



Original Article

Use of levonorgestrel as emergency contraception in overweight women

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ABSTRACT

Objective: Levonorgestrel (LNG) emergency contraception (EC) may have decreased efficacy for women with body mass indices (BMI) ≥ 26 kg/m². This study aims to evaluate the prevalence of LNG EC use and EC counseling among overweight women.

Methods: The 2013–2015 dataset from the National Survey of Family Growth was analyzed to determine the proportion of women with BMI ≥ 26 kg/m² who report recent use of LNG EC and EC counseling.

Results: Overall, 2.4% of respondents reported recent use of LNG EC. Among women using oral LNG for EC, 29.8% of survey participants reported BMI ≥ 26 kg/m². Additionally, 40.2% of women with BMI ≥ 26 kg/m² using oral LNG EC reported having a doctor or medical provider talk to them about emergency contraception within the last 12 months, compared to 18.3% of LNG EC users with BMI < 26 kg/m² ($p < 0.001$).

Conclusions: Despite recent counseling from clinicians and concerns for decreased efficacy, a significant number of overweight women continue to use LNG for EC. Clinicians should counsel women with BMI ≥ 26 kg/m² on the potential limitations of oral LNG for EC and offer more effective EC methods, including the copper intrauterine device and oral ulipristal acetate.

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Introduction

Emergency contraception (EC) is used to reduce the risk of undesired pregnancy when taken after unprotected intercourse. Two Food and Drug Administration (FDA) approved EC methods are currently available in the United States; these methods include oral levonorgestrel (1.5 mg), either as a single or divided dose, and oral ulipristal acetate (30 mg). Levonorgestrel (LNG) EC is a widely available progestin that is FDA approved for pregnancy prevention up to three days after intercourse and may have some effectiveness up to five days after intercourse. LNG EC prevents conception by delaying follicular development and providing a local contraceptive effect [1,2]. This medication remains the only method of EC available without a prescription in the United States, where it is sold under the brand name “Plan B” [3]. A second method, ulipristal acetate is a selective progesterone receptor modulator that can prevent pregnancy up to five days after intercourse by inhibiting

follicular development [1]. This latter method requires a prescription and is not widely available in the United States (US) [4]. Both forms of oral EC have similar side effect profiles and do not require an in-person exam prior to provision [1].

In 2011, a meta-analysis of 3445 women concluded that oral EC methods are less effective in overweight women [5]. This study found that oral LNG 1.5 mg had no effect on pregnancy rates in women with body mass indices (BMI) ≥ 26 kg/m² and oral ulipristal acetate 30 mg had no effect on pregnancy rates in women with BMI ≥ 35 kg/m² [5]. A second analysis of this same data confirmed a significant increase in the pregnancy rate after LNG EC use for women weighing more than 70 kg and women with a BMI beyond 26 kg/m² [6]. International studies of EC efficacy have produced mixed results. A 2015 meta-analysis of three World Health Organization (WHO) clinical trials [7–9] concluded that BMI does not affect LNG EC efficacy [10]. However, a significant limitation of this study is the low numbers of overweight or obese women included in the analysis. To obtain data from a larger sample of overweight and obese women using LNG EC, a more recent study pooled data from four WHO randomised clinical trials (the three trials included in the 2015 meta-analysis [7–9], plus an additional clinical trial [11]) and reported significantly increased pregnancy rates for women with BMI beyond 30 kg/m² [12]. In this study, the majority of obese women and women who became pregnant were from a single study

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site, potentially compromising the generalizability of these findings [12]. The trend for increased LNG EC failure in overweight and obese women seen in these studies [5,6,12] raises concern about EC use in this high-risk population.

This compromised efficacy may be secondary to differences in pharmacokinetics, as women with obesity taking oral LNG have lower serum LNG concentrations compared to women without obesity. Women who are overweight or obese may require higher doses to effectively prevent pregnancy [13,14], consistent with the current recommendation of the Royal College of Obstetricians and Gynaecologists (RCOG) that women with BMI ≥ 26 kg/m² receive either ulipristal acetate or a double dose of LNG EC [15,16]. However, the pharmacokinetics of oral EC in obese women remains unclear and understudied. The true relationship between body weight and EC effectiveness, as well as the exact etiology of any decreased efficacy in overweight women, is controversial [16]. Unlike RCOG, the American College of Obstetricians and Gynecologists (ACOG) does not recommend an increased LNG dose, regardless of BMI [1], but both the ACOG and the Centers for Disease Control and Prevention acknowledge a possible decrease in LNG EC efficacy in obese women [1,17].

