

## Screening of Blood Hemoglobin Levels for Filling Station Operators in Gresik

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**Abstract:** The filling station operator's work environment has risks to health, including anemia. Anemia is a condition that hemoglobin (Hb) levels in the blood below the minimum limit. This community service activity aims to provide anemia education and conduct Hb level screening for filling station operators in Gresik. Examination of the filling station operator's Hb level was carried out using a simple random sampling with a cross-sectional time approach. The number of respondents was as much as 69 filling station operators from 7 filling stations in Gresik. The results of examination of Hb levels showed that 11.6% of respondents had Hb levels below the minimum limit. The data obtained were analyzed statistically using the Fisher test, the results showed that there was no relationship between Hb levels of filling station operators and gender, age, length of work (years), duration of work (hours/week), and use of Personal Protective Equipment (PPE). Nonetheless, these four variables have a prevalence risk (PR) of anemia, namely gender (PR=2.347), age (PR=1.17), length of work (PR= 0.867) and duration of work (PR=1.240), so that operators filling stations have a risk of anemia. Health education and medical check-up periodically are needed as a preventive measure to maintain employee health.

**Keywords:** Anemia, Filling station, Health education, Hemoglobin levels, Operators

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### Introduction

Most of the total employee time is spent at work (Suzuki et al., 2021). Factors that influence employee health status include an unsupportive work environment such as poor air quality, high workload and the absence of a health program for employees (Suzuki et al., 2021; Thach et al., 2019). One of the risks endangering the health of filling station operators is exposure to fuel oil through the air and vehicle fumes. Common fuels that are usually used by the community include pertalite, Pertamina, and Pertadex. The fuel component is an aromatic group of hydrocarbons. The oil and gas industry are a major source of volatile aromatic hydrocarbons in the environment (Rao et al., 2006). The main substances found in gasoline are organic compounds with a low boiling point and high vapor pressure, such as the volatile organic compound, benzene toluene ethylbenzene xylene (BTEX) (Fizal et al., 2019).

Benzene is a hazardous chemical classified as a class 1 carcinogen and mutagen that can

infect humans and animals through skin, mouth, and inhalation exposure (Li et al., 2015). Exposure to benzene in workers at work mainly occurs through inhalation compared to dermal and oral (Tompa et al., 2005). The average exposure to benzene in humans through inhalation has been reported to be around 50 to 80% (DECOS, 2014). Acute exposure to benzene concentrations can also affect health, including fatigue, dizziness, headaches, drowsiness, confusion, tremors, and loss of consciousness (Mitri et al., 2015; Li et al., 2015). Chronic exposure can cause more serious adverse health effects, such as myeloid leukemia, myeloma, decreased production of red and white blood cells from the bone marrow, decreased immune system, central nervous system damage, slowed reflexes, liver and kidney failure, and cancer (Li et al., 2015). Research states that there is a relationship between benzene and anemia and working time affects exposure (Putri et al., 2022). According to PT Pertamina's 2017 safety



data sheet, repeated exposure to benzene at low concentrations can cause abnormalities in human blood such as anemia and leukemia.

A job as a filling station operator requires him to be in the filling station environment and be exposed to benzene without using personal protective equipment (PPE) when serving the public refueling for motorized vehicles. The absence of the application of occupational health for filling station operators makes the health of employees less concerned. This is the motivation for conducting community service in the form of anemia education and measuring hemoglobin levels at filling station operators.

### Method

Community service activities are carried out in April-June 2023. Sampling uses a cross-sectional time approach. Respondents are filling station operators in the Gresik area. The stages of this community service activity are as follows:

#### Planning

This planning includes coordination and consolidation with the filling station management. Retrieval of secondary data regarding the description of the number of operators, workload, and occupational health and safety policies for employees, especially at filling stations in Gresik

#### Implementation

The implementation of activities includes education on anemia and measurement of Hb levels for health screening for filling station operators in the following stages:

- a) Filling station operators agreed informed consent
- b) Filling station operators answer the questionnaire including the length of time worked, the length of time per working day (work duration) and the use of PPE.
- c) Measuring Hb levels by taking blood from the tip of the ring finger aseptically according to the applicable Standard Operating Procedures (SOP). Blood hemoglobin measurement was carried out using the Point of Care

Testing (POCT) method by dripping a blood sample on a strip and reading the detection results on the screen of the device.

