

The Influence of Oral Contraceptive Knowledge on Oral Contraceptive Continuation Among Young Women

Kelli Stidham Hall, PhD,¹ Paula M. Castaño, MD, MPH,² and Carolyn L. Westhoff, MD, MSc^{2,3}

Abstract

Background: Using a multidimensional approach, we assessed young women's knowledge of oral contraceptives (OC) and its influence on OC continuation rates.

Methods: We used data from 659 women aged 13–25 years participating in a randomized controlled trial of an educational text message OC continuation intervention. Women received 6 months of daily text messages or routine care. At baseline and 6 months, we administered a comprehensive 41-item questionnaire measuring knowledge of OC's mechanism, effectiveness, use, side effects, risks, and benefits. We ascertained OC continuation status and reasons for discontinuation at 6 months. We analyzed relationships between OC knowledge and continuation with multivariable logistic regression.

Results: Young women scored, on average, 22.8 out of 41 points on the OC knowledge assessment at baseline and 24.7 points at 6 months. The 6-month OC continuation rate was 59%. OC continuers had >2-points-higher OC knowledge scores at 6 months than discontinuers ($p < 0.001$). Those who reported discontinuing their OCs for side effects and forgetfulness scored >2 points lower than women who discontinued for other reasons (p -values < 0.001). In multivariable regression models, each correct response on the baseline and 6-month knowledge assessments was associated with a 4% and 6% increased odds of OC continuation, respectively. Six-month OC knowledge scores were negatively associated with OC discontinuation due to side effects (odds ratio [OR] 0.94) and forgetfulness (OR 0.88).

Conclusions: OC knowledge, which was low among young women in our study, was associated with OC continuation and common reasons for discontinuation. Continued efforts to characterize relationships between OC knowledge and behavior and to test the effectiveness of different components of interventions aimed at increasing knowledge, addressing side effects, and improving use of OCs are warranted.

Introduction

ORAL CONTRACEPTIVE (OC) MISUSE and discontinuation lead to more than three quarters of a million unintended pregnancies among young U.S. women each year.^{1,2} Many diverse and complex predictors of poor OC behavior have been widely studied and include a range of demographic, social, relationship, reproductive history and attitudinal characteristics.^{1–6} Cognitive factors, and in particular knowledge, have been of interest to reproductive health scholars for decades.⁷ Well-established cognitive behavioral frameworks such as the Theories of Reasoned Action and Planned Behavior would suggest that comprehension of information about contraception shapes women's contraceptive decision-making and behaviors.³ The most commonly used contra-

ceptive methods including OCs are highly user-dependent and rely upon some level of cognitive processing—that is, their effectiveness depends upon the woman to understand how the method works (i.e., the interaction between efficacy and use) as well as upon her memory and diligence to use it correctly (i.e., take a pill at approximately the same time every day).

The few family planning studies (including descriptive and educational intervention studies) to directly test whether inadequate contraceptive knowledge may at least partially account for poor contraceptive behavior have had conflicting and inconclusive results, especially for OCs.^{6–9} This may be due, in part, to inconsistent and limited approaches for conceptualizing and measuring OC knowledge, approaches which have largely focused on women's understanding of the

¹Department of Obstetrics and Gynecology, Institute for Social Research, University of Michigan, Ann Arbor, Michigan.
²Departments of ²Obstetrics and Gynecology, School of Medicine, and ³Epidemiology, School of Public Health, Columbia University, New York, New York.

risks and side effects of hormonal methods.^{7,10} Whether more comprehensive knowledge of OCs, including such understudied dimensions as benefits and mechanism of action, is an important factor that may contribute to correct and continued OC use among young women remains unclear.

The influence of other cognitive factors closely related to knowledge, such as perceptions and attitudes of hormonal contraception, may further indirectly explain associations between OC knowledge and behavior. For instance, an understanding of OCs' non-contraceptive benefits could serve as an incentive for initiation and continued use, while persistent concerns about OC side effects and risks could lead to a negative user experience and subsequent discontinuation.^{5,7,10} Reported side effects, including weight gain and mood changes, and forgetfulness are among the most commonly cited reasons for contraceptive misuse and discontinuation.^{2,4,10} The impact of OC knowledge (or lack thereof) on reasons for OC discontinuation have not yet been well studied. Research is needed to clarify and better characterize the relationship between OC knowledge and behavior in order to identify evidence-based clinical interventions for contraceptive education, counseling and management, as well as effective public health strategies to reduce unintended pregnancy rates among young women in the United States.

