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# Community-Based Analysis of Anemia Risk Factors in Pregnant Women at Primary Healthcare

Anita Dahliana[1*], Adinda Rizkita N. H[1], Chentya Catheriane L [1], Geraldy Aziz S. H[1], Isro Rafidatus S[1], Ketut Ayu O. S[1], Rinandha Yusfahreza W[1], Dyan Eka Puspitasari[2], Farida Yan Pratiwi Kurnia[2]

[1]Kedokteran, Fakultas Kedokteran, Universitas Surabaya, Surabaya-Indonesia
[2]Puskesmas Kebomas, Gresik, Indonesia.

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Corresponding Author:
Anita Dahliana
anitadahliana@staff.ubaya.ac.id

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**Abstract:** Anemia during pregnancy remains a significant public health concern, particularly in developing countries, where it contributes to adverse maternal and fetal outcomes. Data from Puskesmas Kebomas, Gresik, indicates that between July 2022 and June 2023, there were 167 cases of anemia among pregnant women across 11 villages. Anemia in pregnant women is influenced by various factors, including gestational age, parity, dietary patterns, infections during pregnancy, education level, economic status, and adherence to iron tablet consumption. In Kebomas District, Kedanyang Village recorded the highest number of anemia cases among pregnant women. This study was a descriptive cross sectional study using questionnaire for determine the risk of anemia in pregnant woman in Desa Kedanyang, Kebomas through interview. The result will processed to find the cause of anemia. Incidence of anemia in pregnancy in Desa Kedanyang, Kebomas is disobedient of consuming iron tablets (21 people) and the pregnancy interval less than 2 years (16 people). **Conclusion:** The incidence of anemia in pregnancy Desa Kedanyang, Kebomas is mostly caused by non-compliance with the consumption of iron tablets and a pregnancy interval less than 2 years.

**Keywords:** Anemia; Iron tablets; Pregnancy; Risk factors.

## Introduction

Anemia during pregnancy is a major global health issue, disproportionately affecting women in developing countries (Zulkifal et al., 2022). This condition occurs when there is a deficiency of red blood cells or hemoglobin, reducing the blood's ability to deliver oxygen to body tissues (Aji et al., 2020). The World Health Organization (WHO) classifies anemia in pregnancy as a hemoglobin level lower than 11 g/dL (Stephen et al., 2018).

Pregnancy triggers significant physiological changes, including a 20–30% increase in plasma volume to support fetal growth. This expansion necessitates a higher intake of iron and vitamins to sustain optimal hemoglobin (Hb) levels for both the mother and the fetus. Various factors contribute to anemia in pregnant women, such as the number of pregnancies, age, childbirth history, dietary habits, infections, educational background, economic conditions, and adherence to iron supplement consumption (Zulkifal et al., 2022). Anemia is more prevalent among pregnant women in developing nations compared to those in developed countries (Stephen et al., 2018).

The most prevalent form of anemia during pregnancy in Indonesia is iron deficiency anemia, accounting for 62.3% of cases. This condition can lead to complications such as miscarriage, premature birth, weak uterine contractions, prolonged labor, uterine atony, severe bleeding, and shock. The consequences of iron deficiency anemia extend beyond maternal health to fetal outcomes, with fetal mortality rates reported between 12% and 28%, perinatal mortality at 30%, and

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neonatal mortality ranging from 7% to 10%. Due to these significant risks, anemia in pregnancy is often considered a "serious threat to both mother and child," as it affects not only maternal well-being but also fetal development (Aji et al., 2020).

According to WHO data from 2019, anemia among pregnant women is the second most common health issue in Asian countries, with a prevalence rate of 36.5% (Dim & Onah, 2007). In Indonesia, it ranks as the fifth most prevalent disease among pregnant women. The Basic Health Research (RISKESDAS) conducted in Indonesia in 2013 found a 37.1% prevalence of anemia in pregnant women, which rose to 48.9% in 2018, indicating a continuous upward trend in cases (Afifah et al., 2020).

Data from the Kebomas Primary Health Center in Gresik Regency show that between July 2022 and June 2023, 167 pregnant women across 11 villages were diagnosed with anemia. Kedanyang Village reported the highest number of cases, with 40 pregnant women affected, followed by Kembangan Village with 32 cases and Randuagung Village with 26 cases.

Considering the high incidence of anemia during pregnancy, identifying its causes and risk factors is essential to prevent further cases. Implementing comprehensive strategies that address nutrition, education, and medical interventions is necessary to effectively lower the prevalence of anemia among pregnant women in Gresik Regency, particularly in Kedanyang Village, where cases are most concentrated.

## Method

This research employs a descriptive approach with a cross-sectional method, utilizing a questionnaire as the primary instrument to identify risk factors associated with anemia in pregnant women. The study was conducted at Kebomas Public Health Center from September to October 2023. The sample was selected using a total sampling technique, encompassing all pregnant women diagnosed with anemia in Kedanyang Village, Kebomas, from July 2022 to June 2023.

The questionnaire included inquiries regarding respondents' demographic characteristics (such as marital status, religion, and education level) and various risk factors contributing to anemia in pregnancy . These factors included the age at last pregnancy, nutritional status, parity, pregnancy spacing, the number and frequency of Ante Natal Care (ANC) visits, frequency of iron supplement intake, history of previous illnesses, and adherence to iron tablet consumption. The data were gathered through in-depth interviews with pregnant women suffering from anemia in Kedanyang Village, Kebomas.

The collected data were analyzed using a theoretical-descriptive approach, focusing on categorical data processing through statistical methods. The analysis examined factors such as age at last pregnancy, nutritional status, parity, pregnancy spacing, number and frequency of ANC visits, iron supplement intake frequency, history of previous illnesses, and compliance with iron tablet consumption. The hypothesis was tested using descriptive analysis, involving sum and mean calculations with the Statistical Package for Social Sciences (SPSS). Descriptive statistics were used to determine the distribution and frequency of respondents' characteristics. Additionally, the correlation between variables such as age at last pregnancy, nutritional status, parity, pregnancy spacing, ANC visit frequency, iron supplement intake, history of previous illnesses, and compliance with iron tablet consumption was assessed using Spearman correlation analysis.

## Result and Discussion

The characteristics of respondents show that the number of pregnant women in Kedanyang Village, Kebomas District, Gresik Regency, who are all married is 34 people (100%). Based on the religion they adhere to, all respondents are Muslim. Based on the level of education, it is known that the number of pregnant women who have education > SMP is 31 people (91.2%). This shows that the level of education is quite high as represented in Table 1.

**Table 1.** Frequency Distribution of Respondent Characteristics in Pregnant Women with Anemia

| Characteristics | Frequency | Percentage % |
|---|---|---|
| Marital status: | | |
| Married | 34 | 100 |
| Not married yet | 0 | 0 |
| Religion: | | |
| Islam | 34 | 100 |
| Kristen | 0 | 0 |
| Hindu | 0 | 0 |
| Budha | 0 | 0 |
| Education: | | |
| < Junior high school | 3 | 8.8 |
| > Junior high school | 31 | 91.2 |

The relationship between marital status and anemia in pregnant women is complex. However, marital status is typically considered a demographic factor rather than a direct biomedical cause of anemia. Marital status can indirectly affect a pregnant woman's access to resources, social support, and healthcare. Married pregnant women are more likely to have financial and emotional support from their partners, which can improve their

ability to access nutritious food, prenatal care, and supplements (Al-Mutawtah et al., 2023). In this study, all participants who were pregnant were legally married.

