International Surgery Journal
Khan AAM et al. Int Surg J. 2025 May;12(5):701-705
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20251162

Original Research Article

A comparative study on condition of hypertensive and non-hypertensive patients with dental implant success and survival: 15 years follow ups

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Received: 11 February 2025
Revised: 19 March 2025
Accepted: 21 March 2025

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ABSTRACT

Background: The study evaluates the success and survival of dental implants in hypertensive and non-hypertensive patients over a 15-year follow-up period. Hypertension may affect osseointegration and implant longevity, necessitating careful assessment of its impact on implant success.
Methods: This comparative study was conducted at Banasree Dental and Implant Center and German Dental and Implant Center, Dhaka, Bangladesh. A total of 109 patients were initially selected, but 19 were excluded due to loss to follow-up. Finally, 90 patients (67 females, 23 males, 45 in each group) were included, receiving a total of 257 implants (135 implants in maxilla and 122 implants in mandible), including guided bone regeneration (GBR) and sinus elevation. Participants aged 35 to 70 years underwent implant surgeries in 2009, with follow-ups until 2024.
Results: Marginal bone loss ranged from 0.5 mm to 2.0 mm, which is within the normal limit. All implants (100%) remained functional, with no significant difference in outcomes between hypertensive and non-hypertensive groups. This suggests that well-integrated implants can achieve long-term survival even in uncontrolled hypertensive patients.
Conclusions: With careful planning, proper blood pressure management, and close collaboration between healthcare providers, dental implants can be a durable and successful tooth replacement option for hypertensive patients. Ensuring optimal preoperative, intraoperative, and postoperative care is crucial for long-term implant stability, regardless of hypertension status.

Keywords: Dental implant, GBR, Sinus elevation, Uncontrolled hypertensive patients, Non-hypertensive, Success, Survival

INTRODUCTION

Generally dental implant is a prosthetic tooth root that is placed into the jawbone and mostly made of titanium, it is biocompatible and integrates with the jaw bone. Dental implants are considered as a highly successful treatment option, which is durable and long-lasting solution for replacing missing teeth compared to traditional dentures or bridges, which has benefits such as improved appearance, enhanced chewing ability, comfort, and preservation of jawbone structure.[1] This process involves several steps, which include the initial consultation, comprehensive dental and medical examinations, placement of the implant into the jawbone by a specialist oral surgeon, healing and osseointegration (bone grows around the implant), and finally, the attachment of the replacement tooth or teeth.

However, candidacy for dental implants depends on various factors, including overall health, oral health, and the quality of the jawbone.[2] By providing certain precautions and considerations, the success of dental implants in hypertensive patients can be quite high. One of the most critical factors is the control and management

of the patient's blood pressure.[3] Normally hypertension (high blood pressure) itself does not preclude someone from getting dental implants, however it's important that the condition is well-managed and stable.

Untreated chronic high blood pressure can lead to angina, heart attacks, heart failure, irregular heartbeat, stroke, kidney damage, damage to the heart, and sudden death.[1] Also, there is evidence to show that the condition has negative impacts on bone health as it is associated with many biochemical and physiological pathways.[3,4] Also, hypertension may have a negative effect on microvascular remodeling and angiogenesis.[5]

Uncontrolled hypertension can grow the risk of complications during and after surgery also affect healing after implant placement. Before undergoing dental implant treatment, hypertensive patients should undergo a thorough medical evaluation by their physician.[1] Which helps to assess overall health status, including cardiovascular health, and make sure that the patient is medically stable for the procedure. A large number of hypertensive patients are on medications to control their blood pressure. It's essential for the dental team to be aware of these medications, as they can influence the choice of anesthesia and antibiotics used during the procedure.[2] Coordination between the dentist/oral surgeon and the patient's physician or cardiologist is crucial.

The main objective of this study is to compare the survival and success rates of dental implants in hypertensive and non-hypertensive patients. The study aims to assess whether hypertension, a common systemic condition, has a significant impact on the outcomes of dental implant procedures.

METHODS

This comparative study was carried out in two center, Banasree dental and implant center and German dental and implant center, Dhaka, Bangladesh. After implant treatment, the patient who comes for follow-ups at least once in three years are included. Primarily 109 patients were selected for this study and 19 cases were excluded because they did not come for follow-ups. So finally, 90 cases included in which 67 female and 23 male, 45 cases in each group included for this study, total number of implants 257 (135 implants in maxilla and 122 implants in mandible) including GBR and sinus elevation, age between 35 to 70. Their implant surgery was done in 2009 and follow ups done up to 2024.

