

Birth Control: A Review of Pharmacological and Non-pharmacological Modalities and Their Effectiveness

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ABSTRACT

Introduction: Family planning importance is increasing progressively and is regarded as an essential part in every couple's life. Family planning has a lot of benefits for the whole family as it provides a better control over the period between each pregnancy leading to a better balance over the personal, financial, and societal life. There are multiple birth control methods, from which couples can choose from with the assistance of their physicians since each method has its own advantages and disadvantages. Furthermore, some contraceptive methods may be more suited for a certain couple or situation than another one.

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Methodology: A thorough search was carried out on PubMed using the most suitable keywords representing the aim of the present study. A total of 120 were found and based on whether they are suited to achieve the aim of the study, 28 were selected.

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Discussion: There is a great variety of birth control methods, and each has its associated advantages and disadvantages. Barrier contraceptive methods, most common of which are male condoms, are extremely popular in Western countries. Combined hormonal contraception methods which are available in the form of pills, patches, and rings. Progestin only contraception either in the form of a pill, injection or an implant is the most commonly used type among breastfeeding women. Furthermore, intrauterine devices are another effective contraceptive method which may be copper-based or hormonal-based.

Conclusion: Contraception is an integral part of family planning, which can be achieved through a variety of methods. Each birth control method has its own pros and cons that should be explained to the couple clearly, so they can choose the method that is most suited for them.

Keywords: Contraception, family planning, birth control, contraceptive methods, pregnancy, Saudi Arabia

1. INTRODUCTION (ARIAL, BOLD, 11 FONT, LEFT ALIGNED, CAPS)

The median age of first intercourse is around 17 years in most Western countries, and unfortunately adolescents were found to have the lowest level of knowledge and use of contraceptives [1,2]. Unprotected sexual intercourse can lead to unwanted pregnancies, unsafe abortions and sexually transmitted infections (STI) [1].

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Family planning is extremely essential for all couples, as it significantly improves the quality of life of parents, children, as well as other family members, and it affects the family's wellbeing in a lot of ways [3]. It allows couples to control the number of desired children as well as the time-period between each of the children, which will directly affect the mother's quality of life as she can predict the timing of her pregnancy and delivery [3]. Family planning is mainly achieved through contraception which can be done by a variety of methods involving either the male, the female partner or both [3].

Family planning has a lot of benefits and advantages that have been appreciated more and more throughout the years as it has an enormous impact on couples' lives [3]. It reduces the risk of abortion, reduces adolescents' pregnancies, and prevents unsustainable population growth [3]. Aside from family planning, some contraceptive methods can provide protection against Human Immunodeficiency Virus (HIV) and other STIs [3]. It has also been found that contraception and family planning prevent around 33% of pregnancy related deaths as well as 44% reduction in neonatal deaths [3].

The prevalence of contraceptive use has been increasing all over the world, for example in Latin America, contraceptive use and consultation prevalence has been increasing continuously till it reached around 66% [3]. However, in Africa, especially Nigeria, which is the most populous nation in this continent, the prevalence of contraceptives remains very low despite its high fertility rate [3,4]. According to a study about family planning practices in Nigeria, only around 17% were found to be currently using at least one contraceptive method, and around 68% of the participants had used at least one family planning method at some point in their life [4].

According to the Saudi Household Health Survey, the prevalence of contraception usage in 2018 was around 30% [5]. Furthermore, the most commonly used family planning methods in Saudi Arabia were found to be oral and intrauterine contraceptives [6]. According to a cross-sectional study about contraceptive use prevalence in Saudi Arabia by Doaa Abdelsalam et al., the main source of participants' knowledge and awareness about contraceptive methods among participants were found to be doctors (53.9%), followed by friends and relatives (40.8%), while only around 5% were getting their contraceptive awareness mainly from TV [5]. Moreover, around 45% of women participating in the aforementioned study were found to be currently using family planning methods, and around 32% used contraceptives at a certain point in their lives [5]. On the other hand, around 22% of the participants have never used any contraception [5].

As for the awareness of contraceptive methods among women in Saudi Arabia, according to a cross-sectional study among women in Saudi Arabia carried out by Rehab Elgharabawy et al., 20% of participants did not read about contraceptive methods before starting to use them, and 18% are completely unaware of their side effects [6]. Knowledge and awareness were found to be better in regard to oral contraceptive pills as around 39% of the participants read about it before using it, followed by those using intrauterine devices as only 13% approximately have read about, then those using condoms (13%) [6].

The main aim of this study is to shed more light on the importance of family planning and contraceptive methods and the huge number of benefits resulting from understanding and applying its concepts. Furthermore, it aims to elaborate more on the different types of contraceptive methods that can be used and what are the advantages and disadvantages of each.

