

BODY DYSMORPHIC DISORDER SCREENING IN AESTHETIC PRACTICE AND THE ROLE OF ARTIFICIAL INTELLIGENCE

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ABSTRACT

Background: Body dysmorphic disorder (BDD) is a psychiatric disorder characterized by a persistent preoccupation with perceived defects in physical appearance that are minimal or not observable to others. It is particularly relevant in aesthetic medicine, where prevalence appears higher than in the general population. Patients with BDD often seek cosmetic interventions; however, aesthetic treatment rarely addresses the underlying psychopathology and may worsen dissatisfaction, reinforce distorted self-perception, and increase requests for repeated procedures.

Objectives: To review the literature on the screening of BDD in aesthetic practice and to examine the emerging role of artificial intelligence (AI) as a supportive tool for early detection.

Methods: A structured literature review was conducted using PubMed, Embase, Scopus, and Google Scholar. Studies published in English between January 2000 and March 2026 were considered. Search terms included body dysmorphic disorder, BDD, aesthetic medicine, cosmetic surgery, psychological screening, artificial intelligence, machine learning, and deep learning. A Best Evidence Topic (BestBETs) approach was used to evaluate the literature.

Results: The reviewed literature supports the use of validated screening tools, including the Body Dysmorphic Disorder Questionnaire (BDDQ), BDDQ-Dermatology Version (BDDQ-DV), Dysmorphic Concern Questionnaire (DCQ), and Cosmetic Procedure Screening Questionnaire (COPS), for identifying patients at risk of BDD in aesthetic settings. However, screening tools alone are insufficient for diagnosis, and a clinical interview by a mental health professional remains essential. Emerging AI-based approaches, including machine learning, natural language processing, digital phenotyping, and computer vision, show potential as adjunctive methods for identifying behavioral, linguistic, and visual patterns associated with dysmorphic concern. Current evidence is promising but limited by small sample sizes, heterogeneity of methods, and lack of large-scale clinical validation.

Conclusion: Conventional screening tools remain the cornerstone of BDD detection in aesthetic practice. AI may serve as a useful decision-support tool for early recognition, but it should complement rather than replace clinical judgment and psychiatric evaluation. Future research should prioritize prospective validation, ethical implementation, and standardized clinical pathways.

Keywords: Body dysmorphic disorder, BDD screening, aesthetic medicine, cosmetic surgery, artificial intelligence, machine learning, psychodermatology

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INTRODUCTION

Body dysmorphic disorder (BDD) is an underrecognized but clinically important psychiatric disorder with

particular relevance to aesthetic and cosmetic practice.¹ It is characterized by a disproportionate preoccupation with perceived defects in physical appearance that are either not observable or appear slight to others. Under the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition², BDD is classified within obsessive-compulsive and related disorders. Patients commonly report intrusive appearance-related thoughts and engage in repetitive behaviors such as mirror checking, excessive grooming, camouflage, reassurance seeking, or repeated consultation for cosmetic correction.

In the general population, the prevalence of BDD has been estimated at approximately 0.7% to 2.9%.¹ In contrast, prevalence appears substantially higher among patients

seeking aesthetic procedures, with studies reporting rates commonly between 5% and 15% and even higher estimates in selected cosmetic subspecialties such as rhinoplasty and facial plastic surgery.³ The most commonly reported areas of concern include the nose, skin, and hair. BDD affects both men and women and often begins during adolescence, although many patients present later in cosmetic settings rather than psychiatric services.

The relevance of BDD to aesthetic medicine lies in the mismatch between the patient's psychological distress and the limited capacity of cosmetic intervention to address it. Patients with BDD are often poor candidates for aesthetic procedures because treatment rarely resolves the core psychopathology. Instead, procedures may reinforce distorted body image, increase dissatisfaction, and lead to repeated interventions. These patients may also pose greater medicolegal and ethical challenges, including complaints, unrealistic expectations, and, in rare cases, hostility toward practitioners.^{3,4,5}

Despite its importance, BDD remains underdiagnosed in aesthetic practice. One reason is that affected individuals frequently seek cosmetic care rather than mental health treatment. Another is that busy aesthetic consultations often prioritize procedural planning over psychological assessment. For this reason, several screening tools, such as BDDQ, BDDQ-DV, DCQ, and COPS, have been developed to aid the identification of patients at risk. Although these tools are useful, no single instrument has been universally adopted, and clinical interview remains necessary for diagnostic confirmation.¹ More recently, AI has emerged as a potential adjunct to conventional screening. AI-based methods may help identify subtle behavioral, linguistic, or visual indicators of dysmorphic thinking through natural language processing, digital phenotyping, structured questionnaire analysis, and image-based pattern recognition.⁵ These approaches are not intended to replace clinical judgment but may support earlier recognition and safer decision-making.