- d) Recording the results of measuring Hb levels on the control card and making recommendations to those concerned.
- e) Anemia education is carried out by giving flyers or leaflets and asking questions and answers about anemia to filling station operators.

#### 3. Data analysis

The data obtained was in the form of Hb levels, gender, age, length of work (years), duration of work (hours/week), and use of PPE. The data obtained were analyzed descriptively and statistically. Analysis of the relationship between Hb levels and gender, age, length of work and duration of work was carried out by Fisher's exact test.

### Result and Discussion

This community service aims to measure hemoglobin levels and provide education to filling station operators about anemia. Measurement of hemoglobin levels for filling station operators was carried out from April to June 2023 at 7 filling stations in the Gresik area.

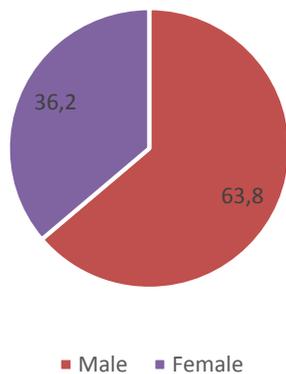
**Table 1.** Data on the number of respondents, age, Hb level, length of time worked, duration of work per week, and use of PPE for filling station operators in the Gresik area

| No | Variable                    | Amount | Percent age |
|----|-----------------------------|--------|-------------|
| 1  | Total number of respondents | 69     | 100         |
| 2  | Sex                         |        |             |
|    | Male                        | 44     | 63,8        |
|    | Female                      | 25     | 36,2        |
| 3  | Age                         |        |             |
|    | < 30 years                  | 46     | 66,7        |
|    | > 30 years                  | 23     | 33,3        |
| 4  | Hb level                    |        |             |
|    | Normal                      | 61     | 88,4        |
|    | Anemia                      | 8      | 11,6        |
| 5  | Length of worked            |        |             |
|    | < 1 year                    | 12     | 17,4        |
|    | 1-3 years                   | 20     | 28,9        |

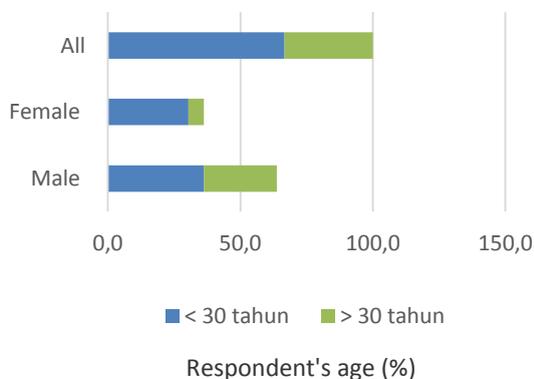
|   |                          |    |      |
|---|--------------------------|----|------|
|   | > 3 years                | 37 | 53,7 |
| 6 | Duration of work in week |    |      |
|   | < 40 hours               | 15 | 21,7 |
|   | 40 hours                 | 11 | 15,9 |
|   | > 40 hours               | 43 | 62,4 |
| 7 | Use of PPE               |    |      |
|   | Use PPE                  | 4  | 5,8  |
|   | Not using PPE            | 65 | 94,2 |

The total number of filling station operators who were respondents to this community service activity was 69 people. Data on the results of community service are presented in table 1.

The percentage of male respondents was 63.8% and the percentage of female respondents was 36.2% (Figure 1). The age distribution of respondents was between 19-57 years, respondents aged less than 30 years dominated by 66.7%, while respondents aged more than 30 years were 33.3% (Figure 2).



