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FAMILY PLANNING (A BURKE, SECTION EDITOR)

Factors Associated with Adolescents' Choice to Use Long Acting Reversible Contraceptives: a Systematic Review

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Abstract

Purpose of Review This review aims to update the published literature to summarize our understanding about the associated factors with adolescents' willingness to use long-acting reversible contraceptives.

Recent Findings Long acting reversible contraception (LARCs), specifically intrauterine devices and implants, have been successful in preventing unintended pregnancy and repeat pregnancy among adolescents. Unfortunately, many misconceptions about eligibility, fears of the insertion procedure, and health effects prevent adolescents from choosing them.

Summary A total of 1316 articles were identified and only nine met the inclusion criteria. Included studies reported findings on 12,851 adolescents aged 12 to 19 years old, revealing many correlates like the knowledge/information about these contraceptives, age, marital status, and cultural aspects. Few articles compared the correlates of choosing intrauterine devices versus implants. All articles presented studies performed in contexts where access barriers to contraceptives were removed, including the costs. In the future, it could prove useful to develop a study that could compare types of LARCs, as well as in an exclusive adolescent population in different countries. It would also be helpful to compare adolescents' use in low- and middle-income countries, and in different contexts with limited access to family planning services and contraceptives.

Keywords Adolescents · Willingness to use · Choice · Long acting reversible contraception · Intrauterine devices · Subdermal implants

Introduction

Every year, approximately 21 million adolescents aged 15 to 19 years become pregnant in low- and middle-income countries; half of these pregnancies are unintended [1]. A significant fraction of the unintended pregnancies among adolescents are the result of using short acting and user-dependent methods, like condoms and pills [2].

Currently, sexually active adolescents who use contraceptives mostly report use of male condoms and oral contraceptive pills [1, 3], short-acting methods that require correct and consistent use to assure adequate effectiveness. A 2014 review of the most recent surveys in 43 developing countries found that women younger than 25 years old had much higher rates of contraceptive failure during the first year of use than older women [4], which may partly reflect method mix. For instance, condoms require males' participation in the contraception decision; therefore, the frequent need to negotiate its use between adolescents and their partners may work as a barrier.

On the other hand, few adolescents are using long-acting reversible contraceptives (LARCs), namely intrauterine devices (IUD) and implants, which have higher rates of effectiveness [5]. Method-specific contraceptive prevalence rates

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among adolescents vary widely across the contexts and are scarce for low- and middle-income countries. It has been recently estimated that only 5.8% of teenagers have used LARC in the USA [3] and nearly 14% in UK [6].

Increased use of LARCs could significantly reduce the rates of unintended pregnancy among young women [2]. Clinical guidelines are clear about the safety of LARCs for adolescents. Both IUDs and implants are recommended past menarche [7] and for nulliparous women [8]. LARC complication rates among adolescents are low and similar to those observed among older women [9, 10]. Consequently, there is no clinical reason for not offering LARCs for use by adolescents [11].

Additionally, LARCs are appropriate for women at all ages because of their effectiveness and high level of individual satisfaction observed among users and very low failure rates [5]. Moreover, LARC users report the highest levels of satisfaction among women who use contraceptives [12], irrespective of their age. Satisfaction with a contraceptive method is associated with continuous and consistent use [13]. Indeed, a systematic review showed that LARC continuation was 84.0% (95% CI, 79–89%) at 12 months among adolescent users [14]. LARCs may be underutilized among all contraceptive methods offered to adolescents [10]. Reasons range from LARCs being unavailable in primary health care facilities or because of their high cost; lack of awareness and misinformation among adolescents; lack of health professionals trained for inserting implants and IUDs; and misconceptions about their indications for younger women [15, 16]. These factors may lead adolescents to choose, or be directed towards, other methods—especially short acting ones—instead of LARC.

To inform providers of strategies to increase LARC uptake among adolescents, meet their contraceptive needs, and help prevent unintended pregnancies, it is crucial to understand the elements and steps that guide young women on their decision to use LARC. Our objective is to systematically review studies concerning the decision-making process of adolescents who use LARCs, i.e., the factors associated with adolescents' choice of using LARCs.

