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Original Article

Comparison of Knowledge of Women with Gestational Diabetes Mellitus and Healthy Pregnant Women Attending at Hospital in Bangladesh

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Abstract

Background: A very common medical condition during pregnancy is Gestational Diabetes Mellitus (GDM) which has become a global health concern, not only for its higher prevalence, but also because it can be a predisposing factor for type 2 DM and causes other increased health risk for both mother and their offspring in later life. **Objective:** The objective of the study was to compare knowledge of GDM including source of knowledge, treatment, awareness about GDM and impact of GDM on the baby among mothers with GDM and healthy pregnant mothers. **Methodology:** The study was a cross-sectional study conducted in Cumilla city from May to October 2016. Eighty-nine participants attending the outpatient department of two hospitals and one antenatal clinic in Cumilla city were selected. A structured questionnaire and in-depth interview method was used to obtain data. **Result:** Significant difference has been found in knowledge between GDM patients and normal pregnant women regarding source of knowledge (p=0.01), treatment of GDM (p=0.000), risk factors of GDM (p=0.01), problems in managing GDM (p=0.003), nutrition maintenance (p=0.006) and physical exercise (p=0.000). No significant difference has been found in GDM awareness (p=0.83) and its impact on the baby (p=0.28) in two groups. Awareness of GDM is found to be associated with higher education (p=0.000), meal plan (p=0.03) and maintaining nutrition (p=0.01). **Conclusion:** Knowledge about GDM is poor among pregnant women, especially among normal pregnant women. *[Journal of Science Foundation 2018;16(1):20-26]*

Keywords: Gestational diabetes mellitus; knowledge; awareness

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Introduction

Gestational Diabetes Mellitus (GDM) is a form of diabetes, which is first recognized, or onset during pregnancy. The increasing prevalence of GDM, in the current decades, has become a growing public health concern globally. An estimated 21.3 million (16.2%) live births had hyperglycaemia during pregnancy in 2017, of which GDM contribution was 85.1% (IDF, 2017). Depending on the diagnostic criteria and

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ethnicity, 14.0% of all pregnancies are affected by GDM (Hunt and Schuller, 2007) and ranges from <1.0% in Germany to 28.0% in Nepal (Jiwani et al., 2012). In US, the prevalence of GDM is 4.0 to 10.0% whereas in UK it is 5.0% (Agarwal et al., 2010; Gandhi et al., 2012). Nonwhite population has higher incidence of GDM compared to Caucasian (Solomon et al., 1997) and Asians especially among Indian Asians has highest GDM prevalence (Chu et al., 2009). Bangladesh like other south east Asian (SEA) countries also has progressively increase prevalence of GDM (Mahtab and Bhowmik, 2016). Although the exact prevalence of GDM in Bangladesh is not known, based on some population-based studies at different time points it is known that there is an increasing trend of GDM prevalence which ranges from 6.0% to 14.0%, using different diagnostic criteria (Sayeed et al., 2005; Jesmin et al., 2014).

The increasing rate of obesity and Diabetes Mellitus (DM) is found to be associated with increased prevalence of GDM (Ferrara et al., 2004). Other observed risk factors include higher maternal age, family history of DM, Asian ethnicity with caesarean section history, macrocosmic baby and still birth (Anna et al., 2008; Shannon and Wong, 2010). The impediment of effective pregnancy outcomes for women diagnosed with GDM possibly are- lower socio-economic condition, social discrimination, inadequate nutritional knowledge, myths and misbelieves related to GDM and lack of knowledge related to proper pregnancy planning and care (Jesmin et al., 2011). If GDM is left untreated, it carries a risk for both the mother and child and will result in serious short and long-term consequences (Sermer et al., 1995; Langer et al., 2005 and Yang et al., 2002) which include neonatal and obstetric complications during pregnancy and childbirth such as miscarriages, lengthened labour pain, cesarean section, macrosomia, shoulder dystocia, neonatal hypoglycaemia, still birth and neonatal death (Ferrara et al., 2004; Schneiderman, 2008; Holmes et al., 2004; Reece, 2010; Pratipanawatr and Pratipanawatr, 2010; Ferrara, 2007 and Clausen et al., 2008). It also increases the risk of obesity and DM in the mother and offspring in later life (Vohr and Boney, 2008; Hillier et al., 2007 and Silverman et al., 1995).

