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Hormonal Oscillations and Periodontal Equilibrium: A Cross-Sectional Study on Women's Awareness and Perception of Menstrual-Associated Periodontal Variations

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Abstract: Background: Hormonal fluctuations occurring throughout the menstrual cycle exert a significant influence on periodontal tissues by modulating gingival vascularity, collagen turnover, and inflammatory mediator expression. These cyclic endocrine variations may transiently increase gingival sensitivity, edema, and bleeding. However, awareness and perception among women regarding the interplay between hormonal rhythmicity and periodontal health remain limited.
Aim: To evaluate women's awareness and perception concerning the influence of menstrual-associated hormonal fluctuations on periodontal health.
Methods: A descriptive cross-sectional survey was conducted using a pre-validated online questionnaire disseminated among women, yielding 103 responses. The collected data were tabulated and analyzed using Microsoft Excel to derive descriptive statistics and percentage distributions.
Results: The survey findings indicated that awareness of menstrual-associated gingival alterations was relatively low (20%), despite more than half of the participants acknowledging the influence of other hormonal phases such as pregnancy and menopause on oral health. Notably, 80% of respondents expressed a willingness to receive educational materials, and 85% believed that maintaining optimal oral hygiene during menstruation could positively influence overall well-being.
Conclusion: These findings underscore the necessity of incorporating targeted oral health education into broader menstrual and reproductive health awareness programs to enhance women's preventive oral health competence.
Keywords: Periodontal health, Menstrual cycle, Hormones, Gingival inflammation, Oral hygiene awareness, Women's health

I. INTRODUCTION

Periodontal health is a fundamental determinant of overall systemic well-being, governed by a complex interaction among microbial biofilms, environmental influences, and host-related factors. Among these, hormonal fluctuations particularly those involving estrogen and progesterone have been recognized as key modulators of periodontal tissue response.[1] The menstrual cycle, characterized by cyclical variations in these hormones, influences gingival vascularity, collagen turnover, and immune responsiveness, thereby predisposing women to transient yet clinically discernible periodontal alterations. Despite substantial evidence establishing the endocrino-periodontal interrelationship, awareness among women regarding these hormonally mediated oral changes remains inadequate, often resulting in under-recognition and delayed intervention.[2]

The menstrual cycle encompasses four phases : menstrual, follicular, ovulatory, and luteal, each governed by distinct hormonal patterns. [3]During the ovulatory and premenstrual phases, elevated estrogen and progesterone levels promote increased gingival vascularity, capillary permeability, and inflammatory cell infiltration, often resulting in symptoms such as gingival erythema, edema, and bleeding on brushing. Conversely, the abrupt decline in hormonal levels during menstruation may aggravate gingival inflammation and transient discomfort.[4] These variations occur independent of plaque accumulation, underscoring the hormonal influence on periodontal tissue dynamics rather than microbial load alone.

Although hormonal effects on periodontal health extend across other physiological stages such as puberty, pregnancy, and menopause, the menstrual cycle presents a recurrent and prolonged exposure to cyclical hormonal modulation throughout a woman's reproductive life. [5]Yet, many women remain unaware of the oral–systemic interplay linking menstrual health to periodontal status, frequently misattributing symptoms such as bleeding gums, halitosis, or oral burning sensations to non-hormonal causes.[6] The recurrent nature of these endocrine fluctuations, coupled with limited awareness and inconsistent preventive practices, may cumulatively increase susceptibility to chronic periodontal inflammation and tissue breakdown over time.

Recognizing this knowledge gap, the present study was undertaken to assess women's awareness and perception of the influence of menstrual-associated hormonal oscillations on periodontal health, with the broader objective of emphasizing the integration of oral health education within women's health and reproductive awareness initiatives.

II. MATERIALS AND METHODS

This descriptive cross-sectional study was conducted to assess women's awareness and perception regarding the influence of hormonal fluctuations during the menstrual cycle on periodontal health. The investigation was carried out over a two-month period, from September to November 2025, following systematic phases of data collection, validation, statistical analysis, and report preparation. Ethical clearance was obtained from the Institutional Review Board prior to commencement, and the study was undertaken under the supervision of the Department of Periodontics, Thai Moogambigai Dental College and Hospital, Chennai.

