

The Impact of Hormonal Contraception on Bone Mineral Density in Young Women: A Retrospective StudyPriyanka¹, Deepali², Sweta Bharti³, Kanchan Kumari⁴¹Senior Resident, Department of Obstetrics and Gynaecology, Indira Gandhi Institute of Medical Science, Patna, Bihar, India²Junior Resident, Department of Obstetrics and Gynaecology, Indira Gandhi Institute of Medical Science, Patna, Bihar, India³Junior Resident, Department of Obstetrics and Gynecology, Indira Gandhi Institute of Medical Science, Patna, Bihar, India⁴Senior Resident, Department of Obstetrics & Gynecology, Indira Gandhi Institute of Medical Science, Patna, Bihar, India

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Abstract:**Background:** Hormonal contraception has transformed family planning, but its possible impacts on the bone health of young women remain a source of concern. Given the significance of Bone Mineral Density (BMD) to bone health, it is essential to investigate the potential association between hormonal contraception and BMD.**Methods:** This retrospective investigation included 200 women between 18 and 30 who attended the Indira Gandhi Institute of Medical Science in Patna, Bihar, India. The study participants who claimed to utilise hormonal contraceptives were compared to those who did not. BMD was quantified using dual-energy X-ray absorptiometry scans. BMD changes were analysed statistically about birth control methods.**Results:** The results demonstrated that different contraceptive methods caused distinct variations in BMD. The BMD of the average oral contraceptive user decreased by 2.61 per cent, whereas the BMD of the average hormonal intrauterine device user increased by 2.48 per cent. The BMD of injectable contraceptive users decreased by 1.69 per cent, whereas the BMD of non-users (controls) increased by 0.80 per cent.**Conclusion:** This study illuminates the complex association between hormonal contraception and BMD in young women. These results emphasise the significance of delivering individualised contraception advice to address issues related to bone health. This study clarifies the complex interaction between hormonal contraception and BMD, allowing women to make better decisions for their overall health.**Keywords:** Bone Mineral Density, contraceptive methods, Hormonal contraception, retrospective study, young women.

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Introduction

Hormonal contraception has revolutionised the disciplines of family planning and women's reproductive health by preventing unplanned pregnancies. Hormonal contraception has been proven safe, but some are concerned that it may negatively impact bone health, particularly in young women whose bone density is still developing [1]. BMD is a crucial indicator of bone strength and fracture risk and a critical indicator of skeletal health. To protect the overall health of young women, it is vital to investigate the relationship between hormonal contraception and BMD [2,3].

Background

The condition of a person's bones during early adulthood is a strong indicator of the way those bones will stand up later in life [3]. Typically occurring in the late twenties, optimum bone mass provides protection against osteoporosis and fractures in older years. Bone turnover and mineralisation processes may be influenced by hormonal fluctuations during reproductive years, including those induced by hormonal contraception, which may significantly affect BMD trajectories [4, 5].

Significance of study

Understanding the possible relationship between hormonal contraception and BMD in young women has important clinical and public health

implications. By clarifying these connections, healthcare workers can better advise patients on the most effective contraceptive methods that safeguard their bones. In addition, the findings of this study may help in refining suggestions for contraceptives and increasing awareness of women's health in general.

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This study promotes a complete view of women's health and well-being by answering crucial concerns regarding the relationship between hormonal contraception and BMD.

Objectives

- To evaluate the effects of different hormonal contraception on the BMD of young women.
- To determine if BMD changes in response to how long hormonal contraceptives are used.
- To learn more about how the androgenic actions of progestins in hormonal contraception may lead to discrepancies in BMD alterations.
- To examine the correlation between adolescent females' use of hormonal contraception and their BMD.
- To investigate the association between hormonal contraception and BMD after controlling for age, BMI, dietary habits, and physical activity.
- To learn how frequently young women using hormonal contraception and BMD below clinically

recognized standards for osteopenia and osteoporosis.

