KERATOCONUS
EPIDEMIOLOGICAL PROFILE
AND RISK FACTORS

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PROF VR MOODLEY (PHD)
**EPIDEMIOLOGICAL PROFILE?**

■ Epidemiology *(cornerstone of public health)*
  - study & analysis of disease within defined populations
  - determines the extent, distribution and progression of disease.
  - identifies etiology or cause of disease.
  - identifies the risk factors
  - targets preventive and therapeutic measures for a disease
  - informs public health policy.

■ Epidemiological profiles - describes the burden of a disease on the population in terms of sociodemographic, geographic, behavioral and general clinical characteristics of the population.

■ KC - epi data in most countries?
INCIDENCE vs PREVALENCE

- **Incidence** often confused with **Prevalence**

- **PREVALENCE** - proportion of cases in the population at a **given time** - tells us how widespread the disease is.

- **INCIDENCE** - conveys the rate of occurrence of **new cases** - risk of contracting the disease,
PREVALENCE OF KERATOCONUS

• Global prevalence estimated at 0.2-2.3% (Jonas el al., 2009)

• High prevalences reported in Asian and Middle Eastern countries – India, Israel, China (Millodot et al.; Assiri et al.)

• Minimal empirical data on prevalence of KC globally

• Limited population based studies: 5 out of 19 prevalence studies
## GLOBAL PREVALENCE STUDIES

<table>
<thead>
<tr>
<th>REGION</th>
<th>COUNTRY</th>
<th>SITE</th>
<th>STUDY SAMPLE</th>
<th>PREVALENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. AMERICA</td>
<td>USA (2)</td>
<td>POPULATION</td>
<td>13 395 + 64</td>
<td>600/100 000 &amp; 54,5/100 000</td>
</tr>
<tr>
<td>N. AMERICA</td>
<td>MEXICO (1)</td>
<td>HOSPITAL CLINIC</td>
<td>221</td>
<td>1.8/100 000</td>
</tr>
<tr>
<td>ASIA</td>
<td>INDIA</td>
<td>POPULATION</td>
<td>4667</td>
<td>2 300/100 000</td>
</tr>
<tr>
<td>ASIA</td>
<td>JAPAN (1)</td>
<td>HOSPITAL</td>
<td>2601</td>
<td>9/100 000 (I)</td>
</tr>
<tr>
<td>ASIA</td>
<td>AUSTRALIA (1)</td>
<td>HOSPITAL</td>
<td>241</td>
<td>2 340/100 000</td>
</tr>
<tr>
<td>SCANDINAVIA</td>
<td>FINLAND (1)</td>
<td>HOSPITAL</td>
<td>249</td>
<td>30/100 000</td>
</tr>
<tr>
<td>SCANDINAVIA</td>
<td>DENMARK (1)</td>
<td>HOSPITAL</td>
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<td>86/100 000</td>
</tr>
<tr>
<td>SCANDINAVIA</td>
<td>NETHERLANDS (1)</td>
<td>NATIONAL REGISTRATION REVIEW</td>
<td>4 M</td>
<td>265/100 000</td>
</tr>
<tr>
<td>EUROPE</td>
<td>UK (2)</td>
<td>HOSPITAL ARMY RECRUITS</td>
<td>382 + 74</td>
<td>57-229/100 000</td>
</tr>
<tr>
<td>EUROPE</td>
<td>FRANCE (1)</td>
<td>HOSPITAL</td>
<td>670</td>
<td>1 190/100 000</td>
</tr>
<tr>
<td>EUROPE</td>
<td>SPAIN (1)</td>
<td>HOSPITAL</td>
<td>400</td>
<td>24-36/100 000</td>
</tr>
<tr>
<td>EUROPE</td>
<td>RUSSIA (1)</td>
<td>HOSPITAL</td>
<td>91</td>
<td>0.2-0.4/100 000</td>
</tr>
<tr>
<td>MIDDLE EAST</td>
<td>SAUDI ARABIA (2)</td>
<td>POPULATION</td>
<td>125 + 23</td>
<td>20(I) 4/100 000</td>
</tr>
<tr>
<td>MIDDLE EAST</td>
<td>PALESTINE (1)</td>
<td>POPULATION</td>
<td>1 234</td>
<td>97/100 000</td>
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<tr>
<td>MIDDLE EAST</td>
<td>ISRAEL (1)</td>
<td>POPULATION</td>
<td>981</td>
<td>54/100 000 &amp; 2 340/100 000</td>
</tr>
<tr>
<td>MIDDLE EAST</td>
<td>IRAN (1)</td>
<td>POPULATION</td>
<td>401</td>
<td>7.6/100 000</td>
</tr>
</tbody>
</table>

(Gordon-Shaag et al., 2015, Jordan et al.)
EPI PROFILE OF KERATOCONUS

• Starts in 2nd decade of life / early adulthood & progress until 3rd - 4th decade (Rabinowitz et al.).