A structured, pre-validated questionnaire was developed using Google Forms, consisting of five sections: demographic information, oral hygiene habits, awareness of oral health in relation to the menstrual cycle, attitudes and beliefs, and educational needs comprising a total of 40 questions. The survey tool underwent content validation by subject-matter experts in Periodontology to ensure conceptual clarity, contextual relevance, and comprehensiveness. Participation was entirely voluntary, and no personally identifiable information was collected at any stage. The introductory section of the online questionnaire included a detailed electronic informed consent statement describing the study objectives, voluntary participation, and assurances of confidentiality and anonymity. Only participants who selected the option "I agree to participate" were allowed to proceed with the survey. A total of 103 valid responses were obtained and automatically compiled through Google Forms. The dataset was subsequently exported and tabulated using Microsoft Excel (Microsoft Corp., USA) for descriptive and comparative analyses. Data were expressed as frequencies and percentage distributions across demographic, behavioral, and awareness parameters. Comparative statistical evaluations were performed to identify variations in periodontal health perception, awareness levels, and self-reported oral hygiene practices among different participant cohorts.

III. RESULTS

The survey on oral health awareness among women in relation to hormonal changes yielded valuable insights into their knowledge, practices, and perceptions across diverse age, educational, and occupational backgrounds. The majority of respondents were young adults between 18 and 25 years, with the highest representation at 23 years (17.48%), followed by 22 years (12.62%) and 25 years (9.71%). With respect to educational status, undergraduates formed the largest group (49.51%), followed by professionals (23.3%) and postgraduates (22.33%), while a smaller proportion had school-level education or doctoral qualifications. Most participants were students (35.9%), with smaller representations from teachers, doctors, and homemakers, and nearly 70% were unmarried.

Regarding oral health behavior, 60% of respondents visited a dentist only when experiencing a problem, 25% once a year, 10% every six months, and 5% rarely or never. In terms of daily oral hygiene, 65% reported brushing twice daily, 30% once daily, and 5% occasionally. However, only 40% used additional oral hygiene aids such as floss or mouthwash, indicating a gap in comprehensive oral care practices. About 70% reported no change in their oral hygiene routine during menstruation, 15% reported modifying it, and 15% were unaware of any change. Only 20% noticed increased gingival discomfort during menstruation.

Awareness regarding hormonal influences on oral health varied among participants. More than half (55%) recognized that other hormonal stages such as pregnancy and menopause could affect gum health, while 30% were unaware and 15% uncertain. When asked about hormonal contraceptives, 40% believed they could influence gum health, 30% disagreed, and 30% were unsure. About half of the participants (50.5%) strongly agreed and 29.1% agreed that gum health changes during menstruation are normal and temporary, although many underestimated the need for professional evaluation. Conversely, 55% strongly agreed and 25% agreed that gum bleeding during menstruation warrants dental attention, indicating moderate awareness of its clinical significance.

A large majority (70%) strongly agreed and 20% agreed that oral health is as important as reproductive health, and 75% believed that lack of awareness contributes to poor oral health among menstruating women.

Encouragingly, 80% expressed interest in receiving educational material on oral changes during hormonal cycles, and 85% believed that maintaining optimal oral hygiene during menstruation could enhance overall well-being. Furthermore, 80% agreed that menstrual health awareness programs should incorporate oral and periodontal health education, while 15% were unsure and only 5% disagreed.

1) Section 1: Demographic Information

Question	Response Option	Count	%
Mean Age of Respondents		28.14 years	
Age Distribution	18–25 years	64	62.1%
	26–35 years	18	17.5%
	36–50 years	12	11.6%
	Above 50 years	9	8.7%
Educational Qualification	Undergraduate	51	49.5%
	Professional Degree	24	23.3%
	Postgraduate	23	22.3%
	School Level	3	2.9%
	Ph.D.	1	1.0%
Marital Status	Single	72	70.0%
	Married	31	30.0%