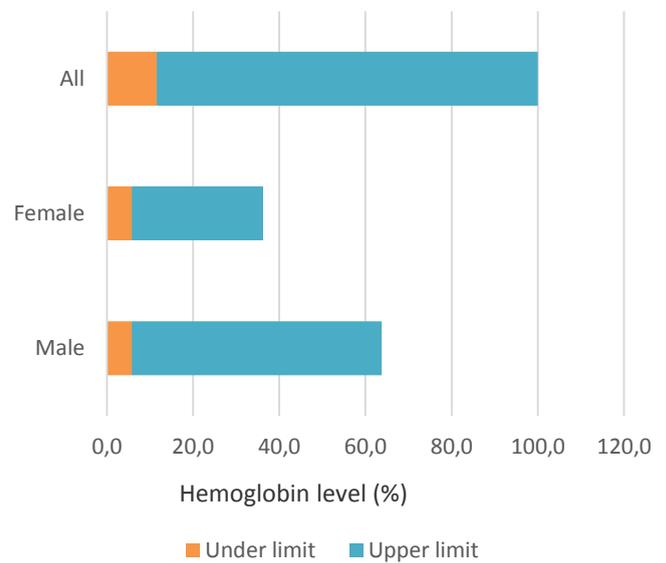
**Figure 1.** Percentage of respondents based on gender



**Figure 2.** Age of respondents as a whole

and by sex

The results of screening Hb levels for filling station operators, 11.6% of respondents had Hb levels below the minimum limit, while 88.4% had Hb levels above the minimum limit (Figure 3). According to WHO, the minimum limit for adult women is 12 mg/dL while the minimum limit for male Hb levels is 13 mg/dL. From the data it can be analyzed that the incidence of anemia is more in female respondents. The incidence of anemia in women is 16% of female respondents, while in men it is as much as 9% of male respondents (Figure 3).



**Figure 3.** Percentage of Hb levels for respondents as a whole filling station operator

The filling station operator's hemoglobin level can be influenced by the respondent's daily activities. In this community service activity, we took secondary data including length of work, duration of work in a week, and use of PPE. The results of our survey show the largest percentage of respondents who work more than 3 years at 53.6%, work duration of more than 40 hours/week at 62.3%, and do not use PPE at 94.2%.

The results of the statistical analysis of all variables were not significant where the p value > 0.05 for both gender, age, length of work, duration of work and use of PPE with Hb levels (Table 2). Results that are not significant in the test can be analyzed through an approach to risk factors such as prevalence risk (PR).

The gender of female filling station

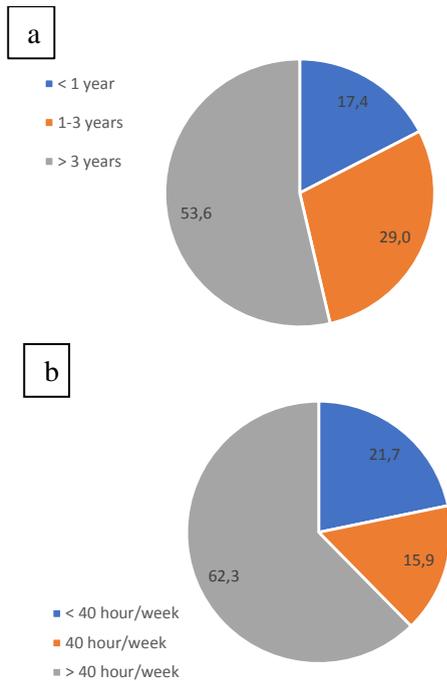
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operators has a risk of developing anemia by 0.2 times compared to male operators. Age less than or equal to 30 years also has a risk of developing anemia by 1.17 times compared to age over 30 years. Working duration 1-3 years (less than 3 years) has a risk of developing anemia 0.86 times compared to working time (working period) of more than 3 years while working duration per week which is less or equal to 40 hours has a risk of developing anemia 1, 2 times compared to more than 40 hours.

