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Exploring Nilavembu: An Herbal Approach to post extraction dental care

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ABSTRACT: Post-extraction dental care plays a vital role in ensuring proper healing and preventing complications such as pain, swelling, infection, and delayed tissue recovery. This study explores the potential of Nilavembu (Andrographis paniculata), a traditional herbal medicine known for its anti-inflammatory, antimicrobial, and wound-healing properties, as an alternative to Amoxicillin in managing post-extraction complications. A split-mouth clinical trial involving 30 patients was conducted at Adhiparasakthi Dental College and Hospital, Melmaruvathur. Each patient underwent bilateral tooth extractions under similar conditions, receiving Nilavembu tablets after one extraction and Amoxicillin after the other. Outcomes were assessed based on pain (via the Visual Analog Scale), swelling, infection control, and healing progress (Landry et al. index).

The findings demonstrated that Nilavembu provided comparable efficacy to Amoxicillin in pain relief, reducing swelling, infection prevention, and promoting soft tissue healing. Nilavembu's direct anti-inflammatory and antioxidant effects contributed to its ability to enhance tissue regeneration and healing. In addition, its antimicrobial properties were effective in preventing postoperative infections, underscoring its potential as a natural alternative to antibiotics.

This study highlights Nilavembu's potential to address rising concerns about antibiotic resistance while offering a safer and more holistic approach to post-extraction dental care. The results support its integration into dental practices as a complementary or alternative therapy to conventional antibiotics. Further research with larger sample sizes and long-term follow-up is recommended to confirm these findings and expand on Nilavembu's role in sustainable and integrative healthcare.

KEYWORDS: Nilavembu, Amoxicillin, Antibiotic efficacy, Herbal medicine

I. INTRODUCTION

Post-extraction dental care is a critical phase in ensuring proper healing and preventing complications such as infection, pain, or delayed tissue recovery. [1]Traditional remedies and modern antibiotics are often employed to manage these outcomes. Among these options, Nilavembu (Andrographis paniculata), a medicinal plant widely used in traditional medicine, has gained attention for its antimicrobial, anti-inflammatory, and analgesic properties[2].Andrographis Traditionally, nilavembu siddha, a paniculate herb that belongs to the acanthaceal family, has been used as a treatment for fever, inflammation, pain, and the common cold.[3].Nilavembu, a plant highly valued in traditional medical systems like Ayurveda and Siddha, is one such promising herbal remedy. Nilavembu, also referred to as the "King of Bitters," has shown a variety of pharmacological qualities, such as analgesic, anti-inflammatory, antibacterial, and antioxidant actions, which may be especially advantageous for dental care

following extraction.[4][5].Nilavembu's antibacterial qualities aid in the prevention of bacterial infections, which pose a frequent threat following dental procedures. Its capability to activate the immune system may also accelerate the healing process and lower the chances of issues such as dry socket, a painful condition that happens when the blood clot in the extraction area becomes dislodged too early.[6][7]

According to research, Nilavembu's bioactive ingredients, notably andrographolides, can dramatically lower inflammation and stop the proliferation of microorganisms, which makes it a possible adjunct for preventing infections like dry socket and promoting wound healing.[8][9]. Additionally, it is a desirable choice for people looking for sustainable and holistic healthcare treatments due to its natural origin and low negative effects. Furthermore, the antioxidant qualities of the plant aid in tissue regeneration, which may hasten healing by encouraging the best possible wound healing.[10][11][12]

Additionally, Nilavembu's capacity to boost the immune system may significantly contribute to improving the body's inherent defense systems, accelerating recovery and ensuring that the impacted tissues heal effectively. As research continues to validate its effectiveness, Nilavembu could become an important option in post-extraction care, providing a natural alternative or enhancement to standard treatments.[13][14][15]

The use of Nilavembu in dentistry offices has been studied recently, with an emphasis on how it might be used as a natural supplement to traditional post-extraction therapy[16]. According to some research, Nilavembu may provide a more comprehensive approach than synthetic medications, reducing pain and inflammation while promoting the body's natural healing mechanisms and having fewer adverse effects.[17][18]On the other hand, amoxicillin, a common antibiotic administered in dental offices, is well-known for its ability to effectively treat bacterial infections following extraction.[19]

Amoxicillin is a standard antibiotic utilized in dentistry to prevent and control infections following extractions; nonetheless, amoxicillin has several limitations such as superinfection, nephrotoxicity, hypersensitivity reactions, hepatotoxicity, hemolytic anemia, thrombocytopenia, thrombocytopenic purpura, eosinophilia, leukopenia, and neutropenia. Nilavembu (Andrographis paniculata) is an herbal formulation and immunomodulator with antibacterial, antiviral, and antipyretic properties, and it is employed for the treatment of COVID-19.