A healthy diet for pregnant women means that the food consumed must meet the required calorie intake and essential nutrients, such as carbohydrates, fats, proteins, vitamins, minerals, and water, according to their needs. This dietary pattern is influenced by several factors, including habits, preferences, culture, religion, economic status, and the environment. As a result, these factors affecting the eating patterns of pregnant women have an impact on their nutritional status (Happiness et al., 2021). In this study, all pregnant women are Muslim.

Lower levels of education often correlate with limited knowledge about proper nutrition, prenatal care, and hygiene practices, all of which increase the risk of anemia during pregnancy. Occupation can also impact access to healthcare services and resources. Additionally, lower family incomes may restrict access to nutritious food and essential healthcare services, exacerbating the risk of anemia during pregnancy (Zulkifal et al., 2022). Furthermore, the lack of knowledge among young women about the importance of iron intake can also contribute to the high prevalence of anemia (Afifah et al., 2020).

The level of education influences the incidence of anemia, particularly in terms of the ability to receive nutritional information and how easily a person acquires knowledge. The higher the education level, the easier it is for someone to absorb nutritional information (Priyanto, 2018). Education level also affects how individuals act and seek causes and solutions in their lives. Educated individuals are more receptive to new ideas. Similarly, highly educated mothers are more likely to undergo regular prenatal check-ups to maintain their health and that of their unborn child (Panjaitan et al., 2019). Increasing knowledge through education and information is a crucial step in changing behaviour.

**Table 2.** Hemoglobin Levels in Mothers with Anemia in Kedanyang Village

| HB (Hemoglobin) | Frequency | Percentage % |
|---|---|---|
| <11 g/dL | 34 | 100 |
| >11 g/dl | 0 | 0 |
| Total | 34 | 100 |

The results showed that pregnant women in Kedanyang Village experienced anemia. Table 2 shows that there are 34 pregnant women with Hb levels below 11 in Kedanyang Village. Therefore, it can be stated that 34 respondents have anemia.

Anemia is a condition in which hemoglobin levels are below normal. At low Hb levels, several studies have suggested that the synthesis of corticotropin-releasing hormone induces maternal and fetal stress, increasing the risk of complications such as pregnancy-induced hypertension, eclampsia, and premature rupture of membranes. Hemoglobin levels below 10 g/dL in the third trimester also increase the risk of low birth weight (LBW) by 3.6 times (Jung et al., 2019).

Risk factors that can cause anemia include maternal age during pregnancy, nutritional status, parity, pregnancy spacing, ANC visits, the number of iron tablets consumed per trimester, adherence to iron tablet consumption, and a history of pre-existing diseases.

Anemia in pregnancy remains a significant public health concern, particularly in developing countries like Indonesia and Ghana (Aji et al., 2020). The prevalence of anemia among pregnant women in Indonesia is notably high, with recent data indicating that nearly half of all pregnant women in the country are affected (Afifah et al., 2020). This is consistent with global trends, where anemia affects a substantial proportion of pregnant women, contributing to maternal and prenatal deaths (Ramadhannanti et al., 2019). Factors such as inhibited fetal growth, bleeding during labor, and low infant weight have been linked to anemia during pregnancy (Nurdin et al., 2018).

**Table 3.** Risk Factors for Anemia Based on Last Gestational Age

| Gestational age | Frequency | Percentage % |
|---|---|---|
| <20 years | 4 | 11.8 |
| 20-30 years | 29 | 85.3 |
| >35 years | 1 | 2.9 |
| Total | 34 | 100 |

Table 3 describes maternal age when pregnant. The majority of pregnant women are between 20-30 years old. Based on the table above, it is known that pregnant women aged 20-30 years are 29 people (85.3%), pregnant women aged 35 years are 1 person. Pregnant women <20 years are 4 people.

Age is closely related to the maturity of the female reproductive system. The ideal age range for pregnancy is between 20-35 years. Pregnancies in women under 20 years old are considered biologically and emotionally immature. This mental vulnerability often leads to instability, resulting in a lack of attention to fulfilling essential nutritional needs during pregnancy. Meanwhile, pregnancies in women over 35 years old are associated with a decline in immune function, making them more susceptible to various diseases, including infections, which can contribute to the occurrence of anemia (Wu et al., 2020). The high prevalence of anemia among pregnant women aged 15-24 years underscores the need for targeted interventions to address iron deficiency in this age group (Afifah et al., 2020).

Based on maternal age during pregnancy, women under 20 years old tend to experience mental

unpreparedness in facing pregnancy, making them more susceptible to complications. This lack of preparedness can lead to inadequate attention to nutritional fulfillment, including iron intake. Meanwhile, for women over 35 years old, maternal health begins to decline, and the birth canal becomes less flexible, affecting the nutritional needs required. Pregnancies in this age group are often classified as high-risk, with an increased likelihood of complications such as preeclampsia, miscarriage, and prolonged labor (Madoué et al., 2019).

Age is a significant demographic factor influencing various health outcomes, including the risk of anemia during pregnancy. Advanced maternal age, typically defined as 35 years or older, has been associated with increased risks of adverse pregnancy outcomes such as gestational diabetes, pre-eclampsia, and chromosomal abnormalities in the fetus (Aji et al., 2020). Teenage pregnancies also carry substantial risks, including a higher likelihood of preterm birth, low birth weight, and maternal mortality. The prevalence of anemia is highest among women aged 15-24 years. This is attributed to several factors, including inadequate nutritional intake, poor iron stores, and the physiological demands of growth and development in adolescent mothers (Merid et al., 2023).

**Table 4.** Risk Factors for Anemia Based on Nutritional Status

| Nutritional Status | Frequency | Percentage % |
|---|---|---|
| Poor nutrition MUAC <23.5 cm | 7 | 20.6 |
| Normal nutrition MUAC >23.5 cm | 27 | 79.4 |
| Total | 34 | 100 |

Based on table 4, most pregnant women have normal nutritional status. Based on the table above, 7 pregnant women have poor nutritional status (MUAC 23.5).

Mid-upper arm circumference (MUAC) has been recognized as a rapid assessment tool adopted to monitor nutritional status and is highly correlated with BMI. MUAC allows for the evaluation of protein intake and storage, which is associated with severe malnutrition. A study conducted showed a relationship between MUAC and the incidence of anemia, where a MUAC measurement of less than <23.5 cm indicates poor nutrient absorption in the body, including hemoglobin levels (Ghosh et al., 2019).

Good nutrition is essential for maintaining optimal health during pregnancy, as it directly impacts both the mother and the developing fetus (Nguyen et al., 2017). Poor nutritional status, characterized by low mid-upper arm circumference, is associated with low birth weight (Ghosh et al., 2019). The proportion of undernourished women of reproductive age with a body mass index of less than 18.5 kg/m2 is very high in South Asia, exceeding 20% (Nguyen et al., 2017).

Nutritional status, as indicated by measurements like mid-upper arm circumference, plays a crucial role in determining a pregnant woman's susceptibility to anemia. Poor nutritional status, characterized by inadequate intake of essential nutrients such as iron, folate, and vitamin B12, can lead to decreased hemoglobin production and subsequent anemia (Zulkifal et al., 2022).

**Table 5.** Risk Factors for Anemia Based on Parity

| Parity | Frequency | Percentage % |
|---|---|---|
| Number of children <3 | 22 | 64.7 |
| Number of children >3 | 6 | 17.6 |
| No children yet | 6 | 17.6 |
| Total | 34 | 100 |

Based on Table 5, the majority of participants had fewer than three children, totaling 22 individuals (64.7%). Meanwhile, six individuals (17.6%) had more than three children, and another six had no children.

