature delivery (OR=1.65, 95% CI: 1.08-2.58, p=0.024). There was no significant association between GDM and nationality, PCOS, hypertension, hyperthyroid disease, heart disease, asthma, preeclampsia, vaginal delivery, cesarean section, miscarriage history or stillbirth.

Table 5: Qualitative insights on women's experiences with gestational diabetes mellitus (GDM): diagnosis, knowledge, daily impact, and management feelings.

Theme	Codes	Results
Experiences with diagnosis	Emotional response	Many women felt anxious, scared, overwhelmed, or confused when they first received the GDM diagnosis
	Support systems	Most reported seeking support from family, friends, or healthcare providers, which helped alleviate anxiety
	Information clarity	Confusion regarding the implications of GDM was common; effective communication from healthcare providers was crucial for understanding
	Stigmatization	Some women experienced feelings of guilt or shame, believing they had failed in their health management
Knowledge and perceptions of risk factors	Awareness of risk factors	Many women were aware of obesity and age as risk factors but lacked in-depth knowledge about genetic predispositions and prior health conditions
	Misconceptions	Some women had misconceptions that GDM was entirely caused by their diet, neglecting other contributing factors such as stress and family history
	Educational resources	Resources varied significantly; some women sought additional information online or from peer groups
	Clarity of risk information	Clear and straightforward information about GDM risks helped many women feel more informed and better prepared
Impact on daily life	Lifestyle changes	Significant adjustments to diet and physical activity routines were reported, but adherence varied among individuals
	Work and social life	Challenges were noted in balancing work responsibilities and social life, with some experiencing isolation due to dietary restrictions
	Mental health impact	Increased stress, anxiety, and worry about health were frequently reported, with some women developing coping mechanisms
	Physical discomfort	Some women experienced physical symptoms like fatigue or discomfort, affecting their daily activities
Feelings about managing GDM	Coping strategies	Many developed personal strategies for managing GDM, such as meal prepping, exercise routines, and regular monitoring of blood glucose levels
	Perception of control	Feelings of empowerment varied; some found solace in actively managing their condition, while others felt overwhelmed by the demands
	Future concerns	Concerns about long-term health implications for themselves and their babies, as well as the possibility of GDM in future pregnancies, were pervasive
	Community connections	Some women felt a sense of community with others who had GDM, sharing tips and emotional support, which helped diminish feelings of isolation
Healthcare experience	Access to care	Some reported positive experiences with healthcare providers, while others faced challenges in accessing consistent care or support
	Follow-up care	Regular follow-up appointments were viewed positively, but many desired more frequent or tailored follow-up that addressed their specific concerns
	Quality of communication	Many women expressed the need for better communication from healthcare teams regarding GDM management and treatment options
Nutritional knowledge and challenges	Understanding of dietary needs	Although many received dietary guidelines, there was often confusion regarding how to interpret them in daily life
	Cooking and meal preparation	Women faced challenges in finding recipes or meal ideas that fit within GDM dietary recommendations, leading to frustration
	Social dining situations	Navigating social events or dining out was often stressful, with concerns about food choices and possible blood sugar implications

Qualitative results

The qualitative insights captured in Table 5 highlight the multifaceted experiences of women diagnosed with gestational diabetes mellitus (GDM) across various domains: their experiences with the diagnosis, perceptions of risk factors, daily life impacts, management of the condition, healthcare experiences, and nutritional issues.

Experience of diagnosis

Most of the women who were diagnosed with GDM reported having anxiety, fears, and being confused about the DMT2. Many sought help from their close relatives,

friends, and health personnel, which benefited them during such a difficult period.

Knowledge and perceptions of risk factors

While a notable number of women were aware of the common risk factors for GDM, such as obesity and advanced maternal age, there was often a lack of understanding regarding other contributors, including genetic predispositions. Misconceptions existed, particularly the belief that GDM was solely diet-related. Some women expressed a desire to improve their understanding of GDM, and this comprehension was regularly sought from various relevant sources, which in turn influenced their management of GDM.