2) Section 2: Oral Hygiene Habits

Question	Response Option	Count	%
How often do you visit a dentist?	Only when I have a problem	61	59.2%
	Once a year	26	25.2%
	Every six months	10	9.7%
	Rarely/Never	6	5.9%
How often do you brush your teeth?	Twice daily	66	64.1%
	Once daily	31	30.1%
	Occasionally	6	5.8%
Do you use any additional oral hygiene aids (Floss/Mouthwash)?	Yes	41	39.8%
	No	62	60.2%

3) Section 3: Oral Health and Menstrual Cycle

Question	Response Option	Count	%
Do you change your oral hygiene routine during your menstrual cycle?	Yes	15	14.6%
	No	71	68.9%
	Not aware	17	16.5%
Have you noticed increased gum sensitivity during your periods?	Yes	21	20.4%
	No	82	79.6%
Are you aware that pregnancy or menopause can affect gum health?	Yes	57	55.3%
	No	31	30.1%
	Maybe	15	14.6%
Do you think hormonal contraceptives can influence gum health?	Yes	41	39.8%
	No	30	29.1%
	Not sure	32	31.1%

4) Section 4: Attitudes and Beliefs

Question	Response Option	Count	%
Gum health changes during menstruation are normal and temporary.	Strongly Agree	52	50.5%
	Agree	30	29.1%
	Neutral	17	16.5%
	Disagree	4	3.9%
Gum bleeding during menstruation requires dental attention.	Strongly Agree	56	54.4%
	Agree	26	25.2%
	Neutral	18	17.5%
	Disagree	3	2.9%
Oral health is as important as reproductive health.	Strongly Agree	72	69.9%
	Agree	21	20.4%
	Neutral	8	7.8%
	Disagree	2	1.9%
Lack of awareness contributes to poor oral health among menstruating women.	Strongly Agree	74	71.8%
	Agree	22	21.4%
	Neutral	6	5.8%
	Disagree	1	1.0%

5) Section 5: Awareness and Educational Needs

Question	Response Option	Count	%
Would you like to receive educational material on oral changes during hormonal cycles?	Yes	80	77.7%
	No	23	22.3%
Improving oral hygiene during menstruation can improve overall well-being.	Yes	88	85.4%
	No	15	14.6%
Menstrual health awareness programs should include oral health.	Yes	83	80.6%
	Not sure	15	14.6%
	No	5	4.8%

IV. GRAPHICAL REPRESENTATION OF THE RESULTS

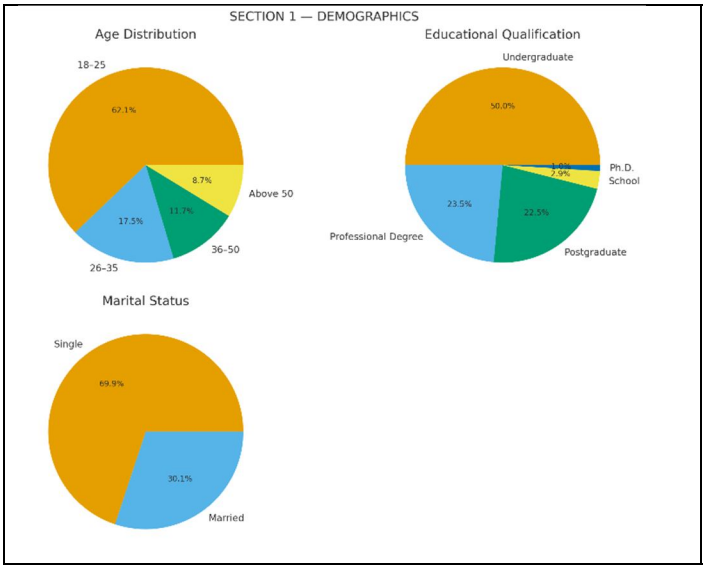

Figure 1: Demographic Information

The participants were predominantly young adults with a mean age of 28.14 years, most falling between 18–25 years. The sample was largely well-educated, with nearly 95% having undergraduate or higher qualifications. A majority were single (70%), indicating a youthful, independent population. This demographic profile reflects a group likely comfortable with digital surveys and receptive to health education, making them ideal for awareness-based interventions.