Parity is an important factor to consider in preventing anemia in pregnant women. The more frequently a woman experiences pregnancy and childbirth, the more iron reserves her body utilizes, making her more susceptible to anemia. Nutritional issues linked to anemia include insufficient intake of protein, carbohydrates, and micronutrients (vitamins and minerals). Additionally, non-compliance with iron tablet consumption remains a significant cause of anemia in pregnant women, despite government programs that provide 90 iron tablets to support maternal health (Suryanarayana et al., 2017). From the parity Table 5, it is evident that most pregnant women have fewer than three children. Mothers with parity >3 face a higher risk of anemia due to the increased demands on their bodies from multiple pregnancies.

Parity refers to the number of pregnancies that have resulted in a fetus capable of surviving outside the womb. Women who experience multiple pregnancies are at a higher risk of developing anemia in subsequent pregnancies if their nutritional needs are not adequately met. This is because, during pregnancy, essential nutrients are distributed between the mother and the fetus. Having more than three pregnancies is a significant risk factor for anemia, as frequent pregnancies can deplete the mother's nutrient reserves (Yuniarwati & Fitriasari, 2022).

**Table 6.** Risk Factors for Anemia Based on Pregnancy Spacing

| Pregnancy Spacing | Frequency | Percentage % |
|---|---|---|
| Spacing <2 years | 16 | 47.2 |
| Spacing 2-5 years | 9 | 26.4 |
| Spacing >5 years | 5 | 14.7 |
| First child | 4 | 11.7 |
| Total | 34 | 100 |

Table 6 shows that the most common pregnancy spacing is less than 2 years, with 16 women (47.2%). Pregnancy spacing of 2-5 years was found in 9 women (26.4%), spacing of more than 5 years in 5 women (14.7%), and first pregnancies in 4 women (11.7%).

In this study, a significant number of women experienced closely spaced pregnancies. Pregnancy spacing refers to the time interval between the current pregnancy and the previous one. The ideal pregnancy spacing is at least 2 years. A gap of less than 2 years is associated with a higher proportion of maternal mortality. Closely spaced pregnancies hinder the full recovery of the reproductive system and uterus. Additionally, short pregnancy intervals increase the risk of anemia due to the mother's iron stores not being fully replenished, leading to depletion for fetal development (Sanga et al., 2020). Short interpregnancy intervals, defined as less than 18 months between the end of one pregnancy and the beginning of the next, have been associated with adverse maternal and infant outcomes, including anemia, preterm birth, and low birth weight (Suryanarayana et al., 2017). Shorter birth intervals can lead to maternal depletion of essential nutrients such as iron and folate, increasing the risk of anemia in subsequent pregnancies (Ayele et al., 2023). Short interpregnancy intervals, defined as less than 24 months between the delivery of one child and the conception of the next, have been associated with adverse maternal and infant health outcomes (McKinney et al., 2017).

**Table 7.** Risk Factors for Anemia Based on ANC Visits

| Number of ANC visits | Frequency | Percentage % |
|---|---|---|
| Trimester 1 and 2 | | |
| a. Number of visits <1 | 6 | 17.6 |
| b. Number of visits 1 | 28 | 82.4 |
| Total | 34 | 100 |
| Trimester 3 | | |
| a. Number of visits <2 | 4 | 11.8 |
| b. Number of visits 2 | 30 | 88.2 |
| Total | 34 | 100 |

Based on table 7, it is known that most pregnant women visit ANC >1 in the 1st and 2nd trimesters and ANC >2 in the 3rd trimester. Antenatal care is a crucial component of prenatal care that involves regular check-ups and interventions to monitor the health of both the mother and the developing fetus (Suryanarayana et al., 2017). ANC (Antenatal Care) examinations during pregnancy can significantly impact the health status of both the mother and the fetus. Regular ANC visits help minimize potential pregnancy complications. A study conducted by Dolang (2020) found a correlation between irregular ANC visits and the incidence of anemia. ANC services play a crucial role in reducing the prevalence of anemia during pregnancy.

During ANC visits, healthcare providers assess various health indicators, provide essential supplements, and offer health education to pregnant women. The World Health Organization recommends that pregnant women initiate antenatal care in the first trimester to improve maternal health outcomes. Late initiation of antenatal care, particularly after the first trimester, can result in missed opportunities for early detection and management of risk factors associated with anemia (Kouanda et al., 2023).

The WHO emphasizes the importance of early and continuous antenatal care visits for positive pregnancy experiences (Khatri et al., 2022). The detection of high-risk pregnancies through the analysis of socioeconomic, medical, and obstetrical factors represents a key element of ANC. It is also often used as a platform for additional interventions that have been shown to positively influence the maternal (Kuhnt & Vollmer, 2017).

**Table 8.** Risk Factors for Anemia Based on the Number of Iron Tablets Consumed

| Consumption of Iron Tablets | Frequency | Percentage % |
|---|---|---|
| Trimester 1 | | |
| a. <30 tablets | 19 | 55.8 |
| b. >30 tablets | 15 | 44.2 |
| Total | 34 | 100 |
| Trimester 2 | | |
| a. <60 tablets | 14 | 41.2 |
| b. >60 tablets | 20 | 58.8 |
| Total | 34 | 100 |
| Trimester 3 | | |
| a. <90 tablets | 12 | 35.3 |
| b. >90 tablets | 22 | 64.7 |
| Total | 34 | 100 |

Based on table 8, it is known that more than half of pregnant women consume more than 30, 60, and 90 iron tablets. One of the primary drivers of anemia in pregnant women is iron deficiency, which can be exacerbated by factors such as poor nutritional intake and parasitic infections. Iron tablet consumption is essential for pregnant women, especially in areas with high anemia prevalence.

The use of iron supplements is an important method to prevent anemia during pregnancy. Iron supplementation is an effective strategy for preventing and treating iron deficiency anemia during pregnancy (Khatri et al., 2022).

The daily iron needs for pregnant women cannot be met by food intake alone. Iron deficiency is associated with decreased work capacity, impaired immune function, and adverse pregnancy outcomes. During pregnancy, the demand for iron increases, leading to a higher risk of anemia. Additionally, there is a disproportionate increase in plasma volume compared to red blood cell mass, resulting in a physiological decline in hemoglobin (Hb) levels during mid-trimester. Hemoglobin concentration plays a crucial role in nutrition, particularly in iron status, and can help identify neonatal adverse effects. Therefore, early intervention measures, such as iron supplementation, are essential to prevent complications (Lestari & Saputro, 2022).

**Table 9.** Risk Factors for Anemia Based on Medical History

| Medical History | Frequency | Percentage % |
|---|---|---|
| Anemia | 18 | 52.9 |
| Blood Disorders | - | - |
| Diabetes Mellitus | 1 | 2.9 |
| Hipertention | 3 | 8.8 |
| None | 12 | 35.3 |
| Total | 34 | 100 |

Based on Table 9, the majority of pregnant women had a history of anemia, with 18 individuals (52.9%). Additionally, 12 women (35.3%) had no comorbidities, 3 women (8.8%) had hypertension, and 1 woman (2.9%) had diabetes mellitus. Pregnant women with chronic diseases experience prolonged inflammation, which can affect the production of healthy red blood cells. As a result, pregnant women with chronic illnesses are at a higher risk of developing anemia due to inflammation and acute infections (Pinto, 2017). The presence of anemia during gestation can precipitate a cascade of complications, encompassing increased risks of maternal mortality, intrauterine growth restriction, and impaired neurodevelopment in offspring, thereby underscoring the imperative for proactive screening and management strategies. Several studies have shown a relationship between infections during pregnancy and the incidence of anemia in pregnant women. Additionally, other studies have indicated that infections such as malaria during pregnancy can lead to anemia. Factors such as age, parity, nutritional status, and adherence to iron tablet consumption also play a role in the incidence of anemia in pregnant women (Sifakis & Pharmakides, 2000). Socioeconomic status, encompassing income, education, and access to healthcare services, also plays a pivotal role in determining the nutritional status and overall health of pregnant women (Panjaitan et al., 2019).

