LETTER TO THE EDITOR

Journal of General and Family Medicine   WILEY

Investigation on prediction formulae for calculating erythrocyte sedimentation rate

Dear Editor:

The erythrocyte sedimentation rate (ESR) is commonly determined in laboratory blood testing and is often elevated in patients with underlying systemic disorders. In 1983, Miller et al.[1] clarified the upper limits of ESR and, since then, these parameters have been widely applied in clinical practice. In a study of the upper limits of ESR based on 26 836 healthy men and 1076 nonpregnant healthy women, Miller et al.[1] reported that the maximum values varied in 98% of the study cohort, increasing from 11 mm/h in young men to around 30 mm/h at the age of 65. The corresponding values for women were around 20 and 36 mm/h, respectively. They suggested that the upper ESR limit can be calculated by the following formulae: men, age in years/2; women (age in years + 10)/2. However, no reports have addressed the integrity of these limits. Although some reports have explored the application of these limits for patients aged 20-65 years in routine health screening, there has been no mention of the applicability in elderly patients. In 1996, Wetteland et al.[2] reported that there was a significant association between ESR level and age (range 20-90 years). In 1993, Gillum reported differences in ESRs between Caucasians and Negro races, independent of age, hemoglobin concentration, and certain chronic diseases.[3] However, there are currently no reports on differences in ESRs between Asians and other races. Therefore, the aim of this investigation was to assess the normal maximum range of ESR as described by Millar et al.[1] and to determine whether this rule is applicable to Asians and the elderly.

We retrospectively reviewed the records of 249 patients (85 males and 164 females; mean age, 75.0 years; age range, 65-91 years) who were examined at the outpatient department of St. Marianna University Hospital from September 2012 to August 2013. Requirements of participation for this study were age >65 years, C-reactive protein ≤0.03 mg/L, and clinical stability (vital signs were stable and afebrile in a few months). Patients with affecting factors for values of ESR were excluded from subjects of this investigation (e.g, anemia, hyper gammopathy, disseminated intravascular coagulation syndrome, polycythemia). The study was approved by ethical committee of St. Marianna University (No. 3128). The median ESR value of males and females was 6 mm/h (range, 1-31 mm/h) and 12 mm/h (range, 2-45 mm/h), respectively. The overall median difference between the measured and predicted ESRs was 30 mm/h (range, 1-50.5 mm/h), 30 mm/h (range, 1-50.5 mm/h) for males, and 30 mm/h (range, 12.5-43.5 mm/h) for females.

The results of our study indicated that the Millar's rule for calculating normal maximum ESR values is applicable to patients aged >65 years and Asians. However, a limitation of this study was the lack of control groups for age and race.

Individual differences in ESR present an important shortcoming. Various factors, such as age and gender among others, affect ESR.[3-5] Thus, a formula to calculate ESR is essential. This study was conducted with Japanese healthy patients includes elderly. Most of the measured values were lower than the predicted value. Our investigation showed that actual ESR mostly fits within the range of the predicted values and may be applicable to both Asians and the elderly (Figures 1 and 2).

Erythrocyte sedimentation rate can be used as an index to analyze and evaluate the treatment period, especially in cases that require
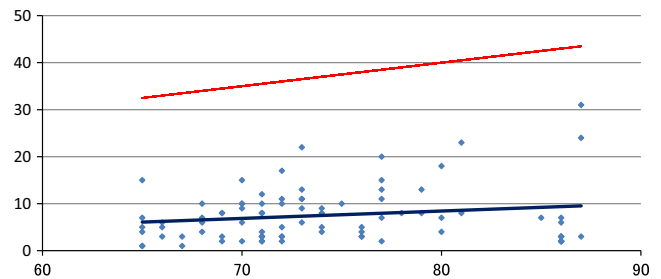

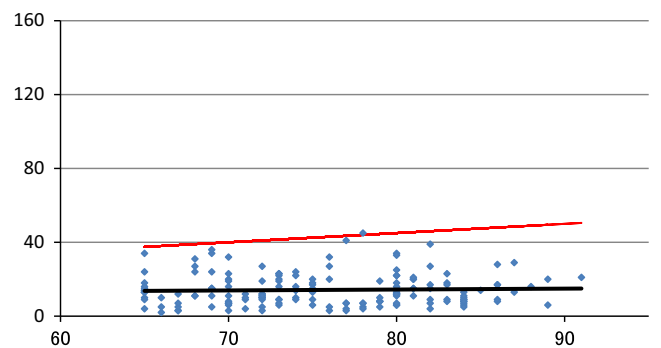**FIGURE 1** Measured value and predicted value of ESR (Male)

FIGURE 2 Measured value and predicted value of ESR (Female)

long-term administration of antibiotics, as in osteomyelitis.[4,5] The predicted value is not normally observed in patient samples, but rather a normal maximum value. Therefore, it is necessary to carefully consider these differences when applying this rule in clinical practice; for example, the use of these formulae is inappropriate to determine the duration of antibiotic therapy.

Erythrocyte sedimentation rate had been used for evaluate the progression of various inflammatory disease. Recently, it has been used as a therapeutic effect determination marker for the long-term antibiotic therapy in daily practice (e.g, osteomyelitis, abscess, deep tissue infection). These infectious diseases commonly found in elderly. Therefore, to evaluate therapeutic effect of the diseases, it is necessary to develop further detailed study for Japanese baseline of ESR.

CONFLICT OF INTEREST

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

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