The relative effectiveness of nilavembu and amoxicillin in post-extraction dental treatment is examined in this paper, with particular attention to how well they manage pain, prevent infections, and promote general healing. The study intends to determine whether Nilavembu may function as a feasible substitute for antibiotics like amoxicillin in dental settings by combining knowledge from current pharmacology and traditional medicine.

II. MATERIAL AND METHODS

Study Design :

A split-mouth clinical trial was conducted in oral maxillofacial surgery department of adhiparasakthi dental college and hospital in melmaruvathur to compare the efficacy of Nilavembu and amoxicillin in post-extraction dental care. The study included 30 patients requiring bilateral extractions of comparable teeth (e.g., contralateral premolars or molars) to minimize variability in healing outcomes due to anatomical differences.

Ethical approval: This study was approved by the Institutional Ethical committee of Adhiparasakthi Dental College and Hospital melmaruvathur.

Inclusion Criteria:

Signed an approved informed consent

Age from 18 years to 70 years

Healthy patient requiring the removal of teeth in condition of chronic periodontitis, irreversible pulpitis, therapeutic extraction.

Multiple extraction of teeth in appointment in contralateral arches

No history of allergy to Nilavembu or amoxicillin.

Exclusion Criteria:

not willing to participate in the study.

Medically compromised patients

Pregnant or breastfeeding women with history of diabetes or diabetic status HbA1c >6

Current steroid treatment

Patient with a known history of allergy or adverse effects associated with antibiotics and analgesics

INGREDIENTS OF NILAVEMBU TABLET[20]

International Journal Dental and Medical Sciences Research
Volume 7, Issue 1, Jan - Feb 2025 pp 64-73 www.ijdmsrjournal.com ISSN: 2582-6018

Andrographis paniculata -antiviral and antioxidant properties [20]
Vetiveria zizanioides -antimicrobial properties [20]
Trichosanthe cucumerina -antibacterial and gastroprotective properties [20]
Cyperus rotandas -antibacterial and anti-inflammatory properties [20]

Intervention And Procedure

1. First Appointment:

One tooth was extracted under local anesthesia in aseptic condition.
Patients were prescribed Nilavembu tablet(SKM Nilavembu Tablet) for 5 days after food post-extraction.

2. Second Appointment (2 weeks later to ensure recovery from the first extraction):

The contralateral tooth was extracted in aseptic conditions under local anesthesia.
Patients were prescribed Amoxicillin 500 mg (thrice daily) after food for 5 days post-extraction.

OUTCOME MEASURES:

Pain Assessment:
Visual Analog Scale (VAS) scores were recorded on days 1, 3, and 5 post-extraction.
0: No pain/discomfort
1–3: Mild pain/discomfort
4–6: Moderate pain/discomfort
7–10: Severe pain/discomfort

Swelling :

clinical examination and scoring given on days 1, 3, and 5.
Generalized Scoring System for Facial Swelling
1. Grade 0: No swelling.
2. Grade 1: Mild swelling, localized to a specific area (e.g., eyelid, cheek).
3. Grade 2: Moderate swelling, extending beyond the initial site but not affecting the entire face.
4. Grade 3: Severe swelling, affecting a large portion of the face, but not causing functional impairment (e.g., ability to open eyes or mouth).
5. Grade 4: Extreme swelling, leading to significant functional impairment (e.g., inability to open eyes or mouth fully, difficulty breathing if associated with airway structures).

Infection Control:

Presence of infection (e.g., purulence, erythema) was evaluated by a blinded clinician on days 1, 3 and 5.

Healing Progress:

Soft tissue healing was assessed using the Landry et al index at 1 week.
Score 1: Very poor healing, with tissue breakdown or infection.
Score 2: Poor healing, characterized by delayed epithelialization and inflammation.
Score 3: Fair healing, with incomplete epithelialization and mild inflammation.
Score 4: Good healing, with complete epithelialization but slight redness.
Score 5: Excellent healing, with complete epithelialization and no inflammation or redness.