**Table 10.** Risk Factors for Anemia Based on Compliance with Iron Tablet Consumption

| Compliance with Iron Tablet Consumption | Frequency | Percentage % |
|---|---|---|
| Compliant | 13 | 38.2 |
| Non-compliant | 21 | 61.8 |
| Total | 34 | 100 |

Based on table 10, it is known that the majority of pregnant women are not compliant in taking iron tablets, as many as 21 people. From interviews with pregnant women, the main reasons for non-compliance with iron supplement (TTD) consumption include forgetfulness due to laziness or fatigue from daily activities, side effects such as nausea and vomiting, a lack of awareness due to the absence of symptoms during pregnancy, insufficient knowledge about the benefits of TTD, and a lack of support from both themselves and their families. Compliance with TTD consumption plays a crucial role in preventing anemia, as higher adherence leads to increased hemoglobin levels in the blood (Atika Suri et al., 2022).

Iron tablets (Fe) are essential minerals needed during pregnancy for both the mother and the baby. Since the baby's body cannot store its own iron reserves, it must absorb iron from the mother. Irregular consumption of iron tablets can significantly impact fetal growth and the health of the newborn (Ramadhini & Dewi, 2021).

To address anemia in pregnant women, the government has implemented a program providing 90 iron tablets throughout pregnancy. However, some women still do not adhere to this supplementation. Previous studies have shown a strong correlation between anemia in pregnant women and compliance with iron tablet consumption, with 72.2% of anemic pregnant women not regularly taking their iron tablets (Maryanto, 2021).

The spatial distribution of anemia among pregnant women reveals critical insights into geographical disparities and localized risk factors (Ayele et al., 2023). Medication compliance during pregnancy has a substantial effect on maternal and fetal health outcomes. Non-compliance with iron supplementation during pregnancy poses a substantial risk, exacerbating the potential for iron deficiency anemia and its attendant adverse effects on both maternal and fetal well-being (Tegodan et al., 2021).

**Table 11.** Signs of Anemia

| Weakness, Fatigue, Lethargy | Frequency | Percentage % |
|---|---|---|
| Yes | 12 | 35.3 |
| No | 5 | 14.7 |
| Sometimes | 17 | 50.0 |
| Total | 34 | 100 |

Based on Table 11, it is known that most pregnant women sometimes experience fatigue, weakness, and lethargy, with as many as 17 people, while 12 people experience it, and 5 people do not.

Common symptoms of anemia include fatigue, shortness of breath, chest pain, headaches, pale skin, cold extremities, spoon-shaped nails (koilonychia), and a pale tongue, which can be observed during a physical examination (Weckmann et al., 2023).

The manifestation of symptoms such as fatigue, weakness, and lethargy in pregnant women underscores the physiological challenges encountered during gestation, wherein the heightened metabolic demands and hormonal fluctuations contribute to a propensity for exhaustion and diminished energy reserves.

Socioeconomic disparities and environmental determinants exert considerable influence on the prevalence and distribution of anemia among pregnant women. Populations residing in resource-constrained settings often encounter barriers to accessing nutritious food, sanitation facilities, and healthcare services, thereby amplifying their susceptibility to nutritional deficiencies and infectious diseases, which are established risk factors for anemia (Ayele et al., 2023).

**Table 12.** Analysis of the Relationship Between Risk Factors for Anemia

| Risk factors | Signs of Anemia |
|---|---|
| Previous medical history | 0.542 |
| Compliance with Iron Supplement Consumption | 0.358 |
| Nutritional status | 0.027* |
| Pregnancy spacing | 0.213 |
| Parity | 0.169 |
| Hemoglobin levels | 0.677 |
| ANC visits in the 1st and 2nd trimesters | 0.884 |
| ANC visit in the 3rd trimester | 0.212 |
| Iron supplement consumption in the 1st trimester | 0.628 |
| Iron supplement consumption in the 2nd trimester | 0.638 |
| Iron supplement consumption in the 3rd trimester | 0.425 |

* Spearman's correlation ($p<0.05$; CI = 95%)

Table 12 shows that the risk factor of nutritional status and the incidence of anemia has a p-value <0.05 and a correlation coefficient (r) ranging from $0.3 < r \leq 0.7$, indicating a moderate relationship between nutritional status and anemia incidence. Meanwhile, previous disease history, compliance with iron supplement (TTD) consumption, pregnancy spacing, parity, ANC visits in the first, second, and third trimesters, as well as iron supplement consumption in the first, second, and third trimesters, have a p-value >0.05 and a correlation coefficient (r) ranging from $-0.3 \leq r < 0$ and $0 < r \leq 0.3$, indicating a weak relationship between these seven risk factors and anemia incidence.

The intricate interplay between nutritional status and anemia underscores the significance of holistic dietary interventions and nutritional support initiatives in mitigating the burden of anemia among pregnant women. Anemia is a prevalent nutritional deficiency disorder among pregnant women, particularly in developing countries, leading to adverse pregnancy outcomes and posing risks to both mother and fetus (Suryanarayana et al., 2017). The prevalence of anemia during pregnancy varies due to socioeconomic conditions, lifestyles, and health-seeking behaviors. Inadequate nutrition, characterized by deficiencies in iron, vitamin B12, and other essential nutrients, is a primary driver of anemia in pregnant women. Parasitic infections and chronic blood loss exacerbate the problem. Globally, anemia affects 1.62 billion people, with pregnant women accounting for approximately 38% of cases, with a disproportionate burden in Africa, especially Sub-Saharan Africa (Ayele et al., 2023). The impact of anemia on pregnancy outcomes is substantial, leading to inhibited fetal growth, bleeding during labor, low infant weight, and placental size abnormalities (Nurdin et al., 2018).

Poor nutrition during pregnancy affects the incidence of anemia. A proper dietary pattern includes eating three main meals a day accompanied by snacks. Food should contain carbohydrates, animal protein, plant-based protein, vegetables, and fruits. Fruits are essential for the body as they help neutralize the body's pH balance (Ilmiyati et al., 2021). Malnutrition during pregnancy exerts a profound and multifaceted influence on maternal and fetal well-being, predisposing pregnant women to heightened susceptibility to infections, impaired immune function, and adverse pregnancy outcomes, encompassing preterm birth and low birth weight (Suryanarayana et al., 2017).

Anemia during pregnancy remains a significant public health concern, particularly in developing countries, where it contributes to adverse maternal and fetal outcomes (Ayele et al., 2023).

## Conclusion

Based on the research findings and discussion, it can be concluded that many pregnant women are still not compliant in consuming iron (Fe) tablets during pregnancy, as revealed through interviews. Additionally, the results of the Spearman correlation analysis indicate that maternal nutritional status plays a role in the occurrence of anemia in this study. It is imperative to implement comprehensive interventions

encompassing nutrition education, iron supplementation, and prevention to mitigate the risk of anemia during pregnancy and improve maternal and child health outcomes.

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The authors declare no conflict of interest.

