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RESEARCH ARTICLE

Statins in Dental Implant- A Systematic Review and Meta-Analysis

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Abstract: Statins in addition to lowering cholesterol also affects bone metabolism by decreasing osteoclastic activity, promoting osteoblast development and modifying immunological responses, inflammation, and bacterial elimination. These effects points to use of statins in enhancing implant stability and peri-implant tissue health. A systematic literature search was performed in PubMed, Google Scholar, Trip Database, and Cochrane Library till June 2025. The main outcome measured were Crestal Bone Change (CBC), Pocket Probing Depth (PPD), and Implant Stability Quotient (ISQ). In implants, simvastatin (SMV) was evaluated in five trials. Three trials evaluating the Implant Stability Quotient (ISQ) revealed that statin had higher mean values (13.25) than the control. The pooled difference was not statistically significant (mean difference: 4.61; 95% CI: –3.41 to 12.64; P = 0.26), and there was significant heterogeneity (I2 = 88%) (8.01). Three studies showed lower values for statin groups for PPD. Crestal bone changes (CBC) were reported in 2 studies, with one showing less bone loss and one showing more gain in the statin group, though differences were inconsistent. Statins show potential to enhance ISQ, reduce PPD, and preserve CBC. Despite these promising effects, current evidence is limited by small sample sizes, heterogeneous methodologies, and short follow-up periods.

Keywords: Alveolar Bone Loss, Dental Implants, Hydroxymethylglutaryl-CoA Reductase Inhibitors, Osseointegration

INTRODUCTION

Natural products, including various mushroom species, have garnered significant attention in drug development, particularly in Asian nations, where they are utilized for both dietary supplements and medicinal formulations. A notable example of pharmaceuticals derived from fungi is statins, which were for a long time the exclusive source of such medications. Prior to the advent of statins, options for reducing cholesterol were limited. Medications like nicotinic acid and fibrates were employed to decrease cholesterol and triglyceride levels, but these drugs offered only minimal reductions in cholesterol levels [1].

Hydroxymethylglutaryl-CoA reductase inhibitors, commonly known as statins, are substances that compete with the enzyme HMG-CoA reductase, which plays a critical role in cholesterol production. Beyond their ability to lower lipid levels, they also have multiple beneficial effects, including reducing inflammation, supporting new blood vessel formation, and improving bone health, making them important in implant dentistry. Statins are a type of medication used to lower cholesterol levels and lower the risk of atherosclerotic cardiovascular disease (ASCVD). They are typically the preferred medication because they can decrease both morbidity and mortality in patients at a heightened risk for ASCVD. Their wide-ranging impact on lipid levels, along with their protective benefits for the heart, makes statins among the most commonly prescribed drugs globally. Statins are categorized into natural varieties, their derivatives, and those that are synthetically developed [2]. The pleiotropic effects include enhanced anti-inflammatory effects, endothelial function, immunomodulatory effects, antioxidant capabilities, and anti-thrombotic properties. In addition to their recognized applications, statins are being investigated for possible uses in the treatment of bone disorders [3, 4].

There is an increasing amount of evidence indicating that statins may have beneficial effects on oral and dental health through various mechanisms. Research has shown that statins promote anabolic processes in bone metabolism through multiple pathways. They encourage the differentiation of osteoblastic stem cells in the bone marrow by enhancing the expression of the bone morphogenic protein-2 (BMP-2) gene. Statins also promote bone formation by preventing the apoptosis of osteoblasts [5]. Furthermore, statins have an impact on the regeneration of dentin and pulp [6]. Regarding different oral cancers, statins can inhibit tumor cell growth, invasion, metastasis, proliferation, differentiation, and regulate the cell cycle [7].

The therapeutic advantages of statins include antimicrobial, antiviral, and fungicidal characteristics [8]. Research has identified the antibacterial effects of statins on specific microorganisms, including those responsible for periodontal diseases [9]. As a result, the antimicrobial properties of statins, along with their roles in immunomodulation, inflammation reduction, cancer

prevention, bone formation, and healing of wounds, underscore their importance in periodontology, especially for preventing alveolar bone loss and serving as a complementary treatment to scaling and root planing (SRP) [10]. Furthermore, studies involving humans have shown promising effects of statins on bone integration related to implants [11].