Using a comprehensive, multidimensional approach, we investigated the influence of OC knowledge on OC continuation rates and reasons for OC discontinuation among a multiethnic, urban sample of young women enrolled in an OC continuation intervention study.

Materials and Methods

This study was part of a larger randomized trial that tested the impact of daily educational text message reminders on OC continuation rates.¹¹ We described the sample and reported on the main text message intervention effects on OC continuation and OC knowledge elsewhere.^{11,12} In brief, young women presenting to an urban family planning health center requesting OCs were informed of the study and asked to participate. Women eligible for inclusion were (1) aged 13–25 years, (2) currently sexually active, (3) owners of a cell phone with text messaging capabilities, and (4) specifically requesting OCs. Research assistants screened participants, obtained written consent, conducted a baseline interview, and documented contact information for a 6-month exit interview.

The baseline interview collected information on socio-demographic characteristics and sexual, contraceptive, and reproductive histories. We also administered a comprehensive 41-item OC knowledge questionnaire we designed for this study to measure six major dimensions of OC knowledge including mechanism of action (4 items), effectiveness (2), use (9), side effects (4), risks (9), and benefits (13). We have described the questionnaire in more detail elsewhere.¹² Briefly, information from comprehensive, standardized handouts from the clinical site was used to develop the knowledge questions. Question formats included true–false (10 items), multiple choice (15 items), and alternate choice (16 items). Knowledge scores could range from 0 to 41 points. Specific question examples included, “The pill works partly by thickening the cervical mucus so

sperm cannot get into the womb, true or false” (mechanism of action); “Please select whether you think the pill makes menstrual cramps better, worse, or has no effect” (benefits); “Select whether you think the pill increases, decreases or has no effect on the risk of getting ovarian cancer” (benefits); “For the health problem of leg pain or swelling, please select whether you would continue or stop taking the pill, and whether you would call your doctor immediately or discuss at the next visit” (risks, use). The questionnaire was available in both English and Spanish and had a Flesch-Kincaid readability score of 4.6 (corresponding to a fourth- to fifth-grade reading level). We pilot tested the questionnaire on 25 participants recruited from the same clinic site and revised the questionnaire as needed before the onset of the larger study.

Women enrolled in the study were then randomized in a one-to-one fixed allocation ratio to the intervention (routine care with 6 months of daily text messages) or control (routine clinical care only) groups. Routine clinical care included contraceptive counseling by staff and provision of the standard written educational handout. The intervention group received this routine care in addition to 180 daily text messages, including 47 individual messages (which were repeated up to four times over the study) with educational content adapted from the clinic handouts.

The content for the text messages was designed to include information about six major dimensions of OC knowledge: mechanism of action (4 messages), effectiveness (6), use (17), side effects (5), risks (13), and benefits (14). Example text messages included, “The pill may work by keeping the ovaries from releasing eggs” (mechanism of action) and “U should not use the pill if u have uncontrolled hi blood pressure” (risks, use). The length of all text messages was 160 characters or less. All participants chose to receive their messages in English.

At 6 months, we conducted a telephone interview to assess OC use over the study period. Discontinuation was determined through a series of questions including whether participants had experienced interruptions in use of greater than seven days and current use at the time of and during the seven days prior to the interview. We also attempted to elicit additional information on use patterns, such as episodes of missed pills and use at the last sexual intercourse. The primary outcome of this study was OC continuation at 6 months, and women were considered to be OC continuers if they were still taking their OC at the time of and during the full 7 days prior to their interview. We further assessed information about women's primary reasons for OC discontinuation, which included reported side effects, forgetting to take the pill, access problems, and fear of fertility changes. We readministered the comprehensive OC knowledge questionnaire during the 6-month interview.

