

# **Prevalence of high blood pressure in male vegetable farmers with primary exposure to chlorpyrifos in Central Java, Indonesia**

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# Disclosure statement

I have no conflict of interest to disclose  
regarding the material presented in this  
presentation

# Introduction

- According to the 2018 Indonesian Basic Health Research (RISKESDAS) report, the prevalence of hypertension in people aged  $\geq 18$  years was 34.1%. Nevertheless, as one of the most common non-communicable diseases it is unclear whether the prevalence in the agricultural population differs from the national prevalence, and whether there are occupational factors associated with the development of hypertension in vegetable farmers.
- Objective:
  - The current study aimed to determine the prevalence of high blood pressure (BP) and its contributing factors in male vegetable farmers with primary exposure to chlorpyrifos.

# Methods

# (1)

- The study protocol was approved by the Ethical Committee of the Faculty of Medicine Universitas Indonesia on March 23, 2020 (No. KET-339/UN2.F1/ETIK/PPM.00.02/2020). Written informed consent was obtained from all study participants.
- Study design: Cross-sectional study
- Study population:
  - Location: Vegetable farming area in Central Java, Indonesia
  - All eligible participants were recruited consecutively, therefore a total of 172 male vegetable farmers aged 18–65 who had been actively using CPF for at least one year participated in this study.
- Data collection: July – October 2020

## (2)

- A structured interviewer-administered questionnaire was used to obtain the sociodemographic and occupational characteristics of the participants.
- Intensity levels (IL) of CPF exposure was estimated using a validated quantitative method from Dosemeci et.al. in Agricultural Health Study.<sup>1</sup>
- IL was estimated as the function of:
  - Activity related to application (i.e., mixing, application method, repairing and/or washing the equipment)
  - The use of personal protective equipment
  - Gloves replacement
  - Personal hygiene practices
  - Spill treatment

1. Dosemeci M, Alavanja MC, Rowland AS, Mage D, Zahm SH, Rothman N, et al. A quantitative approach for estimating exposure to pesticides in the Agricultural Health Study. *Ann Occup Hyg.* 2002;46:245–60.

### (3)

- Blood pressure measurement → upper arm digital blood pressure monitor. High blood pressure (BP) was defined as a systolic BP  $\geq$  140 mmHg and/or a diastolic BP  $\geq$  90 mmHg.
- Body weight was measured with a bathroom weighing scale and a microtoise as the height measurer. Weight and height were used to calculate the body mass index (BMI) in kilograms per square meters. According to the BMI, participants were categorized as obese if the BMI  $\geq$  25 kg/m<sup>2</sup> and not obese  $<$  25 kg/m<sup>2</sup>

## (4)

- Statistical analysis was performed with SPSS 20 for Windows.
- The difference in the characteristics of the study population according to BP group were analyzed using Chi-square and Mann-Whitney test. Logistic regression analysis was performed to examine the association between BP and its predictors. The variables associated with BP at a significance level of  $p \leq 0.20$  in the bivariate analysis were included in the multivariate model.
- All p values are two-sided, with significance was considered at  $p < 0.05$  for these tests.

# Results

(1)

Table 1. Characteristics of study population

| Variable                                    | n (%)             |
|---|-------------------|
| Age > 50 years                              | 91 (52.9)         |
| Low educational level                       | 150 (86.7)        |
| Smoking                                     | 91 (52.9)         |
| Body mass index $\geq$ 25 Kg/m <sup>2</sup> | 29 (16.9)         |
| Blood pressure $\geq$ 140/90 mmHg           | 79 (45.9)         |
| Arable land area (acres)*                   | 0.20 (0.05 - 0.4) |
| Daily work duration (hours)*                | 6 (3 - 12)        |
| Duration of pesticide exposure > 25 years   | 87 (50.6)         |
| Annual spraying frequency (days)*           | 104 (36 - 364)    |
| Use multiple pesticide                      | 156 (90.7)        |
| Never use PPE in agriculture activities     | 37 (21.5)         |
| Spraying during daytime                     | 10 (5.8)          |
| Intensity levels                            | 11.5 (1.0 - 27.4) |