METHOD

2.1. Protocol and Registration

The current review was carried out in accordance to the Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines, conforming to which detailed protocol was established. The protocol has been registered with Prospero under the Registration ID CRD42024543733

2.2. PICO

- The PICO model employed was as follows:
- Participants/population (P): Patients who required implant placement
- Intervention (I): Effect of statins therapy
- Comparator (C): No statins therapy or placebo use or alternative materials
- Outcome (O): Implant Stability Quotient (ISQ) and Pocket Probing Depth (PPD), Crestal Bone Change (CBC)

2.3. Information sources and search

A comprehensive search was carried out using Pubmed, Google Scholar, the Trip database, and the Cochrane Library that was limited to English language works published between January 1, 2014, and June 30, 2025. Alveolar Bone Loss, Dental Implants, Hydroxymethylglutaryl-CoA Reductase Inhibitors, and Osseointegration were the MESH terms utilized as keywords. When entire texts were not available in electronic databases, manual searches were performed. The literature search was conducted by two separate researchers. The systematic review and meta-analysis included randomized controlled trials (RCTs) using parallel and split-mouth designs with patients aged 18–80 years who required implant insertion. When preparing the immediate implant site, studies comparing the use of statins to no statin use or other materials were taken into consideration.

2.4. Eligibility criteria

INCLUSION

1. Participants aged 18–80 years.
2. Only human studies.
3. Studies published in the English language.
4. Studies reporting number of patients and immediate implants placed.
5. Randomized controlled trials (parallel or split-mouth design).
6. Minimum follow-up of 3 months

EXCLUSION

1. Studies without a control group.
2. Case studies, case series, case reports, and systematic reviews.

2.5. Risk of bias

Version 2 of the Cochrane risk-of-bias tool for randomized trials (RoB 2) provides a framework to assess the risk of bias. RoB 2 is structured into a fixed set of domains of bias, focussing on different aspects of trial design, conduct, and reporting. A proposed judgement about the risk of bias arising from each domain is generated by an algorithm and the judgement can be 'Low' or 'High risk of bias', or 'some concerns.[12]

2.6 Quality of Evidence

Grading of Recommendations Assessment, Development, and Evaluation (GRADE) provides a structured framework for evaluating and grading the quality of evidence, considering factors such as study design, risk of bias, inconsistency, indirectness, imprecision, and publication bias'. This systematic approach ensures a comprehensive evaluation of the evidence [13].

For quality of evidence GRADE Pro software was used [14] for assessment the rating from 'high quality' is reduced by one level for 'serious concerns' or by two levels for 'very serious concerns' for 'risk of bias, inconsistency, indirectness, imprecision. The numbers of reviewers involved were two and the outcomes included for selection in Summary of finding table- were, ISQ at 3 months, PPD at 3, 6 and 9 months as well as CBC at 3, 6 and 9 months.

RESULTS

3.1. Study selection

A total of 14,493 records were found using a variety of databases, such as Google Scholar, The Cochrane Library, Trip Database, and PubMed. 14,449 of these records were eliminated prior to screening following the application of filters. 37 records remained for screening after 7 duplicates were eliminated. 30 items were eliminated after examining these 37 records in accordance with the inclusion and exclusion criteria. Two studies out of the seven remaining reports that were attempted to be retrieved were unsuccessful. Ultimately, five studies were included in the qualitative synthesis after being determined to meet the eligibility requirements [15–19]. In Figure 1, the PRISMA flowchart is shown.