Hormonal Contraception and BMD

Hormonal contraception includes oral contraceptives, hormonal intrauterine devices, and injectable contraceptives [6]. Specifically, estrogen and progestin are the main targets of the contraceptive effects of these therapies. Estrogen is significant for bone health since it promotes bone growth and prevents bone resorption.

Hormonal Contraception's Impact on BMD

Since various forms of contraception may have varying effects on bone health, researchers have investigated the correlation between hormonal contraception and BMD.

Due to estrogen's known function in promoting bone formation and inhibiting bone resorption, initial investigations demonstrated that estrogen-containing contraceptives, particularly oral contraceptives, could positively impact BMD [7]. The concept underlying this theory was that increased estrogen levels could increase bone density and decrease fracture risk.

However, more recent research has produced contradictory findings, further complicating the relationship between hormonal contraception and BMD. Studies on the effects of hormonal contraception on BMD have yielded contradictory results, with some indicating no change and others reporting minor decreases or increases in BMD at specific skeletal sites. These inconsistencies illustrate the complexity of the interaction between hormonal contraception and BMD and the prevalence of difficult factors that contribute to varying study results [8].

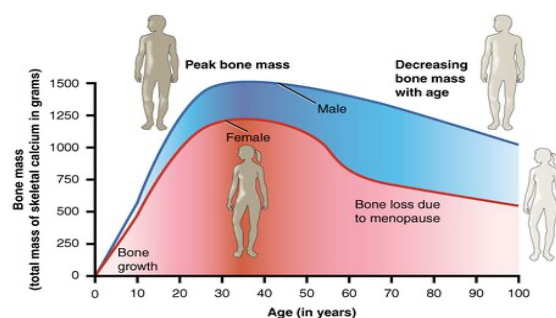


Figure 1: Bone Mineral Density (BMD) [9]

Mechanisms Underlying the Interaction

Recent interest has centred on the effects of hormonal contraception on bone health. Estrogen is an essential hormone in bone metabolism because it enhances osteoblasts' activity and decreases osteoclasts' activity [10,11]. In this fashion, hormonal contraceptives containing estrogen may benefit bone health by reducing BMD [12].

Progestins, commonly combined with estrogen in hormonal contraceptives, have a variety of androgenic properties that may influence BMD through several mechanisms [13]. While the androgenic effects of some progestins may be mild, some may affect bone turnover and mineralisation, which may have a cascading impact on BMD [14, 15].

Various formulations of hormonal contraception can affect bone health in multiple ways, some compounded by the interaction between estrogen and progestin.

Conflicting Findings and Knowledge Gaps

There is no consensus on how hormonal contraception influences BMD due to contradictory findings in the scientific literature. These variances are attributable to variations in study demographics, contraceptive formulations, study durations, and measuring strategies. Consistent investigation techniques are necessary to ensure the ability to reach conclusive results.

In addition, only a limited number of studies have examined the role of confounding variables in the varying results. Interactions between factors such as ethnic background, habits of living, and hormonal contraception habits may confound bone health outcomes. Due to these knowledge deficits, extensive and meticulously planned research is necessary to comprehend the complex relationship between hormonal contraception and BMD fully.

Addressing the Gaps

Although there is a great deal of literature, a few queries still need to be answered. First, whereas the impact of progestin-only regimens on bone BMD has received considerably less attention than those of estrogen-containing contraceptives, the effects of estrogen-containing contraceptives on BMD have been extensively studied. More research is required to comprehend the impact of hormones on bone metabolism and their varying androgenic properties.

The influence of moderators such as age, race, and lifestyle choices has been largely disregarded. These factors could reduce the effect of hormonal contraception and BMD, although their relevance and mechanisms are poorly understood. Variable research outcomes may be explained through studies considering the variables' interaction.