This review examines the role of established screening methods and AI-assisted approaches in the identification of BDD within aesthetic practice. It also considers the ethical and clinical implications of integrating AI into patient assessment pathways.

METHODS

Study Design: A Best Evidence Topic *BestBETs*,⁶ methodology was used to provide a structured and clinically relevant review of the literature on BDD screening in aesthetic practice and the potential role of AI in early detection.

Search Strategy: A literature search was conducted using PubMed, Embase, Scopus, and Google Scholar. Studies published between January 2000 and March 2026 were considered. Search terms included *body dysmorphic disorder*, BDD, artificial intelligence, machine learning, deep learning, cosmetic surgery, aesthetic medicine, and psychological screening, combined using Boolean operators.

Manual searching of reference lists from relevant publications was also performed to identify additional eligible studies.

Eligibility Criteria: Studies were included if they:

- examined BDD in aesthetic, cosmetic, dermatologic, or psychodermatologic settings,
- evaluated screening or diagnostic approaches for BDD,
- investigated AI, machine learning, or digital tools relevant to BDD identification or management, and
- were peer-reviewed articles published in English between 2000 and 2026.

Studies were excluded if they were case reports, conference abstracts, unpublished data, non-English publications, or unrelated to either BDD or AI in clinically relevant settings.

Study Selection and Data Extraction: Titles and abstracts were screened independently, followed by full-text assessment of potentially relevant articles. Extracted data included author, year, country, patient population, study design, screening approach, AI method where applicable, and key outcomes. Disagreements were resolved by discussion and consensus.

Quality Assessment and Synthesis: The level of evidence was assessed using the Oxford Centre for Evidence-Based Medicine hierarchy. Owing to heterogeneity in study design, clinical setting, screening instruments, and AI methodologies, a quantitative meta-analysis was not performed. Findings were synthesized qualitatively.

RESULTS

Overview of Included Evidence: The identified literature comprised systematic reviews, narrative reviews, prospective cohort studies, observational studies, and AI-related conceptual or exploratory studies. Most studies were conducted in settings such as cosmetic surgery, facial plastic surgery, dermatology, and psychodermatology. Considerable heterogeneity was observed across study populations, screening methods, and reported outcomes.

Prevalence and Clinical Relevance of BDD in Aesthetic Settings: BDD appears to be more common in aesthetic populations than in the general community. Published estimates in cosmetic and facial aesthetic settings generally range from 5% to 15%, with some studies reporting even higher rates in selected populations. This elevated prevalence has important clinical implications because patients with BDD are consistently associated with poorer satisfaction after cosmetic procedures and are more likely to pursue repeated interventions.

Conventional Screening Approaches: Validated screening instruments remain central to the early identification of BDD in aesthetic practice. The most frequently cited tools include:

- Body Dysmorphic Disorder Questionnaire (BDDQ)
- BDDQ-Dermatology Version (BDDQ-DV)
- Dysmorphic Concern Questionnaire (DCQ)
- Cosmetic Procedure Screening Questionnaire (COPS)

Among these, the BDDQ and BDDQ-DV have shown strong sensitivity and specificity in some aesthetic and

dermatologic settings. Dufresne et al. reported high screening performance in cosmetic dermatology practice,⁷ while Dey et al. validated the BDDQ in a facial plastic and reconstructive surgery clinic.⁸ Veale et al. developed the COPS instrument specifically for cosmetic procedure settings.⁹

Although screening questionnaires are practical and clinically useful, they do not establish a definitive diagnosis. False-positive results may occur, and positive screens should prompt further evaluation. Clinical interview by a psychiatrist or psychologist remains the reference standard for diagnosis. **Clinical Outcomes in**

Patients With BDD: The literature consistently shows that patients with BDD tend to have poorer outcomes after cosmetic intervention. Many remain dissatisfied despite technically successful procedures, and some experience worsening of distress or seek repeated treatment. Reviews of cosmetic outcomes in BDD indicate that aesthetic intervention rarely produces meaningful improvement in the underlying disorder. These findings reinforce the importance of screening and appropriate referral before elective treatment is undertaken.