Figure 1: Prisma flowchart

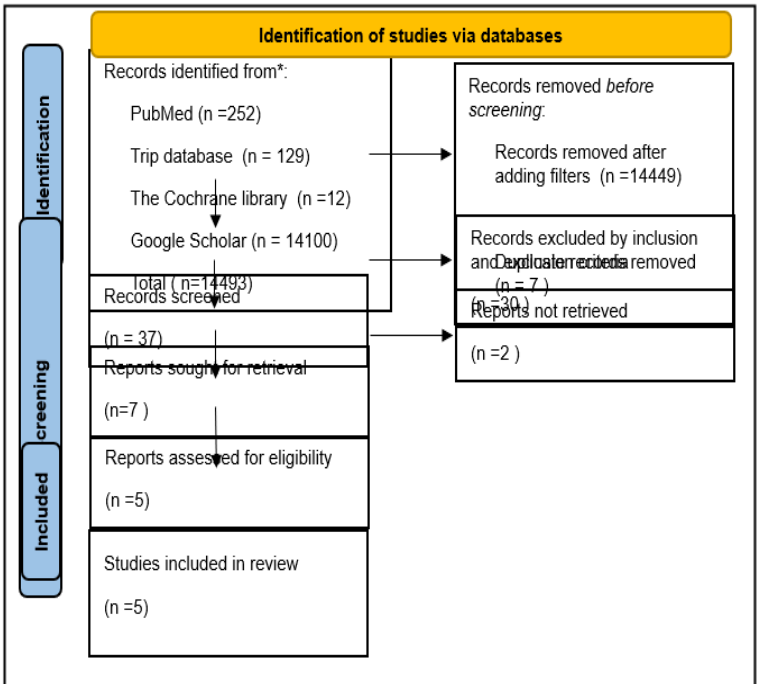


Table 1: Included Randomized controlled trials

Note: SMV - Simvastatin; PRF- Platelet rich fibrin; ISQ - Implant stability quotient; CBC - Crestal bone change; T - Test; C - Control; mg- Miligram; G - Gram; NS - Not significant; ** - Highly significant; * - Significant

Study	No of Sample Size	Age range	Test	Control	Clinical Parameters	Follow up	Mean Difference	P value
Hassan [15] 2015	14/12 (26)	45-51	40 mg SMV	NO	ISQ	3 Months	T= 5.9±7.3 C=3.5±8.3	0.01
El Shafei [16] 2022	6/6 (12)	45-60	1.2 mg SMV+PRF	PRF	ISQ CBC (loss)	3 Months	T= 13.6±1.1 C=14.4±0.92 T=0.42±0.02 C=0.63±0.04	> 0.05* <0.0001**
Ibrahim [17] 2023	6/6 (12)	27-50	Hyaluronic gel + 20 g SMV	SMV	ISQ	3 Months	T= 20.17± 8.12 C= 6.14±3.82	0.065 (NS)
Betha [18] 2024	25/25 (50)	41-50	1% SMV	NO	PPD CBC (GAIN)	3 Months	T=2.5±0.3 C=1.7±0.3 T=0.4±0.3 C= − 1.1±0.3	< 0.05 < 0.05
Issa 2024 [19]	11/11 (22)	18-50	1.2% SMV + Xenograft + Membrane	Xenograft + Membrane	PPD CBC (LOSS)	6 months	T = 2.45 ± 0.34 C = 2.73 ± 0.50 T = − 0.88 ± 0.27 C = − 0.73 ± 0.13	< 0.001** 0.21 (NS)
					PPD	9 Months	T = 2.18 ± 0.246	< 0.001**

					CBC (LOSS)		C = 2.36 ± 0.384 T = − 0.96 ± 0.25 C = − 0.94 ± 0.12	0.77 (NS)

3.2. Study characteristics

Implant Stability Quotient (ISQ)

Implant Stability Quotient (ISQ) is a scale from 1 to 100 that measures the stability of a dental implant where Resonance Frequency Analysis (RFA) checks implant vibrations. In order to anticipate clinical outcomes, ISQ values are utilized as an indicator for mechanical implant stability. The more stable the implant, the higher the ISQ value [20].

Three studies on Implant Stability Quotient (ISQ) was used by Hassan (2015), El Shafei (2022), and Ibrahim (2023) to assess implant stability. When 40 mg simvastatin (SMV) users and non-users were compared, Hassan (2015) discovered that the test group had higher ISQ values (T = 5.9 ± 7.3 vs. C = 3.5 ± 8.3; P = 0.01), which suggested better implant stability after three months. This implies that early osseointegration is positively impacted by systemic statin treatment. El Shafei (2022) evaluated the usage of 1.2 mg SMV in conjunction with platelet-rich fibrin (PRF) and found that the test group's ISQ values were substantially higher than those of PRF alone (T = 13.6 ± 1.1 vs. C = 14.4 ± 0.92; P < 0.0001). Demonstrating improved early implant stability when growth hormones are administered locally along with statins. The combination group had higher mean ISQ values (T = 20.17 ± 8.12 vs. C = 6.14 ± 3.82), but the difference was not statistically significant (P = 0.065). Ibrahim (2023) also tested hyaluronic gel + 20 µg SMV vs SMV alone. Overall, over the first three months after implant placement, the use of statins, either topically or systemically, showed a trend toward greater implant stability across these investigations. Statistical significance was uneven, probably because of small sample numbers and brief follow-up periods, even though local administration in conjunction with biomodulators such PRF or hyaluronic acid seems promising. Forest plot tabulation was made possible by the fact that all of the studies had the same follow-up duration.

