

## ORIGINAL RESEARCH ARTICLE

# Prevalence and risk factors for gestational diabetes in Jambi, Indonesia

DOI: 10.29063/ajrh2024/v28i10s.14

Ratna S. Dewi<sup>1\*</sup>, Santi Martini<sup>2</sup> and Muhammad A. Isfandiari<sup>2</sup>

Doctoral Program in Public Health, Universitas Airlangga, Surabaya, 60115, Indonesia<sup>1</sup>; Department of Public Health, Universitas Airlangga, Surabaya, 60115, Indonesia<sup>2</sup>

\*For Correspondence: Email: [ratna.sari.dewi-2021@fkm.unair.ac.id](mailto:ratna.sari.dewi-2021@fkm.unair.ac.id); Phone: +6281366179336

### Abstract

The most common time for gestational diabetes mellitus (GDM), which affects anywhere from 1% to 40% of pregnant women, is between the 24th and 28th week of pregnancy. One of the provinces in Indonesia, Jambi, was the focus of this study, which aimed to characterize the incidence and risk factors of GDM. One hundred twenty-two women without GDM and twelve women with GDM participated in this case control research. Oral glucose tolerance tests were used to diagnose gestational diabetes mellitus (GDM) in women who were assessed between 24 and 28 weeks of gestation. Data Collection in this research used questionnaire about woman's social demographics, history GDM, parity, family support, and social support. Multivariate analysis is used to measure the relationship between variables. The results of the study showed a high prevalence of GDM of 37.6%. The identified risk factors were hypertension (OR=2,121;CI95%=1,405-3,203), family history of DM (OR=1,610;CI95%=1,333-1,946),BMI>30 kg/m<sup>2</sup>(OR=1,465;CI95%=1,243-1,727) and history of GDM previous pregnancy (OR=2,857;CI95%=0,839-9,727). We conclude that a GDM risk factor score is required so that health services can utilize these indicators as gold standards for screening GDM, due to the large heterogeneity in GDM risk factors. (*Afr J Reprod Health 2024; 28 [10s]: 118-124*).

**Keywords:** Gestational diabetes mellitus, risk factors, Jambi

### Résumé

La période la plus courante de diabète sucré gestationnel (DG), qui touche entre 1 % et 40 % des femmes enceintes, se situe entre la 24<sup>e</sup> et la 28<sup>e</sup> semaine de grossesse. L'une des provinces d'Indonésie, Jambi, a fait l'objet de cette étude, qui visait à caractériser l'incidence et les facteurs de risque du DG. Cent vingt-deux femmes sans DG et douze femmes avec DG ont participé à cette recherche cas-témoins. Des tests oraux de tolérance au glucose ont été utilisés pour diagnostiquer le diabète sucré gestationnel (DG) chez les femmes évaluées entre 24 et 28 semaines de gestation. La collecte de données dans cette recherche a utilisé un questionnaire sur la démographie sociale de la femme, ses antécédents de DG, la parité, le soutien familial et le soutien social. L'analyse multivariée est utilisée pour mesurer la relation entre les variables. Les résultats de l'étude ont montré une prévalence élevée de DG de 37,6%. Les facteurs de risque identifiés étaient l'hypertension (OR = 2 121 ; IC95 % = 1 405-3 203), les antécédents familiaux de diabète (OR = 1 610 ; IC95 % = 1 333-1 946), l'IMC > 30 kg/m<sup>2</sup> (OR = 1 465 ; IC95 % = 1 243-1 727) et antécédents de grossesse antérieure avec diabète gestationnel (OR=2 857 ; IC95 % =0,839-9 727). Nous concluons qu'un score de facteur de risque de DG est nécessaire pour que les services de santé puissent utiliser ces indicateurs comme référence en matière de dépistage du DG, en raison de la grande hétérogénéité des facteurs de risque de DG. (*Afr J Reprod Health 2024; 28 [10s]: 118-124*).