A third form of EC which is not affected by body weight is available; the copper intrauterine device (IUD) can be used as EC up to five days after intercourse with a pregnancy rate of less than 0.1% [1,18]. Although the FDA has not approved the copper IUD for an EC indication, ACOG recommends the copper IUD as an off-label EC option. Given the possible influence of body weight on oral EC efficacy, ACOG recommends the copper IUD be considered for EC as an alternative to oral EC methods for women with obesity [1].

Over the past decade, obesity has become increasingly common among reproductive-age women [19]. Further, 68.8% of US women are overweight with a BMI >25 kg/m² and cannot reliably depend on oral LNG for EC [20]. Additionally, these women carry an increased risk of pregnancy-related complications, making reliable contraception especially vital to the health of obese women [21].

Given the data suggesting diminished efficacy of LNG EC for overweight women and the availability of superior methods (ulipristal acetate and the copper IUD), this study aims to evaluate the proportion of women taking LNG EC who have a BMI ≥ 26 kg/m². This subpopulation was selected for analysis as these women with BMI ≥ 26 kg/m² would receive questionable pregnancy prevention benefit from LNG EC [1,5,6,15]. We hypothesized that LNG EC use would be less common among overweight women compared to women with normal or underweight BMI and that very few of the women taking oral LNG EC would have a BMI ≥ 26 kg/m². It was also predicted that this subpopulation of overweight women choosing this inferior method would have purchased this over-the-counter product without consulting a clinician, which may represent a missed opportunity to counsel these women on more effective EC methods.

Methods

The analysis of the National Survey of Family Growth (NSFG) datasets used in this study was determined to be exempt from a full review by the Institutional Review Board within our hospital system. The NSFG is a publicly available database that surveys men and women concerning general and reproductive health topics. This nation-wide survey collects responses from women ages 15 to 44 living in the United States [22,23]. As the NSFG oversamples certain subgroups, sampling weights must be applied to correct for under-sampling and over-sampling [24]. The weighted 2013–2015 dataset [22–24] was analyzed using Statistical Package for the Social Sciences (SPSS) 23 (Chicago, IL, USA). Statistical weight variables included in the NSFG dataset were applied prior

to analysis to make the sample more representative of the US Census Bureau population projections of age, race, and ethnicity subgroups. Although the NSFG asks participants about EC use in the previous 12 months, this question does not specify EC method type. Recent oral LNG EC use was defined as women who reported using EC without a prescription in the previous 12 months, while excluding women who reported using both EC and an IUD during that same 12 month period. This definition was developed to distinguish oral LNG EC, which is available over-the-counter, from ulipristal acetate EC, which requires a prescription. This methodology also distinguishes oral EC use from copper IUD insertions for EC purposes. Respondents missing BMI, EC use, or IUD use data (23.2% of the weighted dataset) were excluded from the analysis. Demographic characteristics between LNG EC users were compared using Pearson's Chi-Square Test and the Student's t-test. The population of women with recent oral LNG EC use was compared by BMI categories (BMI <26 kg/m² and BMI ≥ 26 kg/m²). This comparison was selected based previously published findings that oral LNG may be less effective for women with BMI ≥ 26 kg/m² [5,6].

Results

Weighted responses from interviews with 5699 women were included in the analysis from the NSFG 2013–2015 NSFG dataset. Overall, 2.4% of respondents reported using LNG EC in the previous 12 months. Regardless of BMI, the most common reason for using this medication was because of a lack of contraception during intercourse, as reported in 52.3% of respondents. The second most common reason for LNG EC use was due to concern for birth control method failure (35.1% of surveyed women).

The mean BMI for this weighted dataset was 27.5 ($\sigma = 6.62$) with 51.6% of women reporting BMI ≥ 26 kg/m². Recent LNG EC use was less prevalent for women with BMI ≥ 26 kg/m² than for women with BMI <26 kg/m² (RR=0.399, CI=0.397 to 0.401, $p < 0.001$). Additionally, 1.4% of women with BMI ≥ 26 kg/m² report using LNG EC in the previous 12 months. Among women using LNG EC, 29.8% reported BMI ≥ 26 kg/m² (see Fig. 1).

Demographic characteristics of women using LNG EC was compared by BMI category (see Table 1). LNG EC users were younger (mean age of 25.9 years vs 32.4 years, $p < 0.001$) and thinner (Mean BMI of 24.9 vs 27.55, $p < 0.001$). Regardless of BMI, most LNG EC users were nulliparous and less than 30 years of age. While the majority of women in this NSFG dataset identified as White (62.5%) or Hispanic (18.5%), women with BMI ≥ 26 kg/m² using LNG EC tended to be White (45.3%) or Black (29.7%).

