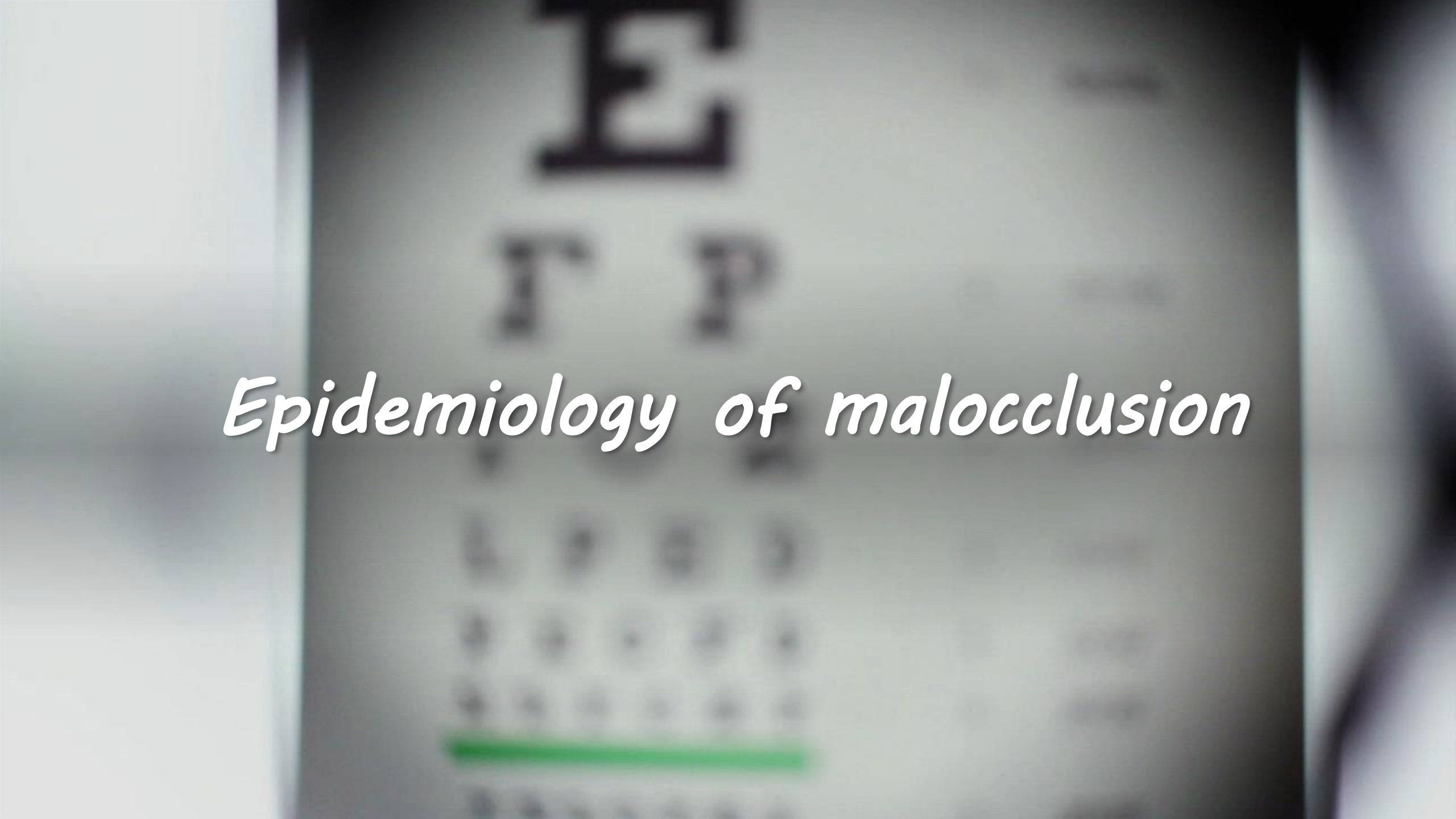
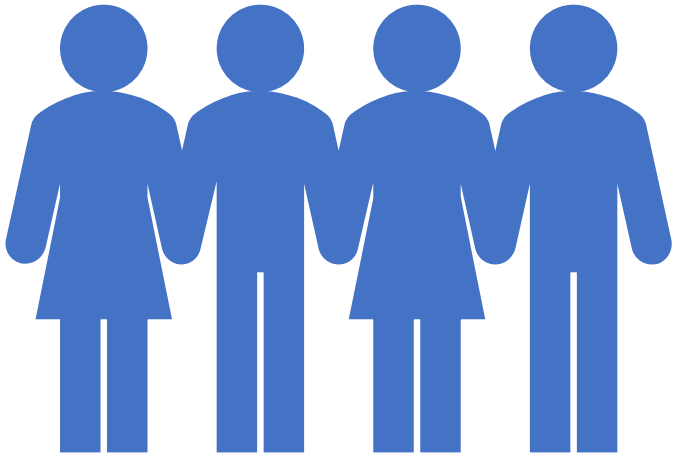


Epidemiology of malocclusion

- **Epidemiology:** It is a branch of medical science that deals with the incidence, distribution and control of disease in a population.