Pocket Probing Depth (PPD)

One important clinical metric for evaluating the soft tissue health around implants is Pocket Probing Depth (PPD). A periodontal probe is used to measure the distance between the gingival margin and the base of the peri-implant sulcus. Improved soft tissue healing and less inflammation surrounding the implant are usually indicated by a decrease in PPD. Assessing the effectiveness of implant maintenance is made easier by tracking PPD over time [21].

The studies conducted by Betha (2024) and Issa (2024) evaluated the depth decrease of pocket probing. A substantial decrease in PPD after three months (T = 2.5 ± 0.3 mm vs. C = 1.7 ± 0.3 mm; P < 0.05) was seen by Betha (2024) when 1% SMV was applied to peri-implant soft tissue. This suggests that soft tissue healing and inflammation are improved in statin-treated areas. This demonstrates how statins may improve peri-implant mucosal health by regulating the local inflammatory response. At six and nine months, Issa (2024) compared xenograft and membrane alone with 1.2% SMV in combination. Both groups experienced a substantial drop in PD values at both intervals, although the statin treated sites experienced a larger reduction (six months: T = 2.45 ± 0.34 vs C = 2.73 ± 0.50; nine months: T = 2.18 ± 0.246 vs C = 2.36 ± 0.384; P < 0.001*). These results show that locally applied SMV has a long-lasting beneficial effect on peri-implant pocket reduction and soft tissue remodeling. According to the trials taken together, statin use, either by itself or in conjunction with grafting materials, enhances peri-implant soft tissue outcomes by improving mucosal stability and decreasing pocket probing depth. The process might have something to do with statins angiogenic and anti-inflammatory qualities, which promote soft tissue attachment and healing throughout the early and middle stages of implant integration. Because the follow-up periods for each study varied, it was not possible to tabulate forest plots.

Crestal Bone Changes (CBC)

The vertical changes in the marginal bone level around a dental implant are known as crestal bone changes (CBC). These alterations are evaluated radiographically using cone beam commuted tomography and are a crucial sign of long-term stability and implant success. Minimal crestal bone loss implies positive osseointegration and healthy bone remodeling, while excessive loss may indicate peri-implant bone resorption [21].

Four studies—El Shafei (2022), Betha (2024), and Issa (2024) (6- and 9-month follow-ups) analyzed changes in crestal bone level. The inclusion of 1.2 mg SMV in PRF at three months significantly decreased crestal bone loss (T = 0.42 ± 0.02 mm vs. C = 0.63 ± 0.04 mm; P < 0.0001), according to El Shafei (2022). This suggests that statins may decrease early marginal bone resorption by increasing osteoblastic activity. Local statin delivery may promote bone regeneration around implants, according to Betha (2024), who found significant crestal bone gain with topical 1% SMV treatment compared to

