Systematic Review

Evaluation of Awareness of Functional Jaw Orthopedics Appliances in Population: A Systematic Review

[1]Amol A. Verulkar, [2]R. H. Kamble, [3]Sunita Srivastav, [4]Niyati Potode

[1]PhD Resident, [2]Professor & Head, [3]Professor, [4]P G Student

[1,2,3,4]D Department of Orthodontics and Dentofacial Orthopedics, S.P. Dental College, DMIMS, Sawangi, Wardha, M.S. India.

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Amol A. Verulkar, R. H. Kamble, Sunita Srivastav, Niyati Potode

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ABSTRACT

Background:the Functional jaw orthopedics appliances effectively correct the skeletal problems, but still majority of patients are not aware about these appliances

Objectives: to evaluate the literature regarding the awareness of functional jaw orthopedics appliances in population.

Search methods: A comprehensive search of electronic databases without language or time restrictions was undertaken, applying a pre-specified search strategy. Supplementary electronic searching of orthodontics journals and references list of included studies was performed.

Data sources: Cochrane Central Register of Controlled Trials and the Cochrane database of systematic reviews, PUB-MED and SCOPUS.

Study eligibility criteria: Participants-Population related to orthodontic treatment. Interventions-Functional jaw orthopedics appliances i.e internal growth modification appliances (e.g. myofunctional appliances) or external growth modification appliances (e.g. head gear)

Selection criteria: Randomized controlled trials (RCT) and non-randomized studies (NRS).We considered prospective and retrospective non-randomized studies. We did not consider other reviews, opinions, case series, case reports and in vitro studies.

Data collection and analysis: Three selection phases were carried out by two independent researchers. Initially, all titles were analyzed to eliminate irrelevant publications, review articles, case series, case reports, studies involving animals and in vitro studies. All abstracts of the selected publications were analyzed in first phase and the full texts of the articles were read in second phase. After that studies were excluded as per eligibility criteria. A table was constructed with the data from final selected studies and the findings. The data considered for final table: author, year of publication, study design, study group, sample size, methods/measures, results of study and conclusion regarding functional jaw orthopedics.

Results: Search strategy resulted in the retrieval of 262 publications, only two studies were found to meet our criteria. These both studies are cross-sectional survey studies. All articles selected had a high risk of bias.

Conclusion: There is little evidence concerning the awareness of functional jaw orthopedics among the population. There is a need to enhance the awareness regarding functional jaw orthopedics. These results should be viewed with caution, as a definitive need for high-quality long-term research into this area is required.

Registration: PROSPERO (CRD42020180458)

Key words: Functional jaw orthopedics, Awareness, Myofunctional appliance.

INTRODUCTION

RATIONALE

Skeletal class II and class III malocclusion can be most effectively treated by non-extraction means if diagnosed at an early age with correct patient –parent motivation. As Witzig has rightly said, "*There are no bad patients or appliance that fail, it's we doctor who fail to motivate the patient for a correct*

patient-appliance combination"

Functional appliances improve the sagittal intermaxillary relationship mainly by their effect on the mandible and show a significant dental effect by overjet reduction. The skeletal changes are brought about by stimulation of condylar growth [1-5] as well as a contribution by a certain amount of fossa advancement.[6-9] They also seem to exert a growth-restraining effect on the maxilla.[7,10,11] Besides the small sagittal skeletal base improvement influencing overjet, the dentoalveolar effect on overjet is brought about by palatal tipping of maxillary and labial tipping of mandibular incisors, respectively.[7, 12,] Extra Oral Appliance like Headgear appliances also improve the sagittal intermaxillary relationship, demonstrating a large effect on the maxillary skeleton. They appear to achieve this growth modification by means of a sutural response.[13-15]

Functional jaw orthopedics appliances treat the etiology behind the development of malocclusion and not the consequences produce by it as in camouflage treatment. This treatment modality can eliminate the need and/or minimize the extent of surgical correction that may be required after completion of growth.

Though, the Functional jaw orthopedics appliances effectively correct the skeletal problems, but still majority of patients are not aware about these appliances. And they use to visit dentist and/or orthodontist after cessations of growth. Effects of the functional appliances on skeletal and dental tissues have been promptly investigated, whereas patients' and parents' perception of these appliances has not been questioned yet.[16, 17] Thus itis important to find out level of awareness regarding functional jaw orthopedics among the population.

OBJECTIVES

The aims of this review were to critically evaluate in systematic manner, the available literature regarding the awareness of functional jaw orthopedics appliances in population.

