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Contraceptive Use by Diabetic Women in the 2011-2013 National Survey for Family Growth

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An abstract of

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Abstract

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By Beata Gabriela Koziol

As the incidence of obesity and diabetes increase in the United States steps should be taken to ensure at-risk women with these conditions are protected from unintended and mistimed pregnancies.

The results of the 2011-2013 NSFG were analyzed to determine differences in contraceptive use between diabetic and non-diabetic women. Logistic models, adjusted for interaction between race/ethnicity and place of usual healthcare as well as for confounding by age, poverty, BMI, age at menarche, pregnancy intention, place of usual medical care, general health, and diabetes status, were utilized to predict odds of contraceptive use.

Compared to non-diabetic women, diabetic women were significantly more likely to be older, black or Hispanic, and obese (P <0.0001). They were significantly more likely to have a usual place of healthcare but were less affluent. They also reached menarche at an earlier age, and reported worse general health (P <0.0001). Although a greater proportion of diabetic women reported sterilization as their primary contraceptive (39.3% vs 28.8%), there was no significant association between contraceptive method and disease status. No association was found between diabetes and contraceptive use, even after adjustment for interaction and confounding (OR 0.93 [0.37-2.34]). However, adjustment revealed a significant association between irregular healthcare and contraceptive nonuse (OR 0.31 [0.14-0.70]).

It is imperative that both diabetic women and their providers are educated regarding the criteria established by the USMEC to provide guidelines for contraceptive use in women with medical comorbidities as many may erroneously believe that diabetic women cannot use effective, reversible forms of contraception.

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TABLE OF CONTENTS

BACKGROUND

The number of American adults with diabetes has almost tripled in the past twenty years from 7.6 million in 1994 to 21.9 million in 2014 (1). Likewise, as of 2014 more than a third (36.3%) of adults in the United States (US) were obese (2). As the prevalence of diabetes and obesity (body mass index (BMI) $\geq$ 30) continues to grow, ever more women of reproductive age are diagnosed with both conditions (3). In this population, pregnancy can aggravate either condition, which in turn increases the risk of maternal and infant morbidity through spontaneous abortion, congenital malformation, preeclampsia, and operative delivery (4,5). Furthermore, diabetic women with poorly controlled glucose levels have an even higher risk of spontaneous abortion and fetal malformations (4). In addition, metabolic imprinting of the fetuses of diabetic mothers is thought to contribute to a future increased risk of obesity, insulin resistance, diabetes, and cardiovascular disease. Thus, it is pertinent that pregnancy in diabetic women be planned to coincide with optimal control of the patient's disease (6). Fortunately, unintended and mistimed pregnancy can be avoided through the effective use of contraception.

However, family planning may be complicated in this population because of perceived limitations in contraceptive eligibility (7). Several studies have shown that diabetic women are less likely to receive counseling or prescriptions for contraceptives than their non-diabetic peers (8,9). They are also less likely to choose highly effective reversible contraceptive methods, but are more likely to elect sterilization (10). While contraceptive nonuse in this population is troubling, it is still unknown to what extent a diagnosis of diabetes itself

contributes to the phenomenon. Vahratian et al. previously examined data from the 2002 National Survey for Family Growth (NSFG) to explore associations between diabetes, obesity, and contraceptive nonuse (11). They found that overall, women with diabetes were more likely to lack contraception than non-diabetic women (unadjusted OR 2.61 [95% CI 1.22-5.58]). However, after adjusting for confounding by age, race/ethnicity, education, marital status, income level, receipt of medical assistance to become pregnant, desire to become pregnant, and BMI, the association was no longer statistically significant (adjusted OR 1.84 [95% CI 0.81-4.19]). This study was limited, however, by limiting the sample to include only non-sterilized women. In addition, several factors related to reproductive health care access could not be assessed using results of the 2002 NSFG.

The present study aims to expand upon Vahratian et al.'s work using data from the lengthier 2011-2013 iteration of the NSFG, which does assess reproductive healthcare access. We chose contraceptive use as the primary outcome in order to include all contraceptive options, including female and male sterilization. We hypothesize that the association between diabetes status and contraceptive use of all methods, including sterilization, will be significant. Furthermore, by adjusting for known and potential confounders, we hope to better understand how access to care and reasons motivating contraceptive decisions, including fertility desires, impact that association.

