

Prevalence of Body Dysmorphic Disorder in Patients Seeking Orthodontic Treatment: A Systematic Review and Meta-analysis

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Abstract

Background: Body dysmorphic disorder (BDD) is a psychological state in which patients recognize a distorted perception of their body images. Herein, we aimed to evaluate the prevalence of BDD in patients seeking orthodontic treatment via a systematic review of the scientific literature. Further, in the meta-analysis, the emphasis was to explore the central tendency and level of significance in cases of BDD seeking orthodontic treatment. **Data sources:** A detailed scientific literature search was conducted utilizing the most relevant scientific studies between 2000 and 2020. We searched various databases, including PubMed, Cochrane Central Register of Controlled Trials, and Scielo databases. The MedCalc tool was used for the meta-analysis. **Data selection:** We analyzed a total of 1745 participants enrolled in five different studies. The clinical diagnosis results showed 122 cases of BDD-YBOCS (based on the Yale-Brown Obsessive-Compulsive Scale for BDD score) seeking orthodontic treatment. A significant increase (5–10%) in the number of BDD cases opting for orthodontic treatment was noted, and female patients with BDD showed a higher tendency of seeking orthodontic treatment than the male patients. Considering the forest plot and funnel plot analyses, a significant increase in the cases of BDD was observed (proportions; $P < 0.0001$). **Conclusions:** The patients with BDD seeking orthodontic treatment have increased over the last two decades (range: 5–10%). Orthodontists are recommended for these cases of BDD seeking multiple consultations.

Keywords: Body dysmorphic disorder; Orthodontic; Randomised clinical trials; Prevalence

Introduction

Psychological disorders are associated with human physiology and have a detrimental impact on mental and physical health. However, the increase in psychological disorders and diversity among them pose a challenge to the modern healthcare system. Body dysmorphic disorder (BDD), also referred to as dysmorphophobia, is a common and severe psychological state where patients perceive a distorted image of their bodies. [1] BDD remains associated with distress, and the impaired perception with imagined or slight defects in appearance raises behavioural problems. Patients with BDD, especially in severe cases, possess a comparatively higher tendency of compulsive behaviour and suicidal thoughts. Over the period, efforts have been made for an effective and robust approach for the diagnosis of BDD. Using the Yale-Brown Obsessive-Compulsive Scale for BDD (BDD-YBOCS), the diagnosis of BDD was evaluated by Phillips et al., for reliability and reproducibility. The BDD-YBOCS questionnaire is comprised of 12 questions, the first three questions access the diagnosis of BDD and the remaining questions largely focus on the severity of diseases based on the symptoms. According to the BDD-YBOCS questionnaire-based evaluation, a score of three refers to patients with BDD, while

a score ranging from 4–5 represents mild and 6–7 represents moderate BDD. Further, a score of 8–9 and 10–11 pertains to severe and extremely severe BDD, respectively. [2] As per the Diagnostic and Statistical Manual of Mental Disorders–5, BDD is classified as obsessive-compulsive disorder closely associated with distorted physical appearance. [1]

The face is a significant concern for patients diagnosed with BDD. [3] In recent years, there has been an increase in the number of patients opting for orthodontic treatment to improve their physical appearance. Patients with BDD are concerned regarding the ugliness of the nose, eyes, eyelids, eyebrows, ears, cheeks, teeth, lips, mouth, and jaws and they seek treatment procedures.

Patients with BDD opting for orthodontic treatment procedure seek multiple orthodontists for their satisfaction of their

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physical appearance. The rise in the number of cases seeking orthodontic treatment, both patients with BDD and healthy individuals, is because of the availability of treatment options. This study was conducted because of the increase in the cases of BDD and patients seeking treatment for physical appearance mainly associated with facial ugliness. The study aimed to provide a comparative analysis of the increase in patients with BDD seeking orthodontic treatment in different countries using a systematic review and meta-analysis method. The study explored the prevalence of disease and tendency for orthodontic treatment based on participants enrolled and percentage of BDD cases, including region and sex. Therefore, in this systematic review and meta-analysis, patients with BDD seeking orthodontic treatment were analyzed for the prevalence of disease. A meta-analysis was conducted on the eligible studies published between 2000 and 2020 based on inclusion and exclusion criteria to provide a general and central tendency of the increase in the cases of BDD and clinically diagnosed BDD cases seeking orthodontic treatment.

Materials and Methods

This systematic review and meta-analysis was performed in compliance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.

