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Original Research Article

Perceptions of the dental attractiveness and orthodontic treatment needs among the school-going population of the rural areas of Lucknow

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ABSTRACT

Aim and Objectives: Application of the Index of Orthodontic Treatment Need (IOTN) to assess and grade the perceptions of dental attractiveness and orthodontic treatment need among the school-going population of the rural areas of Lucknow, formulate a questionnaire to record the response of the study population and comparison by the statistical appraisal, the grading of aesthetics and treatment need as recorded by the orthodontist and as implied by the study subjects.

Materials and Methods: A multistage cluster sample of 650 school students aged 12-18 years was selected. A proforma containing personal data such as name, gender, age, DHC grading, AC grading (by both examiner and subject), and a brief questionnaire was created to record the results per person. The Dental health component (DHC) and the aesthetic component (AC), both were recorded for IOTN-based treatment needs assessment.

Results: According to the DHC, 30% of people had a clear need for therapy, 54.62% had a marginal or mild need, and 15.38% had no need at all. As per the AC, 52.9% of respondents had no or a mild need for therapy, 22.3% had a questionable need, and 24.8% had a clear need for intervention. Furthermore, 43.5% of the subjects had no idea at all about Orthodontics and Dentofacial Orthopaedics, while 31.4% identified the branch with the word braces which is a concerning fact.

Conclusion: A statistically significant association between the DHC and the subject's willingness to undergo locally provided and economically feasible Orthodontic treatment indicates a large base of potential orthodontic patients who are unable to seek treatment due to a lack of access to better healthcare facilities. The outcomes of the current study can, however, be used to plan for public health and to provide ideas for more research.

1. Introduction

There is more to health than just the absence of disease or infirmity. The state of health describes the well-being of a person on every level, including their mental, physical, and social well-being.[1] A healthy mouth is an integral part of a healthy body.[2] It is imperative that an individual's mouth is healthy in order to eat, speak, and socialize freely without active disease or discomfort.[3] Society's perception of people is greatly

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influenced by their dentofacial appearance.[4] The social maladaptation and negative self-esteem of adolescents with dentofacial disharmonies have been demonstrated to be associated with significant dentofacial disharmonies.[5] Improved aesthetics and social-psychological well-being as well as potential effects on attitudes towards oral health may be the primary advantages of orthodontic therapy for patients.[6] Basic knowledge of treatment requirements is necessary for orthodontic therapy to become a crucial element of oral health care programs.[7] Therefore, for the purpose of organizing orthodontic services, measuring and documenting the population's need for treatment is helpful. Designing and managing an effective orthodontic service without a reliable assessment of the demand and need for treatment is challenging. Malocclusion is more common in some countries than others, as well as among different age groups and sexes. The incidence of orthodontic treatment requirements varies significantly between nations, from 11% in Sweden[7] to 75.5% in Saudi Arabia.[8] Hence, arranging orthodontic preventative measures logically and according to the demographic is crucial. This underlines the need for epidemiological research in learning about the incidence of certain malocclusions, the need for orthodontic care, and how to get access to the resources needed for such treatments.

Quantitative metrics are crucial in the era of evidence-based dentistry nowadays to quantify the therapy and compare orthodontic results to some standard of care. To measure the need for and success of therapy for both healthcare practitioners and patients, several relevant and trustworthy indices have been designed. Nevertheless, there isn't a single index that everyone agrees with.[9] However, in 1989, Brook and Shaw established the Index of Orthodontic Treatment Priority to address the shortcomings of earlier indexes. Later, they changed its name to the "Index of Orthodontic Treatment Need".[10] The index includes a measure of function and specifies different, specific types of therapeutic needs.[11] The IOTN acts as a tool for categorising the severity of occlusal characteristics that can pose a risk to the lifespan of dentition. The grades assigned to these features determine the urgency of the requirement for therapy. The Dental Health Component (DHC) and the Aesthetic Component (AC) are both included in the index.[12] By employing such an index, services may be better targeted, and it may lead to more uniformity within the profession and standardisation of the evaluation of orthodontic treatment needs.[9] International acceptance of the IOTN as a technique for evaluating treatment needs objectively has been growing.[13] The request for orthodontic treatment is expanding in most of the nation's counting India. In this manner, judicious arranging of orthodontic preventive measures on populace premise is fundamental. Although many studies have been conducted in India to determine the prevalence of malocclusion and the need for orthodontic treatment using the Dental Aesthetic Index (DAI) and Orthodontic Needs Index (IOTN), no such studies have been implemented or published in Lucknow, Uttar Pradesh.

