Family-Planning Practices Among Women With Diabetes and Overweight and Obese Women in the 2002 National Survey for Family Growth

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OBJECTIVE — To examine contraceptive practices among diabetic women and obese women.

RESEARCH DESIGN AND METHODS — We analyzed the responses of 5,955 participants aged 20–44 years in the 2002 National Survey for Family Growth. Diabetes, BMI, desire for pregnancy, history of infertility treatment, sexual activity, parity, and demographic variables (age, race/ethnicity, education, marital status, income, insurance, and smoking history) were obtained by self-report. Lack of contraception was defined as absence of hormonal-, barrier-, or sterilization-based methods. Associations among contraception, diabetes, and BMI category were assessed in multivariable logistic regression models in nonsterile, sexually active women.

RESULTS — In unadjusted comparisons among sexually active women who were not sterilized, women with diabetes were more likely to lack contraception than women without diabetes (odds ratio [OR] 2.61 [95% CI 1.22–5.58]). Women with BMI ≥35 kg/m^2 were more likely to lack contraception than women with BMI <25 kg/m^2 (1.63 [1.16–2.28]), but associations between contraception use and lesser degrees of overweight and obesity were not significant. In multivariable models, women who were older (aged ≥30 vs. 20–29 years), were of non-Hispanic black race, were cohabitating, had a history of infertility treatment, and desired or were ambivalent about pregnancy were significantly more likely to lack contraception. The associations among diabetes, BMI, and contraception were no longer significant after these adjustments.

CONCLUSIONS — Older women with diabetes and obesity who desire pregnancy, regardless of pregnancy intention, should be targeted for preconceptive management.

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Diabetes and obesity increasingly affect women of reproductive age in the U.S. (1,2). Data from the National Health and Nutrition Examination Survey show that the prevalence of physician-diagnosed diabetes in women aged ≥20 years was 7.1% from 2001 to 2004 (3). Moreover, in 2003–2004, one in three women aged ≥20 years was identified as obese (BMI ≥30 kg/m^2) (4). Women with diabetes and those who are obese are at increased risk for pregnancy complications, including those from surgical delivery, and their offspring are at risk for congenital anomalies (5,6). Women with diabetes can improve pregnancy outcomes by delaying pregnancy until optimal glucose levels are reached (7). Obese women are also at risk for gestational diabetes mellitus and future onset of diabetes (8,9). Effective family planning, used in conjunction with glucose management for women with diabetes, as well as weight loss and diabetes screening before pregnancy, may reduce the risk to the mother and fetus associated with diabetes and obesity. In addition, family planning will reduce the risk of mistimed pregnancies (10).

Between one-half and two-thirds of women with diabetes have experienced unplanned pregnancies (11–14). However, Chuang et al. (15) found that among sexually active women with diabetes, only a quarter reported no contraceptive use. Similarly, reports of contraceptive practices of obese women vary. While Chuang et al. (15) found that one-fifth of potentially fertile obese women reported no contraceptive use, other reports (16) have found much lower rates of contraception among obese women.

It is also not clear to what extent diabetes or obesity are independent risk factors for contraception nonuse. The objective of this study was to examine contraceptive nonuse and its associations with diabetes and categories of BMI using data from the 2002 National Survey for Family Growth (NSFG). We hypothesized that women with diabetes would report less contraceptive use than nondiabetic women and that this difference would persist after adjustment for demographic factors and potential confounders, such as desire for pregnancy, history of infertility treatment, and obesity. We also hypothesized that overweight and obese women would report less frequent contraceptive use than healthy-weight women after adjustment for potential confounders.

RESEARCH DESIGN AND METHODS

— The study population was drawn from the 2002 NSFG, a periodic survey designed and administered by the National Center for Health Statistics (NCHS). This survey is the principal source of U.S. national estimates of factors affecting pregnancy and birth rates, particularly contraceptive use and preg-

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nancy, with oversampling of African American women, Latinas, and teenagers. The 2002 survey was designed to obtain detailed information on factors affecting childbearing, marriage, and parenthood from a national probability sample of 12,571 noninstitutionalized men and women 15–44 years of age (n = 7,643 nonpregnant women) (17). The survey was administered using computer-assisted personal interviewing. Trained interviewers asked participants questions and entered the responses into a notebook computer. A detailed description of the 2002 NSFG sample design and sampling weights is provided elsewhere (17).

