

**CONTRACEPTIVE THERAPY: AN INCREASED RISK FOR  
PERIODONTITIS**

An Undergraduate Research Scholars Thesis

by

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## **ABSTRACT**

### Contraceptive Therapy: An Increased Risk for Periodontitis

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Contraceptive therapy is being used by patients for various reasons. Several forms of contraceptive therapy are available for use such as, an oral pill, injection, implant, and intrauterine device. Evaluating the adverse effects of oral and non-oral contraceptives on the periodontal health of women is essential for providing the standard of care to patients. Studies demonstrate contraceptives such as Medroxyprogesterone acetate, the Levonorgestrel implant, and traditional estrogen/progestin oral contraceptives are all linked to increased risk of periodontal disease. Additionally, hormonal forms of the intrauterine device (IUD) and non-hormonal forms known as intrauterine systems (IUS) have yet to be researched to determine their effects on the periodontium of women. Due to several forms of contraceptives available for women, it is important for the dental hygiene profession to focus more intently on this topic by providing patients with information regarding the possible oral side effects of contraceptive therapy and develop a personal oral hygiene care plan for women that are exposed to such risks. Research has found that women exposed to Medroxyprogesterone acetate or levonorgestrel implant displayed an increase in periodontal pocket depths. Along with pocket depths,

Medroxyprogesterone demonstrated an increased bleeding on probing, clinical attachment loss and inflammation of the gingiva. Focusing on the different forms of contraceptives and their effects on women's oral health is important to educate communities and dental professionals. This can be achieved by promoting evidence-based dental care through the implementation of continuing education courses for the dental health care professional in order to benefit the overall health of the community.

## **KEY WORDS**

Medroxyprogesterone Acetate (MPA)

Intrauterine device (IUD)

Intrauterine system (IUS)

Levonorgestrel implant (LNG)

Temporomandibular joint (TMJ)

Temporomandibular joint disorder (TMJD)

Bone mineral density (BMD)

## INTRODUCTION

As women are a large portion of the patients that are seen in the dental office, it is important to understand what oral effects may be presented in women who utilize contraceptive therapy. Studies demonstrate contraceptives such as Medroxyprogesterone Acetate, Levonorgestrel implant, and traditional estrogen/progestin oral contraceptives are all linked to periodontal disease.<sup>1,2,3</sup> However, studies also indicate that various forms of contraceptive therapy can negatively affect the overall oral health of women.<sup>1,2</sup> For example, in 2019, Kazerooni et al. demonstrated that Levonorgestrel implant is linked to increased risk for periodontitis.<sup>2</sup> Similarly, in 2017, Taichman et al.<sup>1</sup> showed that women who utilize Medroxyprogesterone acetate are at higher risk for periodontal disease. Additionally, in 2019 Clark et al.<sup>4</sup> discovered women using Medroxyprogesterone acetate for more than two years were put at risk for osteoporotic fractures. Due to this relationship between the Medroxyprogesterone acetate injection and osteoporosis, further research would be beneficial to determine if this method of contraceptive therapy can impact the relationship between osteoporosis, bone density levels, and periodontal health. Research has yet to be conducted to demonstrate the effects of hormonal and non-hormonal forms of the intrauterine device/system (IUD/IUS) that may present adverse effects to the oral health of women.<sup>5</sup> Therefore, new research needs to be conducted to reflect the constant advancements that are occurring with contraceptive therapy to benefit the overall population.

## SECTION I

# ORAL HEALTH EFFECTS ASSOCIATED WITH ORAL AND NON-ORAL CONTRACEPTIVES

### Objective 1

#### *Oral Contraceptives*

Oral contraceptives are typically used for the prevention of pregnancy. Additionally, oral contraceptives can be used for the treatment of acne, hormonal balance, and the treatment of premenstrual syndrome.<sup>6</sup> Typically, traditional oral contraceptives are a combination of two synthetic hormones; estrogen and progestogen.<sup>6,7</sup> Evidence suggests that women taking traditional forms of oral contraceptives have presented, during clinical examinations, with increased risk for gingival inflammation, dry sockets, temporomandibular disorders, increased clinical attachment loss, gingival hyperplasia, and increase in *Prevotella spp.*<sup>6,7</sup> An increase in the *Prevotella* bacterium creates a more susceptible environment for periodontal disease to occur.<sup>6,7</sup>