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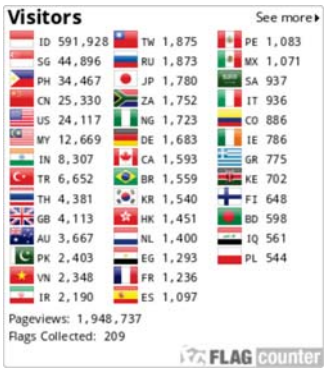


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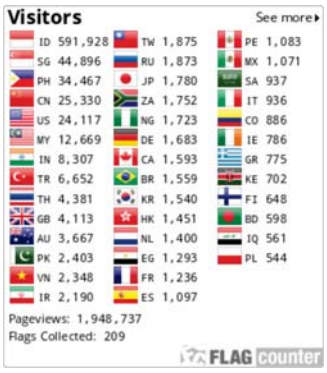


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Tri Utami Widayati , Destrinelli , Muhammad Sofwan

364-371

**DOI:** 10.29303/jppipa.v11i4.10669
**Statistics:** 74 | 73



PDV

### Evaluating and Mitigating Musculoskeletal Risks among the Operators: A Case Study in a Small-Scale Automotive Repair Workshop

Rini Oktavera , Muh Ilal Sarifudin , Wahyu Eko Cahyono , Moh. Ainul Fais , IGA Sri Deviyanti

372-381

**DOI:** 10.29303/jppipa.v11i4.10682
**Statistics:** 67 | 46



PDV

### In Vitro Study of The Activity of Yellow Rope (Anamirta cocculus) Extract As An Antibacterial

Darmayanti Tumpu , A.M. Muslihin , Lukman Hardia

382-387

**DOI:** 10.29303/jppipa.v11i4.10753
**Statistics:** 99 | 70

PDV

### Guided Inquiry-Based LKPD on Swamp Vegetation Biodiversity: Development and Effectiveness in Enhancing Science Process Skills

Yetty Hastiana , Bella Anjelia , Astrid Sri Wahyuni Sumah 388-397

**DOI:** 10.29303/jppipa.v11i4.10958
**Statistics:** 75 | 44

Citations 0

PDV

### Scrapbook Media Development to Improve IPAS Learning Outcomes

Safira Galuh Yuniarizki , Fitria Dwi Prasetyaningtyas 398-407

**DOI:** 10.29303/jppipa.v11i4.11047
**Statistics:** 94 | 57

Citations 0

PDV

### Problem-Based Learning Model to Increase Students' Science Literacy in Grade V Science Learning on Heat Transfer Topic

Srinita Susanto , Setiawan Edi Wibowo , Anisa Kurniasih , Vitry Rayani Bethesda Saragih , Annisyah Yuni 408-415

**DOI:** 10.29303/jppipa.v11i4.9793
**Statistics:** 59 | 49

Citations 0

PDV

### Development of Integrated Flipbook Learning Media with 2-Dimensional Quartet Cards (KAKASIBOOK) to Improve Student Learning Outcomes in IPAS Learning Content

Restu Eri Yulianti , Barokahah Isdaryanti 416-426

**DOI:** 10.29303/jppipa.v11i4.10822
**Statistics:** 99 | 32

Citations 0

PDV

### Effect of Project-Based Learnıng (PjBL) on Study Results and Critical Thinking Ability of Students ın Lathe Engıneerıng Lessons

Suyono , Wawan Purwanto , Hasan Maksum , Refdinal 427-434

**DOI:** 10.29303/jppipa.v11i4.8926
**Statistics:** 56 | 42

Citations 0

PDV

### Analysis of Students' Concept Understanding Using the STEM Integrated Cognitive Conflict Model

Putri Nabila , Fatni Mufit , Fuja Novitra 435-443

**DOI:** 10.29303/jppipa.v11i4.10281
**Statistics:** 70 | 54

Citations 0

PDV

### Using K-Means Clustering to Analyze Socio-Economic Welfare of Oil Palm Farmers for Decision Support and Contextual Learning Integration

Fenty Kurnia Oktorina , Zulfikar , Andri Nofiar Am , Nurkholis , Agung Pramono 444-450

**DOI:** 10.29303/jppipa.v11i4.10975
**Statistics:** 122 | 67

Citations 0

PDV

### Antibacterial Activity Testing of Methanol Extract of Yellow Rope Barb (Anamirta cocculus)

Wa Ode Nurwahida , A.M. Muslihin , Lukman Hardia

451-458

**DOI:** 10.29303/jppipa.v11i4.10760
**Statistics:** 89 | 73

Citations 0

PDV

### Transformation of Science Learning with Android Applications: Improving Learning Outcomes and Student Activity Through “Marbel Sains SD 4-5”

Ponco Nur Hidayah , Waris , Rina Sugiarti Dwi Gita

459-466

**DOI:** 10.29303/jppipa.v11i4.10613
**Statistics:** 50 | 30

Citations 0

PDV

### Standardizing Catch Per Unit Effort (CPUE) of Coryphaena hippurus in the Southern Java Waters Using Generalized Additive Model (GAM)

Vianta Mandhalika , Bambang Semedi , Abu Bakar Sambah , Amin Setyo Leksono

467-477

**DOI:** 10.29303/jppipa.v11i4.9970
**Statistics:** 78 | 55

Citations 0

PDV

### Improving Student Learning Concentration in Chemistry Using the ‘Everyone Is a Teacher Here’ Strategy Assisted by Genially Media

Elferida Sormin , Nova Irawati Simatupang , Sumiyati , Dera Savera

478-483

**DOI:** 10.29303/jppipa.v11i4.10782
**Statistics:** 92 | 52

Citations 0

PDV

### Evaluation of P5 Implementation in Supporting STEM-based Learning at Vocational Schools using the CIPP Model

Nengka Putri , Remon Lapisa , Ambiyar , Arwizet K

484-491

**DOI:** 10.29303/jppipa.v11i4.10640
**Statistics:** 93 | 44

Citations 0

PDV

### Disaster Mitigation through Team Games Tournament (TGT) Model Based on Start with A Question in Learning

Khairil , Afdhal Afdhal

492-498

**DOI:** 10.29303/jppipa.v11i4.10610
**Statistics:** 67 | 36

Citations 0

PDV

### The Relationship Between Digital Literacy and Emotional Intelligence

### on Vocational High School Students' Work Readiness

Endeli , Hansi Efendi , Hendra Hidayat 499-505

**DOI:** 10.29303/jppipa.v11i4.10628
**Statistics:** 99 | 46



PDV

### The Integrating Science Education and Financial Economics to Enhance Knowledge-Based Entrepreneurship

Muhammad Nadhar , Norhaedah , Sariana , Ernawati , Syamsuni HR 506-515

**DOI:** 10.29303/jppipa.v11i4.10687
**Statistics:** 96 | 40



PDV

### The Effects of Mangrove Ecosystem on Mud Crabs (Scylla serrata) in East Lombok, Indonesia

Bintang Prayoga , Dietriech Geoffrey Bengen , I Wayan Nurjaya , Nyoman Metta N. Natih 516-526

**DOI:** 10.29303/jppipa.v11i4.10709
**Statistics:** 97 | 85



PDV

### Antibacterial Effectiveness Test of Wrap Leaf Extract (Smilax rotundifolia) Against Escherichia coli and Propionibacterium acnes Bacteria

Heti Aisyah , Irwandi , Angga Bayu Budiyanto , A.M. Muslihin 527-532

**DOI:** 10.29303/jppipa.v11i4.10699
**Statistics:** 93 | 82



PDV

### Development of Metacognition-Based LKPD to Improve Conceptual Understanding in Reaction Rate Material

Euis Nurmiati , Sugeng Bayu Wahyono , Muhammad Risal Rhomadan , Nurul Khairah , Ulfa Nabila Tafrienda 533-541

**DOI:** 10.29303/jppipa.v11i4.10464
**Statistics:** 69 | 37



PDV

### Colchicine Colchicine-Induced Phenotypic Alterations in Dendrobium 'Transient White Rika' and 'Florenza': Valuable Material for Genetics-Based Learning Modules