Impact on daily life

The diagnosis called for significant modifications to one's lifestyle such that many women changed their calorie intake and engaged in more exercise than previously; however, the extent of adherence to such changes was different. Other women added social dimensions to stress and isolation due to dietary regimen changes, often challenging to implement and sustain within their working contexts. The reviews also reported higher levels of distressing psychological symptomology, including stress and anxiety, and other factors, including tiredness due to physical strain.

Perception on managing GDM

To manage GDM, women employed various coping strategies, including meal preparation, blood glucose control, and regular physical activity. There was a spectrum of feelings regarding personal control; some women felt empowered by managing their condition, while others were overwhelmed by the demands of treatment. The majority of those surveyed felt apprehensive about the aftermath of GDM, especially about their health and that of their young ones. Several were concerned that they could suffer from GDM if they were to conceive in the future.

Healthcare experience

The experiences with healthcare providers varied significantly. A few women appreciated the service; however, quite a few experienced challenges in receiving continued care and support.

Nutritional knowledge and challenges

Although women received dietary guidelines, there often needed to be more clarity about implementing these recommendations in practical, everyday situations. Meal preparation proved challenging, and navigating social dining events was frequently stressful as women grappled with food choices and their implications for blood sugar management.

DISCUSSION

This study provides important insights into the prevalence and risk factors associated with GDM during 2024 among females attending the MCH in Bisha, Saudi Arabia. The overall GDM prevalence of 16.4% highlights the growing concern of GDM in this region, underscoring the need for routine screening and early intervention strategies. Comparing these findings to previous research, the GDM prevalence in this study aligns with the results of, which reported a slightly lower GDM prevalence of 12.75% at a university hospital in Saudi Arabia.[15] Both studies point to obesity and younger age as significant risk factors for GDM. In contrast to a study that conducted a global analysis of GDM prevalence and risk factors across various continents, reporting substantial variability in GDM rates, with prevalence as high as 20-25% in some regions, particularly Asia and the Middle East. Saudi Arabia exhibited the highest prevalence of GDM globally, reaching 49.5%. While the present study's GDM prevalence of 16.4% falls within this global range, the findings add to the growing body of evidence that GDM is becoming increasingly prevalent across different regions, including Saudi Arabia. Justifications for this discrepancy could include regional variations in diet and physical activity that disproportionately affect younger Saudi women, potentially due to modernization and urban lifestyle influences.[16]

In our study, several risk factors were significantly associated with GDM, including younger age, a positive family history of diabetes mellitus, overweight/obesity, and, interestingly, underweight. However, the association between underweight and GDM should be interpreted cautiously due to the small sample size in this BDM category, which may influence the results. Additionally, hypothyroidism and a history of premature delivery were notable risk factors. These findings are consistent with existing literature, highlighting the importance of addressing these risk factors in the prevention and management of GDM. Further research with larger sample sizes is needed to confirm these associations and explore underlying mechanisms.[17-19]

In our study, a significant proportion of participants had PCOS, a condition associated with insulin resistance. Despite PCOS being a known risk factor, we found no statistical significance in our results. This could be influenced by environmental or genetic factors specific to our population or due to the small sample size, which may have reduced the study's power to detect true effects. Further research with larger, more diverse cohorts is needed to elucidate these relationships and confirm our findings. Studies have consistently shown that PCOS is associated with insulin resistance, affecting up to 80% of patients.[20,21] This association is well-documented and is a key factor in the pathophysiology of PCOS.[22-25]

In our study, the highlighted advanced maternal age (≥35 years) as a risk factor, while this study found that younger

women (≤30 years) were more likely to develop GDM. This discrepancy may reflect regional or demographic differences, suggesting that younger Saudi women may be increasingly susceptible to GDM due to lifestyle factors, such as diet and physical activity levels. These findings are consistent with studies that emphasize the role of obesity and metabolic factors in GDM development, with both studies highlighting overweight and obese women as being at a particularly high risk. This age-related difference underlines the importance of tailoring public health strategies to address these emerging risk factors specific to younger populations.[15,16]

Overall, the findings aligned with national and international evidence. These findings highlight the complex interplay of demographic, lifestyle, and metabolic factors in GDM risk. They underscore the need for tailored public health interventions focusing on education, lifestyle modification, and early screening to mitigate GDM risk, particularly among younger women and those with metabolic health issues. Future research should continue exploring these dynamics to develop effective preventive and management strategies for GDM globally.[26-28]

