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Normative and Perceived Orthodontic Treatment Need of 12 years old School Children in Jimma Town, South West Ethiopia

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Abstract

Back ground: - A systematic and well-organized orthodontic service for any target population requires an assessment of the orthodontic treatment need. In practice, the need for orthodontic care is often determined by normative need. However, a person's decision to seek orthodontic treatment is dependent on multiple factors. Therefore, this study aimed to assess self-perception of malocclusion and its assessment, as well as normative needs for orthodontic treatment, and its comparison between these two needs.

Objective: This study aimed to assess the Normative and Perceived Orthodontic treatment need of 12 years old school-children in Jimma Town, South West Ethiopia, 2018.

Methods: Institutional based cross-sectional study was employed in selected public primary schools in Jimma town. The study participants were selected by simple random sampling method. Data was collected using a structured questionnaire and standard clinical examination procedures. Descriptive statistics was undertaken to characterize the study participants. Association between dependent variables and independent variables were measured by chi-square test and regression analysis. P-value less than 0.05 used to declare statistically significant association on multivariate logistic regression.

Result: Three hundred and forty-seven 12 years old school children participated, giving a response rate of 91.8%. Most of the children were female (55.3%). About 48.2% of the children had need for orthodontic treatment. The correlation between normative and perceived need was low ($r=0.343$, $p < 0.001$). Students who had high DHC scores, hence a great need for treatment had significantly lower self-perceived AC scores and lower legal guardian perceived AC scores. Legal guardian perceived need ($\chi^2= 33.2$, $P < 0.001$), child perceived need ($\chi^2 = 33.4$, $p < 0.001$), examiner AC score ($\chi^2 = 117.2$, $p < 0.001$) and demand were significantly associated with Normative need. Determinants of perceived need were legal guardian perceive need (AOR = 5.79, 95% CI= 2.83-11.85), higher examiner AC score (AOR = 13, 95% CI= 5.96-28.4), mother's lower educational status (AOR = 4.13, 95% CI= 1.61-10.55) and child's unhappiness with satisfaction of teeth arrangement (AOR = 2.72, 95% CI= 1.38-5.59) when adjusted to covariates.

Conclusion and Recommendation: This study revealed that the need for orthodontic treatment was high. Normative and perceived need had low correlation. The determinant factors of

normative orthodontic treatment need were child perceived need, legal guardian perceived need, examiner AC score and demand. Therefore, awareness about orthodontic treatment should be given. Also, publicly subsidized orthodontic treatment should be provided to those who are in great need for orthodontic treatment. Further studies comparing normative and perceived orthodontic treatment need are necessary.

Keywords: Normative need, Perceived need, IOTN

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Acronyms

AC: Aesthetic Component

AOR: Adjusted odds ratio

COR: Crudes odds ratio

DHC: Dental Health Component

IOTN: Index of Orthodontic Treatment Need

OT: Orthodontic Treatment

WHO: World Health Organization

X²: Chi square

1. Introduction

1.1 Background Information

Malocclusion can be defined as an occlusion in which there is a malrelationship between the arches in any of the planes or in which there are anomalies in tooth position beyond the normal limits (1). Malocclusion causes psychosocial problems related to impaired/altered dentofacial aesthetics, disturbances of oral functions and greater susceptibility to trauma and periodontal disease (2). Thus, patients may require orthodontic treatment to produce healthy functional bite, with greater resistance to dental diseases, as well as improving personal appearance.

“Orthodontic treatment need” can be defined as the degree to which a person needs orthodontic treatment because of certain features of his or her malocclusion, the functional, dental health or aesthetic impairment it occasions and the negative psychological and social repercussions to which it gives rise (3).

Assessment of orthodontic treatment is required to provide a systematic and well organized orthodontic service for any target population (4). Epidemiological indices have enabled quantification of treatment need (4). Indices such as the Index of Orthodontic Treatment Need (IOTN) and Dental Aesthetic Index have been used successfully in various countries such as the United Kingdom (5), Brazil (6), Iran (7), Tanzania (8) and Burkina Faso (9) to provide useful information on orthodontic treatment need and provision of orthodontic services.

The majority of measures of orthodontic treatment need are normatively assessed based on professional opinions. However, this method is criticized for unrealistic estimation of need for treatment planning, especially in developing countries with scarce oral health care resources(10). And, the most important determinants of the demand for orthodontic treatment are subjective elements. Thus, it is no longer accurate to solely measure objective need, when allocating resources for orthodontic care, as doing so will not accurately reflect the demand. Due to the paradigm shift toward patient-centered care in dental clinical practice and particularly in orthodontics, it is important to acknowledge both the clinicians’ need for establishing a rationale

for treatment interventions and the patients' evaluation regarding what is necessary treatment (11).

Although significant correlations have been noted between self-perceived and normative treatment need assessments, there still exists a considerable difference between the two and both needs should be addressed in the treatment plan (10). Understanding self-perception of malocclusion and assessing it, as well as assessing normative needs for orthodontic treatment, and comparing the two for a given population are crucial issues in modern orthodontic practice (12).

To the best of my knowledge, a study that has assessed orthodontic treatment need have not been found in Ethiopia. Hence, the present study will assess the normative orthodontic treatment need and its association with self-perceived orthodontic treatment need among 12 years old school children. It will also try to provide further evidence of the discrepancy between the normative need of the clinician and the perceived need of the children in another population.

1.2 Statement of the problem

Malocclusion is one of the most frequent oral cavity anomalies. It is the third most important condition in oral health problems, outranked only by dental caries and periodontal disease (13). General agreement exists that malocclusion have a multi-factorial etiology with the basic categories being environmental and genetic. Globally, reported incidences of dental malocclusion vary from 39 to 93% (14). The variations in the reported frequencies may depend on age, ethnic groups, and number of subjects and largely due to differences in registration methods which include: estimates of total frequency of malocclusion, methods based on typological classification and Angles modified classifications (14). For instance, the prevalence of malocclusion was 88% in Colombian school children, 53.7 % in India, 70% in USA, 51% in Tanzania (2,14–16).

Malocclusion influences many aspects of life, such as social interaction; opportunities or the lack of them when seeking employment; the choice of partners; and in personality characteristics. Malocclusion causes oral functional problems such as difficulty in chewing food, swallowing and speech problems. In people with poor oral hygiene, trauma resulting from occlusion can superimpose periodontitis and intensifies the pocket formation. Malocclusions especially those occur in the anterior teeth may increase teeth traumas. Severe overbites can also lead to intense tissue injuries and cause the loss of maxillary anterior teeth and in some cases, severe caries occur in the anterior teeth (2,7). Therefore, the treatment of such problems is of great importance in dental health.

Assessment of orthodontic treatment needs and demand are important for dental public health programs, clinical treatment, treatment priority determination, resource planning and third party funding (8). Studies on orthodontic treatment need have been investigated worldwide including Africa, however, to the best of my knowledge, there is no study conducted in Ethiopia.

With the improvement of the socio-economic situation in Ethiopia, the demand for orthodontic treatment is increasing quite rapidly. More patients with malocclusion problems visit dental clinics in both government and private health facilities. The lack of data on the orthodontic treatment need could be affecting the effective planning for the orthodontic services, which is

needed to address the ever-increasing demand for orthodontic treatment. Therefore, this study aims to study the orthodontic treatment need in school children aged 12 years belonging to Jimma Town using IOTN.

1.3 Significance of the study

Provincial oral health management requires accurate data on the orthodontic treatment need of its child population. Such data is essential for the effective planning of education, training and deployment of dental manpower and resources as well as the distribution thereof.

As public interest in oral health increases, the demand for orthodontic treatment will increase; it is important to have epidemiological data to estimate the total need for orthodontic care services. The epidemiological data on orthodontic treatment need is of interest for dental public health programs, clinical treatment, screening for treatment priority, resource planning, and third party funding.

So, the Information gained from this study can be used to influence decision making on orthodontic services to be provided, human resource training needs, design of treatment facilities, continuing education for oral health personnel, public health programs, screening for treatment priority, resource planning, and patient education and information

It will also try to provide further evidence of the discrepancy between the normative need of the clinician and the perceived need of the children in another population

2. Literature Review

2.1 Introduction

Malocclusion is one of the most frequent oral cavity anomalies. It is the third most important condition in oral health problems, outranked only by dental caries and periodontal disease (13). Malocclusion can be defined as an occlusion in which there is a malrelationship between the arches in any of the planes or in which there are anomalies in tooth position beyond the normal limits. It may be the result of a combination of minor variations from the normal, each too mild to be classed abnormal but their combination summates to produce a clinical problem (1).

General agreement exists that malocclusion have a multi-factorial aetiology with the basic categories being environmental and genetic. Globally, reported incidences of dental malocclusion vary from 39 to 93%, making it clear that the majority of children have irregular teeth and an occlusal relationship that differs from the ideal (14). The variations in reported frequencies could be due to differences in the study populations, such as age, ethnic groups, and number of subjects and largely due to differences in registration or measurement methods which include: estimates of total frequency of malocclusion, methods based on typological classification and Angles modified classifications (14)

In the study conducted by Proffit et al, in the USA, almost 30% of people have normal occlusion and 70 % have different types of malocclusion. Another study in Colombia has reported that 88% of the subjects had some type of anomaly, from mild to severe (14). In the study conducted in India on 1200 children aged 10-15 years old, the prevalence of malocclusion was 53.7% (15). In Tanzania using the Bjork et al. registration method, the prevalence of malocclusion was 51% (8). In Nigeria, a malocclusion distribution of 76% was found by Onyese in 2004 (16). Despite the amount of literature on the subject, there are no epidemiologic studies on Ethiopian population.

Malocclusion causes changes to the craniofacial structures, affecting the temporomandibular articulation, neuromuscular systems and other soft tissues. These problems bring sign and symptoms for the patient such as disturbances of oral function, such as mastication, swallowing and speech, greater susceptibility to trauma and periodontal disease and psychosocial problems

related to impaired/altered dentofacial aesthetics. The psychosocial impact of malocclusion has been described as the major determinant of orthodontic treatment need (2,7). Timely orthodontic treatment for the correction of malocclusion can prevent the exaggeration of the psychological as well as functional abnormalities of the oral cavity.