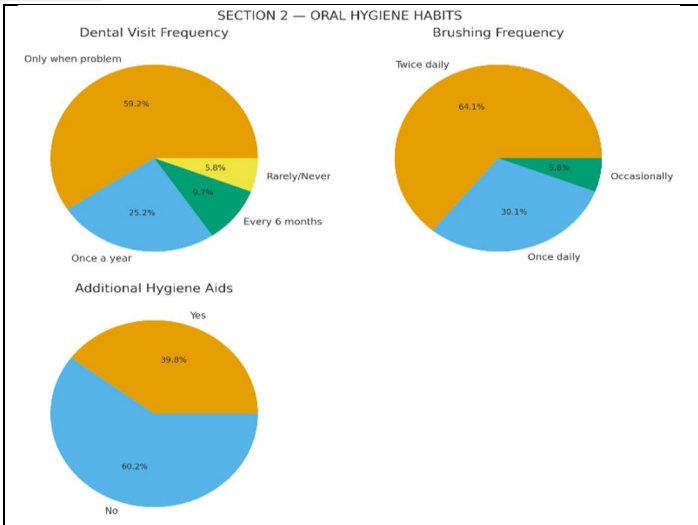

Figure 2: Oral Hygiene Habits

Most respondents exhibited good brushing habits, with 64% brushing twice daily, but preventive care was lacking as 59% visited the dentist only when a problem occurred. Additionally, 60% did not use floss or mouthwash, showing incomplete oral hygiene practices. While basic habits are strong, the data highlights a clear need to improve preventive dental awareness and promote comprehensive oral hygiene routines.

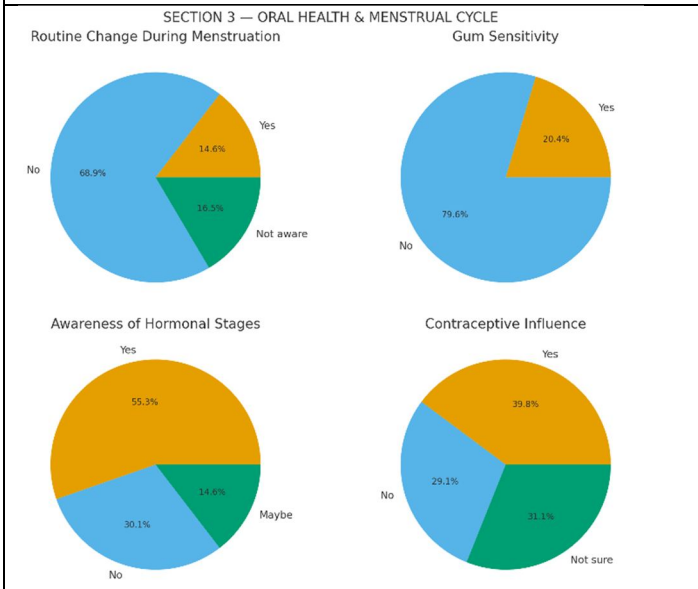

Figure 3: Oral Health & Menstrual Cycle

Awareness of hormonal influences on oral health was limited. Only 14.6% adjusted oral hygiene during menstruation, and most did not notice gum sensitivity. Although 55% recognized that pregnancy and menopause can affect gums, uncertainty remained high across all questions, especially regarding contraceptive impact. This indicates significant knowledge gaps and emphasizes the need for focused education on hormone-related oral changes.