METHODS

The study population was determined by complex probability sampling of the US population between 2011 and 2013 for the National Survey of Family Growth (NSFG) administered by the National Center for Health Statistics (NCHS). This periodically conducted survey is the nation's primary source of information on family life, marriage and divorce, pregnancy, infertility, use of contraception, and men's and women's health. In this most recent iteration (at the time of the study) of the nationally-representative survey, interviews were conducted with 10,416 non-institutionalized men and women 15-44 years of age living in the US. Women, adolescents, non-Hispanic blacks, and Hispanics were intentionally oversampled. A more detailed description of the sampling design and weights has been described elsewhere (12).

We chose to include only non-pregnant women 20-44 years old in our sample (n=4,351). We excluded adolescents from the sample population because body mass index (BMI) was only calculated in post processing for non-pregnant women at least 20 years old. Excluding women who had not reported sexual intercourse within the 3 months prior to the interview, those who were actively trying to conceive, and those for whom BMI was not available further reduced the final sample, which was used in all multivariable analyses (n=3010). This project did not require approval from Emory University's Institutional Review Board because the NSFG is a de-identified, publically accessible database.

The outcome of interest, contraceptive use at the time of the interview, was assessed using computer-assisted self-report of all current contraceptive use. In instances where multiple contraceptives were reported by a participant, we

included only the primary method for this analysis. The methods were categorized as long acting reversible contraceptives ((LARC) – Norplant implant, Implanon implant, or copper or hormonal intrauterine device (IUD)), other hormonal contraceptives (Depo-Provera injection, pill, patch, ring, or morning-after pill), barriers (diaphragm, male condom, foam, sponge, suppository or insert, or jelly or cream without a diaphragm), sterilization (of either partner for either contraceptive or non-contraceptive reasons), or some other method (periodic abstinence through natural family planning (NFP), cervical mucus test, temperature rhythm, calendar rhythm, withdrawal, or any other method). Non-users were separated into two groups determined by whether they were actively seeking pregnancy.

The primary exposure, diabetes, was determined through the combination of answers to two specific questions in the interview: "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?" The latter question was only applicable if the participant was ever pregnant and reported diabetes or borderline/pre-diabetes.

Demographic characteristics were ascertained through bivariate analyses in SAS 9.4 (Cary, NC). The SURVEYFREQ procedure was employed for these analyses due to the complex sampling structure including strata and clusters, which also necessitated the use of the Rao-Scott modified X^2 test to determine statistical significance at the $P < 0.05$ level. These results can be generalized to all non-pregnant, non-institutionalized women 20-44 years of age in the United States.

The odds of contraceptive use were determined using the SURVEYLOGISTIC procedure. Potential confounders included in the full multivariable model were chosen if they were associated with diabetes at $P < 0.10$. Age in years (20-29, 30-29, 40-45), race/ethnicity (non-Hispanic white, non-Hispanic black, non-Hispanic other, and any Hispanic), percent of federal poverty level (0-99, 100-199, 200-299, ≥300), BMI (<25.0, 25.0-29.9, 30.0-34.9, ≥35.0), age at menarche in years (≤10, 11-13, ≥14), pregnancy intention, place of usual medical care (doctor's office, community or public health or family planning or Planned Parenthood clinic, hospital emergency room or urgent care center, some other provider, or none), general health (excellent, very good, good, fair, poor), and diabetes status were all included.

The final model used to determine adjusted odds of contraceptive use was determined after assessment of interaction and confounding. Interaction was tested between age and all other variables, race/ethnicity and all other variables, federal poverty level and all other variables, and diabetes status and all other variables. After backwards elimination of non-statistically significant interaction terms ($P > 0.05$) the only interaction retained in the model was between race/ethnicity and place of usual medical care. All potential confounders were kept in the final model. While the deletion of any single confounder did not meaningfully change the odds estimates neither did it improve the precision of the prediction.

RESULTS

Diabetic women comprised 3.2% (n=159) of the sample population. Compared to non-diabetic women, diabetic women were significantly more likely to be older, black or Hispanic, and obese (P <0.0001). They were significantly more likely to have a usual place of healthcare but were less affluent. They also reached menarche at an earlier age, and reported worse general health than their non-diabetic peers (P <0.0001) (Table 1).