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2. MATERIAL AND METHODS / EXPERIMENTAL DETAILS / METHODOLOGY (ARIAL, BOLD, 11 FONT, LEFT ALIGNED, CAPS)

A comprehensive search was carried out independently by five co-authors on PubMed using the following MeSh terms: "Contraception", "Contraceptive methods", "Family planning", "Family planning methods", "Saudi Arabia", "Unintended pregnancy" "Birth control". Then, search results were filtered based on the title, abstract, study included humans only, and availability in English language as well as availability of full texts. A total of 120 articles were found and based on the previously mentioned criteria and whether or not they provide benefit towards achieving the aim of the study, 28 were selected.

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3. RESULTS AND DISCUSSION

Birth control methods have gained much more popularity and notice in the recent few years due to the benefits provided to the child, the mother, and the family as a whole as it can prevent a lot of the social and medical issues that can result from repeated or unintended pregnancies [5]. Due to the increase in female education and the rising need for family planning, women are seeking contraception methods for their positive effects on controlling reproduction to better fit their needs [7]. The prevalence of contraceptive use among Saudi women in Jeddah is 67.7%, out of which 55.2% were taking them because they were counseled by medical practitioners [7]. The most popular contraceptive methods as per a cross-sectional study that was performed in Saudi Arabia were found to be oral pills and intrauterine devices [8]. On the other hand, as per a study done in Nigeria regarding family planning, male condom was found to be the most commonly used contraceptive method, followed by pills, injectables and implants [3]. In the present study, we aim to discuss in depth all available family planning methods as well as the pros and cons of each method.

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Barrier contraception, specifically male condoms are found to be the most common method to be used by adolescents as well as being the most common to be used during first intercourse [1,2]. One of the unique advantages of this method is protection against STIs, which is why adolescents are always encouraged to use them [9]. They are generally free from side effects and are easily accessible even without a prescription [9]. Condoms' major disadvantage is marginal contraceptive efficacy, which is mainly due to breakage, improper or inconsistent usage [10]. Another reported disadvantage or reason for not using condoms is that some men believe that it decreases sexual pleasure [11]. Furthermore, most condoms are made of latex, which can cause an allergic reaction to some men and women [9,12]. According to a cross-sectional study involving 287 women in Saudi Arabia about family planning, only 17.1% out of those using contraceptive methods, were found to be using condoms [6]. It is also recommended especially for adolescents that regardless of the contraceptive method that is being used, to continue using condoms for protection against STIs and for further contraceptive back-up in case of contraceptive failure [1].

Combined hormonal contraception (CHC) is a popular birth control method that contains both hormones estrogen and progestins, and they are available in multiple forms including pills, patches, and vaginal rings [1]. According to a cross-sectional study involving 374 women in Saudi Arabia, oral contraceptive pills were found to be the most popular contraceptive method (48.6%) [8]. CHC can be taken with a 4- or 7-day hormone free interval (HFI) and can be either taken cyclically or for an extended duration by skipping cycles [13]. The cyclical usage of CHC is the typically used method in which the woman takes the CHC for 21 consecutive days then takes her HFI allowing for withdrawal bleeding to occur [13]. On the other hand, continuous or extended use of CHC is achieved by taking it for two or three consecutive cycles without taking a HFI and ultimately having no withdrawal

bleeds [13]. The advantages of the aforementioned method are reduction in the conditions that are exacerbated by cyclical variation of the menstrual cycle such as inflammatory bowel disease (IBD), irritable bowel syndrome (IBS), migraine without aura and epilepsy [13,14]. Moreover, extended or continuous use of CHC can also benefit those suffering from heavy menstrual bleeding as well as dysmenorrhea [13,14]. Combined oral contraceptive (COC) pills are the most commonly used hormonal contraceptive method in Saudi Arabia, and the typical use failure rate is 9% and it is mainly due to non-compliance [7,15]. Thus, they must be instructed to adhere to taking the pills closely by setting up alarms and reminders, and ask family members to support them in remembering to take it, in order not to miss any [2,14]. Another form of CHC is the contraceptive patch that is used once weekly for three consecutive weeks then starting HFI to allow for withdrawal bleeding by not using it in the fourth week or can be used continuously without a HFI [1]. It is worth mentioning that obesity decreases the efficacy of the contraceptive patch, but it is not a contraindication of using it [16]. Finally, vaginal ring, which is a form of CHC, can be inserted into the vagina and stays there for three weeks, then either it is removed for four or seven days HFI to allow for withdrawal bleeding or another ring is inserted immediately if extended contraception use is desired without any bleeding [17].

