Pregnancy Test Taking Is a Correlate of Unsafe Sex, Contraceptive Nonadherence, Pregnancy, and Sexually Transmitted Infections in Adolescent and Young Adult Women

Mahbubur Rahman, MBBS, PhD, MPH, and Abbey B. Berenson, MD, PhD

Abstract

Objectives: This study was conducted to examine the hypotheses that adolescent and young adult pregnancy test takers are at increased risk for unsafe sex, oral contraception (OC) nonadherence, and higher pregnancy and sexually transmitted infection (STI) rates.

Methods: We conducted secondary analyses using data collected for a study on OC adherence among 1155 women 16–24 years of age. Data collected at baseline and 3, 6, and 12 months were used for the analyses.

Results: At baseline, 33% of women reported having undergone ≥ 1 pregnancy test at home or a clinic during the past 3 months. Pregnancy test takers were more likely to have ≥ 3 sexual partners (odds ratio [OR] 2.12; 95% confidence interval [CI] 1.49–3.02) in the past year, report unprotected oral (OR 1.48; 95% CI 1.28–1.72) or anal sex (OR 1.78; 95% CI 1.32–2.39), be diagnosed with an STI (OR 1.76; 95% CI 1.23–2.51), become pregnant (hazards ratio 1.52; 95% CI 1.10–2.10), or not use any birth control method (OR 2.11; 95% CI 1.66–2.60). Moreover, they were less likely to continue using OC that was prescribed at baseline (OR 0.38; 95% CI 0.31–0.47) and to report being ambivalent about pregnancy (OR 0.73; 95% CI 0.60–0.90) compared to non-test takers.

Conclusions: Pregnancy test taking is an important correlate of high-risk sexual behaviors, OC nonadherence, and risk of subsequent pregnancy and STIs among adolescent and young adult women. Future interventions should target these women to decrease the risk of unintended pregnancies and STIs.

Introduction

UNPROTECTED SEX, UNINTENDED PREGNANCY, and sexually transmitted infections (STIs) are interrelated and a matter of major public health concern for adolescent and young adult women. Nearly half of the 6.7 million pregnancies reported in the United States each year are unintended; this rate is even higher among 15- to 24-year-old women (69%).¹ The unintended pregnancy rate in the United States had shown a downward trend during the 1980s and 1990s.² However, it has remained almost static since then and recently showed a slight upward trend.^{1,3} Moreover, unintended pregnancy rates, based on 2006 national data, are even higher among low-income women, with a 50% increase being reported among women with an income below the federal poverty line compared with a 29% decrease among women with incomes $\geq 200\%$ of the poverty line.¹

About one third of adolescent women report using home pregnancy tests.^{4,5} Prior studies have observed that these women

are more likely to initiate sexual activity at a young age, less likely to use contraception or perceive negative consequences of pregnancy, and more likely to become pregnant at a young age than non-test takers. One limitation of these studies, however, is that they only reported on use of home pregnancy tests. Moreover, these studies were cross-sectional in design and did not examine a range of outcomes, such as high-risk sexual behaviors or prevalence of STIs. Thus longitudinal data, which include a number of outcomes, are needed to adequately examine this association. The objectives of this study were to examine the association between home- and clinic-based pregnancy test taking and contraceptive use, high-risk sexual behaviors, and STI and pregnancy rates over 12 months of follow-up.

Methods

As a part of a larger study that examined the effect of a clinic-based ($n=383$) and a clinic-based plus telephone intervention ($n=384$) versus standard care ($n=388$) on