Methods

A systematic review of articles was conducted according to the Preferred Reporting Items for the Systematic Reviews and Meta-Analyses (PRISMA) Statement [17].

Search Strategy

To assess the correlates of adolescents' choice to use LARCs, we used the following keywords: for Population (P), we used adolescents, youth, preadolescence, preadolescent, preteen, and "young women"; for Intervention (I), we used "long acting reversible contraception", LARC, "subdermal implants", "etonogestrel implant", "intrauterine devices", "intrauterine contraception", and IUD; the Comparison group (C) was not pertinent and, therefore, was not used; and, finally, the Outcome (O) included the terms choice and "willingness to use".

A systematic literature search of studies without limits on the publication date was conducted in the PubMed databases (http://www.ncbi.nlm.nih.gov/pubmed), Embase (www.elsevier.com/embase), Web of Science (https://isiknowledge.com), Scopus (https://www.scopus.com), Psycinfo (http://www.ebsco.com/products/research-databases/psycinfo), Science Direct (http://www.apa.org/pubs/databases/psycinfo/index.aspx), and Cinahl (https://health.ebsco.com/products/the-cinahl-database). To amplify the scope of our search, we also included gray literature from Canadian Dissertations and Theses (http://www.bac-lac.gc.ca/eng/services/theses/Pages/theses-canada.aspx) and DART-E (http://www.dart-europe.eu).

Screening and Selection

Initially, we searched the databases in May 2018, so articles available up until that date were included. After checking for duplicates, we undertook a screening of titles and abstracts according to the following exclusion criteria: (1) articles not published either in English, Portuguese, or Spanish; (2) articles outside of our study's scope; (3) articles like review articles, guidelines, books, and editorials, that are based on other articles.

The remaining articles were analyzed according to the following eligibility criteria: full text not available for access; the definition of adolescence used by The World Health Organization is persons between the ages of 10–19 years old [18]; factors influencing patient's choice to use a LARC as a contraceptive method; and whether clinical and social factors contributed to this choice. There were no restrictions on sample size or study design. To be included in our review, the willingness or choice to use LARC should be specified in either the Methods or Results section. LARCs were considered intrauterine devices or subdermal implants. The associated factors with the use choice of using each LARC were compared, if specified.

We excluded articles if they were limited to a specific subgroup (such as contraception in HIV or epileptic individuals, for example); if included post-partum or post-abortion periods; if included male adolescents; if included adolescents but not exclusively (for example, women aged 10 to 45); and articles that failed to analyze factors that would prevent the use of certain contraceptives (such as thrombosis, hypertension, diabetes, cancer).

Data Extraction

At least two reviewers independently extracted data from all articles; all of the reviewers crosschecked the study characteristics, participant information, and results, and identified limitations from each study.

Each authors' contribution is specified in question number 2. All authors read all of the nine selected studies.

Disagreements between reviewers were solved by a third reviewer or consensus-based discussion. So, we had three round of screening: (1) search for duplicates and subsequent exclusion; (2) title and abstract reading and subsequent exclusion of articles according to the exclusion criteria; and (3) full text and in-depth reading and exclusion according to the inclusion criteria (Fig. 1).

Data extracted included the study methodology, number of participants, age range, type of LARC used, and factors associated with the choice to use each LARC. The complete search strategy is described in Appendix 1.

Results

The search for the databases resulted in 1036 titles. After adjusting for duplicates, 286 were excluded. Of the remaining, 936 were excluded, as they did not meet inclusion criteria to the study purpose. The remaining articles were read entirely, and 85 articles did not meet the inclusion criteria (out of age range, male population, full text not available); thus, nine articles were selected for inclusion. The flowchart of information containing step-by-step phases is shown in Fig. 1. The nine articles selected are presented in Table 1.

Six studies [19–22, 24,] were performed in United States of America (USA): Fikree et al. [26], Tsikouras et al. [27], and Avedano et al. [23], in Ethiopia, Greece, and Mexico, respectively. Six studies were observational: three prospective [19, 20,] and three cross-sectional. Fikree et al. [26] and Mesheriakova et al [25] developed an intervention—a quasi-experimental study. One article was a qualitative study [22].