MATERIAL AND METHOD

Protocol and registration-

This systematic review was registered in the International Prospective Register of Systematic Reviews (PROSPERO) under protocol number (CRD4202018458). This review was conducted following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

ELIGIBILITY CRITERIA

Participants:

Population related to orthodontic treatment

INTERVENTIONS

Functional jaw orthopedics appliances i.e internal growth modification appliances (e.g. myofunctional appliances) or external growth modification appliances (e.g. head gear)

COMPARISONS

Other orthodontic appliances

OUTCOMES

The main outcome of this systematic review was to evaluate the level of awareness of functional jaw orthopedic appliance in population.To address the uncertainty or variation in practice of functional jaw orthopedics appliances.

The additional outcomes of this systematic review were-

1. Find out the reasons of variation in awareness of functional jaw orthopedic appliance in population.
2. Find out the solutions for reasons of variation in awareness of functional jaw orthopedic appliances in population.

Types of included studies:

- Randomized controlled trials (RCT) and non-randomized studies (NRS)
- We considered prospective and retrospective studies.
- We did not consider other reviews, opinions, case series and case reports

Information sources, Search and study selection.

Unrestricted electronic literature searches were performed using database-specific controlled text and keywords up to 15 April 2020 in the following database: Cochrane Central Register of Controlled Trials and the Cochrane database of systematic reviews, PUB-MED and SCOPUS. In addition, a comprehensive manual search was performed screening the reference lists of the included articles and relevant review articles. Ongoing and unpublished studies were retrieved by searching trial registries and databases of grey literature (table 1).

The study selection was performed in duplicate by two independent review authors (AV and NP). Disagreements were resolved by discussion with third review author (RK).

Data collection process and Data items.

Three selection phases were carried out by two independent researchers (AV and NP). Initially, all titles were analyzed to eliminate irrelevant publications, review articles, case series, case reports and studies involving animals. All abstracts of the selected publications were analyzed in first phase and then full texts of the articles were in second phase. After that studies were excluded as per eligibility criteria. A table was constructed with

the data from final selected studies and the findings. The data considered for final table: author, year of publication, study design, study group, sample size, methods/measures, results of study and conclusion regarding functional jaw orthopedics.

all the following criteria were reported:

1. Randomized sample selection;
2. Definition of inclusion and exclusion criteria for sample;

Table 1- Characteristics of studies selected

Author (year)	Study design	Study group	Sample size	Method used	Results of study	Conclusion (regarding FJO)
S. Sruthi (2018)	Cross-sectional Survey	Patient and general population	100	A questionnaire with 15 questions were printed and distributed among patients and general public and their responses regarding the importance of undergoing early orthodontic treatment, functional and myofunctional appliance therapy were recorded	65% of the people were aware, 35% of the people were not aware of the existence of fixed and removable myofunctional appliances	From this study, it has been concluded that the patients and general public were aware of the facial skeletal jawbone problems to an extent, but the acceptability of these appliances was relatively less and most of them felt it unpleasant to be worn in public and their knowledge regarding functional and myofunctional appliances are less and more awareness has to be created.
Naif A. Bindayel (2018)	Cross-sectional Survey	Saudi Arabia general population	350	Saudi participants have completed a survey listing various orthodontic modalities nextto its images. Likert awareness scale was used to assess the awareness of nine orthodonticmodalities and participants were asked to rank the most preferred orthodontic appliance.	Stainless steel and ceramic brackets, along with clear aligners displayed moderate-to-high awareness levels. However,statistically significant lower recognition of early treatment tools, namely, expander, headgear, and functional appliances wasevident (P < 0.01).	Educational community program should focus onimproving general knowledge of orthodontic appliances,especially the ones concerning early dentofacialorthopedic treatments.

The process of data extraction was performed independently by two review author (AV and NP). Disagreements were handled by contracting a third review author (RK).

Risk of bias in individual studies

Prisma guidelines were used to assess the methodological quality of studies. The risk of bias was considered low when

3. Use of validated measures; and
4. Adequate statistical analysis.

When one of the above criteria was absent, the risk of bias wasconsidered as moderate.When two or more criteria were absent, the risk of bias wasconsidered as high.

Summary measures and approach to data synthesis

A comprehensive qualitative synthesis of the results comprising the pre-set outcomes of this review was performed. If results of two studies reporting on similar interventions and outcomes, we conducted pair-wise meta-analysis.For dichotomous data, the relative risk (RR) alongside its 95% confidence interval (CI) was planned to choose as a summery effect measure.For continuous data, the change scores and their corresponding standard deviation (SD) were pooled together and the mean difference (MD) was used as a summery effect measure alongside its 95% confidence interval (CI). Statistical heterogeneity was quantified using the I^2 metric where arbitrary threshold of 0-40%, 30-60%, 50-90 % and 75-100% corresponds to non-important, moderate, substantial, and considerable amount of inconsistency, respectively.