In 2007, Mullally et al. found that women who were actively consuming oral contraceptives, displayed increased pocket depths while performing six-site periodontal charting.<sup>7</sup> Periodontitis was seen in 60% (n=50) of women who were actively utilizing oral contraceptives.<sup>7</sup> Based on the case study there was a higher retention rate for biofilm, increased gingivitis, and bleeding on probing in women who were using oral contraceptives ( $p < 0.05$ ), however these results are not of clinical significance.<sup>7</sup> An estimated 41.7% (n=50) of women, demonstrated increased pocket depths ranging from 4mm-6mm.<sup>7</sup> Additionally, according to Mullally et al., women who are taking oral contraceptives experienced an increased susceptibility

to periodontal disease if they had preexisting gingivitis, as compared to women who were not currently taking an oral contraceptive.<sup>6</sup> *Prevotella* is a gram-negative anaerobic rod shaped bacterium that is associated with periodontitis.<sup>6,7</sup> In a study conducted by Collins et al. 2019, subgingival samples were collected to evaluate which bacteria were present in patients who were diagnosed with periodontal disease. *Prevotella intermedia* was the most prevalent bacterial species identified in 29 patients.<sup>8</sup> In women using oral contraceptives a higher number of *Prevotella* bacterium was found therefore increasing the susceptibility of periodontal disease. With early detection, the rate of progression can be delayed with the addition of oral hygiene instructions and a regular periodontal maintenance schedule.

#### *Medroxyprogesterone Acetate*

The Medroxyprogesterone acetate shot was first approved by the Food and Drug Administration (FDA) in 1992, as a contraceptive injection that contains the synthetic hormone, Progestin, for the prevention of pregnancy.<sup>1</sup> Throughout the years of administration of the Medroxyprogesterone acetate injection, researchers have discovered that users of this contraceptive method have presented with an increased loss of bone mineral density and as a result are at an increased risk for experiencing osteoporotic fractures.<sup>1,4</sup> In 2004, the FDA placed a black box label for the Depo-Provera injection listing the possible risk of developing osteoporosis.<sup>1,4</sup> Currently, research has discovered oral contraceptives (containing progestin and estrogen) to have a negative effect on women's oral health.<sup>6,7</sup> This poses concerns regarding Medroxyprogesterone acetate and its effects on women's oral health due to the treatment only containing one hormone (Progesterone), which typically a contraceptive pill contains. The Medroxyprogesterone acetate injection releases Progestin which may have an effect on women's oral health from a periodontal perspective, just like oral contraceptives have previously already



shown. Although both contraceptives share the same hormone, Progestin, there is a concern specifically with the Medroxyprogesterone acetate contraceptive shot in reducing estrogen serum levels.<sup>1</sup> Since the Medroxyprogesterone acetate injection only consists of progestin, there has been evidence of a decrease in estrogen levels in women.<sup>1</sup> This decrease of estrogen has led to the decrease of bone mineral density due to estrogen's association with overall bone health.<sup>1</sup>

According to a study conducted from Clark et al. 2019,<sup>4</sup> the osteonecrotic effects that present in women receiving the Medroxyprogesterone acetate injection for more than two years have shown to clinically increase bone loss. In addition to the risk of osteonecrosis, Medroxyprogesterone acetate has shown to increase the probability of bleeding, clinical attachment loss, increased pocket depths, and inflammation of the gingiva.<sup>1</sup> A distinct clinical characteristic of periodontal disease is the evidence of bone loss. Therefore, it is suspected that the contraceptive injection could exacerbate this condition if patients are already presenting with first signs of periodontal disease.

In 2018, Taichman et al.<sup>1</sup> identified a significant increase in pocket depths ( $p < 0.01$ ), bleeding points ( $p < 0.01$ ), and clinical attachment loss ( $p < 0.05$ ) among women who were receiving the Medroxyprogesterone acetate injection. Taichman suggested that there is a possibility that the progestin could be promoting tissue destruction.<sup>1</sup> Since this injection only contains progestin, the absence of estrogen in the contraceptive chemical agent can potentially increase the susceptibility to tooth loss, clinical attachment loss and alveolar bone loss.<sup>1</sup> In addition, the contraceptive injection of progestin may stimulate the production of prostaglandins contributing to gingival inflammation.<sup>1</sup> Taichman et al. 2018 stated a decrease of bone mineral density (BMD) with the medroxyprogesterone acetate injection by 5.7%-7.5% after two years of

use.<sup>1</sup> Since this may possibly contribute to periodontal bone loss, further clinical studies are needed to evaluate the relationship of the injection in women's oral health more closely.

The recent discovery of injectable contraceptives on the effects of women's oral health brings upon the possibility of affecting more than the physiology of a tooth and its surrounding structures, but the temporomandibular joint (TMJ) as well. Temporomandibular joint disorder (TMJD) is a condition that presents as stiffening of the jaw, limited opening, and pain.

According to the National Institute of Health, TMJD was more common in women as compared to men in 2017.<sup>9</sup> This correlation is most likely due to one of the several potential reasons, including the change of hormones the body goes through as aging progresses. It is possible that the contraceptive injection could alter women's hormones enough to result in TMJD. According to Cleveland Clinic, the injectable progestin decreases natural estrogen thus amplifying the effects of inflammation and bone loss which could possibly be affecting the TMJ.<sup>10</sup> If women are taking the Medroxyprogesterone acetate injection for a prolonged period, it is essential to educate them on the awareness of its effects and what they can do to minimize the damage if decided to stay on this method of contraceptive. Therefore, further research is needed to determine if the alteration in women's hormones from contraceptive injections can be linked not only to the periodontal health of women but to TMJD as well.