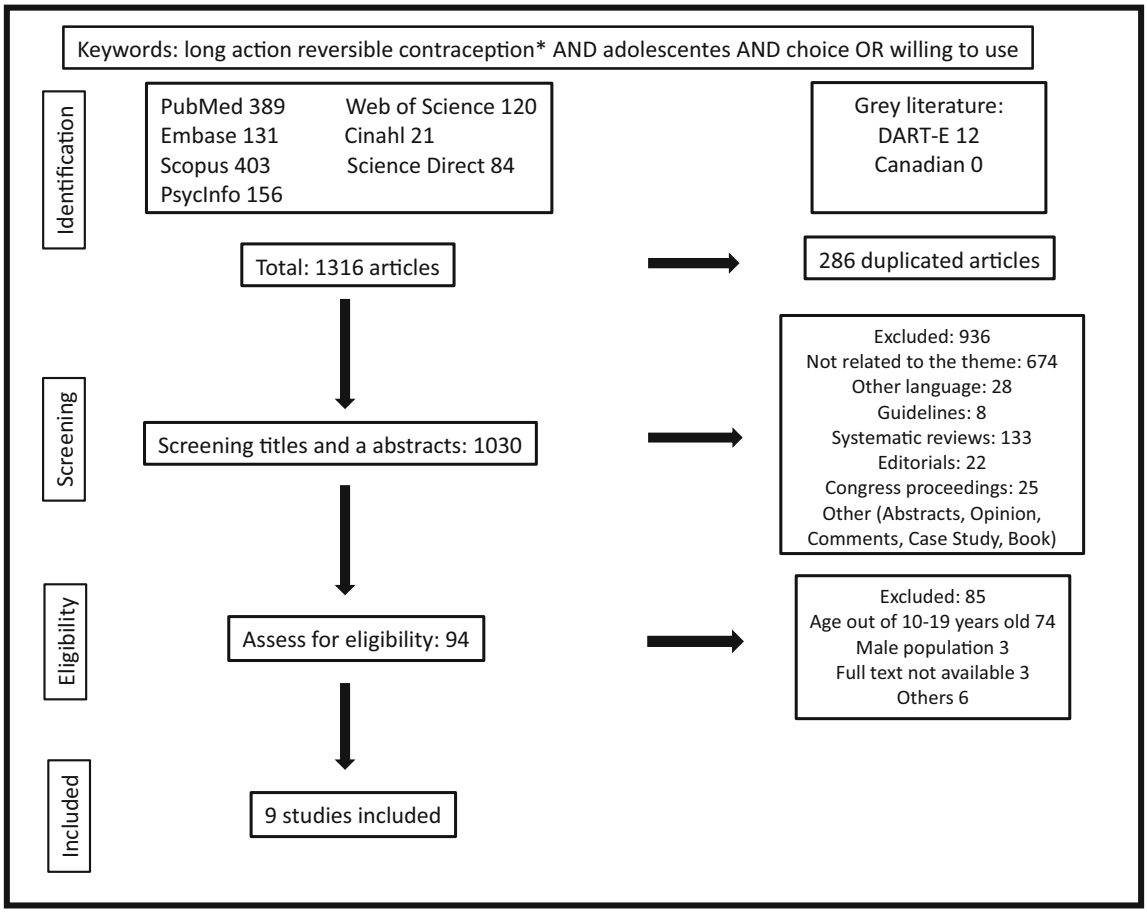

Fig. 1 Study selection. This Flowchart illustrates the study selection. Boxes on the left side of the figure show the number of studies assessed in each stage of the screening process, while the boxes on the right side are those excluded after screening or those included from reference lists.

*The term "long acting reversible contraception" was used here to synthesize all the terms used at the search strategy. See complete search strategy at Appendix 1

Table 1 Included studies evaluating the choice of long-acting reversible contraception among adolescent patients