During the planning visit, evaluated dental health, discusses your medical history, and takes X-rays or CT scans to assess the jawbone and surrounding structures. Based on the evaluation, a personalized treatment plan is created. This plan considers factors such as the number of teeth to be replaced, the condition of the jawbone, and your overall oral health, preventive measures taken to minimize the risk of complications such as bleeding and infection. This includes strict adherence to sterile techniques, careful handling of tissues, and appropriate antibiotic prophylaxis if indicated.[2]

In the next phase, the dental implant(s) are surgically placed into the jawbone. This procedure is performed under local anesthesia. Surgical procedure done by a precise incision in the soft tissue to expose the underlying bone where the implant will be placed. Used a sequence of drills to prepare the implant site according to the planned dimensions (depth and diameter) based on the implant system being used. Carefully placed the dental implant into the prepared osteotomy (bone socket) site. Ensured proper orientation and depth according to the surgical plan. Closed the incision with sutures. Depending on the case, a healing abutment or cover screw may be placed over the implant.

After implant placement, hypertensive patients followed post-operative care instructions diligently and waited for a healing period during which osseointegration occurs. Once osseointegration is complete, a connector called an abutment is placed on top of the implant. The abutment served as the support structure for the final artificial tooth.

Finally, a custom-made crown or bridge, is attached to the abutment to replace the missing tooth or teeth. The restoration is designed to match the color, size, and shape of your natural teeth, providing a natural-looking result.

Educated the patient about the importance of managing their hypertension, and adhering to their prescribed medications is essential for long-term success. Hypertensive patients may benefit from lifestyle changes such as quitting smoking, reducing alcohol intake, and adopting a healthy diet and exercise regimen, all of which contribute to overall health and the success of dental implants.

Regular follow-up visits are done which is necessary to monitor the healing process and ensure the implant is functioning properly. Good oral hygiene practices, including brushing, flossing, and regular dental check-ups, are essential to maintain the health of the implant and surrounding teeth. Data analysis was conducted using SPSS software, version 25.

RESULTS

Marginal bone loss ranged from 0.5 mm to 2.0 mm, which is within the normal limit. All implants (100%) remained functional, with no significant difference in outcomes between hypertensive and non-hypertensive groups. This suggests that well-integrated implants can achieve long-term survival even in uncontrolled hypertensive patients. (Microsoft Office tool used for making Figure and Table).

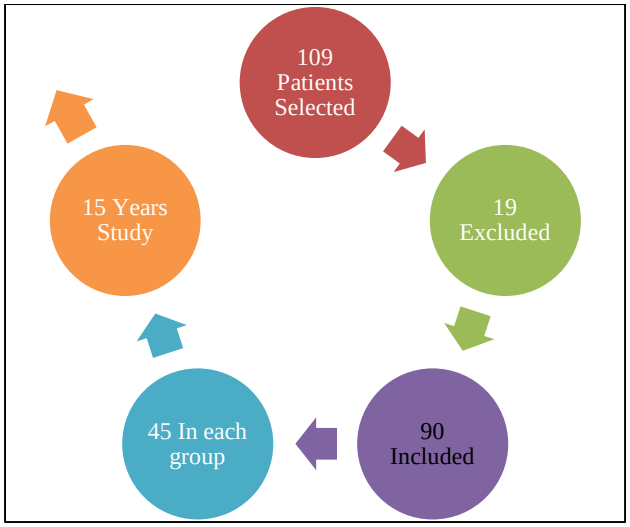

Figure 1: Patient selection flowchart.

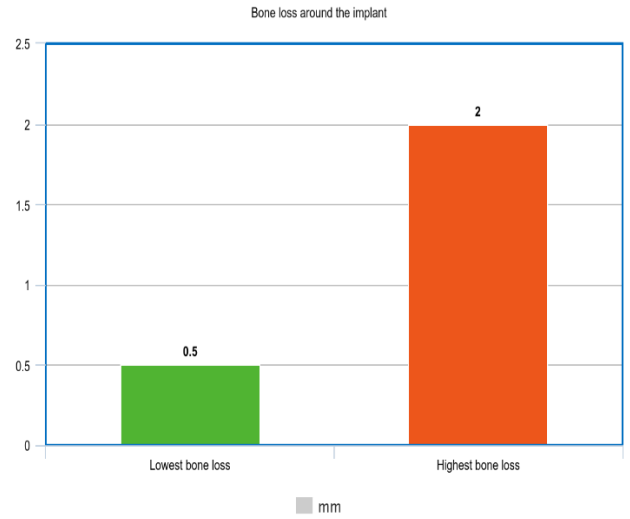

Figure 2: Bone loss around the implant.

Figure 1 illustrates the patient selection process for the 15-year comparative study on dental implant success in hypertensive and non-hypertensive patients. Initially, 109 patients were selected, but 19 cases were excluded due to loss to follow-up. Ultimately, 90 patients were included in the study, with 45 patients in each group (hypertensive and non-hypertensive). The study was conducted over a 15-year follow-up period to evaluate implant survival and success rates.

Table 1 presents the sex distribution of the study participants (N=90). The majority were female (74.4%), while male participants accounted for 25.6% of the total sample. The male-to-female ratio was 1:2.9, indicating a higher proportion of female participants in the study.