For statistical analysis, we first employed descriptive and bivariate statistics (student's and paired *t*-tests and Chi-square) to describe the sample and compare OC knowledge, continuation rates, and reasons for discontinuation across socio-demographic and intervention groups. We used multivariable logistic regression models to examine associations between (1) OC knowledge and OC continuation, and (2) OC knowledge and reasons for OC discontinuation, while controlling for confounders. We examined models among all women and then stratified by intervention group. We treated baseline and

6-month OC knowledge as primary independent variables in separate regression models and also examined a variable for change in OC knowledge score (not shown). Potential covariates, including sociodemographic and reproductive correlates we had previously shown to be associated with OC knowledge and continuation, were considered for inclusion in regression models if their *p*-value in bivariate tests was ≤ 0.25 .^{11,12} We present final reduced multivariable models in which we retained only those covariates that were associated with OC knowledge or continuation at $p < 0.05$. For variables that appeared to be collinear (e.g., age and grade of education), we retained those variables with the strongest effect. These variables included the text message intervention effect, age, education level (in years), race/ethnicity, employment status, age at coitarche, prior pregnancy, and previous OC use.

Results

Description of the sample

We enrolled 962 women; 69% completed a knowledge questionnaire at both baseline and follow-up. Demographic, social, and reproductive characteristics of these 659 women are summarized in Table 1. Participants were on average 21 years of age. Most participants were U.S. natives (84%). Nearly half of participants identified as African American race/ethnicity (41%), followed by Caucasian (29%), Hispanic (25%), and Asian and other (5%). The average participant had completed 14 years of education, with at least some college education reported by 63%. Over half reported a current student status (60%) and over half were employed (55%). The majority of participants were uninsured (34%) or had Medicaid (41%). Past OC use was reported by 75% of the

TABLE 1. ORAL CONTRACEPTIVE KNOWLEDGE SCORES AT BASELINE AND SIX MONTHS, BY DEMOGRAPHICS, ORAL CONTRACEPTIVE CONTINUATION STATUS, AND REASONS FOR DISCONTINUATION

<i>Baseline sociodemographic characteristics (n=659)</i>	<i>Mean baseline knowledge score</i>	<i>p</i>	<i>Mean six month knowledge score</i>	<i>p</i>
Age (years)		<0.001		<0.001
Adolescents ages 13–19 (n=210)	21.0		22.8	
Young adults ages 20–24 (n=449)	23.6		25.6	
Education		<0.001		<0.001
<High school (n=101)	19.9		21.6	
High school diploma/GED (n=141)	21.3		23.6	
>High school (n=417)	24.0		25.8	
Race/ethnicity		<0.001		<0.001
African American (n=270)	21.2		23.0	
Hispanic (n=167)	21.8		23.7	
Caucasian (n=189)	25.7		27.6	
Asian or other (n=33)	23.7		26.3	
Employment status		<0.001		<0.001
Employed (n=366)	23.4		25.4	
Unemployed (n=293)	22.1		23.8	
Past OC use		<0.001		<0.001
Yes (n=502)	23.4		25.3	
No (n=157)	20.9		22.6	
Past pregnancy		<0.001		<0.001
Yes (n=270)	23.8		25.7	
No (n=389)	21.3		23.2	
OC Continuation Status				
Yes (n=394)	23.6	<0.001	25.7	<0.001
No (n=265)	21.6		23.2	
Reasons for OC Discontinuation				
Access problems		0.91		0.59
Yes (n=69)	22.8		24.9	
No (n=590)	22.8		24.6	
Side effects		0.05		<0.001
Yes (n=66)	21.8		22.8	
No (n=593)	22.9		24.9	
Fear of fertility changes		0.04		0.94
Yes (n=53)	21.5		24.6	
No (n=606)	22.9		24.6	
Forgot to take the pill		0.008		<0.001
Yes (n=34)	20.7		21.4	
No (n=625)	22.9		24.8	

Results are presented as mean oral contraceptive (OC) knowledge score (points out of 41 possible) with *p*-values (*p*) from comparisons in scores within groups with independent *t*-tests or analysis of variance where appropriate.

sample; 20% were OC users at the time of enrollment. The average age at coitarche 17 years, with 46% having experienced a pregnancy and 39% an abortion; only 11% had ever delivered a child, but 88% planned to bear children in the future. Sexual activity within the past 6 months was nearly universal (96%), and sexual activity in the last week was reported by 50%. Of the 80% who had a primary sexual partner, nearly all participants (95%) reported that their partners were aware of their plans for OC use.