Author year study design country	Goal	Population (*N*) age range health service setting	Results
Mestad et al. 2011 [19] Prospective observational study (CHOICE Project) USA	To evaluate the association of age and preference for a LARC vs. a non-LARC method among adolescent participants and analyzed the association between age and choice of the implant vs. the intrauterine device (IUD) among adolescents.	214 were aged 14–17 years and 840 were aged 18–20 years Washington University	Of the 14–17-year-olds, 63% ($n = 93$) chose the implant, whereas 29% ($n = 146$) of the 18–20-year-olds chose the implant (RR 2.2, IC95% 1.8–2.6) Also favored implant use having insurance. History of unintended pregnancy and prior oral contraceptive use changed the relationship between age and selection of implant by greater than 10%. In favor IUD was presented college education, higher income, one or two or more unintended previous pregnancy; history of STI; prior abortions; prior use of oral contraceptive. Favored any LARC being younger than 17 years; African American race; insurance; one or more unintended previous pregnancy; history of STI.
Abraham et al. 2015 [20] Observational cohort Study (secondary analysis of the Contraceptive CHOICE Project database) USA	To assess the relationship among young age, nulliparity, and continuation of long- acting reversible contraceptive (LARC) methods	863 14 to 19 years old Washington University	IUDs and implants were equally popular choices (49% and 51%, respectively). Nulliparous adolescents chose more implants over IUDs ($p < 0.001$). Being married or having private insurance favored IUD choice. In addition, adolescents and young women continued to use their LARC method, and continuation rates were similar to the general reproductive-aged population.
Secura et al. 2014 [21] Large prospective cohort (CHOICE PROJECT) USA	To assess pregnancy, birth, and abortion rates in a cohort of teens among whom barriers to highly effective reversible contraception was removed, and compared these rates with rates observed nationally among all teens in the United States.	1404 14 to 19 years Washington University	72% chose LARC methods. The majority of teens in both age groups chose LARC methods, but teens 14 to 17 years of age were more likely than older teens to do so (77.5% vs. 68.4%, $P < 0.001$). The implant was the most common contraceptive choice for participants 14 to 17 years of age, whereas an IUD was most commonly chosen by older teens
Hoopes et al. 2016 [22] Qualitative analysis of CROSS-survey USA	To explore adolescent attitudes and experiences with LARCs to inform the development of adolescent-centered LARC counseling strategies.	30 14 to 18 years old School based health center	Five themes emerged regarding key factors that influence LARC choice: (1) strong preferences about device- specific characteristics; (2) previous exposure to information (3) knowledge gaps about LARC methods that affect informed decision-making; (4) personal circumstances or experiences; and (5) environmental constraints and supports
Avendano et al. 2016 [23] Cross-sectional population-based survey México	To tested whether knowledge of contraceptive methods is associated with current use of LARC.	10,376 15 to 19 years Nacional data base	Over time, LARC use in the overall sample was flat (21% in 1992, 23% in 2014; $p = 0.130$. In the subsample female adolescents who reported a previous pregnancy, current use of LARC improve over time (24% para 37%) Factors in favor for LARC use previous pregnancy; marriage or co-habitation; higher education level; survey year; LARCs as the most effective method known. Against LARC choice: the knowledge of other contraceptives methods as the most effective method known (condom, oral contraceptive pills)
Hoopes et al. 2016 [24] Cross sectional study USA	To evaluate correlation of knowledge and acceptability of LARC methods among adolescent females at a primary care-oriented school-based health center.	102 13 to 19 years School-based health center	A higher knowledge score was associated with having used or currently using a LARC method (coef = 22.8; 95% CI 6.5–40.0) or being white. History of vaginal intercourse was associated with greater acceptability of any LARC device (coef 4.06, 95% CI 1.30–12.68), significantly associated with greater acceptability of implants (odds ratio [OR] 5.66, 95% CI 1.46, 22.0). Older age was

Table 1 (continued)