Table 1: Evidence Summary of Body Dysmorphic Disorder (BDD) and Artificial Intelligence (2001 – 2025)

Author, Year, Country	Patient Group	Study Type (Level of Evidence)	Outcomes	Key Results	Study Weaknesses
Dufresne et al., 2001, USA (7)	46 cosmetic dermatology patients (36F, 10M)	Prospective cohort (Level 3)	Identification of BDD using screening tools	Sensitivity 100%, Specificity 93%, 19.6% screened positive	Small sample size; female predominance; single-center study
Castle et al., 2006 (10)	Not available	Review article (Level 5)	Treatment of BDD (SSRI, CBT)	Established SSRIs and CBT as the mainstay treatment	Not RCT or meta-analysis
Veale et al., 2012, UK (9)	Community (n=108), BDD group (n=97)	Cohort study (Level 3)	Validation of the COPS screening tool	Score ≥ 40 indicates need for further assessment	Small sample; unclear gender distribution
Dey et al., 2015, USA (8)	234 patients (cosmetic & reconstructive)	Prospective cohort (Level 3)	Prevalence and validation of BDDQ	Prevalence: 13% cosmetic, 1.8% reconstructive; Sensitivity 100%, Specificity 90.3%	Single setting; incomplete demographics; no RCT
Bowyer et al., 2016, UK (10)	Not available	Critical review (Level 2)	Cosmetic outcomes in BDD patients	The majority showed poor satisfaction post-procedure	Not RCT; heterogeneous data
Sweis et al., 2017, USA (11)	Cosmetic patients	Review article (Level 5)	Pathophysiology and medico-legal aspects	Highlighted legal risks, patient dissatisfaction, need for consent	Not empirical; no statistical analysis
Higgins et al., 2018, USA (3)	Not available	Review article (Level 5)	Screening and classification of BDD	Emphasized severity classification and the importance of screening	No clinical data; no meta-analysis
Flygare et al., 2020, Sweden (12)	88 BDD patients undergoing ICBT	RCT secondary analysis + Machine Learning (Level 2)	Prediction of treatment remission	ML predicted remission with 78% accuracy, outperforming regression models	Small sample; reduced long-term accuracy
Pereira et al., 2023, UK/Portugal (1)	Aesthetic clinical patients	Evidence-based review (Level 3)	Effectiveness of BDD screening tools	BDDQ and DCQ most valid; BDD is linked with poor aesthetic outcomes	Limited studies; heterogeneity
Tan et al., 2024, USA (5)	Psychodermatology patients	Narrative review (Level 4)	AI in diagnosis and treatment prediction	AI improved diagnostic accuracy and predicted treatment outcomes	Limited large-scale validation
Rahsepar Meadi et al., 2025, Netherlands (13)	Mental health patients using AI tools	Scoping review (Level 3)	Ethical implications of AI in mental health	Identified key issues: privacy (61%), safety (51%), bias, and accountability	Mostly non-clinical studies
Haykal & Kroupouzou, 2025 (14)	Aesthetic patients	Perspective article (Level 5)	AI-assisted detection of BDD	AI can detect behavioral and linguistic cues for early screening	No empirical validation; theoretical

Artificial Intelligence in BDD Identification: Artificial intelligence offers a promising and innovative approach to improving the recognition of body dysmorphic disorder in aesthetic practice. Although AI systems are not intended to diagnose psychiatric conditions independently, they may assist clinicians by identifying subtle behavioral, linguistic, and visual patterns suggestive of dysmorphic concerns. Advanced methods such as digital phenotyping, image analysis, and natural language processing can be used to extract meaningful contextual information that is not readily apparent during routine clinical consultations. By complementing traditional assessment methods, AI has the potential to enhance early detection and support more informed, patient-centered decision making.¹⁵ Recent literature suggests that AI may have a supportive role in identifying patients at risk of BDD. Reported and proposed applications include the following.