Dealing with missing data

When there are missing data, we attempted to contact original authors of the study to obtain the relevant missing data.

Risk of bias across studies

Clinical heterogeneity was gauged by inspecting the participants with regards to their education, age, occupation, and rural/urban status.

Table 2 – Quality assessment of studies selected

Quality criteria	S. Sruthi (2018)	Naif A. Bindayel (2018)
Randomized sample selection	Yes	Yes
Definition of inclusion and exclusion criteria	No	No
Use of validated measures	Yes	Yes
Adequate statistical analysis	No	No
Estimated potential risk of bias	High	High

RESULTS

Study Selection

The electronic database searches resulted in 261 articles and 1 additional article was identified through manual search. After removal of duplicated and irrelevant articles only 64 articles remained and after screened based on their titles and abstracts 56 remained.A final sample of 8 articles was subsequently screened based on their full texts and only two studies were found to meet our criteria. These both studies are cross-sectional survey studies. Figure 1 displays the different steps of selection process. Table 1 offer a detailed analysis of each article selected for the present systematic review.

Study characteristics

A total two studies were found to meet our criteria. These both studies are cross-sectional survey studies. First study by S. Sruthi[18] (2018) is a questionnaire base study. In that study 15 questions were printed and distributed among 100 patients and general public and their responses regarding the importance of undergoing early orthodontic treatment, functional and myofunctional appliance therapy were recorded. In second study by Bindayel NA[19] (2018) 350 Saudi participants have completed a survey listing various orthodontic modalities next to its images. Likert awareness scale was used to assess the awareness of nine orthodontic modalities and participants were asked to rank the most preferred orthodontic appliance.

Risk of bias within studies

All articles selected had a high risk of bias (Table 2).

Results of individual studies

As per first study by S. Sruthi[18] (2018) 65% of the people were aware, 35% of the people were not aware of the existence of fixed and removable myofunctional appliances. And results of second study by Bindayel NA[19] (2018) isstainless steel and ceramic brackets, along with clear aligners displayed moderate-to-high awareness levels. However, statistically significant lower recognition of early treatment tools, namely, expander, headgear, and functional appliances was evident ($P < 0.01$).

Synthesis of results

From a methodological standpoint, a meta-analysis was not possible due to both clinical and statistical heterogeneity. Comparisons of studies are also limited due to difference in study design, sample selection and sample size.

DISCUSSION

Summary of Evidence

The present finding should be interpreted with caution, as only two papers met the eligibility criteria established and none exhibited a high degree of scientific evidence. [18,19]Thus, while the studies selected regarding the awareness of functional jaw orthopedics appliances in population, the scarcity of consistent studies underscores the lack of scientific evidence on the actual

awareness of functional jaw orthopedics appliances.

Functional jaw orthopaedics appliances treat the etiology behind the development of malocclusion and not the consequences produce by it as in camouflage treatment. This treatment modality can eliminate the need or minimize the extent of surgical correction that may be required after completion of growth. Though, the Functional jaw orthopaedics appliances effectively correct the skeletal problems, but still majority of patients are missed the crucial treatment time as skeletal corrections are possible only in the growing phase. And less awareness of functional jaw orthopedics appliances among the population might be the reason for this.

LIMITATIONS

To reiterate, while the studies selected for the present systematic review regarding awareness of functional jaw orthopedics among the population, a number of limitations are found, especially with regard to a number and quality of the studies analyzed. As there is a maximum orthodontic patients are of class II and class III malocclusion, further studies with more rigorous methods should be carried out to find out the awareness of functional jaw orthopedics appliances among the population.

CONCLUSION

There is little evidence concerning the awareness of functional jaw orthopedics among the population. There is a need to enhance the awareness regarding functional jaw orthopedics. These results should be viewed with caution, as a definitive need for high-quality long-term research into this area is required.