Additionally, 40.2% of women with BMI ≥ 26 kg/m² using LNG EC reported having a doctor talk to them about emergency contraception within the previous 12 months. Whereas, only 18.3% of women with BMI <26 kg/m² using LNG EC reported recent EC counseling ($p < 0.001$). Rates of recent EC counseling among non-EC users was much lower for women of all body mass indices (3.0% for BMI <26 kg/m² and 2.9% for BMI ≥ 26 kg/m²).

Discussion

Pregnancy outcomes and pharmacokinetic research suggests that LNG EC may be less effective for women with BMI ≥ 26 kg/m² [5,6]. This compromised efficacy likely contributes to the lower rates of LNG EC use seen among overweight women compared to women of normal weight in this study. However, a significant number of women with BMI ≥ 26 kg/m² continue to use LNG EC in an effort to prevent pregnancy despite this method's decreased efficacy and the existence of superior EC methods. The 29.8% of LNG EC users who report a BMI ≥ 26 kg/m² are spending money on a less effective medication with questionable benefit and potential

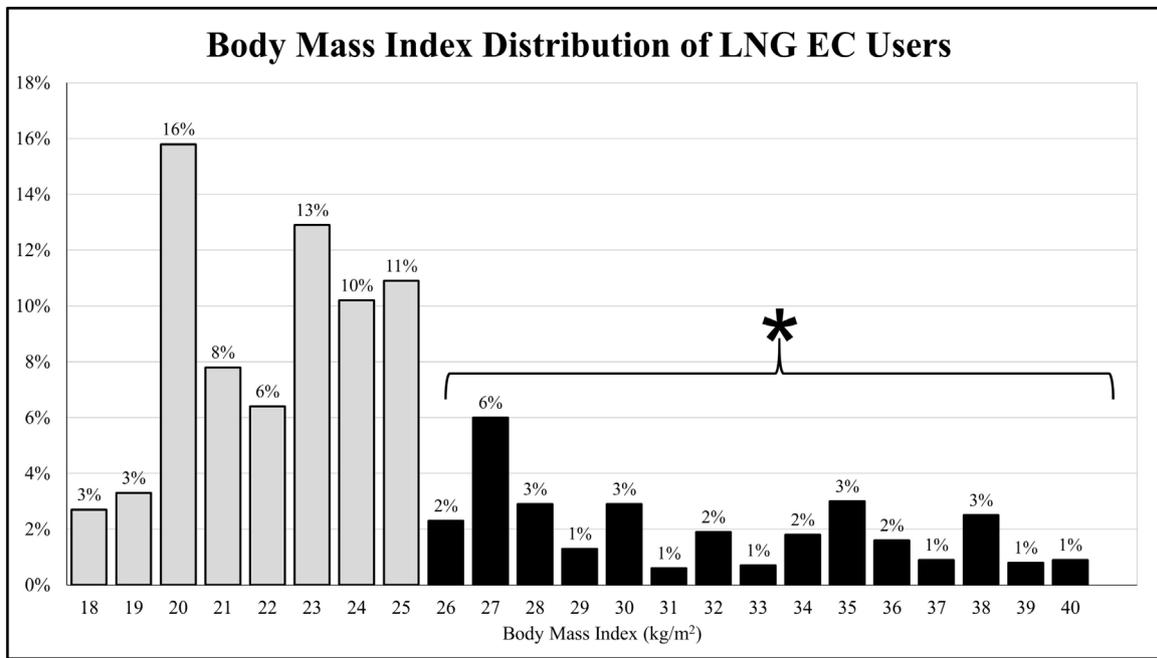


Fig. 1. Distribution of body mass indices for women taking oral levonorgestrel emergency contraception. Among levonorgestrel emergency contraception (LNG EC) users, 29.8% report a BMI ≥ 26 kg/m² (signified by a single asterisk), which is above the body mass index (BMI) cutoff associated with decreased LNG EC efficacy. Only 70.2% of LNG EC users report a BMI within the effective range for this medication.

Table 1
Demographic characteristics.

