

Review article

Intrauterine devices for adolescents: a systematic review

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Abstract

Background: The appropriateness of IUDs for adolescents remains unsettled, as does the definition of the term *adolescent*. Unplanned pregnancy among teenagers remains epidemic, and long-acting methods, such as IUDs, offer the promise of top-tier effectiveness.

Study Design: We conducted a systematic review of the literature concerning IUD use in adolescents using MEDLINE, Popline, EMBASE and CINAHL databases.

Results: Six cohort studies and seven case-series reports met our inclusion criteria; none included IUDs in current use in the United States. Overall, continuation rates were high and cumulative pregnancy rates low, ranging from 2% at 6 months to 11% at 48 months. Compared with combined oral contraceptives, IUDs had similar or better continuation rates; pregnancy rates were similar at 2 years. IUD expulsion rates may be inversely related to age.

Conclusions: The literature on IUD use among adolescents is scanty and obsolete. Nevertheless, published reports were generally reassuring. Randomized controlled trials and cohort studies comparing contemporary IUDs with other methods are urgently needed.

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Keywords: IUD; Intrauterine device; Systematic review; Teenagers; Adolescents; Contraception

1. Introduction

Adolescent pregnancy remains a stubborn public health problem. Each year in the United States, almost 750,000 teenagers become pregnant, and 82% of these pregnancies are unplanned. Since almost half of teenagers have had sexual intercourse, millions are at risk of unplanned pregnancy [1].

Contraceptive effectiveness depends on both method continuation and adherence. Adolescents have higher continuation rates with longer-acting contraceptive methods such as implants [2,3] than with shorter-acting methods. Nevertheless, most adolescents use oral contraceptives and condoms for contraception [4]. Most sexually active teenagers report using contraception [4], but their compliance with these methods is suboptimal. For example, adolescents are twice as likely to become pregnant while using oral contraceptives than are women over 30 years of age [5]. Many adolescents could benefit from easy-to-use, “forgettable” contraception.

Professional guidelines differ regarding the use of IUDs in adolescents. In 2007, an American College of Obstetricians and Gynecologists (ACOG) Committee Opinion recommended that IUDs be considered as first-line choices for both nulliparous and parous adolescents [6]. The World Health Organization (WHO) also supports IUD use in adolescents by giving IUDs a level 2 recommendation (“benefits outweigh the risks”) for women from menarche to 20 years [7]. However, the American Academy of Pediatrics policy statement on contraception is more conservative: an IUD may be appropriate for adolescents who have children and are protecting themselves from sexually transmitted infections (STIs) [8]. The Academy suggests that IUDs be a second-line choice for contraception for adolescents who have had an unintended pregnancy with another method. Because the appropriateness of IUDs for adolescents is unsettled, we sought the relevant evidence on this question.

2. Materials and methods

We performed a systematic review of the literature concerning IUD use in adolescents. Adolescence is defined

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as the interval from puberty to completed growth and physical maturity [9]. The duration of this interval varies from person to person, and this variation is reflected in the age limits used in studies of adolescents. We did an online search of MEDLINE, Popline, Embase and CINAHL from their inception. We excluded non-English publications, and we did not perform a LILACS search for this reason. Excluding trials in non-English languages narrowed the scope of our review but probably had little effect on our findings [10]. We also excluded reports of the Dalkon Shield since it was an aberrant device [11]. Our initial search strategies were as follows:

MEDLINE: (IUD* OR IUCD* OR IUS OR intrauterine device* OR intrauterine contraceptive device* OR intrauterine system* OR intrauterine devices) AND (adolescent OR adolescen* OR teen* OR youth OR student*) With an English-language limitation, this strategy resulted in 1588 hits.

Popline: (IUD*/IUCD*/IUS/intrauterine device*/intrauterine contraceptive device*/intrauterine system*) &

(adolescen*/teen*/youth/student*) This yielded 1436 hits (including non-English citations).

Embase: adolescent? or youth or teen? or student? and iud? or iucd? or ius or intrauterine()device? or intrauterine ()contraceptive()device? or intrauterine()system This yielded 552 references.

