Geographical Distribution of Liver Cancer and Current Status of *Opisthorchis viverrini* Infection in Khon Kaen Province
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Tropical Disease Research Laboratory
Department of Pathology
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Liver Cancer

Hepatocytes (Hepatic cells)
Hepatocellular carcinoma

Bile duct epithelium
Cholangiocarcinoma
Thailand, North-East: Khon Kaen
Korea: Busan
The Gambia
Korea: Seoul, Daegu
Japan: Hiroshima, Osaka, Saga Prefectures
China: Jiashan, Hong Kong Regions
Mali
Korea: Kangwondo County
Zimbabwe
Japan: Nagasaki Prefecture
Thailand, North: Chiang Mai, Lampang
Viet Nam and Philippines
China: Beijing, Tianjin Regions
Singapore: Chinese, Malays
USA, California: Chinese and Koreans
Japan: Miyagi, Yamagata Prefectures
Italy, Outer regions including Parma
Thailand, Central: Bangkok
USA, New Mexico: American Indians
France, Northern and Central
Australia, Northern Territory
Italy, Central excluding Parma
Singapore: Indians
Uganda
Kuwait, Oman, Pakistan
Central Europe, Spain and Portugal*
Thailand, South: Songkhla
USA: Blacks
Yugoslavia, Vojvodina, Croatia
Central America*
Russia
France, Southern and islands
USA: Whites
Canada*
South America*
New Zealand, Australia except NT
Israel*
India*
Northern Europe*
Malta
Algeria

World Age Standardised Rate (per 100,000 people)

(WHO, 2002)

- Thailand: Male 12.3, Female 33.41
- Chiang Mai: Male 5.85, Female 17
- Lampang: Male 14.73, Female 32.9
- Nakhon Phanom: Male 31.08, Female 63.51
- Udon Thani: Male 49.79, Female 113.36
- Khon Kaen: Male 78.41
- Bangkok: Male 4.34, Female 13.41
- Rayong: Male 4.14, Female 14.9
- Prachuap Khiri Khan: Male 2.41, Female 7.34
- Songkhla: Male 2.09, Female 7.7
<table>
<thead>
<tr>
<th>Rank</th>
<th>Disease</th>
<th>Males DALYs (X 100,000)</th>
<th>Males %</th>
<th>Females Rank</th>
<th>Disease</th>
<th>Females DALYs (X 100,000)</th>
<th>Females %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HIV/AIDS</td>
<td>9.6</td>
<td>17%</td>
<td>1</td>
<td>HIV/AIDS</td>
<td>3.7</td>
<td>11%</td>
</tr>
<tr>
<td>2</td>
<td>Traffic injury</td>
<td>5.1</td>
<td>9%</td>
<td>2</td>
<td>Stroke</td>
<td>2.8</td>
<td>6%</td>
</tr>
<tr>
<td>3</td>
<td>Stroke</td>
<td>2.7</td>
<td>5%</td>
<td>3</td>
<td>Diabetes</td>
<td>2.7</td>
<td>6%</td>
</tr>
<tr>
<td>4</td>
<td><strong>Liver cancer</strong></td>
<td><strong>2.5</strong></td>
<td><strong>4%</strong></td>
<td>4</td>
<td>Depression</td>
<td>1.5</td>
<td>3%</td>
</tr>
<tr>
<td>5</td>
<td>Diabetes</td>
<td>1.7</td>
<td>3%</td>
<td>5</td>
<td><strong>Liver cancer</strong></td>
<td><strong>1.2</strong></td>
<td><strong>3%</strong></td>
</tr>
<tr>
<td>6</td>
<td>IHD</td>
<td>1.6</td>
<td>3%</td>
<td>6</td>
<td>Osteoarthritis</td>
<td>1.1</td>
<td>3%</td>
</tr>
<tr>
<td>7</td>
<td>COPD (emphysemal)</td>
<td>1.6</td>
<td>3%</td>
<td>7</td>
<td>Traffic injury</td>
<td>1.1</td>
<td>3%</td>
</tr>
<tr>
<td>8</td>
<td>Homicide violence</td>
<td>1.6</td>
<td>3%</td>
<td>8</td>
<td>Anemia</td>
<td>1.1</td>
<td>3%</td>
</tr>
<tr>
<td>9</td>
<td>Suicides</td>
<td>1.5</td>
<td>3%</td>
<td>9</td>
<td>IHD</td>
<td>1.1</td>
<td>3%</td>
</tr>
<tr>
<td>10</td>
<td>Drug dependence</td>
<td>1.4</td>
<td>2%</td>
<td>10</td>
<td>Cataracts</td>
<td>1.0</td>
<td>2%</td>
</tr>
</tbody>
</table>
## Risk factors of Cholangiocarcinoma: community-based studies

