

Hemoglobin Levels as a Predictor of Menopausal Symptom Severity Based on the Menopause Rating Scale (MRS)

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Abstract: Menopause is a physiological phase characterized by a decline in estrogen levels and the emergence of various symptoms that affect women's quality of life. In addition to hormonal factors, hemoglobin (Hb) levels are suspected to influence the severity of menopausal symptoms. Purpose of the study to analyze hemoglobin levels as a predictor of menopausal symptom severity based on the Menopause Rating Scale (MRS). This study used an observational analytic design with a cross-sectional approach involving 67 menopausal women aged 45–60 years in Pasir Lor Village, Banyumas. Data were collected through Hb measurement and MRS questionnaires. Data analysis included correlation tests and linear regression. The results showed a mean Hb level of 13.18 ± 1.17 g/dL and an MRS score of 17.03 ± 8.59 . There was a significant negative correlation between Hb and MRS scores ($r_s = -0.355$; $p = 0.003$). However, linear regression analysis indicated that Hb was not a significant predictor of menopausal symptom severity ($p = 0.141$; $R^2 = 0.033$). In conclusion, hemoglobin levels are associated with menopausal symptom severity but are not a strong predictor. Other factors may play a more dominant role in determining the severity of menopausal symptoms.

Keywords: hemoglobin levels; menopause; menopause rating scale (MRS)

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Introduction

Menopause is a physiological phase experienced by women as part of the aging process, characterized by the permanent cessation of menstruation due to the decline in ovarian function. It typically occurs between the ages of 45 and 55 years and is clinically confirmed after 12 consecutive months of amenorrhea (World Health Organization, 2021). Menopause is not merely a reproductive event but a multidimensional condition that affects overall health, including hormonal changes such as decreased estrogen levels, which influence metabolism, nutritional status, hemoglobin (Hb) levels, fat distribution, and increase the risk of anemia (Ahanchi et al., 2024).

Recent scientific evidence indicates that menopausal symptoms vary widely, ranging from vasomotor symptoms (hot flushes, night sweats), somatic complaints (joint pain, fatigue, sleep disturbances), to psychological disturbances (anxiety, depression, irritability). These symptoms significantly impact quality of life and can be assessed using the Menopause Rating Scale (MRS). Studies have shown that nutritional status plays an important role in either exacerbating or alleviating menopausal symptoms. Both undernutrition and overnutrition have been associated with an increased prevalence of vasomotor complaints. In addition to nutritional status, hematological status also plays a crucial role in influencing the health condition of menopausal women. Low hemoglobin (Hb) levels (anemia) are still observed in some postmenopausal women despite the cessation of menstruation. Anemia in this group may result from iron deficiency, chronic diseases, or micronutrient deficiencies, and contributes to symptoms such as fatigue, sleep disturbances, palpitations, and decreased cognitive function. These conditions may overlap with or exacerbate menopausal symptoms, making Hb assessment relevant in the context of elderly women's reproductive health (Freeman AM, 2025). Furthermore, several studies have highlighted the important role of hematological and nutritional status in menopausal symptoms. Anemia or low hemoglobin levels have been shown to worsen fatigue, sleep disturbances, and mood swings. Individuals with anemia are more likely to experience insomnia (adjusted odds ratio [OR]: 1.32; 95% confidence interval [CI]: 1.03–1.70) compared to those without anemia (Neumann et al., 2021).

Anemia has also been associated with fatigue, reduced energy levels, cognitive impairment, and psychological disturbances affecting mood and mental well-being (Elyn et al., 2025). However, most previous studies have primarily focused on hormonal aspects or subjective assessments using questionnaires, while the use of simple hematological

parameters such as hemoglobin as a predictive tool remains limited. In fact, Hb measurement is relatively simple, cost-effective, and widely accessible across healthcare settings, including primary care. Based on these considerations, hemoglobin levels have the potential to serve as a predictor of menopausal symptom severity as measured by the Menopause Rating Scale (MRS). The use of Hb as a predictive indicator is expected to facilitate early detection of women at risk of experiencing severe menopausal symptoms in a more practical and efficient manner. The urgency of this study lies in the need to develop a simple, objective, and applicable predictive method in primary healthcare settings, thereby supporting preventive efforts and improving the quality of life of menopausal women through more timely and appropriate interventions.

Method

This study employed an observational analytic design with a cross-sectional approach to examine the relationship between hemoglobin (Hb) levels and clinical menopausal symptoms at a single point in time. The study was conducted among menopausal women aged 45–60 years in Pasir Lor Village, Karanglewas District, Banyumas.