2.2 Orthodontic treatment need

Orthodontic treatment needs and demand are assessed for dental public health programs, clinical treatment, treatment priority determination, resource planning and third party funding (8). Measuring the need for orthodontic treatment is a complex process, as the need arises from teeth appearance problems, functional problems, traumatic potency to periodontal diseases and dental caries (7).

There are three elements to assessing orthodontic treatment need; Normative need, Perceived need and Demand. **Normative need** is the actual professionally judged need in a population cohort as defined following a clinical examination using a standardized clinical index such as IOTN. This represents the capacity to benefit from healthcare. Perceived need is subjective need by the individual, whereas; demand is expressed need that is presented for treatment (5).

Although there is no universal consensus concerning the use of any particular index to detect orthodontic treatment need, the index of orthodontic treatment need (IOTN) has been widely used, in many different epidemiological studies, since its development by Brook and Shaw (1989), to analyze orthodontic treatment need in the general population. The IOTN classifies malocclusions according to the presence of particular occlusal features which are considered important for dental health and aesthetics, in order to identify individuals who would derive the most benefit from orthodontic treatment. This index includes an Aesthetic Component (AC) with 10 severity levels and a Dental Health Component (DHC) with five severity levels (17).

2.3 Normative need

Normative needs are the oral health needs of a population. These are defined as the quantity of dental services which expert opinions believed ought to be consumed over a relevant period of

time in order for its members to remain or become as “healthy” as is permitted by existing dental knowledge.

The Dental health component of Index of orthodontic treatment need is commonly used to objectively assess the orthodontic treatment need from clinician point of view. It records the need for treatment based on dental health and functional grounds. The AC component of IOTN can also be used, if assessed by the clinician (18). In the National Health Service in the United Kingdom, many health authorities use the DHC division of IOTN to identify individuals whose traits of malocclusion are deemed appropriate for the expenditure of the resources needed for orthodontic treatment (5).

Various studies have used IOTN for measuring the degree of malocclusion and the need of orthodontic treatment in different population sectors.

Using the IOTN, a study in France (2006) on 9-12 years old on a total of 531 school children showed that using the DHC, 50.1% had little or no need, 28.6% had borderline need and 21.3% had definite need for treatment. Using the AC, 75% had little or no need, 18% had a borderline need and 7% had definite need (19).

A cross-sectional study conducted in a group of 9-12 years old 407 Brazilian school children to estimate the need for orthodontic treatment showed that, 34.2% had definite need for orthodontic treatment according to DHC of IOTN. According to AC of the IOTN only 11.3% of the children had definite need for treatment (20).

In Jordan, using the IOTN DHC and/or AC showed that of the 1002, 12-14 years old students, 26% had “no need” for Orthodontic treatment, 40% had borderline need and 34% had definite need for the same (21).

A study conducted in Burkina Faso in 12-16 years old patients attending at teaching hospital using the IOTN index found a 56.8% of orthodontic treatment need (9). Using the DHC in Tanzania, Mugonzibwa and co-workers found that about 11% of the children definitely needed orthodontic treatment (8).

In spite of the usefulness of this concept in the estimation of people, procedures, and delivering service costs, it has considerable limitations. A major shortcoming of the normative approach is that it fails to take into account the broader concepts of health as it has been stated by World Health Organization (WHO) in 1948, which have led to incorporate functional, psychological,

and social well-being to almost all disciplines of health. More considerably, this method is criticized for unrealistic estimation of need for treatment planning, especially in developing countries with scarce oral healthcare resources.

2.4 Perceived need

The majority of measures of orthodontic treatment need are normatively assessed based on clinical examinations alone. Few have attempted to measure or even record the patient's subjective perceptions in relation to their disability or handicap (8,22). Yet these subjective elements are the most important determinants of the demand for orthodontic treatment. Thus, it is no longer accurate to solely measure objective need, the need as determined by the professional, when allocating resources for orthodontic care, as doing so will not accurately reflect the demand. Due to the paradigm shift toward patient-centered care in dental clinical practice and particularly in orthodontics, it is important to acknowledge both the clinicians' need for establishing a rationale for treatment interventions and the patients' evaluation regarding what is necessary treatment (11).

The associations are of interest to orthodontists because they help establish relevant methods to assess treatment priority when selecting orthodontic patients in a publicly funded oral health care system; moreover, the success of care should be assessed on the basis of whether it meets the expectations of both patients and clinicians.

Studies that have related objective and subjective treatment need have shown considerably different results. The children have in some studies estimated their treatment need as being relatively close to the opinions of dentists, although their criteria and preferences can be very different (8,10). In other studies, the estimates of subjective treatment need among children have been significantly lower than the estimates of objective need (23,24). So, it is important to take into consideration the patient's point of view of his/her dental attractiveness before treatment is decided. This is all the more important as the main benefit of orthodontic treatment is considered to be an improved socio psychological well-being which is within the realm of the patient's well-being.

Locally, a study has not been found that have tried to relate the objective and subjective treatment need.

2.5 Factors associated with orthodontic treatment need

2.5.1 Gender

Studies have noted inconsistent results about gender differences in orthodontic treatment need. Most have shown no significant difference in orthodontic treatment need between gender (16,25,26). Some, have shown men have a higher normative need for orthodontic treatment than women (12). Others found men to have a slightly lower, but not significantly different, normative need than woman (10).

2.5.2 Ethnicity

Different ethnic groups usually have different features of facial appearance. Studies show differences in need for orthodontic treatment can vary between ethnic groups. A study conducted in Malaysia showed that, Chinese had the highest need for treatment followed by the Malays and Indians (25).

2.5.3 Socio-economic status

Most studies have found greater normative and perceived treatment needs among low socio-economic position groups compared to high position groups (16). A study conducted in Brazil found that family income significantly correlated with the objective orthodontic treatment need. They noticed as the family income increased, the AC grades given to those subjects were approaching a more aesthetic occlusion. This suggests a lesser need for orthodontic treatment(20).

2.6 Age group

Orthodontic treatment is usually initiated around 12 years of age. This is because; it is likely that by this age all the permanent teeth except the third molars will have erupted and active pubertal growth has started. Also, at this early age, the percentage of the target population that has started orthodontic fixed appliance treatment is at its lowest and the likelihood of loss of permanent tooth material affecting the IOTN disproportionately is greatly reduced; consequently, reducing the two potential sources of error in epidemiological studies (5,27).

Psychologically, 12 year old children are in the final cognitive developmental stage known as the formal operational stage of development according to the widely accepted Piaget's Theory of

Cognitive development. They are therefore capable of deductive reasoning and can successfully interpret and answer questions posed to them.

The photographs reflected in the AC pictures were selected on the basis of the attractiveness ratings of six non dental judges of a sample of 1000 photographs of 12-year-old subjects collected during a large multidisciplinary survey. For these reasons, a target group of 12 year olds is attractive for research regarding orthodontic treatment need (18).

Also, WHO chooses this age group as the global indicator age group for international comparisons and surveillance of disease trends (28).

2.7 Conceptual frame work

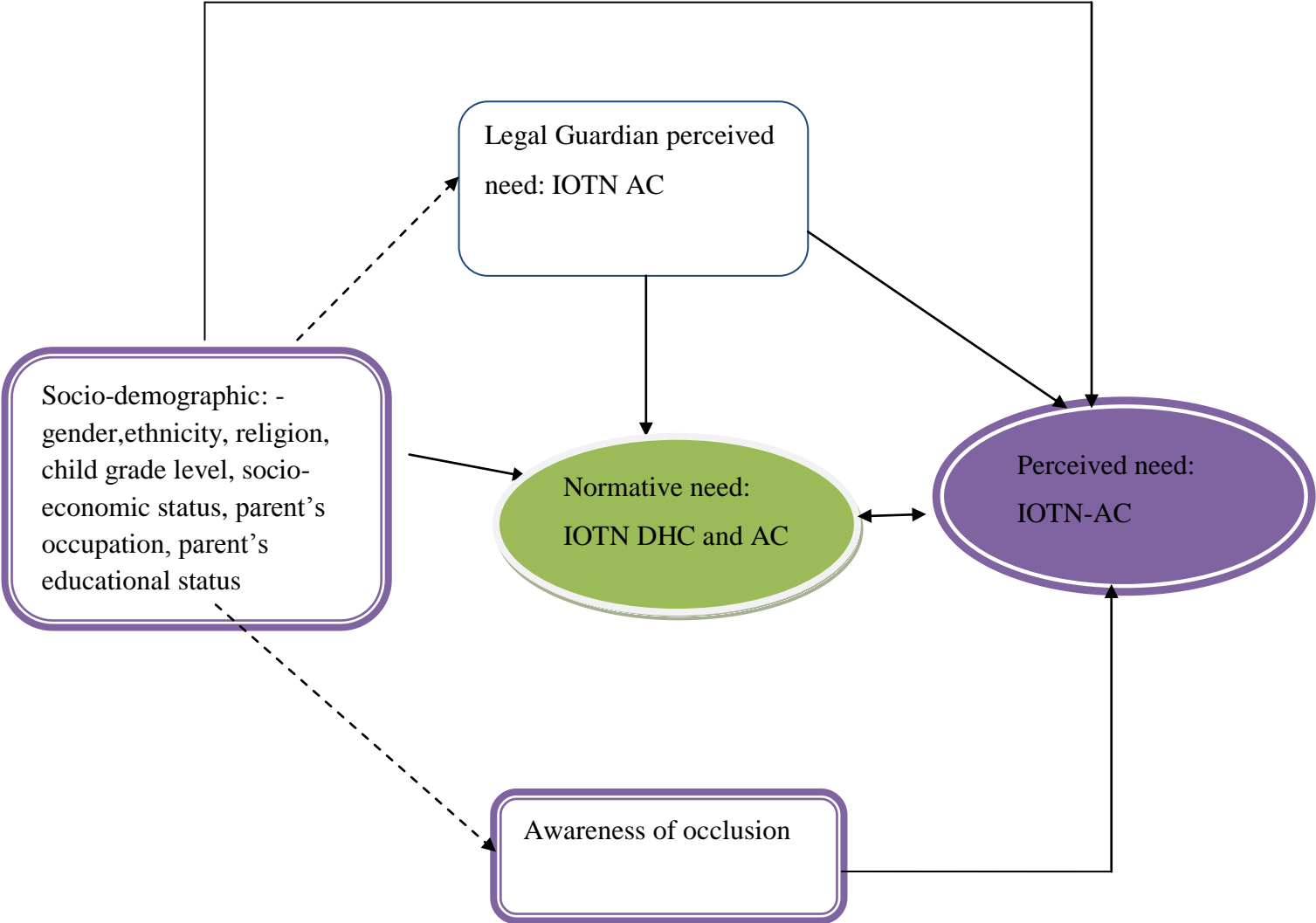


Fig 1: Conceptual Framework showing the relationship between Normative and Perceived orthodontic treatment need among 12 years old school-children in Jimma Town, South West Ethiopia, 2018 (8,10,12,16,26)