CINAHL: IUD* or IUCD* or IUS or intrauterine device* or intrauterine contraceptive device or intrauterine system AND adolescent* or youth or teen* or student* This returned 28 citations.

We also examined references from bibliographies of “related studies” in PubMed, randomized controlled trials, review articles, editorials, commentaries and professional organization guidelines. We investigated papers whose title included “adolescent” or “nulliparous” or whose abstract mentioned a subgroup analysis of adolescents. Although our original eligibility criterion was age ≤ 18 years, six studies included 19-year olds, one included ≤ 20 -year olds and another included women up to 22 years of age. Because of the limited number of reports found, we included these

Table 1
IUD continuation rates, selected cohort studies and case-series reports, 1973–2007

Reference	Age range (years)	Study period (months)	Method and number of participants	Continuation rate (%)	Comments
<i>Cohort studies</i>					
Jorgensen [12]	11–17	12	IUD: 82 (Lippes Loop, Copper-T)	88	Postpartum
Goldman et al. [13]	13–18	12	COC: 90	70	Nulliparous postabortion
			Lippes Loop A: 56	48	
			Copper-7: 45	87	
			Copper-T: 61	75	
Goldman and Reichman [14]	14–18	24	Total: 69	73	Nulliparous Rate at 12 months: IUD: 80 COC: 86 Condoms: 87 Foam: 35
			IUD: 30 (Copper-7, Copper-T)	72	
			COC: 72	79	
			Condoms: 38 Vaginal foam: 20	16	
Diaz et al. [15]	<20	48	T-Cu200B: 995	31	Parous Rates: 12 months: 78 24 months: 60 36 months: 45
<i>Case-series reports</i>					
Lane and Sobrero [18]	13–19	9	Loop C: 44 Loop D: 1 W ^a : 2 Lem ^a : 54	Total: 73	Nulligravid (83% of participants) Nulliparous (96% of participants)
Weiner et al. [19]	13–20	6	IUD: 243 (Copper-T-200, Copper-7)	Total: 79	Nulligravid
Kulig et al. [20]	13–22	36	Copper-7: 120	39	Nulliparous (81% of participants) Rates: 6 months: 83 12 months: 70 24 months: 49

^a Experimental devices.

reports as well. Our primary outcomes were continuation, pregnancy rates and expulsion rates. Secondary outcomes included side effects and acceptability.

3. Results

We found few recent reports on this topic. Six cohort studies [12–17] and seven case-series reports [18–24] met our inclusion criteria; no randomized controlled trials were found. One trial randomized 200 women aged 18 to 25 years to either a levonorgestrel-releasing IUD or to oral contraceptives; because of the older age of these participants, we did not include it in this review [25].

Seven studies reported continuation rates (Table 1). IUD continuation rates were generally high at 1 year and decreased over time. The continuation rates at 12 months ranged from 48% [13] to 88% [12]. At 24 months, continuation rates ranged from 49% [20] to 73% [14]. At 36 months, they ranged from 39% [20] to 45% [15]. Only one study extended to 48 months, with a continuation rate of 31% [15]. Two studies compared IUDs to combined oral contraceptives; IUD continuation rates were similar to or better than those of pills [12,14].

Pregnancies were infrequent among adolescent IUD users (Table 2). Seven studies reported pregnancy rates over 6 to 48 months of observation. Cumulative pregnancy

rates increased from 2% [19] at 6 months to 11% [15] at 48 months. One study compared pregnancy rates at 24 months between copper IUDs and pills (3% and 0%, respectively) [14].