**Mots-clés:** : Diabète sucré gestationnel, facteurs de risque, Jambi

### Introduction

Glucose intolerance during pregnancy is known as gestational diabetes mellitus (GDM). Worldwide, the prevalence of GDM ranges from 7.6% to 11.6%, with the highest rates observed in Asia and the Pacific Islands<sup>1</sup>. There is a positive correlation between the prevalence of obesity and the incidence of GDM<sup>2</sup>. Because of differences in reporting methodologies and the possibility that some

pregnant women had undiagnosed diabetes rather than hyperglycemia caused by pregnancy, estimating the prevalence of GDM is challenging. Prenatal care visits<sup>3-6</sup> may be the first time asymptomatic, younger women with diabetes are diagnosed, rather being screened for the disease<sup>3-6</sup>. According to the same report, projections suggest that by 2030, Indonesia will likely see a considerable rise<sup>7</sup>, with an estimated 21.3 million individuals affected by diabetes mellitus (DM) (World Health

Organization, 2020). Referring to the national prevalence of DM based on the 2018 Riskesdas survey among individuals aged over 15, it stands at 2.0% (National Institute of Health Research and Development, 2018). In Jambi Province, the incidence of DM was recorded at 5.2% during the 2007 Riskesdas survey, which subsequently declined to 1.2% in the 2013 findings, only to rise again to 1.4% by 2018<sup>8</sup>. The gender distribution of DM cases in Riskesdas indicates a higher prevalence among women compared to men, as observed in data from the Jambi Provincial Health Office in 2019. Based on the results of Sari and Haflin's<sup>2</sup> research, 81% of women in Jambi have a history of DM. This certainly provides a negative risk when women are pregnant<sup>3</sup>.

Based on the research evidence, Getahun *et al*<sup>1</sup> explained that For women without a history of gestational diabetes mellitus (GDM), the probability of acquiring GDM in the next pregnancy was 4.2%, whereas for those with current GDM, it was 41.3%. After a diagnosis of GDM, the chance of acquiring diabetes increases to 21.1% after 10 years and 6.9% after 5 years<sup>9</sup>. GDM therapy will reduce the risk of macrosomia, shoulder dystocia, and gestational hypertension<sup>10</sup>. Research has uncovered a plethora of possible risk factors for GDM. The mother's age, BMI, parity, history of diabetes in her family, and smoking habits are all risk factors for macrosomia. Everyone now agrees that GDM prevention and control should get greater support<sup>11-15</sup>.

Evidence from epidemiological studies has also indicated that overweight and obesity are associated with the development of type 2 diabetes<sup>12</sup>. A recent meta-analysis showed that the absolute risk for developing type 2 diabetes for obese women exceeds 3% after 10 years<sup>16</sup>. Additionally, many studies have shown that pre-pregnancy obesity, overweight, and induced hypertension are independent risk factors for gestational diabetes mellitus<sup>12</sup>. Although many studies suggest that maternal obesity is one of the strongest risk factors for GDM, in several studies, overweight showed a higher likelihood to increase the risk of GDM and its complications<sup>17</sup>.

The objective of this study was to determine the prevalence and risk factors for GDM in Jambi. We believe the data would be useful in identifying

policies and strategies for making early diagnoses and to prevent the complications associated with GDM.

## Methods

This research utilizes a case-control study method, with the primary objective being to identify cases of GDM based on oral glucosa test results conducted between 24-28 weeks of pregnancy. Cases are selected from individuals within the health center's jurisdiction in Jambi City, while controls consist of mothers with normal blood sugar test result. In 2023, researchers in Jambi City, Indonesia, studied 324 pregnant women; 122 of these women met the inclusion criteria for the study group due to diabetes they had during their pregnancies, while 202 women served as controls. Here are the inclusion criteria: The following criteria must be met in order for a patient to be diagnosed with gestational diabetes mellitus (GDM) during pregnancy, according to the guidelines set out by the Diabetes Association: a fasting glucose level between 92 and 125 mg/dl (5.1 to 6.9 mmol/l), a glucose level between 153 and 199 mg/dl (8.5 to 11.1 mmol/l), or a glucose level between 180 and 240 mg/dl (10.1 mmol/l) within 60 minutes of testing, or a glucose level between 153 and 199 mg/dl (8.5-11 mmol/l) after 2 hours of testing.