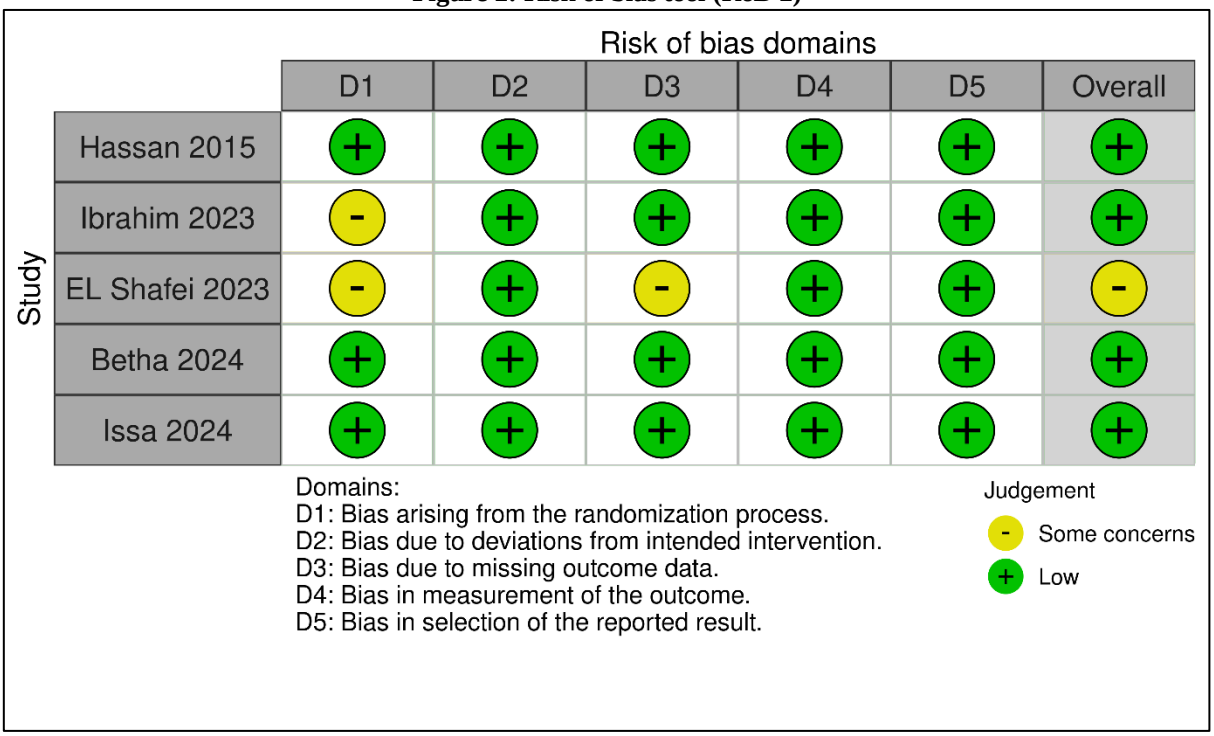
the control (gain: T = 0.4 ± 0.3 mm vs. C = 1.1 ± 0.3 mm; P < 0.05). While both groups demonstrated bone stability over time, Issa (2024) found no discernible difference in crestal bone loss between the test and control groups at six months (P = 0.21) or nine months (P = 0.77). When combined, the results suggest that statins may have a beneficial effect on early crestal bone preservation and may even short-term encourage bone growth. Longer follow-up studies showed similar bone loss between statin-treated and control groups, therefore the long-term data are still ambiguous. These differences are probably caused by variations in the concentration, sample size, and delivery technique. Because the follow-up periods for each study varied, it was not possible to tabulate forest plots. Table 1 lists the specifics of the listed studies.

3.3. Quality assessment

The risk of bias among the included randomized clinical trials was assessed using the Cochrane Risk of Bias 2.0 tool, which evaluates five domains: bias resulting from the randomization process (D1), bias resulting from deviations from intended interventions (D2), bias resulting from missing outcome data (D3), bias in outcome measurement (D4), and bias in selecting the reported result (D5). A rating of low risk (green), moderate concern (yellow), or high risk (red) was assigned to each domain, with the overall assessment accounting for the cumulative assessment of all domains.

Based on the risk of bias evaluation, most studies showed an overall low risk of bias. Hassan (2015), Betha (2024), and Issa (2024) were considered low risk in each domain. While Ibrahim (2023) voiced some concerns regarding randomization, Al Shafei (2023) voiced some concerns regarding randomization and the absence of outcome data. Despite these concerns, the majority of studies had low RoB across all evaluated areas, and the included research's overall risk of bias was low to moderate. [Figure 2].