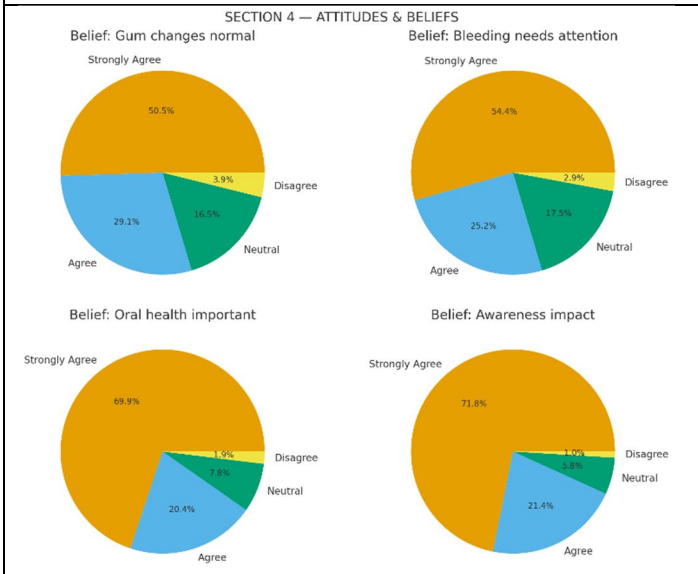

Figure 4: Attitudes & Beliefs

Participants demonstrated strong positive attitudes toward health, with 70–80% strongly agreeing that oral and reproductive health are equally important and that lack of awareness contributes to poor gum health during menstruation. Many believed gum bleeding warrants dental attention. Despite limited knowledge, the group shows strong willingness to understand and acknowledge oral health changes, reflecting high receptiveness to educational interventions.

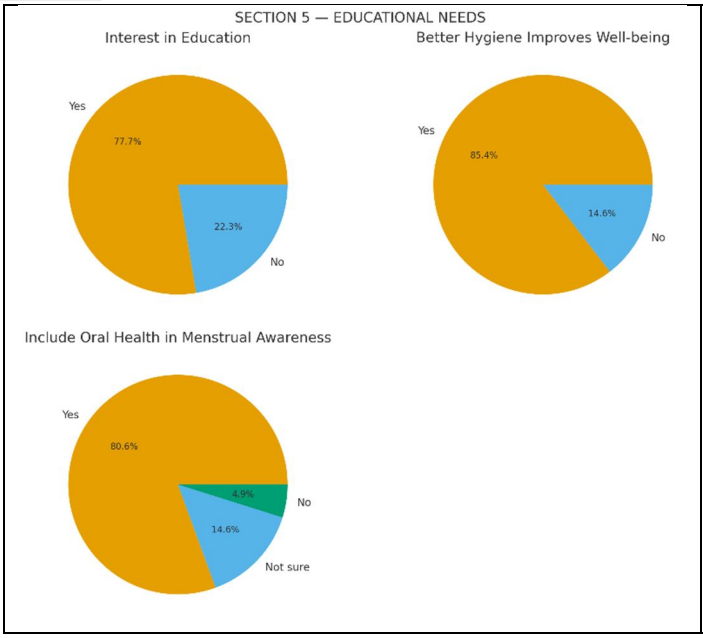

Figure 5: Awareness & Educational Needs

The findings reveal a strong demand for information, with 78% wanting educational materials on oral changes during hormonal cycles, 85% agreeing that improved oral hygiene enhances well-being, and 80% supporting the inclusion of oral health in menstrual awareness programs. This section clearly shows that participants not only value oral health but actively seek integrated, accessible education on the topic.

V. DISCUSSION

The present descriptive cross-sectional study evaluated women's awareness and perception of the influence of hormonal fluctuations during the menstrual cycle on periodontal health, highlighting both general oral hygiene practices and behavioural patterns during hormonal variations. The findings revealed a satisfactory level of basic oral hygiene awareness but a significant knowledge gap concerning the specific impact of menstrual-associated hormonal changes on periodontal status. Although most respondents practiced favourable oral hygiene habits, such as brushing twice daily (65%) and recognizing the importance of oral health as part of general well-being (90%), only about half were aware of the link between hormonal changes and periodontal conditions. This indicates that awareness remains fragmented, participants acknowledged the presence of oral changes yet lacked understanding of their physiological mechanisms or clinical implications.

Physiologically, fluctuations in estrogen and progesterone during the menstrual cycle modulate inflammatory responses in periodontal tissues. As reported by Kovár et al., gingival inflammation tends to intensify during ovulation and the premenstrual phase owing to elevated progesterone levels that increase vascular permeability and inflammatory mediator release.[7] Similarly, Chelluboina et al. observed that decreased estradiol levels during menstruation correlate with heightened symptoms of chronic gingivitis, reinforcing the hormonal basis of cyclical periodontal variation.[8] The present study observed that 20% of women experienced increased gingival sensitivity during menstruation and 15% modified their oral hygiene practices, consistent with this physiological trend though at a lower prevalence. This discrepancy may be attributable to limited clinical awareness, self-reporting bias, or differences in the perceived severity of symptoms.