3 Objectives

3.1 General objective

- To assess the normative and perceived orthodontic treatment need of 12 years old public-school children in Jimma Town, South West Ethiopia, 2018

3.2 Specific objectives

- To assess the magnitude of orthodontic treatment need
- To determine the correlation between the normative and perceived need
- To determine factors associated with normative need
- To determine factors associated with perceived need

4 Methods and materials

4.1 Study area and period

The study was conducted in Jimma Town, which is located approximately 350 km southwest of the capital Addis Ababa at a latitude and longitude of 7°40'N36°50'E and at 1720–2010 m above sea level. The area is characterized by a semi-arid type of climate with an average annual rainfall of 800–2500 mm. The mean daily temperature is 19 °C, but ranges from 12 to 30 °C. This study focused on schoolchildren of 12 years. In Jimma Town, there are 43 public schools, out of which 22 are public and 21 private primary schools. The total number of 12 years old school children attending in public primary schools was 3474. Out of which, 1951 were female and 1523 male. The study was conducted from October 20- November 4, 2018.

4.2 Study Design

An institutional based cross-sectional study design was employed

4.3 Population

4.3.1 Source population

All 12 years old school children who attended all public primary schools in Jimma town. Study Population

All randomly selected 12 years old school children from selected public primary schools of Jimma town during the study period

4.4 Inclusion and exclusion criteria

4.4.1 Inclusion criteria

- 12 years of age

4.4.2 Exclusion Criteria

- Current or History of prior orthodontic treatment
- Participants who refused the study after reading the informed consent.
- Participants who were away from school during the data collection time

4.5 Sample size determination and sampling procedure

4.5.1 Sample size determination

The sample size was calculated using single population proportion formula using the following assumptions:

$$\frac{Z_{1-\alpha/2}^2 * p(1 - p)}{d^2}$$

Assumptions:

Confidence level, 95%; $Z_{1-\alpha/2} = 1.96$

P: proportion of orthodontic treatment need among 12 years old school children in Jimma Town
(P: 0.5, no previous study)

d- Degree of precision = 5%

$$N = (1.96)^2 * 0.5(1-0.5)/(0.05)^2$$
$$N = 384$$

As the number of 12 years old school children in primary public school of Jimma town was estimated to be less than 10,000, population correction factor was used. Hence, the final sample size was calculated by

$$n = \frac{n_o}{\left(1 + \frac{n_o}{N}\right)}$$

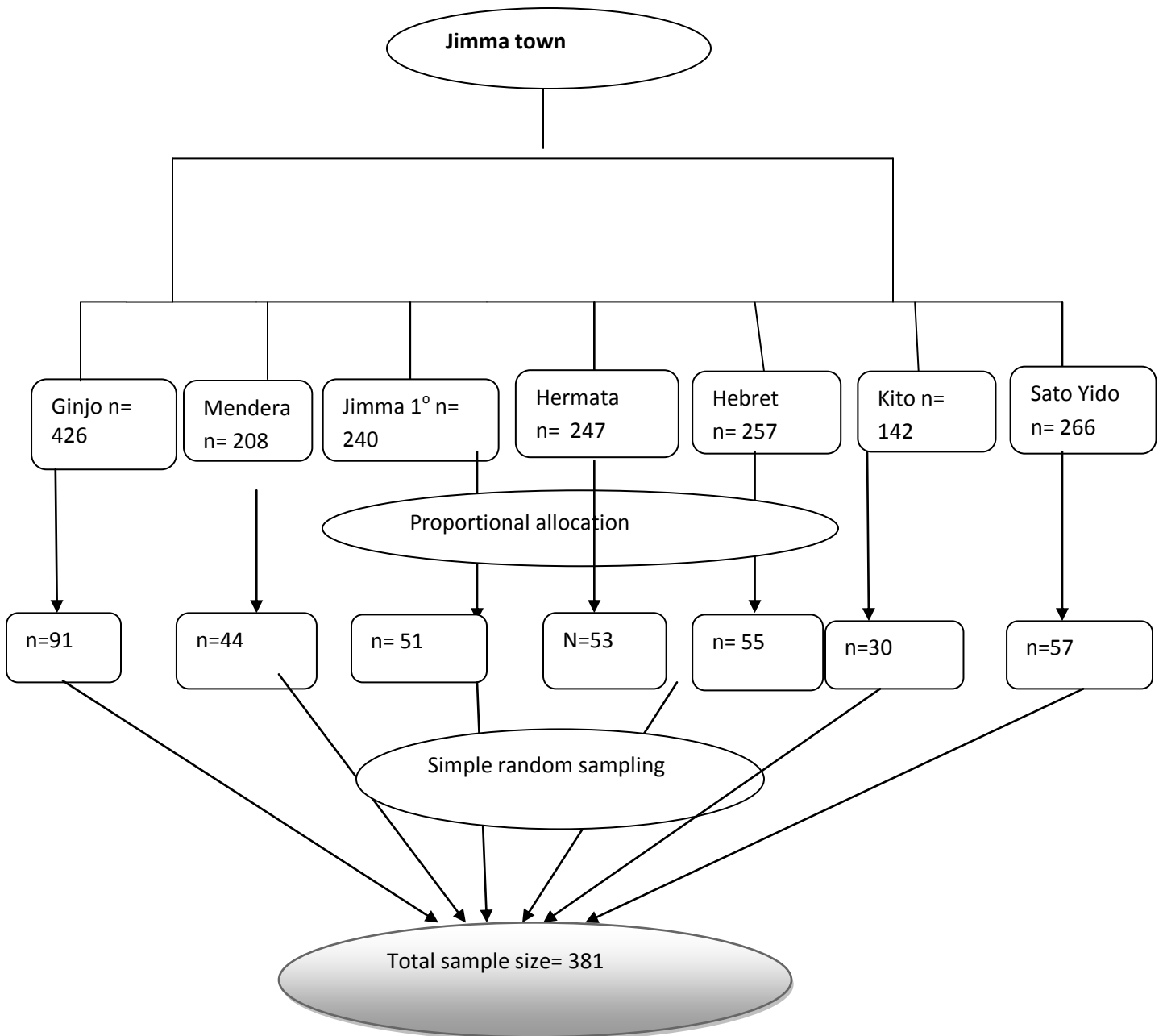
$$n = 384 / (1 + 384/3474) = 384 / 1.111 = 345.6 = 346$$

Therefore, after adding 10% non-response rate, the final sample size was $346 + 34.6 = 380.6 = 381$.

4.5.2 Sampling techniques:

First, schools were selected from the 22 public primary schools using simple random sampling technique. The use of simple random sampling method is justified for its potential in providing all the public schools an equal and independent chance to be included in the sample.

30% of 22 primary schools = 6.6 = 7 schools



Then sampling frame of the study subjects was obtained from the list of 12 years old school children attending in selected primary schools. Samples were proportionally allocated and computed from each selected schools with their corresponding measures of size and finally simple random sampling technique (lottery method) was used to get study subjects from each selected schools.

4.6 Variables

4.6.1 Dependent variable

- Normative need
- Perceived need

4.6.2 Independent variables:

- Socio-demographic characteristics: Gender, Socio-economic status, Ethnicity, Religion, Student grade level, Parent's occupation, Parent's educational status
- Awareness of occlusion
 - Demand (Expressed need for treatment)
 - Satisfaction with appearance of their teeth
 - Satisfaction with arrangement of their anterior teeth
 - Importance of well-aligned teeth for overall facial appearance
- Legal guardian perceived need

4.7 Data Collection tool and Procedure

4.7.1 Data collection tool

4.7.2

Data was collected using a structured questionnaire and clinical examination. Data collection tool included socio-demographic characteristics, Awareness of occlusion, Dental Health Component of IOTN and Aesthetic Component of IOTN. The children were asked questions to obtain information about their name, sex, history of orthodontic treatment, religion, ethnicity and grade attending. The socio-economic information, parent's educational status and parents' occupation was also obtained from their parents.

Awareness of occlusion:

Awareness of children's own occlusion includes questions on their subjective need of treatment, satisfaction with the arrangement and appearance of their teeth, and the importance of well-aligned teeth. The questions were scaled and scored with 3 or 5 points, as follows:

1. Do you need orthodontic treatment? (1 _ yes, 2 _no, and 3 _ do not know)
2. Are you happy with the arrangement of your anterior teeth? (1 _ very happy, 2 _ happy, 3 _ normal, 4 _ unhappy and 5 _ very unhappy)
3. Are you happy with the appearance of your own teeth compared to the teeth of your peers? (1 _ very happy, 2 _ happy, 3 _ normal, 4 _ unhappy and 5_ very unhappy)
4. Do you consider well-aligned teeth important for overall facial appearance? (1 _ very important, 2 _important, 3 _ does not matter, 4 _ not important, and 5 _ not important at all).