A comprehensive questionnaire was filled out by each participant, which inquired about their age, education, socioeconomic status, family income, occupation, history of gestational diabetes mellitus (GDM), family history of diabetes, hypertension, body mass index (BMI), parity, social support, and medical history (including fasting glucose and 2-hour glucose values in the oral glucose tolerance test (OGTT) and treatment of gestational diabetes mellitus during pregnancy).

With decision no. LB.02.06/2/154/2023, the Health Research Ethics Committee of Health Politechnic Jambi authorized the study. Every healthcare facility that participated in the study was also approached for permission. Everyone involved made sure the participants knew their identities would remain anonymous, and they gave their consent voluntarily. They were also made aware, prior to the study's commencement, that the results would be utilized only for research.

## Results

The mean age of the participants was 28,48 (range 15-45 years), while the mean BMI was 26,43 kg/m<sup>2</sup> (range 16-50). The analysis of the educational level of respondents showed that 56.5% were in high school; up to 67.3% were in lower socio-economic level; while 84.6% did not suffer from hypertension. In the control group, the majority were pregnant women in the age ≤30 (97.5%), elementary school (56,9%), 50,5% obesity and without have family support (58,9%), without have social support (86,6%). The results are shown in Table 1.

Education, socioeconomic status, parity, body mass index (BMI), blood pressure, history of gestational diabetes mellitus (GDM) in a previous pregnancy, first-time pregnancy age, stress level, family and community support, and several other maternal characteristics are shown to be associated with the incidence of gestational diabetes mellitus (GDM) in table 1.

According to statistical analysis, factors that increase the likelihood of gestational diabetes mellitus (GDM) in pregnant women include socioeconomic status (p-value 0.000; OR 0.677), blood pressure (p-value 0.000; OR 2,121), a history of DM in the family (p-value 0.000; OR 1,610), and a mother's own experience with GDM in prior pregnancies (p-value 0.030; OR 2,857).

## Discussion

During pregnancy, changes in endocrine and carbohydrate metabolism occur for fetal nutrition and preparation for breastfeeding<sup>18</sup>. This condition affects the condition of the pancreas of pregnant women, resulting in an increase in insulin production which can increase blood glucose levels. The occurrence of hyperglycemia in pregnant women if not treated, can result in development of type 2 diabetes mellitus in later life<sup>19</sup>. The incidence of GDM tends to occur in the third trimester (at 28-40 weeks of gestation) compared to the second trimester. So far efforts to diagnose GDM in Jambi City have never been carried out, the ANC program is carried out in an effort to check the blood sugar of pregnant women only in the first trimester or when the first ANC examination is carried out and if the results of the blood sugar examination are suspected to be high based on the results of the GDS

examination then the examination is continued at the next trimester, while based on the theory above, an increase in blood glucose in pregnant women occurs in the third trimester. The prevalence of GDM in the city of Jambi based on the results of research that has been conducted is 37.6%, the average fasting blood glucose level for 8 hours before giving oral glucose to pregnant women is lower than the average blood glucose level for pregnant women 2 hours after giving it. oral glucose (OGTT). Based on International Association of Diabetes and Pregnancy Study Groups (IADPSG) the results of checking blood sugar levels according to the recommendations of the American Diabetes Association (ADA), this research analyzed social factor variables and biological factors affecting 324 pregnant women. Among them, 122 had gestational diabetes mellitus (GDM) and 202 did not. The research used a case control study design.

Based on the research results, the prevalence rate of GDM in Jambi City was 37.6%, where this research was carried out in all health services in Jambi City (PKM) by taking blood from pregnant women in 2 stages, namely taking fasting blood sugar and 2 post-fasting hours. The research results show that there are several risk factors associated with the incidence of GDM, namely socioeconomics, blood pressure, family history of DM, mother's history of suffering from GDM in previous pregnancies.

The results of this research are in line with research conducted<sup>13</sup>, which states that 48% of GDM can recur in the next pregnancy or an increase in glucose can occur after delivery and will increase the risk of type 2 DM in the future (CI 95% 41-54). The results of other researchers also show that there is a relationship between social factors and the increase in the incidence of GDM<sup>3,20</sup>.