contraceptive adherence, 1155 sexually active, nonpregnant women between 16 and 24 years of age who requested initiating oral contraception (OC) were recruited between July 2006 and January 2010. After obtaining approval from the University of Texas Medical Branch (UTMB) Institutional Review Board, subjects were recruited at five different publicly funded reproductive health clinics. These clinics serve low-income women, of which 80% have an annual income below US \$30,000/y. The methods for the larger study are reported detail elsewhere.⁶ Briefly, a total of 20,263 women were approached to determine if they were eligible for this study; 1638 of these women were eligible. The most common reasons for ineligibility were that women did not want to use OC (57.2%), were already using OC (9.3%), had previously used OC for >1 month (22.7%), or planned to become pregnant within 12 months (3.2%). Of those eligible, 483 (30%) declined to participate, usually due to time constraints that day. Thus, 1155 women met all inclusion/exclusion criteria and agree to be enrolled in the study. No differences were observed between those who declined to enroll and those who enrolled with regard to desire for a pregnancy within the next year ($p=0.26$) or having ever had sex ($p=0.09$). However, Hispanic women were significantly less likely to agree to participate than white and black women (65% of Hispanic women vs. 80% of white and black women; $p<0.001$).

At the initial visit, participants were asked to report their demographic characteristics, sexual behaviors, and condom use. Demographic characteristics included were age, race/ethnicity, marital status, employment, education level, and gravidity. Sexual behaviors were assessed at baseline using questions pertaining to age at first sexual intercourse, oral and anal sex, and number of sexual partners in the past year and in the woman's lifetime. Questions on condom use at last sexual intercourse and percentage of time it was used during the last 3 months were also asked. Similar questions on sexual behaviors were also asked at 3, 6, and 12 months. Study participants were reimbursed \$20 for the baseline visit and each assessment phone call.

All participants were also asked at baseline and at each follow-up phone interview about their history of recent pregnancy testing using three questions:

1. During the past 3 months, have you had or performed a pregnancy test?
2. How many pregnancy test have you done?
3. Where were these tests done?

Pregnancy ambivalence was also assessed using a question: If you found out that you are pregnant today, how would you feel about it? Response options were *very happy*, *somewhat happy*, *neither happy nor unhappy*, *somewhat unhappy*, and *very unhappy*. Those who responded neither happy nor unhappy were considered as ambivalent while the rest of the respondents together were considered as not ambivalent.

Phone interviews at 3, 6, and 12 months after the initial visit assessed OC continuation, other adherence variables, and pregnancy and STI rates. At each call, all participants were asked if they were still using OC. In addition, pregnancy and STI rates were assessed by self-report and medical record review after 3, 6, and 12 months. At the conclusion of the study, the entire UTMB medical record of each subject since beginning the study was reviewed to detect any additional

unreported STIs or pregnancies during the 12 months of follow-up. All participants had a Pap smear at baseline since recommendations to begin cervical cancer screening at age 21 years were not published until after recruitment was completed.⁷ STI tests performed between study initiation and the end of the 12-month follow-up period were also recorded. *Neisseria gonorrhoeae* and *Chlamydia trachomatis* were diagnosed by GYN-probes, *Trichomonas vaginalis* by wet mount, herpes simplex by culture, and human papillomavirus and genital warts by Pap smear or visual inspection of warts.

During 12 months of follow-up, 510 were lost to follow-up. White women were more likely to be lost to follow-up than black and Hispanic women (52%, 40%, 42%, $p=0.006$). However, no other characteristics, such as age, condom use at last sexual intercourse, pregnancy test-taking behavior (at home, clinic, or both), or STI rate, differed by loss to follow-up status after 12 months of the study period. However, subsequent pregnancy rate was higher among those who were lost to follow-up at 12 months compared with those who continued the study (16.3% vs. 11.4%, $p=0.016$).