IUD expulsion rates for adolescents ranged widely (Table 3). For example, rates varied from 5% to 22% over observation periods of 6 to 48 months. One study reported a 9-month expulsion rate of 21%. However, half of the IUDs used were experimental devices, which were never marketed [18]. Rates were inversely related to age in two studies [15,21], but the relationship to parity was inconsistent. Nulligravid women had significantly higher expulsion rates compared to primiparous women in one Swedish study, although this association was not controlled for age [21]. Over 24 months, the expulsion rates were 8% for nulligravid women, 5% for nulliparous women, 2% for women with one birth and 3% for those with two births. However, another study of 13- to 22-year-old women found expulsions more common by 36 months among women who had given birth: 22% among parous and 17% among nulliparous women. These results were not controlled for age, and the sample size was small [20].

Three studies focused on pelvic inflammatory disease (PID) [16,17,23]. Because of the lack of consistent definitions of upper genital tract infection, interpretation of these outcomes is impossible [26].

Table 2
IUD pregnancy rates, selected cohort studies and case-series reports, 1973–2007

Reference	Age range (years)	Study period (months)	Method and number of participants	Pregnancy rates (%)	Comments
<i>Cohort studies</i>					
Goldman et al. [13]	13–18	12	Lippes Loop A: 56 Copper-7: 45 Copper-T: 61	Total: 4	Nulliparous postabortion
Goldman and Reichman [14]	14–18	24	IUD: 30 (Copper-7, Copper-T) COC: 72 Condoms: 38 Vaginal foam: 20	3 0 5 5	Nulliparous
Diaz et al. [15]	<20	48	T-Cu200B: 995	11	Parous Gross cumulative rate 12 months: 3 24 months: 6 36 months: 8
<i>Case-series reports</i>					
Lane and Sobrero [18]	13–19	9	Loop C: 44 Loop D: 1 W ^a : 2 Lem ^a : 54	Total: 4	Nulligravid (83% of participants) Nulliparous (96% of participants)
Weiner et al. [19]	13–20	6	IUD: 243 (Copper-T-200, Copper-7)	Total: 2	Nulligravid Pearl index: 4.6
Kulig et al. [20]	13–22	36	Copper-7: 120	3	Nulliparous (81% of participants) Pearl index: 2.0
Larsson et al. [21]	15–19	24	Copper-7: 179	6	

^a Experimental devices.

Table 3
IUD expulsion rates, selected cohort studies and case-series reports, 1973–2007

Reference	Age range (years)	Study period (months)	Method and number of participants	Expulsion rates (%)	Comments
<i>Cohort studies</i>					
Jorgensen [12]	11–17	12	IUD: 82 (Lippes Loop, Copper-T)	Total: 5	
Goldman et al. [13]	13–18	12	Lippes Loop A: 56 Copper-7: 45 Copper-T: 61	Total: 11	Nulliparous postabortion
Goldman and Reichman [14]	14–18	24	IUD: 30 (Copper-7, Copper-T)	Total: 7	Nulliparous
Diaz et al. [15]	<20	48	T-Cu200B: 995	11	Parous Gross cumulative rate 12 months: 7 24 months: 9 36 months: 10
<i>Case-series reports</i>					
Lane and Sobrero [18]	13–19	9	Loop C: 44 Loop D: 1 W ^a : 2 Lem ^a : 54	Total: 21	Nulligravid (83% of participants) Nulliparous (96% of participants)
Weiner et al. [19]	13–20	6	IUD: 243 (Copper-T-200, Copper-7)	Total: 12	Nulligravid
Kulig et al. [20]	13–22	36	Copper-7: 120	18 Nulliparous: 17 Parous: 22	Nulliparous (81% of participants)

^a Experimental devices.

Pain at insertion was addressed in one report. In this study (96% nulliparous women), 14% complained of severe pain, 23% complained of moderate pain and 63% complained of minimal to no pain. IUDs in this study included the experimental W, Lem IUD and Lippes Loop C and D, none of which is in current use [18]. No explanation was provided for using Loop sizes C and D rather than A and B, which were smaller.

Bleeding and pain are common reasons for copper IUD discontinuation [27,28]. In a study from Brazil, parous adolescents had higher removal rates over 48 months for bleeding and pain (17%) compared to parous adults (9%) [15]. In a report from Sweden, removal rates for bleeding and pain at 2 years were similar for adolescents and older women [21]. In a study of Israeli adolescents, more IUD users (27%) complained of bleeding disturbances than did pill users (11%) [14].