Unfavorable outcomes can be reduced by well-controlled GDM (Read et al., 2004). Proper GDM management is a prerequisite for better health outcomes (Beischer et al., 1996; Turok, 2003). One of the important components of health literacy is Knowledge (Baker, 2006). According to studies, inadequate knowledge about the disease causes poor understanding of medical information, which in turn leads to limited adherence to management strategies and results in unfavorable pregnancy outcome (Ostlund et al., 2003). However, in Bangladesh context, pregnant women have poor knowledge about GDM but have positive attitude to control GDM and response positively toward education program on GDM (Islam et al., 2017). There is a lack of available study on GDM knowledge among general pregnant women in Bangladesh.

To prevent DM in two generations, GDM is a perfect window of opportunity. With appropriate knowledge and positive attitude including healthy eating habits, weight control and regular exercise, the complications of GDM can be prevented which permits mothers to live a better life with their offspring. To care for themselves all pregnant women require education and knowledge associated with preventing GDM (Islam et al., 2017).

Methodology

The present study was a cross sectional study and the study design was purely quantitative and observational. The study participants were recruited from outpatient department (OPD) of Gynaecology of Cumilla Diabetic Hospital, Cumilla Sadar Hospital and Nagar Matrisadan **(**Nababbari Choumuhani branch**)** at Cumilla city in Bangladesh. The study technique was nonprobability and purposive sampling. Study Period was May to October 2016 and the study populations were pregnant women with GDM and without GDM. A pretested structured questionnaire was used to obtain data. Data collection method was face to face interview. Knowledge was assessed on the variables including previous knowledge on GDM, source of knowledge, treatment of GDM, impact of GDM on the baby and nutritional management. Statistical analysis was done using SPSS version 20. The data obtained were compared against knowledge and practices using chi-square, logistic regression.

Results

A total of 89 pregnant women were interviewed, of whom 43 were diagnosed with GDM and the rest were normal pregnant women. Table 1 represents the demographic characteristics of the participants. The mean age of the participants was 27.79±5.37 years ranging from 18 to 43 years where the mean age was 29.12±4.5 years for the GDM patients and 26.54±5.85 years for normal pregnant women. Almost 35% GDM participants and 28.3% normal pregnant women belonged to 23 to 27 years age group. GDM prevalence increased with age, where the highest prevalence was found in 23 to 27 years age group (34.9%) which is closely followed by 28-32 years age group (30.2%) and >33 years age group (25.6%) compared to women aged 18 to 22 years (9.3%). Most of the participants (44.2%) had GDM in their third pregnancy. Majority of the participants both GDM (51.2%) and normal pregnant women (50%) had secondary level of education. Around 74.4% GDM patients had family history of DM whereas it was 39.1% among normal pregnant women.

Table 2 shows participants source of knowledge about GDM. Majority of the participants both with (53.5%) and without (56.5%) GDM did not have any knowledge on GDM and there is significant difference (p=0.01) between participants about GDM source of knowledge. Neighbor (47.6%) and family (42.9%) were source of knowledge for participants with GDM whereas both medical professionals and neighbor (30%) provided knowledge among normal pregnant women.

Table 1: Demographic Characteristics (n = 89)

Variables	**Pregnant Women**	
	GDM	**Normal**
Age Group		
18 to 22 Years	4(9.3%)	13(28.3%)
23 to 27 Years	15(34.9%)	13(28.3%)
28 to 32 Years	13(30.2%)	12(26.1%)
>33 Years	11(25.6%)	8(17.4%)
Mean Age±SD	29.12±4.5	26.54±5.85
Parity		
1	6(14.0%)	17(37.0%)
2	14(32.6%)	18(39.1%)
3	19(44.2%)	8(17.4%)
4	4(9.3%)	3(6.5%)
Educational level		
Illiterate	1(2.3%)	2(4.3%)
<JSC	6(14.0%)	8(17.4%)
Secondary	22(51.2%)	23(50.0%)
Graduate or above	14(32.6%)	13(28.3%)
Family H/O Diabetes	32(74.4)	18(39.1)