Statistical analysis

For this study secondary analyses were performed to compare women by pregnancy testing (pregnancy test takers during last 3 months versus did not have the test during that time) using the chi square test or Student *t* test, as appropriate. We examined the effect modification of different interventions on the relationship between pregnancy test-taking behavior and different outcomes of interest. Since there was no effect modification ($p>0.20$), we combined both interventions and control groups together and adjusted the effects of interventions in all multivariate models. Sociodemographic variables were also screened for inclusion in a multivariable model. Any variables that were unevenly distributed by pregnancy test-taking behavior were controlled for in the multivariate statistical procedures. Candidate variables with $P\leq 0.20$ were included in the multivariable models. Multivariate logistic regression was used to examine the association of pregnancy test taking with sexual behaviors reported at baseline and STI diagnosed during 12 months of follow-up. Cox proportional hazards model was used to examine the association of pregnancy test taking with the incidence of pregnancy during 12 months of follow-up. We also used longitudinal analyses using generalized estimating equation (GEE) procedures⁸ to examine the association between pregnancy test taking, and condom use, sexual behaviors, pregnancy ambivalence, and OC adherence reported over the course of the study after adjusting for confounders (race/ethnicity and other variables identified through univariate analysis) and effects of interventions. This method can be considered a linear regression technique in which models repeated effects for individual study participants over time. Each model allowed us to estimate odds ratios for the predictors while adjusting for the estimated errors due to repeated measurements. All analyses were performed using STATA 11 (Stata Corporation, College Station, TX).

Results

Among the 1155 participants, 644 (55.8%) were between 16 and 19 years of age and 511 (44.2%) were 20–24 years old. Distribution among racial or ethnic groups was representative of the

clinics' patient bases: 54.2% were Hispanic ($n=626$); 18.6% were black ($n=215$); 24.8% were white ($n=287$); and 2.3% were other ($n=27$). Most women were single or never married (78%), and about a quarter worked >20 hours per week.

At baseline, 33.0% (381/1155) of women reported having ≥ 1 pregnancy test at home or at a clinic during the past 3 months. Of the 1155 women, 212 (18.4%) had the test at home, 88 (7.6%) at a clinic, and 78 (6.8%) both at home and at a clinic, while 3 (0.3%) did not specify any location. Analyses of baseline characteristics revealed that adolescent and young

adult test takers were more likely than non-test takers to be younger, white, never married, employed, have initiated sex at a younger age, have sexual intercourse without condom, or have ever received anal or given oral sex (Table 1). They were more likely to be diagnosed with an STI (18.7% vs. 11.2%, $p=0.001$) and become pregnant (17.3% vs. 12.5%, $p=0.028$) during the 12 months of follow-up. They were also less likely to continue OC based on data collected after 3, 6, and 12 months.

Sociodemographic variables that met the screening criteria for inclusion in the multivariable model were age, race or

TABLE 1. CHARACTERISTICS OF PARTICIPANTS BY PREGNANCY TEST TAKING BEHAVIOR REPORTED AT BASELINE

Characteristics	One or more pregnancy tests taken during last 3 months ($n=1155$)		p value
	No ($n=774$)	Yes ($n=381$)	
Demographic characteristics			
Age, mean (SD)	20.0 (2.4)	19.7 (2.3)	0.034
Race, n (%)			0.015
White	176 (22.7)	111 (29.1)	
Black	136 (17.6)	79 (20.7)	
Hispanic	445 (57.5)	181 (47.5)	
Other ^a	17 (2.2)	10 (2.6)	
Marital status, n (%)			<0.001
Never married	584 (75.8)	322 (84.7)	
Married, divorced, or separated	186 (24.2)	58 (15.3)	
Education, n (%)			0.946
Did not complete HS or get GED	375 (48.9)	184 (48.7)	
At least HS graduate	392 (51.1)	194 (51.3)	
Employment status, n (%)			<0.001
Does not work	504 (65.5)	204 (53.5)	
Employed (full/part time)	266 (34.6)	177 (46.5)	
Sexual behaviors			
No. of prior pregnancies, mean (SD) ^b	1.5 (0.7)	1.6 (0.9)	0.076
Age at first sexual intercourse, n (%)			0.008
≤ 15 years	464 (62.1)	196 (53.9)	
≥ 16 years	283 (37.9)	168 (46.2)	
Sexual partners in the last year, n (%)			<0.001
≤ 2	694 (89.8)	293 (78.6)	
≥ 3	79 (10.2)	80 (21.5)	
Sexual partners lifetime, n (%)			<0.001
≤ 2	420 (54.8)	136 (37.1)	
≥ 3	346 (45.2)	231 (62.9)	
Condom use at last intercourse, n (%)	345 (48.3)	155 (44.3)	0.223
Percentage of time condom was used during last 3 months, mean (SD)	62.4 (31.9)	56.1 (33.1)	0.004
Last sexual intercourse without any birth control method, n (%)	316 (40.8)	181 (47.3)	0.028
Used condom none of the time during last 3 months for vaginal sex, n (%)	170 (22.2)	81 (21.5)	0.803
Gave oral sex to a male during last 3 months, n (%)	266 (34.9)	192 (50.8)	<0.001
Used condom none of the time during last 3 months for giving oral sex, n (%)	252 (33.1)	160 (42.7)	0.002
Ever received anal sex, n (%)	137 (17.8)	103 (27.0)	<0.001
Used condom none of the time during last 3 months for anal sex, n (%)	79 (10.2)	66 (17.3)	0.001
Pregnancy ambivalence, n (%)	201 (26.3)	76 (20.2)	0.025
Outcome during 12 months of follow-up			
Became pregnant during 12 months, n (%)	97 (12.5)	66 (17.3)	0.028
Had at least one STI diagnosed at baseline and during 12 months, n (%)	86 (11.2)	71 (18.7)	0.001
OC continuation, n (%)			
After 3 months	443 (57.2)	186 (48.8)	0.007
After 6 months	299 (38.6)	119 (31.2)	0.014
After 12 months	165 (21.3)	57 (15.0)	0.010