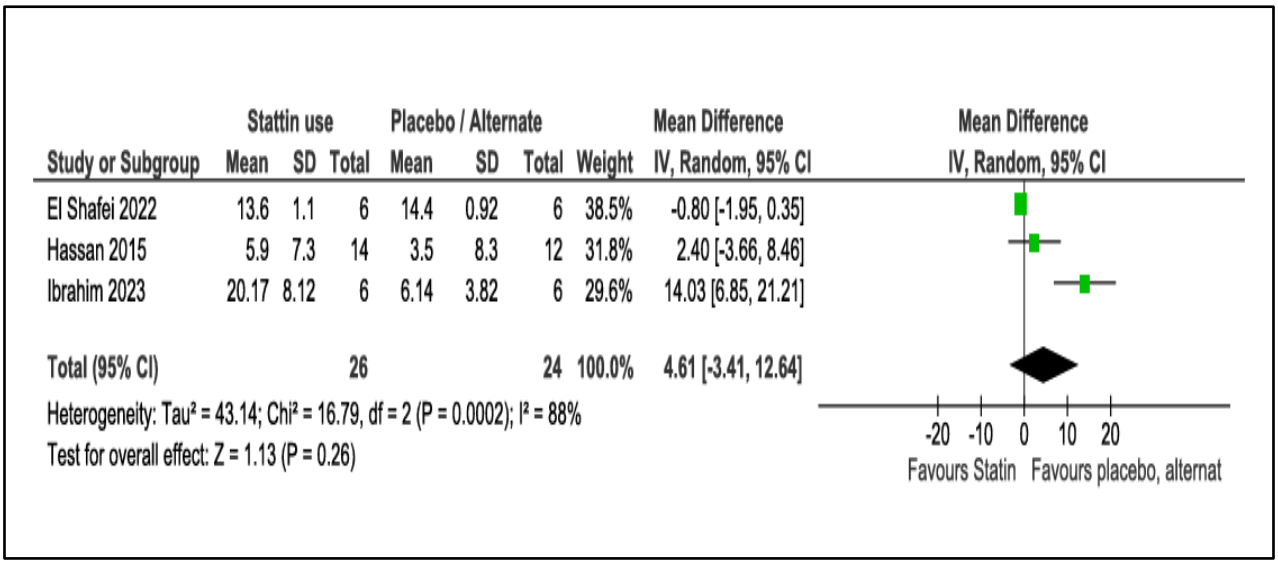
Figure 2: Risk of bias tool (RoB 2)



The heterogeneity among the included studies was evaluated using a random effects model. With an I^2 value of 88%, the study demonstrated a considerable level of heterogeneity, indicating that most of the observed variance among studies was due to real differences in populations, methodologies, or interventions rather than random variation. The statistical significance of the chi-square test for heterogeneity (Chi^2 = 16.79, df = 2, P = 0.0002) further indicated the existence of variation between trials. High variability suggests that the effect of statins on ISQ may differ depending on the study. Variability may arise from differences in the kind or dosage of statins, the sites of implants, and the duration of follow-up.

The pooled mean difference between the statin and control groups at the end of the study was 4.61 (95% CI: –3.41 to 12.64), however it was not statistically significant (Z = 1.13, P = 0.26). Because they reflect uncertainty in the overall estimate, the broad confidence ranges should be interpreted cautiously.

Figure 3: Forest plot for Implant stability quotient (ISQ) at 3 months



3.4 Effect of Intervention

Implant Stability Quotient and Crestal Bone Change importance level was considered as 'critical' and pocket probing depth was considered as 'important' for immediate implant placement. There was high quality of evidence that statins were more effective in immediate implant placement as compared to placebo (Mean Difference (MD) pocket probing depth at 3 months 0.80, 95 % Confidence Interval (CI) 0.63 to 0.97, one study with 50 participants). There was low quality of evidence that statin or combination of an alternative materials like Hyaluronic gel or biologic concentrates like platelet rich fibrin were equally effective after immediate implant placement (MD primary stability at 3 months 4.61, 95 % CI -3.41 to 12.64, three studies with 50 patients).

There was moderate quality of evidence that favors statin use clinically but not statistically after immediate implant placement (MD PPD at 6 months -0.28, 95 % CI -0.64 to 0.08, one study with 22 patients and MD CBC at 3 months -0.45, 95 % CI -0.93 to 0.03, two studies with 62 patients) and statins use with or without other combination of materials (membrane, xenograft and platelet concentrates) were equally effective (PPD at 9 months 0.02, 95 % CI -7.07 to 7.11; MD CBC 6 months 0.15, 95 % CI -0.03 to 0.33 and MD CBC at 9 months 0.02, 95 % CI -0.4 to 0.18, one study with 22 patients). Summary of findings for evidence analysis is depicted in Table 2