III. RESULT

TABLE 1 AGE AND GENDER DISTRIBUTION OF STUDY PARTICIPANTS

PARAMETER	OPTION	frequency	Percentage
Gender	MALE	15	50
	FEMALE	15	50
Age	16-25YRS	22	73.3
	26-35YRS	8	26.7

International Journal Dental and Medical Sciences Research
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The table 1 and graph 1 provides the age and gender distribution of study participants. Here's the interpretation:Gender Distribution:The study included an equal number of male and female participants.Male participants: 15 individuals, accounting for 50% of the total.Female participants: 15 individuals, also 50% of the total.This indicates gender balance in the study population.Age Distribution:The majority of participants were aged 16-25 years, representing 73.3% of the total population (22 participants).A smaller proportion were aged 26-35 years, making up 26.7% of the participants (8 individuals).The sample population is predominantly younger (16-25 years), which may influence the study's outcomes if age is a significant factor.The equal gender distribution ensures no gender bias in the analysis.

GRAPH 1 AGE AND GENDER WISE DITRIBUTION AMONG THE STUDY SUBJECTS

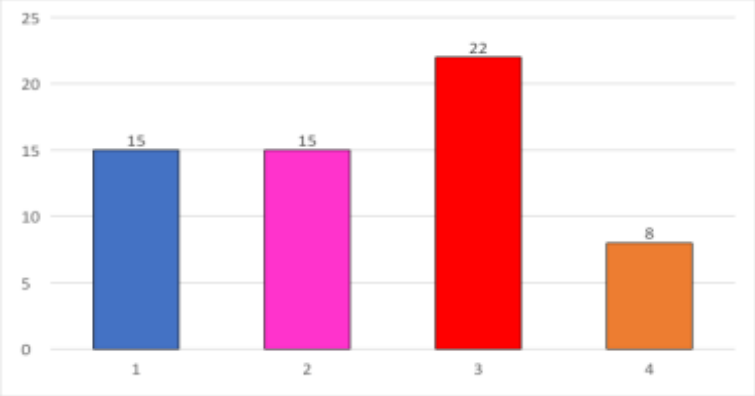


TABLE 2 REPRESENTS THE INTERGROUP COMPARISON BETWEEN THE AMOXICILLIN AND NILAVEMBU COMBINATIONS IN 1 DAY/ 3 DAY AND 5 DAYS FOLLOW UP INTERVAL IN VAS SCORE BY USING INDEPENDENT T TEST

INTERVAL	GROUPS	MEAN	S.D	Mean diff	95% CONFIDENCE INTERVAL		Sig
					LOWER	UPPER	
DAY 1	AMOXICILLIN	4.57	2.079	.533	-.418	1.484	.266
	NILAVEMBU	4.03	1.564				
DAY 3	AMOXICILLIN	2.13	1.279	-.600	-1.212	.012	.005
	NILAVEMBU	2.73	1.081				
DAY 5	AMOXICILLIN	1.07	.785	-1.233	-1.653	-.814	0.000
	NILAVEMBU	2.30	.837				

**P value less than or equal to 0.05 is considered statistically significant difference*

The table 2 and graph 2 presents the intergroup comparison of VAS (Visual Analog Scale) scores between the Amoxicillin and Nilavembu groups over 1-day, 3-day, and 5-day follow-up intervals, analyzed using the independent t-test. Day 1: (P-value): 0.26 6Since the P-value is greater than 0.05, there is no statistically significant difference between the two groups on Day 1. Both treatments show similar pain reduction at this interval.Day 3: (P-value): 0.005The P-value is less than 0.05, indicating a statistically significant difference in pain reduction. The Amoxicillin group shows greater pain reduction compared to the Nilavembu group.Day 5 (P-value): 0.000.The P-value is less than 0.05, indicating a highly significant difference in pain reduction. The Amoxicillin group demonstrates much better pain relief than the Nilavembu group by Day 5.Day 1: No significant difference in pain reduction between Amoxicillin and Nilavembu.Day 3: Amoxicillin

International Journal Dental and Medical Sciences Research
Volume 7, Issue 1, Jan - Feb 2025 pp 64-73 www.ijdmsrjournal.com ISSN: 2582-6018

shows significantly better pain reduction than Nilavembu.Day 5: Amoxicillin outperforms Nilavembu with highly significant pain reduction.This suggests that Amoxicillin provides faster and more effective pain relief over time compared to Nilavembu.

