Epidemiological analysis of Adolescent Idiopathic Scoliosis (AIS) in terms of diagnosis, family history, hobbies, pain and curve type

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Disclosures

• I have nothing to disclose.
Study design

- Epidemiological study
- Retrospective analysis from a prospective database
- Determine the characteristics of Idiopathic Scoliosis patients
  - Age of diagnosis
  - Originator of scoliosis detection
  - Pre/post menarche
  - Curve magnitude at diagnosis
  - Family history
  - Hobbies and activities
  - Pain
  - Curve pattern
175 IS patients, 10-18 years

Males; 21; 12%

Females; 154; 88%
Age of diagnosis

<table>
<thead>
<tr>
<th>Age</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-6 years</td>
<td>5</td>
<td>2.9%</td>
</tr>
<tr>
<td>6-10 years</td>
<td>33</td>
<td>18.9%</td>
</tr>
<tr>
<td>10-12 years</td>
<td>61</td>
<td>34.8%</td>
</tr>
<tr>
<td>12-14 years</td>
<td>53</td>
<td>30.3%</td>
</tr>
<tr>
<td>&gt;14 years</td>
<td>23</td>
<td>13.1%</td>
</tr>
</tbody>
</table>
Menarche

- Pre-menarche: 61%
- Post-menarche: 39%
Cobb angle at diagnosis

- Cobb angle at diagnosis
  - 10-25 degrees: 54.8%
  - 25-40 degrees: 38.9%
  - >40 degrees: 6.3%

Cobb angle:
- 10-25 degrees
- 25-40 degrees
- >40 degrees
Scoliosis detection

- Patient/family: 40%
- Pediatrician: 31.4%
- Orthopedic Surgeon: 13.7%
- School screening: 8%
- Sports coach: 4.6%
- Random x-ray: 2.3%
Scoliosis detection, patient characteristics, referral patterns and treatment in the absence of a screening program in Norway

Raphael Dziwornu Adobor¹, Rolf Bjørne Riise¹, Roger Serensen¹, Thomas Johan Kibsgård¹, Harald Steen² and Jens Ivar Brox²

<table>
<thead>
<tr>
<th>Risser sign¹</th>
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<tbody>
<tr>
<td>0</td>
<td>182</td>
<td>24</td>
</tr>
<tr>
<td>1</td>
<td>38</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>76</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>67</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>251</td>
<td>34</td>
</tr>
<tr>
<td>5</td>
<td>135</td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender (n=752)</th>
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<tbody>
<tr>
<td>Girls</td>
<td>644</td>
<td>86</td>
</tr>
<tr>
<td>Boys</td>
<td>108</td>
<td>14</td>
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</table>

<table>
<thead>
<tr>
<th>Age/years</th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>7-12</td>
<td>105</td>
<td>14</td>
</tr>
<tr>
<td>13-14</td>
<td>228</td>
<td>30</td>
</tr>
<tr>
<td>15-16</td>
<td>292</td>
<td>39</td>
</tr>
<tr>
<td>17 and older</td>
<td>127</td>
<td>17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cobb angle/°</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10 - 24.9</td>
<td>119</td>
<td>16</td>
</tr>
<tr>
<td>25 - 34.9</td>
<td>229</td>
<td>31</td>
</tr>
<tr>
<td>35 - 39.9</td>
<td>114</td>
<td>15</td>
</tr>
<tr>
<td>40 - 44.9</td>
<td>91</td>
<td>12</td>
</tr>
<tr>
<td>&gt;45</td>
<td>199</td>
<td>27</td>
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</tbody>
</table>
Scoliosis detection, patient characteristics, referral patterns and treatment in the absence of a screening program in Norway

Raphael Dziwornu Adobor1, Rolf Bjarne Riise1, Roger Sørensen1, Thomas Johan Kibsgård1, Harald Steen1 and Jens Ivar Brox1

- 86% girls-14% boys (**88%-12% in our study**)
- 56% first diagnosis above 15 years (**13.1% in our study**)
- 74% post-menarche (**39% in our study**)
- 52% Risser 4 and 5
- 40% major curve >40° (**6.3% in our study**)
- 71% detected by patients, families, friends (**40% in our study**)

**Possible explanations:***
- Mean age of menarche in Norway was 13.2 years, higher than in Greece
- Different climate
- Absence of school screening
Family history

- Family history: 44%
- No family history: 56%

77 vs 98
Family history – Literature review

• Adobor et al 2012:
  31% FH.