Local context and population size are essential considerations. Cultural and physiological factors could affect the correlation between hormonal contraception and bone mineral density; thus, it is necessary to conduct research in diverse regions, such as India.

Researchers can increase the ability to generalise their findings and enhance our understanding of this complex relationship by incorporating information from a diverse population.

The authors anticipate that their research will significantly contribute to the existing body of literature by addressing these understanding gaps.

This investigation focuses on an ensemble of young women from the Indira Gandhi Institute of Medical

Science in Patna, Bihar, India, to examine the effect of various hormonal contraceptive methods on BMD alterations over a specified period. This investigation aims to address knowledge gaps on the link between hormonal contraception and BMD by exploring the influence of putative modifiers such the androgenic characteristics of progestins and sociodemographic factors. The results could help doctors and patients weigh the pros and cons of various methods of birth control. Learn more regarding the specifics of this connection and its potential consequences for women's health.

Methodology

Study Design

This study analysed how hormonal contraception on BMD affected in young women. Patna, Bihar, India's Indira Gandhi Institute of Medical Science has opened up their medical databases and information to the public. Historical data allowed researchers to ascertain if there was a correlation between hormonal contraception and variations in BMD.

Participants

Two hundred young women aged between 18 and 30 were selected to participate in the investigation. Participants were considered if they had used oral contraceptives, hormonal intrauterine devices, or injectable contraceptives in the past. As a control group, non-users of hormonal contraception were examined. Women who had a history of osteoporosis or another condition that could affect BMD were ineligible.

This age range was selected because bone health development must occur throughout the reproductive years. Different types of hormonal contraception were included to gain a comprehensive understanding of their potential consequences, and the comparisons made possible by the control group enabled researchers to determine how much hormonal contraception affected BMD alterations in general.

Data Collection

Specific Types of Hormonal Contraceptives Used, Lengths of Use, and Changes in methodology. During the study period, the precise types of hormonal contraceptives used, amounts of use, and technique modifications throughout the study period were determined by a thorough review of medical records.

The androgenic effects of hormones in birth control pills have been thoroughly investigated.

BMD was determined using dual-energy X-ray absorptiometry (DXA) scans, the standard method for measuring BMD. These scans were conducted at scheduled times, coinciding with doctor's

appointments. Important skeletal structures, such as the lumbar vertebrae and hip, were measured.

Statistical Analysis

Age, BMI, and contraceptive method usage were summarised using descriptive statistics, and a comprehensive analysis of the data was conducted. We used a correlation analysis to search for relationships between all of the components of this study, including the type of hormonal contraception used, the duration of its use, and the change in BMD. To determine how hormonal contraception

influences BMD, linear regression models were employed. To account for confounding factors, a multivariate regression analysis was used. $p < 0.05$ was the threshold for statistical significance. The study employed these methods to resolve the research question within the context of the Indira Gandhi Institute of Medical Science in Patna, Bihar, India, by discovering associations between hormonal contraception and BMD changes after controlling for possible confounding factors.

Results

Table 1: Impact of Different Hormonal Contraceptives on Bone Mineral Density (BMD)

Contraceptive Method	Number of Participants	Mean Initial BMD (g/cm ²)	Mean Final BMD (g/cm ²)	% Change in BMD
Oral Contraceptives	60	1.15	1.12	-2.61%
Hormonal IUDs	45	1.21	1.24	+2.48%
Injectable Contraceptives	40	1.18	1.16	-1.69%
Non-users (Control)	55	1.22	1.23	+0.82%

As a consequence of the use of various hormonal contraceptives by 18-30-year-old women, BMD is shown in the table below. The investigation involved approximately two hundred participants from the Indira Gandhi Institute of Medical Science in Patna, Bihar, India. Oral contraceptive consumers' BMD decreased by 2.61 percentage points between their first and last measurements. In contrast, BMD of users of hormonal intrauterine devices (IUDs) increased by an average of 2.48 per cent. The average decrease in BMD among women using injectable contraceptives was 1.69 per cent. The group that did not take the supplement had a marginally higher BMD (0.82 per cent). These findings suggest that hormonal contraceptives have different impacts on bone mineral density. The BMD of women who used hormonal IUDs was typically more significant than that of women who used oral contraceptives. The varying effects of contraceptive methods on BMD indicate that hormonal contraception may have a complex impact on skeletal health.