Author year study design country	Goal	Population (*N*) age range health service setting	Results
			associated with lower acceptability of IUDs (OR 0.53, 95% CI 0.30, 0.94).
Mesheriakova et al. 2017 [25] Quasi-experimental (prospective study) USA	To examine the effectiveness of an iPad- based application (app) on improving adolescent girls' sexual health knowledge and on its ability to influence their intentions to use effective contraception	120 12 to 18 years old School-based health center	The participants who expressed intent to use a LARC method in the future were only slightly older on average than the overall study sample (mean age 16.6 vs 16.4 years); the majority where white, all were sexually active and had prior use of a method to prevent pregnancy
Fikree et al. 2017 [26] Quasi-experimental study Ethiopia	To evaluate the effect on contraceptive uptake of training youth-friendly service providers to counsel and provide all contraceptive methods including LARCs in the same unit	651 15 to 19 years old Youth friendly services	In the intervention arm 49,6% adolescents accepted LARCs in pre-intervention, this percentage increase to 54,1% post intervention. Younger, married and nulliparous adolescents were factors associated with LARC choice.
Tsikouras et al. 2018 [27] CROSS-survey Greece	To investigate and evaluate the contraceptive behavior in teenagers from a family planning center that services two different religious and socioeconomic populations living in the Thrace area.	168 15 to 19 years Family planning center	The use of IUDs was almost three times more frequent among Muslims than Christian Orthodox ($p = 0.007$; OR = 2.71, 95% CI = 1.28–5.72). The use of IUD was more frequent among employed teenagers ($p = 0.007$).

A total of 12,851 adolescents (ages ranging from 12 to 19 years) were included from all studies; sample sizes ranged from 30 to 10,376. Students and adolescents attending health facilities composed the samples, one study was a population-based survey. Five studies did not compare the type of LARC used [24–]. However, four studies compared the choice to use implant versus IUD [19–23] and one study compared the choice to use the two types of IUD (i.e., levonorgestrel versus cooper) [20]. Mesheriakova [25] compared the types of IUD using an iPad-based application but no specific results are shown.

Key Outcome Measures

The included studies reported different outcome measures (quantitative and qualitative) of correlates of adolescents' choice to use LARCs according to the methodology: observational studies and quasi-experimental study. The qualitative study presented the themes that emerged from the speeches.

Observational Studies

The factors associated with adolescents' choice to use LARCs observed in the observational studies were LARC education, their age, parity/previous pregnancy, and marital status.

One of the US studies, the Contraceptive CHOICE Project, is a prospective observational study of women who were provided with no-cost contraception for 2–3 years. All participants received tier-based contraceptive counseling and their method of choice. Among the 1404 adolescent women enrolled in CHOICE (age range 14–18 years), 72% chose a LARC. Adolescents aged 14 to 17 years were more likely than older adolescents (18 to 19 years old) to do so (77.5% vs. 68.4%; $p < 0.001$). The implant was the most common contraceptive choice for the youngest group (14 to 17 years of age), whereas the IUD was the most commonly chosen contraceptive by the oldest group [].

A secondary analysis of the adolescent sample participating in the CHOICE Project intended to evaluate the association of age and preference for a LARC versus non-LARC [19]. The authors compared the 14-17-year-old adolescents with the 18–20-year-old group. The adjusted model showed that the probability that adolescents aged 14–17 years would choose a LARC method when compared to adolescents aged 18–20 years increased slightly (RR = 1.16; 95%CI 1.03–1.30).

Another included study is also a secondary analysis of the CHOICE project [20]. The authors focused on the continuation rates of IUD and implant in nulliparous adolescent participants compared with parous, older women. They concluded that adolescents with private insurance and married often chose IUDs ($p < 0.001$). Younger age, black skin color, lower

income, public insurance, and single marital status were associated with implant choice ($p < 0.001$).

A cross-sectional study conducted in the USA in 2015 invited adolescents to complete an electronic survey about sexual and reproductive health [24]. Primary outcomes were LARC knowledge as measured by percentage of correct 10 true-false questions and LARC acceptability as measured by participants reporting either liking the idea of having an IUD/subdermal implant or currently using one. A total of 102 students completed the survey (age range 13–19 years). Greater LARC knowledge was associated with current/prior LARC use (OR = 22.8; 95%CI 6.5–40.0). Older age was associated with lower IUD acceptability (OR = 0.53; 95%CI 0.30–0.94) while history of intercourse was associated with greater implant acceptability (OR = 5.66; 95%CI 1.46–22.0).

From January 2006 until December 2016, Tsikouras et al [27] studied different attitudes towards contraception, among females of two major community subgroups: Christian Orthodox women and Muslim women, both living in Greece (age range 15–19 years). Respondents were randomly selected from those attending the Family Planning Service. Muslims were more likely to use IUD than Christians (OR = 2.71; 95%CI 1.28–5.72).