4. Discussion

Few recent studies have examined IUD use in adolescents, but the findings were generally reassuring regarding IUD use. IUDs have high continuation rates and provide effective protection from pregnancy. Young age may be associated with an increased risk of IUD expulsion.

Our review has both strengths and weaknesses. A strength is our transparent, systematic search of the literature. We were unable to combine results in a meta-analysis because of differences in exposures and outcomes.

Weaknesses include the obsolete IUDs studied and small number of reports available. Although adolescents have been included in many studies [29], teenagers have been the focus of little IUD research.

Selection bias was inevitable in the cohort studies; women choosing IUDs were different from those choosing other methods. External validity is another problem. The adolescents studied varied greatly, from “motivated, intelligent” Israeli teenagers [14] to “high-risk” urban American adolescents [12]. The latter have poor adherence with short-acting methods [2] compared with motivated teenagers [14]. Thus, differences in patient populations may help explain the reported differences in pregnancy and continuation rates with IUDs and oral contraceptives in adolescents.

These findings are consistent with existing literature concerning long-acting contraceptives. Overall, adolescents have better compliance with long-acting methods than with methods requiring daily or ad hoc use [2,3]. Additionally, in a recent randomized controlled trial of women 18 to 25 years old, 1-year continuation rates were higher for LNG-IUDs than for pills (80% vs. 73%) [25].

Difficult or painful IUD insertion is another concern for adolescents. Paracervical blocks and nonsteroidal anti-inflammatory drugs may improve insertion-related pain, although evidence does not uniformly support these interventions [30]. In a large randomized controlled trial, even nulliparous women noted little pain. However, prophylactic 400 mg ibuprofen did not improve pain compared to placebo [30]. Misoprostol may help dilate the cervix before IUD insertion, analogous to suction curettage [31]. A recent

randomized controlled trial found that misoprostol treatment increased ease of insertion but failed to produce significant changes in dilation and patient pain perception compared to controls [32].

Concern about upper genital tract infection has limited use of IUDs in adolescents. The risk of salpingitis associated with IUD insertion in the presence of STIs is similar to or below PID rates without IUD insertion [26]. Limited evidence suggests that the LNG-IUD protects against salpingitis [33]. Providers can either screen or presumptively treat adolescents for gonorrhea and chlamydial infection at IUD insertion [6]. Prophylactic antibiotics at the time of insertion are not beneficial in low-risk populations [34].

Concern about future fertility has also limited insertion of IUDs [35]. These concerns have been allayed by better research in recent decades [36–38]. In a landmark case-control study, previous infection with *Chlamydia trachomatis* was associated with a significant increase in tubal infertility; prior copper IUD use was not [39]. Thus, restricting IUD use for fear of tubal infertility is not warranted.

Surveys of adolescents in the United States reveal little knowledge about IUDs. A survey of 72 women aged 14 to 18 years in family planning clinics demonstrated that although 74% were using contraception, only 19% had ever heard of IUDs. After an educational session, most adolescents reported that they liked the fact that IUD use did not impair later fertility, require daily usage, require use with each sex act and was discreet [40]. A survey of young pregnant women also documented limited knowledge. Half of 190 pregnant women aged 14 to 25 years had heard of an IUD; of these, only 58% and 55% of these knew about its high efficacy and its routine use beyond 1 year, respectively [41].

Studies of contemporary IUDs in adolescents are urgently needed [42]. A randomized controlled trial comparing IUDs and oral contraceptives in an exclusively adolescent population, as has been done in older women in Sweden [25], would provide meaningful comparisons between methods. However, a prospective cohort study in which adolescents choose their methods would more closely resemble clinical practice. Built-in selection bias, however, would be a limitation of this approach. Unless new evidence suggests otherwise, IUDs should be offered as a first-line contraception to all women—including adolescents who may have difficulty with methods requiring ongoing compliance [5,6,43].

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