Progestin only contraceptive options are beneficial for those unable to take estrogen, which is present in combined contraception, such as those breastfeeding for example [1]. However, there are some contraindications to its usage such as active breast cancer, breast cancer remission within the last five years, hepatocellular adenoma, or severe liver cirrhosis [18]. As for the potential benefits, it includes reduced dysmenorrhea and endometriosis associated pain, on the other hand, the most commonly faced side effect is unscheduled bleeding [1]. It is available in the form of implants, intramuscular injections and pills [1]. Progestin only contraceptive implant is the most effective reversible birth control method with an efficacy of 99%, and it is functionally effective for around three years [19]. One of its advantages is being extremely convenient, in contrast to COC pills for example, as well as having a three year duration of effectiveness, and it prevents pregnancy by cervical mucous membrane thickening and ovulation inhibition [1]. The most common side effect is unscheduled bleeding and most common reasons for removal of implants are acne, abnormal uterine bleeding and weight gain [20]. The second form of progestin only contraception is the intramuscular injection known as depo-medroxyprogesterone acetate (DMPA), which is injected every one year [1]. DMPA is known to have several advantages such as decreasing premenstrual symptoms, dysmenorrhea, heavy menstrual bleeding, fibroids and sickle cell crises [1,14]. The disadvantages of this contraceptive method include unscheduled bleeding, delayed return to fertility, and weight gain, which is found to be more significant compared to those not using any contraceptive methods as well as those using other birth control methods [21]. Furthermore, DMPA has been found to be associated with reversible bone mineral density (BMD) loss, which seems to return to baseline within two years of stopping the drug [22]. Lastly, progestin-only pills (POP) which are most frequently used in post-partum settings since it is the best contraceptive method for breastfeeding women, and it should be taken every day at the same time without a HFI [1]. The most common reason for stopping this birth control method is unscheduled bleeding which can be quite disturbing [1].

Intrauterine contraceptive device (IUD) is an extremely effective long acting reversible birth control method that has an efficacy of 99% and around 80% continuation rate at one year of usage [23]. There are two types of intrauterine contraception: copper based intrauterine device (Cu-IUD) and levonorgestrel releasing intrauterine device (LNG-IUS) [1]. The hormonal based intrauterine device is chosen over the copper based one by those desiring improvement in regard to their dysmenorrhea and heavy menstrual bleeding, but some may experience sort of dissatisfaction due to certain side effects including breast tenderness, headache, mood changes, and acne [1]. LNG-IUS has been shown to be effective for five

years, and the main reasons for removing it after these five years were desiring fertility (15.2%), bleeding (13.7%), and hormonal issues (11.9%) [24]. As for the Cu-IUD, it is associated with higher rates of dysmenorrhea and menstrual bleeding since it is not hormonal based [1]. Additionally, upon IUD insertion, there is a risk of possible uterine perforation, which is the most serious complication of this type of contraception [25,26]. According to a cross-sectional study conducted in Saudi Arabia involving 979 females, intrauterine devices were found to be the second most frequently used contraceptive method (21%) second only to oral contraceptives [7].

In the setting of a contraceptive failure, interruption or non-adherence, emergency contraception can be used to prevent pregnancy from occurring [1]. Emergency contraception is available in many forms, the most effective of which is insertion of Cu-IUD [27]. It works mainly through an inflammatory reaction that affects oocytes and spermatozoa as well as the smooth muscles of the fallopian tube and myometrium preventing implantation from occurring [1]. On the other hand, hormonal emergency contraception mechanism of action is through impairment of dominant follicle production and development, if they are taken before ovulation [28].

4. CONCLUSION

In conclusion, birth control is an essential element that must be taken into consideration by all married couples as well as those planning to get married. Family planning has various benefits such as improving maternal health, child survival and reduces the number of overall abortions. This can be achieved through a variety of different contraceptive methods that each couple should be counselled properly about. Thereafter, each couple should choose the birth control method that best suits their situation based on the pros and cons of each method. Furthermore, prevention of STIs is a benefit that is achieved by some methods such as condoms. Progestin only pills for example are the most suitable contraceptive method for breastfeeding women. Finally, the duration of effectiveness and side effects of each method should be explained clearly to each couple.

Comment [a8]: This conclusion does not seem to lift the results and discussions that you have compiled. Please readjust because you are explaining a theory that already exists. Maybe you need to provide a statement that explains the new science from your review paper.