Normative need:

Normative need was measured using Index of Orthodontic treatment need. IOTN ranks malocclusion in terms of the significance of various occlusal traits for the person's dental health and aesthetic impairment with the intention of identifying those persons who would be most likely to benefit from Orthodontic treatment (18). This Index is chosen, because, it is the most frequently used index to date, especially in determining treatment priority and needs of a given population. It is valid and reproducible, easy to learn and the recording of all the relevant features of malocclusion can be done in a minute amount of time (27).It has two components; the Dental Health Component (DHC) derived from occlusion and alignment and an Aesthetic Component (AC) derived from comparison of the dental appearance to standard photographs, to provide a balanced approach to evaluating the necessity for treatment in addition to prioritizing treatment need.

The DHC of the IOTN records the various occlusal traits (Missing teeth, Overjets, Crossbites, Displacements and Overbites) into five grades according to severity and the needs for orthodontic treatment. Grades 1 and 2 represent 'no need for treatment'; grade 3 as 'borderline need' and grades 4 and 5 are considered to be a 'definite need' for orthodontic treatment. In

using this component, only the worst occlusal feature or the highest scoring trait is recorded, as this determines the grading of the subject & treatment priority.

The AC of the IOTN consists of a ten-point scale illustrated by a series of photographs, rated for attractiveness by a lay panel, and which were selected as being equidistantly spaced through the range of grades. Grade 1 represent the most attractive and grade 4 the least attractive. Photographs 1-4 represent 'no need for treatment'; 5-7 'borderline need'; and 8-10 'definite aesthetic need for orthodontic treatment'. A rating is allocated for overall dental attractiveness rather than specific similarities to the photographs. The final value reflects the treatment need on the grounds of aesthetic impairment and by implication, the social psychological need for orthodontic treatment.

Perceived need:

Self-assessment of orthodontic treatment need was measured using the Aesthetic Component scale of the Index of orthodontic treatment.

Legal guardian perceived need:

It was assessed using the Aesthetic Component scale of the Index of orthodontic treatment.



Fig. 2: Aesthetic Component of IOTN(2)

4.7.3 Data collection procedure

Prior to data collection date, school unit leaders were contacted to arrange a date for data collection. The parents of the children were given an invitation paper prior to 3-5 days of the pre-scheduled date to give their permission, attend the data collection and give answers to questions related to them. On the pre-scheduled date, the selected students and their parents were called up to the room prepared for the investigation. A brief description about braces and orthodontic treatment were given to them. And, the data collectors answered any questions raised.

A pre-structured questionnaire was administered to the children in the prepared room. They were asked to answer questions related to socio-demographic characteristics and awareness of their own occlusion. Question related to their perceived need was asked after the examiner conducted clinical examination and rated their AC score. This was done to avoid bias that may arise from their friends if they rated themselves toward unattractive side of the AC pictures.

Then the examiner conducted clinical examination and rated the children AC scores

4.7.4 Examination area and procedure

The examination was carried out with the children sitting in a chair and the examiner sitting in front of the chair. Daylight was used for illumination during examination. A modified stainless steel rulers and dental mirrors were used by the examiner for each schoolchild to identify the worst occlusal trait that would grade the child in one of the five categories of treatment need. Then, the examiner rated the AC scores of the child comparing to the AC photographs. The scores and results of the examination were encoded by a research assistant

Subsequently, the self-perception of treatment need was evaluated by asking each student to identify which photograph of the AC scale most closely resembled the appearance of their anterior teeth. The children were first asked to look their teeth on mirror and then the following question was asked: ‘Here is a series of 10 photographs showing a range of dental attractiveness, number 1 is the most attractive and number 10 the least attractive arrangement of teeth. Where would you put your teeth on this scale?’(25). At each examination, it was emphasized that a general aesthetic impression was being sought, not an exact match with the one shown in the photographs.

4.8 Data quality Management

The questionnaire used to collect data was prepared in English version and translated in to Afan Oromo and Amharic and back to English to check consistency. The examiner was trained and calibrated in the use of the IOTN before data collection began. Training was also given to data collectors (dental interns) to orient the objectives, sampling procedures, how to approach with the study subjects, and ethical conduct of the study. Every day case sheets were reviewed to ensure accuracy of recording; a tap record was used for double checking.

4.9 Intra-examiner reliability

There was one examiner who conducted all the examinations. Every tenth participant was re-examined to determine the reliability of the examiner and the two measurements were compared.

4.10 Data processing and analysis

The data was checked, cleaned, coded, entered by epi data 3 then exported in to SPSS V 20. Later the data was organized and presented using proportion, summary statics, tables, figures and frequencies

Descriptive statistics was undertaken to characterize socio-demographic characteristics, Awareness of occlusion, normative and perceived need. Spearman correlation coefficient was used to assess the correlation between the different methods of assessing orthodontic treatment need. Chi-square test was used to determine the association between normative need and independent variables. Logistic regression was used to determine the association between perceived need in relation to independent variables. Candidate variables on bivariate analysis with p-value less than 0.20 were fitted on multivariate logistic regression to evaluate independent association between explanatory variables and perceived need. P-value less than 0.05 with 95% CI as a cutoff point was used to declare statistically significant association.

4.11 Operational definitions

Normative need: - The need for orthodontic treatment based on dental health and esthetic impairment as determined by the examiner using the Dental Health Component of the IOTN and The Aesthetic Component of the IOTN.

Perceived need: - The need for orthodontic treatment based on the aesthetic impairment as determined by the child using the Aesthetic Component of the IOTN. It is the grade of the Aesthetic Component the child will choose to represent his/her own dentition (child-rated AC).

Legal guardian perceived need: - The need for orthodontic treatment based on the aesthetic impairments depicted by the Aesthetic Component of the Index of Orthodontic Treatment Need. It represents caregiver's view on need of treatment for each grade of the Aesthetic Component.

4.12 Ethical Clearance

Ethical clearance was obtained from Jimma University, Institute of health Ethical review committee. Prior to data collection, the Jimma Town Educational Office was contacted for permission to carry out the research in public primary schools in Jimma town; thereafter the selected schools were contacted for consent.

Prior to data collection, the principals of schools were contacted for permission to carry out the research by explaining the aims and research procedure. Then, consent from children's legal guardian and assent from the child was obtained. Only those children whose caregiver's consent obtained were invited to participate in the study and approached on the day of data collection. During data collection, the study participants were well informed that the information collected will be kept anonymous and confidential. They were also informed verbally, prior to handing out the questionnaires that they could withdraw from the study at any time. Children requiring dental treatment for any condition diagnosed during the examination were referred to JUSH Dental Department for further management.

4.13 Dissemination Plan

The findings of this study will be presented to JU, distributed to Jimma University Specialized Hospital Dental Department, and to Ministry of Health. Besides, the findings of the works will be tried to be presented at different seminars and training organized by the Ministry of Health, professional associations, regional health bureau and scientific conferences. Also, the results will be disseminated through publication in international journals.

5. Result

5.1. Socio-demographic characteristics of respondents

A total of 347 aged 12 years school children participated in the study, giving a response rate of 91.08%. Majority of the respondents were female 192 [55.3%]. With respect to ethnicity, 220 [63.4%] were Oromo and 42 [12.1%] were Amhara. About 189 [54.5%] of the participants were Muslim and 112 [32.3%] were orthodox in religion. Most of the children were attending in grade 5, 168 [48.4%]. (Table 1)

Regarding the respondent's mother educational status and occupation; most had primary education 138 (39.8%) and are housewife 183 (54.1%), respectively. While, the majority of the children father had secondary and above education 170 [49.0%] and are governmental employee 99 [28.5%]. Household income level per month of the respondents had shown that, most had a monthly income between 1000-1999 birr per month 137 [39.5%]. (Table 1)

Table 1: Socio-economic and demographic characteristics of participants (n=347), Jimma town, southwest Ethiopia, 2018

Variables	Category	Frequency (n=347)	Percentage (%)
Gender	Male	155	44.7
	Female	192	55.3
Ethnicity	Oromo	220	63.4
	Amhara	42	12.1
	Dawro	34	9.8
	Others	51	14.7

Religion	Muslim	189	54.5
	Orthodox	112	32.3
	Others	46	13.3
Grade	Grade 1-4	84	24.2
	Grade 5	168	48.4
	Grade 6	95	27.4
Educational status of mother	No formal education	98	29.0
	Primary school (grade 1-8)	135	39.9
	Secondary school and above (\geq grade 9)	105	31.1
Occupational status of mother	House wife	183	54.1
	Government employee	37	10.9
	merchant	60	17.8
	Daily laborer	38	11.2
	Others	20	6.0
Educational status of father	No formal education	50	14.9
	Primary school (grade 1-8)	116	34.5
	Secondary school and above (\geq grade 9)	170	50.6
Occupational status of father	Government employee	99	29.4
	Merchant	84	24.9

	Daily laborer	91	27.0
	Private worker	24	7.1
	Others	39	11.6
House hold Income (Birr/month)	< 1000	107	30.8
	1000-1999	137	39.5
	>=2000	103	29.7

5.2. Awareness of the children's occlusions

On the evaluation of orthodontic treatment need determined by the responses of the subjects to the questionnaires, it was found that majority 168 [48.4%] of the subjects were willing to undergo orthodontic treatment whereas 92 [26.5%] of subjects expressed no desire for orthodontic treatment. Around quarter 87 [25.1%] were unsure about their orthodontic treatment need.