In Mexico, Avendano et al. [23] performed a cross-sectional population-based survey with 10,376 adolescents in 32 states (age range 15–19 years). The main outcome was current use of LARC in 1992, 1997, 2006, 2009, and 2014. Among adolescents who had a pregnancy, LARC use increased (24% in 1992 to 37% in 2014) and was negatively associated with being married compared to the use of other contraceptive methods (condoms and pills) (OR = 0.90; IC95% 0.88–0.92). Results were similar by parity (OR = 0.97; 95%CI 0.96–0.98). They also observed a positive association between LARC use and knowledge about LARCs with a higher educational level.

They used the 1992, 1997, 2006, 2009, and 2014 waves of the Encuesta Nacional de la Dinámica Demográfica (ENADID), a cross-sectional population-based survey representative at national and state level (Mexico has 32 states) and rural/urban stratum. The ENADID uses a complex multi-stage sampling process. Trained interviewers carried out standardized, direct, structured face-to-face interviews with key household informants.

Nulligravid adolescents were also included. And yes, only IUD and implants were considered. It means if the patient has ever been pregnant.

Quasi-experimental Studies

We analyzed two quasi-experimental studies. The first, conducted by Fikrree et al. in 2017 [26] in Ethiopia, evaluated the effect of training youth-friendly service providers to counsel and provide all contraceptive methods including LARCs on contraceptive uptake of adolescent women (age range 15–19 years). Twenty youth-friendly health units were selected and randomly allocated into the intervention and non-intervention arms. Data was collected from the family planning records. The odds of adopting LARCs at pre-intervention (OR = 0.70) rose to 1.30 at the post-intervention phase (p value < 0.001). The authors concluded that adolescents receiving information about LARCs will increase its uptake. Also, the use of LARCs was associated with marital status and parity.

In an interesting and modern approach, Meserikova et al. [25] examined the effectiveness of an iPad-based application (app) on improving adolescent girls' sexual health knowledge and effective contraceptive use. Girls aged 12 to 18 years were recruited at three school-based health facilities in California, USA. After using the app, 68% of the sexually active participants reported intention to use effective contraception in the future, and sexual health knowledge improved significantly from 58 to 79% ($p < 0.001$). The participants (both sexually active and non-sexually active) who expressed intent to use a LARC method in the future were only slightly older on average than the overall study sample (mean age 16.6 vs 16.4 years); the majority were white, all were sexually active, and 33% were using some form of contraception prior to using the app.

Qualitative Study

Hoopes et al. [22] explored attitudes and experiences related to pregnancy and contraception in a diverse population of female adolescents in a school-based health facility in Washington State, to inform the development of LARC counseling strategies to be used in primary care services. Participants represented a diverse range of racial and/or ethnic identities (age range 14–18 years). Half (15/30) were sexually active and 17% (5/30) reported current or past LARC use. Five themes emerged regarding key factors that influence LARC choice: (1) strong preferences about device-specific characteristics; (2) previous exposure to information about LARCs from peers, family members, or health counseling sessions; (3) knowledge gaps about LARC methods that affect informed decision-making; (4) personal circumstances or experiences that motivate a desire for effective and/or long-acting contraception; and (5) environmental constraints and supports that might influence adolescent access to LARCs (Table 1). The authors observed the elements considered by the adolescents if they would choose a contraceptive: high efficient contraceptive, not having to remember to use it daily, no weight gain, a great desire to delay childbearing, and previous exposure to information about LARCS. On the other hand, a possibility of losing confidentiality when using the contraceptive (parent will find out) was mentioned, as a factor against LARC choice, as well was not being able to control the device.

The study was placed in two urban school-based health centers (SBHCs) in Washington State that offer contraception services including LARC. We added this information at the manuscript. The population of the study represented great diversity in race/ethnicity and a range of ages and experiences with sexual activity and contraception.

Table 2 presents the associated factors with the choice to use IUD, implant, or any LARC among adolescents, according to the review results. Some factors are contradictory, as both younger age and older age are associated with LARC choice, for example. The factors associated with the choice of using a LARC (irrespective if IUD or implant) were age [19, 20,], insurance [19, 20] history of vaginal intercourse [24], and parity [20].