REFERENCES

1. Todd N, Black A. Contraception for Adolescents. *J Clin Res Pediatr Endocrinol* [Internet]. 2020 Jan 1;12(1):28–40. Available from: http://cms.galenos.com.tr/Uploads/Article_35761/JCRPE-12-28-En.pdf
2. Bitzer J, Abalos V, Apter D, Martin R, Black A. Targeting factors for change: contraceptive counselling and care of female adolescents. *Eur J Contracept Reprod Heal Care* [Internet]. 2016 Nov 1;21(6):417–30. Available from: <https://www.tandfonline.com/doi/full/10.1080/13625187.2016.1237629>
3. Olubodun T, Balogun MR, Ogunsilu EA. Awareness and practice of family planning among women residing in two rural communities in Ogun State, South West Nigeria. *Ann Afr Med* [Internet]. 19(4):246–51. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/33243947>

4. Etokidem A, Ndifon W, Etowa J, Asuquo E. Family planning practices of rural community dwellers in cross River State, Nigeria. *Niger J Clin Pract* [Internet]. 2017;20(6):707. Available from: <http://www.njcponline.com/text.asp?2017/20/6/707/208951>
5. Abdel-Salam DM, Albahlol IA, Almusayyab RB, Alruwaili NF, Aljared MY, Alruwaili MS, et al. Prevalence, correlates, and barriers of contraceptive use among women attending primary health centers in aljouf region, Saudi Arabia. *Int J Environ Res Public Health*. 2020;17(10).
6. Elgharabway RM, Ahmed AS, Alsuhaibani RA. Awareness, Prevalence and Determinants of Birth Control Methods Use among Women in Saudi Arabia. *Int Arch Med* [Internet]. 2015;1–11. Available from: <http://imed.pub/ojs/index.php/iam/article/view/1334>
7. Alhusain F, Alkaabba F, Alhassan N, Alotaibi S, Breakeit S, Musaudi E, et al. Patterns and knowledge of contraceptive methods use among women living in Jeddah, Saudi Arabia. *Saudi J Heal Sci* [Internet]. 2018;7(2):121. Available from: <http://www.saudijhealthsci.org/text.asp?2018/7/2/121/242506>
8. Alsaleem MA, Khalil SN, Siddiqui AF, Alzahrani MM, Alsaleem SA. Contraceptive use as limiters and spacers among women of reproductive age in southwestern, Saudi Arabia. *Saudi Med J* [Internet]. 2018 Nov;39(11):1109–15. Available from: <https://smj.org.sa/lookup/doi/10.15537/smj.2018.11.22817>
9. Amory JK. Male contraception. *Fertil Steril* [Internet]. 2016 Nov;106(6):1303–9. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0015028216627449>
10. D'Anna LH, Korosteleva O, Warner L, Douglas J, Paul S, Metcalf C, et al. Factors Associated With Condom Use Problems During Vaginal Sex With Main and Non-Main Partners. *Sex Transm Dis* [Internet]. 2012 Sep;39(9):687–93. Available from: <https://journals.lww.com/00007435-201209000-00005>
11. Newby K V., Brown KE, French DP, Wallace LM. Which outcome expectancies are important in determining young adults' intentions to use condoms with casual sexual partners?: a cross-sectional study. *BMC Public Health* [Internet]. 2013 Dec 13;13(1):133. Available from: BMC Public Health
12. Levy DA, Khouader S, Leynadier F. Allergy to latex condoms. *Allergy* [Internet]. 1998 Nov;53(11):1107–8. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/j.1398-9995.1998.tb03827.x>
13. Edelman A, Micks E, Gallo MF, Jensen JT, Grimes DA. Continuous or extended cycle vs. cyclic use of combined hormonal contraceptives for contraception. *Cochrane Database Syst Rev* [Internet]. 2014 Jul 29;3:1–48. Available from: <https://doi.wiley.com/10.1002/14651858.CD004695.pub3>
14. Ott MA, Sucato GS. Contraception for Adolescents. *Pediatrics* [Internet]. 2014 Oct 1;134(4):e1257–81. Available from: <https://publications.aap.org/pediatrics/article/134/4/e1257-e1281/33010>
15. Trussell J. Contraceptive failure in the United States. *Contraception* [Internet]. 2011 May;83(5):397–404. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3624763/pdf/nihms412728.pdf>