Although a greater proportion of diabetic women reported sterilization (39.3% vs 28.8%), there was no significant association between contraceptive method and disease status.

For all sexually active women who were not currently seeking pregnancy (n=3010) the unadjusted odds of any contraceptive use were lower in black women (OR 0.67 [0.49-0.91]) and women who reported any kind of health clinic as their primary healthcare provider (OR 0.63 [0.40-0.99]). Conversely, women with an income greater than 300% of the federal poverty level, those who did not intend pregnancy, and those who reported excellent health were more likely to use contraception (Table 2). There was no association between diabetes status and contraceptive use (OR 0.80 [0.30-2.12]).

The following results were obtained after adjusting for the interaction between race/ethnicity and place of usual medical care, and confounding by age, race/ethnicity, percent of federal poverty level, BMI, age at menarche, pregnancy intention, place of usual medical care, general health, and diabetes status. Women with an income greater than 300% of the federal poverty level and those who did not intend to become pregnant continued to be significantly more likely

to use contraception (OR 1.87 [1.17-3.00] and OR 2.22 [1.40-3.53]). However, the associations between excellent health and contraceptive use, and race and contraceptive use did not hold following adjustment (Table 2). While diabetes status was still not a significant predictor of contraceptive use after adjustment (OR 0.93 [0.37 - 2.34]) it was found that not having any usual health provider was now significant in predicting contraceptive nonuse (OR 0.31 [0.14-0.70]).

DISCUSSION

Based on the literature we expected to find some association between diabetes and contraceptive nonuse. However, our results showed no significant association, even after adjustment for interaction and confounding. There were several differences between this work and that of Vahratian et. al that may explain this discrepancy. While the earlier study limited the scope of its investigation to reversible contraceptive methods, we chose to include sterilization as a valid method of contraception. This change allowed a larger sample of the diabetic population to be included in the final analysis, which may have predisposed our conclusion to be nonsignificant due to a wider variety of contraceptive choices among women with diabetes. This population may also lack access to effective reversible methods, such as LARC or other hormonal contraceptives, or believe they are unable to utilize certain methods due to their disease. In fact, while the overall difference in types of contraceptive methods was not significant, the proportion of nondiabetic women using a hormonal contraceptive was nearly double that of diabetic women (21.3% vs 11.0%). This could lead women in this group to feel they must choose between forgoing contraception or undergoing a sterilization procedure.

Strengths and Limitations

The findings of our study were strengthened by the expanded subject interview conducted in the 2011-2013 NSFG. Useful information on insurance status and usual health care provision that was not included in previous versions of the NSFG helped elucidate connections between access to care and the

resulting impact on contraceptive access. In addition, we could distinguish between women who were not using contraception specifically to conceive and those who were not protected for any other reason. This difference may also have impacted the results regarding diabetes and contraceptive use as there are surely women with diabetes who should have been categorized as nonusers for this specific reason and then excluded from the final analysis. However, the main strength of this work derives from the unique sampling method utilized to collect information that allows these results to be generalized to the entire US population.

Although this work was undertaken to expand upon results of the slightly less insightful 2002 iteration of the NSFG, there were still limitations in fully understanding why these groups make these choices. Specifically, it could not be ascertained from the results of the participant interview whether a person suffered from Type 1 or Type 2 diabetes. Differentiation between these diseases would enable more targeted recommendations to be made for each population as they usually differ in age and family planning goals. Another associated limitation involves where each participant receives her usual medical care. Although diabetic women were more likely than nondiabetic women to have a doctor as their usual care provider this may be a provider they see for their condition instead of for family planning strategies. Finally, there may be more women at risk of unintended pregnancy than previously identified by these interviews. It is not known whether women who listed “postpartum” as their primary contraceptive method were benefitting from true lactational amenorrhea (LAM) or if they were unknowingly at risk of conception. If these subjects were to be

categorized as using no contraception instead of "other" contraception it may be possible to draw different conclusions than those found here.