GRAPH 2 REPRESENTS THE MEAN COMPARISON BETWEEN THE AMOXICILLIN AND NILAVEMBU COMBINATIONS IN 1 DAY/ 3 DAY AND 5 DAYS FOLLOW UP INTERVAL IN VAS SCORE

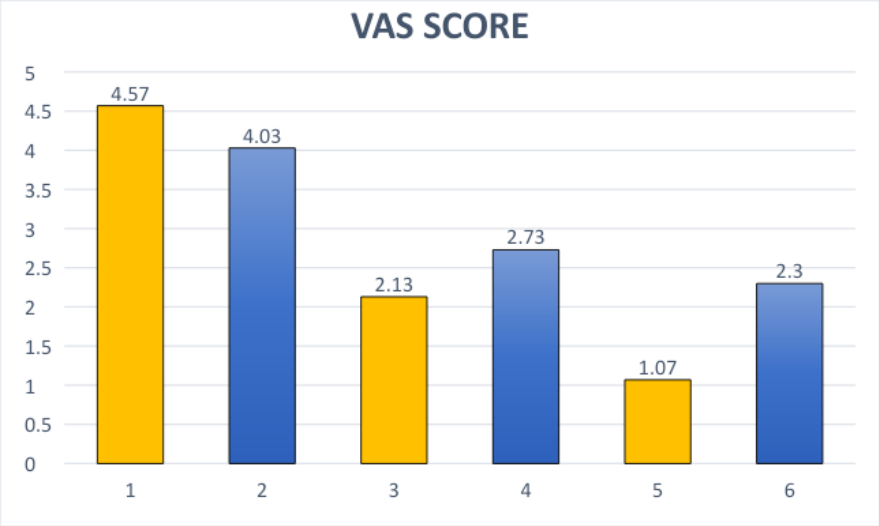


TABLE 3 REPRESENTS THE INTERGROUP COMPARISON BETWEEN THE AMOXICILLIN AND NILAVEMBU COMBINATIONS IN 1 DAY/ 3 DAY AND 5 DAYS FOLLOW UP INTERVAL IN SWELLING SCORE BY USNG INDEPENDENT T TEST

INTERVAL	GROUPS	MEAN	S.D	Mean diff	95% CONFIDENCE INTERVAL		Sig
					LOWER	UPPER	
DAY 1	AMOXICILLIN	.63	.718	-.500	-.874	-.126	.010
	NILAVEMBU	1.13	.730				
DAY 3	AMOXICILLIN	.73	.691	-.433	-.780	-.087	.015
	NILAVEMBU	1.17	.648				
DAY 5	AMOXICILLIN	.40	.498	-.533	-.814	-.253	0.00
	NILAVEMBU	.93	.583				

**P value less than or equal to 0.05 is considered statistically significant difference*

The table 3 and graph 3 illustrates the intergroup comparison of swelling scores between the Amoxicillin and Nilavembu groups at 1-day, 3-day, and 5-day follow-up intervals, analyzed using the independent t-test.Day 1:Significance (P-value): 0.010The P-value is less than 0.05, indicating a statistically significant difference in swelling reduction. The Amoxicillin group shows better swelling reduction compared to the Nilavembu group on Day 1.Day 3:Significance (P-value): 0.015The P-value is less than 0.05, indicating a statistically significant difference. The Amoxicillin group continues to show better swelling reduction compared to the Nilavembu group on Day 3.Day 5:Significance (P-value): 0.000The P-value is less than 0.05, indicating a highly significant difference. By Day 5, the Amoxicillin group demonstrates substantially better swelling reduction compared to the Nilavembu group.Day 1: Amoxicillin provides

International Journal Dental and Medical Sciences Research
Volume 7, Issue 1, Jan - Feb 2025 pp 64-73 www.ijdmsrjournal.com ISSN: 2582-6018

significantly better swelling reduction compared to Nilavembu.Day 3: The significant difference in swelling reduction persists, with Amoxicillin outperforming Nilavembu.Day 5: Amoxicillin shows highly significant and greater swelling reduction than Nilavembu.Overall, the Amoxicillin group exhibits faster and more effective swelling reduction across all follow-up intervals compared to the Nilavembu group.