• Grauers et al 2013:
  51% FH. Not a strong prognostic factor, but higher risk of developing more severe scoliosis

• Watanabe et al 2017:
  1.5 higher odds ratio(OR) risk to develop AIS for children whose mother has scoliosis. Also found association of AIS and BMI.
Ballet dancers – Literature review

• Warren et al 1986:
Predisposed for scoliosis due to delay of menarche (83%) that reflect to prolonged hypoestrogenism

• Langworth et al 2014:
Significantly higher risk to develop scoliosis in ballet dancers, due to hypermobility. 12.4 more likely for scoliosis than non-dancers at the same age.

• Watanabe et al 2017:
AIS associated with classical ballet training. Positive relationship with frequency, duration of training and years of experience
Gymnastics – Literature review

• Tanchev et al 2000:
10-fold higher incidence for scoliosis. “Dangerous triad”:
- Delay of menarche
- Joint laxity
- Asymmetrical loading

• Meyer et al 2006:
High Joint laxity in gymnastics. Girls with JL more prone to develop AIS
Swimming/Tennis – Literature review

• McMaster et al 2006,2015: Early introduction to indoor heated pools can increase the risk of scoliosis. Vertical spinous process asymmetry in 15/18 children

• Zaina et al 2015: Some experts suggest swimming to “treat” scoliosis, without any scientific evidence. Competitive swimming increases the risk to develop scoliosis

• Zaina et al 2016: Tennis is not dangerous to develop trunk asymmetries or scoliosis
Pain

- No pain: 146 (83.4%)
- Upper back pain: 15 (8.6%)
- Low back pain: 14 (8%)

Legend:
- Blue: No pain
- Orange: Upper back pain
- Gray: Low back pain
Pain – Literature review

- **Ramirez et al 1997:**
  23% back pain, but 9% due to other conditions like spondylolysis, Scheuermann’s Kyphosis, syrinx, herniated disc. Higher incidence above 15 years and at late skeletal maturity.

- **Sato et al 2011:**
  Pain 27.5% for scoliosis group, 11.4% for non-scoliosis

- **Adobor et al 2012:**
  Back pain
  - Absent 42%
  - Seldom 19%
  - Sometimes 22%
  - Often 13%
  - All the time 4%
Schroth BSPTS classification
Schroth BSPTS classification

- 4C: 57 (32.5%)
- 3C: 49 (28%)
- N3N4: 29 (16.6%)
- STL: 25 (14.3%)
- SL: 15 (8.6%)
Conclusions

• Not so late diagnosis compared to other studies (Adobor et al 2012), but still high percentage of patients with first diagnosis within brace indication range (25° -40° / 38.9%) and surgery indication range (>40° / 6.3%)
• 54.8% into PSSE indication range (10° -25°). Need to promote the role and effectiveness of PSSE in mild scoliosis treatment (Level of Evidence I), less adolescents will need to be braced for AIS
• Pediatricians made the first diagnosis in 31.4% of patients. Important to give proper advice
• School screening services in Greece are not very well developed, only 8% detected
Conclusions

• Family History is not a very strong prognostic factor (56% no FH)
• 1/4 patients had no hobbies (24.6%)
• Most common activities in patients with AIS were ballet, dance, swimming, gymnastics, in accordance with current literature
• Sports personnel and coaches need to be educated about scoliosis suspicion, especially sports with high incidence of AIS (ballet, dance, gymnastics, swimming)
• Pain prevalence was slightly lower than other studies
• Single thoracic and double scoliosis were almost equally distributed
Thank you for your attention