A Meta-analysis on Accuracy of Dengue Diagnostic Tests Used for Point-Of-Care Testing Among ASEAN patients

Tin Myo Han¹*, Swe Swe Latt¹, Iskandar Firzada Osman², D.M Thuraiappah³, Aung Gyi¹, Mohd Aznan Md Aris¹, Fa'iza Abdullah¹, Tin Tin Aye⁴

1. International Islamic University Malaysia, Kuantan Campus
2. Klinik Kesihatan JaraGarding, Kuantan, Pahang, Malaysia
3. MAHSA University, Kuala Lumpur
4. University Malaysia Sabah
Burden of Dengue

• Dengue, a vector born disease caused by the dengue virus is a major public-health concern throughout tropical and sub-tropical regions of the world.

• Estimated that 50–100 million dengue infections occur each year.

• 30-fold increase in global incidence over the past 50 years (WHO,2012).

• 75% of the global population exposed to dengue are in the Asia-Pacific region*

Countries / Area At Risk of Dengue Transmission (2008)*

Average Numbers of Dengue Cases in “30 Most highly endemic Countries (2004-2010)*

Strategy to mitigate Dengue Morbidity & Mortality vs Primary Care Physicians

• Implementing improved outbreak prediction which is determined by “early detection of the cases” through coordination of:
  - Clinical management,
  - Epidemiological investigation & response and
  - Entomological surveillance

- Primary care physicians (GPs/FPs) working at both public and private primary care clinics are crucial for early detection of dengue cases
WHO Recommendation in Dengue Diagnosis

Confirmed Dengue cases by laboratory tests
Accuracy of Dengue Diagnostic tests for “Point-Of-Care Testing”

- Primary care physicians (GPs/FPs) from both public & private should adhere WHO recommendation in dengue case management*

- Thus application of dengue diagnostic tests (RDTs) used for POCT by PCPs with a sound knowledge on “accuracy” of these test kits is desirable in early detection of confirmed (ruling in/ ruling out) dengue cases in primary care clinics


**Start D B (2012): “Commercial Dengue Rapid Diagnostic tests for point-of-care Application: Recent evaluation & future needs?”
Aim & Objectives

Aim
To review the “accuracy” of dengue diagnostic tests used for POCT by applying meta-analysis

Objectives
1. To find out range and pooled “sensitivity” of the dengue diagnosis tests (RDTs and ELISA)
2. To find out range and pooled “specificity” of the dengue diagnosis tests (RDT and ELISA)
Methods

• The accuracy results of **31 dengue diagnosis tests** in **5308 ASEAN patients** except Brunei were extracted from **14** published articles published within **2007 and 2014**.

• Rapid diagnosis tests (**RDT**) and **WHO-Clinical criteria** were considered for POCT.

• **ELISA tests** with/without WHO-Clinical criteria were included in meta-analysis.

• **Pooled sensitivity** (**SN**) and **specificity** (**SP**) were computed.

• Egger-bias was analysed for publication bias.

• StatDirect Statistical software was used for Meta-analysis
Selection of 31 Dengue Diagnostic tests for Meta-analysis

“36” Articles with dengue diagnostic tests published 2005 onwards retrieved using keywords
(Dengue, Diagnostic Tests, sensitivity, specificity, name of Asian countries) via Google scholar & Pub-Med

Excluded – 10 articles with non-Asian subjects/patients and 4 articles without SN or SP value of the dengue diagnostic test

“22” Articles with Dengue diagnostic tests with SN & SP value and subjects/patients were from Asian countries except Brunei

Excluded – 8 articles without 95% CI value of SN & SP

“14” Articles with Dengue diagnostic tests from ASEAN countries (except Brunei) with SN & SP value together with respective 95% CI value

Included – the tests based on detection of antigens & Serological tests (RDT, ELISA and WHO clinical Criteria)
Excluded- Virus Isolation, Nucleic acid detection, PCR/ R-TPCR, Isothermal amplification methods, Haem-agglutination-inhibition test