• Affects both men and women

• Disease progression:
  • early stage - Px typically asymptomatic
  • progresses - V/A decreases
  • severe cases → significant visual loss

• SA practitioners & hospitals – increasing incidence of patients mostly presenting with late stages of disease.

• NO POPULATION BASED STUDY - EPI-K STUDY
EPI–K Study
RISK FACTORS

A characteristic, exposure, condition or behaviour that increases the likelihood of a person getting a disease or injury.

Eg.

Smoking – lung disease
Obesity – heart disease
Risk Factors to be Discussed

Risk

Environmental

Socio-Economic

Systemic Diseases

Nutritional

Genetics/Demography

(Gorden-Shaag et al., Suger et al., Patel et al., Copeman, Karsas, Rabinowitz)
DEMOGRAPHY

■ AGE – Average age at diagnosis 27,3 ± 9,5 years (CLEK study)
  - incidence at much younger age (4-6YRS)

■ GENDER - unclear whether men or women have higher prevalence of the disease (Millodot et al., 1983).

■ ETHNICITY – Asians, African Americans, Latinos
Socio-Economic Status

1. Low Socioeconomic Status
   - Parental Education

2. Other questions that could be asked:
   - Social grant
   - School feeding scheme
**NUTRITION**

<table>
<thead>
<tr>
<th>DECREASED TRACE ELEMENTS</th>
<th>INFO ON FOOD CONSUMPTION</th>
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<tbody>
<tr>
<td>ZINC</td>
<td>FISH</td>
</tr>
<tr>
<td>SELENIUM</td>
<td>BEANS</td>
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<tr>
<td>COPPER</td>
<td>CHICKEN</td>
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<td></td>
<td>CHICK PEAS</td>
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<td></td>
<td>ALMONDS/CASHEWS</td>
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</tbody>
</table>

Possible lower antioxidative activity
SUN EXPOSURE

- **Warmer Climates** (India, Israel, Lebanon, Iran, Saudi Arabia) - higher KC prevalence
- **Cooler Climates** (Northern USA, Europe & Russia) – low KC prevalence

- **UV light** – produces excessive reactive oxygen species in cornea- KC cannot process → oxidative stress, cytotoxicity & corneal thinning
- Wearing a hat outdoors during susceptible age – protective for KC
SYSTEMIC DISEASES

- Downs Syndrome
- Asthma
- Atopy
  - VKC*
- Sleep apnea
- Connective Tissue Disorders
  - Ehlers-Danlos syndrome
  - Marfan syndrome
Positive family history – 12-27%

Autosomal dominant: 50% of the descendants have the risk of inheriting the disease

NO causative gene identified but many factors indicate genetic link:
  - *familial aggregation*
  - *high ectasia concordance in monozygotic compared to dizygotic twins*
  - *association with genetic systemic disorders*

Environmental factors combined with the genetic disposition triggers the cascade of biochemical events which cause KC.
Consanguinity

Consanguineous Marriage:
- Unions contracted between biologically-related individuals
  - first cousins
  - second cousins

Prevalence of KC found to be more in communities where the culture allows
EYE RUBBING

- MOST SIGNIFICANT PREDICTOR OF KC (Bawazeer et al.)

- PARTICULARLY IF RUBBING WITH KNUCKLES
RGP WEARING?

LONG TERM WEAR

IMPROPER FITTING LENSES
LASIK

a) Post-LASIK ectasia - genetic KC patients and LASIK hastens development of KC.

b) >90% of the post-LASIK ectasias had genetic keratoconus.

c) If caused by LASIK – ectasia will be central as opposed to inferior temporal.

(Source: https://www.eyeworld.org/)
FUTURE WORK NEEDED

- SLEEP POSITIONS
  - PRONE
  - SIDE
- HISTORY OF DRY EYE
  - NIGHT TIME WORK
  - SCREEN TIME
- SLEEP APNEA
- DIABETES – strengthens cornea
Thank you!
UPCOMING WEBINARS:
6-PART KERATOCONUS SKILLS DEVELOPMENT PROGRAMME

PART I  KERATOCONUS: DISEASE PROFILE AND EPIDEMIOLOGY

PART II  DIAGNOSTIC APPLICATIONS IN KERATOCONUS

PART III  CLINICAL CLASSIFICATION AND THERAPEUTIC OPTIONS 1:
a)  Fitting Soft and Corneal RGP Contact Lenses
b)  Fitting Hybrid & Scleral Contact Lenses

PART IV  CLINICAL CLASSIFICATION AND THERAPEUTIC OPTIONS 2:
Intracorneal Rings & Corneal Cross Linking

PART V  SURGERY FOR KERATOCONUS
Keratoplasty modalities, complications & co-management

DATES: 3RD FRIDAY OF EACH MONTH
TIME??
REFERENCES


• Gorskova EN and Sevost’ianov EN. Vestnik oftalmologii. 1998 114: 4 38-40


• Rabinowitz, YS. Keratoconus. Survey of Ophthalmology 42(4).