- **Incidence:** This denotes the number of new cases in a particular period of time.

- **Prevalence:** The percentage of a population that is affected with a particular disease at a given time.



- ✓The most prevalent type of malocclusion in the deciduous dentition is anterior open bite, tied in with tongue thrust and finger habits, and class II division 1 (mandibular retrusion) is the next.

- ✓In mixed dentitions, crowding is most common, with mandibular retrusion being the second most common.

- ✓The single most common type of malocclusion prevalent in permanent dentition is crowding.

- Malocclusion indices have been used to categorize disorders for the purpose of epidemiology and research in order to allocate patients into categories of treatment need and to compare the treatment success.

- It does not provide any information concerning the prevalence of a given manifestation of malocclusion.

Types of indices

- 1. *Diagnostic index*: It is used for the purpose of communication between orthodontists. An example of this is Angle's classification.
- 2. *Epidemiologic indices*: These indices record every trait in a malocclusion to allow estimation of the prevalence of malocclusion in a given population, e.g. Summers' Occlusal Index.
- 3. *Treatment need (treatment priority) indices*: According to the level of treatment need, several indices have been developed to allow the categorization of malocclusion. An example of this is Grainger's Treatment Priority Index (TPI).
- 4. *Treatment outcome indices*: Assessment of the outcome of treatment or the changes resulting from treatment is a further potential use of occlusal indices. The Peer Assessment Rating (PAR) Index is specifically for this purpose.
- 5. *Treatment complexity index*: At present, no index has been developed to specifically measure the treatment complexity.

Summary of important indices used in orthodontics

Massler and Frankel Index (1951)	Count the number of teeth displaced or rotated. Assessment of tooth displacement and rotation is qualitative – all or none.
Malalignment Index by Vankirk and Pennell (1959)	Tooth displacement and rotation are measured. Tooth displacement defined quantitatively <1.5 mm or >1.5 mm. Tooth rotation defined quantitatively <45° or >45°.
Handicapping Labiolingual Deviations Index by Draker (1960)	Measurements include cleft palate (all or none), traumatic deviations (all or none), overjet (mm), overbite (mm), mandibular protrusion (mm), anterior open bite (mm) and labiolingual spread (a measurement of tooth displacement in mm).
Occlusal Feature Index by Poulton and Aaronson (1961)	Measurements include lower anterior crowding cuspal interdigitation, vertical overbite and horizontal overjet. Occlusion features measured and scored according to defined criteria.
Malocclusion Severity Estimate by Grainger (1960–1961)	Seven weighted and defined measurements: (1) overjet, (2) overbite, (3) anterior open bite, (4) congenitally missing maxillary incisors, (5) first permanent molar relationship, (6) posterior crossbite and (7) tooth displacement (actual and potential). Six malocclusion syndromes were defined: 1. Positive overjet and anterior open bite 2. Positive overjet, positive overbite, distal molar relationship and posterior crossbite with maxillary teeth buccal to mandibular teeth 3. Negative overjet, mesial molar relationship and posterior crossbite with maxillary teeth lingual to mandibular teeth 4. Congenitally missing maxillary incisors 5. Tooth displacement 6. Potential tooth displacement

Occlusal Index by Summers (1966)	Nine weighted and defined measurements: (1) molar relation, (2) overbite, (3) overjet, (4) posterior crossbite, (5) posterior open bite, (6) tooth displacement, (7) midline relation, (8) maxillary median diastema, (9) congenitally missing maxillary incisors Seven malocclusion syndromes were defined: 1. Overjet and open bite 2. Distal molar relation, overjet, overbite, posterior crossbite, midline diastema and midline deviation 3. Congenitally missing maxillary incisors 4. Tooth displacement (actual and potential) 5. Posterior open bite 6. Mesial molar relation, overjet, overbite, posterior crossbite, midline diastema and midline deviation 7. Mesial molar relation, mixed dentition analysis (potential tooth displacement) and tooth displacement Different scoring schemes and forms for different stages of dental development, deciduous dentition, mixed dentition and permanent dentition.