Regarding the children satisfaction to their dental appearance when compared to their friends; 174 [50.1%] were happy and 88 (25.4%) were unhappy. The response of the children to satisfaction with arrangement of their teeth showed that, about 139 [40.1%] were happy and 110 [31.7%] of them were not happy. Almost all the children 329 (94.8%) were aware that having well-aligned teeth is important or very important for general facial appearance. (Table 2)

Table 2: Awareness of the children's occlusions of participants (n=347), Jimma town, southwest Ethiopia, 2018

variables	category	Frequency (n=347)	Percentage %
Demand (Expressed need for treatment)	Yes	168	48.4
	No	92	26.5
	I don't know	87	25.1
Satisfaction with appearance	Very happy	48	13.8
	Happy	174	50.1
	Normal	13	3.7
	Not happy	88	25.4
	Very unhappy	24	6.9
Satisfaction with arrangement	Very happy	43	12.4
	Happy	139	40.1
	Doesn't matter	19	5.5
	Not happy	110	31.7
	Very unhappy	36	10.4
Importance of well aligned teeth for general facial appearance	Very important	162	46.7
	important	167	48.1
	Doesn't matter	3	0.9
	Not important	14	4.0

5.3. Orthodontic treatment need

Orthodontic treatment need by the investigator using DHC has showed that; 104 (30%) children had definite need for orthodontic treatment, 63 (18.2%) had moderate need and 180 (51.9%) had no or little need.

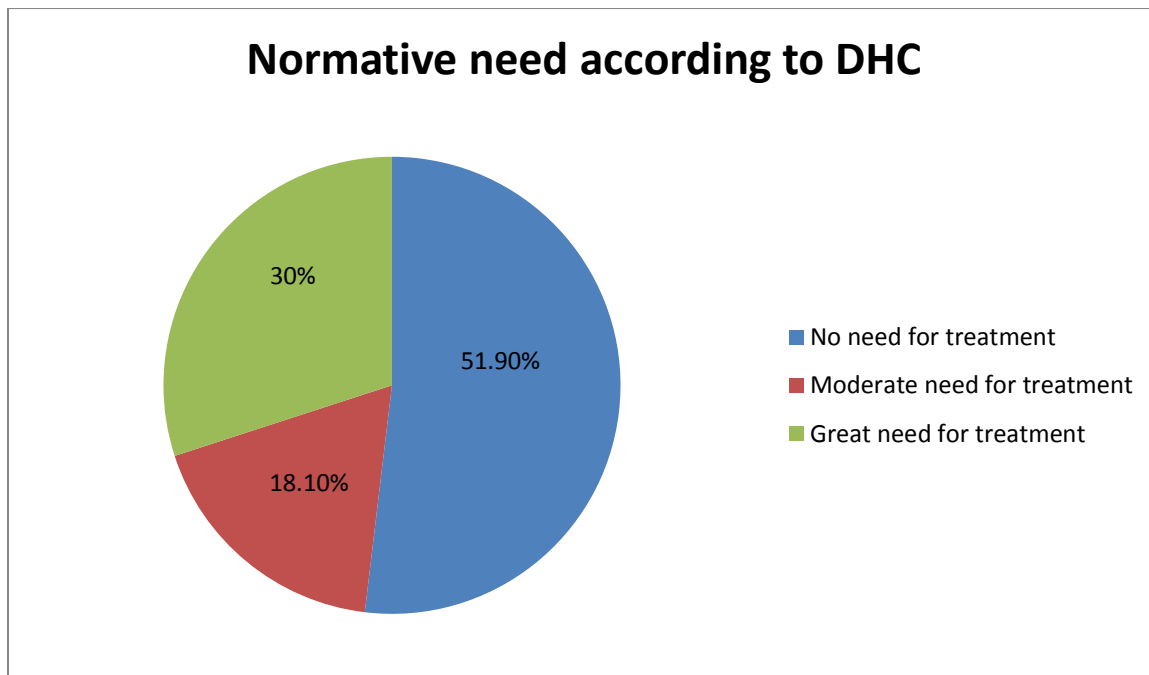


Figure 3: Normative orthodontic treatment as determined by examiner DHC of respondents (n=347), Jimma town, southwest Ethiopia, 2018

On the evaluation of orthodontic treatment need determined by the investigator using AC of IOTN, it was found that 53 (15.3%) subjects had definite treatment need (AC score 8-10) and 80 (23.1%) subjects had borderline treatment need (AC score 5-7) whereas 214 (61.7%) subjects had no or little treatment need (AC score 1-4).

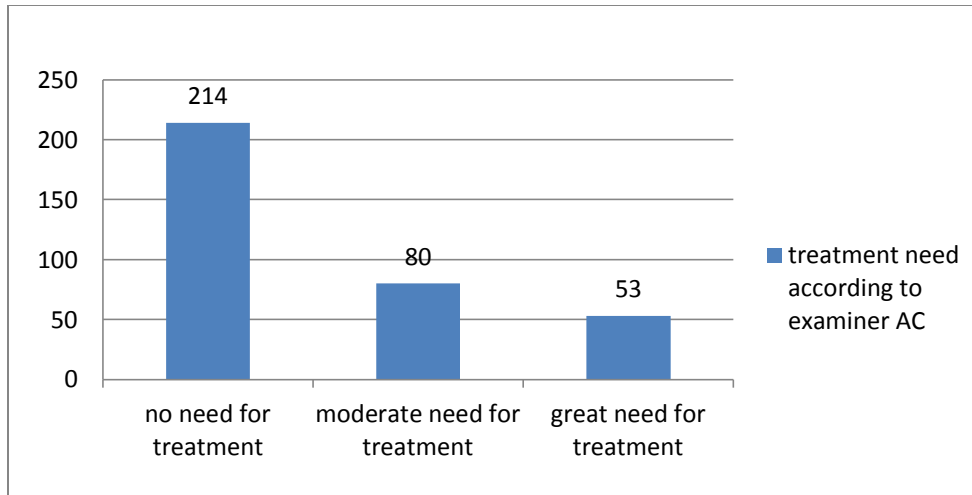


Figure 4: Objective orthodontic treatment as determined by AC examiner of respondents (n=347), Jimma town, southwest Ethiopia, 2018

On the evaluation of orthodontic treatment need determined by self-perception of the subjects using AC of IOTN, it was found that a very small proportion 25 [7.2%] subjects had a definite need of treatment (AC score 8-10) and 53 (15.3%) subjects had a borderline treatment need (AC score 5-8). A majority 269 [77.5%] of subjects had no or little treatment need (AC score 1-4).

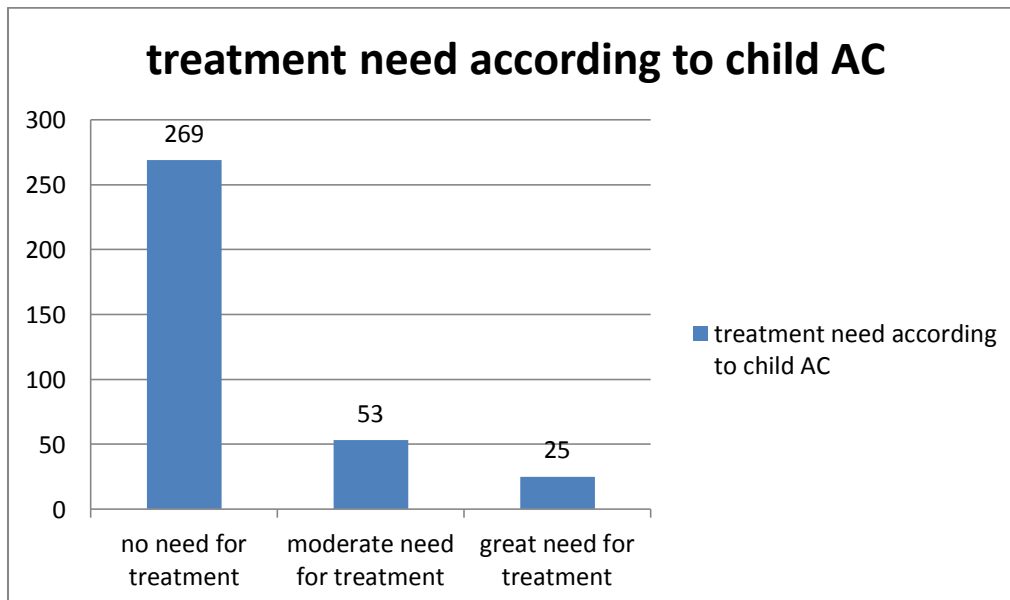


Figure 5: Perceived orthodontic treatment as determined by AC Child of respondents (n=347), Jimma town, southwest Ethiopia, 2018

On the evaluation of orthodontic treatment need determined by legal guardian of the children using AC of IOTN, majority 274 (79%) of subjects had no or little treatment need (AC score 1-4), 52 (15%) had moderate treatment need and 21 (6.1%) had definite need. (Table 3)

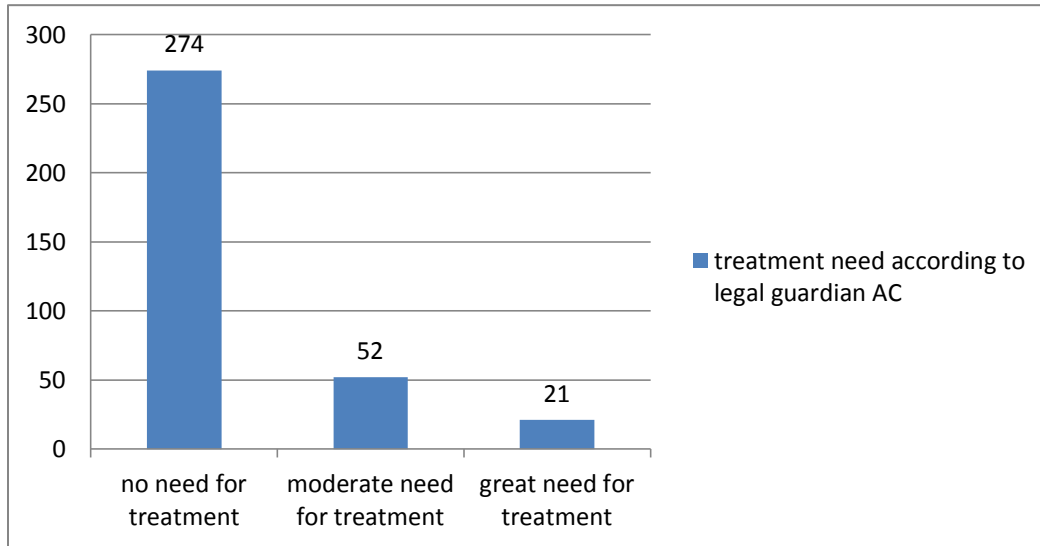


Figure 6: Perceived orthodontic treatment as determined by legal guardian AC of respondents (n=347), Jimma town, southwest Ethiopia, 2018

5.4 Correlations between DHC of IOTN, AC (Examiner), AC child and AC legal guardian scores

Spearman’s correlation coefficient was used to compare perceived and normative treatment need using IOTN AC and DHC.