Table 2: Summary of findings for evidence analysis

Outcome with timeline	No. of studies	Study Design	Effect Estimate (95% Confidence Interval)	Certainty of Evidence	Comments
Implant Stability Quotient at 3 months	3	Randomized Control Trial	Mean Difference 4.61 [-3.41, 12.64]	⊕⊕◯◯ Low	Downgraded as one study (El Shafai 2022) did not mention allocation concealment, heterogenicity (I^2 – 88%) was present between studies, all 3 studies (as seen in the Forest plot). Confidence interval across studies overlap, one study (Hassan 2015) had extreme effect size.
Pocket Probing Depth at 3 months	1	Randomized Control Trial	Mean Difference 0.80 [0.63, 0.97]	⊕⊕⊕⊕ High	Well-conducted study (Betha 2024) with consistent results and minimal risk of bias.
Pocket Probing Depth at 6 months	1	Randomized Control Trial	Mean Difference -0.28 [-0.64, 0.08]	⊕⊕⊕◯ Moderate	Downgraded as Allocation concealment was not mentioned in the study (El Shafai 2022) and Sample size of study was small
Pocket Probing Depth at 9 months	1	Randomized Control Trial	Mean Difference 0.02 [-7.07, 7.11]	⊕⊕⊕◯ Moderate	Downgraded as Allocation concealment (El Shafai 2022) not mentioned, and confidence interval was wide and span both the treatments

Crestal Bone Level at 3 months	2	Randomized Control Trial	Mean Difference -0.45 [-0.93, 0.03]	⊕⊕⊕◯ Moderate	Downgraded as Allocation concealment (El Shafai 2022) was not mentioned.
Crestal Bone Level at 6 months	1	Randomized Control Trial	Mean Difference 0.15 [-0.03, 0.33]	⊕⊕⊕◯ Moderate	Downgraded as Allocation concealment was not mentioned. Sample size of study is small. (El Shafai 2022)
Crestal Bone Level at 9 months	1	Randomized Control Trial	Mean Difference 0.02 [-0.4, 0.18]	⊕⊕⊕◯ Moderate	Downgraded as Allocation concealment (El Shafai 2022) was not mentioned and sample size of the study is small (El Shafai 2022).

DISCUSSION

The purpose of this meta-analysis and systematic review was to assess the impact of statins on soft and hard tissue parameters when implants are placed immediately. The reviewed randomized controlled trials were conducted during the past ten years; prior research was conducted on animals and in vitro. The possible function of statins in implant dentistry and bone regeneration has also been emphasized by earlier systematic reviews. In animal trials using simvastatin, showed improved bone growth surrounding titanium implants [22]. A study examined statins' in vitro effects and found that they were effective against oral microbes, which indirectly supported the health of the area around implants [23]. Therefore, statins may enhance osseointegration and lessen marginal bone loss [24]. The biological plausibility of statins in implant therapy is supported by previous evaluations taken together, but they also stress the necessity of larger, standardized clinical trials prior to widespread use.

According to the results of this systematic review and meta analysis, systemic statin use may have a beneficial effect on human patients' dental implant osseointegration. When comparing statin users to non-users, a number of included studies showed enhanced implant stability and better marginal bone preservation. An implant with high ISQ stability is one that has stability greater than 70, as demonstrated by three investigations. These findings align with preclinical data showing that statins enhance bone morphogenetic protein-2 (BMP-2) expression, inhibit osteoclastic function, and stimulate osteoblastic activity—all of which support bone growth and remodeling surrounding implants [3, 25–27].

Despite the strong biological justification, there are a number of obstacles in converting these effects into therapeutic results in people. Variability in statin dosage, duration of treatment, and type of administration is a significant problem. Nevertheless, the human dose-response relationship for bone effects is not well defined. High-dose statin therapy may have a strong osteogenic impact, according to animal research [23,25], but clinical usage is limited by worries about side effects like myopathy and liver toxicity [28].

According to the reviewed research, statin-using patients tended to exhibit less crestal bone change after starting the medication, which is crucial for early osseointegration and stability. A large effect size is necessary to fully detect the impact of statin medication on osseointegration outcomes, as evidenced by the failure of small sample sizes to attain statistical significance. Across all time periods, soft tissue metrics demonstrated a strong clinical correlation with statin use. The existence of confounding variables is another difficulty. Statin users are frequently elderly and may have systemic illnesses that impact bone metabolism and repair on their own, such as diabetes mellitus, cardiovascular disease, or osteoporosis [29–31]. The ability to separate the effect of statins per se was limited by the fact that some research corrected for these comorbidities while others did not. The interpretation of the data was further complicated by the fact that variables such as smoking status, dental hygiene habits, and concurrent drugs (such as corticosteroids and bisphosphonates) were frequently underreported or inconsistently monitored.