SN/SP with (95%CI) value of “20” tests (RDT & WHO Clinical Criteria) which are applicable in POCT, “10” ELISA Tests “1” ELISA + WHO Clinical Criteria
<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Study site</th>
<th>Subjects (n)</th>
<th>Diagnosis tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fry, S. R., Meyer, M., Semple, M. G., Simmons, C. P., Sekaran, S. D., Huang, J. X., ... &amp; Cooper, M. A.</td>
<td>2011</td>
<td>Vietnam, Malaysia</td>
<td>Vietnam (n=298), Malaysian (n=293)</td>
<td>NS1 Rapid tests, Combined NS1/IgM, IgG</td>
</tr>
<tr>
<td>Guzman, M. G., Jaenisch, T., Gaczkowski, R., Ty Hang, V. T., Sekaran, S. D., Kroeger, A., ... &amp; Simmons, C. P.</td>
<td>2010</td>
<td>Asia (Malaysia, Thailand, Philippines, Vietnam) and Americas (Nicaragua and Venezuela)</td>
<td>n=1385, Malaysia (n=124), Thailand (n=161), Philippines (n=369), Vietnam (n=407+214), Nicaragua (n=36), Venezuela (n=74)</td>
<td>Pan-E Dengue Early ELISA, Dengue NS1 Ag Assays</td>
</tr>
<tr>
<td>Wang, S. M., &amp; Sekaran, S. D.</td>
<td>2010</td>
<td>Malaysia</td>
<td>(n=420)</td>
<td>SD Dengue Duo NS1 Ag and IgG/IgM test, Virus isolation, In-house hemagglutination inhibition assay, In-house IgM capture ELISA, Real-Time RT-PCR</td>
</tr>
<tr>
<td>Gan, V. C., Tan, L. K., Lye, D. C., Pok, K. Y., Mok, S. Q., Chua, R. C., ... &amp; Ng, L. C.</td>
<td>2014</td>
<td>Singapore</td>
<td>(n=246), Singapore patients</td>
<td>Dengue Duo (NS1/IgM/IgG), Dengue Duo (NS1/IgM), Dengue Duo (NS1 only), WHO 1997, 2009, WHO 97+ Dengue Duo (NS1/IgM/IgG), WHO 2009 +Dengue Duo (NS1/IgM/IgG), Confirmation: virus isolation, RT-PCR, NS1-IgM and IgG ELISA</td>
</tr>
<tr>
<td>Chaterji, S., Allen, J. C., Chow, A., Leo, Y. S., &amp; Ooi, E. E.</td>
<td>2011</td>
<td>Singapore</td>
<td>(n=354), Adult 18 years and above Singapore patients</td>
<td>Dengue NS1 Strip 15 minutes, Dengue NS1 Strip 30 minutes, WHO 1997, WHO 2009, Confirmation: RT-PCR, Virus isolation, IgM/IgG ELISA</td>
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<tr>
<td>Tricou, V., Vu, H. T., Quynh, N. V., Nguyen, C. V., Tran, H. T., Farrar, J., ... &amp; Simmons, C. P.</td>
<td>2010</td>
<td>Vietnam</td>
<td>(n=245+47), Vietnamese children</td>
<td>BioRad NS1 SD NS1 alone, SD NS1 or IgM ELISA, SDNS1 or IGM or IgG, Confirmation: RT-PCR, IgM/IgG ELISA</td>
</tr>
<tr>
<td>Authors</td>
<td>Year</td>
<td>Study site</td>
<td>Subjects (n)</td>
<td>Diagnosis tests</td>
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<tr>
<td>Pok, K. Y., Lai, Y. L., Sng, J., &amp; Ng, L. C.</td>
<td>2010</td>
<td>Singapore</td>
<td>(n= 433)</td>
<td>NS1 rapid test, NS1 ELISA, IgM/IgG Rapid/ IgM/IgG ELISA</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Confirmation : RT-PCR</td>
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<tr>
<td>Wang, S. M., &amp; Sekaran, S. D.</td>
<td>2010</td>
<td>Malaysia</td>
<td>(n=399 ) sera Malay Patients</td>
<td>SD dengue NS1 Ag ELISA confirmation: Virus isolation</td>
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<td>In-house hemagglutination inhibition assay, In-house IgM capture ELISA</td>
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<td>Real-Time RT-PCR</td>
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<td></td>
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<td>IgM/ IgG capture ELISA</td>
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<td>IgM/ IgG, Combined: NS1 + IgM</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>NS1+rRT-PCR, IgM+rRT-PCR, NS1 +rRT-PCR+IgM</td>
</tr>
<tr>
<td>Andries, A. C., Duong, V., Ngan, C., Ong, S., Huy, R., Sroin, K. K., ... &amp; Buchy, P.</td>
<td>2012</td>
<td>Cambodia</td>
<td>(n= 157) Children</td>
<td>NS1 Rapid test</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>NS1 Rapid +IgM+ IgG confirmation: RT-PCR, Virus isolation</td>
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<td></td>
<td></td>
<td></td>
<td>In-house hemagglutination inhibition assay, In-house IgM capture ELISA</td>
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<tr>
<td>Duong, V., Ly, S., Ong, S., Chroeung, N., Try, P. L., Deubel, V., ... &amp; Buchy, P.</td>
<td>2011</td>
<td>Cambodia</td>
<td>(n= 260 ) confirmed dengue patients</td>
<td>NS1 Rapid test</td>
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<td>NS1 rapid + IgM antibody ELISA</td>
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<td>IgM/IgG ELISA</td>
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<td></td>
<td></td>
<td>NS1 (ELISA)+ IgM (ELISA) confirmation: RT-PCR</td>
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<tr>
<td>Kosasih, H., Alisjahbana, B., Widjaja, S., de Mast, Q., Parwati, I., Blair, P. J., ... &amp; Williams, M.</td>
<td>2013</td>
<td>Indonesia</td>
<td>(n= 220) confirmed dengue + ( n= 55) non- dengue febrile illness</td>
<td>NS1 ELISA</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td>confirmation: RT-PCR, (HI) assay</td>
</tr>
</tbody>
</table>
Findings
## Accuracy Description of “3I” Dengue Diagnostic Tests