The study's finding that GDM was predominantly diagnosed among Saudi women, with a small percentage of non-Saudi participants also affected, underscores the universal nature of GDM risk. This observation aligns with the broader understanding that GDM is not confined to specific ethnicities or nationalities but is influenced by a complex interplay of genetic, environmental, and lifestyle factors. Comparative studies from various regions have similarly reported a high prevalence of GDM among different demographic groups, indicating that the condition is a global public health concern. For instance, research from countries such as India, Italy, and Norway has shown significant rates of GDM across diverse populations, emphasizing the need for universal screening and management strategies.[29-31] The study's results justify the implementation of comprehensive GDM screening and intervention programs that are inclusive of all females, regardless of nationality or ethnic background. This approach is crucial for early detection and management of GDM, which can reduce the risk of adverse maternal and fetal outcomes. Furthermore, the findings underscore the importance of public health initiatives that prioritize lifestyle modifications and education about GDM risk factors. Such initiatives can be particularly beneficial in regions with high rates of GDM, including Saudi Arabia, where they can help mitigate the increasing burden of the disease.

The qualitative insights gained from this study provide a deeper understanding of the emotional, practical, and healthcare-related challenges faced by women diagnosed with gestational diabetes mellitus (GDM). The results underscore the complex and multifaceted experiences of these women, highlighting areas that require improvement in terms of communication, support, and education. Comparative studies have also documented similar challenges faced by women with GDM across different cultural and geographical contexts. For instance, research from Canada, Ireland, and the United Kingdom have identified feelings of isolation, anxiety, and frustration among women with GDM, as well as difficulties in managing dietary restrictions and physical activity.[32-34] The results of this study justify the need for enhanced support systems and educational programs tailored to the specific needs of women with GDM. These interventions should aim to address the emotional and practical challenges by providing psychological support, peer support groups, and accessible information on managing GDM. Additionally, improving communication between healthcare providers and patients is crucial to ensure that women with GDM receive clear, consistent, and empathetic guidance throughout their pregnancy. Moreover, the findings underscore the importance of healthcare providers being sensitive to the individual experiences of women with GDM. This includes recognizing the emotional impact of the diagnosis and providing personalized care that takes into account the woman's lifestyle, cultural background, and socioeconomic status.

The findings suggest a need for comprehensive support systems, improved education on GDM risk factors and management, and enhanced communication from healthcare providers to improve maternal and child health outcomes. The findings point to a clear need for more comprehensive support systems that address both the emotional and practical challenges of living with GDM. Enhanced education around GDM risk factors, including a focus on the role of genetics and lifestyle factors beyond diet, could help women better understand their condition. Additionally, improving the communication between healthcare providers and patients, particularly in terms of dietary management and treatment options, would significantly improve the overall experience of women diagnosed with GDM. Addressing these areas could mitigate many of the difficulties faced by women and improve their ability to manage their condition effectively during and after pregnancy.

The study emphasizes the necessity for targeted interventions focusing on lifestyle modifications and preventative care as essential measures to curb the rising prevalence of GDM, thereby improving maternal and fetal health outcomes in the region. It also calls for ongoing research to further elucidate the underlying causes of GDM's prevalence and variability across different populations.

The study's limitations must be considered when analyzing the results. First, it is a single-center study, which may restrict the validity of the findings to other populations and locations. Secondly, because of its cross-sectional design, the study allows for the depiction of the so-called time frame of the data, rather than because risk factors may change over time, and the probability that

GDM will develop may be affected. Thirdly, the small sample size diminishes the power of the study in detecting actual effects. These limitations required caution in interpreting the results. They remind us to critically evaluate the study's findings and be aware of potential limitations. They also highlight the importance of conducting larger, multi-center studies with longitudinal designs. This emphasis on further research is essential, as it ensures that we constantly expand our knowledge and understanding in the field.