Interestingly, there is research that suggests impaired people may be more susceptible to the osteogenic effects of statins. For instance, when taking statins, patients with osteoporosis showed higher gains in bone density and implant stability than did healthy controls [32, 33]. This observation supports the concept that statins could be particularly effective as an adjuvant in high-risk patient populations though specific research are needed to prove this.

Notably, none of the included human trials examined local statin delivery in statin-coated implants or peri-implant gels, in contrast to animal research. As evidenced, a biofunctionalized dental prosthetic abutment employing titanium covered with poly(lactic-co-glycolic) acid (PLGA) containing simvastatin, this approach is still promising [32]. These in vitro findings demonstrated enhanced biocompatibility and fibroblast vitality, especially at a 0.6% SMV concentration, and a gradual, regulated release of simvastatin over 600 hours. Human gingival fibroblasts (HGFs) and stem cells from exfoliated deciduous teeth displayed enhanced proliferation on SMV-loaded surfaces. These results imply that local delivery methods, like PLGA coatings, could be able to get around the drawbacks of systemic

administration and offer tailored anti-inflammatory and osteogenic effects with a lower chance of systemic side effects. Furthermore, Littuma et al. noted that at low dosages, this delivery method produced a uniform coating with improved cell adhesion and proliferation without cytotoxicity. These findings provide credence to upcoming clinical studies investigating localized statin administration as a means of improving long-term stability and peri-implant healing [34].

The possible anti-inflammatory and antibacterial qualities of statins, which may guard against peri-implantitis, are another developing field of investigation. Statins have been demonstrated to inhibit the production of bacterial biofilms in vitro and lower levels of inflammatory cytokines such TNF-α and IL-6 [35]. It's yet unclear if these effects result in less peri-implant problems among statin users, but they might be a useful side effect.

Quality of Evidence

Using GRADE, we found that the evidence's certainty varied from moderate to low for the outcomes for which data was available, and from high for one particular outcome. The Summary of findings for the primary comparison provides an explanation of the rationale behind these conclusions. When soft tissue parameters (pocket probing depth) were assessed in this systematic review and meta-analysis, there was a high degree of confidence in the use of statins in immediate dental implants. With one experiment being uncertain, we assessed the five included trials as having a low risk of bias. To evaluate main stability and hard tissue parameters on initial implant placement, more trials are necessary, nonetheless, as indicated by the variability and small sample sizes in different investigations.

Recommendations

To validate the results, larger, multicenter RCTs with longer follow-up should be a part of future research. It is necessary to standardize the kind, dosage, and administration mechanism of statins (local vs. systemic). Research should also assess peri-implant health and long-term implant survival, with an emphasis on patients with impaired conditions (such as diabetes and osteoporosis). Statin-coated implants are one example of a localized delivery technology that shows great promise and merits additional clinical testing.

However, the present human trials have certain drawbacks. First, with only a small number of randomized controlled trials. Second, despite the fact that variations in the absorption and distribution of statins may have an impact on bone health, none of the research evaluated different types of statins (for example, hydrophilic versus lipophilic). Third, there is still a lack of solid evidence about long-term implant survival and bone stability because the follow-up durations were often brief (3–9 months) [36].

CONCLUSION

Statins, commonly used cholesterol-lowering medicines, reveal substantial benefits for dental and oral health. Their function in treating periodontitis, preventing alveolar bone loss, and improving implant osseointegration is supported by evidence from a variety of study types. Particularly when administered locally, statins have osteogenic and anti-inflammatory qualities that increase absorption and reduce adverse effects. In animal investigations, rosuvastatin in particular provides a good pharmacological profile. Simvastatin's efficacy as a supplement to periodontal therapy is also demonstrated by clinical research. Statins used to treat periodontal disease are still generally safe and available, even though high dosages can have negative effects. More extensive clinical research is necessary to fully explore their potential as a unique therapeutic alternative in dentistry.

Conflict of interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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