\* median (minimum-maximum)

Ten of them had never attended

Almost 1 out of 2 participants had high BP

Frequent multiple pesticide use + improper PPE

# (2)

**Table 2. Individual and occupational characteristics of CPF exposed farmers grouped according to the blood pressure**

| Variable                               | Blood Pressure - n (%)  |                         | p <sup>cs</sup>     |
|--|-------------------------|-------------------------|---------------------|
|  | ≥ 140/90 mmHg<br>(n=79) | < 140/90 mmHg<br>(n=93) |                     |
| Age > 50 years                         | 56 (70.9)               | 35 (37.6)               | < 0.001             |
| Low educational level                  | 74 (93.7)               | 76 (81.7)               | 0.019               |
| Body mass index ≥ 25 Kg/m <sup>2</sup> | 19 (24.1)               | 10 (10.8)               | 0.020               |
| Smoking                                | 43 (54.4)               | 48 (51.6)               | 0.712               |
| Lifetime pesticide exposure > 25 years | 50 (63.3)               | 37 (39.8)               | 0.002               |
| Spraying during day time               | 8 (10.1)                | 2 (2.2)                 | 0.028 <sup>#</sup>  |
| Using manual knapsack sprayer          | 22 (27.8)               | 21 (22.6)               | 0.427               |
| Using > 3 pesticides                   | 20 (25.3)               | 28 (30.1)               | 0.485               |
| Arable land area (acres)*              | 0.2 (0.01 - 0.70)       | 0.2 (0.03 - 1.00)       | 0.545 <sup>mw</sup> |
| Daily work duration (hours)*           | 6 (3 - 10)              | 6 (4 - 10)              | 0.364 <sup>mw</sup> |
| Annual spraying frequency (days)*      | 104 (36 - 312)          | 104 (36 - 364)          | 0.746 <sup>mw</sup> |
| Intensity level*                       | 11.4 (1.4 - 27.4)       | 12.1 (1.0 - 24.2)       | 0.316 <sup>mw</sup> |

cs: Chi-square; #: Fishers's exact; mw: Mann-Whitney

\* median (minimum-maximum)

**(3)**

**Table 3. Multiple logistic regression analysis of the association between blood pressure and the predictors**

| <b>Predictor</b>                            | <b>B</b> | <b>SE (B)</b> | <b>p</b> | <b>aOR</b> | <b>95% CI for aOR<br/>(Lower ; Upper)</b> |
|---|----------|---------------|----------|------------|---|
| (Constant)                                  | -3.055   | 0.992         | 0.002    |            |   |
| Age > 50 years                              | 1.096    | 0.428         | 0.011    | 2.99       | 1.29 ; 6.92                               |
| Body mass index $\geq$ 25 Kg/m <sup>2</sup> | 1.031    | 0.463         | 0.026    | 2.80       | 1.13 ; 6.94                               |
| Spraying during day time                    | 1.734    | 0.872         | 0.047    | 5.66       | 1.03 ; 31.30                              |
| Low educational level                       | 0.885    | 0.572         | 0.122    | 2.42       | 0.79 ; 7.44                               |
| Lifetime pesticide exposure > 25 years      | 0.238    | 0.425         | 0.575    | 1.27       | 0.55 ; 2.92                               |

B=Parameter estimate; SE (B)= Standard error for B

aOR= adjusted odds ratio

# Conclusion

- The prevalence of high BP in this study was higher than the national prevalence of Indonesia. Farmers aged >50 years, obese, and spraying during the day time were associated with high BP.
- Although there was no association of IL with high BP in this study, the occupational characteristics identified, highlight the need for farmers to practice proper pesticide handling, wear proper PPE and have their health monitored regularly as well as warrant further studies to investigate the causal relationship between CPF exposure and high BP.
- A cross-sectoral collaborative education programs to address the need for controlling pesticide exposure to farmers will be very beneficial.

**Thank you**