A total of 67 respondents were selected using a simple random sampling technique based on predefined inclusion and exclusion criteria. The independent variable in this study was hemoglobin (Hb) level, while the dependent variable was menopausal clinical symptoms measured using the Menopause Rating Scale (MRS) questionnaire.

Data analysis included univariate analysis to describe data distribution, bivariate analysis using Pearson correlation for normally distributed data and Spearman rank correlation for non-normally distributed data, and multivariate analysis using linear regression to determine the extent to which hemoglobin levels influence the severity of menopausal symptoms.

Results and Discussion

Based on Figure 1, the mean menopausal symptom score among respondents was 17.03 ± 8.59 , with a minimum value of 3 and a maximum value of 31. These findings indicate a wide variation in menopausal symptoms, reflecting differing levels of severity experienced by the participants. According to the Menopause Rating Scale (MRS), menopausal symptom severity is commonly classified into mild, moderate, and severe categories, and the instrument remains widely used and validated in recent studies for assessing menopausal symptoms and their impact on quality of life (Santo et al., 2023);(Mediboina et al., 2024). The observed distribution suggests that respondents experienced a range of symptom severities from mild to severe.

Based on Figure 1, the mean menopausal symptom score among respondents was 17.03 ± 8.59 , with a minimum value of 3 and a maximum value of 31. These findings indicate a considerable variation in menopausal symptoms, reflecting differences in the severity of symptoms experienced among women. The mean hemoglobin (Hb) level among respondents was 13.18 ± 1.17 g/dL, with a minimum value of 10.7 g/dL and a maximum of 16.8 g/dL. This indicates that most respondents had hemoglobin levels within the normal range, with relatively low variability (Figure 2). The analysis of the relationship between hemoglobin (Hb) levels and upper arm circumference (MUAC) with menopausal symptoms measured using the Menopause Rating Scale (MRS) score was conducted using the

The results showed a correlation coefficient between Hb levels and MRS scores of $r_s = -0.355$, with a **p-value = 0.003**. This finding indicates a statistically significant negative correlation of weak to moderate strength between hemoglobin levels and menopausal symptom severity ($p < 0.05$). This means that higher hemoglobin levels are associated with lower MRS scores, indicating milder menopausal symptoms. Based on the results of a simple linear regression analysis examining the relationship between hemoglobin (Hb) levels and menopausal symptom severity (MRS scores) among 67 respondents, the Multiple R value was 0.181, indicating a weak relationship between Hb levels and MRS scores.

The R Square value was 0.033 (3.3%), suggesting that hemoglobin levels account for only 3.3% of the variability in menopausal symptom severity, while the remaining 96.7% is influenced by other factors not assessed in this study. The ANOVA test results showed an F-value of 2.21 with a p-value (Significance F) of 0.141 (> 0.05). This indicates that the regression model is not statistically significant, meaning that hemoglobin levels cannot be considered a meaningful predictor of menopausal symptom severity. Based on the regression coefficient analysis, the Hb coefficient was -1.33, indicating that each 1 g/dL increase in hemoglobin level is associated with a decrease of 1.33 points in the MRS score. However, this association was not statistically significant, with a p-value of 0.141 (> 0.05) (Figure 3). Furthermore, the 95% confidence interval for the Hb variable ranged from -3.12 to 0.46, which includes zero, further confirming that the effect of hemoglobin on menopausal symptom severity is not statistically significant.

It can be concluded that hemoglobin levels show a negative relationship with the severity of menopausal symptoms; however, this association is not statistically significant. Therefore, hemoglobin levels cannot yet be considered a strong predictor of menopausal symptom severity based on the Menopause Rating Scale (MRS) in this study. The results of this study indicate that hemoglobin (Hb) levels have a negative association with the severity of menopausal symptoms as measured by the Menopause Rating Scale (MRS); however, this relationship was not statistically significant ($p = 0.141$). This finding suggests that although there is a tendency for higher Hb levels to be associated with lower menopausal symptom scores, hemoglobin cannot yet be considered a strong predictor in this study.

From a theoretical perspective, hemoglobin plays a crucial role in transporting oxygen to body tissues, including the brain and nervous system. Low Hb levels may lead to tissue hypoxia, which can contribute to symptoms such as fatigue, sleep disturbances, reduced concentration, and mood changes—symptoms that are also commonly observed during menopause. Therefore, anemia is often associated with increased severity of somatic and psychological symptoms in menopausal women (World Health Organization, 2021).