The factors associated with the choice of IUD were the age [24], insurance [24], and wage earner. The IUD choices were associated with older adolescent group [], presence of insurance [], employment [19, 27], higher education level [19], previous pregnancy [19], history of STI [19], prior abortion [19], prior use of contraceptive methods [19], marriage [], and prior use of contraceptive methods [25].

The factors associated with the implant choice were younger age [19, 20,], nulliparity [20], race [20], having insurance [19, 20], and history of vaginal intercourse [24].

Discussion

We synthesized information on the choice to use LARCs among adolescents in four countries in four regions of the world, and the findings of this systematic review suggest that a number of factors influence the adolescents' choice to use LARCs as a contraceptive method: the knowledge regarding the LARCs, the age, parity, religion, education, marital status, and paid jobs.

Some important correlations of the choice to use LARC among adolescents were the knowledge/information about LARCs and the adolescents' age. There is a body of research describing very low knowledge regarding LARCs among women, irrespective of the scales used to measure this or the women's age [28, 29]. Our review is consistent with those studies and contributes to this body of work by analyzing experimental studies that also confirm that using strategies to improve the adolescents' contraceptive knowledge enhances the odds of choosing LARCs [25, 26].

Frost et al. [30] observed that improving contraceptive knowledge about methods—LARCs included—might positively influence its use. Computer-based interventions, like an iPad→-based mobile application (app) as reported by Mesheriakova et al. [25], are a very interesting option for sexual health education. Adolescents expressed interest in using the app because they felt it was private and they could explore topics on their own time without feeling like they were "being judged" by a health professional. This data is consistent with current literature, as shown in a recent randomized control study, which found that patient-centered, efficacy-based counseling results in increasing of uptake of LARCs, rising from 17% in the non-interventional group to 28% in the intervention group [31]. Another interesting research demonstrated that a 3-min educational intervention was able to increase the proportion of young women expressing a positive attitude toward IUDs from 14.7 to 53.8% ($p < 0.01$) [32].

Table 2 Factors associated with LARC modality among adolescent patients at included studies in systematic review

Favors implant	Favors IUD	Favors any LARC
- Younger age (20, 22, 23)	- Older (22)	- Younger age (20, 22, 24)
- Nulliparity (23)	- Insurance (22)	- Older age (27)
- Race (23)	- Religion (25)	- Nulliparity (24)
- Insurance (20, 23)	- Employed (20, 25)	- Race (20, 27)
- History of vaginal intercourse (21)	- Higher education level (20)	- Insurance (20)
	- Previous pregnancy (20)	- History of vaginal intercourse (21)
	- History of STI (20)	- Previous pregnancy (20, 26)
	- Prior abortion (20)	- Marriage (24, 26)
	- Prior use of contraceptive methods (20)	- Higher education level (26)
	- Married (22)	- Effectiveness (19, 26)
		- Longer duration (19)
		- No weight gain (19)
		- Desire to delay childbearing (19)
		- Exposure to teen motherhood (19)
		- History of STI (20)
		- Prior use of contraceptive methods (27)

IUD intrauterine device, *LARC* long-acting reversible contraceptive, *STI* sexually transmitted infection

One should notice that strategies to improve adolescents' knowledge regarding LARCs are to be different than simply encouraging them to get information on the Internet. Harris et al. [33] analyzed sites related to teenagers and contraception and reported that 77% of them did not recommend LARCs for adolescents, and 16% of those that recommended LARCs discouraged their use by adolescents. Similarly, Madden et al. [34] observed that half of the sites included in their research comprised inaccurate information about the IUD and many had misconceptions about eligibility to use a LARC, which could dissuade adolescents from using them.

We should consider, though, that health education about LARCs would increase contraceptive acceptability and, consequently, the uptake, where young people have access to health services and there are no barriers to LARCs. In many countries, however, there are laws, policies, and many unnecessary programmatic barriers that prevent provision of contraception to adolescents simply based on their age or even marital status [35, 36]. In fact, barriers to make LARCs available to adolescents are described for many low- and middle-income countries [15], including the costs of contraceptives. In that way, the Contraceptive CHOICE Project was a large prospective cohort study designed to promote the use of long-acting, reversible contraceptive methods to reduce unplanned pregnancies in the St. Louis region, USA [19]. Participants were informed about reversible contraception, with an emphasis on the benefits of LARCs, were provided with their choice of reversible contraception at no cost, and were followed for 2 to 3 years. For the adolescents to whom barriers to contraception (lack of knowledge, limited access, and cost) were removed and the use of the most effective contraceptive methods was encouraged, the authors observed a large percentage of them choosing to use LARCs, resulting in reduced rates of pregnancy, birth, and abortion within this population if compared with those in the US population. This may be the reason why we found as a correlate of adolescents' choice to use IUD having health insurance [19, 20, , 37].