Table 2: Knowledge of Participants about GDM

Variables	**GDM patients (%)**	**Normal Pregnant Women (%)**	**P-Value***
Source of Knowledge (n=31)			
Family	9(42.9)	5(25.0)	0.01[a]
Book	2(9.5)	3(15.0)	
Neighbor	10(47.6)	6(30.0)	
Medical professionals	---	6(30.0)	
Treatment of GDM[b]			
Treating GDM with Diet	26(24.1)	17(23.9)	0.000
Treating GDM with Insulin	41(38.0)	21(29.6)	
Treating GDM by Maintaining Weight	9(8.3)	3(4.2)	

Treating GDM with Exercise	32(29.6)	13(18.3)	
Do not Know	----	17(23.9).	
Risk factors of GDM[b]			
Family History	22(41.5)	16(31.4)	0.01
Obesity	5(9.4)	5(9.8)	
Previous History	6(11.3)	------	
Don't Know	20(37.7)	30(58.8)	
Problems to Manage GDM			
Lack of financial support	7(16.3)	14(30.4)	0.003[a]
Unsupportive attitude of family	2(4.7)	1(2.2)	
Not ready to stick to the meal plan	3(7.0)	11(23.9)	
Unwilling to continue the treatment	----	3(6.5)	
No problem	31(72.1)	17(37.0)	
Aware of GDM	20(46.5)	20(43.5)	0.83
Aware of GDM impact on Baby	27(62.8)	23(50)	0.28

In all the analysis, *P* value of <0.05 was considered as significant; *Chi-Square test; [a]Likelihood Ratio; [b]Multiple responses

Knowledge about GDM treatment shows that, all of the GDM patients had knowledge about treatment where 38% knew about insulin therapy and 29.6% about exercise. Among normal pregnant women around 24% did not know about GDM treatment and around 29.6% knew about insulin treatment. Significant difference (p=0.000) has been observed between GDM patients and normal pregnant women's knowledge regarding treatment of GDM.

Table 3: Attitude of Participants regarding Nutrition and Physical activity

Variables	GDM patients (%)	Normal Pregnant Women (%)	P-Value*
Meal plan during Pregnancy	30(69.8)	28(60.9)	0.50
Maintaining Nutrition	16(37.2)	31(67.4)	0.006
Physical Exercise	36(83.7)	21(45.7)	0.000
Daily physical activity			
Light	12(27.9)	14(30.4)	0.49
Moderate	18(41.9)	23(50)	
Heavy	13(30.2)	9(19.6)	

*Chi-Square test

Majority (58.8%) of the normal pregnant women were unaware about risk factors of GDM, which was 37.7% among GDM participants. Family history was known as a risk factor for GDM by 41.5% and 31.4% with and without GDM participants respectively. There is significant difference (p=0.01) between GDM patients and normal pregnant women's knowledge about risk factors of GDM.

When GDM patients were asked about the problems they faced to manage GDM, majority (72.1%) answered they did not face any problem. While 37% of the normal pregnant women felt there would not be any problem to manage GDM, but they also identified financial support (30.4%) and not ready to stick to the meal plan (24%) as problems to manage GDM.

Attitude of participants about nutrition and physical activity is given in table 4. Although, around 70% of GDM patients had meal plan during pregnancy, only 37.2% were maintaining nutrition. Among normal pregnant women, 60.9% had meal plan during pregnancy, but 67.4% were maintaining nutrition. Majority (83.7%) of patients with GDM have done physical exercise, which was 45.7% among normal pregnant women. Moderate physical activity was done by most of the participants both with (41.9%) and without (50%) GDM.

Odds ratios were calculated using logistic regression for variables influencing awareness of GDM and statistically significant association (p=0.05) was found with education, family history of DM, meal plan and maintaining nutrition (Table 5).