The treatment needs of rural residents in Lucknow are also important, as 77.73% of Uttar Pradesh's population lives in rural areas, according to the 2011 census. The consequences of orthodontic dysplasia and the benefits of orthodontic treatment are unknown to the majority of the rural population. Access to this area is not feasible for economically disadvantaged populations due to a lack of awareness and high treatment costs. As a result, many malocclusion patients go undiagnosed and fail to avail benefits from orthodontic treatment. Therefore, the present study is an attempt to use his IOTN (Index of Orthodontic Treatment Need) and modified aesthetic component (AC) based on frequently prevalent malocclusions in the Central Uttar Pradesh region. This study is an economically feasible and locally available study that educates rural school children about dentistry and orthodontics and helps develop long-term public health strategies related to orthodontics. It helps map their perceptions of treatment options.

2. Materials and Methods

The study was conducted in the rural areas of the Lucknow district, Uttar Pradesh from 1st August 2019 to 22nd March 2020. The areas included were Mohanlalganj, Bakshi Ka Talab and Malihabad tehsils. A multistage cluster sample of 650 school students aged 12-18 years formed the sample for the study (Tables 1 and 2). Ethical approval was obtained from the university's ethics committee and prior approval to conduct an oral examination was obtained from the principal of the afflicted school. To avoid any ethical conflict, the identities of the children were not revealed in the study.

2.1. Inclusion criteria

1. All the children aged 12-18 years of age who agreed to take part in the study and had not undergone orthodontic treatment were included in this study.

2.2. Exclusion criteria

1. The children who had or are having an orthodontic treatment including those on interceptive orthodontics.
2. Children with a history of dentofacial trauma, congenital defects and craniofacial anomalies (clefts and syndromes).
3. Children with a history of maxillofacial or plastic surgery.

2.3. Armamentarium used

Mouth mirror, Disposable examination gloves, N95 mask, Face shield, Williams periodontal probe, Disposable tongue

blades, Gauze pieces, Cotton rolls, Cold sterilization medium/Cidex (Figure 1). Basic infection control procedures in hand hygiene and personal protective equipment (examination gloves, N95 masks, face shields) are implemented. No more than 25 children were examined per session to avoid fatigue effects. No radiographs or plaster casts were made. A proforma containing personal data such as name, gender, age, DHC grading, AC grading (by both examiner and subject), and a brief questionnaire was created to record the results per person. Only one person oversaw the entire rating system to avoid distortion. To confirm the reproducibility and reliability of the indices, the same orthodontist re-examined 150 children at 20-day intervals. At school, presentations were made to make all children aware of dental disease and the need to maintain good dental health. The Dental health component (DHC) and the aesthetic component (AC), both were recorded for IOTN-based treatment needs assessment. In expansion to the IOTN parameters, a survey in the form of a questionnaire was also prepared and the response was recorded to further understand the psychology of the children living in rural areas.

2.3.1. Assessment of dental health component

Dental Health Component was recorded by examining the following occlusal traits - MOCDO i.e., Missing teeth, Overjet, Crossbite, Displacement, and Overbite. All five grades of DHC were defined as per the following Performa (used originally by Brook and Shaw).[6]

The five grades for DHC were:

Grade 1: No need for Orthodontic treatment,

Grade 2: Little need for Orthodontic treatment,

Grade 3: Moderate need for Orthodontic treatment,

Grade 4: Great need for Orthodontic treatment,

Grade 5: Very great need for Orthodontic treatment.

The most severe malocclusion features determined the degree of DHC in the individual's IOTN.