Dwi Sucianingtyas Sukamto , Sarwo Danuji , Hanif Rafika Putri , Nurul Komaria 542-549

**DOI:** 10.29303/jppipa.v11i4.10727
**Statistics:** 74 | 50



PDV

### Analysis of Outpatient Satisfaction at Sylvani Hospital: The Influence of Service Quality on the Patient Satisfaction Index

Sugianto , Alamsyah , Susanna Halim

550-556

**DOI:** 10.29303/jppipa.v11i4.10866
**Statistics:** 80 | 36



PDV

### The Influence of the PhET Virtual Lab Assisted PBL Model on Energy Transformation Material on the Learning Motivation of Elementary School Students

Tiza Ariesta Saputri , Ana Fitrotun Nisa , Akbar Al Masjid , Banun Havifah Cahyo Khosiyono

557-566

**DOI:** 10.29303/jppipa.v11i4.9680
**Statistics:** 91 | 50



PDV

### Analysis of Environmental Dynamic Factors During Salt Crystallization Process in Greenhouse Salt Tunnel (A Case Study in South Coastal and North Coastal East Java, Indonesia)

Abd Aziz Amin , Adi Tiya Yanuar , Zulkisam Pramudia , Yogita Ayu Dwi Susanti , Ilham Misbakudin AL Zamzami , Lutfi Ni'matus Salamah , Riski Agung Lestariadi , Lukman Hakim , Gatot Ardian , Mokh Hanifuddin , Andi Kurniawan

567-574

**DOI:** 10.29303/jppipa.v11i4.7131
**Statistics:** 75 | 51



PDV

### Air Conditioner (AC) Operation Using the Internet of Things

I Nyoman Sukarma , Beauregard Anakottapary , I Gede Ketut Sri Budarsa , I Ketut Parti

575-582

**DOI:** 10.29303/jppipa.v11i4.10943
**Statistics:** 67 | 42



PDV

### The Significance of The Bio-Psycho-Spiritual Dimension in Relation to Islamic Education

Sri Haryanto

583-589

**DOI:** 10.29303/jppipa.v11i4.10549
**Statistics:** 59 | 41



PDV

### Enhancing Email Security Against Phishing Attacks Through User Behavior Analysis and Data Loss Prevention (DLP)

Tamara Sinatrya Yasmin , Tomi Yulianto

590-600

**DOI:** 10.29303/jppipa.v11i4.10781
**Statistics:** 89 | 75



PDV

### Intelligent Monitoring of Smoking Prohibition in Public Spaces Using YOLOv8: Real-Time Detection and Telegram Notifications

Salsabilla Azahra Putri , Murinto , Sunardi

601-610

**DOI:** 10.29303/jppipa.v11i4.10519
**Statistics:** 81 | 58

PDV

### Development of Articulate Storyline based Local Content Learning Media to Improve Learning Outcomes of Elementary School Students

Eka Wulandari , Atip Nurharini 611-623

**DOI:** 10.29303/jppipa.v11i4.10785
**Statistics:** 63 | 40



PDV

### Development of Photo Studio Reservation Website Design Using Design Thinking Method

Asty Yuliani , Ariq Cahya Wardhana 624-629

**DOI:** 10.29303/jppipa.v11i4.10909
**Statistics:** 101 | 95



PDV

### The Correlation between Dietary Compliance and Random Blood Glucose Levels in Patients with Type 2 Diabetes Mellitus

Anita Dahliana , Agnes Mirandadea Evangelista Manek , Puri Safitri Hanum , Winnie Nirmala Santosa 630-636

**DOI:** 10.29303/jppipa.v11i4.10787
**Statistics:** 88 | 64



PDV

### Development of Progressive Integrated Testing to Identify Science Concept Understanding and Misconceptions of Grade VII Junior High School Students

Desak Nyoman Srinadi , Putu Budi Adnyana , Putu Artawan 637-648

**DOI:** 10.29303/jppipa.v11i4.10608
**Statistics:** 83 | 51



PDV

### The Effect of Adding Variations in the Combination of Anthocyanin Extract and Curcumin Volume Fraction on the Mechanical Properties and Biodegradability of Seaweed-Based Bioplastic Materials

Nuzulul Rahmah , Sujito , Yuda Cahyoargo Hariadi 649-656

**DOI:** 10.29303/jppipa.v11i4.9769
**Statistics:** 51 | 45



PDV

### Gender in Social Forestry Progam (Case of LMDH Wono Lestari Burno Village Senduro Sub-District Lumajang District)

zakaria Yahya , Leti Sundawati , Soni Trison 657-666

**DOI:** 10.29303/jppipa.v11i4.10096
**Statistics:** 46 | 35



PDV

### Characterization of Overpressure in Well Al, North Sumatra Basin: Evaluation of Pore Pressure Using the Eaton Method and Sonic-Density Crossplot

### Project-Based Integrated Science Learning for Developing Students' Creative Thinking Skills: A Case Study at a Madrasah Tsanawiyah in Sukabumi City

Melda Yunita , Elin Driana , Sri Yuliawati , Ernawati

724-735

**DOI:** 10.29303/jppipa.v11i4.10919
**Statistics:** 91 | 62

Citations 0

PDV

### Validity of the Development of PjBL-Based Science Teaching Modules Containing Ethno-STEAM to Empower Creative Thinking Skills on Ecology and Biodiversity Materials in Indonesia

Melynia Ariningtyas Prabawati , Sri Yamtinah , Bramastia

736-744

**DOI:** 10.29303/jppipa.v11i4.10952
**Statistics:** 94 | 60

Citations 0

PDV

### Is Project-Based Learning a Guaranteed Boost for Students' Creativity? A Meta-Analytic Review

Hera Puspita Sari , Arys Rafiah , Ilham Falani

745-751

**DOI:** 10.29303/jppipa.v11i4.10159
**Statistics:** 61 | 37

Citations 0

PDV

### Development of Interactive Learning Media My Indonesia is Rich in Culture INKAYA Based on Unity to Improve Science Learning Outcomes of Grade IV Elementary School Students

Yulia Cahyaningrum , Sri Sami Asih

752-762

**DOI:** 10.29303/jppipa.v11i4.10731
**Statistics:** 75 | 52

Citations 0

PDV

### The Relationship between Teacher Creativity in Teaching and Student Activeness with IPAS Learning Outcomes of Grade IV Elementary School Students

Vaella Silfa Soleha , Sri Sami Asih

763-774

**DOI:** 10.29303/jppipa.v11i4.10877
**Statistics:** 70 | 35

Citations 0

PDV

### Development of e-Modules Based Case Study on the Nervous System Materials for Students

Richa Amalia , Afreni Hamidah , Dara Mutiara Aswan , Jodion Siburian

775-787

**DOI:** 10.29303/jppipa.v11i4.10686
**Statistics:** 59 | 45

Citations 0

PDV

### Students' Cognitive Ability Improvement on Mechanical Wave Material with Chamilo Learning Media

I Made Astra , Hilmi Khoirulloh , I Gede Indra Aryasa

788-794

**DOI:** 10.29303/jppipa.v11i4.10630
**Statistics:** 61 | 47

Citations 0

PDV

### Simulation of The Conductivity Hydraulic Effect on Seawater Intrusion

Ferdy , Tirza Wungkana , Dolfie Paulus Pandara , Maria D. Bobanto , Hanny F. Sangian , Adey Tanauma , Seni H. Tongkukut , Hesky S. Kolibu