FUTURE DIRECTIONS

As more women of childbearing age are diagnosed with diabetes it is imperative that their needs for contraceptives and effective family planning are met. The best strategy to achieve these goals would be to expand access to effective, reversible forms of contraception including LARC and other hormonal methods. The United States Medical Eligibility Criteria for Contraceptive Use (USMEC) provides clear guidelines regarding the use of contraceptives in women with medical comorbidities with a simple scale. Each method is categorized as 4) presenting an unacceptable health risk, 3) having theoretical or proven risks which usually outweigh the advantages, 2) having advantages generally outweigh theoretical or proven risks, or 1) posing little to no risk so that a method may be used without restriction. Per the USMEC both women with nonvascular non-insulin dependent and women with nonvascular insulin dependent diabetes are eligible to use the copper IUD with no restrictions. The use of all other hormonal methods in these populations fall under category 2. Only women who suffer nephropathy, retinopathy, neuropathy, those who have another vascular disease, or those who have suffered from diabetes for more than twenty years are cautioned to avoid Depo Provera (DMPA) injections, which are classified as category 3, and combined hormonal contraceptives (CHC), which are classified as category 3 or 4 (13). While obstetricians, gynecologists, and family planning specialists are familiar with these criteria and their application generalists and

endocrinologists who work more closely with diabetic patients may not be familiar or comfortable with counseling patients on reproductive health. For this reason, it is critically important that these messages are shared with these providers to enable them to help their patients make the best decisions to meet their family planning goals.

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TABLES

Table 1
Demographic characteristics of the population of non-pregnant, non-institutionalized women at least 20 years old interviewed for the 2011-2013 NSFG stratified by diabetes status (N=4351).

	Diabetes Status		
	Yes	No	
	159 (3.2)	4192 (96.8)	
	n (%)	n (%)	p value
Age (years)			0.0019
20-29	38 (23.9)	1873 (40.7)	
30-39	74 (35.4)	1626 (38.6)	
40-45	47 (40.7)	693 (20.7)	
Race			0.0952
Non-Hispanic White	61 (51.1)	2000 (60.2)	
Non-Hispanic Black	39 (21.9)	916 (13.8)	
Non-Hispanic Other	7 (3.7)	243 (6.8)	
Hispanic of any race	52 (23.3)	1033 (19.2)	
Highest Level of Education			0.3016
Some high school or less	35 (15.5)	524 (10.5)	
High school or GED	51 (26.8)	1121 (25.4)	
Some college or associate degree	46 (35.3)	1461 (33.9)	
Bachelor's degree or more	27 (22.4)	1086 (30.2)	
Percent of Federal Poverty Level			0.0282
0-99	77 (39.1)	1352 (26.2)	
100-199	30 (25.5)	970 (21.2)	
200-299	19 (18.8)	646 (15.8)	
≥300	33 (16.7)	1224 (36.8)	
Marital Status			0.5845
Never Married	58 (35.2)	1461 (28.0)	
Cohabitating	20 (14.9)	643 (16.4)	
Married	57 (37.7)	1539 (44.5)	
Divorced/Separated/Widowed	24 (12.2)	558 (11.1)	
Smoking Status			0.3503
Never	93 (53.4)	2704 (64.2)	
Former	21 (15.6)	400 (10.9)	
Current	45 (30.9)	1088 (24.8)	
BMI (kg/m^2)			<0.0001