2.3.2. Assessment of aesthetic component

Each child was shown the collection of illustrations initially used by Brook and Shaw[6] (formerly known as the SCAN Index, or Standardized Continuum of Aesthetic Need; used by Evans and Shaw in 1987).[14] All youngsters were instructed to evaluate their teeth, look at the reference images and rank their aesthetics according to the one that came the closest to them. The child's score was used to determine the grade. Also noted was the orthodontist's aesthetic assessment of the children. Nevertheless, for simplicity of recording and tabulation, the scale was changed from the original ten-point scoring of "0.5 to 5" in SCAN Index to a ten-point score from Grade 1 (most appealing) to Grade 10 (least attractive). In addition to the 10 photographs, 2 more photographs were included owing to the predominance of that sort of facial profile in the region under examination and the lack of the same from the original SCAN index (Figure 2). The correlation between the patient's aesthetic opinion (AC as per the subject) and Orthodontist's aesthetic opinion (AC as per the orthodontist) was also evaluated.

The scores are categorized according to the need for orthodontic treatment as follows:[15]

AC grade 1- 4 -no/ slight need

AC grade 5-7 -moderate/borderline need

AC grade 8-12 -Definite need

2.3.3. Questionnaire

A questionnaire based on the Oral Aesthetic Subjective Impact Scale (OASIS)[16] was provided to every child to evaluate their perception of their dental attractiveness and their outlook towards orthodontic treatment.

OASIS Questionnaire

1. How do you feel about how your teeth look?
   1. 2. 3. 4. 5. 6. 7
   Not concerned at all
   Very concerned
2. Have you noticed other people commenting on the appearance of your teeth?
   1. 2. 3. 4. 5. 6. 7
   Not concerned at all
   Very concerned
3. Have you noticed other people making fun of you about the appearance of your teeth?
   1. 2. 3. 4. 5. 6. 7
   Not concerned at all
   Very concerned
4. Do you attempt to avoid smiling, because of the way your teeth seem?
   1. 2. 3. 4. 5. 6. 7
   Not concerned at all
   Very concerned
5. Do you attempt to cover your mouth, because of the way your teeth seem?
   1. 2. 3. 4. 5. 6. 7
   Not concerned at all
   Very concerned

For the ease of conduction of the survey and the ease of analysis, the OASIS questionnaire was modified in the following way:

Scores 1,2 were classified as Not concerned at all.

Scores 3-5 were classified as Indifferent.

Scores 6,7 were classified as Concerned.

The questionnaire was further divided into two types of questions (Aesthetics based and functionality based) and an additional three questions about the functional aspects of treatment need was added.

The following questions were asked:

Aesthetic based questions:

1. How do you feel about how your teeth look?
   ○ Not concerned at all.
   ○ Indifferent.
   ○ Concerned.
2. Have you noticed other people commenting or making fun of you about the appearance of your teeth?
   ○ Not concerned at all.
   ○ Indifferent.
   ○ Concerned.
3. Do you attempt to avoid smiling or keep your mouth covered, because of the way your teeth seem?
   ○ Not concerned at all.
   ○ Indifferent.
   ○ Concerned.

Need based questions:

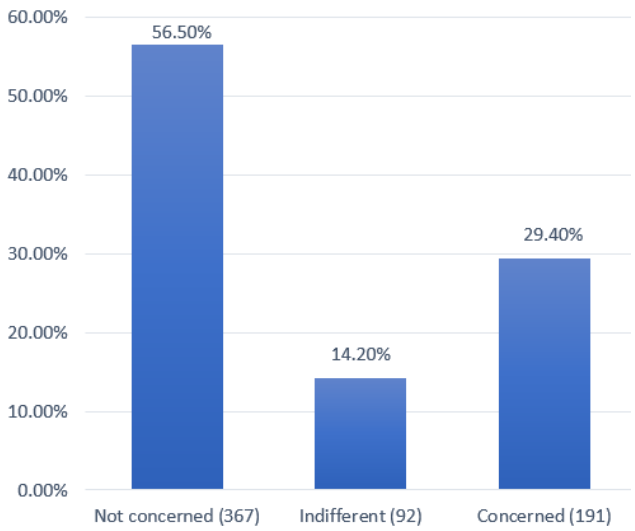
4. If your teeth were better positioned, do you think your smile would be more appealing?
   ○ No.
   ○ Maybe.
   ○ Yes.
5. Do you know Orthodontics and Dentofacial Orthopaedics department can help improve your smile and improve your chewing function?
   ○ No.
   ○ Maybe.
   ○ Yes.
6. Would you consider getting orthodontic treatment if it is provided at your local level at affordable rates?
   ○ No.
   ○ Maybe.
   ○ Yes.