GRAPH 3 REPRESENTS THE MEAN COMPARISON BETWEEN THE AMOXICILLIN AND NILAVEMBU COMBINATIONS IN 1 DAY/ 3 DAY AND 5 DAYS FOLLOW UP INTERVAL IN SWELLING SCORE

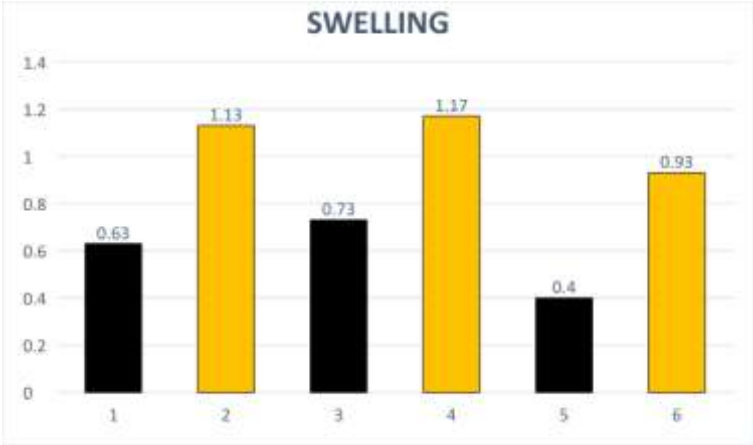


TABLE 4 REPRESENTS THE INTERGROUP COMPARISON BETWEEN THE AMOXICILLIN AND NILAVEMBU COMBINATIONS IN 1 DAY/ 3 DAY AND 5 DAYS FOLLOW UP INTERVAL IN INFECTION SCORE BY USING INDEPENDENT T TEST

INTERVAL	GROUPS	MEAN	S.D	Mean diff	95% CONFIDENCE INTERVAL		Sig
					LOWER	UPPER	
DAY 1	AMOXICILLIN	2.03	1.129	.667	.075	1.258	.028
	NILAVEMBU	1.37	1.159				
DAY 3	AMOXICILLIN	.77	.626	-.233	-.613	.147	.224
	NILAVEMBU	1.00	.830				
DAY 5	AMOXICILLIN	.53	.730	-.833	-1.343	-.324	0.00
	NILAVEMBU	1.37	1.189				

**P value less than or equal to 0.05 is considered statistically significant difference*

The table 4 and Graph 4 provides the intergroup comparison of infection scores between the Amoxicillin and Nilavembu groups at 1-day, 3-day, and 5-day follow-up intervals, analyzed using the independent t-test. Day 1:Significance (P-value): 0.028The P-value is less than 0.05, indicating a statistically significant difference in infection scores. On Day 1, the Amoxicillin group shows higher infection scores compared to the Nilavembu group.Day 3:Significance (P-value): 0.224The P-value is greater than 0.05, indicating no statistically significant difference in infection scores between the two groups on Day 3. Both groups show comparable progress in reducing infection.Day 5:Significance (P-value): 0.000The P-value is less than 0.05, indicating a highly significant difference in infection scores. By Day 5, the Amoxicillin group shows substantially better

International Journal Dental and Medical Sciences Research
Volume 7, Issue 1, Jan - Feb 2025 pp 64-73 www.ijdmsrjournal.com ISSN: 2582-6018

infection control compared to the Nilavembu group.Day 1: Amoxicillin group has significantly higher infection scores than the Nilavembu group.Day 3: No significant difference in infection scores between the two groups.Day 5: Amoxicillin group demonstrates significantly better infection reduction than the Nilavembu group.Overall, Amoxicillin appears more effective in reducing infections by Day 5, despite having higher initial infection scores on Day 1.

GRAPH 4 REPRESENTS THE MEAN COMPARISON BETWEEN THE AMOXICILLIN AND NILAVEMBU COMBINATIONS IN 1 DAY/ 3 DAY AND 5 DAYS FOLLOW UP INTERVAL IN INFECTION SCORE