The present results are consistent with those of Adhupia et al. (2025)[9], who found that approximately 50% of women were unaware of periodontal changes associated with menstruation, underscoring a persistent gap in public understanding. They also reported higher awareness among women aged 25–30 years, a pattern mirrored in the current study, where younger and more educated participants demonstrated relatively greater awareness. Similarly, Nirola et al. (2018)[10] emphasized that hormonal fluctuations can trigger exaggerated inflammatory responses independent of plaque accumulation, corroborating the biological plausibility of our findings.

Further evidence from Moharir et al. (2024)[11] supports the hormonal–periodontal relationship, reporting that 59% of women experienced oral changes during the premenstrual phase, including gum bleeding (9%), burning sensation (5%), ulcers (16%), and halitosis (18%). Comparatively, only 20% of participants in our study reported similar symptoms, indicating that while hormonal influences are universal, their recognition and self-awareness vary across populations due to differences in education, cultural perceptions, and dental exposure. Likewise, Kulkarni et al. (2022)[12] in Western Maharashtra reported low awareness (66%) regarding hormonal effects on periodontal health, reinforcing the need for integrated oral health education within women's wellness programs.

Parallel observations were made by Ghuman et al. (2023)[13] who reported that although 79.5% of women acknowledged bodily changes during menstruation, only 15.5% recognized a correlation between menstrual irregularity and oral health. This aligns with our results, where 55% of participants were aware that other hormonal stages, such as pregnancy and menopause, could influence gum health, yet fewer recognized the menstrual cycle's specific role. Similarly, Gomes et al. (2019)[14] found that while most participants were familiar with menstruation and its systemic effects, only 4% were aware of its oral manifestations. These findings collectively indicate a widespread lack of awareness regarding the interrelationship between hormonal physiology and periodontal health, particularly among adolescents and young adults.

Educational status appears to play a crucial role in determining awareness. Sasi and Suchitra (2020)[15] demonstrated a significant correlation between education level and periodontal knowledge, with rural populations exhibiting poorer awareness and higher self-reported oral problems. Our study showed a similar trend, where undergraduates and professionals displayed greater awareness compared with those with only school-level education. Consistent findings by Alkhurayji et al. (2022) and Almutairi et al. (2021) also highlighted the positive impact of education on oral health awareness during hormonal stages such as pregnancy.[16, 17]

From a clinical perspective, these findings have considerable implications. Hormonal fluctuations can increase gingival vascularity and inflammatory mediator production, resulting in heightened bleeding, swelling, and tenderness even in the absence of significant plaque accumulation. As emphasized by Jawed et al. (2025)[18] preventive measures such as meticulous oral hygiene during hormonally susceptible phases and periodic dental evaluations are essential. In the present study, 55% of participants agreed that gum bleeding during menstruation warrants professional attention, and 80% expressed interest in receiving educational material, an encouraging indicator that awareness interventions could be highly effective.

Overall, the study underscores the importance of integrating oral health education into broader menstrual and reproductive health programs to promote early recognition, preventive care, and timely management of hormone-related periodontal manifestations.[19]

VI. CONCLUSION

The present investigation underscores the intricate interplay between hormonal oscillations and periodontal homeostasis, reaffirming that cyclical endocrine fluctuations exert a profound modulatory influence on gingival vascularity, collagen metabolism, and host inflammatory responses. These rhythmic variations in estrogen and progesterone, intrinsic to the menstrual cycle, can transiently disrupt periodontal tissue equilibrium, precipitating episodic manifestations of gingival inflammation and vascular hyper-reactivity. Despite substantial scientific evidence substantiating this endocrino-periodontal interrelationship, awareness among women remains disproportionately low, revealing a persistent lacuna in preventive oral health consciousness within the spectrum of women's healthcare. The significance of this study lies in its elucidation of a biologically critical yet frequently overlooked facet of systemic well-being, wherein periodontal health serves as both a mirror and a mediator of hormonal balance. Elevating awareness of this dynamic through integrated educational interventions, interdisciplinary collaboration between dental and gynecological professionals, and incorporation of oral health modules into reproductive health programs is imperative. Such coordinated efforts would not only facilitate early recognition and timely management of hormone-mediated periodontal alterations but also advance a holistic paradigm of women's health that emphasizes prevention, empowerment, and overall quality of life.