2.4. Statistical analysis

The data collected were analyzed using the Statistical Package for Social Sciences for Windows (SPSS V27 Inc., Chicago, Illinois, USA). The Spearman correlation test was used to correlate the DHC and AC grades in the study sample. The difference in Orthodontist's opinions and children's perception of aesthetics was done using the Pearson correlation test. The questionnaire had questions on aesthetics and treatment need. The aesthetics-based questions were correlated with the AC grade of the Orthodontist and the treatment need-based questions were correlated with the DHC grade using the Spearman correlation test. A significance level of 5% ($p<0.05$) was considered statistically significant.

3. Results

As per the Dental Health Component scores observed it is noteworthy that 84.62% of the subjects under study required some kind of orthodontic intervention with only 15.38% having no need for orthodontic treatment. Grades 4 and 5 absolutely require orthodontic treatment which is amounting to approximately 30% (Table 3). As per the AC grading the subjects were more optimistic about their oral condition owing to the lack of proper oral health education prevalent in the rural areas which was revealed in their judgement of their own dental appearance. When the same subjects were graded for AC by an orthodontist the results were indicative of no treatment being required in around 52.9% of the observed subjects while around 24.8% were in absolute need of orthodontic intervention (Tables 4, 5 and 6). The questionnaire helped in multiple ways in judging the psychology of the rural population when it comes to physical appearance and their outlook towards orthodontic treatment. 56.5% of the subjects were not bothered by the appearance of their teeth while 72.2% never faced the social stigma of being teased or bullied for their dental aesthetics. Another noteworthy observation was the fact that 73.4% of the subjects were not bothered by their smiles being aesthetically unpleasing due to the less social stigma prevalent in rural society. 43.5% of the subjects had no idea at all about Orthodontics and dentofacial orthopaedics while 31.4% identified the branch with the word braces which is a concerning fact. Almost 71% of the subjects agreed to be open to getting orthodontic consultation/treatment if affordable facilities were to be made available at a local level owing to the high costs of travel and/or treatment available in urban areas (Graphs 1, 2, 3, 4, 5 and 6).



Graph 1: How do you feel about how your teeth look?

4. Discussion

Only a community's evaluation of malocclusion can reveal the frequency of various levels of deviance from normal occlusion, including those that do not require any kind

Table 1: Gender distribution of subjects.

Sex	Frequency	Percentage
Females	194	29.85%
Males	456	70.15%
Total	650	100%

Table 2: Age demographic wise we can further divide the subjects in two categories: a) 12-15 years old, b) 16-18 years old.

Sex	12-15	16-18	Total
Females	113 (45.70%)	81 (20.10%)	194
Males	134 (54.30%)	322 (79.90%)	456
Category total	247 (38%)	403 (62%)	650

Table 3: The result of the dental health component (DHC) scores.

DHC Grade	Frequency	Percentage	95% CI*
1 (No need for treatment)	100	15.38%	12.81%, 18.36%
2 (Little need for treatment)	169	26.00%	22.78%, 29.51%
3 (Moderate need for treatment)	186	28.62%	25.27%, 32.21%
4 (Great need for treatment)	124	19.08%	16.24%, 22.28%
5 (Very Great need for treatment)	71	10.92%	8.75%, 13.55%
Total	650	100%	

*Wilson 95% Conf Limits

Table 4: Aesthetic component (AC) grade as per the Subject.

AC Grade	Frequency	Percentage	95% CI*
1	120	18.46%	15.67%, 21.63%
2	145	22.31%	19.28%, 25.67%
3	119	18.31%	15.52%, 21.46%
4	82	12.62%	10.28%, 15.39%
5	25	3.85%	2.62%, 5.62%
6	34	5.23%	3.77%, 7.22%
7	47	7.23%	5.48%, 9.48%
8	16	2.46%	1.52%, 3.96%
9	24	3.69%	2.49%, 5.44%
10	0	-	-
11	34	5.23%	3.77%, 7.22%
12	4	0.62%	0.24%, 1.57%