795-810

**DOI:** 10.29303/jppipa.v11i4.5437


PDV

### Validity of Science Module Based on Problem Based Learning Multiple Representations to Improve Students' Higher Level Thinking Skills on the Topic of Acid-Base

Siti Sholikhah , Sentot Budi Rahardjo , Bowo Sugiharto

811-820

**DOI:** 10.29303/jppipa.v11i4.10837


PDV

### The Influence of Various Types of Flipped Classroom Assisted by Learning Management System (LMS) on Creative Thinking Skills in Junior High School Students

Azmi Fathin Eka Nugraha , Adnan , Firdaus Daud

821-828

**DOI:** 10.29303/jppipa.v11i4.10991


PDV

### Study on the Influence of Positive Learning Environment on Student Motivation and Achievement in Elementary Schools

Cikita Fadila , Harsono , Anatri Desstya

829-833

**DOI:** 10.29303/jppipa.v11i4.10876


PDV

### Patient Satisfaction with Dental and Oral Health Services in Independent Dental Practices in Medan City in 2025

Emerentia Angela , Susanna Halim , Alamsyah

834-838

**DOI:** 10.29303/jppipa.v11i4.10925


PDV

### Impact of Differentiated Learning Strategies on Student Resilience and Academic Performance at State Junior High School

Ely Wahyuni Hidayati , Eges Triwahyuni , Ahmad Zaki Emyus

839-846

**DOI:** 10.29303/jppipa.v11i4.10612


PDV

### Identification of Patient Satisfaction with the Main Clinic Services of Ramanathan in Medan City

Ramanathan , Susanna Halim , Alamsyah

847-851

**DOI:** 10.29303/jppipa.v11i4.10924
**Statistics:** 54 | 34

Citations 0

PDV

### Biodiversity and Relationships in Species Annonaceae Using the Phenetic Method in the Purwodadi Botanical Garden

Hamidah , Junairiah , Putri Akustia

852-861

**DOI:** 10.29303/jppipa.v11i4.10808
**Statistics:** 68 | 47

Citations 0

PDV

### Community-Based Analysis of Anemia Risk Factors in Pregnant Women at Primary Healthcare

Anita Dahliana , Adinda Rizkita N. H , Chentya Catheriane L , Geraldy Aziz S. H , Isro Rafidatus S , Ketut Ayu O. S , Rinandha Yusfahreza W , Dyan Eka Puspitasari , Farida Yan Pratiwi Kurnia

862-871

**DOI:** 10.29303/jppipa.v11i4.10875
**Statistics:** 451 | 427

Citations 0

PDV

### Potential Bioactivity of Carrot (Daucus carota L.) as a Health Protector Through Antioxidant, Antibacterial, and Antifungal Activities

Digna Renny Panduwati , Dian Pratiwi , Liza Mutia , Suryani MF Situmeang , Karolina Br Surbakti , Wardati Humaira , Sahala Fransiskus Marbun

872-879

**DOI:** 10.29303/jppipa.v11i4.9441
**Statistics:** 123 | 75

Citations 0

PDV

### Development of ULTAGRAM Media Based on Quizwhizzer in an Effort to Increase Interest and Learning Outcomes

Tazkia Nurul 'Aini , Ika Ratnaningrum

880-888

**DOI:** 10.29303/jppipa.v11i4.10996
**Statistics:** 80 | 77

Citations 0

PDV

### The Correlation between Critical Thinking Skills and Argumentation Skills of Biology Students: A Study across RQA, ADI, WE-ARe, and Conventional Learning

Astuti Muh. Amin

889-899

**DOI:** 10.29303/jppipa.v11i4.7849
**Statistics:** 54 | 44

Citations 0

PDV

### Development of Website-Based Creative Content as Learning Media on Molecular Geometry

Nahadi , Hayuni Retno Widarti , Ari Syahidul Shidiq , Wiwi Siswaningsih , Atep Rian Nurhadi , Triannisa Rahmawati , Miarti Khikmatun Nais , Rara Djati Anggraeni , Hasna Athaya Rifa , Rismayanti Chusnul Chotimah , Amara Dwi Ayuni , Lusiana Citra Aphelia , Tanti Oktaviani



**DOI:** 10.29303/jppipa.v11i4.10116


### Implementation of The Learning Sciences Approach Through The Reading and Thinking Aloud Method to Improve Reading Comprehension Skills of Elementary School Students

Erna Sefriani Sabuna , Henny Dewi Koeswanti , Stefanus Christian Relmasira



**DOI:** 10.29303/jppipa.v11i4.10923


### Development of Technopreneur Learning Modules through Transformative Learning Strategies to Increase Student Entrepreneurial Interest

Ika Kumala Dewi , Gunadi



**DOI:** 10.29303/jppipa.v11i4.6888


### Water Pollution Index and Microplastic Ecological Risk in The North Coastal Area of Situbondo

Arisda Maryama Santikanuri , Riyanto Haribowo , Sri Wahyuni



**DOI:** 10.29303/jppipa.v11i4.10990


### The Diversity index and Importance Value of Herbaceous Vegetation in the Joko Tarub Forest Tuban

Yudhistian , Dede Nuraida , Susi Novita Sari , Fitriatus Sholikah



**DOI:** 10.29303/jppipa.v11i4.10974


### Optimization of Tetrigona apicalis Propolis Extract using Glycerol Solvent with Shaking Ultrasound Assisted Extraction Method

Dwi Desmiyeni Putri , Syahdilla Anggiva Akhni Rarasati , Oktaf Rina , Isnina



**DOI:** 10.29303/jppipa.v11i4.10466


### Seismic Attenuation Characteristics in Sumba Island Based on Coda Wave Analysis

Ayu Puput Ariyanti , Titi Anggono , Aditya Dwi Prasetio , Kartika Hajar Kirana



**DOI:** 10.29303/jppipa.v11i4.10870

**Statistics:** 150 | 112

Citations 0

PDV

### Analysis of Electric Field Intensity in Residential Areas Due to Lightning Strikes on Base Transceiver Station Towers

Ni Made Seniari , Supriyatna , Abdul Natsir , Ida Ayu Sri Adnyani , I Made Ginarsa , Muh. Sultanul Mahdi , Haidar Hamdi , Bagus Widhi Dharma S

964-972

**DOI:** 10.29303/jppipa.v11i4.8550
**Statistics:** 54 | 68

Citations 0

PDV

### The Relationship Between Communication Skills and Student Learning Activities with the IPAS Learning Outcomes of Grade IV Elementary School Students

Hasna Luthfiyah , Eka Titi Andaryani

973-978

**DOI:** 10.29303/jppipa.v11i4.10960
**Statistics:** 81 | 39

Citations 0

PDV

### Science Flipbook Media on Elementary School Students' Learning Outcomes

Rima Devita Sari , Ana Fitrotun Nisa , Akbar Al Masjid , Banun Havifah Cahyo Khosiyono

979-986

**DOI:** 10.29303/jppipa.v11i4.10308
**Statistics:** 58 | 37

Citations 0

PDV

### Implementation of Project-Based Learning and Critical Thinking on Students' Learning Outcomes

Yuda Ganda Putra , Yayat Ruhiat , Lukman Nulhakim , Endang Iryani

987-995

**DOI:** 10.29303/jppipa.v11i4.10525
**Statistics:** 78 | 47

Citations 0

PDV

### Development of Interactive Chemistry Activity Book on Hydrocarbon Topics

Nicholas Noel Ferdiansyah , Natalia Diyah Hapsari

996-1002

**DOI:** 10.29303/jppipa.v11i4.7587
**Statistics:** 36 | 32

Citations 0

PDV

### Students' Perception Toward the Utilization of Tiktok as Vocabulary Learning Media

Mikhael Parlindungan Hutasoit , Margana , Yuyun Yulia , Hillario Satria

1003-1010

**DOI:** 10.29303/jppipa.v11i4.10637
**Statistics:** 64 | 67

Citations 0

PDV

### Assessment on Medowo Village Kandangan District, Kediri Regency as

### Biogas Based Energy Independent Village

Wahyu Devi Hapsari Wijayanti , Surjono , Hartati Kartikaningsih

1011-1022

**DOI:** 10.29303/jppipa.v11i4.10172



### Development of Flipbook Assisted by Augmented Reality Media on Human Respiratory System Subject of IPAS in Grade V Elementary School