Socioeconomic status, blood pressure, body mass index (BMI) (obesity), a history of gestational diabetes mellitus (GMM) in the mother, and a family history of DM were all significantly linked to GDM in the multivariate analysis described. Consistent with earlier studies, this one finds that obesity, hypertension, and a family history of diabetes are risk factors for gestational diabetes mellitus (GDM)<sup>3,11,12,20-22</sup>. On the other hand, we failed to discover a substantial correlation with social and familial support. The findings are consistent with other studies<sup>23</sup>.

**Table 1:** The characteristic of women with and without GDM

No.	Characteristics	Cases (N) % 122	Controls (N) % 202	
1	Education	College	28.7	22.8
		High school	2.5	5.4
		Middle school	11.5	14.8
		Elementary school	55.7	56.9
		No school	1.6	0
2	Socio economic	Low	54.1	75.2
		High	45.9	24.8
3	BMI	Obesity	74.6	49.5
		Not obesity	25.4	50.5
4	Blood pressure	Hypertension	27.9	7.9
		Not hypertension	72.1	92.1
5	Parity	Risk	6.6	6.9
		Not risk	93.4	93.1
6	Family history of DM	Yes	65.6	35.1
		No	34.4	64.9
7	History of GDM previous pregnancy	Yes	5.7	1.0
		No	94.3	99.0
8	The first age pregnancy	Risk (>30 year)	2.5	2.5
		Not risk ( $\geq$ 30 year)	97.5	97.5
9	Stage of stress	Risk	61.5	70.8
		Not risk	38.5	29.2
10	Family support	Yes	56.6	58.9
		No	43.4	41.1
11	Community support	No	89.3	86.6
		Yes	10.7	13.4

Women with diabetes who reported greater quality of life assessments also reported higher levels of social support across all measures of social support in our study<sup>24,25</sup>. Lack of correlation between social support and living conditions is a subjective experience, according to<sup>26,27</sup>. This variable does not show a statistically significant relationship with GDM.

The results of this research are in line with research conducted<sup>13</sup> which states that 48% of GDM can recur in the next pregnancy or an increase in glucose can occur after delivery and will increase the risk of type 2 DM in the future (CI 95% 41-54). The results of other researchers also show that there is a relationship between social factors and the increase in the incidence of GDM<sup>19</sup>. The weaknesses of this study the respondents of pregnant women in Jambi

City, where the pregnant women were given intervention by fasting for 8 hours before the OGTT and then being loaded with oral glucose of 75 grams of glucose after fasting. Another weakness of this study is difficult to collect pregnant women at several health centers whose access is far from the health center.

In order to alleviate the burden of diabetes and its complications among Indonesian women, the National Diabetes Education program<sup>28</sup>, suggests that doctors should direct their patients with gestational diabetes mellitus (GDM) to information about the risk of developing diabetes and should ask for diabetes testing after giving birth<sup>29,30</sup>. Obese women with a history of diabetes mellitus (DM) in their families should be warned that their doctors should take extra measures to check for the disease.

**Table 2:** The relationship with social economic, age, BMI, hypertension and social support

No	Variable	Without GDM		GDM		Total		OR	95 % CI	p
		n	%	n	%	n	%			
1	Socio economic									
	High	50	24.8	56	45.9	106	32.7	0.677	0.543-0.843	0.000
	Low	152	75.2	66	54.1	218	67.3			
2	BMI									
	Not obesity	102	50.5	31	25.4	133	41.0	1.465	1.243-1.727	0.000
	Obesity	100	49.5	91	74.6	191	59.0			
3	Blood pressure									
	Not hypertension	186	92.1	88	72.1	274	84.6	2.121	1.405-3.203	0.000
	Hypertension	16	7.9	34	27.90	50	15.4			
4	Parity									
	Not risk	188	93.1	144	93.4	302	93.2	0.978	0.705-1.358	1.000
	Risk	14	6.9	8	6.6	22	6.8			
5	Family history of DM									
	No	131	64.9	42	34.4	173	53.4	1.610	1.333-1.946	0.000
	Yes	71	35.1	80	65.6	151	46.6			
6	History of GDM previous pregnancy									
	No	200	99.0	115	94.3	315	97.2	2.857	0.839-9.727	0.030
	Yes	2	1.0	7	5.7	9	2.8			
7	The first age pregnancy									
	Not risk ( $\leq 30$ year)	197	97.5	119	97.5	316	97.5	0.997	0.579-1.718	1.000
	Risk ( $>30$ year)	5	2.5	3	2.5	8	2.5			
8	Stage of stress									
	Not risk	59	29,2	47	38.5	106	32.7	0.849	0.698-1.031	0.107
	Risk	143	70,8	75	61.5	218	67.3			
9	Family support									
	Yes	83	41,1	53	43.4	136	42	0.964	0.811-1.146	0.764
	No	119	58,9	69	56.6	188	58			
10	Community support									
	Yes	27	13,4	13	10.7	40	12.3	1.095	0.867-1,384	0.586
	No	175	86,6	109	89.3	284	87.7			