The greatest correlation was found between Examiner AC scores and DHC scores ($r= 0.621$), whereas the correlation between family AC scores and DHC scores was the least ($r=0.329$).

Low correlation was found between Normative need (DHC) and self-perceived need of the children ($r=0.343$). Moderate correlation was found between perceived need (Child AC) and Normative need (Examiner AC) ($r=0.555$). Students were less critical in evaluating their esthetic appearance. All components of orthodontic treatment need were significant ($p<0.001$).

Table 3: Correlations between DHC of IOTN, AC (Examiner), AC child and AC family scores in 12 years old school children (n=347), Jimma town, southwest Ethiopia, 2018

Variable	Normative Need (DHC of IOTN)	Normative Need (IOTN of AC)	Perceived Need (Child AC)	Perceived Need (Family AC)
Normative Need (DHC of IOTN)	1	0.621 (0.000)	0.343 (0.000)	0.329 (0.000)
Normative Need (IOTN of AC)	0.621 (0.000)	1	0.555 (0.000)	0.436 (0.000)
Perceived Need (Child AC)	0.343 (0.000)	0.555 (0.000)	1	0.496 (0.000)
Perceived Need (Family AC)	0.329 (0.000)	0.436 (0.000)	0.496 (0.000)	1

Correlation is significant at the 0.01 level (2-tailed).

5.5 Factors associated with normative need

Different factors were assessed if they influenced the normative need for treatment as shown in table 5. The Chi-square result has shown that factors such as Legal guardian's perceived need, child's perceived need, treatment need by examiner using IOTN AC and demand (expressed need for treatment) were significantly associated with Normative need evaluated using IOTN DHC. (All $P < 0.05$)

Table 4: Determinants of normative need for orthodontic treatment assessed by IOTN DHC in 12 years old school children (n=347), Jimma town, southwest Ethiopia, 2018

Variables	category	Normative Need (DHC)		df ,chi-square value	p-value
		Yes	NO		
Gender	Male	71 (45.8%)	84 (54.2%)	1,0.604	0.437
	Female	96 (50%)	96 (50%)		
Ethnicity	Oromo	104 (47.3%)	116 (52.7%)	3, 0.305	0.959
	Amara	21 (50%)	21 (50%)		
	Dawro	16 (47.1%)	18 (52.9%)		
	Others	26 (51%)	25 (49%)		
Mother education	No formal education	40 (40.8%)	58 (59.2%)	2, 3.186	0.203
	Primary education	64 (47.4%)	71 (52.6%)		
	Secondary education and above	56 (53.3%)	49 (46.7%)		
Income	<1000	46 (43%)	61 (57%)	2, 2.687	0.261
	1000-1999	73 (53.3%)	64 (46.7%)		
	≥2000	48 (46.6%)	55 (53.4%)		
Legal guardian AC score	Need	57 (78.1%)	16 (21.9%)	1, 33.229	0.000
	No need	110 (40.1%)	164 (59.9%)		

Demand	Yes	91 (54.2%)	77 (45.8%)	1, 4.759	0.029
	No	76 (42.5%)	103 (57.5%)		
Mother occupation	Housewife	84 (47.7%)	92 (52.3%)	2, 0.401	0.762
	Government employee	19 (51.4%)	18 (48.6%)		
	Self-employed	57 (45.6%)	68 (54.4%)		
Father education	No formal education	20 (12.4%)	30 (17.1%)	2, 2.066	0.356
	Primary education	54 (33.5%)	62 (35.4%)		
	Secondary education and above	87 (54%)	83 (47.4%)		
Father occupation	Govt employee	48 (48.5%)	51 (51.5%)	1, 0.010	0.922
	Self-employed	114 (47.9%)	124 (52.1%)		
Examiner AC score	Need	113 (85%)	20 (15%)	1, 117.212	0.000
	No need	54 (25.2%)	160 (74.8%)		
Child AC score	Need	60 (76.9%)	18 (23.1%)	1, 33.421	0.000
	No need	107 (39.8%)	162 (60.2%)		

5.6 Factors associated with perceived need

Bivariate analysis showed a significant statistical association ($p < 0.05$) between Perceived orthodontic treatment need and the variables: Treatment need as perceived by the legal guardians, treatment need as determined by examiner using both components of IOTN (AC and DHC), demand (expressed need for orthodontic treatment), satisfaction with appearance of their teeth and satisfaction with arrangement of their teeth. Socio-demographic factors, such as

gender, ethnicity, grade level of the children, educational status of their parents, occupational status of their parents, socio-economic level and awareness of importance of well-aligned teeth for general facial appearance were not associated with orthodontic treatment need as perceived by the children. (Table 5)

Multiple logistic regression analysis with the statistically significant variables ($p < 0.20$) showed that treatment need as perceived by the legal guardians, normative treatment need using AC, mothers educational status and satisfaction with arrangement of their teeth remained significantly associated with orthodontic treatment need as perceived by the child, when adjusted to the treatment need as determined by examiner using IOTN DHC, demand (expressed need for orthodontic treatment), satisfaction with appearance of their teeth, and mother's occupational status. (Table 6)

Table 5: Bivariate analysis on factors associated with Perceived orthodontic treatment need as assessed by Child Using IOTN AC among 12 years old school children in Jimma town, southwest Ethiopia, 2018

variables	Category	Perceived Need (Child AC)		Crude Odds Ratio	p-value
		Yes	NO		
Gender	Male	39 (50%)	116 (43.1%)	1	
	Female	39 (50%)	153 (56.9%)	0.76 (0.46-1.26)	0.283
Ethnicity	Oromo	45 (57.7%)	175 (65.1%)	1	
	Amara	12 (15.4%)	30 (11.2%)	1.66 (0.74-3.28)	0.245
	Dawro	10 (12.8%)	24 (8.9%)	1.62 (0.72-3.63)	0.241
	Others	11 (14.1%)	40 (14.9%)	0.86 (0.51-2.25)	0.859

Mother education	Secondary education	17 (22.7%)	88 (33.5%)	1	
	Primary education	35 (46.7%)	100 (38%)	1.81 (0.95-3.46)	0.072
	No formal education	23 (30.7%)	75 (28.5%)	1.59 (0.79-3.19)	0.195
Income (Birr/month)	≥2000	24 (30.8%)	79 (29.4%)	1	
	1000-1999	25 (32.1%)	112 (41.6%)	0.74 (0.39-1.38)	0.337
	<1000	29 (37.2%)	78 (29%)	1.22 (0.66-2.29)	0.526
Legal guardian AC score	Need	45 (57.7%)	28 (10.4%)	11.7 (6.5-21.3)	0.000
	No Need	33 (42.3%)	241 (89.6%)	1	
Demand	Yes	47 (60.3%)	121 (45%)	1.86 (1.1-3.1)	0.018
	No	31 (39.7%)	148 (55%)	1	
Mother occupation	Government employee	4 (5.1%)	33 (12.3%)	1	
	Self-employed	30 (38.5%)	97 (36.1%)	2.55 (0.84-7.79)	0.10
	housewife	44 (56.4%)	139 (51.7%)	2.61 (0.88-7.78)	0.085
Father education	Secondary education and above	35 (46.7%)	135 (51.7%)	1	
	Primary education	27 (36%)	89 (34.1%)	1.17 (0.66-2.07)	0.588
	No formal education	13 (17.3%)	37 (14.2%)	1.36 (0.65-2.82)	0.416
Father occupation	Govt employee	25 (33.3%)	74 (28.2%)	1	
	Self-employed	50 (66.7%)	188 (71.8%)	0.79 (0.45-1.36)	0.394

Grade	Grade 6	20 (25.6%)	75 (27.9%)	1	
	Grade 5	38 (48.7%)	130 (48.3%)	1.1 (0.6-2.02)	0.769
	Grade 1-4	20 (25.6%)	64 (23.8%)	1.17 (0.58-2.37)	0.659
Satisfaction with appearance	Happy	35 (44.9%)	187 (69.5%)	1	
	Normal	1 (1.3%)	12 (4.5%)	0.45 (0.06-3.53)	0.444
	Unhappy	42 (53.8%)	70 (26%)	3.21 (1.9-5.42)	0.000
Satisfaction with arrangement	Happy	24 (30.8%)	158 (58.7%)	1	
	Normal	6 (7.7%)	13 (4.8%)	3.03 (1.05-8.76)	0.040
	Unhappy	48 (61.5%)	98 (36.4%)	3.22 (1.86-5.59)	0.000
Importance of well-aligned teeth	Important	76 (97.4%)	253 (94.1%)	1	
	Doesn't matter	1 (1.3%)	3 (1.1%)	1.11 (0.11-10.8)	0.929
	Not Important	1 (1.3%)	13 (4.8%)	0.26 (0.03-1.99)	0.20
DHC score	No need	18 (23.1%)	162 (60.2%)	1	
	Need	60 (76.9%)	107 (39.8%)	5.05 (2.82-9.02)	0.000
Examiner AC score	Need	67 (85.9%)	66 (24.5%)	18.7 (9.4-37.5)	0.000
	No Need	11 (14.1%)	203 (75.5%)	1	