Our sample was comprised of nonpregnant female respondents 20–44 years of age with recorded information on both diabetes status and BMI (n = 5,955). As the appropriate method to assess weight for height in subjects <20 years of age (standardized growth curves for age) differs from the approach used to calculate BMI in adults, subjects <20 years of age were excluded from these analyses. For all multivariable analyses, our sample was further restricted to women who reported having sexual intercourse in the past 4 weeks and were not sterile (n = 3,822). As this analysis was conducted on a deidentified public-use dataset, it was classified as exempt by the University of Michigan Institutional Review Board.

Dependent variable

Our outcome of interest was contraceptive nonuse at the time of the interview. Participants were asked to list the types of contraceptive methods that they were using at the time of the interview. Participants were classified as contraceptive nonusers if they indicated that they were not using a contraceptive method at the time of interview. Contraceptive methods were categorized as hormonal (including birth control pills, injectables, implants, intrauterine devices, and the contraceptive patch), barrier (including the male condom, female condom, diaphragm, cervical cap, and sponge), or sterilization.

Independent variables

Our primary exposures of interest were diabetes status and BMI. Diabetes status was ascertained based on responses to the following two questions: "Has a doctor or other medical care provider ever told you that you had diabetes or 'sugar'?" and "Were you ever told you had diabetes when you were not pregnant?" (17). The first question was asked of all respondents. The second question was only asked to those who reported ever being pregnant and responded "yes" to being told that they had diabetes. Women were categorized as having diabetes if they answered "yes" to the first question (if never pregnant) or "yes" to both of these questions if they had ever been pregnant. Self-report of preexisting (nongestational) diabetes has a good concordance (κ) of 0.8 when compared with medical record reviews, with a sensitivity of ~85% and specificity of 97% (18).

All participants were asked to report their height and weight at the time of interview. Data cleaning was performed by the NCHS staff to account for some extremely high and low values reported for height and weight (based on the 5th and 95th percentiles). In particular, height for females was bottom coded at 60 to indicate "60 inches or less" and top-coded at 70 to indicate "70 inches or more." Weight for females was bottom and top coded at 108 and 240 lb, respectively (17). For the purposes of this analysis, BMI was recoded as a categorical variable and consisted of the following levels: underweight or normal weight (<25.0 kg/m^2), overweight (25.0–29.9 kg/m^2), class I obesity (30.0–34.9 kg/m^2), and class II or III obesity (≥35 kg/m^2). Of note, height is generally overestimated by an average of 0.5 inches and weight is generally underestimated. However, the correlation between measured weight and self-reported weight exceeded 0.90 and between measured height and self-reported height was 0.92 in women in a population-based survey (19).

Statistical analysis

Bivariate analyses were conducted to ascertain demographic characteristics of the study population and to document variations in family-planning practices according to diabetes status and BMI category. The SURVEYFREQ procedure in SAS was used to perform these analyses, and the Rao-Scott modified χ^2 test was applied to test for statistical significance at the $P < 0.05$ level.

The SURVEYLOGISTIC procedure in SAS was used to assess the effect of diabetes status and BMI category on the odds of contraceptive nonuse in this study population. Potential confounders were included in the full model if they were risk factors for contraceptive nonuse and associated with diabetes and/or BMI, based on a P value <0.20. These covariates included respondent age (20–29, 30–39, or 40–44 years), race/ethnicity (non-Hispanic white, non-Hispanic black, non-Hispanic other, or Hispanic), educational attainment (<12, 12, or >12 years), total household income (<$20,000, $20,000–34,999, $35,000–49,999, or ≥$50,000 annually), marital status (never married, cohabitating, married, or separated/divorced/widowed), use of medical assistance to become pregnant (yes or no), and desire to become pregnant (yes, no, or do not know). The NSFG assessed pregnancy intention only in women who were not sterile. Among these women, pregnancy intention was assessed in married or cohabitating women and among single women expressing desire to become pregnant. Due to these different denominators and the stronger association between desire and contraception than between intention and contraception reported in other analyses (20), we used desire for pregnancy in a multivariate analysis, although we reported both desire and pregnancy intention in an unadjusted analysis. Only those covariates that changed the β-coefficient of either the diabetes or BMI variable by >10% were retained in the final model for all analyses. For this analysis, the full and the final models remained the same.