It is important to consider additional vulnerable populations, such as those with a low social-economic status (SES) that choose this method of contraceptive and have limited access to care. With Taichman et al. currently being the only study focused on the contraceptive injection and its effects on periodontal health, researchers were able to establish a target population of Medroxyprogesterone acetate users that are non-Hispanic black women of low socioeconomic status.<sup>1</sup> This particular population group has been found to have poor oral hygiene and are less

likely to visit the dental office regularly.<sup>1</sup> In this situation, dental clinicians carry an important role in educating non-Hispanic black women of low SES that are taking this type of contraceptive method in developing a strict oral hygiene care plan to reduce the risk of periodontal disease that this injection may increase.

### *Contraceptive Implant*

The first contraceptive implant, which contained levonorgestrel a synthetic form of progestin, was approved by the FDA in 1990.<sup>11</sup> The implant is placed subdermal in the upper arm of women, and releases hormones in the body to prevent pregnancy for up to five years.<sup>11</sup> Discontinuation of the levonorgestrel implant was partially attributed by negative media coverage.<sup>11</sup> Due to the lack of success, a new contraception implant was created with etonogestrel, also a form of synthetic progestin.<sup>11,12</sup> Later in 2010, a modified version of the etonogestrel implant was created.<sup>13</sup> Both etonogestrel-containing implants protected women against pregnancies for up to three years however, there were only two differences between the new etonogestrel and the older etonogestrel implant.<sup>13</sup> The new etonogestrel implant is radio-opaque, which allows it to be seen in radiographs easier, and it has a different placement than the older etonogestrel-containing implant.<sup>13</sup>

In 2008, Kazerooni et. al<sup>2</sup> conducted a case study to evaluate the effects of levonorgestrel in the periodontium of women six months after receiving the implant. The study include 148 women who use barrier forms of contraceptives, such as prophylactic sheaths compared to forty-seven women who received the implant.<sup>2</sup> Women with the levonorgestrel implant exhibited increased pocket depths ( $p < 0.05$ ).<sup>2</sup> With almost all teeth affected by periodontium the women with the levonorgestrel implant continued to demonstrate deeper periodontal pockets after six months.<sup>2</sup> Although the case study evaluated the effects of levonorgestrel on the periodontium, it

is important to discuss the type of women that were studied. Researchers failed to mention the age of the women that were studied, if women were using any other form of contraceptives besides barrier methods, and that the women used in the case study were also women who were referred to the Committee for Family Planning Research.<sup>2</sup>

There have been very few case studies or research on the effects of etonogestrel in the oral cavity of women. Etonogestrel is similar to levonorgestrel as they are both synthetic progestins, therefore it is possible but not known if they both have similar side effects in the oral cavity.<sup>12</sup> Although the levonorgestrel implant was discontinued, the hormone levonorgestrel is now seen today in intrauterine devices (IUD), so its effects on the periodontium may still be relevant.<sup>5</sup> Therefore, further clinical studies need to be conducted in order to evaluate the effects of etonogestrel on the periodontium, and if the effects are similar to levonorgestrel. This is not only critical for dental health professionals, but to all health professionals. General practitioners who are taking part into the decision making of their patients considering contraceptive therapy need to educate their patients on all risks, including for those overlooked such as periodontal health.

### *IUD*

Women have an array of options to choose from for the prevention of pregnancy. One option includes receiving an IUD or IUS. An IUD is made with copper and does not contain any hormones, while the IUS releases a small amount of the hormone levonorgestrel directly into the uterus.<sup>5</sup> Effects on the periodontium can be related to the hormones that are released while using hormone releasing contraceptives. However, there have not been any studies to evaluate if there are any effects to the periodontium related to the use of IUDs. One may suspect that no significant effects would be seen in the periodontium of women using copper IUDs due to no

hormones being released directly by the copper. However, further research needs to be conducted to determine side effects to the periodontium of women utilizing IUDs.