Machine Learning: Machine learning models have been used to analyze structured questionnaires and clinical data to predict symptom severity or treatment outcomes. In one study, machine learning predicted remission following internet-delivered cognitive behavioral therapy for BDD with greater accuracy than traditional regression methods, suggesting a role in personalized risk stratification.^{5, 14}

Natural Language Processing / Large Language Models: Natural language processing or large language models (LLMs) can help identify appearance-focused language, negative self-referencing, repetitive complaint patterns, and unrealistic expectations within digital intake forms, chatbots, teleconsultations, or other text-based interactions. Such tools may be particularly relevant in high-volume aesthetic practices.

Digital Phenotyping: Digital phenotyping refers to the analysis of behavior-derived digital signals to identify clinically relevant psychological patterns. In BDD, this includes repeated symptom reporting, communication patterns, or online behavior that reflects excessive appearance-related preoccupation.

Computer Vision: Computer vision and image-based approaches have been proposed as methods for assessing facial attention patterns and distorted appearance-related focus. However, these approaches remain early in development and currently lack robust clinical validation for routine use in aesthetic settings.

Ethical and Practical Considerations

The integration of AI into BDD screening raises several ethical and practical concerns. These include algorithmic bias, especially where training data reflect narrow or idealized beauty standards; privacy and confidentiality risks associated with text, image, and behavioral data; limited transparency of AI decision-making; and uncertainty regarding accountability when AI systems produce misleading outputs. Current evidence therefore supports the use of AI only as a clinician-supervised support tool rather than an autonomous diagnostic mechanism.

DISCUSSION

Aesthetic intervention often improves a person's morale, self-esteem, and confidence. However, a subgroup of

patients remains dissatisfied with their appearance despite multiple cosmetic interventions, and in some cases, repeated revisions may result in a progressive loss of identity. Body dysmorphic disorder (BDD) may be understood as a form of "imagined ugliness," in which the perceived defect is exaggerated or not observable to others. Proper psychiatric screening in aesthetic practice is therefore essential to optimize patient satisfaction and improve clinical outcomes.¹⁶

Higgin et al.³ described the point prevalence of BDD in the general population as 0.7–2.4% according to DSM-IV criteria. The prevalence appears to be considerably higher in aesthetic practice, with reported rates of 14% in aesthetic dermatology, 21% among patients seeking rhinoplasty, and 10% in facial and plastic reconstructive settings. Their review also noted that cosmetic procedures in the UK had increased by 300% since 2002. The authors emphasized the importance of classifying BDD according to severity, as patients with severe BDD often demonstrate impaired functioning, marked social withdrawal, and substantial disruption of marital and social life. Such patients require urgent psychiatric consultation.

Pre-procedural validated screening tools such as BDDQ, DCQ, and BDDQ-DV are reported to be highly sensitive. Nevertheless, the gold standard for the diagnosis of BDD remains a clinical interview based on DSM-IV Axis I disorders, consisting of 24 questions. Although comprehensive, this interview is lengthy and may be impractical in routine clinical settings. In contrast, screening tools are more convenient and feasible in aesthetic practice. The Yale-Brown scale, modified for BDD, is used primarily in research and clinical practice, although validated perioperative and postoperative screening tools remain limited. BDDQ has shown sensitivity of up to 100% and specificity of 91%, and it is widely regarded as the principal screening tool, followed by subsequent refinements in later studies.⁸

Dufresne et al.⁷ validated a self-reported questionnaire, BDDQ-DV, for the screening of BDD in dermatological settings. However, its effectiveness in mild BDD and in specialties outside dermatology remains uncertain.

Jacob Key Dey et al.⁸ assessed the prevalence of BDD using BDDQ in combination with BDD SCID (Structured Clinical Interview for DSM disorders), which appeared to provide a better framework for identifying patients with BDD. Although this validation study was considered important, it was limited to a single clinic. Follow-up after psychiatric referral and post-treatment psychiatric evaluation remains necessary.

D. Veale et al.⁹ developed the Cosmetic Procedure Screening Questionnaire (COPS), which includes nine domains for assessment. COPS appears to be useful not only in the pre-procedural identification of BDD, but also in monitoring changes following psychiatric treatment.