All analyses were performed using SAS version 9.1.3 for Windows (SAS Institute, Cary, NC). For all analyses, the data were weighted to adjust for the survey design, sampling, coverage, and response rates so that accurate national estimates can be made from the sample. Thus, the findings presented can be generalized to all U.S. nonpregnant, noninstitutionalized women 20–44 years of age.

RESULTS — The study sample consisted of 135 women with diabetes (2.3%) and 5,820 women without diabetes (97.7%). Women with diabetes were more likely to be older, of minority status, and to be separated, divorced, or widowed than women without diabetes (Table 1). Diabetic women reported higher rates of receiving medical help to become pregnant (13.0%) than women without diabetes (9.7%), although differences were not statistically significant. Additionally, diabetic women were slightly less likely to have been sexually active in the past 4 weeks and less likely to desire pregnancy and were more likely to report surgical sterility than nondiabetic women. Diabetic women reported a higher percentage of contraceptive nonuse compared with

Table 1—*Characteristics of the study population (%), stratified by diabetes and BMI, in the 2002 NSFG* (n = 5,955)

	Diabetes		BMI (kg/m^2)			
	Yes	No	Under/normal (<25.0)	Overweight (25.0–29.9)	Class I obese (30.0–34.9)	Class II/III obese (≥35.0)
n	135	5,820	3,028	1,522	795	610
Age (years)*†						
20–29	15.8	36.1	41.1	29.9	33.3	25.3
30–39	41.7	40.8	37.7	44.2	43.0	45.6
40–44	42.5	23.1	21.2	25.9	23.7	29.1
Race and Hispanic origin*†						
Non-Hispanic white	63.7	67.6	71.6	63.0	62.0	64.2
Non-Hispanic black	21.5	13.7	9.5	16.9	19.1	22.3
Non-Hispanic other	1.1*	5.1	6.5	3.6	3.6	3.0
Hispanic	13.7	13.6	12.4	16.5	15.3	10.5
Completed years of education†						
<12	13.9	15.0	13.2	17.1	15.5	18.6
12	29.6	20.5	18.1	21.6	25.6	25.7
>12	56.5	64.5	68.7	61.3	58.9	55.7
Marital status*						
Never married	18.1	25.0	26.7	21.8	22.8	24.7
Cohabitating	8.9	9.4	9.6	8.7	9.7	9.8
Married	48.5	53.7	52.5	56.3	54.0	52.3
Separated, divorced, or widowed	24.5	11.9	11.2	13.2	13.5	13.2
Total combined income, 2001 (USD)†‡						
<20,000	34.6	24.2	23.4	22.0	28.8	29.5
20,000–34,999	17.5	22.1	20.3	22.8	23.6	26.0
35,000–50,000	17.6	15.2	14.5	15.8	13.9	19.1
≥50,000	30.2	38.5	41.7	39.3	33.6	25.4
Health insurance coverage, 2001						
Private or Medi-Gap	69.3	70.8	73.5	70.3	66.6	63.5
Medicaid, CHIP, or state sponsored	14.4	9.1	7.6	8.9	12.3	14.4
Other	3.6§	3.2	3.2	3.3	2.8	3.7
Uninsured	12.7	16.7	15.5	17.5	18.2	17.9
Do not know/refused	0.0§	0.1§	0.1§	0.02§	0.0§	0.4§
Tobacco use						
Current (in past 12 months)	39.7	29.6	30.2	30.0	28.6	29.0
Past	10.4	11.8	11.3	10.7	14.1	14.4
Never	49.9	58.5	58.5	59.3	57.3	56.6
Previously pregnant†						
Yes	80.0	74.2	69.3	80.0	79.5	79.7
No	20.2	25.8	30.7	20.0	20.5	20.3
Medical help to become pregnant						
Yes	13.0	9.7	9.5	8.7	10.8	12.5
No	87.0	90.3	80.5	91.3	89.2	87.5
Pregnancy desire*						
Yes	41.7	49.8	52.0	46.4	49.3	45.9
No	57.8	47.7	45.4	51.4	48.1	52.1
Do not know	0.5§	2.5	2.6	2.2	2.6	2.0
Pregnancy intention‖						
Intend	62.7	63.5	65.4	61.3	58.6	64.3
Do not intend	37.3	33.7	32.2	35.1	39.4	32.8
Do not know	0.0§	2.7	2.4	3.5	2.0§	2.9§
Currently sexually active*†						
Yes	77.2	87.1	88.1	87.7	86.0	79.7
No	22.8	12.9	11.9	12.3	14.0	20.3
Current contraceptive methods¶						
None*†	38.8	27.3	28.0	25.2	25.3	33.0
Hormonal based*†	15.3	26.4	29.3	24.8	23.7	16.5

