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## Introduction

Anaemia is a global health concern that affects primarily pregnant women and children 1-3. It can go undetected but is easily diagnosed with a simple blood count. Scheduled health screening take-up is low in Malaysia but opportunity arises at every healthcare contact. This study aims to determine the prevalence of anaemia and its associated factors among patients presented with dengue-like symptoms at a public clinic in Selangor.

## Methods

Secondary data from a prospective cross-sectional primary study that recruited all patients presented to Klinik Kesihatan Seksyen 7, Shah Alam, Selangor from November 2017 to March 2018 with dengue-like symptoms were used. The dataset was cleaned and verified previously. The inclusion criteria of the primary study were: 1)  $\geq$ nine month-old, and 2) fever, and 3)  $\geq$ two symptoms according to WHO 2009 criteria for suspected dengue; and the exclusion criteria were: 1) required emergency care, or 2) prone to complications from venipuncture. This secondary study further included only patients with a documented haemoglobin level.

The socio-demographic characteristics (age group, sex, ethnicity, education, marital status, and monthly household income) and haemoglobin level of all included patients were used for further analysis. Anaemia and its severity were defined according to the classification of the World Health Organization (Table 1) 1. As pregnancy status was not captured in the original/primary study, all females were assumed not pregnant. Secondary data management, descriptive and subgroup analyses, and chi-square and Fisher's exact tests were performed on Stata v12.

Table 1 Anaemia and its severity by haemoglobin levels at sea level (WHO definition)

| Age Group              | Haemoglobin level, g/dl corresponding to Anaemia Severity at Sea Level |   |          |   |      |    |            |    |    |
|------------------------|--|---|----------|---|------|----|------------|----|----|
|                        | <<   | 7 | 8        | 9 | 10   | 11 | 12         | 13 | >> |
| 6-59 months            | Severe   |   | Moderate |   | Mild |    | No anaemia |    |    |
| 5-11 years             | Severe   |   | Moderate |   | Mild |    | No anaemia |    |    |
| 12-14 years            | Severe   |   | Moderate |   | Mild |    | No anaemia |    |    |
| Pregnant               | Severe   |   | Moderate |   | Mild |    | No anaemia |    |    |
| Female $\geq$ 15 years | Severe   |   | Moderate |   | Mild |    | No anaemia |    |    |
| Male $\geq$ 15 years   | Severe   |   | Moderate |   | Mild |    | No anaemia |    |    |

## Results

Out of 504 patients eligible for the primary study, 493 (97.8%) with haemoglobin level available were included in the secondary analysis. Majority of them were  $\geq$ 15 years old – 449 (91.1%), male – 284 (57.6%), and Malay – 394 (79.9%), had up to secondary education – 202 (41.0%), were unmarried – 317 (64.3%), and had a household income of RM 3000 and above – 176 (35.7%) (Table 2).

Table 2 Socio-demography, anaemia status and severity of the study participants (n=493)

| Category                        | Mean (s.d.) or n (%)* |
|---------------------------------|-----------------------|
| <b>Age (years)</b>              | 27.3 (11.8)           |
| <b>Age group</b>                |                       |
| Under 5 years                   | 16 (3.2)              |
| Aged 5-11 years                 | 17 (3.5)              |
| Aged 12-14 years                | 11 (2.2)              |
| Aged 15 years and above         | 449 (91.1)            |
| <b>Sex</b>                      |                       |
| Male                            | 284 (57.6)            |
| Female                          | 209 (42.4)            |
| <b>Ethnicity</b>                |                       |
| Malay                           | 394 (79.9)            |
| Chinese                         | 5 (1.0)               |
| Indian                          | 46 (9.3)              |
| Sabahan & Sarawakian            | 12 (2.4)              |
| Foreigner                       | 36 (7.3)              |
| <b>Education</b>                |                       |
| Pre-school                      | 21 (4.3)              |
| Up to primary                   | 45 (9.1)              |
| Up to secondary                 | 202 (41.0)            |
| Up to diploma                   | 138 (28.0)            |
| Completed tertiary              | 85 (17.2)             |
| Missing                         | 2                     |
| <b>Marital status</b>           |                       |
| Not married                     | 317 (64.3)            |
| Married                         | 176 (35.7)            |
| <b>Monthly household income</b> |                       |
| Less than RM 1500               | 157 (31.9)            |
| RM 1500-2999                    | 156 (31.6)            |
| RM 3000 and above               | 176 (35.7)            |
| Missing                         | 4                     |
| <b>Anaemia status</b>           |                       |
| No anaemia                      | 449 (91.1)            |
| Anaemia                         | 44 (8.9)              |
| <b>Anaemia severity (n=44)</b>  |                       |
| Mild                            | 25 (56.8)             |
| Moderate                        | 17 (38.6)             |
| Severe                          | 2 (4.6)               |