Table 4: Association between variables and Awareness of GDM

Variables	Number (%)	Odds ratio	95% CI for OR Lower-Upper	P Value*
Education				
<JSC	2(2.2)	11.50	0.833-158.721	0.06
Secondary	14(15.7)	34.50	5.505-216.207	0.000
Graduate or above	23(25.8)	12.73	3.702-43.786	0.000
Family history of DM	27(30.3)	2.35	0.986-5.590	0.05
Meal plan	31(34.8)	0.356	0.140-0.904	0.03
Maintaining nutrition	27(30.3)	0.332	0.139-0.795	0.01

*Logistic Regression

Discussion

The overall findings of this study show that there are significant difference in knowledge between GDM patients and normal pregnant women concerning major aspects of GDM. According to the study, pregnant women of 23-27 age group has highest GDM rate. A study of Bangladesh reported that, with increasing age, the prevalence of GDM also increase significantly and the odds of a woman >25 years to develop GDM were 3.8 times than a woman 25 years of age (Begum et al., 2017). Study conducted in India (Seshiah et al., 2008) found the odds ratio was 2.1 for women aged >25 years.

The study found that there was significant difference (p=0.014) between GDM patients and normal pregnant women regarding source of knowledge on GDM. Main source of knowledge was neighbor (47.6%) and family (42.9%) for GDM patients and both medical professionals and neighbor (30%) for the rest. None of the participants reported electronic media as their source of knowledge. But a Bangladeshi study reported that, hospital/clinic (50.5%), peer (29.9%) and family (20.6%) was the major and friends (.9%), internet (5.6%), television (15.9%) and other patients (18.7%) were the other source of knowledge (Islam et al., 2017). A study of India conveyed among all the antenatal women attending a Primary Health Center (PHC) for antenatal care, found that major sources of knowledge on GDM were television/radio (40%), neighbors/friends (34.2%), and family members (29.2%) while doctors (13.3%), health-care workers (20.8%), or hospital charts/boards (18.3%) were less common sources (Shriraam et al., 2013).

The study revealed there are significant difference (p=0.000) in knowledge between GDM patients and normal pregnant women about treatment of GDM. All the GDM patients knew about GDM treatment whereas around 24% normal pregnant women did not know about GDM treatment. The above mentioned study of India by Shriraam et al., 2013 found that, 64% participants knew about diet and exercise while 17.5% about insulin therapy.

The study exhibits that most of the GDM patients knew about family history (41.5%) as a risk factor whereas majority of the normal participants did not know about risk factors of GDM. Significant difference (p=0.014) has been found between GDM patients and normal pregnant women's knowledge about risk factors of GDM. Bhavadharini et al., 2017 also revealed that majority of rural women were not aware about any risk factor of GDM like obesity and family history of type 2 DM. Similar results were also published in a qualitative study (Poth and Carolan, 2013) which disclosed that most women were unaware of GDM and other related factors.

According to the study, 46.5% and 43.5% with and without GDM respectively knew about GDM while 62.8% and 50% with and without GDM respectively were aware about its impact on the baby and pregnancy. In India, Shriraam et al., 2013 found that 68.3% participants knew about GDM and 75.8% were

aware about the risk on unborn child if the mother is untreated, 52.5% were aware that women diagnosed with GDM have an increased risk of type 2 DM in future.

The study also revealed majority of the participants had meal plan during pregnancy but significant difference (p=0.006) have been found between GDM patients and normal pregnant women in maintaining nutrition and physical exercise. But a case-control study in Iran (Sedaghat et al., 2017) found that control group had higher energy intake and physical activity.

Other findings of the study exhibit significant association among education, meal plan (P= 0.03) and maintaining nutrition (P= 0.01) with awareness of GDM. These findings are consistent with study conducted in Malaysia (Hussain et al., 2015) where patients with higher education, family history of DM had better knowledge about GDM.

There are some limitations of the study. The sample size was not very large so the results cannot be generalized.

Conclusion

The study has revealed that knowledge about GDM is poor among pregnant women, especially among normal pregnant women. Normal pregnant women lack knowledge of GDM in every aspect, which leads to limited awareness. This highlights the need of more necessary efforts at the program level to improve women knowledge on GDM because higher knowledge will certainly leads to improve pregnancy outcomes.