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Table 1—*Continued*

	Diabetes		BMI (kg/m^2)			
	Yes	No	Under/normal (<25.0)	Overweight (25.0–29.9)	Class I obese (30.0–34.9)	Class II/III obese (≥35.0)
Barrier†	11.1	15.8	17.6	14.9	13.1	11.1
Sterilization†	36.7	28.4	24.1	31.5	33.8	37.5
Other*	1.6§	7.9	7.1	9.9	8.5	5.6
Female's sterility status*†						
Not sterile	55.8	75.5	81.0	72.0	66.9	62.3
Surgically sterile	36.3	22.3	16.7	26.1	31.0	34.3
Nonsurgically sterile	7.9	2.2	2.3	1.9	2.1	3.4
Partner's sterility status						
Not sterile	91.4	86.2	84.5	88.3	89.4	86.4
Surgically sterile	5.0§	12.7	14.3	10.9	9.0	12.1
Nonsurgically sterile	3.6§	1.1	1.2	0.8§	1.6§	1.5§

*Rao-Scott χ^2 test, $P < 0.05$, for diabetes. †Rao-Scott χ^2 test, $P < 0.05$, for BMI. ‡Data available for 5,664 (95%) of respondents. §Unweighted frequency was <10. ‖Eligible respondents were physically able to have children. ¶Respondents could select up to three methods. Percentages do not sum to 100.

nondiabetic women (38.8 vs. 27.3%, respectively; $P < 0.05$).

Overweight and obesity were more common among older women than among women aged 20–29 years and among women who had less education, lower income, and higher parity than women with BMI <25 kg/m^2. Obese and overweight women reported higher rates of treatment for infertility than women with BMI <25 kg/m^2, although these differences were not statistically significant. Overweight and obese women were slightly less likely to have been sexually active in the past 4 weeks and to desire pregnancy compared with women with BMI <25 kg/m^2. The association between BMI and current contraceptive method was statistically significant.

Among sexually active women who were nonsterile (n = 3,822), the unadjusted odds of contraceptive nonuse were 2.61 times higher in diabetic women than in nondiabetic women (95% CI 1.22–5.58) (Table 2). After adjusting for age, race/ethnicity, education, marital status, income level, receipt of medical assistance to become pregnant, desire to become pregnant, and BMI, the odds of contraception nonuse decreased slightly in diabetic women and were no longer statistically significant compared with women without diabetes (adjusted odds ratio [OR] 1.84 [95% CI 0.81–4.19]).

Similarly, the unadjusted odds of contraceptive nonuse were higher among women with class II or III obesity, although not for overweight women or women with class I obesity. However, the association between class II or III obesity and lack of contraception did not persist after adjustment for confounders. Covariates such as higher age, non-Hispanic black race, history of medical assistance to become pregnant, and the desire to become pregnant were associated with lack of contraception, while higher educational attainment and a cohabitation living environment were associated with contraception use.