Table 6: Multivariate analysis on factors associated with Perceived orthodontic treatment need determined by Child Using IOTN AC among 12 years old school children (n=347) in Jimma town, southwest Ethiopia, 2018

Variables	Category	Perceived need (Child AC)		Crudes OR (COR)	Adjusted Odds ratio (AOD)	p-value
		Yes	NO			
Legal guardian AC score	No need	33 (42.3%)	241 (89.6%)	1	1	0.000
	Need	45 (57.7%)	28 (10.4%)	11.7 (6.5-21.3)	5.79 (2.83-11.85)	
Examiner AC score	No need	11 (14.1%)	203 (75.5%)	1	1	0.000
	Need	67 (85.9%)	66 (24.5%)	18.7 (9.4-37.5)	13 (5.96-28.40)	
Mother educational status	Secondary education and above	17 (22.7%)	88 (33.5%)	1	1	0.013
	Primary education	35 (46.7%)	100 (38%)	1.81 (0.95-3.46)	2.92 (1.25-6.81)	
	No formal education	23 (30.7%)	75 (28.5%)	1.59 (0.79-3.19)	4.13 (1.61-10.55)	
Satisfaction with teeth arrangement	Happy	24 (30.8%)	158 (58.7%)	1	1	0.118
	Normal	6 (7.7%)	13 (4.8%)	3.03 (1.05-8.76)	3.03 (0.76-12.17)	
	Unhappy	48 (61.5%)	98 (36.4%)	3.22 (1.86-5.59)	2.72 (1.38-5.59)	

6. Discussion

In this study the need for orthodontic treatment was assessed in 12 years old children coming from low socioeconomic classes who study at Jimma Town public schools (Oromia Region, Ethiopia) and, therefore, they are those who would benefit the most from a public dental health program. Although the sample was only representative for this population, the study can provide an overview about the potential Ethiopian orthodontic service consumers in an urban area.

The Normative Need according the DHC scores showed that almost half of the children (48.2%) were in need for orthodontic treatment when the subjects with moderate or great need for treatment were summed. Definite need for orthodontic treatment need according to DHC was observed in 30% of the study subjects, a figure similar to the ones reported by other researchers(25)(29). Lower(19)(8) and higher (26)(6) prevalence rates were reported from other African and international studies. The wide variability of malocclusion prevalence rates is mainly due to the different methods and indices used. Furthermore, differences among the age ranges studied may also have contributed to the variability of the reported results.

According to the examiner assessed AC of the IOTN, 53 (15.3%) of the children had a great need for orthodontic treatment. This is higher than a prevalence reported from other studies(19)(29)(8).

The results on objective need for orthodontic treatment in this study provide baseline data for planning orthodontic services in Ethiopia. It is interesting to note that about half of the samples needed OT to avoid the associated health risks generated by malocclusion, but unfortunately, not many of them had access to OT. This is because orthodontic services are not readily accessible to the general population. Orthodontic concern like other oral health care procedures is given low priority in the health care system in Ethiopia because of the high cost of treatment and the shortage of orthodontists. Cost-benefit and cost-effectiveness analyses should be carried to assess the acceptability of the level of service and provide publicly subsidized orthodontic treatment.

The perceived orthodontic treatment using stimulus photographs of AC of IOTN showed that most (77.5%) of the children perceived themselves to be in AC grade 1-4 indicating no esthetic need for orthodontic treatment, which contrasts with this examiner's view. It could possibly be

due to the subjects subconsciously trying to allocate themselves on the attractive side. However, this contrasted with expressed demand for treatment reflected in the questionnaires responded by the subjects; 48.4% of the children expressed their demand for orthodontic treatment. This disparity of treatment need using AC and expressed demand could be explained by the fact that stimulus photographs of AC of IOTN were a two-dimensional representation of malocclusion in the frontal view. The sagittal or vertical discrepancies of the malocclusion and occlusal traits such as crowding in the lower arch might not be readily appreciated.

The association between normative measures of orthodontic treatment need and perceived measures was investigated in this study. The findings showed students who were assessed by the examiner as having high DHC scores, and hence a great need for treatment based on dental health and functional risks had significantly lower self-perceived AC scores and lower legal guardian perceived AC scores. Similar to other studies(23)(30)(24), it was observed that the normative evaluation is more critically carried out, thus overestimating the occlusal problems in comparison to patient's perception. Children evaluate themselves, according to the AC scores, usually lower than those estimated by the practitioners, and even those cases of self-evaluation indicating great need did not coincide with those of the practitioner. Therefore, the concept that the patient's perception should not be underestimated is reinforced, as it is the patient who is the target of treatment and who expresses the need to gain satisfaction from improved aesthetics and function. Moreover, certain types of malocclusions are accepted by a given population and this should be taken into account whenever an orthodontic treatment is indicated, particularly in public services(29).

The correlation between normative orthodontic treatment need (DHC) and perceived need (child AC) was also low. A possible explanation for which normatively defined need for orthodontic care was not matched by the perceived need is that the IOTN is a normative measure of something that is subjectively defined (aesthetics). Such a difference is supported by the conceptual distinction between health and disease; while clinical indicators measure disease, which is a purely a biological concept, subjective indicators concentrate on health, a concept inclined more towards sociology and psychology(29). The logistic regression result has also

found no association between normative and perceived need when other confounders are controlled.

In this study, the determinants of perceived need were found to be treatment need as perceived by the legal guardians, normative treatment need using AC, mother's lower educational status and child's unhappiness with satisfaction of arrangement of their teeth.

This study corroborates the opinion that normative and perceived orthodontic treatment need represent different standpoints and should always be considered before treatment prescriptions are given.

7. Conclusion and Recommendation

7.1. Conclusion

The present study reported that half of the students requested OT. Normative need using the DHC scores showed that 30% of subjects had great need, 18.1% had moderate need, and 50.2% required little or no treatment. Perceived need using AC scores revealed majority of the children perceived no need for treatment

There was low correlation between normative and perceived measures of orthodontic need assessment. Students who were assessed by the examiner as having high DHC scores, and hence a great need for treatment had significantly lower self-perceived AC scores and lower legal guardian perceived AC scores.

Factors such as Legal guardian perceived need, child perceived need, treatment need determined by examiner using IOTN AC and demand (expressed need for treatment) were significantly associated with Normative need evaluated using IOTN DHC Determinants of perceived need were found to be treatment need as perceived by the legal guardians, normative treatment need using AC, mother's lower educational status and child's unhappiness with satisfaction of arrangement of their teeth

7.2. Recommendations

- As the magnitude of orthodontic treatment is high, publicly subsidized orthodontic treatment should be provided to those who are in great need for orthodontic treatment
- Awareness about orthodontic treatment should be given.
- Further studies comparing normative and perceived orthodontic treatment need are necessary

8. Reference

1. Houston W. Walther's orthodontic Notes. 4th editio. The Stonebridge Publishers; 2000.
2. William R. Proffit, Henry W. Fields DMS. Contemporary orthodontics. 5th editio. Elsevier Inc.; 2013.
3. Carlos Bellot-Arcis JMM-C and JMA-S. Orthodontic Treatment Need : An Epidemiological Approach, Orthodontics - Basic Aspects and Clinical Considerations [Internet]. Bourzgui PF, editor. InTech; 2012. Available from: <http://www.intechopen.com/books/orthodontics-basic-aspects-and-clinical-considerations/orthodontictreatment-%0Aneeds-an-epidemiological-approach>
4. Daniels C, Richmond S. The Development of the Index of Complexity , Outcome and Need (ICON). J Orthod. 2000;27:149–62.
5. Yasmin A, Desmond W NK. Needs Assessment for Orthodontic Services in London About Public Health England. 2015.
6. Almeida Anderson Barbosa De, Leite CIG. Orthodontic treatment need for Brazilian schoolchildren : A study using the Dental Aesthetic Index. Dent Press J Orthod. 18(1):103–9.
7. Rahimi F, Golshah A, Dadfar E. Assessment of the need and demand for orthodontic treatment in 13- to 14-year-old students in Kermanshah , Iran in 2012. Tech J Eng Appl Sci. 2015;5(3):101–5.
8. Mugonzibwa Emeria A., Anne M. Kuijpers-Jagtman, Martin A. Van 't Hof, Emil NK. Perceptions of dental attractiveness and orthodontic treatment need among Tanzanian children. Am J Orthod Dentofac Orthop. 125(4):16–8.
9. Ouédraogo Y, Camara T, Bationo R, Bahije L, Beugré JB, Diouf JS, et al. Prevalence of Malocclusions and Normative Orthodontic Treatment Need Using IOTN Index for Patients in Yalgado Ouédraogo Teaching Hospital. Open J Stomatol. 2017;7:519–29.
10. Oshagh M, Salehi P, Pakshir H, Bazyar L, Rakhshan V. Associations between normative and self-perceived orthodontic treatment needs in young-adult dental patients. Korean J Orthod. 2011;41(6).
11. De Oliveira CM. The planning , contracting and monitoring of orthodontic services , and the use of the IOTN index : a survey of consultants in dental public health in the United