Sweis et al.¹¹ highlighted the legal implications, threats, and risk of violence following cosmetic intervention in patients with BDD. The article also discussed the importance of informed, valid, and voluntary consent. In addition, it outlined the pathogenesis of body dysmorphic disorder and clearly described important warning signs that should alert the clinician.⁹ David J. Castle et al.¹⁷ provided an update on BDD and discussed its association with obsessive-

compulsive disorder, psychosis, and cognition, while also recommending appropriate psychological and pharmacological treatment approaches. Laura Bowyer et al.¹⁰ in their critical review, examined the outcomes of cosmetic procedures in patients with BDD. Their review, supported by multiple studies, showed that the majority of patients with BDD experience poor outcomes after cosmetic intervention. However, some studies reported positive outcomes in selected patients with mild BDD. It was also noted that approximately 40% of clinics considered BDD to be a contraindication to cosmetic procedures. The literature states that more than 47% of patients seek cosmetic interventions, and among these patients, BDD appears to be more prevalent in cosmetic practice.³ Philip et al.¹⁸ noted that BDDQ focuses on distressing concerns related to physical appearance that preoccupy the patient and lead to distress and impaired functioning.

Jacob K. Dey et al.⁸ demonstrated that a validated screening instrument can be effectively implemented in aesthetic practice. Patients who screen positive on BDDQ should undergo a clinician-administered assessment with BDD SCID. Although these tools help identify BDD, false-positive results may occur. Patients with suicidal tendencies should be carefully identified and referred for psychiatric treatment. Therefore, collaborative teamwork between psychiatrists and aesthetic practitioners is clearly needed. A notable strength of their study lies in the clear conceptualization of BDD as both a psychological and ethical concern in aesthetic practice. They effectively highlight the risks associated with overlooking the disorder, including patient dissatisfaction, repeated interventions, and worsening psychological distress. By placing BDD within the broader context of cosmetic medicine, the article underscores the need for a more psychologically informed model of care.

Haykal et al. emphasize that BDD remains both underdiagnosed and misunderstood in cosmetic settings despite its relatively high prevalence.¹⁴ The authors argue that this diagnostic gap is partly due to the fast-paced nature of aesthetic consultations, in which psychological assessment may be overlooked in favor of procedural planning. The observation is consistent with earlier studies, including Higgins et al., which stressed the importance of detailed history taking and classification of BDD severity to ensure patient safety and optimal outcomes.³ A key contribution of Haykal et al. is their focus on integrating AI as a supportive tool in BDD detection. Traditional screening methods such as BDDQ, DCQ, and BDDQ-DV remain essential, but time constraints and differences in clinician expertise may limit their implementation. The role of AI is not to replace clinical judgment but to enhance it. For example, AI should function as a decision-support system, identifying patients who may require further psychological evaluation rather than proceeding directly to cosmetic intervention. This aligns with evidence from Pereira et al., which demonstrated that patients who screen positive for BDD are more likely to experience poor postoperative outcomes, including dissatisfaction and complications.¹ Taken together, these findings support a more cautious and reflective approach to aesthetic practice, in which

technological tools assist in identifying at-risk individuals and guiding appropriate referral pathways.

In their study, Flygare et al. examined whether machine learning could predict treatment outcomes in individuals with BDD receiving internet-based cognitive behavioral therapy. They found that a machine learning model (random forest) was able to predict remission with reasonable accuracy after treatment, correctly classifying approximately 78% of patients. However, this predictive accuracy declined at follow-up assessments.¹² The study also found that the most important factors associated with better outcomes were lower depressive symptoms, a stronger early therapeutic alliance, greater confidence in the treatment, and less severe BDD symptoms at baseline. Traditional statistical methods performed less well, suggesting that machine learning may be more useful in understanding complex treatment outcomes. Overall, the study suggests that machine learning may help guide more personalized treatment in BDD, although further research with larger samples is required before clinical implementation can be considered.

Importantly, their work demonstrates strong engagement with ethical considerations. The authors critically examine the risk of algorithmic bias, particularly where training datasets are shaped by culturally narrow or idealized standards of beauty. They also emphasize the importance of informed consent, data privacy, and transparency in the use of AI-driven tools. This ethical perspective is an important contribution because it places technological innovation within the broader framework of patient-centred care. However, the article is primarily conceptual and does not provide empirical evidence to confirm the effectiveness of AI systems in detecting BDD. The absence of clinical data, pilot studies, or quantitative validation limits the assessment of the practical applicability of the proposed approaches. In addition, the article offers limited discussion of implementation challenges, including workflow integration, cost, and practitioner training, all of which are essential for real-world adoption. Overall, their work provides a thoughtful and ethically grounded discussion of AI's potential in the detection of BDD. It contributes to the literature by promoting a model of care that prioritizes psychological well-being alongside aesthetic outcomes. Although further empirical research is needed to validate these concepts, it establishes a strong theoretical framework for the responsible integration of AI into aesthetic practice.