< 25.0	26 (17.7)	1551 (41.5)	
25.0 - 29.9	22 (11.8)	1119 (28.0)	
30.0 - 34.9	33 (20.5)	698 (15.6)	
≥35.0	75 (50.1)	750 (15.0)	
Age at Menarche (years)			0.0358
≤10	25 (12.5)	448 (8.3)	
11-13	103 (73.3)	2762 (67.7)	
≥14	31 (14.3)	982 (24.0)	
Parity (number of living children)			0.9816
0	58 (34.2)	1353 (33.9)	
1	34 (17.2)	898 (19.3)	
2	30 (25.5)	1017 (23.9)	
3 or more	37 (23.0)	924 (23.0)	
Any Fertility Assistance	21 (10.5)	325 (8.2)	0.3372
Desires Pregnancy	84 (49.1)	2464 (55.7)	0.3215
Intends Pregnancy	56 (32.7)	1887 (42.2)	0.0985
Current Contraceptive Method			0.2155
LARC	8 (6.0)	418 (8.7)	
Other hormonal method	16 (11.0)	855 (21.3)	
Barrier	19 (9.8)	434 (10.7)	
Sterilization (female or male partner)	58 (39.3)	1090 (28.8)	
Other	36 (21.3)	803 (17.6)	
None, seeking pregnancy	9 (4.4)	226 (5.6)	
None, not seeking pregnancy	13 (8.1)	366 (7.3)	
Place of Usual Care			0.0036
Doctor's Office	95 (67.4)	2507 (63.7)	
Clinic (Community/Family Planning/Planned Parenthood)	35 (18.9)	546 (10.7)	
Emergency Room or Urgent Care	3 (1.4)	208 (4.4)	
Other	13 (5.9)	219 (5.5)	
None	13 (6.5)	712 (15.7)	
Any Reproductive Health Services in Past Year	112 (62.8)	3165 (74.8)	0.1150
Current Insurance			0.7739
Private	65 (57.0)	2110 (58.3)	
Medicaid / State	47 (17.4)	817 (14.3)	
Medicare / Military / Federal	11 (5.6)	248 (4.9)	
None	36 (20.0)	1017 (22.6)	
Lacked Insurance at Least 1 Month in Past Year	49 (26.6)	1322 (28.4)	0.7052
General Health (self-reported)			<0.0001
Excellent	7 (8.4)	1166 (29.0)	
Very Good	33 (29.4)	1591 (40.3)	
Good	67 (35.3)	1066 (23.8)	
Fair	37 (19.3)	297 (5.6)	
Poor	14 (7.5)	62 (1.2)	

Table 2
Unadjusted and adjusted odds ratios (OR) and 95% confidence intervals for contraceptive use among women at risk of unintended pregnancy in the 2011-2013 NSFG (N=3010).

	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age (years)		
20-29	1.00	1.00
30-39	1.36 (0.98 - 1.87)	0.91 (0.62 - 1.34)
40-45	1.53 (0.89 - 2.63)	0.80 (0.40 - 1.60)
Race/Ethnicity		
Non-Hispanic White	1.00	1.00
Non-Hispanic Black	0.67 (0.49 - 0.91)	0.79 (0.56 - 1.12)
Non-Hispanic Other	0.65 (0.41 - 1.03)	0.64 (0.38 - 1.09)
Hispanic of any race	0.77 (0.50 - 1.19)	1.10 (0.67 - 1.79)
Federal Poverty Level (%)		
0-99	0.89 (0.55 - 1.45)	0.96 (0.58 - 1.60)
100-199	1.01 (0.66 - 1.55)	1.03 (0.66 - 1.61)
200-299	1.00	1.00
≥300	1.86 (1.16 - 2.97)	1.87 (1.17 - 3.00)
BMI (kg/m^2)		
< 25.0	1.00	1.00
25.0 - 29.9	0.78 (0.54 - 1.13)	0.79 (0.54 - 1.16)
30.0 - 34.9	0.89 (0.51 - 1.55)	0.89 (0.50 - 1.59)
≥35.0	0.85 (0.57 - 1.25)	0.96 (0.63 - 1.45)
Age at Menarche (years)		
≤10	1.09 (0.65 - 1.83)	1.38 (0.79 - 2.40)
11-13	1.00	1.00
≥14	0.96 (0.66 - 1.40)	0.93 (0.65 - 1.34)
Intends Pregnancy		
Yes	1.00	1.00
No	1.92 (1.41 - 2.62)	2.22 (1.40 - 3.53)
Place of Usual Care		
Doctor's Office	1.00	1.00
Clinic (Community/Family Planning/Planned Parenthood)	0.63 (0.40 - 0.99)	0.76 (0.47 - 1.24)
Emergency Room / Urgent Care	1.22 (0.62 - 2.38)	1.51 (0.79 - 2.89)
Other	0.85 (0.49 - 1.48)	1.04 (0.60 - 1.81)
None	0.81 (0.54 - 1.22)	0.31 (0.14 - 0.70)
General Health		
Excellent	1.73 (1.04 - 2.88)	1.59 (0.93 - 2.69)
Very Good	1.20 (0.82 - 1.76)	1.06 (0.70 - 1.62)
Good	1.00	1.00

Fair	0.88 (0.44 - 1.75)	0.90 (0.47 - 1.75)
Poor	2.04 (0.65 - 6.40)	2.23 (0.69 - 7.20)
Diabetic		
Yes	0.80 (0.30 - 2.12)	0.93 (0.37 - 2.34)
No	1.00	1.00