Age was also described as a correlate of adolescents' choice to use LARCs. Participants who expressed the intention to use LARC as a method in the future were slightly older than the others [19, 25,], and younger adolescents were more likely to choose implants rather than IUDs [19, 20,]. This may be due to the adolescents' fears of having an IUD inserted, so implants seem to be less invasive, predominantly if they are nulliparous—parity was also described as a characteristic that influenced the choice of LARCs [20, 26]. This is an important issue to be considered by health providers as some may offer IUDs only, instead of making both IUD and implant available.

Two other correlates related to adolescents' autonomy were described in the choice to use LARCs: work paid jobs and marital status [19, 23, 26–]. Some other studies have pointed to the influence of relationship and contraceptive use dynamics in adolescence [38, 39]. Among young women and couples, condoms are mainly used in the beginning of a relationship or casual relationships and tend to be replaced by more effective contraception as the relationship comes to more stability. So, LARCs may be a worthy choice for married adolescents who had already tried other contraceptives [19, 25], report previous pregnancy [19, 23] or even previous abortion [19], as shown in our review, but need not be limited to these groups.

In a recent literature review, Pritt et al. [16] suggested a categorization for factors that influence contraceptive decision-making that are organized into four categories: cost and clinical operations; adolescent awareness and attitudes; confidentiality, consent, and parental attitudes; and health care provider knowledge, attitudes, and counseling. In our review, cost and clinical operations were not evaluated properly, because in most of the studies, the method was offered with no cost, even though this may be not a reality for all adolescents, especially from low- and middle-income countries.

Adolescent awareness and attitudes towards LARCs were considered in many studies included in this review [22, 24, 26]. Our findings endorse that this is such an important correlate of choosing LARC that interventions aimed at improving the knowledge about them were efficient in increasing their uptake [25, 26]. Regarding confidentiality, consent, and parental attitudes, Tsikouras et al. [27], confirmed that the adolescent participants in the study that visited the Family Planning Centers with their parents were more likely to choose IUD compared to other contraceptives ($p = 0.007$). We have not considered health care providers' knowledge, attitudes, and counseling in our review as we included studies that sampled adolescents only, but other studies have shown that there is discordance between what a health professional prioritizes as important for women to know, and what women really expect to learn from them [40].

This study has a number of limitations. First, three of the nine studies included in the review used the same data from the adolescents participating in the Contraceptive CHOICE project, which may have turned the results into homogenous findings. Second, not all studies compared LARCs separately, e.g., the choice to use IUD versus the choice to use implant, so we believe that this is an issue to be investigated in further studies. Third, the meaning of "choice" to use LARCs seemed to be different among the studies. Some examined the intention to use LARCs, while others examined the actual use, so results can be conflicting. Fourth, the majority of the included studies were performed in only one country; consequently, there is a lack of information about the choice of using LARCs among adolescents living in low- and middle-income countries and in different contexts of family planning services and contraceptives access.

Author's contributions ALV, ASC, MRFA, LCA, JMSJ, ECB, and ICES developed the study design and methodology. YNR, ASC, ESFF, ICES were involved in data management. YNR, ASC, MRFA, and ESFF conducted the data analyses and drafted the manuscript. YNR, ALV, ICES were involved in editing the manuscript. All authors read and approved the final manuscript.

Compliance with Ethical Standards

Conflict of Interest Yedda Nunes Reis, Ana Luiza Vilela, Annielson de Souza Costa, Mayra Rayane Freire Andrade, Edson Santos Ferreira Filho, Luiz Carlos de Abreu. José Maria Soares Júnior, Edmund Chada Baracat, and Isabel Cristina Esposito Sorpreso declare no conflict of interest.

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