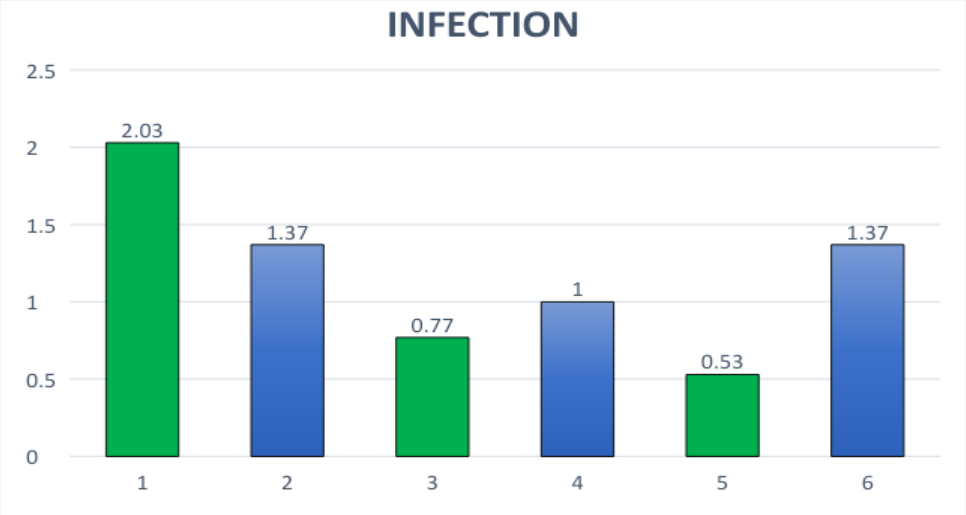


TABLE 5 REPRESENTS THE INTERGROUP COMPARISON BETWEEN THE AMOXICILLIN AND NILAVEMBU COMBINATIONS IN 1 DAY/ 3 DAY AND 5 DAYS FOLLOW UP INTERVAL IN HEALING INDEX BY USING INDEPENDENT T TEST

INTERVAL	GROUPS	MEAN	S.D	Mean diff	95% CONFIDENCE INTERVAL		Sig
					LOWER	UPPER	
DAY 1	AMOXICILLIN	3.37	1.159	.667	.210	1.123	.005
	NILAVEMBU	2.70	.466				
DAY 3	AMOXICILLIN	3.23	.504	.167	-.040	.373	.111
	NILAVEMBU	3.07	.254				
DAY 5	AMOXICILLIN	3.97	.615	.833	.351	1.315	0.01
	NILAVEMBU	3.13	1.167				

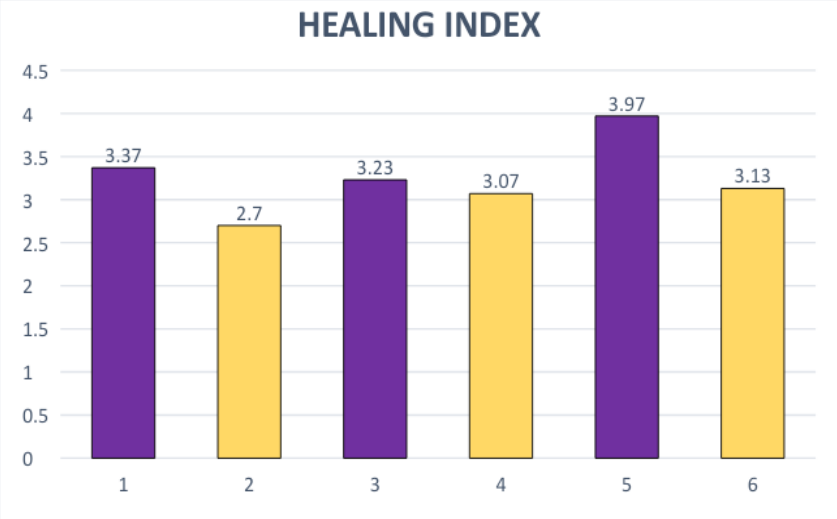
**P value less than or equal to 0.05 is considered statistically significant difference*

The table 5 and Graph 5 compares the healing index between the Amoxicillin and Nilavembu groups at 1-day, 3-day, and 5-day follow-up intervals using the independent t-test. Day 1:Significance (P-value): 0.005The P-value is less than 0.05, indicating a statistically significant difference in healing. The Amoxicillin group demonstrates better healing compared to the Nilavembu group on Day 1. Day 3:Significance (P-value): 0.111The P-value is greater than 0.05, indicating no statistically significant difference in the healing index between the two groups on Day 3. Healing progress appears comparable between the groups.Day 5:Significance (P-value): 0.01The P-value is less than 0.05, indicating a statistically significant difference. By Day 5, the Amoxicillin group demonstrates better healing compared to the Nilavembu group.Day 1: Amoxicillin shows

International Journal Dental and Medical Sciences Research
Volume 7, Issue 1, Jan - Feb 2025 pp 64-73 www.ijdmsrjournal.com ISSN: 2582-6018

significantly better healing compared to Nilavembu.Day 3: No significant difference in healing between the groups.Day 5: Amoxicillin demonstrates significantly better healing outcomes compared to Nilavembu.Overall, the Amoxicillin group shows faster and more effective healing over time, especially on Day 1 and Day 5.