*Wilson 95% Conf Limits

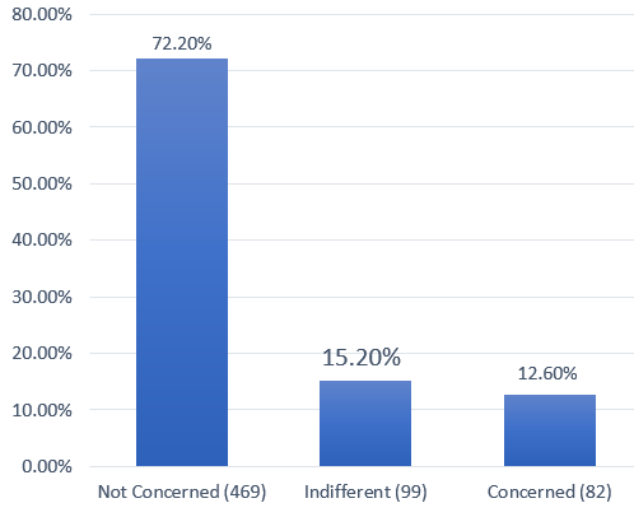
Table 5: Aesthetic component (AC) grade as per the Orthodontist.

AC Grade	Frequency	Percentage	95% CI*
1	96	14.77%	12.25%, 17.70%
2	35	5.38%	3.90%, 7.40%
3	74	11.38%	9.17%, 14.06%
4	139	21.38%	18.41%, 24.70%
5	52	8.00%	6.15%, 10.34%
6	61	9.38%	7.38%, 11.87%
7	32	4.92%	3.51%, 6.87%
8	39	6.00%	4.42%, 8.10%
9	72	11.08%	8.89%, 13.72%
10	12	1.85%	1.06%, 3.20%
11	34	5.23%	3.77%, 7.22%
12	4	0.62%	0.24%, 1.57%

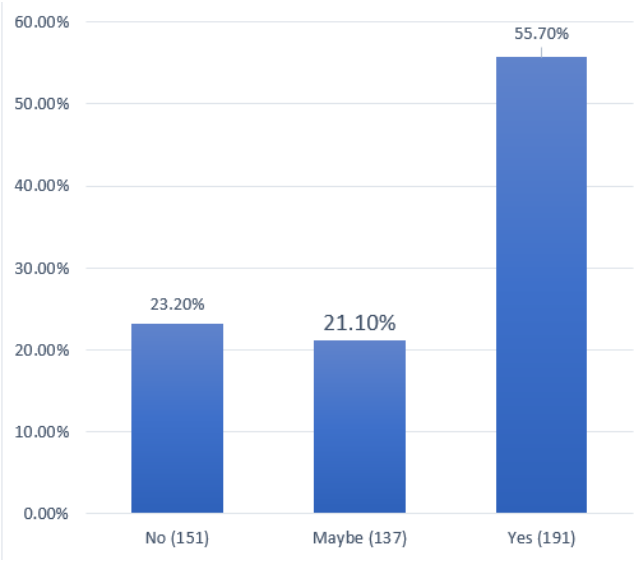
*Wilson 95% Conf Limits

Table 6: Comparison of aesthetic component (AC) grade category for treatment needs as per the Orthodontist and the Subject.

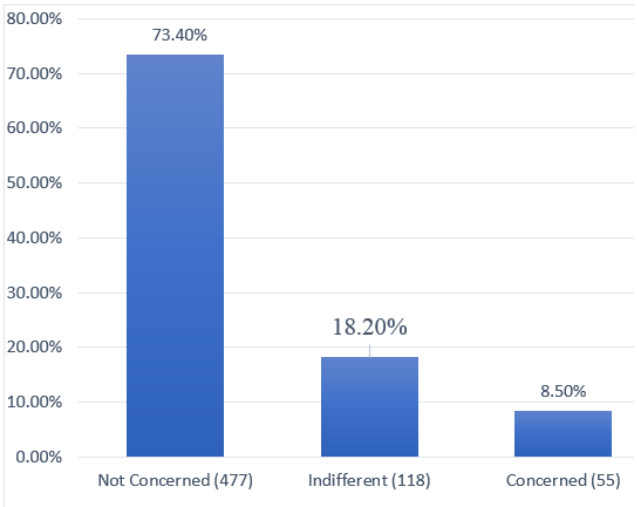
Treatment Need	AC Grade as per Orthodontist	AC Grade as per Subject
No/slight need	52.9%	71.7%
Moderate/ borderline need	22.3%	16.3%
Definite need	24.8%	12.0%