CONCLUSION

The research highlighted the importance of many factors, like education, the role of health care guidance, and communication, to address the emotional and practical challenges that GDM faces. Addressing these areas is essential for enhancing maternal and child health outcomes and for curbing the rising tide of diabetes in the region. An extended multicentre study addressing GDM is recommended to address these growing problems in Saudi Arabia.

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REFERENCES

1. Sweeting A, Wong J, Murphy H, Ross G. A clinical update on gestational diabetes mellitus. Endocr Rev. 2022;43(5):763-93.
2. Choudhury A, Devi Rajeswari V. Gestational diabetes mellitus- a metabolic and reproductive disorder. Biomed Pharmacother. 2021;143:112183.
3. Yong HY, Mohd Shariff Z, Mohd Yusof BN, Rejali Z, Bindels J, Tee YY, et al. High physical activity and high sedentary behavior increased the risk of gestational diabetes mellitus among women with excessive gestational weight gain: a prospective study. BMC Pregnancy Childbirth. 2020;20(1):597.
4. Yahaya T, Salisu T, Abdulrahman Y, Umar A. Update on the genetic and epigenetic etiology of gestational diabetes mellitus: a review. Egypt J Med Hum Genetics. 2020;21(1):13.
5. Sibiak R, Jankowski M, Gutaj P, Mozdziak P, Kempisty B, Wender-Ożegowska E. Placental lactogen as a marker of maternal obesity, diabetes, and fetal growth abnormalities: current knowledge and clinical perspectives. J Clin Med. 2020;9(4):1142.
6. Kampmann U, Knorr S, Fuglsang J, Ovesen P. Determinants of maternal insulin resistance during pregnancy: an updated overview. J Diabetes Res. 2019;2019:1-9.
7. Rastogi S, Rastogi D. The epidemiology and mechanisms of lifetime cardiopulmonary morbidities associated with pre-pregnancy obesity and excessive gestational weight gain. Front Cardiovasc Med. 2022;9.
8. Lewandowska M. Gestational diabetes mellitus (GDM) risk for declared family history of diabetes, in combination with BMI Categories. Int J Environ Res Public Health. 2021;18(13):6936.
9. Nakshine V, Jogdand S. A comprehensive review of gestational diabetes mellitus: impacts on maternal health, fetal development, childhood outcomes, and long-term treatment strategies. Cureus. 2023;5(10).
10. Alshomrany A, Miskeen E, Alfaifi J, Alshamrani H, Alshahrani A. Maternal diabetes mellitus and neonatal outcomes in Bisha: a retrospective cohort study. Med Sci. 2024;12(2):21.
11. Staynova R, Vasileva E, Yanachkova V. Gestational diabetes mellitus: a growing economic concern. Folia Med. 2022;64(5):725-32.
12. Abualhamael S, Mosli H, Baig M, Noor AM, Alshehri FM. Prevalence and associated risk factors of gestational diabetes mellitus at a university hospital in Saudi Arabia. Pak J Med Sci. 2019;35(2):325-9.
13. Albejaidi F, Nair K. Addressing the burden of non-communicable diseases; Saudi Arabia's challenges in achieving vision 2030. J Pharm Res Int. 2021;13:34-44.
14. Alsaedi SA, Altalhi AA, Nabrawi MF, Aldainy AA, Wali RM. Prevalence and risk factors of gestational diabetes mellitus among pregnant patients visiting National Guard primary health care centers in Saudi Arabia. Saudi Med J. 2020;41(2):144-50.
15. Abualhamael S, Mosli H, Baig M, Noor AM, Alshehri FM. Prevalence and associated risk factors of gestational diabetes mellitus at a university hospital in Saudi Arabia. Pak J Med Sci. 2019;35(2):325-9.
16. Dłuski DF, Ruszała M, Rudziński G, Pożarowska K, Brzuszkiewicz K, Leszczyńska-Gorzelak B. Evolution of gestational diabetes mellitus across continents in 21st century. Int J Environ Res Public Health. 2022;19(23).
17. Ott R, Stupin JH, Loui A, Eilers E, Melchior K, Rancourt RC, et al. Maternal overweight is not an independent risk factor for increased birth weight, leptin and insulin in newborns of gestational diabetic women: observations from the prospective 'EaCH'cohort study. BMC Pregnancy Childbirth. 2018;18(1):250.
18. Ke JF, Liu S, Ge R Le, Ma L, Li MF. Associations of maternal pre-pregnancy BMI and gestational weight gain with the risks of adverse pregnancy

