The burden of CVD & T2DM in South East Asia: Call for action

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Diabetes is the world’s THIRD MOST POPULOUS country\textsuperscript{1}

425 MILLION have Diabetes
>90% of cases are T2DM\textsuperscript{1}

by 2040
629 MILLION will have Diabetes\textsuperscript{1}

4 MILLION
Number of deaths due to Diabetes\textsuperscript{1}

Diabetes expenditure was USD 727 billion in 2017 and will reach USD 776 billion by 2045\textsuperscript{1}

17 Medications
12 Classes
19 Combinations

Number of FDA-approved DIABETES DRUGS\textsuperscript{3}

WHO Region

South – East Asia

Western Pacific
Number of people with diabetes worldwide and per region in 2017 and 2045 (20-79 years)
1 in 11 adults have diabetes.

~170 million people have diabetes; will rise to 208 million by 2045.

highest number of people with diabetes among the IDF regions.

More than half (54%) of them have not been diagnosed and are at a higher risk of developing harmful and costly complications.

Home to 37% of the total number of diabetics in the world.

Highest number of deaths due to diabetes (1.7 million) among the IDF regions.

Despite being the region with the highest diabetes burden, only USD 136.1 billion will be spent on treating diabetes – 16% of the total worldwide.
“Rising Star”: Diabetes in Southeast Asia

Top 5 Countries
1. India
2. Bangladesh
3. Sri Lanka
4. Nepal
5. Mauritius

- 1 in 12 adults have diabetes.
- 84 million have diabetes (2nd highest region); will rise to 156 million by 2045.
- More than half (58%) have not been diagnosed and are at a higher risk of harmful & costly complications.
- Second highest number of deaths due to diabetes (1.3 million) among the IDF regions.
- Second lowest diabetes-related expenditure per person with diabetes (USD 9.7 billion).
High proportion of undiagnosed diabetes patients in SEA and WP

Table 3.3 People living with diabetes (20-79 years) who are undiagnosed per region, 2017

<table>
<thead>
<tr>
<th>Rank</th>
<th>IDF region</th>
<th>Proportion undiagnosed</th>
<th>Number of people with undiagnosed diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Africa</td>
<td>69.2%</td>
<td>10.7 million [6.8-19.0]</td>
</tr>
<tr>
<td>2</td>
<td>South-East Asia</td>
<td>57.6%</td>
<td>47.2 million [36.0-59.4]</td>
</tr>
<tr>
<td>3</td>
<td>Western Pacific</td>
<td>54.1%</td>
<td>85.9 million [76.1-108.0]</td>
</tr>
<tr>
<td>4</td>
<td>Middle East and North Africa</td>
<td>49.0%</td>
<td>19.0 million [13.1-25.3]</td>
</tr>
<tr>
<td>5</td>
<td>South and Central America</td>
<td>40.0%</td>
<td>10.4 million [8.8-12.6]</td>
</tr>
<tr>
<td>6</td>
<td>Europe</td>
<td>37.9%</td>
<td>22.0 million [17.6-30.3]</td>
</tr>
<tr>
<td>7</td>
<td>North America and Caribbean</td>
<td>37.6%</td>
<td>17.3 million [14.4-19.3]</td>
</tr>
</tbody>
</table>
Plausible Factors for High Propensity to Develop DM Among Asians

Genetic and Acquired risk factors
- Genetic factors
- Familial aggregation
- Gene – Environmental interactions
- Ethnicity
- Low threshold for risk factors (age, BMI, central adiposity)
- Adverse intrauterine, maternal and perinatal conditions

Environmental risk factors
- Urbanization, modernization
- Rural – urban migration
- Globalization and Industrialization
- Sedentary lifestyle, consumption of energy dense food, smoking, tobacco chewing, excess alcohol
- Sleep disturbances
- Psychological stress

Societal factors
- Low awareness about diabetes
- Several cultural and religious taboos
- Psycho-social factors affecting health
- Inadequate healthcare facilities
- Environment not congenial for physical activity

Prediabetes / Diabetes Cardiovascular risk

Prevalence of Cardio-Metabolic Risk Factors in Asian Diabetics

Data from a web-based T2DM registry that included 41,029 patients from 9 Asian countries enrolled between November 2007 to December 2012.