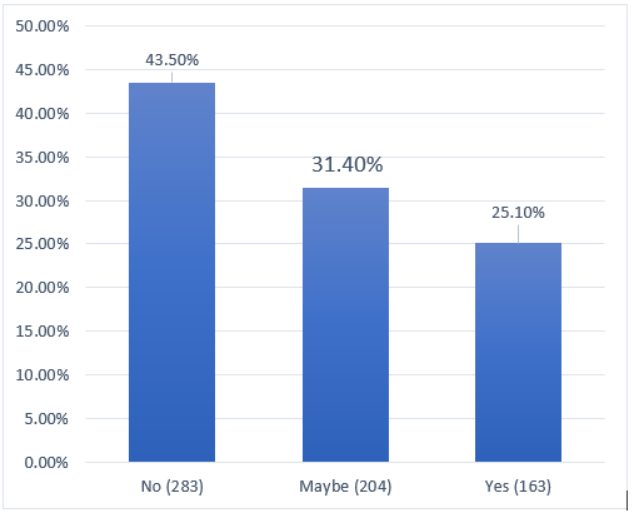
Graph 2: Have you noticed other people commenting or making fun of you about the appearance of your teeth?



Graph 4: If your teeth were better positioned, do you think your smile would be more appealing?



Graph 3: Do you attempt to avoid smiling or keep your mouth covered, because of the way your teeth seem?



Graph 5: Do you know orthodontics and dentofacial orthopaedics department can help improve your smile and improve your chewing function?

Fig. 1: Armamentarium used for Intra-oral examination.

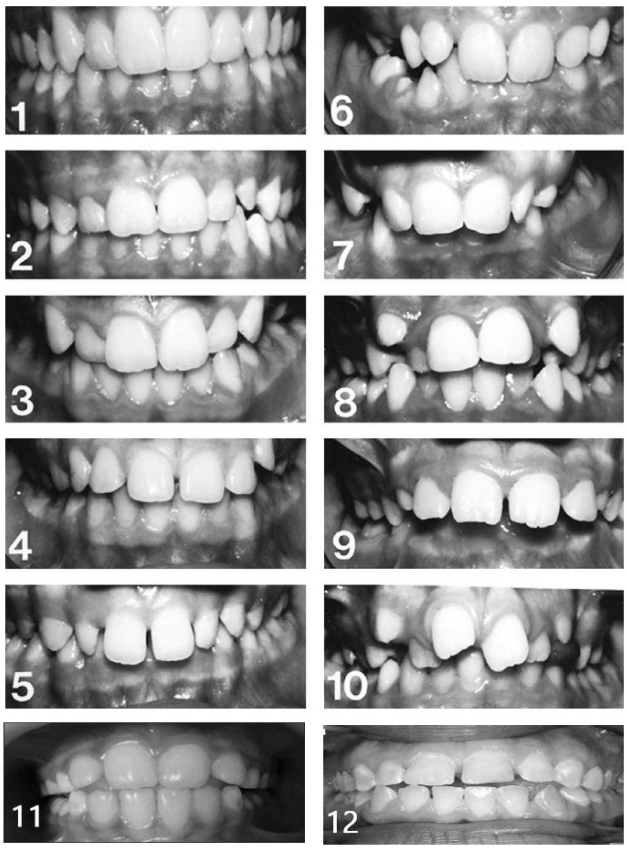
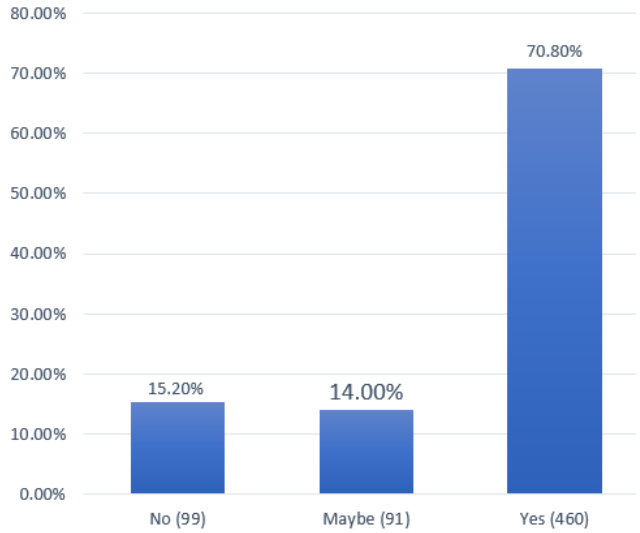


Fig. 2: Modified scan index.