A detailed scientific literature search was performed utilizing the most relevant scientific studies between 2000 and 2020. Herein, we investigated various databases, including PubMed, Cochrane Central Register of Controlled Trials, and Scielo databases. A detailed examination was performed for the most relevant studies of scientific outcomes in the given area. Different databases and resources were explored to investigate the most relevant studies, mainly randomised clinical trials (RCTs), meta-analyses, and expert opinions. The details of the studies were retrieved using several specific searches, which were specific to our theme. The meta-analysis was performed using the MedCalc tool (MedCalc Software Ltd, Acaciaaan 22 8400, Ostend, Belgium) with multiple selection criteria for the continuous measure, proportion, and relative risk analysis.

Procedure

The studies associated with RCTs and meta-analyses were included in this study. Different key search words were used for searching the most relevant studies. The keywords used in search of most relevant studies included 'body dysmorphic disorder', 'dysmorphophobia', 'body dysmorphia,' 'prevalence', and 'orthodontic treatment.' During this process of searching the most relevant studies, keywords were used alone and or in combination. Further, search keywords, such as RCTs, meta-analyses, and human studies, were used for evaluating the study design, protocol, and number of participants. The full-length studies fulfilling inclusion and exclusion criteria were selected for the systematic review and meta-analysis.

Inclusion and exclusion criteria

The inclusion and exclusion criteria applied to this study are summarized in Table 1. We strictly included RCTs and meta-analyses, explicitly discussing patients with BDD seeking

orthodontic treatment options. All the relevant studies were included for the analysis from all different languages. We excluded poorly defined studies, those not covering our theme, or those in which only abstracts were available.

Data analysis

A meta-analysis of selected studies was conducted using the MedCalc tool (<https://www.medcalc.org/>). We used three distinct features of this tool for the meta-analysis, namely, continuous measures, proportion, and risk factor analysis. In the meta-analysis, three different variables (sample size, clinically diagnosed cases of BDD, and percentage of BDD cases opting for orthodontic treatment) were considered for the studies published between 2000 and 2020. The data analysis was conducted for significance level using continuous measure, proportion, and risk analysis. Further, 95% confidence interval (CI) and standard error were determined using the selected studies.

Results

We found 53 original articles using multiple keywords searches among various databases. Out of these, only five articles were found suitable for the analysis based on the predefined inclusion and exclusion criteria. During the screening, 42 studies were excluded based on a lack of selective and complete information. Further, six more studies were excluded owing to partial information on cases of BDD and orthodontic treatment. Further analysis was conducted based on the findings of these five articles. Figure 1 represents the study design based on the PRISMA flow diagram. The selection of studies, including full-length articles, was based on the BDD-YBOCS score (mild, moderate, and severe). Only five out of 53 studies included for the meta-analysis showed a low risk. The reported cases of BDD and percentage of BDD cases opting for orthodontic treatment were the key variables, and studies were selected based on our inclusion and exclusion criteria.

Baseline characteristics

As shown in Table 2, a significant increase in cases of BDD (5–10%) and the tendency for orthodontic treatment among these patients was noted. Additionally, among the included studies, a significant variation in the percentage of BDD cases in different countries was observed [Table 2] and [Table 3]. Based

Table 1: Criteria followed in the present systematic review.

Inclusion and Exclusion Criteria	
Inclusion criteria	
	RCTs
Outline	Studies that provide an estimated prevalence and the total number of the population affected.
Patients	Orthodontics with or without BDD
Intervention	Orthodontic treatment procedure
Language	BDD Diagnosis
	Not Defined
Exclusion criteria	
Outline	Poorly explained and/or incomprehensible methodology
	BDD diagnosis performed in a non-standardized/recommended way
Publication Method	Abstract only

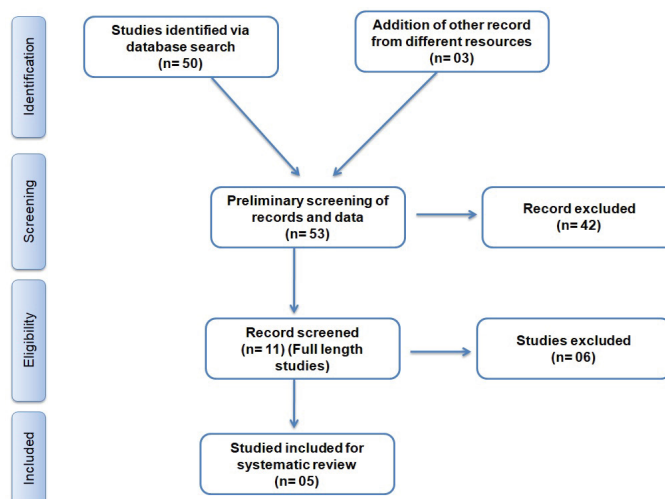


Figure 1: Preferred reporting items for systematic reviews and meta-analyses. Flow diagram: Figure depicts work layout for this study.