The gender of filling station operators is mostly male, namely 63.8%. A company's consideration of male and female workers is adjusted to the needs and goals of improving the business they own (Sa'adah et al., 2021). The prevalence of anemia is higher for female filling station operators, namely 0.2 times, this is because female operators experience pregnancy or menstruation which can cause anemia. The age of most filling station operators is less than 30 years (66.7%), although there are some operators who are over 30 years old and are still filling station operators because they have high morale at work. The prevalence of the risk of developing anemia is 1.17 times at the age of less than or equal to 30 years because according to the SOP in the oil and gas work environment, recruitment of laborers as operators is a maximum of 25 years old.

Most filling station operators' working hours are more than 3 years (53.7%). The duration of work is related to the length of exposure which has an impact on the operator's health or occupational diseases if working in an oil and filling work environment that is not in accordance with Occupational Safety and Health SOP. According to Kamase (2019) there is no significant relationship between length of work or years of work and work fatigue with a p value = 0.125, but the prevalence of the risk of developing anemia is 0.86 times in operators with 1-3 years of work, this is because they have never been examined Hb levels as a working initial examination.

Filling station operators work duration per week on average more than 40 hours, which is 62.3%, this is because after working as an operator there is a calculation of sales proceeds and handover at shift changes for 1 hour. The prevalence of anemia risk is 1.24 times with a working duration of less than or equal to 40 hours per week. Filling station operators are not only exposed to chemicals (benzene) when serving the public, they are also exposed to motor vehicle fumes, which affects Hb levels with a working period of 3-9 hours/day are at high risk of experiencing a decrease in Hb levels (Indwek, 2022). Almost all of the use of PPE, namely 94.2%, did not use PPE when filling station operators were working,



**Figure 4.** a) Percentage of time worked as an operator; b) percentage of working duration per week; c) percentage of PPE use

**Table 2.** PPE with Hb levels

| Variable                        | Hemoglobin Level     |                      | P value | PR    | CI            |
|---------------------------------|----------------------|----------------------|---------|-------|---------------|
|                                 | Below min. limit (%) | Upper min. limit (%) |         |       |               |
| <b>Sex</b>                      |                      |                      | 0,245   | 2,347 | 0,571 - 9,652 |
| Female                          | 4 (16 %)             | 21 (84 %)            |         |       |               |
| Male                            | 3 (6,8 %)            | 41 (93,2 %)          |         |       |               |
| <b>Age</b>                      |                      |                      | 1,000   | 1,117 | 0,246 - 5,567 |
| < 30 years                      | 5 (10,6 %)           | 42 (89,4 %)          |         |       |               |
| > 30 years                      | 2 (9,1 %)            | 20 (90,9 %)          |         |       |               |
| <b>Length of worked</b>         |                      |                      | 1,000   | 0,867 | 0,210 - 3,588 |
| 1-3 years                       | 3 (9,4 %)            | 29 (90,6 %)          |         |       |               |
| > 3 years                       | 4 (10,8 %)           | 33 (89,2 %)          |         |       |               |
| <b>Duration of work in week</b> |                      |                      | 1,000   | 1,240 | 0,301 - 5,109 |
| < 40 hours                      | 3 (11,5 %)           | 23 (88,5 %)          |         |       |               |
| > 40 hours                      | 4 (9,3 %)            | 39 (90,7 %)          |         |       |               |
| <b>Use of PPE</b>               |                      |                      | 1,000   | -     | -             |
| Use PPE                         | 7 (11,3 %)           | 55 (88,7 %)          |         |       |               |
| Not using PPE                   | 0 (0 %)              | 7 (100 %)            |         |       |               |

whereas according to the filling station safety technical guidelines (2018) operators are required to use PPE, gloves and masks.

### Conclusion

As many as 11.6% of filling station operators in Gresik have Hb levels below the minimum limit. The incidence of anemia in women is 16%, while in men it is 9%. The results of the Fisher test statistic for the relationship between HB levels and gender, age, length of work, duration of work, and use of PPE were not significant, but four variables including gender, age, length of work and duration of work Filling station operators had a risk of anemia. Health education or promotion can be used as a preventive to improve employee health.

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