Erythrocyte Sedimentation Rate in Healthy School Children of Bangladesh

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The reference value of erythrocyte sedimentation rate (ESR) should be established for a population concerned because it is influenced by many local conditions. It has not yet been determined in healthy children of Bangladesh. This study was done to determine the reference value of ESR in Bangladeshi children. ESR was determined in a sample of 413 'healthy' primary school students (259 boys and 154 girls, mean age 8.7 years). Ninety-five percent of them had ESR ≤ 30 mm (Westergren 1 h). Our findings suggest that ESR value >30 mm (Westergren 1 h) should be considered high in Bangladeshi primary school children.

INTRODUCTION

Erythrocyte sedimentation rate (ESR) is one of the most commonly employed tests to detect acute phase response, and it plays a relatively important role in clinical decision making. The International Committee for Standardization in Haematology does not recommend an international reference value for ESR because it is influenced by many local conditions 1. Racial variations in ESR levels have also been reported 2. Therefore, it should be established for the population concerned 1,3.

The reference range of ESR in healthy children of Bangladesh is yet to be determined. Previously we have reported the reference value of ESR in Bangladeshi children for differential diagnosis of rheumatic fever among the out-patients of a tertiary level hospital specialized in rheumatic fever 4. Findings of that study 4 may not be generalized because the subjects were recruited in a specialized hospital. As an extension to our work mentioned above, we have done the present study to determine the reference value of ESR in a sample of 'healthy' primary school children.

METHODS

Subjects:
This study was done in the primary section of Mirpur Bangla School located in Mirpur of Dhaka city. Primary education consists of five years. It is a public school, and provides free education as a part of the national compulsory primary education program. Children of all socioeconomic status from the nearby area attend it. It is run by a management committee, which consists of representatives of parents, teachers and government officers. Consent was obtained from the management committee. Then, class teachers explained the purpose of the study to the students, and requested them to participate according to a schedule in July-August 1992. All students of grade I through V were considered eligible. A total of 454 students (277 boys and 177 girls) were present during the days of blood sample collection. Among them, 432 (95%) subjects, 269 (97%) boys and 163 (92%) girls, participated in this study. With a view to include 'healthy' children, C reactive protein was measured for all of them 5. Finally, 413 (96%) students, 259 (96%) boys and 154 (95%) girls, who tested negative for C reactive protein were recruited.
Measurement of ESR:

ESR was measured by the method of Westergren (1 hour) using sodium citrate anti-coagulant and performed within two hours of venepuncture in room temperature, as recommended by the International Committee for Standardization of Haematology. It was done by two experienced laboratory technicians, who were supervised by one of us. However, the validity of ESR measurements was not tested.

Statistical analysis:

The frequency distribution of ESR values was skewed to the right but found to follow log-normal distribution. All analyses were based on log-transformed values. The reference value for normal ESR was defined as the range that included 95% of values. It was calculated by using two methods: (a) mean + 1.64 (standard deviation), which relied on normality assumption; and (b) directly form the cumulative frequency distribution curve.

RESULTS

Our subjects are 5 to 13 years old, with a mean of 8.7 years (8.8 for boys and 8.3 for girls). Initially data are examined for boys and girls separately. Since no statistical difference between ESR values for the two sexes is found and cumulative frequency plots for boys and girls overlie one another, final analyses are accomplished by combining the data. Results are presented in Figure 1. The reference value calculation based on the normality assumption shows that the 95% of the observations have a value ≤ 30 mm (Westergren 1 h). This is further supported by the finding from the cumulative frequency distribution curve.

DISCUSSION

The ESR is poor in quality control and lacks reproducibility. However, it remains the most popular and widely used test in developing countries, because it is less expensive, easy to perform, and does not require electrical power supply and capital investment in equipment. It will remain popular in the developing countries until better tests such as C reactive protein, zeta sedimentation ratio, and plasma viscosity become economically feasible.

The reference value of ESR should be established by using data from a representative local healthy population. The school that we have selected for this study includes children from all socioeconomic background, and may represent primary school children of Dhaka city but not Bangladesh at large. The reference value that we have found in this study (30 mm) is similar to our previous finding of a hospital-based study (29 mm). This lends strength to our conclusion. It could be more informative to know the situation in other developing countries. Unfortunately, information on children is not available.

Implication:

In absence of a recognized reference range of ESR, diagnosis of a clinical condition would vary among physicians. We believe that the reference value suggested here would reduce

![Figure 1. Distribution of ESR in 'healthy' primary school children of Bangladesh. SD indicates standard deviation](image-url)
such variations. On the other hand, the cut-off point, the point on the continuum between normal and abnormal test, is an arbitrary decision. This is true for any test result that takes on a range of values. Therefore, the cut-off point for presence or absence of acute phase response recommended here should be used with caution, and decision should be made in the light of consequence of diagnostic error. Normal results do not always exclude physical disorders.

Possible bias: The use of a ‘well’ person screening test, C reactive protein, does not necessarily ensure inclusion of healthy children (and exclusion of sick children). An important factor for variation in ESR in the so-called ‘healthy’ population is anemia. Unfortunately, we do not have data on anemia.

Conclusion: Our finding suggests that an ESR value >30 mm (Westergren 1 h) should be considered abnormal for primary school children of Bangladesh.

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