Table 2: The table summarizes the pattern and prevalence of BDD cases among patients opting for orthodontic treatments.

Total number of participants	No of diagnosed BDD	(%) BDD	References
40	3	7.5	Hepburn and Cunningham
91	24	26.4*	De Jongh et al.
1184	62	5.2	Sathyanarayana et al.
160	16	10	Vulink et al.
270	17	6.2	Yassaei et al.

*Here in the case of a given study, the percentage is more significant than 100% because most subjects indicated to have appearance concerns about more than one location. ** Patients shown their concern during the BDD YBOCS questionnaire for teeth along with other face parts.

Table 3. Distribution of BDD cases seeking orthodontic treatment with gender-wise in different countries along with the severity of the disease.

Study	Study Size	Confirmed BDD and BDD-YBOCS score	Distribution		Geographical
			Male	Female	
Sathyanarayana et al. (2020)	1184	62 (5.2%) 4-5 (3.2%) Mild 6-7 (1.6%) Moderate 8-9 (0.4%) Severe	49	13	India
*Yassaei et al., (2012)	270	17 (6.2%) 4-5 (2.2%) Mild 6-7(3.3%) Moderate 8-9 (0.7%) Severe	2	13	Iran
De Jongh et al., (2009)	170** 91***	24 (26.4%) BDD-YBOCS score was not mentioned	64	106	Netherlands
Vulink et al., (2008)	160	16 (10%) BDD-YBOCS score was not mentioned	5	11	Netherlands
Hepburn & Cunningham, (2006)	40	3 (7.5%) 5 (1) Mild 7(1) Moderate 9 (1) Severe	1	2	United Kingdom

*BDD Cases qualified for orthodontic treatments were 15 (5.5%) out of 17 diagnosed BDD cases. 2 BDD diagnosed cases fail to qualify for orthodontic treatment. ** Total participants for cosmetic treatment, including orthodontic treatment. ***Total participants are explicit for orthodontic treatment.

on data available in selected studies, Netherland (10%) reported the highest percentage of BDD cases opting for orthodontic treatment, followed by the United Kingdom (7.5%). Further, considering the BDD-YBOCS score for severe patients, there was a uniform distribution of BDD cases. Except for India, the remaining four other countries had a significantly higher prevalence of BDD cases. All the five studies were conducted in different regions and with different sample sizes; hence, we considered the percentage of BDD cases as a key variable for the systematic review and meta-analysis.

Meta-analysis

The results showed that the meta-analysis of selected and qualified studies based on inclusion and exclusion criteria for clinically diagnosed cases of BDD seeking orthodontic treatment differed in the incidence/tendency under analysis setting: continuous measure (P=1.0000), proportion (P<0.0001), and risk factor analysis (P=1.0000). As shown in Figure 2, a significant rise in the cases of BDD opting for orthodontic treatment was observed over the other two analyses settings, i.e., continuous measure and risk factor analysis. The computing level of significance and