<table>
<thead>
<tr>
<th>Types</th>
<th>Accuracy</th>
<th>No of tests</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NS1 (RDT)</strong></td>
<td>SN (%)</td>
<td>6</td>
<td>44</td>
<td>79</td>
<td>64.7(11.6)</td>
</tr>
<tr>
<td></td>
<td>SP (%)</td>
<td></td>
<td>96</td>
<td>100</td>
<td>98(1.5)</td>
</tr>
<tr>
<td><strong>NS1 (ELISA)</strong></td>
<td>SN (%)</td>
<td>8</td>
<td>45</td>
<td>82</td>
<td>64.8(14)</td>
</tr>
<tr>
<td></td>
<td>SP (%)</td>
<td></td>
<td>93</td>
<td>100</td>
<td>98.2(2.4)</td>
</tr>
<tr>
<td><strong>IgM/IgG (RDT)</strong></td>
<td>SN (%)</td>
<td>7</td>
<td>3</td>
<td>50</td>
<td>17.3(15.8)</td>
</tr>
<tr>
<td></td>
<td>SP (%)</td>
<td></td>
<td>93</td>
<td>99</td>
<td>96.1(2.3)</td>
</tr>
<tr>
<td><strong>IgM/IgG (ELISA)</strong></td>
<td>SN (%)</td>
<td>1</td>
<td>50</td>
<td>50</td>
<td>No Meta-Analysis</td>
</tr>
<tr>
<td></td>
<td>SP (%)</td>
<td></td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td><strong>NS1 + IgM/IgG (RDT)</strong></td>
<td>SN (%)</td>
<td>3</td>
<td>69</td>
<td>86</td>
<td>79.7(9.3)</td>
</tr>
<tr>
<td></td>
<td>SP (%)</td>
<td></td>
<td>84</td>
<td>98</td>
<td>93(7.8)</td>
</tr>
<tr>
<td><strong>NS1 IgM/IgG (ELISA)</strong></td>
<td>SN (%)</td>
<td>1</td>
<td>94</td>
<td>94</td>
<td>No Meta-Analysis</td>
</tr>
<tr>
<td></td>
<td>SP (%)</td>
<td></td>
<td>92</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td><strong>WHO-Clinical Criteria (1997 /2009)</strong></td>
<td>SN (%)</td>
<td>4</td>
<td>80</td>
<td>97</td>
<td>92(8)</td>
</tr>
<tr>
<td></td>
<td>SP (%)</td>
<td></td>
<td>20</td>
<td>57</td>
<td>34.8(16.2)</td>
</tr>
<tr>
<td><strong>NSI +IgM/IgG (ELISA) + WHO –Clinical Criteria (2009)</strong></td>
<td>SN (%)</td>
<td>1</td>
<td>91</td>
<td>91</td>
<td>No Meta-Analysis</td>
</tr>
<tr>
<td></td>
<td>SP (%)</td>
<td></td>
<td>94</td>
<td>94</td>
<td></td>
</tr>
</tbody>
</table>
Meta-analysis Plot of “Sensitivity” of NS1(RDT) (n=6)

Summary meta-analysis plot [random effects]