At diagnosis of early onset T2D, higher prevalence of macro- and micro-vascular complication in South Asian patients.
Diabetes Complications

People with diabetes are at **higher risk** of developing periodontal disease.

Diabetic retinopathy affects over **one-third** of all people with diabetes and is the leading cause of vision loss in working-age adults.

Pregnant woman with diabetes or at high risk for GDM should manage their glycaemia throughout their pregnancy to avoid long-term consequences for themselves and their children, and **trasgenerational effects** (higher risk of obesity, diabetes, hypertension and kidney disease in the offspring).

People with diabetes are **2 to 3 times** more likely to have cardiovascular disease (CVD).

Every 30 seconds a lower limb or part of a lower limb is lost to amputation somewhere in the world as a consequence of diabetes.

The prevalence of end-stage renal disease (ESRD) is up to **10 times higher** in people with diabetes.
Diabetes-related CV complications have declined with improved care, but substantial burden remains.
Initial presentation of CV diseases in type 2 diabetes patients

<table>
<thead>
<tr>
<th>Initial presentation of cardiovascular disease</th>
<th>Number of events</th>
<th>Hazard ratio (95% CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No diabetes</td>
<td>Type 2 diabetes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stable angina</td>
<td>12 232</td>
<td>728</td>
<td>1.62 (1.49–1.77)</td>
</tr>
<tr>
<td>Unstable angina</td>
<td>5286</td>
<td>245</td>
<td>1.53 (1.32–1.76)</td>
</tr>
<tr>
<td>Non-fatal myocardial infarction</td>
<td>15 191</td>
<td>706</td>
<td>1.54 (1.42–1.67)</td>
</tr>
<tr>
<td>Unheralded coronary death</td>
<td>5101</td>
<td>255</td>
<td>1.43 (1.23–1.65)</td>
</tr>
<tr>
<td>Heart failure</td>
<td>13 072</td>
<td>866</td>
<td>1.56 (1.45–1.69)</td>
</tr>
<tr>
<td>Arrhythmia or sudden cardiac death</td>
<td>3218</td>
<td>100</td>
<td>0.95 (0.76–1.19)</td>
</tr>
<tr>
<td>Transient ischaemic attack</td>
<td>10 990</td>
<td>513</td>
<td>1.45 (1.31–1.60)</td>
</tr>
<tr>
<td>Ischaemic stroke</td>
<td>5643</td>
<td>316</td>
<td>1.72 (1.52–1.95)</td>
</tr>
<tr>
<td>Subarachnoid haemorrhage</td>
<td>1260</td>
<td>11</td>
<td>0.48 (0.26–0.89)</td>
</tr>
<tr>
<td>Intracerebral haemorrhage</td>
<td>2265</td>
<td>84</td>
<td>1.28 (1.02–1.62)</td>
</tr>
<tr>
<td>Peripheral arterial disease</td>
<td>10 074</td>
<td>992</td>
<td>2.98 (2.76–3.22)</td>
</tr>
<tr>
<td>Abdominal aortic aneurysm</td>
<td>3051</td>
<td>62</td>
<td>0.46 (0.35–0.59)</td>
</tr>
</tbody>
</table>

Per 100 initial presentations of cardiovascular disease (%)

- Peripheral arterial disease: 16.2%
- Heart failure: 14.1%
- Stable angina
- Non-fatal myocardial infarction
- Stroke not further specified
- Coronary disease not further specified
- Transient ischaemic attack
- Ischaemic stroke
- Unheralded coronary death
- Unstable angina
- Arrhythmia or sudden cardiac death
- Intracerebral haemorrhage
- Abdominal aortic aneurysm
- Subarachnoid haemorrhage

People with Diabetes are at Increased Risk of Heart Failure

People with diabetes have a 2- to 5-fold higher risk of developing HF

Diabetes confers a 60–80% greater probability of CV death and all-cause mortality in those with established HF

Diabetes Worsens Heart Failure Prognosis

Kaplan–Meier survival curves of HF patients hospitalised with LVEF ≥50% (n=498) and <50% (n=754)

Higher Diabetes Prevalence in Asian than White Patients With Heart Failure

Bank et al. J Am Coll Cardiol 2017;5:14-24
Number of deaths due to diabetes (20-79 years) in 2017 in millions

**SOUTH EAST ASIA**
- 82 million adults live with diabetes in the region - the second highest of all IDF regions.
- Home to 19.3% of the total number of people with diabetes in the world.
- In 2017, 1.1 million people will die due to diabetes - the second highest number of deaths of all IDF regions.