## Conclusion

The high maternal mortality rate (MMR) is still a problem in Indonesia. GDM is a health problem that can have a direct impact on the health of the mother and fetus. The prevalence of GDM in Jambi City exceeds the results of previous research, namely 37.6%. while in Indonesia based on research result-prevalence ranges from 1.9-3.6%.

## Contribution of authors

Ratna Sari Dewi: Conceptual and designed the study, collect and analysis the data

Santi Martini: Reviewed empirical studies, designed the methodology

M. Atoillah Insfandiari: Analysis the data, wrote the introduction and edited the paper

## Acknowledgement

We would like to thank the parties involved during the research up to the publication of this research, the first opportunity I would like to convey to Stikes Harapan Ibu Jambi which is the funding sponsor for GDM research in Jambi City and then the Jambi City Health Service which has collaborated in provide space while the research is taking place in the working area of the Jambi City Health Service, namely at the Jambi City Health Center.

## References

1. Getahun D, Fassett MJ and Jacobsen SJ. Gestational diabetes: risk of recurrence in subsequent pregnancies. *Am J Obstet Gynecol* [Internet]. 2010;203(5):467.e1-

- 467.e6. Available from: <https://www.sciencedirect.com/science/article/pii/S002937810006757>
2. Krishnan S, Cozier YC, Rosenberg L and Palmer JR. Socioeconomic Status and Incidence of Type 2 Diabetes: Results From the Black Women's Health Study. *Am J Epidemiol* [Internet]. 2010 Mar 1;171(5):564–70. Available from: <https://doi.org/10.1093/aje/kwp443>
  3. Casagrande SS, Linder B and Cowie CC. Prevalence of gestational diabetes and subsequent Type 2 diabetes among U.S. women. *Diabetes Res Clin Pract* [Internet]. 2018;141:200–8. Available from: <https://www.sciencedirect.com/science/article/pii/S01682271731937X>
  4. Capula C, Chiefari E, Vero A, Arcidiacono B, Iiritano S, Puccio L, Pullano V, Foti DP, Brunetti A and Vero R. Gestational Diabetes Mellitus: Screening and Outcomes in Southern Italian Pregnant Women. Tamemoto H, Zajickova K, Pachucki J, editors. *ISRN Endocrinol* [Internet]. 2013;2013:387495. Available from: <https://doi.org/10.1155/2013/387495>
  5. Egan AM and Dunne FP. Epidemiology of Gestational and Pregestational Diabetes Mellitus [Internet]. Lapolla A, Metzger BE, Lapolla A, Metzger BE, editors. Vol. 28, *Gestational Diabetes: A Decade after the HAPO Study*. S.Karger AG; 2020. p. 0. Available from: <https://doi.org/10.1159/000480161>
  6. Hod M, Kapur A, Sacks DA, Hadar E, Agarwal M, Di Renzo GC, Cabero Roura L, McIntyre HD, Morris JL and Divakar H. The International Federation of Gynecology and Obstetrics (FIGO) Initiative on gestational diabetes mellitus: A pragmatic guide for diagnosis, management, and care(). *Int J Gynaecol Obstet Off organ Int Fed Gynaecol Obstet*. 2015 Oct;131 Suppl:S173–211.
  7. Rohmani R, Kusuma AH and Sinaga L. Factors Underlying The Increase in Diabetes Mellitus Patients at The Mopah Health Center, Merauke Regency. *J Syntax Transform*. 2023;4(12):1–18.
  8. Zhang S, Liu H, Li N, Dong W, Li W, Wang L, Zhang Y, Yang Y and Leng J.. Relationship between gestational body mass index change and the risk of gestational diabetes mellitus: a community-based retrospective study of 41,845 pregnant women. *BMC Pregnancy Childbirth* [Internet]. 2022;22(1):336. Available from: <https://doi.org/10.1186/s12884-022-04672-5>