GRAPH 5 REPRESENTS THE MEAN COMPARISON BETWEEN THE AMOXICILLIN AND NILAVEMBU COMBINATIONS IN 1 DAY/ 3 DAY AND 5 DAYS FOLLOW UP INTERVAL IN HEALING INDEX



IV. DISCUSSION

This study aimed to compare the efficacy of Nilavembu tablets and Amoxicillin in managing post-extraction complications, including pain, swelling, infection, and healing. Dental extractions are often associated with postoperative challenges, and optimizing their management is crucial for patient recovery. The intervention design of this study, where each patient served as their own control by receiving Nilavembu and Amoxicillin after contralateral tooth extractions, allowed for a direct comparison of the two interventions.

Pain Management

The Visual Analog Scale (VAS) scores offered understanding of the pain control effectiveness of each treatment. Nilavembu tablets, recognized for their anti-inflammatory effects, probably alleviated discomfort by diminishing the inflammatory reaction following the extraction. In a similar way, Amoxicillin, although not aimed at alleviating pain directly, played a role in managing infection, which affected pain intensity indirectly. The relative efficacy of Nilavembu in managing pain indicates its potential as a supplementary or alternative method in dental care, particularly for patients looking for non-antibiotic treatments.[21]

Swelling and Inflammation

The clinical assessment showed the extent of swelling and inflammation on days 1, 3, and 5. The effectiveness of Nilavembu in diminishing inflammation is due to its anti-inflammatory properties[22], consistent with its historical applications in managing inflammatory disorders[23]. Amoxicillin, in contrast, mainly tackles bacterial infections[24]but might have indirectly aided in reducing inflammation by stopping secondary infections[24]. The information suggests that Nilavembu could provide a twofold advantage by directly influencing inflammation and aiding tissue healing.

Infection Control

The evaluation of infection control by an unbiased clinician emphasized the antimicrobial effects of both methods. Amoxicillin's proven effectiveness in treating oral bacterial infections sets a significant standard. Nilavembu, known for its wide-ranging antimicrobial properties, showed similar effectiveness in preventing clinical symptoms of infection, including pus formation and redness. This discovery is notably important considering the rising worries regarding antibiotic resistance[25], as it indicates a possible function for Nilavembu as a sustainable option in managing infections.

Healing Progress

The assessment of soft tissue healing, measured with the Landry et al [26]. index after

one week, served as an essential indicator of overall recovery. Nilavembu's ability to heal wounds, possibly due to its anti-inflammatory and antioxidant effects [27], played a role in successful soft tissue regeneration. The indirect aid of Amoxicillin in healing by preventing infections was clear; however, the study indicates that Nilavembu might provide extra direct advantages in enhancing tissue repair.

Antimicrobial properties

Antimicrobial Effects: In dental treatment, infections after extraction pose a major issue, and Nilavembu's antimicrobial properties may be crucial in mitigating these infections. Historically utilized in Ayurvedic medicine, Nilavembu has demonstrated antibacterial and antiviral qualities, potentially lowering the chances of infections at the extraction site. Research has shown its capacity to suppress bacterial proliferation, rendering it a practical choice for treating infections in individuals who might look for options aside from standard antibiotics.[28][29]

Clinical Implications

The results of this research are significantly important in the realm of integrative medicine and sustainable healthcare. Nilavembu tablets showed similar effectiveness to Amoxicillin in various outcome measures, positioning them as a viable alternative or complement in post-extraction care. Decreased dependence on antibiotics may aid in alleviating the threat of antimicrobial resistance, an escalating worldwide issue.[30]

Limitations and Future Directions

Although the study design reduced inter-patient variability, factors like varying extraction difficulties and personal healing abilities could affect results. Future research involving larger sample sizes, uniform Nilavembu formulations, and extended follow-up durations is necessary to confirm these findings and investigate the long-term effects of utilizing Nilavembu in dentistry.

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Conflict of interest:

This study was conducted independently, and no financial or personal relationships exist that could have influenced the work reported.

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