Footnote: s.d. - standard deviation  
\*Column %

Chart 1 The prevalence of anaemia by severity among the study participants

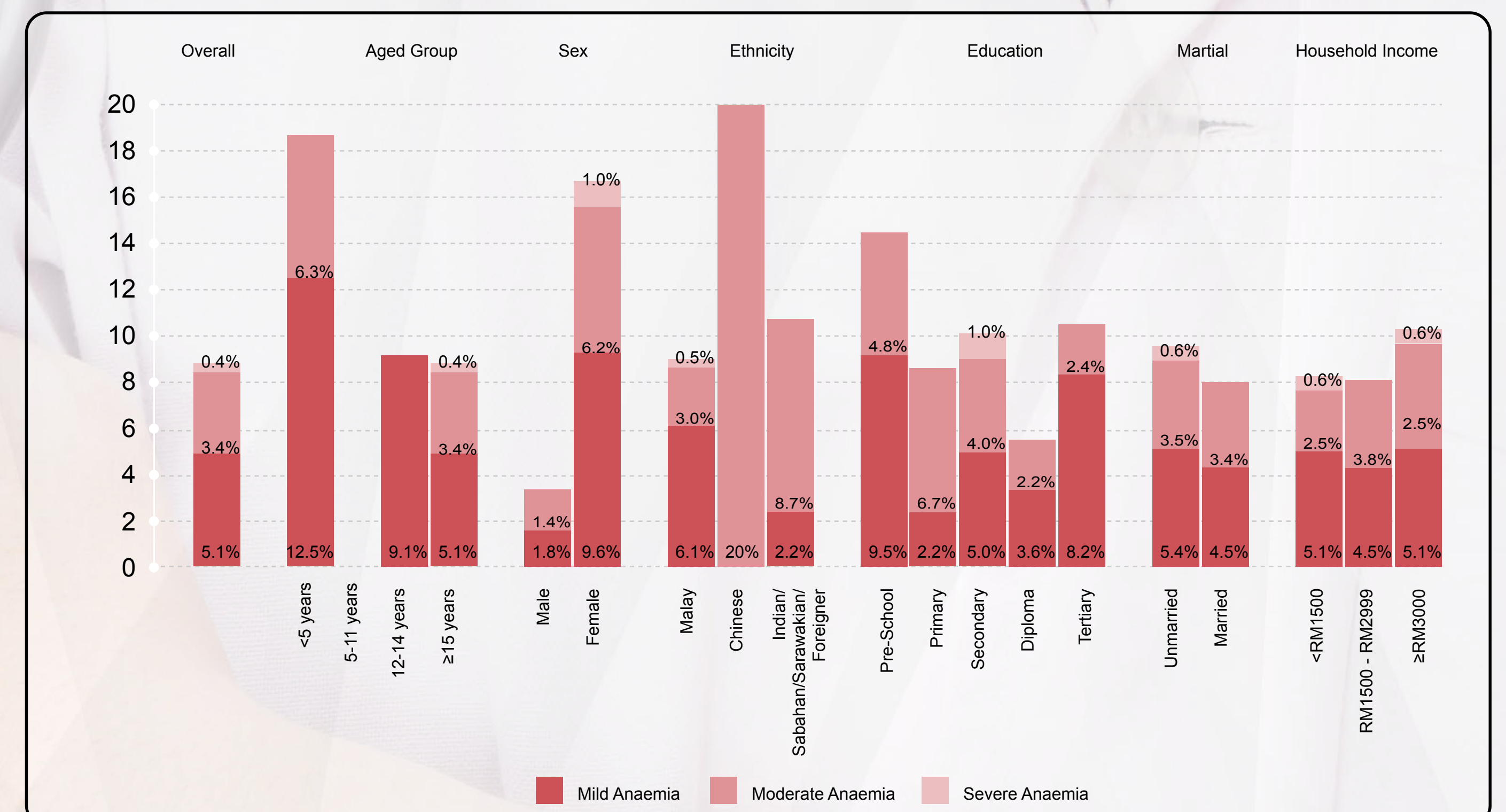


Table 3 Factors associated with anaemia diagnosis among the study participants

| Characteristics                 | n (%) <sup>*</sup> |                    | p-value <sup>^</sup> |
|---------------------------------|--------------------|--------------------|----------------------|
|                                 | Anaemia (n=44)     | No Anaemia (n=449) |                      |
| <b>Age group</b>                |                    |                    | 0.24                 |
| Under 5 years                   | 3 (6.8)            | 13 (2.9)           |                      |
| Aged 5-11 years                 | -                  | 17 (3.8)           |                      |
| Aged 12-14 years                | 1 (2.3)            | 10 (2.2)           |                      |
| Aged 15 years and above         | 40 (90.9)          | 409 (91.1)         |                      |
| <b>Sex</b>                      |                    |                    | <0.0001              |
| Male                            | 9 (20.5)           | 275 (61.2)         |                      |
| Female                          | 35 (79.5)          | 174 (38.8)         |                      |
| <b>Ethnicity</b>                |                    |                    | 0.13                 |
| Malay                           | 38 (86.4)          | 356 (79.3)         |                      |
| Chinese                         | 1 (2.3)            | 4 (0.9)            |                      |
| Indian                          | 5 (11.4)           | 41 (9.1)           |                      |
| Sabahan & Sarawakian            | -                  | 12 (2.7)           |                      |
| Foreigner                       | -                  | 36 (8.0)           |                      |
| <b>Education</b>                |                    |                    | 0.48                 |
| Pre-school                      | 3 (6.8)            | 18 (4.0)           |                      |
| Up to primary                   | 4 (9.1)            | 41 (9.1)           |                      |
| Up to secondary                 | 20 (45.5)          | 182 (40.5)         |                      |
| Up to diploma                   | 8 (18.2)           | 130 (29.0)         |                      |
| Completed tertiary              | 9 (20.5)           | 76 (16.9)          |                      |
| Missing                         | -                  | 2                  |                      |
| <b>Marital status</b>           |                    |                    | 0.57                 |