References

Agarwal MM, Dhatt GS, Shah SM. Gestational diabetes mellitus simplifying the international association of diabetes and pregnancy diagnostic algorithm using fasting plasma glucose. Diabetes Care 2010; 3(9): 2018–20

Anna V, van der Ploeg HP, Cheung NW, Huxley RR, Bauman AE. Socio demographic correlates of the increasing trend in prevalence of gestational diabetes mellitus in a large population of women between 1995 and 2005. Diabetes Care 2008; 31(12): 2288–93

Baker DW. The meaning and the measure of health literacy. The Journal of General Internal Medicine 2006; 21(8): 878–83

Begum P, Shaha DR, Walid KM. Gestational Diabetes Mellitus and Associated Risk Factors in Patients Attending Diabetic Association Medical College Hospital in Faridpur. Journal Enam Medical College 2017; 7(3): 126-33

Beischer NA, Wein P, Sheddy MT, Steffen B. Identification and treatment of women with hyperglycaemia diagnosed during pregnancy can significantly reduce perinatal mortality rates. The Australian & New Zealand journal of obstetrics & gynaecology 1996; 36(3): 239–47

Bhavadharini B, Deepa M, Nallaperumal S, Anjana RM, Mohan V. Knowledge about gestational diabetes mellitus amongst pregnant women in South Tamil Nadu. Journal of Diabetology 2017; 8(1): 22-6.

Chu SY, Abe K, Hall LR, Kim SY, Njoroge T, Qin C. Gestational diabetes mellitus: all Asians are not alike. Preventive Medicine 2009; 49(2): 265–8

Clausen TD, Mathiesen ER, Hansen T, Pedersen O, Jensen DM, Lauenborg J, et al. High prevalence of type 2 diabetes and pre-diabetes in adult offspring of women with gestational diabetes mellitus or type 1 diabetes the role of intrauterine hyperglycemia. Diabetes Care 2008; 31(2): 340–6

Ferrara A, Kahn HS, Quesenberry CP, Candice R, Hedderson MM. An increase in the incidence of gestational diabetes mellitus: Northern California, 1991–2000. Obstetrics & Gynecology 2004; 103(3): 526–33

Ferrara A. Increasing prevalence of gestational diabetes mellitus a public health perspective. Diabetes Care 2007; 30(2): 141–6

Gandhi P, Bustani R, Madhuvrata P, Farrell T. Introduction of metformin for gestational diabetes mellitus in clinical practice: has it had an impact? The European Journal of Obstetrics & Gynecology and Reproductive Biology 2012; 160(2): 147–50

Hillier TA, Pedula KL, Schmidt MM, Mullen JA, Charles M-A, Pettitt DJ. Childhood obesity and metabolic imprinting the ongoing effects of maternal hyperglycemia. Diabetes Care 2007; 30(9): 2287–92

Holmes HJ, Lo JY, McIntire DD, Casey BM. Prediction of diabetes recurrence in women with class A1 (diet-treated) gestational diabetes. The American Journal of Perinatology 2010; 27(1): 47–52

Hunt KJ, Schuller KL. The increasing prevalence of diabetes in pregnancy. Obstetrics and Gynecology Clinics of North America 2007; 34(2): 173–99

Hussain Z, Yusoff ZM, Sulaiman SA. Evaluation of knowledge regarding gestational diabetes mellitus and its association with glycaemic level: A Malaysian study. Primary Care Diabetes 2015; 9(3): 184-90

International Diabetes Federation. IDF Diabetes Atlas. 8th ed. Brussels, Belgium: International Diabetes Federation, 2017

Islam b, Islam MF, Nyeem MAB, Mannan MA, Neaz ANA. Knowledge and attitude regarding gestational diabetes mellitus (GDM) among obese pregnant women coming for antenatal checkup at a tertiary care hospital. International Journal of Chemical Studies 2017; 5(5): 179-89

Jesmin S, Jahan S, Khan MI, Sultana N, Jerin J, Habib SH, et al. The incidence, Predisposing Factors, Complication and Outcomes of Preeclampsia in Diabetes Pregnancy. BIRDEM Medical Journal 2011; 1: 10-4

Jesmin S, Akter S, Akashi H, Al-Mamun A, Rahman MA, Islam MM, et al. Screening for gestational diabetes mellitus and its prevalence in Bangladesh. Diabetes Research and Clinical Practice 2014; 103(1): 57-62

Jiwani A, Marseille E, Lohse N, Damm P, Hod M, Kahn JG. Gestational diabetes mellitus: results from a survey of country prevalence and practices. The Journal of Maternal-Fetal & Neonatal Medicine 2012; 25(6): 600–10