^aAsians, American Indians, Alaskan, and Native Hawaiian.

^bBased on women who had at least one pregnancy.

HS, high school; GED, General Equivalency Diploma; SD, standard deviation; STI, sexually transmitted infection; OC, oral contraception.

ethnicity, marital status, and employment status. Effects of interventions were adjusted in all multivariate models. Multivariable logistic regression analyses showed that women who had pregnancy tests were more likely to start sexual intercourse at an earlier age, receive anal sex, give oral sex to a male, and have last sexual intercourse without any birth control method as well as have more sexual partners in the last year and in their lifetime (Table 2). Also they were more likely to become pregnant during the next 12 months compared with women who did not have a pregnancy test during the last 3 months (hazards ratio 1.52, 95% CI 1.10–2.10). Separate logistic regression models examined the association of pregnancy test taking only at home with all outcome variables. All significant associations observed in the models with home- and clinic-based pregnancy test takers together remained statistically significant in separate models (data not shown).

Based on 12-month follow-up data, 21.4% of participants had at least one pregnancy test at 3 months, 22.6% at 6 months, and 23.8% at 12 months compared to 33.0% at baseline. GEE models, after adjusting for intervention methods and other covariates, showed that, relative to those who did not have pregnancy test, women who had pregnancy test were more likely to have high-risk sexual behaviors, be diagnosed with an STI, remain without using any contraceptive method, and be less likely to continue OC (Table 3). In addition, they were less likely to be ambivalent about pregnancy. No interactions were observed between pregnancy test taking and intervention methods with regard to OC adherence, subsequent pregnancy, or STI rates.

Discussion

In this study, nearly one in three women had undergone a pregnancy test during the 3-month interval prior to enrollment. This high rate is consistent with a study among 10- to 19-year-old girls that reported a 28%–34% rate of pregnancy testing at home.^{4,5} Moreover, young women who underwent pregnancy testing were at higher risk of nonadherence with their oral contraceptives, and experienced an STI and subsequent pregnancy more frequently during the following 12

TABLE 2. ASSOCIATION OF PREGNANCY TEST TAKING WITH AGE AT FIRST SEXUAL INTERCOURSE AND HIGH-RISK SEXUAL BEHAVIORS BASED ON DATA AVAILABLE AT BASELINE

<i>Dependent variables</i>	<i>OR (95% CI)^a</i>
Age at first sexual intercourse (<16 years)	1.35 (1.04–1.77)
Three or more sexual partners in the past year	2.12 (1.49–3.02)
Three or more sexual partners lifetime	1.84 (1.40–2.42)
Last sexual intercourse without any birth control method	1.37 (1.06–1.77)
Ever given a male oral sex	1.53 (1.16–2.02)
Ever received anal sex	1.66 (1.23–2.25)

^aBased on multivariate logistic regression analyses. Separate models were built based on each of the dependent variables. Adjusted by age, race/ethnicity, marital status, working status, and intervention methods. Exposure variable was whether the participants had pregnancy test during 3 months prior to the recruitment (at home or at a clinic).