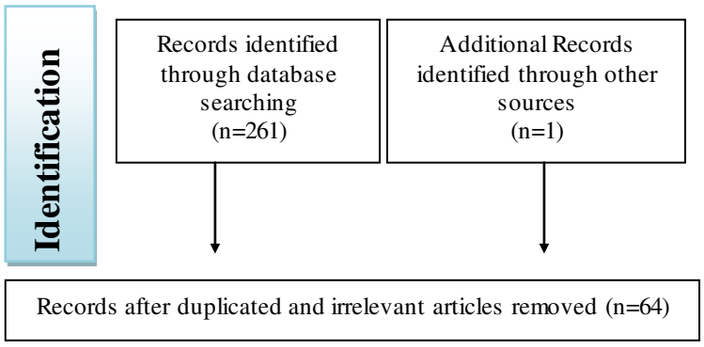
FUNDING

This review received no funding

ABBREVETIONS

- e.g. –(exempli gratia) for example
- i.e. –(id est) in other words
- RCT- Randomized controlled trials
- NRS-Non-randomized studies.
- PROSPERO – International Prospective Register of Systematic Reviews
- PRISMA – Preferred Reporting Items for Systematic Reviews and Meta-Analysis
- AV – Amol Verulkar
- RH- Ranjit Kamble
- NP- Niyati Potode
- SS- Sunita Shrivastav
- RR- relative risk
- CI – confidence interval
- SD – standard deviation
- MD – mean difference

Figure 1- PRISMA flow chart



REFERENCES

1. Charlier JP, Petrovic A, Herrmann-Stutzmann J. Effects of mandibular hyperpropulsion on the prechondroblastic zone of young rat condyle. Am J Orthod. 1969; 55:71–74.
2. McNamara JA, Carlson DS. Quantitative analysis of temporomandibular joint adaptations to protrusive function. Am J Orthod. 1979; 76:593–611.
3. Williams S, Melsen B. Condylar development and mandibular rotation and displacement during activator treatment:an implant study. Am J Orthod. 1982; 81:322–326.
4. Woodside DG, Altuna G, Harvold E, Herbert M, Metaxas A.Primate experiments in malocclusion and bone induction.Am J Orthod. 1983; 83:460–468.
5. Rabie ABM, She TT, Hagg U. Functional appliance therapy accelerates and enhances condylar growth. Am J OrthodDentofacial Orthop. 2003; 123:40–48.
6. Birkebaek L, Melsen B, Terp S. A laminagraphic study of the alterations in the temporomandibular joint following activator treatment. Eur J Orthod. 1984; 6:267–276.
7. Vargervik K, Harvold EP. Response to activator treatment in Class II malocclusions. Am J Orthod. 1985; 88:242–251.
8. Woodside DG, Metaxas A, Altuna G. The influence of functional appliance therapy on glenoid fossa remodeling. Am J Orthod Dentofacial Orthop. 1987; 92:181–198.
9. Voudouris JC, Woodside DG, Altuna G, Angelopoulos G,Bourque PJ, Lacouture CY, Kuftinec

MM. Condyle-fossa modifications and muscle interactions during Herbst treatment,part 2. Results and conclusions. Am J Orthod Dentofacial Orthop. 2003; 124:13–29.

10. Harvold EP, Vargervik K. Morphogenetic response to activator treatment. Am J Orthod. 1971; 60:478–490.

11. Collett AR. Current concepts on functional appliances and mandibular growth stimulation. Aust Dent J. 2000; 45:173–178.

12. Bjork A. The principle of the Andresen method of orthodontic treatment: a discussion based on cephalometric x-ray analysis of treated cases. Am J Orthod. 1951; 37:437–458.

13. Triftshauser R, Walters RD. Cervical retraction of the maxillae in the Macaca mulatta monkey using heavy orthopedic force. Angle Orthod. 1976; 46:37–46.

14. Brandt HC, Shapiro PA, Kokich VG. Experimental and postexperimental

1. effects of posteriorly directed extraoral traction in adult Macacafascicularis. Am J Orthod. 1979; 75:301–317.

15. Jackson GW, Kokich VG, Shapiro PA. Experimental and postexperimental response to anteriorly directed extraoral force in young Macacanemestrina. Am J Orthod. 1979;75: 318–333.

16. Cozza P, Baccetti T, Franchi L, De Toffol L, McNamara JA Jr. Mandibular changes produced by functional appliances in class 2 malocclusion: A systematic review. Am J Orthod Dentofacial Orthop 2006;129:599.e1-12.

17. Koretsi V, Zymperdikas VF, Papageorgiou SN, Papadopoulos MA. Treatment effects of removable functional appliances in patients with class 2 malocclusion: A systematic review and meta-analysis. Eur J Orthod 2015;37:418-34.

18 . Sruthi , S . Knowledge and awareness the importance of undergoing early orthodontic treatment , the importance of undergoing functional and myofunctional appliance , and acceptance among public . Drug Invention Today . 2018 ; 10: 2789-2796.

19. Bindayel NA. Awareness of orthodontic modalities and preference of appliance and payment options in Saudi Arabia.Saudi J Oral Sci 2018;5:98-103