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>n</th>
<th>Adjusted odd ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OV egg count</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>410</td>
<td>1</td>
</tr>
<tr>
<td>1-1500</td>
<td>753</td>
<td>1.67 (0.2-16.3)</td>
</tr>
<tr>
<td>1500-6000</td>
<td>477</td>
<td>3.23 (0.4-29.5)</td>
</tr>
<tr>
<td>&gt; 6000</td>
<td>167</td>
<td>14.08 (1.67-118.6)</td>
</tr>
<tr>
<td><strong>Antibody to OV</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OD&lt;0.2</td>
<td>180</td>
<td>1</td>
</tr>
<tr>
<td>OD&gt;0.2</td>
<td>73</td>
<td>27.09 (6.3-116.57)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>950</td>
<td>1.0</td>
</tr>
<tr>
<td>Male</td>
<td>857</td>
<td>3.0 (0.8-11.2)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-34</td>
<td>563</td>
<td>1</td>
</tr>
<tr>
<td>35-49</td>
<td>754</td>
<td>4.57(0.5-38.5)</td>
</tr>
<tr>
<td>&gt;50</td>
<td>490</td>
<td>9.21 (1.1-74.69)</td>
</tr>
<tr>
<td><strong>Praziquantel treatment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>200</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>200</td>
<td>3.4</td>
</tr>
<tr>
<td>2-4</td>
<td>200</td>
<td>4.6</td>
</tr>
</tbody>
</table>

(Haswell-Elkins et al, 1994: Chuenroongroj, 2000; Honjo et al., 2005)
Life cycle of *Opisthorchis viverrini*
(Sripa, 2003)
Nitric oxide and other oxygen free radicals

Immunosuppression
(37 kDa OV antigen)

Inhibit DNA repair
(BER-inflammation)
8-oxodG (G:C-T:A)

Inflammation

Macrophage
Eosinophil
Epithelium

iNOS

IFN, TNF

T cells

NO
nitrotyrosine

Genotoxic

NO & metabolites
NDMA

DNA damage
(8-oxodG)

amines

adduct

CYP
Liver fluke infection

Epithelial desquamation
Parasite molecules

Epithelial hyperplasia
Goblet cell metaplasia
Adenomatous hyperplasia

DNA damage

Genetic alterations

Malignant transformation

Cholangiocarcinoma

Mechanical

Inflammation

iNOS

Endogenous N.
Exogenous N. (dietary)

Periductal fibrosis
Bile stasis
Ascending cholangitis

Infectious N.

iNOS

Amines

Mechanical

Immunopathology
จำนวนผู้ป่วยใหม่ในมะเร็ง 10 อันดับแรกในระยะเวลา 10 ปี (1997-2006) โรงพยาบาลศรีนครินทร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น

Tumor Registry, Srimagarind Hospital-KKU (1997-2007)
Incidence of CCA (per 100,000) and prevalence of OV infection in Khon Kaen (1986-2005)

CCA incidence = 65.47 (26.46-110.08) per 100,000
OV prevalence = 30%

ASR (Male) = 96.52
ASR (Female) = 38.47
Water reservoirs
Field works
Age distribution of people examined for *Opisthorchis viverrini* from 5 villages in Khon Kaen

Overall prevalence 29.8 %
(Range 24.5%-51.3%)

N = 1,276
Frequency of praziquantel treatment in different age-groups in people from 5 villages in Khon Kaen
ขอบขอบคุณ

หน่วยมะเร็ง โรงพยาบาลศรีนครินทร์
คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น

Professor J. Malone
President, Global Network for Geospatial Health