OR, odds ratio; CI, confidence interval.

TABLE 3. ASSOCIATION OF PREGNANCY TEST TAKING WITH HIGH-RISK SEXUAL BEHAVIORS, ORAL CONTRACEPTIVE ADHERENCE, AND PREGNANCY AMBIVALENCE BASED ON 12 MONTHS OF FOLLOW-UP: GENERALIZED ESTIMATING EQUATIONS MODEL RESULTS

<i>Dependent variables^a</i>	<i>OR (95% CI)^b</i>
Outcomes of interest based on longitudinal data available during 12 months follow-up	
Used condom at last sexual intercourse	0.83 (0.71–0.96)
Used condom none of the time during last 3 months	1.13 (0.91–1.41)
Gave oral sex to a male during last 3 months	1.54 (1.31–1.81)
Used condom none of the time during last 3 months for vaginal sex	1.22 (0.98–1.51)
Used condom none of the time during past 3 months for giving oral sex	1.48 (1.28–1.72)
Used condom none of the time during past 3 months for anal sex	1.78 (1.32–2.39)
OC continued	0.38 (0.31–0.47)
Did not use any birth control method	2.11 (1.66–2.60)
Ambivalent about pregnancy	0.73 (0.60–0.90)
Had STI at baseline or during 12 months of follow-up	1.76 (1.23–2.51)

^aSeparate models were built based on each of the dependent variables.

^bORs (95% CI) were based on generalized estimating equations model adjusted by age, race/ethnicity, marital status, working status, and intervention methods. Exposure variable was whether the participants had pregnancy test during 3 months prior to the recruitment (at home or at a clinic).

months. In a study that examined use of home pregnancy tests, Shew et al.⁵ similarly observed that adolescent test takers were less likely to report birth control use and more likely to become pregnant. Kelly et al.⁴ further noted that adolescent home pregnancy test takers were less likely to perceive negative consequences about childbearing than their counterparts. The latter study suggests that the underlying reason for nonadherence with birth control among this population is a positive, or at least the lack of a negative perception of pregnancy. This illustrates that these women should be targeted at their clinic visit for an in-depth discussion on the ramifications of becoming pregnant at a young age, whether they are ready for a pregnancy, and the importance of using adequate birth control if they are not ready. Further, since pregnancy during adolescence and early adulthood is multifaceted, there is a need to incorporate other issues in the discussion, such as exploration of other suitable birth control options, reasons for nonadherence, and influence of partners and peers. They should also be counseled on the importance of using condoms to avoid an STI. Considering pregnancy test taking as a warning signal among young women coupled with appropriate counseling could play an important role in reducing the unintended pregnancy and STI rate among this population. In addition, since unintended pregnancy was higher among low-income women¹ and pregnancy test takers in our study, more interventions need to be developed targeting this high-risk group.

Our study was limited to women who presented to the clinic requesting OC. One issue with birth control pills is that

the patient must remember to take her medication every day, preferably at the same time, for optimal efficacy. A large percentage of young women are unable to adhere to this strict regimen and discontinue its use within only a few months. In fact, prior studies have demonstrated that almost half of the adolescent women discontinue its use within 6 months of obtaining a prescription.^{9,10} Moreover, in one study of women, 33% of those 13 to 19 years of age and 18% of 20- to 22-year-olds reported that they did not use any contraception for at least 1 month after stopping their birth control pills, even though they did not wish to become pregnant.¹¹ Our finding that women who have recently undergone a pregnancy test are at increased risk of an subsequent pregnancy suggests that oral contraceptives may not be the best method for young OC users in general and recent pregnancy test takers in particular. Thus, when counseling these young women, information about longer acting methods, such as the intrauterine device or depot medroxyprogesterone acetate, should also be provided.