Demographic characteristics	Women with recent LNG EC use		Women without recent LNG EC use	
	BMI < 26 kg/m ² %	BMI ≥ 26 kg/m ² %	BMI < 26 kg/m ² %	BMI ≥ 26 kg/m ² %
Age (years)				
≤21	35.1	12.7	8.3	5.1
22–29	35.6	64.8	35.1	27.9
30–39	24.8	20.2	38.0	42.4
≥40	4.4	2.3	18.6	24.6
Race				
Non-Hispanic White	27.5	45.3	61.6	54.0
Non-Hispanic Black	11.8	29.7	8.3	17.5
Hispanic	37.6	14.7	17.5	20.3
Other/multi-racial	23.1	10.3	12.6	8.3
Education level				
No high school diploma	9.3	6.5	8.0	11.2
High school diploma or equivalent	46.7	52.6	42.2	52.1
Professional or college degree	43.9	41.0	49.8	36.7
Parity				
Nulliparous	72.8	63.7	41.0	27.5
One or more livebirths	27.2	36.3	59.0	72.5
Religious affiliation				
Non-religious	23.1	23.4	26.6	20.3
Catholic	33.8	13.8	22.8	20.1
Protestant	38.2	53.5	42.0	53.6
Other religions	4.9	9.3	8.7	5.9
Annual income				
<\$20,000	31.6	34.6	21.0	26.3
\$20,000–\$39,999	22.7	21.7	18.6	25.9
\$40,000–\$99,999	34.6	35.4	36.8	32.2
>\$100,000	11.0	8.4	23.6	15.7

adverse effects, including nausea, headache, and vaginal bleeding [1]. Additionally, these women may have a misguided confidence in this method which could have clinically significant consequences, such as delayed diagnosis of pregnancy. This population is also more likely to have medical comorbidities that increase maternal and fetal risks associated with pregnancy, making family planning especially important for these women [21]. For women who are overweight or obese using LNG EC, it is imperative that they under-

stand the limitations of this medication and complete a follow-up pregnancy test.

We initially predicted that overweight women taking LNG EC are doing so without consulting a clinical provider. It was hypothesised that although LNG's over-the-counter status improves overall EC access, the ability to purchase this EC method without speaking to a clinician may lead to missed opportunities for EC counseling concerning more effective methods, which is especially critical for

overweight women. However, more than a third of the women with BMI ≥ 26 kg/m² using LNG EC in this study reported receiving recent EC counseling. These findings disprove our initial hypothesis and suggest other etiologies, including ineffective counseling from providers, a knowledge deficit among clinicians, or an inability to provide other EC methods in a time-sensitive manner. It is unclear whether clinicians are incorporating patients' bodyweight into their counseling or decision making when discussing EC methods. As EC is often discussed by providers outside the field of gynecology (including midwives, adolescent medicine physicians, family medicine practitioners, and emergency room doctors), these clinicians may be unaware of the evidence concerning body weight's impact on oral EC efficacy [25]. Even if providers are aware of LNG EC's limitations in overweight women, these clinicians may not be able to offer immediate insertion of the copper IUD and ulipristal acetate is not widely available even with a prescription [4]. Alternatively, some providers may disagree with the studies' and national society guidelines' conclusions concerning the controversial interaction of BMI and LNG EC efficacy [16]. Further research is needed to better understand the barriers to providing copper IUDs for EC and the quality of emergency contraceptive counseling provided to these women.

The strengths of this study include the use of large, nationally representative dataset. Data in the NSFG, such as weight, height, and recent EC use, are self-reported, and this non-objective reporting remains a major limitation of this study. As perceived body weight is often less than measured body weight, this analysis may underestimate the true number of overweight women in the surveyed population [26]. Additionally, the NSFG is limited to participants living in the United States, and conclusions from this data may not be generalizable to international populations.

Conclusion

This study demonstrates the continued use of LNG EC among overweight women despite recent counseling from clinicians and data suggesting the inferior efficacy of LNG EC for preventing pregnancy in these women [5,13,18]. Women's health providers should counsel overweight women on the limitations of LNG EC, the importance of preventing the need for EC through the routine use of highly-effective methods of contraception, and the availability of alternative forms of EC, such as the copper IUD and ulipristal acetate. Further research is needed to identify alternative dosages for oral EC for women with elevated BMIs and to better understand if knowledge of oral EC's limited efficacy affects women's decision-making concerning their first-line contraceptive method. Additionally, given ulipristal acetate's superior efficacy compared to LNG for women with BMI between 26 kg/m² and 35 kg/m², the lack of ulipristal acetate availability at US pharmacies remains a significant barrier [4]. This study highlights the need to improve provider education, patient counseling, and EC availability for our increasing population of patients who are overweight or obese.

Conflict of interest

The authors declared no conflict of interest. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CRediT authorship contribution statement

Paris Stowers: Conceptualization, Methodology, Formal analysis, Writing - original draft, Visualization. **Renee Mestad:** Conceptualization, Writing - review & editing, Supervision.

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