Cambodia(2012) -NS1(Rapid) among Children 44.00 (36.00, 54.00)
Malaysia(2011) -NS1(Rapid) 69.00 (62.00, 76.00)
Malaysia(2010)-NS1(Rapid) 65.00 (58.00, 72.00)
Singapore(2010)-NS1(Rapid) 79.00 (70.00, 86.00)
Vietnam(2011)-NS1(Rapid) 69.00 (63.00, 76.00)
Vietnam(2010)-NS1(Rapid) among Children 62.00 (55.00, 68.00)

combined 64.97 (58.15, 72.59)

Sensitivity (%)

* ratio (95% confidence interval)
Meta-analysis Plot of "Specificity" of NS1(RDT) (n=6)

Summary meta-analysis plot [random effects]

Cambodia(2012) - NS1(Rapid) among Children
Malaysia(2011) - NS1(Rapid)
Malaysia(2010) - NS1(Rapid)
Singapore(2010) - NS1(Rapid)
Vietnam(2011) - NS1(Rapid)
Vietnam(2010) - NS1(Rapid) among Children

combined

Sensitivity (%)
Meta-analysis Plot of “Sensitivity of NS1(ELISA)” (n=8)

Summary meta-analysis plot [random effects]

Malaysia(2010)-NS1(ELISA) 77.00 (71.00, 83.00)
Thai-Myanmar Border(2010)-NS1(ELISA) among adult 54.00 (42.00, 66.00)
Singapore(2014)-NS1(ELISA) among adult 82.00 (75.00, 87.00)
Singapore(2010)-NS1(ELISA)# among adult 81.00 (73.00, 88.00)
Singapore(2010)-NS1(ELISA)* among adult 67.00 (57.00, 76.00)
Thailand(2012)-NS1(ELISA)* among adult 45.00 (38.00, 51.00)
Thailand(2012)-NS1(ELISA)+ among adult 55.00 (49.00, 62.00)
Thailand(2012)-NS1(ELISA)# among adult 57.00 (50.00, 63.00)

combined 63.98 (55.21, 74.13)
Meta-analysis Plot of “Specificity” of NS1(ELISA) (n=8)

Summary meta-analysis plot [random effects]

- Malaysia(2010)-NS1(ELISA) among adult: 98.00 (95.00, 100.00)
- Thai-Myanmar Border(2010)-NS1(ELISA) among adult: 100.00 (96.00, 100.00)
- Singapore(2014)-NS1(ELISA) among adult: 98.00 (90.00, 100.00)
- Singapore(2010)-NS1(ELISA)# among adult: 100.00 (96.00, 100.00)
- Singapore(2010)-NS1(ELISA)* among adult: 100.00 (96.00, 100.00)
- Thailand(2012)-NS1(ELISA)* among adult: 93.00 (88.00, 97.00)
- Thailand(2012)-NS1(ELISA)+ among adult: 97.00 (95.00, 100.00)
- Thailand(2012)-NS1(ELISA)# among adult: 100.00 (98.00, 100.00)
- Combined: 98.98 (97.83, 100.14)

Sensitivity (%)
Meta-analysis Plot of “Sensitivity” of IgM/IgG (RDT) (n=7)

Summary meta-analysis plot [random effects]

Laos (2007)-IgM/IgG (Rapid)*1 aged 10-24 years
13.00 (7.00, 18.00)

Laos (2007)-IgM/IgG (Rapid)*2 aged 10-24 years
6.00 (2.00, 10.00)

Laos (2007)-IgM/IgG (Rapid)*3 aged 10-24 years
22.00 (15.00, 28.00)

Laos (2007)-IgM/IgG (Rapid)*4 aged 10-24 years
10.00 (5.00, 15.00)

Laos (2007)-IgM/IgG (Rapid)*5 aged 10-24 years
17.00 (11.00, 23.00)

Laos (2007)-IgM/IgG (Rapid)*6 aged 10-24 years
3.00 (0.20, 6.00)

Singapore (2010)-IgM/IgG (Rapid)* among adult
50.00 (40.00, 60.00)

combined
14.46 (7.88, 26.55)
Meta-analysis Plot of “Specificity” of IgM/IgG (RDT) (n=7)

Summary meta-analysis plot [random effects]