OC continuation and reasons for discontinuation

Fifty-nine percent of participants had continued using their OC at the 6-month interview (Table 1). The most common reasons for OC discontinuation included access/refill problems (26%), reported side effects (25%), fear of fertility changes (20%), and forgetting to take the pill (13%).

OC knowledge at baseline and six months

Mean OC knowledge scores were 22.8 out of a possible 41 points (56% correct response) at baseline and 24.7 (60%) at 6 months. Baseline scores were similar between the text message intervention and routine care control groups ($p=0.75$), but mean 6-month scores were higher in the intervention than control group (25.5 versus 23.7, $p<0.001$). Scores improved 1.9 points over time for all participants ($p<0.001$) but improved more for participants who received the educational text messages than those who received routine care alone (2.7 versus 0.9 point increase, $p<0.01$).

OC knowledge scores varied by nearly all sociodemographic characteristics (Table 1). Younger, less educated, racial/ethnic minority, and unemployed women had lower OC knowledge scores than their counterparts at baseline and 6 months (all p -values <0.001). Participants with histories of OC use and pregnancy had higher knowledge scores at baseline and 6 months than their counterparts (all p -values <0.001). Scores improved similarly across groups of women with different sociodemographic and reproductive backgrounds (not shown).

Associations between OC knowledge, continuation and reasons for discontinuation

Participants continuing OCs at 6 months had higher OC knowledge scores at baseline (23.6 points, 58% correct) than those discontinuing OCs (21.6 points, 53%) ($p<0.001$) (Table 1). Six-month knowledge scores were also higher among OC continuers than among discontinuers (25.7 points, 63% correct versus 23.2 points, 57% correct, $p<0.001$).

At follow-up, OC knowledge scores were 2.1 points lower for participants who reported discontinuing OC use due to side effects ($p<0.001$) and 3.4 points lower for those who reported discontinuing due to forgetting to take the pill ($p<0.001$) than those who did not report either as a reason for discontinuation (Table 1).

In multivariable analyses controlling for significant sociodemographic and reproductive characteristics and the text message intervention effect, both baseline and 6-month OC knowledge scores were positively associated with OC continuation (Table 2). Each correct response on the baseline OC knowledge assessment was associated with a 4% increased odds of OC continuation at 6 months (odds ratio [OR] 1.04,

95% confidence interval [CI] 1.00–1.09). Similarly, in a separate model, each correct response on the 6-month OC knowledge assessment was associated with a 6% increased odds of OC continuation (OR 1.06, CI 1.02–1.11). Point estimates were similar in models stratified by intervention group (Table 2).

OC knowledge was a protective factor for two commonly reported reasons for discontinuation: side effects and forgetfulness (Table 2). Each correct response on the 6-month OC knowledge assessment was associated with a 6% and 12% reduced odds of OC discontinuation due to side effects and forgetfulness, respectively (OR 0.94, CI 0.89–0.95 and OR 0.88, CI 0.81–0.95, respectively).

Finally, sociodemographic factors that were associated with both OC knowledge and continuation in the bivariate and multivariable analyses included years of education, race/ethnicity, age at coitarche, and past OC use. Young women with increasing years of education, Caucasian women and previous OC users had higher OC knowledge scores and greater odds of OC continuation at 6 months compared with their counterparts (Tables 1 and 2).

Discussion

Research has suggested that lack of contraceptive knowledge is one factor that contributes to poor contraceptive behavior and risk of unintended pregnancy among young women in the United States.^{2–10,12,13} A recent population-based survey by the Guttmacher Institute found that among 897 women ages 18–29 years, higher contraceptive knowledge levels were associated with a decreased odds of unprotected sex and contraceptive nonuse and an increased odds of current hormonal or long-acting contraceptive method use.¹³ For OCs (which continue to be the most commonly used hormonal contraceptive method among young U.S. women¹), studies have also shown that women's knowledge is generally poor,⁷ but findings on associations between low OC knowledge and behavior have been somewhat inconsistent.^{5,6,8,9} Gilliam and colleagues tested an educational intervention (consisting of counseling, video, and handouts) to improve OC use among 25 young, postpartum, African American women and found that OC knowledge improved over time, but knowledge was not associated with OC continuation.⁹ Rickert and colleagues tested immediate recall of OC information in 150 sexually active, ethnic minority women aged 13–40 years and found 53% had poor recall, which was associated with poor OC knowledge and compliance.⁶