16. Zieman M, Guillebaud J, Weisberg E, Shangold GA, Fisher AC, Creasy GW. Contraceptive efficacy and cycle control with the Ortho Evra™/Evra™ transdermal system: the analysis of pooled data. *Fertil Steril* [Internet]. 2002 Feb;77:13–8. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0015028201032757>
17. Timmer CJ, Mulders TMT. Pharmacokinetics of Etonogestrel and Ethinylestradiol Released from a Combined Contraceptive Vaginal Ring. *Clin Pharmacokinet* [Internet]. 2000 Sep;39(3):233–42. Available from: <http://link.springer.com/10.2165/00003088-200039030-00005>
18. Black A, Guilbert E, Costescu D, Dunn S, Fisher W, Kives S, et al. No. 329-Canadian Contraception Consensus Part 4 of 4 Chapter 9: Combined Hormonal Contraception. *J Obstet Gynaecol Canada* [Internet]. 2017 Apr;39(4):229-268.e5. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1701216316397869>
19. Black AY, Guilbert E, Hassan F, Chatziheofilou I, Lowin J, Jeddi M, et al. The Cost of Unintended Pregnancies in Canada: Estimating Direct Cost, Role of Imperfect Adherence, and the Potential Impact of Increased Use of Long-Acting Reversible Contraceptives. *J Obstet Gynaecol Canada* [Internet]. 2015 Dec;37(12):1086–97. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1701216316300743>
20. Blumenthal PD, Gemzell-Danielsson K, Marintcheva-Petrova M. Tolerability and clinical safety of Implanon®. *Eur J Contracept Reprod Heal Care* [Internet]. 2008 Jan 6;13(sup1):29–36. Available from: <http://www.tandfonline.com/doi/full/10.1080/13625180801960012>
21. Beksinska ME, Smit JA, Kleinschmidt I, Milford C, Farley TMM. Prospective study of weight change in new adolescent users of DMPA, NET-EN, COCs, nonusers and discontinuers of hormonal contraception. *Contraception* [Internet]. 2010 Jan;81(1):30–4. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0010782409003527>
22. Scholes D, LaCroix AZ, Ichikawa LE, Barlow WE, Ott SM. Change in Bone Mineral Density Among Adolescent Women Using and Discontinuing Depot Medroxyprogesterone Acetate Contraception. *Arch Pediatr Adolesc Med* [Internet]. 2005 Feb 1;159(2). Available from: <http://archpedi.jamanetwork.com/article.aspx?doi=10.1001/archpedi.159.2.139>
23. Black A, Guilbert E, Costescu D, Dunn S, Fisher W, Kives S, et al. Canadian Contraception Consensus (Part 1 of 4). *J Obstet Gynaecol Canada* [Internet]. 2015 Oct;37(10):936–8. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1701216316300330>
24. Rybo G, Andersson K, Odland V. Hormonal Intrauterine Devices. *Ann Med* [Internet]. 1993 Jan 8;25(2):143–7. Available from: <http://www.tandfonline.com/doi/full/10.3109/07853899309164158>
25. Nagel TC. Intrauterine contraceptive devices. *Postgrad Med* [Internet]. 1983 Mar 18;73(3):155–64. Available from: <http://www.tandfonline.com/doi/full/10.1080/00325481.1983.11697801>
26. Farley TMM, Rowe PJ, Meirik O, Rosenberg MJ, Chen J-H. Intrauterine devices and pelvic inflammatory disease: an international perspective. *Lancet* [Internet]. 1992 Mar;339(8796):785–8. Available from: <https://linkinghub.elsevier.com/retrieve/pii/014067369291904M>

27. Shen J, Che Y, Showell E, Chen K, Cheng L. Interventions for emergency contraception. *Cochrane Database Syst Rev* [Internet]. 2019 Jan 20;2019(1). Available from: <http://doi.wiley.com/10.1002/14651858.CD001324.pub6>

28. Brache V, Cochon L, Duijkers IJM, Levy DP, Kapp N, Monteil C, et al. A prospective, randomized, pharmacodynamic study of quick-starting a desogestrel progestin-only pill following ulipristal acetate for emergency contraception. *Hum Reprod* [Internet]. 2015 Sep 23;dev241. Available from: <https://academic.oup.com/humrep/article-lookup/doi/10.1093/humrep/dev241>

DEFINITIONS, ACRONYMS, ABBREVIATIONS

Abbreviations:

- STI – Sexually Transmitted Infections
- HIV – Human Immunodeficiency Virus
- COC – Combined Hormonal Contraception
- HFI – Hormone Free Interval
- IBD – Inflammatory Bowel Disease
- IBS – Irritable Bowel Syndrome
- COC – Combined Oral Contraceptive
- DMPA – Depo-medroxyprogesterone Acetate
- BMD – Bone Mineral Density
- POP – Progestin-only Pills
- IUD – Intrauterine Contraceptive Device
- Cu-IUD – Copper-Based Intrauterine Device
- LNG-IUS – Levonorgestrel releasing Intrauterine Device