CONCLUSIONS — In this nationally representative, population-based survey of nonpregnant women, we found that ~40% of women with diabetes and up to a third of women with elevated BMIs did not use contraception. Among women who were sexually active and nonsterile, having diabetes was associated with more than a twofold-greater odds of not using contraception, while class II or III obesity (BMI ≥35.0 kg/m^2) was associated with a 1.6-fold–greater odds of not using contraception. However, after adjustment for confounders such as age, racial/ethnic group, education, history of fertility treatment, and desire for pregnancy, neither having diabetes nor being obese was significantly associated with contraceptive nonuse. History of fertility treatment, desire for pregnancy, and ambivalence about pregnancy were associated with the greatest odds of not using contraception.

Previous studies of unplanned pregnancies suggest low rates of contraceptive use among women with diabetes, ranging from roughly a quarter to half (11–14). We found higher (although still suboptimal) rates of contraception use in this sample. The difference between our results and those from previous studies may be due to the fact that previous studies surveyed women who were pregnant at the time of interview, while the NSFG sample that we used only included women who were not pregnant at the time of the interview.

In the Behavioral Risk Factor Surveillance Study, Chuang et al. (15) found similar rates of contraceptive use among women with diabetes to those that we documented. We also found that the majority of overweight and obese women used contraception, similar to their report (15). In our study, we further examined the relationship between severity of obesity and contraception and found that contraception use was significantly lower among women with severe (class II or III) obesity compared with women with lesser degrees of overweight and obesity. In other words, lesser degrees of obesity were not a risk factor for lack of contraception before or after adjustment for potential confounders.

Diabetes and severe obesity were not risk factors for lack of contraception after adjustment for other confounders including history of infertility treatment. Diabetes and obesity are associated with conditions inhibiting ovulation, such as polycystic ovary disease, thus inhibiting pregnancy and increasing the likelihood of infertility (21). In our analysis, treatment for subfecundity or infertility was associated with lack of contraception, presumably due to the assumption that contraception would not be needed (22). However, women may incorrectly perceive that they cannot become pregnant; approximately half of these women who were having regular intercourse reported not using birth control

Table 2—*Unadjusted and adjusted ORs and 95% CIs for contraceptive nonuse among women at risk for pregnancy*

	Unadjusted OR (95% CI)	Adjusted OR (95% CI)*
Age (years)		
20–29	1.00	1.00
30–39	1.18 (0.98–1.42)	1.47 (1.19–1.82)
40–44	1.40 (0.90–2.17)	2.61 (1.61–4.22)
Race and Hispanic origin		
Non-Hispanic white	1.00	1.00
Non-Hispanic black	1.90 (1.48–2.44)	1.76 (1.34–2.30)
Non-Hispanic other	0.99 (0.68–1.46)	1.07 (0.74–1.55)
Hispanic	1.37 (1.02–1.83)	1.19 (0.90–1.59)
Completed years of education		
<12	1.03 (0.68–1.55)	1.01 (0.66–1.54)
12	1.00	1.00
>12	0.61 (0.43–0.86)	0.56 (0.38–0.82)
Marital status		
Never married	1.00	1.00
Cohabitating	0.74 (0.52–1.04)	0.67 (0.47–0.96)
Married	0.88 (0.68–1.14)	0.80 (0.61–1.05)
Separated, divorced, or widowed	1.35 (0.98–1.86)	1.09 (0.77–1.53)
Total combined income, 2001 (USD)		
<20,000	1.00	1.00
20,000–34,999	0.77 (0.60–0.99)	0.86 (0.66–1.12)
35,000–49,999	0.83 (0.49–1.40)	0.89 (0.56–1.43)
≥50,000	0.68 (0.51–0.89)	0.73 (0.54–1.00)
Medical help to become pregnant		
Yes	3.14 (2.37–4.18)	3.32 (2.35–4.70)
No	1.00	1.00
Pregnancy desire		
Yes	1.54 (1.17–2.03)	2.27 (1.79–2.88)
No	1.00	1.00
Do not know	1.51 (0.63–3.60)	2.20 (1.05–4.59)
Diabetes status		
Diabetic	2.61 (1.22–5.58)	1.84 (0.81–4.19)
Nondiabetic	1.00	1.00
BMI (kg/m^2)		
<25.0	1.00	1.00
25.0–29.9	1.03 (0.80–1.32)	0.91 (0.68–1.20)
30.0–34.9	1.05 (0.79–1.39)	0.89 (0.66–1.19)
≥35.0	1.63 (1.16–2.28)	1.30 (0.87–1.94)