Using a comprehensive conceptualization and measurement approach, we found that OC knowledge levels were low among multiethnic, urban young women in our study. Moreover, higher OC knowledge scores (at baseline and 6 months) were related to an increase in the odds of OC continuation at 6 months. While the magnitude of associations between OC knowledge scores and 6-month continuation rates was modest in our study (a 4%–6% increase in the odds of OC continuation with each correct response on the knowledge assessment) and the clinical significance of these results are not fully clear, our study builds upon previous work to further clarify the link between OC knowledge and behavior. Continued research can examine how educational interventions that target relatively small improvements in women's OC

TABLE 2. INFLUENCE OF ORAL CONTRACEPTIVE KNOWLEDGE ON THE ODDS OF ORAL CONTRACEPTIVE CONTINUATION AND REASONS FOR DISCONTINUATION: MULTIVARIABLE LOGISTIC REGRESSION RESULTS

<i>OC continuation</i>	<i>Variable range</i>	<i>All women (n = 659)</i>		<i>Text message intervention group (n = 332)</i>		<i>Routine care control group (n = 327)</i>	
		<i>OR</i>	<i>95% CI</i>	<i>OR</i>	<i>95% CI</i>	<i>OR</i>	<i>95% CI</i>
<i>OC knowledge score (points)^a</i>							
Baseline	9–35	1.04	1.00, 1.09	1.01	1.00, 1.07	1.07	1.01, 1.14
Six months	9–38	1.06	1.02, 1.11	1.05	1.00, 1.11	1.08	1.02, 1.16
Education (years)	7–18	1.12	1.05, 1.28	1.10	0.95, 1.26	1.17	1.01, 1.36
Race/ethnicity	Caucasian	1.73	1.15, 2.75	2.57	1.35, 4.91	1.44	0.77, 2.72
	other	ref		ref		ref	
Age at coitarche (years)	12–24	1.17	1.04, 1.26	1.17	1.02, 1.34	1.18	1.03, 1.36
Past OC use	yes	1.60	1.09, 2.51	2.00	1.07, 3.76	1.54	0.86, 2.78
	no	ref		ref		ref	
<i>Reasons for OC Discontinuation</i>							
<i>Discontinued due to side effects</i>							
Baseline knowledge score		0.97	0.92, 1.03	1.00	0.94, 1.17	0.99	0.90, 1.08
Six-month knowledge score		0.94	0.89, 0.99	0.90	0.82, 0.99	0.95	0.88, 1.03
<i>Discontinued due to forgetfulness</i>							
Baseline knowledge score		0.93	0.85, 1.00	0.97	0.84, 1.13	0.95	0.85, 1.06
Six-month knowledge score		0.88	0.81, 0.95	0.90	0.79, 1.02	0.86	0.78, 1.00

Results are presented as odds ratios (OR) with 95% confidence intervals (CI) from final reduced multivariable logistic regression models for all women and stratified by intervention group and controlling for significant covariates.

^aBaseline and 6-month OC knowledge score variables included in separate regression models. Model for all women also controlling for text message intervention effect, which was significant at $p < 0.01$.

OC, oral contraceptive; Ref, reference.

knowledge levels may impact OC continuation and unintended pregnancy rates at the clinical and population levels.

We also found differences in both OC knowledge levels and continuation rates across sociodemographic groups of young women, with women with more years of education and Caucasian women faring better than women with fewer years of education and racial/ethnic minority women. These findings are consistent with those of other researchers who have documented sociodemographic disparities in poor contraceptive knowledge, behaviors and related family planning outcomes including unintended pregnancy.^{1,9,13} While this analysis and our larger study were not specifically focused on sociodemographic disparities in OC knowledge and continuation, modern technological interventions may offer a unique opportunity to provide individualized and culturally sensitive contraceptive education, counseling, and behavioral interventions to young women across different sociodemographic backgrounds and with a range of learning styles and informational needs.^{3,7} Such an approach is ultimately needed to help reduce inequities in family planning outcomes.^{3,7}