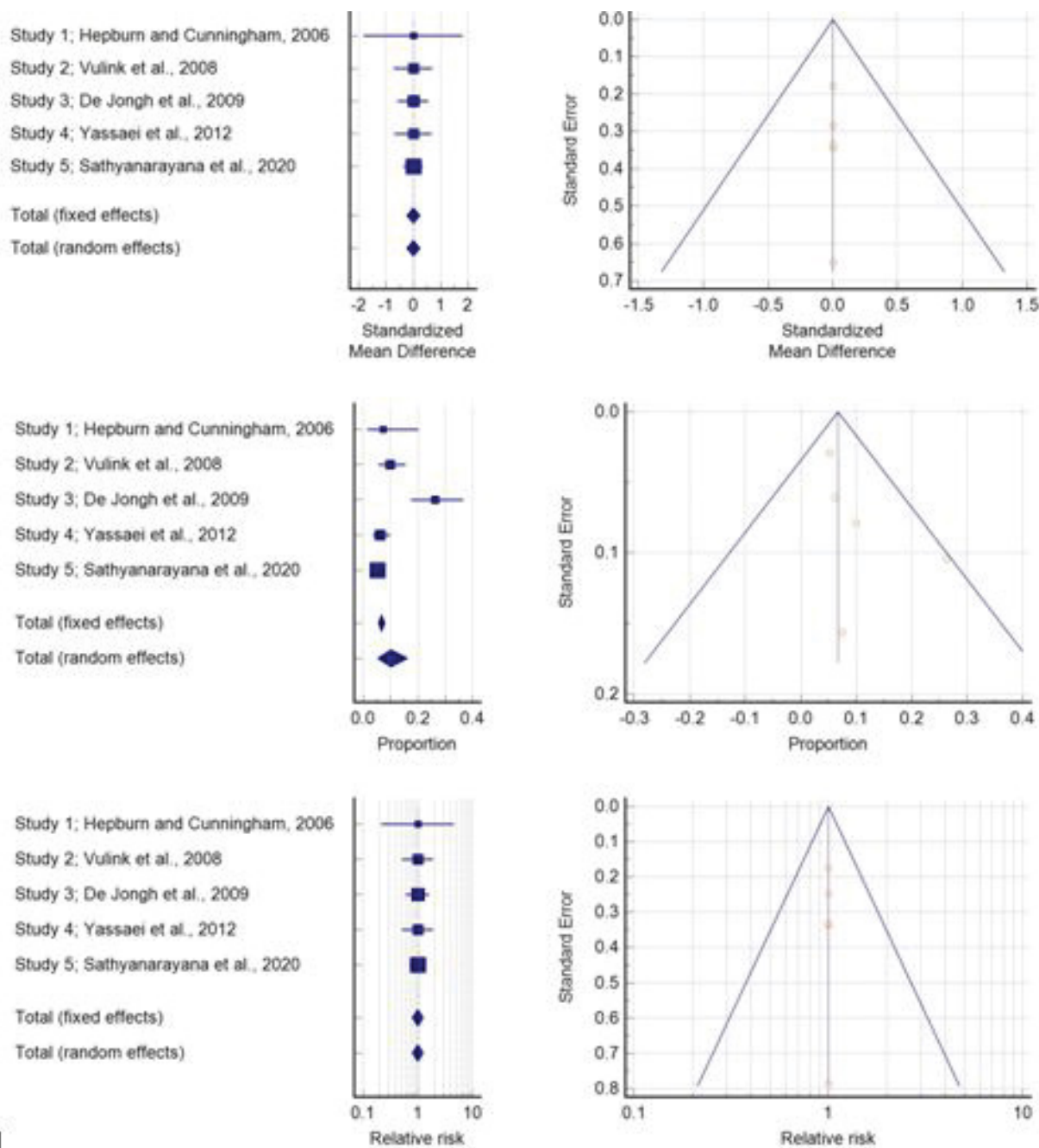


Figure 2: Meta-analysis of body dysmorphic disorder (BDD) cases opting for orthodontic treatment among the selected studies between 2000 and 2020. The continuous measure (a) provides a central tendency of BDD cases seeking orthodontic treatment along with the proportion of BDD cases opting orthodontic treatment (b) and the relative risk for BDD (c).

variance, which were similar, depicted a close resemblance in risk factors of BDD cases and a tendency to seek orthodontic treatment ($P=1.0000$). However, in the selected and qualified studies for this meta-analysis, data were scattered. Therefore, it was difficult to compute a precise percentage of BDD cases seeking orthodontic treatment. As shown in Figure 2, risk assessment and proportions significance level was one i.e., non-significant ($P=1.0000$) considering the forest plot and funnel plot analyses. Details of 95% CI and heterogeneity are provided in Supplementary Tables. Considering the proportion of BDD cases, a high heterogeneity was reported ($I^2=88.91\%$) with 95% CI between 76.83 and 94.69.

Discussion

Recently, a study [4] have reported that a significantly higher percentage of patients with BDD seek orthodontic treatment. In the study, it was reported that 5.2% of clinically diagnosed patients with BDD mostly sought treatment of the following: teeth (38%); hair along with teeth (19%); and teeth, lips, nose, and pigmentation (5%). The study also reported an increased number of cases seeking orthodontic treatment among clinically diagnosed BDD and non-BDD patients owing to the availability of treatment facility. The study further demonstrated that patients with BDD opting for orthodontic treatment sought multiple consultations for different orthodontic problems,