IOTN

Index of Orthodontic Treatment Need:

- Peter Brook and William Shaw (1989) felt that malocclusion could be best quantitatively measured by using two separate components to record firstly the **dental health and functional indications** for treatment and secondly the **esthetic impairment** caused by the malocclusion.

Dental Health Component :

- Swedish Dental Board (Linder-Aronson, 1974) was used as the basis for grading the **functional** and **dental health** indications for treatment.
- There are **5 grades**

  Grade 1 - little or no need for treatment

  Grade 5 - great need for treatment

Grade 1 – None

- **Displacements < 2 mm**

Grade 2 – Little

- **Over jet = 3.5 - 6 mm + Complement lips**
- **Reverse Overjet = 0.1 - 1.0 mm**
- **Crossbite (Anterior or posterior) = 1 mm**

  (b/w Retruded contact position and Intercuspal position)
- **Teeth Displacement** = **1.1 - 2.0 mm**
- **Openbite (Anterior or posterior) = 1.1 - 2.0 mm**
- **Overbite = ≥ 3.5 mm** (without gingival contact)
- **No other anomalies.**

Grade 3 – Moderate

- **Over jet = 3.5 - 6 mm + Incomplement lips**
- **Reverse Overjet = 1.1 - 3.5 mm**
- **Crossbite (Anterior to posterior) = 1.1 – 2.0 mm**

  (b/w Retruded contact position and Intercuspal position)
- **Teeth Displacement** = **2.1 - 4.0 mm**
- **Overbite (Anterior or Lateral) = 2.0 - 4.0 mm**
- **Increased and complete overbite than 3.5 mm without Indentations or Signs of trauma**

Grade 4 – Great

- **Over jet = 6 - 9 mm**
- **Reverse Overjet = > 3.5 mm , no reported masticatory or speech difficulties**
- **Reverse Overjet = 1.0 - ≥ 3.5 mm , with reported masticatory or speech difficulties**
- **Crossbite (Anterior or posterior) = > 2.0 mm**
- **Crossbite (Posterior lingual) with no occlusal contact in one or both Buccal segment.**
- **Teeth Displacement = > 4.0 mm**
- **Overbite (Anterior or Lateral) = > 4.0 mm**
- **Increased and complete overbite with notable indentations on the palate or labial gingivae.**
- **Patient referred by colleague.**
- **Less extensive hypodontia (Pre – restorative Orthodontics = Space Closure) - Not more than 1 tooth missing in any quadrant**

Grade 4 – Great

- **Over jet** = > 9 mm
- Defects of cleft lip and/or palate.
- **Reverse Overjet** = **> 3.5 mm** , with reported masticatory or speech difficulties
- Impeded eruption of teeth **(with exception of 3rd molars) due to** crowding, displacement, presence of supernumerary teeth, retained deciduous teeth **and any other** pathological cause.
- Extensive **hypodontia** with Restorative implications (more than 1 tooth **missing in any quadrant)** requiring **pre-restorative orthodontics.**

Esthetic Component :

- This scale was constructed using dental photographs of 1000, 12- year old collected during a large multidisciplinary survey.
- 6 nondental judges rated these photographs on a visual analog scale, and gave a **10 - point scale** - 0.5 (attractive dental appearance) to 5.0 (unattractive dental appearance).

- **Attractiveness of the patient's labial aspect Ranked from 1 (close to normal) to 10**

- **Photographs 1–4 represent no need for treatment.**
- **Photographs 5–7 represent borderline need for treatment.**
- **Photographs 8–10 represent need for treatment.**

Fig. 1: Esthetic component of IOTN

PAR Index

➢Peer assessment rating index - Richmond (1992)

- **Quantitative, objective method for measuring malocclusion and the efficacy of orthodontic treatment.**
- **Provides a single score, based on a series of measurements, that represents the degree to which a case deviates from normal alignment and occlusion.**
- **Valid and Reliable tool for measuring malocclusion on plaster models and patients.**
- **Average time to record the PAR index score is approximately 5 minutes.**
- **Assess whether a worthwhile improvement has been achieved in terms of overall alignment and occlusion for an individual patient.**

❖**It has 11 components as follows:**

1. **Overjet**
2. **Overbite**
3. **Centerline**
4. **Upper anterior segment**
5. **Upper right segment**
6. **Upper left segment**
7. **Lower anterior segment**
8. **Lower right segment**
9. **Lower left segment**
10. **Buccal Right occlusion**
11. **Buccal Left occlusion.**