outcomes in Chinese women with gestational diabetes mellitus. BMC Pregnancy Childbirth. 2023;23(1).
19. Mantzorou M, Papandreou D, Pavlidou E, Papadopoulou SK, Tolia M, Mentzelou M, et al. Maternal gestational diabetes is associated with high risk of childhood overweight and obesity: a cross-sectional study in pre-school children aged 2-5 years. Medicina. 2023;59(3):455.
20. Ding H, Zhang J, Zhang F, Zhang S, Chen X, Liang W, et al. Resistance to the insulin and elevated level of androgen: a major cause of polycystic ovary syndrome. Front Endocrinol. 2021;12:741764.
21. Xu Y, Qiao J. Association of insulin resistance and elevated androgen levels with polycystic ovarian syndrome (PCOS): a review of literature. J Healthcare Eng. 2022;2022.
22. Khan MJ, Ullah A, Basit S. Genetic basis of polycystic ovary syndrome (PCOS): current perspectives. Appl Clin Genet. 2019;12:249-60.
23. Shaaban Z, Khoradmehr A, Amiri-Yekta A, Nowzari F, Jafarzadeh Shirazi MR, Tamadon A. Pathophysiologic mechanisms of insulin secretion and signalling-related genes in etiology of polycystic ovary syndrome. Genet Res. 2021;2021.
24. Galluzzo A, Amato MC, Giordano C. Insulin resistance and polycystic ovary syndrome. Nutr Metab Cardiovasc Dis. 2008;18(7):511-8.
25. Chen Y, Wan K, Gong Y, Zhang X, Liang Y, Wang X, et al. Assessing the relationship between pregravid body mass index and risk of adverse maternal pregnancy and neonatal outcomes: prospective data in Southwest China. Sci Rep. 2021;11(1):7591.
26. Grieger JA, Hutchesson MJ, Cooray SD, Bahri Khomami M, Zaman S, Segan L, et al. A review of maternal overweight and obesity and its impact on cardiometabolic outcomes during pregnancy and postpartum. Ther Adv Reprod Health. 2021;15:2633494120986544.
27. Parrettini S, Caroli A, Torlone E. Nutrition and metabolic adaptations in physiological and complicated pregnancy: focus on obesity and gestational diabetes. Front Endocrinol. 2020;11.
28. Poblete JA, Olmos P. Obesity and gestational diabetes in pregnant care and clinical practice. Curr Vasc Pharmacol. 2021;19(2):154-64.
29. Balaji B, Ram U, Mohan V. Screening, diagnosis and management of gestational diabetes mellitus. J Indian Inst Sci. 2023;103(1):371-9.
30. Vitacolonna E, Succurro E, Lapolla A, Scavini M, Bonomo M, Di Cianni G, et al. Guidelines for the screening and diagnosis of gestational diabetes in Italy from 2010 to 2019: critical issues and the potential for improvement. Acta Diabetol. 2019;56(11):1159-67.
31. Henkel PS, Burger EA, Sletner L, Pedersen K. Exploring structural uncertainty in cost-effectiveness modelling of gestational diabetes screening: an application example from Norway. Med Decision Making. 2024;44(4):380-92.
32. Tschirhart H, Landeen J, Yost J, Nerenberg KA, Sherifali D. Perceptions of diabetes distress during pregnancy in women with type 1 and type 2 diabetes: a qualitative interpretive description study. BMC Pregnancy Childbirth. 2024;24(1).
33. Smyth S, Mulligan K, Rutter E, Harrington L, Hatunic M, Higgins MF. Attitudes of women with gestational diabetes toward diet and exercise: a qualitative study. J Matern Fetal Neonat Med. 2023;36(1).
34. Moore A, Astbury N, Poduval S, Ross J. How can we improve engagement with gestational diabetes self-management guidance and lifestyle change during pregnancy and beyond? A thematic analysis amongst a diverse sample of UK women. Researchsquare. 2023.

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