**WESTERN PACIFIC**
- Home to the highest number of deaths due to diabetes (1.3 million) of all IDF regions.
- 158.8 million people with diabetes (37.4% of the global population with diabetes) live in the region - the highest number of all IDF regions.
<table>
<thead>
<tr>
<th>Region</th>
<th>Stroke (%)</th>
<th>MI (%)</th>
<th>Angina (%)</th>
<th>Heart Failure (%)</th>
<th>Atherosclerosis (%)</th>
<th>CAD (%)</th>
<th>CVD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>5</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>23.6</td>
<td>28.6</td>
</tr>
<tr>
<td>Europe</td>
<td>7.2</td>
<td>10</td>
<td>14.6</td>
<td>19</td>
<td>33</td>
<td>15.4</td>
<td>30</td>
</tr>
<tr>
<td>Middle East &amp; North Africa</td>
<td>7.1</td>
<td>11.4</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>27.4</td>
<td>26.9</td>
</tr>
<tr>
<td>North America &amp; Caribbean</td>
<td>10.9</td>
<td>13.6</td>
<td>17.2</td>
<td>29.5</td>
<td>NR</td>
<td>20.1</td>
<td>46</td>
</tr>
<tr>
<td>South &amp; Central America</td>
<td>5.5</td>
<td>NR</td>
<td>NR</td>
<td>4.2</td>
<td>NR</td>
<td>22.6</td>
<td>27.5</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>3.1</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>29.4</td>
<td>42.5</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>11.4</td>
<td>NR</td>
<td>NR</td>
<td>4.3</td>
<td>26</td>
<td>23.6</td>
<td>33.6</td>
</tr>
</tbody>
</table>
CV Disease is the Most Common Cause of Death in Diabetics

Type 1 DM
Type 2 DM

CV Death is Increased in Patients with DM +/- Other Risk Factors

<table>
<thead>
<tr>
<th>Diabetes</th>
<th>No diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>120</td>
</tr>
</tbody>
</table>

Data from a web-based T2DM registry that included 41,029 patients from 9 Asian countries enrolled between November 2007 to December 2012.

Data from a web-based T2DM registry that included **41,029** patients from **9 Asian countries** enrolled between November 2007 to December 2012.

Data from a web-based T2DM registry that included 41,029 patients from 9 Asian countries enrolled between November 2007 to December 2012.

Data from a web-based T2DM registry that included **41,029** patients from **9 Asian countries** enrolled between November 2007 to December 2012.

Attainment of BP, Glucose & LDL-C Control in Asian Diabetics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population (2016)</td>
<td>94,569,000</td>
</tr>
<tr>
<td>Gross national income per capita (PPP international $, 2013)</td>
<td>5,030</td>
</tr>
<tr>
<td>Life expectancy at birth m/f (years, 2016)</td>
<td>72/81</td>
</tr>
<tr>
<td>Probability of dying under five (per 1 000 live births, 2017)</td>
<td>21</td>
</tr>
<tr>
<td>Probability of dying between 15 and 60 years m/f (per 1 000 population, 2016)</td>
<td>182/66</td>
</tr>
<tr>
<td>Total expenditure on health per capita (Intl $, 2014)</td>
<td>390</td>
</tr>
<tr>
<td>Total expenditure on health as % of GDP (2014)</td>
<td>7.1</td>
</tr>
</tbody>
</table>

WHO statistics: https://www.who.int/countries/vnm/en/
Major cause of death 2016 in VN

**PROPORTIONAL MORTALITY***

- 31% Cardiovascular diseases
- 19% Cancers
- 6% Chronic respiratory diseases
- 4% Diabetes
- 18% Other NCDs
- 11% Communicable, maternal, perinatal and nutritional conditions
- 11% Injuries

NCDs are estimated to account for **77%** of all deaths.