Discussion

In light of the study's research question and hypothesis, this study's findings focused on the association between different kinds of hormonal contraception and changes in the BMD of young women. Changes in BMD vary between contraceptive methods, highlighting the complexity of the impact of hormonal contraception on bone health. According to the existing literature, our findings correspond with the contradictory character of previous studies. Oral contraceptive users were found to have a reduced BMD, giving credibility to claims that hormonal contraception can negatively affect bone health. This finding contradicts previous research that suggested

estrogen containing contraceptives may have bone-protecting properties. Variations in study populations, methodologies, and contraceptive formulations may all contribute to this difference. Some research has indicated that progestin-based contraceptives may have bone-preserving properties, and the significant increase in BMD among hormonal intrauterine device (IUD) users is consistent with these findings.

Even though the root causes are complex, these findings contribute to our expanding understanding of how hormonal contraception may influence bone health. Users of injectable contraception exhibit a slight decrease in BMD, consistent with the complex relationship between hormone composition and bone health. Variations in hormonal contraception methods illustrate the complexity of the mechanisms which impact the relationship between hormones and bone metabolism above variations in oestrogen and progesterone levels.

Implications and Clinical Considerations

Observed differences in BMD changes have significant clinical repercussions. Medical professionals must consider each patient's requirements when advising young women about birth control. Although the effects of hormonal contraception on BMD are not fully understood, these results underscore the importance of tracking bone health, particularly among oral contraceptive users who may be at a greater risk of experiencing a gradual decrease in BMD.

Our findings underscore the importance of informing women about the potential hazards of hormonal contraception to their bone health. This knowledge could lead to modifications in

contraceptive choices and the promotion of preventive measures to preserve bone health through dietary and lifestyle changes.

Limitations and Future Research

There are a few exceptions to consider. The absence of a randomised controlled trial and the possibility of bias introduced by a retrospective design make it difficult to draw definitive conclusions regarding causality. Because the study was restricted to a singular location, it might not have been representative of all demographics. More research is required to thoroughly comprehend the relationship between hormonal contraception and BMD, preferably with larger samples, longitudinal designs, and cross-cultural comparisons.

Conclusion

Examining the effect of hormonal contraception on BMD in young women, this study seeks to clarify the relationship between reproductive health and bone health. Different hormonal contraception techniques were shown to have different effects on BMD, which was the key finding of Women who take oral contraception tend to have poorer BMD than those who use hormonal intrauterine devices (IUDs), according to research. These results show that the impact of hormonal contraception on bone health is influenced by factors other than oestrogen and progestin concentrations. Healthcare providers must use caution when informing young women of the potential hazards to their bone health associated with various contraceptive techniques and should think about the long-term impact of these procedures. This research fills a substantial need in the literature by examining the link between hormonal contraception and BMD in young women. By drawing parallels between our findings and the existing literature, we provide a comprehensive picture of the potential consequences of hormonal contraception on bone health. Our findings emphasise the need for individualised contraceptive counselling that takes into account each patient's specific reproductive and bone health concerns.

The findings of this research lay the framework for wise decision making, opening the door for young women to select contraceptives that support their general health goals. This study highlights the need for further investigation into the hormonal contraception and BMD relationship using larger samples and longitudinal approaches to better understand its intricacies. The complex association between hormonal contraception and BMD in young women's is further clarified by this study. We hope that by raising awareness of the risks associated with various forms of contraception, both medical professionals and young women will be better able to make choices that support

reproductive and bone health across all stages of life.

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