Langer O, Yogev Y, Most O, Xenakis EM. Gestational diabetes: The consequences of not treating. The American Journal of Obstetrics and Gynecology 2005; 192(4): 989–97

Mahtab H, Bhowmik B. Gestational Diabetes Mellitus – Global and Bangladesh Perspectives. Austin Journal of Endocrinology and Diabetes 2016; 3(2): 1041-3

Ostlund I, Hanson U, Björklund A, Hjertberg R, Eva N, Nordlander E, et al. Maternal and fetal outcomes if gestational impaired glucose tolerance is not treated. Diabetes Care 2003; 26(7): 2107-11

Poth M, Carolan M. Pregnant women's knowledge about the prevention of gestational diabetes mellitus: A qualitative study. British Journal of Midwifery 2013; 21(10): 692-700

Pratipanawatr W, Pratipanawatr T. Glibenclamide (Glyburide) versus insulin for the treatment of gestational diabetes mellitus: a meta-analysis. Khon Kaen Medical Journal 2010; 32(2): 155–66

Read S, Jamal H, Zohar N, Eliezer S. Anthropometric parameters in infants of gestational diabetic women with strict glycemic control. Obstetrics & Gynecology 2004; 104(5): 1021–4

Reece EA. The fetal and maternal consequences of gestational diabetes mellitus. The Journal of Maternal-Fetal & Neonatal Medicine 2010; 23(3): 199–203

Sayeed MA, Mahtab H, Khanam PA, Begum R, Banu A, Azad Khan AK. Diabetes and hypertension in pregnancy in a rural community of Bangladesh: a population-based study. Diabetic Medicine 2005; 22(9): 1267-71

Schneiderman EH. Gestational diabetes: an overview of a growing health concern for women. Journal of Infusion Nursing 2010; 33(1): 48–54

Sedaghat F, Akhoondan M, Ehteshami M, Aghamohammadi V, Ghanei N, Mirmiran P, Rashidkhani B. Maternal Dietary Patterns and Gestational Diabetes Risk: A Case-Control Study. Journal of Diabetes Research 2017, 2017: 5173926

Sermer M, Naylor CD, Gare DJ, Kenshole AB, Ritchie JW, Farine D, Cohen HR, McArthur K, Holzapfel S, Biringer A, et al. Impact of increasing carbohydrate intolerance on maternalfetal outcomes in 3637 women without gestational diabetes: The Toronto Tri-Hospital Gestational Diabetes Project. The American Journal of Obstetrics and Gynecology 1995; 173(1): 146–56

Seshiah V, Balaji V, Balaji MS, Paneerselvam A, Arthi T, Thamizharasi M, et al. Prevalence of gestational diabetes mellitus in South India (Tamil Nadu) ─ a community based study. The Association of Physicians of India 2008; 56: 329−33

Shannon A, Wong CK. Risk factors associated with gestational diabetes mellitus. International Journal Bioautomation 2010; 14(1): 15–26

Shriraam V, Rani SM, Sathiyasekaran B, Mahadevan S. Awareness of gestational diabetes mellitus among antenatal women in a primary health center in South India. Indian Journal of Endocrinology and Metabolism 2013; 17(4): 146-8

Silverman BL, Metzger BE, Cho NH, Loeb CA. Impaired glucose tolerance in adolescent offspring of diabetic mothers: Relationship to fetal hyperinsulinism. Diabetes Care 1995; 18(5): 611–7

Solomon CG, Willett WC, Carey VJ, Rich-Edwards J, Hunter DJ, Colditz GA, et al. A prospective study of pregravid determinants of gestational diabetes mellitus. The Journal of the American Medical Association 1997; 278(13): 1078–83

Turok DK, Ratcliffe SD, Baxley EG. Management of gestational diabetes mellitus. American Family Physician 2003; 68(9): 1767–72

Vohr BR, Boney CM. Gestational diabetes: The forerunner for the development of maternal and childhood obesity and metabolic syndrome? The Journal of Maternal-Fetal & Neonatal Medicine 2008; 21(3): 149–57

Yang X, Hsu-Hage B, Zhang H, Zhang C, Zhang Y, Zhang C. Women with impaired glucose tolerance during pregnancy have significantly poor pregnancy outcomes. Diabetes Care 2002; 25(9): 1619–24