| Not married                     | 30 (68.2)          | 287 (63.9)         |                      |
| Married                         | 14 (31.8)          | 162 (36.1)         |                      |
| <b>Monthly household income</b> |                    |                    | 0.78                 |
| Less than RM 1500               | 13 (29.5)          | 144 (32.1)         |                      |
| RM 1500-2999                    | 13 (29.5)          | 143 (31.9)         |                      |
| RM 3000 and above               | 18 (40.9)          | 158 (35.2)         |                      |
| Missing                         | -                  | 4                  |                      |

\*Column %  
<sup>^</sup>chi-square test / Fisher-exact test (if any cell count <5)

A total of 44 (8.9%) patients were anaemic, with 25 (56.8%) of them being mild, 17 (38.6%) – moderate, and 2 (4.6%) – severe anaemia (Table 2). The prevalence of anaemia was highest among children <5 years – 3 (18.8%), female – 35 (16.8%), Chinese – 1 (20.0%), pre-schoolers – 3 (14.3%), unmarried – 30 (9.5%), and those with the highest monthly household income – 18 (10.2%) (Chart 1). Only female sex was significantly associated with anaemia diagnosis ( $\chi^2=27.3$ ,  $p<0.0001$ ) (Table 3).

## Discussion

This study found a 9% prevalence of anaemia at healthcare contact due to dengue-like symptoms in a public primary care setting in Selangor. This is a considerable yield from an opportunistic screening that does not add any additional costs to the provider and patient alike <sup>1</sup>.

Anaemia prevalence varies between different populations. The only factor significantly associated with anaemia diagnosis in this study was the female sex. The anaemia prevalence of 16.8% coincides with the 20.1% found in The Malaysian Cohort study conducted among the general population aged 35 and above. There, the adjusted odd ratio of anaemia for the female sex was 5.49 (5.20, 5.80) <sup>2</sup>.

This study is underpowered to determine other factors associated with anaemia among the study population, and the prevalence for the subgroups will change when sample size increases in future studies. Still, the 18.8% prevalence of anaemia among children below five requires special attention as this high figure is not unlikely, judging from the 31.4% anaemia prevalence found among rural school children in Sabah <sup>3</sup>.

## Conclusion

Almost one in 10 patients who sought medical attention at a public primary care clinic in Selangor for dengue-like symptoms had anaemia. The diagnosis was significantly more likely to happen to the female sex. Opportunistic screening upon healthcare contact for other purposes provides an additional avenue to detect anaemia in the general population.

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