WHO statistics: https://www.who.int/countries/vnm/en/
Time trends of Diabetes in VN

Not Aware of Diabetes: 68.9%

Data from National Survey Program of Institute of Endocrinology
Hypertension in adults in Vietnam (2009)

1. Hanoi (city)
2. Thai-Binh (lowland)
3. Thai-Nguyen (highland)
4. Nghe-An (costal)
5. Khanh-Hoa (costal)
6. Dac-Lac (highland)
7. Dong-Thap (lowland)
8. Ho-Chi-Minh City (city)

National settings for epidemiological surveys (The map did not include the Spratly and Paracel islands, both belong to Vietnam)

<table>
<thead>
<tr>
<th>No</th>
<th>Population-based cross-sectional surveys</th>
<th>Sample size, area and time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NESH - National epidemiological survey on hypertension and its risk factors in Vietnam</td>
<td>9,832 people in 8 provinces 2001-2008</td>
</tr>
</tbody>
</table>

HYPERTENSION
25.1% (2467/9832)
Population: 11 million

Not aware of hypertension
51.6% (1273/2467)
Population: 5.7 million

Not treated for hypertension
38.9% (464/1194)
P0ulation: 2.1 million

Treated but not controlled
63.7% (465/730)
Population: 2.0 million

17.1 million people need to take care

Population Survey
5454 Vietnam adults
Population: 44 million

HYPERTENSION
47.3% (2577/5454)
Population: 20.8 million

- Not aware of hypertension
  39.1% (1007/2577)
  Population: 8.1 million

- Not treated for hypertension
  7.2% (113/1570)
  Population: 0.9 million

- Treated but not controlled
  69.0% (1005/730)
  Population: 8.1 million

Aware of hypertension
60.9% (1570/2577)
Population: 12.7 million

Treated for hypertension
92.8% (1457/1570)
Population: 11.8 million

Treated and controlled
31.3% (456/1457)
Population: 3.7 million

Normotensive
52.8% (2877/5454)
Population: 23.2 million

≈ \frac{1}{2}

≈ \frac{1}{3}

≈ \frac{2}{3}
Time trends of hypertension in Vietnam

3-year moving average graph

Increase 0.9%/year
Increase 1.1%/year

Prevalence of Hypertension (%)

Urban Area
Rural Area

01-03 03-05 05-07 07-09 01-03 03-05 05-07 07-09


Age-standardized estimation from multiple consecutive cross-sectional surveys
Clustering of major CVDRFs in Vietnam

Age-standardized estimation in two northern provinces (2009)
Time trends of Cardiovascular Disease
In-hospital Data
(CAD and Rheumatic VHD at VNHI from 1990 – 2015)

Internal Data of VNHI
PTMC and PCI at VNHI

Data from Cardiac Cath. Lab. Vietnam National Heart Institute
Coronary artery Profile on Angiography of DM Patient at VNHI (3000 pts. From 2005 – 2010)

• 30% PCI Patients has Diabetes
• Coro. Disease more severe:
  – 3VD: 45% (vs 30% in non-diabetic)
  – More diffuse disease
  – Cor. Artery diameter: smaller
  – LVEF: DM < non- DM’s

Data from VNHI
CONCLUSIONS

- The epidemic of diabetes is very alarming most especially in Western Pacific and Southeast Asia where majority of patients are located and exponential increase in new cases is expected.
- Diabetes is often associated with other cardio-metabolic risk factors that further increase the risk of developing serious and costly complications.
- Cardiovascular death is the most frequent cause of death among diabetic patients.
- A significant treatment gap exists among diabetic patients in Asia with suboptimal attainment of A1c, blood pressure, and hypertension goals that may lead to cardiovascular diseases.
- Optimization of disease management strategies and programs must be prioritized to help curb the diabetes epidemic.