*Models were adjusted for all variables shown in this table.

because they thought that they could not get pregnant (22).

Desire for pregnancy and ambivalence about pregnancy were associated with greater risk of contraceptive nonuse. While the obesity and diabetes literature has focused on unintended pregnancy, the family-planning literature has since documented that desire for pregnancy is a better predictor of family-planning practices than "intendedness" of pregnancy (23). Pregnancies may be unplanned but desired (20). This distinction may explain the lack of contraception in some women who do not intend to become pregnant immediately and may explain why some women do not engage in recommended preconception practices, such as use of family planning until optimal glycemic control is reached. As women with diabetes were less likely to desire pregnancy than nondiabetic women, adjustment for this variable may have strengthened the association between diabetes and lack of contraception, although the association remained nonsignificant. Clinicians caring for women with diabetes and/or elevated BMIs may target women who desire pregnancy or who feel ambivalent about pregnancy for more intensive preconception management, even if these women do not intend to get pregnant. Such management may be more successful if focused on supportive measures and more intensive glucose control, rather than family planning (11).

As with other studies (22), we found that older women were at risk for lack of contraception, even after adjustment for other factors. We found that this was true for women aged 30–39 years as well as for women aged ≥40 years. While it is true that fertility declines with age, women in their 30s and early 40s may still conceive spontaneously. It is possible that women believe that declines in fertility negate the need for contraception. We also found that African American women were less likely to use contraception, even after adjustment for other potential confounders such as age, marital status, and education. Previous reports have speculated that these differences may be due to race-specific beliefs about the risks and benefits of different types of contraception, particularly hormonal contraception (24). Of note, cohabitation was also associated with greater contraception use, while marital status was not. While explanations are speculative, women who cohabit may have greater frequency of intercourse than their single counterparts but also may have less social support for pregnancy than their married counterparts (22).

Strengths of this report include the population-based nationally representative sample and the available information on pregnancy desire, fertility treatment, previous pregnancy, and demographic variables, all of which are associated with contraceptive use. Limitations include little information on reasons for contraceptive nonuse, particularly with respect to reasons specific to chronic disease, diabetes, and obesity. Additionally, we are unable to determine from the NSFG data how long women have had diabetes or whether they have type 1 or type 2 diabetes. Information about perceived risks of hormonal contraception for glucose control, intention to lose weight, ineligibility for particular methods, and lack of effectiveness of hormonal methods due to weight would have added to these analyses. Finally, the NSFG does not inquire about other factors related to health care delivery, such as usual source of care; it is possible that a lack of a usual source of care may serve as a barrier to the receipt of family-planning services.

We conclude that the use of contraception is not optimal among women with diabetes and elevated BMI. However, our findings suggest that the lack of

contraception in women in these high-risk groups is related to sociodemographic factors and other factors related to pregnancy and not these conditions per se. Efforts to improve family-planning practices could address factors associated with contraceptive use, particularly women's beliefs about fecundity, specific to age and history of fertility treatment, as well as ambivalence about their desires for pregnancy. If future pregnancies are desired, preconception management may be more successful if daily folic acid use, weight management, and glycemic control are addressed in these clinical discussions instead of focusing solely on initiation of family planning, even if pregnancy is not immediately intended. Future research is needed that focuses on interventions targeting these factors, particularly in populations aged 30–39 years and women with diabetes, and interactions with health care delivery.

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