However, the findings of this study showed no statistically significant association between hemoglobin (Hb) levels and the severity of menopausal symptoms. This is consistent with several studies suggesting that menopausal symptoms are multifactorial in nature and are not solely influenced by a single biological factor, but also by hormonal, psychological, social, and lifestyle factors (Avis et al., 2015). A decline in estrogen levels is considered the primary factor triggering menopausal symptoms, as menopause is characterized by reduced ovarian function leading to estrogen deficiency, which affects multiple body systems, including the nervous, cardiovascular, and metabolic systems (Yang et al., 2024).

This decrease in estrogen plays a major role in the development of typical menopausal symptoms such as hot flashes, sleep disturbances, mood changes, and urogenital disorders (Crandall et al., 2023). Furthermore, several studies have demonstrated that vasomotor symptoms, which are the hallmark of menopause, are strongly influenced by fluctuations in estrogen levels. Estrogen therapy has been shown to reduce these symptoms by approximately 75%, highlighting the dominant role of estrogen in the pathophysiology of menopause (Crandall et al., 2023).

Nevertheless, the mechanisms underlying menopausal symptoms are not solely driven by estrogen deficiency but also involve other factors, such as alterations in hypothalamic neurotransmitters and disruptions in thermoregulation (Pertynska-Marczewska & Pertynski, 2024). Therefore, other factors such as hematological status, including hemoglobin levels, may act as contributing factors that can exacerbate symptoms, rather than serving as primary causes of menopause. In addition, the low R Square value (3.3%) observed in this study indicates that the majority of the variation in menopausal symptoms is influenced by factors other than hemoglobin levels. These factors may include age, body mass index (BMI), physical activity, psychological status, and the presence of chronic health conditions.

Although the association was not statistically significant, the negative direction observed in this study still holds clinical relevance, indicating that higher hemoglobin (Hb) levels tend to be associated with lower severity of menopausal symptoms. This finding is supported by previous research reporting that large-scale cohort studies have identified anemia as an independent risk factor for reduced quality of life among individuals aged over 60 years, particularly in the domains of physical function and energy (Wouters et al., 2019).

In addition, recent studies have demonstrated that anemia in older adults is associated with decreased physical function, limitations in daily activities, and increased dependency in both basic and instrumental activities of daily living (Karismaz et al., 2024). Other studies have also reported that anemia is linked to reduced functional capacity, cognitive impairment, and mood disturbances in the elderly population (Salis et al., 2023). Furthermore, a recent systematic review highlighted that anemia contributes to diminished quality of life, increased fatigue, and reduced physical performance and daily functioning among older adults (Sahoo et al., 2025).

Therefore, although hemoglobin levels may not represent a primary determinant, hematological status still plays an important contributory role in overall clinical condition. The lack of statistical significance in this study may also be explained by several limitations, including the relatively small sample size, the limited variability of hemoglobin levels among respondents, and the absence of control for potential confounding factors such as nutritional status, chronic diseases, and psychological conditions. In addition, the assessment of menopausal symptoms using the Menopause Rating Scale (MRS) is subjective in nature and may be influenced by individual perceptions of the respondents. Therefore, although hemoglobin levels were not found to be a statistically significant predictor in this study, they may still have potential clinical relevance in relation to menopausal symptoms. Future studies are recommended to combine hemoglobin parameters with other variables, such as nutritional status (e.g., mid-upper arm circumference [MUAC] or body mass index [BMI]) and hormonal factors, in order to develop a more comprehensive predictive model.

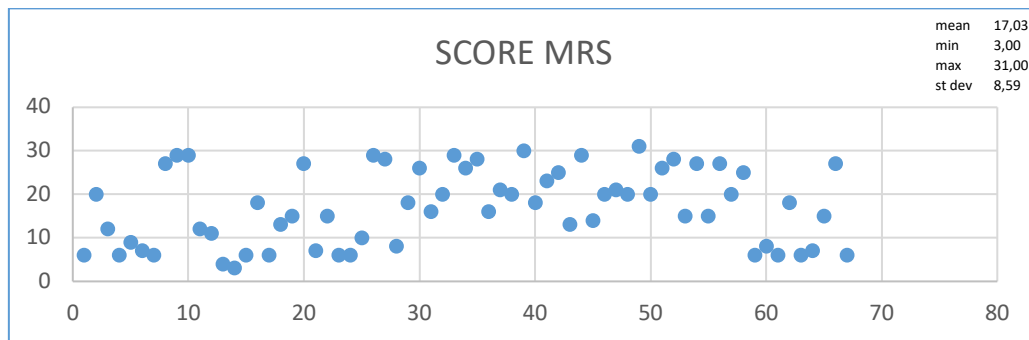


Figure 1. Distribution of Menopausal Symptoms Using the Menopause Rating Scale (MRS)