Additionally, in the US there are three levonorgestrel-releasing intrauterine systems (LNG-IUS).<sup>5</sup> These three IUSs work by releasing hormones into the user's uterus. Levonorgestrel is a synthetic progestogen hormone that is utilized in IUSs.<sup>5</sup> Contraceptives containing levonorgestrel have been shown to display such effects to the periodontium as increased pocket depths and periodontitis.<sup>2</sup> As previously stated above, a case study conducted by Wyeth-Ayerst Pharmaceuticals evaluated the effects of levonorgestrel contraception on the oral health of women.<sup>2</sup> Pocket depth measurements, clinical gingival index, bleeding on probing (BOP), and papillary bleeding were all evaluated.<sup>2</sup> In this study, it was found that women using the levonorgestrel contraceptive presented with increased probing depth and periodontitis ( $p < 0.05$ ).<sup>2</sup> As this study focuses on levonorgestrel used for contraception, it would be beneficial to the public and to dental professionals if further research was done to determine if the levonorgestrel that is used in LNG-IUS contraceptives may also show adverse effects to the periodontium of women. There has been research in the past focusing on oral contraceptives and the effects it has on the oral health of women, currently there have been no studies to evaluate if the IUD/IUS poses any effect on the oral health of women.

## **SECTION II**

# **IMPORTANCE OF CONTRACEPTIVES AS IT RELATES TO PATIENT'S ORAL HEALTH**

### **Objective 2**

Focusing on the specific needs of women is valuable to dental professionals as it allows for a complete assessment of patients. According to the Centers of Disease Control and Prevention (CDC) 66.2% of women visited the dental office in 2016.<sup>14</sup> The CDC reports that 65% of women are using some form of contraceptive.<sup>15</sup> That being said, familiarity with the different forms of contraceptives that women are using and why they are being used is important for comprehensively assessing the dental patient. Patients use contraceptives for varying reasons such as the prevention of pregnancy, heavy menstrual bleeding, menstrual pain, and hormone replacement therapy. This creates an open dialogue with patients which in turn can lead to a better clinician-to-patient relationship. Accounting for all these factors while assessing a patient is helpful in creating a complete health history, which can be used to tailor treatment plans and educational services for these patients.

## **SECTION III**

### **THE CLINICAL AND PUBLIC HEALTH SIGNIFICANCE OF ORAL AND NON-ORAL CONTRACEPTIVES AS IT IMPACTS DENTISTRY**

#### **Objective 3**

Recognizing these adverse side effects in women taking oral contraceptives and non-oral contraceptives is essential for comprehensive patient care. Although many of these adverse effects are known amongst dental professionals, it is crucial to be aware of the current forms of contraceptives and the effects they may have on the oral health of women. Being educated on all of the possible effects that can present in the oral cavity can allow clinicians the benefit of early detection of disease, preventing the progression of disease, and educating the patient about the side effects they may experience. One of the many responsibilities that a clinician has in the dental office is to educate and inform the patient. However, having current research is essential for clinicians to tailor treatment and provide evidence-based care for their patients. Being able to recognize adverse side effects in a patient allows the dental health professional to create a personalized treatment plan that will benefit their patient's specific needs. Dental health professionals can educate patients on signs and symptoms to look for while taking a new medication. Using current scientific based evidence to educate and inform the patient would not only benefit the patient in the dental office but benefit their overall health as well. Dental health professionals can be an excellent source for information to their patients. As women are more likely to visit the dental office, focusing on contraceptive therapy is important for this population of patients. Being informed with the latest research can help dental health professionals in being more comfortable talking with patients about this subject. Focusing on the different forms of

contraceptive therapies that are used, why they are prescribed, and who is likely to utilize them is essential to not only the dental health professional but to women that are visiting the dental office. The practice of dental hygiene can be improved by educating women on the effects of contraceptive therapy. The outreach of education to dental professionals can be obtained through specialized continuing education classes, which allows clinicians to perform more evidence-based dental care.



## CONCLUSION

Women have many contraceptive options. Research currently provides evidence demonstrating the oral health effects in women using oral and non-oral contraceptives. Traditional oral contraceptives demonstrate an increased risk of gingival inflammation, dry socket, temporomandibular joint disorder, clinical attachment loss, gingival hyperplasia, increased probing depths and the increase of the microorganism *Prevotella*. Women who received Medroxyprogesterone Acetate injections demonstrated an increased risk for periodontal disease, decrease bone density, osteoporotic fractures, and gingival inflammation. Further research needs to be conducted to assess the possible link between Medroxyprogesterone acetate and TMJ disorders. On the other hand, the levonorgestrel contraceptive implant demonstrated all or most teeth were affected by periodontitis along with deeper pocket depths in women who received the implant. Although, the levonorgestrel implant was discontinued and is no longer in production, there is no research regarding the new etonorgestrel-containing contraceptive implant. Research identifying the possible effects of the etonorgestrel implant needs to be conducted in order to educate the public and health care professionals. Lastly, there is no current research evaluating the potential effects that the IUD or IUS may have on the oral health of women. There may be an increased probability of the IUS to cause side effects on women's oral health due to its use of levonorgestrel since it has previously been shown to affect the periodontium of women in other methods of contraceptives. Therefore, research needs to be conducted to identify if there are oral health effects in women using the levonorgestrel IUS and the many other methods women are commonly using today.

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