This study has several strengths. First, we recruited a large number of adolescent and young adult women and followed them for an extended period of time (12 months) with four interviews (baseline and 3, 6, and 12 months). Moreover, the medical records of each subject since beginning the study were reviewed to detect any additional unreported pregnancies or STIs during the follow-up period. Several study limitations should also be noted. First, the history of pregnancy test taking was based on self-report and OC users only. Second, we did not ask participants whether the pregnancy they reported was unintended. However, pregnancies that occurred during the 12-month follow-up were most likely unintended as we excluded women at baseline who desired to become pregnant in the next year. Third, the number of women lost to follow-up was higher in our study than we anticipated, which could be due to the fact that the region was badly affected by Hurricane Ike during the study period. Finally, we limited our study to 16- to 24-year-old women, so we do not know whether similar findings would be observed in older reproductive age women.

In conclusion, adolescent and young adults who have pregnancy test performed at home or at a clinic are at increased risk for unsafe sexual practices, unreliable contraceptive use, subsequent pregnancy, and STIs. These women require additional counseling on how to decrease these high-risk behaviors and the likely consequences of contraceptive nonadherence.

Acknowledgments

This study was supported by an award from the Maternal and Child Health Bureau, Health Resources and Services Administration (R40MC06634, Berenson) and a midcareer inves-

tigator award in patient-oriented research (K24HD043659, Berenson) from the Eunice Kennedy Shriver National Institute of Child Health & Human Development, National Institutes of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Maternal and Child Health Bureau, Health Resources and Services Administration, National Institute of Child Health & Human Development, or the National Institutes of Health.

Author Disclosure Statement

No competing financial interests exist.

References

1. Finer LB, Zolna MR. Unintended pregnancy in the United States: incidence and disparities, 2006. *Contraception* 2011; 84:478–485.
2. Henshaw SK. Unintended pregnancy in the United States. *Fam Plann Perspect* 1998;30:24–29, 46.
3. Finer LB, Henshaw SK. Disparities in rates of unintended pregnancy in the United States, 1994 and 2001. *Perspect Sex Reprod Health* 2006;38:90–96.
4. Kelly L, Sheeder J, Stevens-Simon C. Teen home pregnancy test takers: more worried or more wishful? *Pediatrics* 2004; 113:581–584.
5. Shew ML, Hellerstedt WL, Sieving RE, Smith AE, Fee RM. Prevalence of home pregnancy testing among adolescents. *Am J Public Health*. 2000;90:974–976.
6. Berenson AB, Rahman M. Effect of counseling and phone calls on oral contraceptives and condom adherence: a randomized controlled trial. *Contraception* 2012;86:716–724.
7. Cervical cancer in adolescents: screening, evaluation, and management. Committee Opinion No. 463. American College of Obstetricians and Gynecologists. *Obstet Gynecol* 2010; 116:469–472.
8. Liang K, Zeger SL. Longitudinal data analysis using generalized linear models. *Biometrika* 1986;73:13–22.
9. Berenson AB, Wiemann CM. Contraceptive use among adolescent mothers at 6 months postpartum. *Obstet Gynecol*. 1997;89:999–1005.
10. Wiemann CM, Berenson AB. An investigation into why adolescents may reject Norplant. *Pediatrics* 1996;97:185–191.
11. Rosenberg MJ, Waugh MS. Oral contraceptive discontinuation: a prospective evaluation of frequency and reasons. *Am J Obstet Gynecol* 1998;179:577–582.

Address correspondence to:
 Mahbubur Rahman, MBBS, PhD, MPH
 Center for Interdisciplinary Research in Women's Health
 Department of Obstetrics & Gynecology
 University of Texas Medical Branch
 Galveston, TX 77555-0587

E-mail: marahman@utmb.edu