Other investigators have documented relationships between specific dimensions of limited OC knowledge and OC misuse.^{2,4,5,10} In a study of 345 racially diverse adolescents, Moore and colleagues found that those who believed OCs would cause minor and major side effects were less likely to intend to use and to consistently use OCs at one year.⁸ Similarly, the Guttmacher study also found that fear of side effects was associated with one or more “risky” contraceptive behaviors, such as nonuse or less effective method use, among their nationally representative sample of young adult women.¹³ For OCs, side effects remain the most frequently reported reason for discontinuation.^{2,4} This may be due to a variety of factors, including OC product labeling, counseling emphasis,

or media attention to side effects and risks of hormonal contraception—despite evidence (e.g., double-blind randomized trials) showing no OC-related side effects.¹⁰

Our study extends this research to describe a link between OC knowledge and specific reasons for OC discontinuation. We found that lower levels of OC knowledge were associated with discontinuation due to side effects, as well as forgetfulness. In our previous in-depth analysis of the different dimensions of OC knowledge, we described women’s gaps in OC knowledge, which were greatest for OC side effects, risks and benefits.¹² Collectively, our results may reflect specific areas to target in efforts to educate women on all key dimensions of OCs (rather than emphasizing risks or side effects). Such a comprehensive approach could potentially have a stronger impact on OC continuation rates. Indeed, in our larger randomized controlled trial, women who received our comprehensive daily text message intervention (which entailed educational information and behavioral reminders) were 44% more likely to continue OCs at 6 months compared with the control group.¹¹ Unfortunately, we had limited power to further examine the effect of each OC knowledge dimension, as well the effect of “dosage” of intervention content for each dimension, on OC continuation and pregnancy rates.

Several other limitations of our study are noteworthy. Although the link between knowledge and behavior was a primary interest from the onset, the randomized controlled trial design of the larger study did not offer an ideal design to test relationships between OC knowledge and continuation. It is unclear to what extent the “reminder” versus “education” components of the intervention may have affected continuation rates independently or interactively. In our previous work examining the effect of the educational text message intervention

on OC knowledge, we found that women who received the text intervention had higher OC knowledge scores at 6 months than women who received standard of care alone.¹² In the present analysis, because we were interested in understanding the effect of OC knowledge on continuation, we attempted to account for this potential confounding by using comprehensive pre-post OC knowledge assessments, by controlling for the treatment effect and by further stratifying the analysis by intervention groups. Nonetheless, further research is needed to isolate the influence of OC knowledge on behavior and to understand the multilevel, and even interactive, effects of technological health intervention components on family planning knowledge and behaviors.

Additionally, while our design was prospective, we could not determine time-varying associations between knowledge and discontinuation, for example at the precise moments when potential side effects were experienced or when pills were discontinued. Finally, we were also unable to examine the influence of knowledge on intermediate OC attitudes and behaviors that may lead to discontinuation, including pregnancy intentions and OC misuse patterns.

Conclusion

Our study provides insight into the cognitive behavioral factors that help shape young women's experiences with using OCs. Comprehensive OC knowledge (or lack thereof) appears to be one determinant of continued OC use and for commonly reported reasons for OC discontinuation. These findings may have important implications family planning interventions and highlight a need for more multidimensional, tailored educational clinical and public health strategies, especially those capitalizing on modern technological innovations, to improve young women's knowledge and use of OCs. Findings may also point to the role of highly effective long acting reversible contraceptive methods as ideal contraceptive options for young women with adherence concerns. While not the focus of this study, future research can extend these findings to consider the influence of contraceptive knowledge on women's experiences in using a wider range of contraceptive methods including continuation rates of intrauterine devices and subdermal implants. Overall, additional studies that further clarify the complex relationships between family planning knowledge, decision making, and behaviors are ultimately warranted to promote successful contraceptive use and reproductive health outcomes among young women.

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Address correspondence to:
Kelli Stidham Hall, PhD
Department of Obstetrics and Gynecology
Institute for Social Research
University of Michigan
L4000 Women's Hospital
1500 East Medical Center Drive
Ann Arbor, MI 48109

E-mail: hkelli@umich.edu

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