Tan et al. examined the emerging role of artificial intelligence in psychodermatology and highlighted its potential to improve diagnostic accuracy, predict treatment outcomes, and facilitate personalized care.⁵ Drawing on a PRISMA-guided review of literature from 2004 to 2024, the authors identified limited but promising evidence showing that machine learning models may predict remission in BDD and identify biomarkers linking psoriasis and anxiety. However, it is emphasized that the field remains underdeveloped because only a small number of heterogeneous studies were available, thereby limiting generalizability. There are also significant challenges, including ethical issues such as data privacy and algorithmic bias, as well as

practical barriers such as gaps in clinician knowledge and implementation difficulties.

Rahsepar Meadi et al. explored the use of conversational AI tools, including mental health chatbots, and the ethical concerns associated with them.¹³ By reviewing more than 100 studies, they showed that such tools may improve access to support, but also carry substantial risks, including inaccurate advice, lack of genuine human empathy, and serious privacy concerns. They also highlighted issues of bias and the absence of clear accountability when problems arise.

Ethical considerations represent another important dimension of AI integration into BDD screening. The risks include algorithmic bias, reinforcement of unrealistic beauty standards, and threats to patient privacy. These concerns are especially relevant in aesthetic medicine, where social and digital influences already shape patient expectations. It is therefore essential to ensure informed consent, data protection, and transparency in the use of AI to preserve patient trust and maintain ethical standards. These concerns further reinforce the observations of Sweis et al. regarding medicolegal implications and the need to protect both patients and practitioners.¹¹

Despite the promising role of AI, several limitations must be acknowledged. AI systems depend heavily on the quality and diversity of the data on which they are trained. Biases in training datasets may lead to inaccurate or culturally restricted interpretations of “normal” or “ideal” appearance. Furthermore, the current evidence base remains largely conceptual, and there are few large-scale clinical trials validating the effectiveness of AI in real-world aesthetic settings. Similarly, while existing screening tools are helpful, they are not universally standardized, and their predictive value varies across clinical contexts.

The integration of AI into the screening and management of BDD represents a promising development in aesthetic medicine. However, it should be regarded as a complementary tool rather than a substitute for clinical expertise, prioritizing early detection, ethical responsibility, and multidisciplinary collaboration. Future research should focus on validating AI-based screening tools through large prospective studies and on developing standardized guidelines to improve patient selection and clinical outcomes in aesthetic practice.¹⁴

CONCLUSION

Body dysmorphic disorder is a common and clinically significant concern in aesthetic practice. Its prevalence is higher in cosmetic populations than in the general population, and affected patients are at increased risk of poor satisfaction, repeated treatment-seeking, and adverse psychological outcomes after aesthetic intervention.

Validated screening tools such as the BDDQ, BDDQ-DV, DCQ, and COPS remain the most practical methods for identifying patients at risk, but they must be used alongside clinical judgment and followed by formal psychiatric or psychological assessment where indicated. Current evidence does not support cosmetic intervention as a primary solution to BDD-related distress.

Artificial intelligence represents a promising adjunctive approach for early recognition. By analyzing behavioral, linguistic, and visual data patterns, AI may help clinicians identify patients who require further evaluation. However, its use must remain ethical, transparent, and clinician supervised. At present, AI should be regarded as a supportive decision-making tool rather than a replacement for established screening and diagnostic pathways.

Future work should prioritize large-scale prospective studies, real-world clinical validation, and development of evidence-based guidance for integrating AI into aesthetic medicine in a way that protects both patient welfare and professional standards.

AUTHOR'S CONTRIBUTIONS

IA: Conceived idea, design, manuscript writing

SFR: manuscript writing, review of literature

AS: Data collection, data analysis

SS: Manuscript writing

SS: Manuscript writing, critical review

NE: Manuscript writing, critical review

All Authors: Approval of the final version of the manuscript to be published

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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