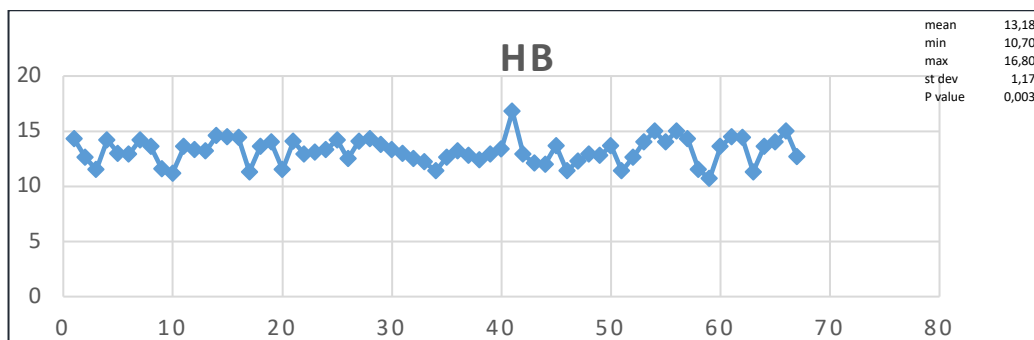


Figure 2. Relationship Between Hemoglobin (Hb) Levels and Menopause Rating Scale

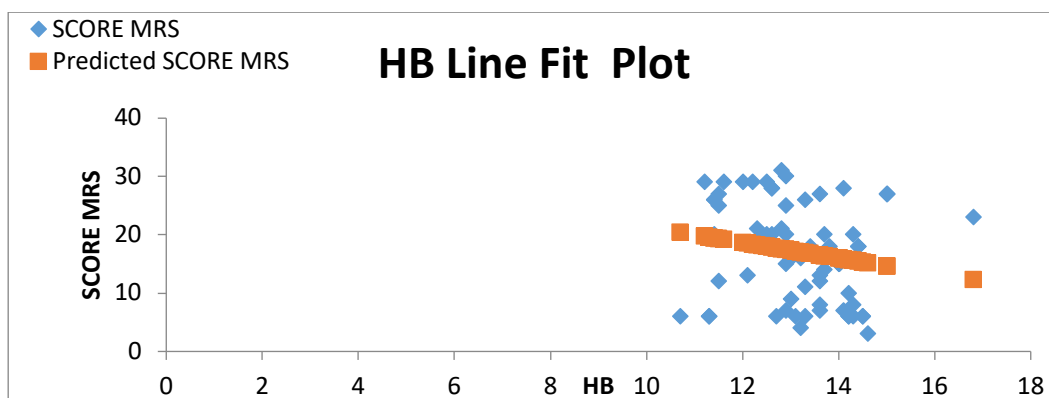


Figure 3. Linear Regression Equation of Hemoglobin (Hb) Levels and Menopause Rating Scale

Description:

- Y = Score Menopause Rating Scale (MRS)
- X = Hemoglobin (Hb) level
- 34,63 = konstanta (MRS value at Hb level = 0)
- -1,33 = koefisien regresi Hb

Table 1. Linear Regression Analysis of Hemoglobin (Hb) Levels and Menopause Rating Scale

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	34,625	11,872	2,917	0,005	10,915	58,335	10,915	58,335
HB	-1,335	0,897	-1,488	0,142	-3,126	0,457	-3,126	0,457

Description:

- $R = 0,181$
- $R^2 = 0,033$
- $F = 2,21$
- $p = 0,141$

Conclusion

Hemoglobin levels demonstrated a negative association with the severity of menopausal symptoms; however, this relationship was not statistically significant ($p > 0.05$). The low R^2 value indicates that hemoglobin is not a strong predictor, suggesting that the severity of menopausal symptoms is more likely influenced by other factors.

Declaration of Generative AI

The authors declare that this manuscript was independently authored without using generative AI or automated content-creation tools. All text, analyses, and conclusions represent original work completed entirely by the authors.

Authors' Contribution

All authors contributed equally to the conceptualization, data collection, analysis, and drafting of this manuscript. Each author has reviewed and approved the final version for submission.

Conflict of Interests Statement

The authors confirm there are no financial, personal, or professional conflicts of interest related to this work. No competing interests affected the execution of the research or the reporting of its results.

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Data Availability

The datasets generated and analyzed during the study are available from the corresponding author upon reasonable request. Access to the data will be provided in compliance with institutional and ethical guidelines.

Informed Consent

Written informed consent was secured from all participants prior to their involvement in the study. All procedures complied with institutional guidelines regarding participant autonomy and data protection.

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