  9. Sivaraman SC, Vinnamala S and Jenkins D. Gestational diabetes and future risk of diabetes. *J Clin Med Res*. 2013 Apr;5(2):92–6.
  10. Poolsup N, Suksomboon N and Amin M. Effect of Treatment of Gestational Diabetes Mellitus: A Systematic Review and Meta-Analysis. *PLoS One* [Internet]. 2014 Mar 21;9(3):e92485. Available from: <https://doi.org/10.1371/journal.pone.0092485>
  11. Movva VC, Gillenwater J, Young AJ, Mackeen AD and Angras K. Impact of BMI on risk of abnormal glucose screening in women with history of GDM. *Am J Obstet Gynecol* [Internet]. 2022 Jan 1;226(1):S434. Available from: <https://doi.org/10.1016/j.ajog.2021.11.722>
  12. Fan Y, Li W, Liu H, Wang L, Zhang S, Li W, Liu H, Leng J, Shen Y, Tuomilehto J, Yu Z, Yang X, Liu M and Hu G. Effects of obesity and a history of gestational diabetes on the risk of postpartum diabetes and hyperglycemia in Chinese women: Obesity, GDM and diabetes risk. *Diabetes Res Clin Pract* [Internet]. 2019;156:107828. Available from: <https://www.sciencedirect.com/science/article/pii/S016822719308198>
  13. Schwartz N, Nachum Z and Green MS. The prevalence of gestational diabetes mellitus recurrence—effect of ethnicity and parity: a metaanalysis. *Am J Obstet Gynecol* [Internet]. 2015;213(3):310–7. Available from: <https://www.sciencedirect.com/science/article/pii/S002937815002069>
  14. Irving RR, Mills JL, Choo-Kang EG, Morrison EY, Kulkarni S, Wright-Pascoe R and McLaughlin W. *Rev Panam Salud Publica/Pan Am J Public Heal*. 2008;23(2):85–91.
  15. Su WL, Lu CL, Martini S, Hsu YH and Li CY. A population-based study on the prevalence of gestational diabetes mellitus in association with temperature in Taiwan. *Sci Total Environ* [Internet]. 2020;714:136747. Available from: <https://www.sciencedirect.com/science/article/pii/S048969720302576>
  16. Habibi N, Mousa A, Tay CT, Khomami MB, Patten RK, Andraweera PH, Wassie M, Vandersluys J, Aflatounian A, Bianco-Miotto T, Zhou SJ and Grieger JA.. Maternal metabolic factors and the association with gestational diabetes: A systematic review and meta-analysis. *Diabetes Metab Res Rev* [Internet]. 2022 Jul 1;38(5):e3532. Available from: <https://doi.org/10.1002/dmrr.3532>
  17. Oleszczuk-Modzelewska L, Malinowska-Polubiec A, Romejko-Wolniewicz E, Zawiejska A and Czajkowski K. What is the “cost” of reducing adverse pregnancy outcomes in patients with gestational diabetes mellitus - risk factors for perinatal complications in a retrospective cohort of pregnant women with GDM. *BMC Pregnancy Childbirth* [Internet]. 2022;22(1):654. Available from: <https://doi.org/10.1186/s12884-022-04980-w>
  18. Marshall NE, Abrams B, Barbour LA, Catalano P, Christian P, Friedman JE, Hay WW Jr, Hernandez TL, Krebs NF, Oken E, Purnell JQ, Roberts JM, Soltani H, Wallace J and Thornburg KL. The importance of nutrition in pregnancy and lactation: lifelong consequences. *Am J Obstet Gynecol* [Internet]. 2022;226(5):607–32. Available from: <https://www.sciencedirect.com/science/article/pii/S002937821027289>
  19. Collier A, Abraham EC, Armstrong J, Godwin J, Monteath K and Lindsay R. Reported prevalence of gestational diabetes in Scotland: The relationship with obesity, age, socioeconomic status, smoking and macrosomia, and how many are we missing? *J Diabetes Investig* [Internet]. 2017 Mar 1;8(2):161–7. Available from: <https://doi.org/10.1111/jdi.12552>
  20. Lewandowska M, Więckowska B and Sajdak S. Pre-Pregnancy Obesity, Excessive Gestational Weight Gain, and the Risk of Pregnancy-Induced