- Kingdom. *Br Dent J.* 195(12):704–6.
12. Aikins EA, DaCosta O., Onyeaso CO, Isiekwe MC. Self-Perception of Malocclusion Among Nigerian Adolescents Using The Aesthetic Component of The IOTN. *Open Dent J.* 2012;6:61–6.
 13. Al-qurashi H, Al-Farea M, Alshamrani HA, Almasoud NN, Nazir MA. ORTHODONTIC TREATMENT NEEDS AND ASSOCIATION BETWEEN MALOCCLUSION AND ORAL HYGIENE BEHAVIORS. *Pakistan Oral Dent J.* 38(1):62–6.
 14. Thilander B, Pena L, Infante C, Parada SS, Mayorga C De. Prevalence of malocclusion and orthodontic treatment need in children and adolescents in 1. Thilander B, Pena L, Infante C, Parada SS, Mayorga C De. Prevalence of malocclusion and orthodontic treatment need in children and adolescents in Bogota , Colombia. *Eur J Orthod.* 2001;23:153–67.
 15. Kumar PC, Londhe BS., Kotwal CA. Prevalence of malocclusion and orthodontic treatment need in schoolchildren e An epidemiological study. *me d i c a l j o u r n a l a r m e d f o r c e s i n d i a.* 2013;69:369–74.
 16. Utomi IL, Onyeaso CO. Orthodontic Treatment Complexity and Need in a Nigerian Teaching Hospital. *OHDM.* 2014;13(3):562–7.
 17. Manzanera D, Montiel-company JM, Almerich-silla JM, Gandia JL. Orthodontic treatment need in Spanish schoolchildren : an epidemiological study using the Index of Orthodontic Treatment Need. *Eur J Orthod.* 2018;31(December 2008):180–3.
 18. Brook PH, Shaw WC. The development of an index of orthodontic treatment priority. *Eur J Orthod.* 1989;11:309–20.
 19. Souames M, Bassigny F, Nil Z, Riordan PJ, Boy-lefevre ML. Orthodontic treatment need in French schoolchildren : an epidemiological study using the Index of Orthodontic Treatment Need. *Eur J Orthod.* 2006;28(November 2006):605–9.
 20. Dias PF, Gleiser R. Orthodontic treatment need in a group of 9-12-year-old Brazilian schoolchildren. *Braz Oral Res.* 2009;23(2):182–9.
 21. Abu Alhajja ESJ, Al-Nimri KS, Al-khateeb SN. Orthodontic treatment need and demand in 12 – 14-year-old north Jordanian school children. *Eur J Orthod.* 2004;26:261–3.
 22. Al-zubair NM. The subjective orthodontic treatment need assessed with the aesthetic component of the Index of Orthodontic Treatment Need. *Saudi J Dent Res.* 2015;6(1):9–

- 14.
23. Ghijselings I, Brosens V, Willems G, Fieuws S, Clijmans M, Lemiere J. Normative and self-perceived orthodontic treatment need in 11- to 16-year-old children. *Eur J Orthod.* 2013;
 24. Reddy S, John J, Sarvanan S, Arumugham IM. Normative and perceived orthodontic needs among 12 year old school children in Chennai , India – A comparative study. *ATI - Appl Technol Innov.* 2010;3(3):40–7.
 25. Zamzuri SZMo, Abdul Razak I, Esa R. Normative and Perceived Need for Treatment of Malocclusion among Malaysian Adolescents. *Sains Malaysiana.* 2014;43(7):1037–43.
 26. Zreaqat M, Hassan R, Ismail AR, Ismail NM, Aziz FA. Orthodontic Treatment Need and Demand among 12- and 16 Year-Old School Children in Malaysia. *OHDM.* 12(4).
 27. Sharma J, Sharma RD. IOTN – A Tool to Prioritize Treatment Need in Children and Plan Dental Health Services. *OHDM.* 2014;13(1).
 28. Petersen PE, Baez RJ. *WHO Basic Oral Health Survey Methods.* 5th editio. 2013.
 29. Mendes JA, Feu D, Bretas R, Canavarro C, Almeida MA de O. ORTHODONTIC TREATMENT NEEDS OF BRAZILIAN 12-YEAR-OLD. *World J Orthod.* 2009;10(4).
 30. Atisook P, Chuacharoen R. The Relationship between Demand and Need for Orthodontic Treatment in High School Students in Bangkok. *J Med Assoc Thai.* 2014;97(7).

Annex 1: consent form

Jimma University

Institute of Health

Department of Dentistry

Title: Normative and Perceived Orthodontic treatment need of 12 years old school children in Jimma Town, South West Ethiopia

Part 1: Introduction

Good morning/afternoon/evening? My name is Dr. Muluaem Tolessa. I am Post graduate student in Dentistry Department and I am conducting research on Orthodontic treatment need in 12 years old public school children in Jimma town from 29/10/2018 – 13/11/2018.

The purpose of conducting this study is to find out (determine) the need of orthodontic treatment (treatment done with braces) in this area. This will help dental professionals to better understand what the need for orthodontic treatment (straightening/moving teeth using wires) is in the area and may help to motivate for publicly funded treatment in the future. All information collected will be kept strictly confidential and neither you nor your child will be identifiable in any reports that are written. The decision to participate in this study depends on you and your child's willingness.

If you have any question or concern related to this study, you can contact the researcher Dr. Muluaem Tolessa at the time of the data collection.

If you decide to allow your child to participate in this study, please sign the consent form and fill the questionnaire below.

Part 2: Certificate of Consent

- By signing below, I have agreed to allow my daughter/son to participate in this study.

I have read the foregoing information and understand that the research is voluntary.

Name of Guardian _____

Signature of Guardian _____

Date _____

Annex 2: Tools: Questionnaire

This questionnaire is part of a research thesis being conducted by Dr Muluaem Tolessa. All information you give is confidential.

DO you want to be part of the study?

Yes

No

Part One: - Socio-demographic Information		
Q.#	Question	Codes
101	Gender	1. Male _____ 2. Female _____
102	What is your Ethnicity?	1. Oromo 2. Amhara 3. Dawro 4. Tigre 5. Kefa 6. Other (specify) _____
103	What is your religion?	1.Orthodox Christian 2.Islam 3.Protestant 4.Catholic 5.Other (specify) _____
104	What grade are you attending?	_____ grade
Part two: awareness of the Children's own Occlusions		
105	Do you need orthodontic treatment?	a. Yes, b. No, c. Do not know
106	Are you happy with the arrangement of your anterior teeth?	a. Very happy, b. Happy, c. Normal,

		<ul style="list-style-type: none"> d. Unhappy, e. Very unhappy
107	Are you happy with the appearance of your own teeth compared to the teeth of your peers?	<ul style="list-style-type: none"> a. Very happy, b. Happy, c. Normal, d. Unhappy, a. Very unhappy
108	Do you consider well-aligned teeth important for overall facial appearance?	<ul style="list-style-type: none"> a. Very important, b. Important, c. Does not matter, d. Not important, e. Not important at all
Part three: Perceived Need		
109	Looking at the pictures, choose what number picture do you think looks most like your teeth?	_____
Part four: Legal guardian questionnaire		
112	Monthly Income	_____
113	What is Mother's Educational level?	<ul style="list-style-type: none"> a. Can't read and write b. Read and write only c. Grade 1-4 d. Grade 5-8 e. Grade 9-12 f. College g. University
114	What is Father's Educational level?	<ul style="list-style-type: none"> a. Can't read and write b. Read and write only c. Grade 1-4 d. Grade 5-8

		<ul style="list-style-type: none"> e. Grade 9-12 f. College g. University 	
113	What is Mother's Occupation	<ul style="list-style-type: none"> a. Merchant b. Farmer c. Housewife d. Government Employee e. Other (specify) _____ 	
113	What is Father's Occupation	<ul style="list-style-type: none"> a. Merchant b. Farmer c. Daily laborer d. Government Employee e. Other (specify?) _____ 	
114	Looking at the pictures below, choose what number picture do you think looks most like your child's teeth?	_____	
Part 5: Normative Need based on Dental Health Component			
115	CLP	5p: defects of cleft lip and palate and other craniofacial anomalies	_____
116	Missing teeth	5h: Extensive hypodontia with restorative implications (more than one tooth per quadrant) requiring pre-prosthetic orthodontics	_____
		5i: Impeded eruption of teeth (except third molars) due to crowding displacement, the presence of supernumerary teeth, retained deciduous teeth, and any pathological cause	_____
		5s: Submerged deciduous teeth	_____
		4h: Less extensive hypodontia requiring pre restorative orthodontics or orthodontic space closure (one tooth per quadrant)	_____

117	Overjet	5a: Increased overjet > 9 mm	—
		4a: Increased overjet > 6mm but =<9 mm	—
		3a: Increased overjet > 3.5 mm but =<6 mm with incompetent lips	—
		2a: Increased overjet >3.5 mm but =< 6 mm with competent lips	—
118	Reverse Overjet	5m: Reverse overjet >3.5 mm with reported masticatory and speech difficulties	—
		4m: Reverse overjet > 1 mm but < 3.5 mm with recorded masticatory or speech difficulties	—
		4b: Reverse overjet > 3.5 mm with no masticatory or speech difficulties	—
		3b: Reverse overjet > 1 mm but =< 3.5 mm	—
		2b: Reverse overjet >0 mm but =<1 mm	—
119	Crossbite	4l: Posterior lingual cross bite with no functional occlusal contact in one or both buccal segments	—
		4c: Anterior or posterior crossbites with > 2mm discrepancies between retruded contact position and intercuspal position	—
		3c: Anterior or posterior crossbites with >1 mm but = < 2 mm discrepancies between retruded contact position and intercuspal position	—
		2c: Anterior or posterior cross bite with =< 1 mm discrepancy between retruded contact position and intercuspal position	—
120	Displacement of contact point	4x: Presence of supernumerary teeth	—
		4t: Partially erupted teeth, tipped, and impacted against adjacent teeth	—
		4d: Severe contact point displacements >4 mm	—
		3d: contact point displacement > 2 mm but =< 4 mm	—

		2d: Contact point displacement > 1 mm but =< 2 mm	—
		1: Extremely minor malocclusions including contact point displacements < 1 mm	—
121	Overbites	4e: Extreme lateral or anterior open bites > 4mm.	—
		3e: Lateral or anterior open bite > 2 mm but =< 4mm	—
		2e: Anterior or posterior open bite > 1 mm but =< 2 mm	—
122	Deepbite	4f: Increased and complete overbite with gingival or palatal trauma	—
		3f: Deep Overbite complete on gingival or palatal tissues but no trauma	—
		2f: Increased overbite >= 3.5 mm without gingival contact	—
123	Molar relationship	2g: Pre-normal or post-normal occlusions with no other anomalies	—