- Laos (2007)-IgM/IgG (Rapid)*1 aged 10-24 years: 99.00 (97.00, 100.00)
- Laos (2007)-IgM/IgG (Rapid)*2 aged 10-24 years: 99.00 (97.00, 100.00)
- Laos (2007)-IgM/IgG (Rapid)*3 aged 10-24 years: 96.00 (93.00, 99.00)
- Laos (2007)-IgM/IgG (Rapid)*4 aged 10-24 years: 96.00 (93.00, 99.00)
- Laos (2007)-IgM/IgG (Rapid)*5 aged 10-24 years: 94.00 (90.00, 98.00)
- Laos (2007)-IgM/IgG (Rapid)*6 aged 10-24 years: 96.00 (93.00, 99.00)
- Singapore (2010)-IgM/IgG (Rapid)* among adult: 93.00 (86.00, 97.00)

Combined: 96.94 (95.38, 98.53)
Meta-analysis Plot of “Sensitivity of NS1+ IgM/IgG (RDT)” (n=3)

Summary meta-analysis plot [random effects]

Vietnam(2010)-NS1+IgM/IgG(Rapid) among Children

Malaysia(2010)-NS1+IgM/IgG(Rapid)

Cambodia(2012)-NS1+IgM/IgG(Rapid) among children

Combined

Sensitivity (%)
Meta-analysis Plot of "Specificity" of NS1+IgM/IgG (RDT) (n=3)

Summary meta-analysis plot [random effects]

- Cambodia(2012)-NS1+IgM/IgG(Rapid) among children: 84.00 (66.00, 95.00)
- Malaysia(2010)-NS1+IgM/IgG(Rapid): 97.00 (83.00, 100.00)
- Vietnam(2010)-NS1+IgM/IgG(Rapid) among Children: 98.00 (89.00, 100.00)
- Combined: 96.25 (90.77, 102.05)

Summary meta-analysis plot [random effects]

- Singapore (2014) - WHO Clinical Criteria 1997 adult: 96.00 (91.00, 98.00)
- Singapore (2011) - WHO Clinical Criteria 1997 adult: 95.00 (91.00, 98.00)
- Singapore (2014) - WHO Clinical Criteria 2009 adult: 97.00 (92.00, 99.00)
- Singapore (2011) - WHO Clinical Criteria 2009 adult: 80.00 (73.00, 86.00)

Combined: 92.87 (87.98, 98.02)

Sensitivity (%)

10 100

Summary meta-analysis plot [random effects]

Singapore(2014)-(WHO Clinical Criteria-1997) adult
20.00 (11.00, 33.00)

Singapore(2011) (WHO Clinical Criteria 1997) adult
36.00 (29.00, 43.00)

Singapore(2014)-(WHO Clinical Criteria-2009) adult
26.00 (16.00, 40.00)

Singapore(2011) (WHO Clinical Criteria 2009) adult
57.00 (50.00, 64.00)

combined
34.08 (22.33, 52.01)

Sensitivity (%)
Forest (meta-analysis) plot Specificity % (95% CI) of Dengue Diagnostic Tests

Summary Meta

- Analysis Plot of “Sensitivity” of 31 Tests

- **Singapore (2014) - NS1+ IgM/IgG (ELISA) among adult**
  - Sensitivity: 91.00 (86.00, 95.00)

- **Singapore (2014) - NS1+ IgM/IgG (ELISA) among adult**
  - Sensitivity: 97.00 (92.00, 99.00)

- **Singapore (2014) - NS1+ IgM/IgG (ELISA) among adult**
  - Sensitivity: 95.00 (91.00, 98.00)

- **Singapore (2014) - NS1+ IgM/IgG (ELISA) among adult**
  - Sensitivity: 96.00 (91.00, 98.00)

- **Singapore (2014) - NS1+ IgM/IgG (ELISA) among adult**
  - Sensitivity: 95.00 (91.00, 98.00)

- **Singapore (2014) - NS1+ IgM/IgG (ELISA) among adult**
  - Sensitivity: 80.00 (73.00, 86.00)

- **Singapore (2014) - NS1+ IgM/IgG (ELISA) among adult**
  - Sensitivity: 91.00 (86.00, 95.00)
Summary Meta-analysis Plot of “Specificity” of 31 Tests