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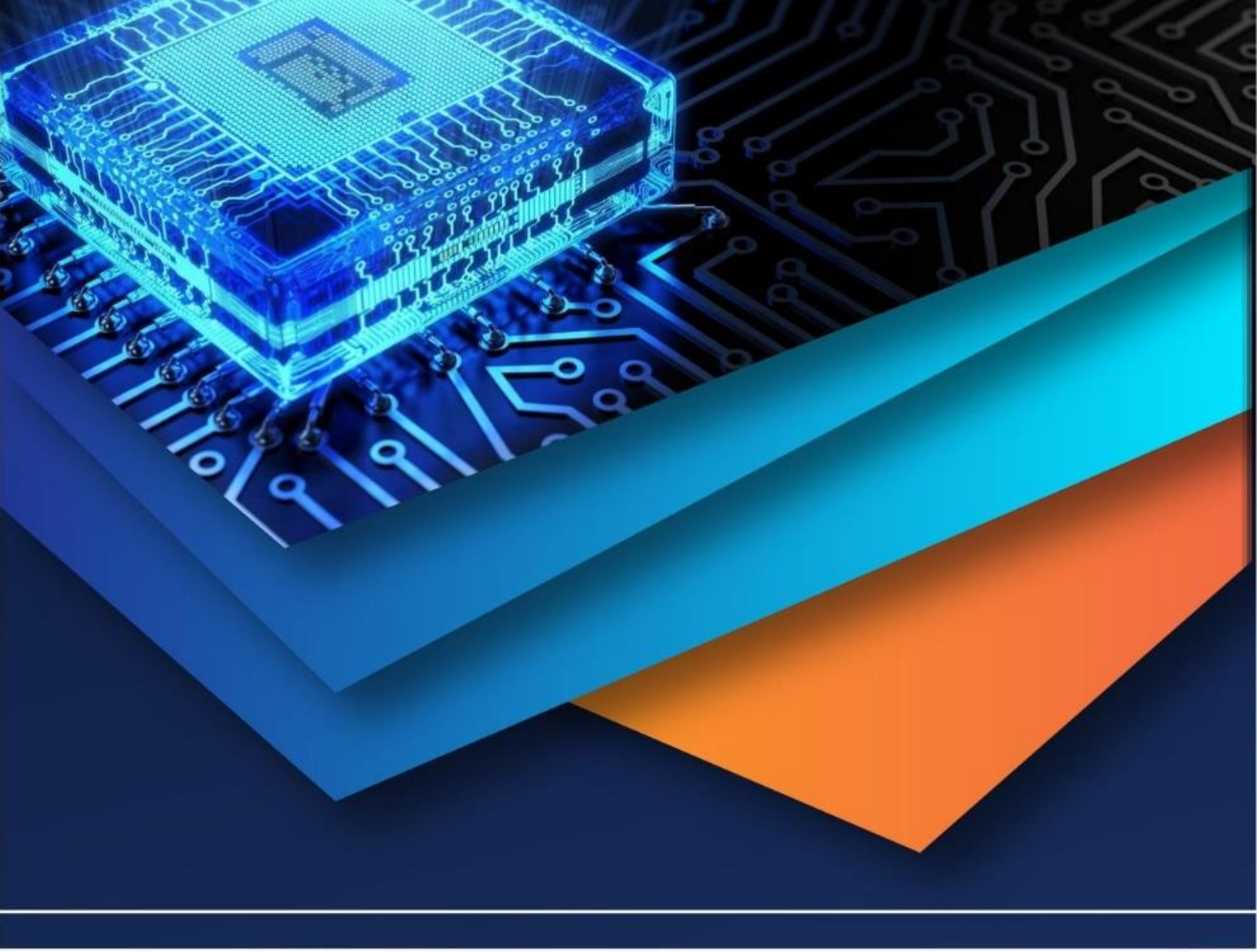

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