Graph 6: Would you consider getting orthodontic treatment if it is provided at your local level at affordable rates?

of therapy. Yet, the necessity for orthodontic therapy becomes more obvious when abnormalities in the normal occlusion affect both its functionality and its appearance. Consequently, it would appear appropriate to assess the requirement for orthodontic treatment using indices. The objective of this study was to use the aesthetic component (AC) and dental health component (DHC) of the Index of Orthodontic Treatment Need (IOTN) to assess the incidence of malocclusion and the need for orthodontic treatment in 12- to 18-year-old rural Lucknow school children. The guidelines provided by the World Health Organization for oral health surveys were followed in this study. The current epidemiologic investigation focused on school-age children utilising the Index of Orthodontic Treatment Need (IOTN), a quick and easy tool that has been approved for use in school screening programmes.[17,18] Comparing the present findings with other studies in Dehradun [Seema Diwan et al, 2013][19] (12%), Bengaluru [Jyothi Shashidhar et al, 2018][20] (15%), Udaipur [Pradeep Vishnoi et al, 2017][21] (17.9%), Spain [Carlos Bellot-Arcís et al, 2012][22] (19.2%), Davangere [Shivkumar et al.,2009][23] (19.9%), Shimla [Bhardwaj et al.,2010][24] (20.42%), France [Mourad Souames et al, 2006][25] (21%), Tanzania [Emeria A. Mugonzibwa et al, 2004][15] (22%), Indore [Aman Sachdeva et al., 2016][26] (22.06%), Colombia [Birgit Thilander et al, 2001][27] (23%), they have reported a lower prevalence of subjects with definite orthodontic treatment need. Our estimate of orthodontic treatment need as assessed by the DHC of the IOTN (30%) is comparable to those reported in Pune [Col Prasanna Kumar et al, 2011][28] (32.8%), Udaipur [Mridula Tak et al.,2013][29] (33.3%), Italy [Letizia Perillo et al, 2009][30] (27.3%), Jordan [Hamdan, 2001][31] (28%), Kuwait [Kerosuo et al.,2004][32] (28%),

Algeria [Neus Puertes-Fernández et al, 2010][33] (28.6%), New Zealand [Crowther et al.,1997][34] (31.3%), Sheffield [Holmes,1992][35] (32%), Manchester and Sheffield [Burden and Holmes, 1994][36] (33.3%), North Jordan [Abu Alhaija et al., 2004][37] (34%), Brazil [Patricia Fernanda Dias et al, 2007][38] (34.2%), Ireland [Burden,1995][39] (36%) and Iran [A. Borzabadi-Farahani et al, 2019][40] (36.1%). However, our findings were lower than those reported in Sweden [Josefsson et al, 2007][41] (37%), Nalagarh [Sarabjeet Singh et al.,2014][42] (37.55%), Turkey [Neslihan Üçüncü et al, 2001][43] (38.8%), Senegal [Papa Ibrahima Ngom et al, 2007][1] (42.6%), Nepal [Varun Pratap Singh et al, 2014][44] (46.3%), Malaysia [Abdullah and Rock, 2001][45] (47.9%), Singapore [Jen Soh et al, 2003][46] (50%), China [So and Tang,1993][47] (52%), Norway [Kari Birkeland et al, 1996][48] (53.2%), U.S.A [W. R. Proffit et al, 1998][49] (57%-59%) and Italy [Carmelo G. A. Nobile et al, 2007][50] (59.5%).