Components

1. Upper and lower anterior segments
2. Left and right buccal occlusion
3. Overjet
4. Overbite
5. Centreline

1) Contact point displacement score

0 0–1 mm
1 1.1–2 mm
2 2.1–4 mm
3 4.1–8 mm
4 >8 mm
5 impacted teeth

2) Buccal occlusal assessment

a) Antero-posterior

0 Good interdigitation
1 <1/2 unit from full interdigitation
2 Half a unit

b) Vertical

0 No open bite
1 Lateral open bite on at least 2 teeth >2 mm

c) Transverse

0 No crossbite
1 Crossbite tendency
2 Single tooth in crossbite
3 >1 tooth in crossbite
4 >1 tooth in scissors bite

3) Overjet assessment

a) Overjet

0 0–3 mm
1 3.1–5 mm
2 5.1–7 mm
3 7.1–9 mm
4 >9 mm

b) Anterior crossbite

0 No crossbite
1 ≥1 teeth egde to edge
2 one single tooth in crossbite
3 2 teeth in crossbite
4 >2 teeth in crossbite

4) Overbite assessment

a) Open bite

0 No open bite
1 Open bite ≤1 mm
2 Open bite 1.1–2 mm
3 Open bite 2.1–3 mm
4 Open bite ≥4 mm

b) Overbite

0 ≤1/3 coverage of the lower incisor
1 >1/3 but <2/3 coverage of the lower incisor
2 ≥2/3 coverage of the lower incisor
3 Greater or equal to full tooth coverage

5) Centreline assessment

0 Coincident and up to 1/4 lower incisor width
1 1/4–1/2 lower incisor width
2 >1/2 lower incisor width

Weightings

1. Upper and lower incisor segments	x1
2. Left and right buccal occlusion	x1
3. Overjet	x6
4. Overbite	x2
5. Centreline	x4

Limitations of PAR and IOTN indices :

(British Journal of Orthodontics, Vol. 27, No. 2, June 2000 ,Daniel Richmonds..,)

- They requires additional training and duplicates the effort of measuring what are often similar occlusal traits.
- Treatment categorizations using the Dental Health Component and the Aesthetic Component can be contradictory, with one component suggesting treatment and the other suggesting no treatment.
- The hierarchical structure of Dental Health Component requires a separate protocol when only study models are available.

- The IOTN or PAR indices have been validated against UK dental opinion and thus may not be representative of professional opinions in other countries.

- PAR takes no account of periodontal destruction, decalcification, root resorption, dynamic occlusion into consideration.

ICON

➢ **Index of complexity Outcome and Need - Richmond and Daniels (2000)**

- Assess treatment need, complexity, treatment improvement and outcome based on international orthodontic professional opinion, intended for use in the context of specialist practice.
- Compare treatment thresholds in different countries and serve as a basis for quality assurance standards in orthodontics.
- Intended for use in late mixed dentition onwards, because transitional stages during the early and middle mixed dentitions are difficult to assess for esthetics.

- Application of the index takes approximately 1 minute for each case and therefore is relatively quick.
- It requires no measurement tools other than an **ordinary millimeter rule** and an **Esthetic component scale** (Shaw et al, 1991)

❖ The occlusal traits scored included :

1. Upper and lower segment alignment.

2. - Anterior vertical relationship

   - Centerline

   - Posterior vertical relationship (left + right)

   - Upper and lower - buccal segment alignment (left + right)

   - buccal segment anteroposterior relationship (left + right)

   Impacted teeth , Missing teeth (excluding 3rd molar).

3. Esthetic assessment based on IOTN esthetic component:

   - Overjet , Reverse overjet

   - Upper and lower incisor inclination relative to the occlusal plane,

   - Overall Upper arch crowding/spacing

   - Lip competency

CONCLUSION

Malocclusion is not just an invariable disease state, but a continuous spectrum of occlusal variation, occurring as a myriad of combinations & permutations of a no of heterogeneous traits or symptoms, each with its own wide range of severity & implications in creating a particular manifestation of occlusion.

- A good method of recording or measuring malocclusion is important for documentation of the prevalence & severity of malocclusion in the population Groups.

- This kind of data is important not only for the epidemiologist but also for the training of orthodontic professionals.

- **There seems to be no universally accepted index for measuring malocclusion yet.**

- **Although the OI had been shown to have the least amount of bias, it still has shortcomings.**

Further research would therefore be needed to develop better indices or to refine the present indices so that they can be more universally accepted.

Many of the current indices of treatment standards show low intra & inter examiner variability when compared with those used for diagnostic or epidemiological purposes.

THANK YOU