- Hypertension and Gestational Diabetes Mellitus. Vol. 9, Journal of Clinical Medicine. 2020.
21. Fanani A and Sulaiman L. Faktor Obesitas dan Faktor Keturunan Dengan Kejadian Kasus Diabetes Mellitus. *Ris Inf Kesehat* [Internet]. 2021;10(1). Available from: <https://jurnal.stikes-hi.ac.id/index.php/rik/article/view/464>
  22. McIntyre HD, Catalano P, Zhang C, Desoye G, Mathiesen ER and Damm P. Gestational diabetes mellitus. *Nat Rev Dis Prim* [Internet]. 2019;5(1):47. Available from: <https://doi.org/10.1038/s41572-019-0098-8>
  23. Iwanowicz-Palusz G, Zarajczyk M, Bień A, Korzyńska-Piętas M, Krysa J, Rahnama-Hezavah M and Wdowiak A. The Relationship between Social Support, Self-Efficacy and Characteristics of Women with Diabetes during Pregnancy. Vol. 19, *International Journal of Environmental Research and Public Health*. 2022.
  24. Freak-Poli R, Ryan J, Tran T, Owen A, McHugh Power J, Berk M, Stocks N, Gonzalez-Chica D, Lowthian JA, Fisher J and Byles J. Social isolation, social support and loneliness as independent concepts, and their relationship with health-related quality of life among older women. *Aging Ment Health* [Internet]. 2022 Jul 3;26(7):1335–44. Available from: <https://doi.org/10.1080/13607863.2021.1940097>
  25. Meaney S, Leitao S, Olander EK, Pope J and Matvienko-Sikar K. The impact of COVID-19 on pregnant womens' experiences and perceptions of antenatal maternity care, social support, and stress-reduction strategies. *Women and Birth* [Internet]. 2022;35(3):307–16. Available from: <https://www.sciencedirect.com/science/article/pii/S1871519221000792>
  26. Dolatian M, Mirabzadeh A, Forouzan AS, Sajjadi H, Alavi Majd H and Moafi F. Preterm delivery and psychosocial determinants of health based on World Health Organization model in Iran: a narrative review. *Glob J Health Sci*. 2012 Nov;5(1):52–64.
  27. Azimi M, Fahami F and Mohamadirizi S. The Relationship between Perceived Social Support in the First Pregnancy and Fear of Childbirth. *Iran J Nurs Midwifery Res* [Internet]. 2018;23(3). Available from: [https://journals.lww.com/jnmr/fulltext/2018/23030/the\\_relationship\\_between\\_perceived\\_social\\_support.14.aspx](https://journals.lww.com/jnmr/fulltext/2018/23030/the_relationship_between_perceived_social_support.14.aspx)
  28. Soelistijo SA, Suaslika K, Lindarto D, Decroli E, Permana H, Sucipto KW and Kusnadi Y . *Pedoman Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 Dewasa di Indonesia 2021*. PB PERKENEI; 2021.
  29. Pujjiyanto TI and Wulaningsih I. Nurses' Role in Taking Care of Gestational Diabetes Mellitus Patients: A Qualitative Study. *J Ners* [Internet]. 2021; Available from: <https://api.semanticscholar.org/CorpusID:245458181>
  30. Arifin B, Probandari A, Purba AKR, Perwitasari DA, Schuiling-Veninga CCM, Atthobari J, Krabbe PFM and Postma MJ. 'Diabetes is a gift from god' a qualitative study coping with diabetes distress by Indonesian outpatients. *Qual Life Res* [Internet]. 2020;29(1):109–25. Available from: <https://doi.org/10.1007/s11136-019-02299-2>.