There was a statistically significant association between Dental Health Component and Aesthetic Component as judged by the orthodontist (p-value <0.01). As images only depict a 2-dimensional representation of a 3-dimensional object, they tend to minimise the prominence of anterior crowding and overjet. Even though the majority of research conducted worldwide has revealed a negligible correlation between the need for DHC therapy and AC, this might be explained by differences in rating AC according to photographs.[13] Differences in results can be due to 1) different methodologies of sample collection, 2) different ethnicity and education level of study populations, 3) differences in IOTN grading by orthodontists, 4) differences in the questionnaire used to evaluate subjective aesthetics and perceived need for orthodontic treatment. The study also involved questions to evaluate the perception of the subjects towards orthodontics, treatment outcomes and the possibility of getting treated if orthodontic services were made more accessible. We found a statistically significant association between the IOTN-DHC and the subject's outlook towards the relationship between smile and a better-arranged dentition indicating that the subjects understood the importance and value of a well-aligned dentition acknowledging the scope of improvement in their dental aesthetics. We also observed a slightly significant association between the DHC and the subject's knowledge about Orthodontics and the benefits provided by orthodontic treatment. This question also revealed a concerning figure of 43.5% of the subjects in the study being unaware of Orthodontics and oblivious to the benefits of getting an orthodontic mechanotherapy. 31.4% of the subjects had some idea while only 25.1% of the subjects were fully aware of the existence of a branch of dentistry that could improve the appearance and functions of their teeth. This could be attributed to the low level of public awareness and lack of available information on orthodontics in the private/government-funded public awareness programs. The study also revealed that 70.8% of the subjects were interested in undergoing orthodontic treatment if it was made accessible to the rural population. The lack of availability of orthodontists in rural areas and the economic implications of traveling to cities for appointments are acting as deterrents for Orthodontic treatment resulting in a large number of people with malocclusion going undiagnosed and unavailable to seek the benefits of orthodontic mechanotherapy. We found a statistically significant association between the DHC and the subject's willingness to undergo locally provided and economically feasible Orthodontic treatment indicating a large base of potential orthodontic patients who are unable to seek treatment due to a lack of access to better healthcare facilities. In the United Kingdom, where practically all orthodontic treatment is publicly supported, the IOTN was initially created to fulfill the requirements of the need for orthodontic treatment [Shaw, 1983].[51] It might be challenging to provide publicly subsidized orthodontic care for up to a third of rural Lucknow pupils in the near future. Orthodontic treatment decisions cannot be decided only based on indices and must take into account a variety of criteria, such as the degree of malocclusion, patient compliance, cost, and hazards. The outcomes of the current study can, however, be used to plan for public health and to provide ideas for more research.

5. Conclusions

Based on the results obtained, the following conclusions can be drawn:

1. According to the DHC, 30% of people had a clear need for therapy, 54.62% had a marginal or mild need, and 15.38% had no need at all.
2. According to the AC, 52.9% of respondents had no or a mild need for therapy, 22.3% had a questionable or moderate need, and 24.8% had a clear need for intervention.
3. The children's opinions on the aesthetics of their smiles differed from the orthodontist's observations, demonstrating a general lack of understanding among students regarding the severity of their current malocclusion. This is caused by their poor oral health awareness and their parents' disregard for the malocclusion.
4. The flaw in the Aesthetic Component of the IOTN was also revealed during the course of this study where it was found that most children despite having a Bi-maxillary dentoalveolar malocclusion pointed to the SCAN image 3 or 4 as the smile they can most relate to.
5. The SCAN Index photographs do not include open bite or anterior edge-to-edge bite as seen in tongue thrust habit-related malocclusion and/or severe

Bimaxillary Dento-alveolar protrusion cases. Owing to this we had to include two photographs in our study to make the recording of the Aesthetic Component of IOTN easy.

6. 43.5% of the subjects had no idea at all about Orthodontics and Dentofacial Orthopaedics while 31.4% identified the branch with the word braces which is a concerning fact.
7. Further studies must be undertaken to include lateral profile photographs as well as SCAN index specific to ethnic backgrounds for various regions of the world to establish a more reliable Aesthetic Component of the IOTN.

The result of the questionnaire has the potential to be used as baseline data to promote public awareness programs in rural areas where a large proportion of India's population remains untouched by the benefits of orthodontic therapy.

6. Source of Funding

None.

7. Conflict of Interest

None.

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