Ilma Yang Fauni , Barokah Isdaryanti

1023-1029

**DOI:** 10.29303/jppipa.v11i4.10841



### Mapping Potential Habitat Characteristics and Identification of Migratory Raptor Species in the Sabang City

Dhea Rhamadini , Aida Fithri , Wira Dharma , Heri Tarmizi

1030-1038

**DOI:** 10.29303/jppipa.v11i4.10078



### Identification of Remote Sensing Data: NDVI, LST, and LULC on Geothermal Manifestations in Bondowoso Regency

Linggar Ayu Octaviani , Bowo Eko Cahyono , Agus Suprianto

1039-1046

**DOI:** 10.29303/jppipa.v11i4.9620



### Air Management in Chemistry Laboratories to Prevent Sick Building Syndrome (SBS): A Mixed-Method Approach

Abdurrasyid , Helmi Geisfarad , Rian Adi Pamungkas , Aprilita Rina Yanti , Duan Elnastio , Diman Wahyudin

1047-1058

**DOI:** 10.29303/jppipa.v11i4.10799



### Innovative Alternative Zinc Supplementation for Stunted Children from Pumpkin Seeds in the Form of Gummy Candy

Chitra Astari , Al Syahril Samsi , Waode Suiyarti , Sunarto S , Asmila

1059-1063

**DOI:** 10.29303/jppipa.v11i4.11017



### Student Activeness in Problem Solving Ability Based Learning on Magnet Material

Shinta Syafitri , Yanti Fitria

1064-1069

**DOI:** 10.29303/jppipa.v11i4.9985

### Innovation in the Design and Manufacture of Rice Fan Tools

Oknovia Susanti , Rizki Afriansyah , Fuadil Fajri Rozali , Yulinda , Hendri Yanda

1070-1077

**DOI:** 10.29303/jppipa.v11i4.10574


### Evaluation of General Bioactive Phytochemicals, Antioxidant Activity, and Organoleptic Properties of Ficus racemosa L. as Herbal Tea

Novia Suryani , Yuli Kusuma Dewi , Baiq Rauhil Hidayanti

1078-1088

**DOI:** 10.29303/jppipa.v11i4.11024


### Science Study of Transportation Infrastructure on Energy Consumption and its Impact on Economic Growth in Aceh Province

Teuku Faiz Kamal , Muhammad Irfan

1089-1093

**DOI:** 10.29303/jppipa.v11i4.10897


### Exploring Individual Experiences in Understanding Environmental Policies: A Phenomenological Approach to Urban Communities

Ayub Kasim , Irman Halid , Asriana Abdullah , Ince Rahmah Ismail

1094-1101

**DOI:** 10.29303/jppipa.v11i4.10890


### Preliminary Analysis of Students' Problem Solving Ability and Self-Efficacy in IPAS Subject at Community Learning Center (CLC) Sabah Malaysia

Kemampuan Pemecahan Masalah dan Efikasi Diri

Anisa Vita Vela , Novi Ratna Dewi , Sri Sukaesih

1102-1107

**DOI:** 10.29303/jppipa.v11i4.10154


### Understanding Elderly Health in Riau: Phenomenology Study on Healthcare Access, Chronic Diseases, and Care Challenges

Gusman Virgo , Indrawati , Sri Hardianti

1108-1115

**DOI:** 10.29303/jppipa.v11i4.10937


### Quasi-Experimental Investigation of Nutritional Interventions and Cognitive Advancement in Stunted Children

Dewi Anggriani Harahap , Fitri Apriyanti , Syukrianti Syahda , Armiyati Nur , Mustika Hana Harahap

1116-1123

**DOI:** 10.29303/jppipa.v11i4.10973

PDV

### Development of STEM-Based E-Module to Enhance Science Literacy and Science Process Skills in Chemistry Learning

Seget Tartiyoso 1124-1132

**DOI:** 10.29303/jppipa.v11i4.10844


### The Morphological Character and Flowering Phenology of White Jasmine (Jasminum sambac (L.) Aiton)

Fadilah Khoirunnisa , Pinta Murni , M. Erick Sanjaya 1133-1140

**DOI:** 10.29303/jppipa.v11i4.10908


### The Effect of Organic Fertilisers on Arbuscular Mycorrhizal Fungi Diversity in the Rizhosphere of Coffea arabica Plants on the Napu Highland, Central Sulawesi, Indonesia

Annadira , Yusran , Wardah , Imran Rachman , Abdul Hadid 1141-1149

**DOI:** 10.29303/jppipa.v11i4.11044


### Development of an Integrated Helminthiasis Prevention Education Model in Elementary Schools: Utilizing Picture Storybooks and Storytelling as Learning Media

Armaidi Darmawan , Ahmad Syauqy , Andika Sulistiawan , Wahyu Indah Dewi Aurora , Erny Kusdiyah 1150-1158

**DOI:** 10.29303/jppipa.v11i4.10883


### Key Predictors of Quality of Life Among the Elderly in Kampar regency: A Multidimensional Approach

Indrawati , Gusman Virgo , Putri Eka Sudiarti 1159-1168

**DOI:** 10.29303/jppipa.v11i4.11005


### Analysis of the Use of Provider and Mi-Fi Devices on Game Performance in Mobile Legends: Bang Bang Ranked Mode

Maulana Ridho Alfarizqa , Made Sutha Yadnya , Abdullah Zainuddin 1169-1178

**DOI:** 10.29303/jppipa.v11i4.10429


### Application of The Marketing Mix Model in Consumer Behavior Analysis and Its Educational Implications: Case Study of Specialty Organic Coffee at Waroeng Kopi Kayumas

Nia Rahmi Setiawati , Abdul Wahib Muhaimin , Agustina Shinta Hartati Wahyuningtyas
1179-1189

**DOI:** 10.29303/jppipa.v11i4.10063
**Statistics:** 43 | 27

Citations 0

PDV

## The Effect of Problem-Based Learning in Biophysics on Science Education Students' Critical Thinking Skills

Muhammad Andika Putra , Madlazim Madlazim , Eko Hariyono , Mohammad Budiyanto
1190-1194

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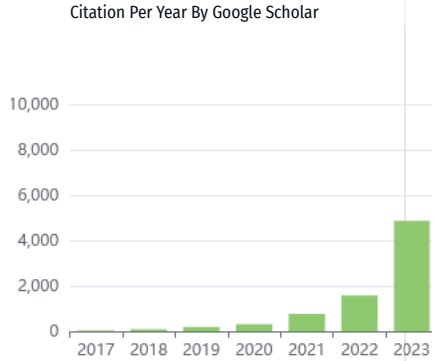


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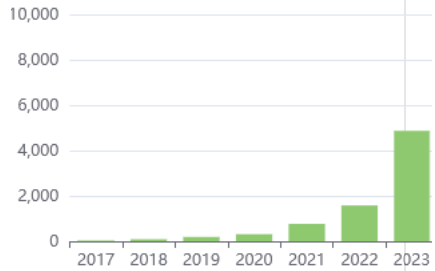


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