In Figure 2 marginal bone loss found 0.5 mm to 2.0 mm, which is normal and all implants are successfully functioning (100%). No difference found in hypertensive or non-hypertensive patient group. The study revealed that after proper osteointegration dental implant can survive even in uncontrolled hypertensive patients.

Table 2 presents distribution of dental implants in maxilla and mandible shows the total number of implants placed in each jaw, with 135 in the maxilla and 122 in the mandible, totalling 257 implants.

Table 1: Sex distribution of our study participants (N=90).

Sex	n	%
Male	23	25.6
Female	67	74.4
Total	90	100

Table 2: Distribution of dental implants in maxilla and mandible.

Jaw location	Total implants
Maxilla	135
Mandible	122
Total	257

DISCUSSION

This is a comparative study was carried out to evaluate the dental implant treatment option between non-hypertensive and hypertensive patient. The research was carried out in the specialized implant center of Banasree Dental and Implant Center and German Dental and Implant Center, Dhaka, Bangladesh. After implant treatment, the patient who comes for follow-ups at least once in three years are included. Primarily 109 patients were selected for this study and 19 cases were excluded because they did not come for follow-ups. So finally, 90 cases included in which 67 female and 23 male, 45 cases in each group included for this study, total number of implants 257 (135 implants in maxilla and 122 implants in mandible) including GBR and sinus elevation, age between 35 to 70. Their implant surgery was done in 2009 and follow ups done up to 2024.

Dental implants can be considered a safe and suitable for hypertensive patients, but there are prime considerations and precautions that need to be taken, before undergoing dental implant treatment, it's fundamental for hypertensive patients to have a full medical evaluation by their physician. This evaluation will assess the overall health status to ensure that the patient's heath is stable and blood pressure is well-controlled. All necessary measures should be taken to monitor and manage the patient's blood pressure during the dental implant procedure. Stress and anxiety associated with treatments can sometimes affect the blood pressure, so it is important to have a calm and reassuring environment. To manage blood pressure, hypertensive patients may be taking medications and the dental surgeon should be aware of these medications and any potential interactions with

anesthesia or other medications used during the implant surgery. Precaution should be taken to reduce the risk of complications such as bleeding or infection during and after the implant procedure. Which includes post-operative care instructions modified to the patient's medical condition and meticulous sterile techniques. Regular follow-up visits are very important to monitor healing and ensure there are no complications, after the dental implant placement. Overall health should be remains stable for all during dental implant surgery and particularly important for hypertensive patients also. The dental team should educate the patient about maintaining good oral hygiene and lifestyle changes to manage hypertension effectively. This can contribute to the success and longevity of dental implants.

Hypertension may also have a detrimental effect on microvascular perfusion and angiogenesis.[5] Hypertension leads to capillary endothelial dysfunction and vasoconstriction of micro vessels, which can result in obliteration. High blood pressure has been shown to contribute to the development of microvascular rarefaction in animal models.[6-8] The resulting microvascular rarefaction may end up increasing peripheral resistance in the microcirculation, thereby reducing blood flow and reserve, and further elevating blood pressure.[9-11]

In the microcirculation, the peripheral resistance rises, which, by reducing blood flow, remains normal and continues to increase blood pressure. The major clinical sequelae due to hypertension are myocardial ischemia, end-organ damage, and stroke, as have been implicated by results in animal models.[5] Within the limited period over which hypertension develops, the microvascular refraction either decompensates or becomes apparent. Hypertension or uncontrolled blood pressure is the cause of capillary destruction, injuring micro vessels, and exaggerated pathogenic influences are implicated in vascular rarefaction.[5]

The intake of antihypertensive medication may be a factor counteracting the negative effects of high blood pressure on bone. The results of some animal studies have suggested that the intake of antihypertensive drugs may reduce bone loss.[12,13] Some clinical studies have shown favorable results when antihypertensive medication is properly and regularly taken by the hypertensive patient, such as it slowing cortical bone loss, and having beneficial skeletal effects, although the positive benefits on cortical bone density could be small.[14-17] However, dental implants can be a viable option for hypertensive patients, but careful planning, coordination with dentist and physician, diligent management of blood pressure and medications are crucial to ensuring a safe and successful outcome. A joint consultation with both dentist and physician to determine the best course of action based on individual health needs.

A limitation of this study is the relatively small sample size, which may not fully represent the broader population. Additionally, patient adherence to follow-up and oral hygiene practices could influence long-term outcomes.

CONCLUSION

In conclusion, with careful planning, meticulous management of blood pressure, and close collaboration between healthcare providers, dental implants can be a successful and durable tooth replacement option for hypertensive patients. The key is to ensure that the patient's overall health is optimized before, during, and after the implant procedure.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Khan AAM, Zahan NP. A comparative study on condition of hypertensive and non-hypertensive patients with dental implant success and survival: 15 years follow ups. Int Surg J 2025;12:701-5.