Forest (meta-analysis) plot Specificity % (95% CI) of Dengue Diagnostic Tests

- Cambodia(2012) - NS1(Rapid) among Children
- Malaysia(2011) - NS1(Rapid)
- Malaysia(2010) - NS1(Rapid)
- Singapore(2010) - NS1(Rapid)
- Vietnam(2011) - NS1(Rapid)
- Vietnam(2010) - NS1(Rapid) among Children
- Malaysia(2010) - NS1(ELISA)
- Thai-Myanmar Border(2010) - NS1(ELISA) among adult
- Singapore(2014) - NS1(ELISA) among adult
- Singapore(2010) - NS1(ELISA)# among adult
- Singapore(2010) - NS1(ELISA)* among adult
- Thailand(2012) - NS1(ELISA)* among adult
- Thailand(2012) - NS1(ELISA)+ among adult
- Laos(2007) - IgM/IgG(Rapid)*1 aged 10-24 years
- Laos(2007) - IgM/IgG(Rapid)*2 aged 10-24 years
- Laos(2007) - IgM/IgG(Rapid)*3 aged 10-24 years
- Laos(2007) - IgM/IgG(Rapid)*4 aged 10-24 years
- Laos(2007) - IgM/IgG(Rapid)*5 aged 10-24 years
- Laos(2007) - IgM/IgG(Rapid)*6 aged 10-24 years
- Singapore(2010) - IgM/IgG(Rapid)* among adult
- Singapore(2010) - IgM/IgG(ELISA)* among adult
- Cambodia(2012) - NS1+IgM/IgG(Rapid) among children
- Malaysia(2010) - NS1+IgM/IgG(Rapid)
- Vietnam(2010) - NS1+IgM/IgG(Rapid) among Children
- Singapore(2014) - NS1+IgM/IgG(ELISA) among adult
- Singapore(2014) - (WHO Clinical Criteria-1997) adult
- Singapore(2011) - (WHO Clinical Criteria-1997) adult
- Singapore(2014) - (WHO Clinical Criteria-2009) adult
- Singapore(2011) - (WHO Clinical Criteria 2009) adult
- Singapore(2014) - NS1+IgM/IgG (ELISA)* (WHO Clinical
Bias Assessment

Bias indicators (Sensitivity)
Begg-Mazumdar: Kendall's tau b = -0.678919  P < 0.0001
**Egger: bias** = -8.667958 (95% CI = -9.783378 to -7.552538)  **P < 0.0001**

Bias indicators (Specificity)
Begg-Mazumdar: Kendall's tau b = -0.576383  P < 0.0001
**Egger: bias** = -3.747528 (95% CI = -5.082488 to -2.412568)  **P < 0.0001**
Discussion and Conclusion (Specificity)

- **Specificity (SP)** of Dengue diagnostic tests (RDT) except WHO-Clinical Criteria -2009(20%) was as high (84%-100%) as those of ELISA tests.

- Thus, the Dengue Rapid Tests can be used as POCT in primary care clinics to **rule in dengue diagnosis** for **early detection of confirmed dengue cases** for clinical management, control, prevention and efficacy of dengue vaccine (in future).
Discussion and Conclusion (Sensitivity)

- Very low sensitivity (3%) of the dengue diagnostic test (IgM/IgG-RDT) and high sensitivity (97%) in WHO-Clinical Criteria were noticed.

- Wide range of SN value particularly in RDT highlighted to improve SN of the tests for ruling out the dengue cases in primary care clinics.
Discussion & Conclusion (Epidemic information)

• For confirmation of dengue diagnosis, 2 out 8 WHO-Clinical Criteria (Acute febrile illness ≥38°C, Generalized rashes, Headache, Retro-orbital pain, Myalgia, Arthralgia, Bleeding manifestation and Leucopenia) and Positive result of either NS1Ag or IgM /IgG are usually used in primary care clinics.

• However, ONE out of 8 WHO-Clinical Criteria is applied for confirmation of the dengue suspected cases from defined epidemic area during outbreak.

• Thus, added value of “dengue epidemic information” in the accuracy of the dengue tests should be verified.
Recommendation

• A multi-centred study with a standardized protocol (considering geographical/prevalence variation, standardization of diagnostic assessment (paired samples, timing of sample collection), primary or secondary infections, age of subjects and confirmation tests applied (RT-PCR, r-RT PCR, virus isolation) should be conducted for diagnostic test accuracy variation for POCT among ASEAN patients.
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Thank You!
Efficient and accurate diagnosis of dengue is of primary importance for...

- **Clinical care** (i.e. early detection of severe cases, case confirmation and differential diagnosis with other infectious diseases)
- **Surveillance** activities, Outbreak control, pathogenesis,
- **Academic research**, vaccine development & clinical trials*
- Recommended to use dengue diagnostic tests

*Ref: World Health Organization (WHO); Dengue Guidelines for diagnosis, treatment, prevention and control, 2009