including tooth rotation and spacing. The study also showed a higher prevalence of mild and moderate cases of BDD in the Indian population that opted for orthodontic treatment procedures, where the female percentage was comparatively higher than the male percentage. Further, Vulink et al. [5] studied 160 cases of BDD with maxillofacial problems, where 17% of clinically diagnosed patients with BDD showed significant concerns towards facial beauty and orthodontic treatment. The study also demonstrates a growing prevalence of BDD cases with orthodontic treatment. The increase in cases of BDD, along with a higher tendency of orthodontic treatment, conveys a message to the orthodontists for more psychological care among these patients. In another study, Yassaei et al. [6] reported patterns and prevalence of BDD cases and orthodontic treatment concerns among these patients. In this study, a significant percentage of BDD (5.5%) was reported in the Iranian population seeking orthodontic treatment. In this study, considering limited original work, only five studies were found in which diagnosed cases of BDD sought orthodontic treatment. In these studies, it was reported that along with orthodontic treatment other treatments for facial improvement were also opted by the patients with BDD.

Further, in one study, among patients diagnosed with BDD, not all patients were qualified for orthodontic treatment. [7] No clear threshold/minimal defect that qualifies a patient with BDD for orthodontic treatment is established, as in one study out of 17 clinically diagnosed cases of BDD, only 15 cases qualified for orthodontic treatment despite the other two cases experiencing a dental issue. Severe lack of precise orthodontic treatment was reported in one of the study. In many cases, orthodontic treatment along with treatment of nose, hair, and another face parts was sought. [8]

Hepburn S and Cunningham S [9] found that there was a significant BDD orthodontic case. There was an unequal distribution of patients with BDD in the given study groups. In another study by Except for India, in the remaining countries women had a higher tendency of seeking orthodontic treatment. In a given sample size, selecting cases of BDD actually seeking orthodontic treatment remains a challenge for meta-analysis. There are no clear-cut criteria based on the BDD-YBOCS score, whether the mild, moderate, or severe cases will qualify for orthodontic treatment. In this study, we reported a similar pattern of BDD cases and a tendency of seeking orthodontic treatment in the clinically diagnosed patients with BDD. However, in this study, significance level and relevancy remain a concern, which depends on the studies selected for the cases of BDD precisely opting for orthodontic treatment and guidelines (to qualify) to clinically diagnose patients eligible for orthodontic treatment. Furthermore, in this study, the researcher emphasised that most of the patients with BDD that sought orthodontic treatment were women, where the BDD-YBOCS score was significant, i.e., mild and moderate. Selecting a single variable in the meta-analysis was a more considerable constraint considering facts mainly in determining the forest plot and risk assessment for the central tendency.

Study Limitations and Conclusion

The major challenge in this study was the lack of studies

fulfilling the inclusion and exclusion criteria. Further, in the available studies, selective work focusing on the cases of BDD opting for orthodontic treatment was another challenge. In this study, the eligibility of clinically diagnosed BDD cases seeking orthodontic treatment remains a concern. Even though the participants were diagnosed with BDD based on the BDD-YBOCS score, a case was found ineligible for orthodontic treatment.

In conclusion, considering the available literature on the cases of BDD seeking orthodontic treatment, our search was limited to five studies that fulfilled the predefined inclusion and exclusion criteria. In this systematic review and meta-analysis, we conclude that the cases of BDD seeking orthodontic treatment have increased in the last two decades. However, patients with BDD seeking aesthetic treatment for physical appearance were only limited to teeth and other facial parts. In general, the female patients diagnosed with BDD reported a higher tendency of seeking orthodontic treatment than the male patients. There was a slight variation in orthodontic treatment as well, including tooth rotations and spacing. The following outcomes can be derived from this systematic review and meta-analysis:

- A significant rise in cases of BDD seeking orthodontic treatment was noted. The rise of such cases also depended on the facility available and clinical diagnosis of BDD cases in a given population.
- Female patients with BDD had a higher tendency of seeking orthodontic treatment than the male patients. In the selected studies, based on our inclusion and exclusion criteria except for India, the remaining countries had a significantly higher number of female patients with BDD that opted for orthodontic treatment.
- Orthodontists must consider the psychological state of the patients with BDD seeking orthodontic treatment, as in most cases multiple consultations were reported.
- Considering the significance level determined from the meta-analysis of selected studies an increase in the number of patients with BDD seeking orthodontic treatment was visible (proportions; $P < 0.0001$); however, eligibility of such cases for orthodontic treatment remains a concern and depends on several factors: the guidelines for orthodontic treatment, availability of facility, and BDD-YBOCS score.

Competing Interests

The authors declare that they have no competing interests. All the listed authors contributed significantly to the conception and design of study, acquisition, analysis, and interpretation of data and drafting of the manuscript, to justify authorship.

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