Letter to the Editor

A Flawed Study: Evaluation of Erythrocytic Indices in Children with Iron Deficiency

Dear Editor,

I was puzzled by the recent article titled Evaluation of Erythrocytic Indices in Children with Iron Deficiency published in the Hong Kong Journal of Paediatrics by Akbayram and Orkmez.[1] There is a serious flaw in the design of the study that would invalidate the results and the conclusion.

The authors recruited 400 children with iron deficiency, defined by their serum ferritin at 15 ng/mL or less. They were further divided into two groups: (A) iron deficiency anaemia with Hb <11 g/dL, and (B) iron deficiency with Hb ≥11 g/dL (non-anaemic). Comparing the erythrocytic indices between group A and group B and noting that the Hb, haematocrit (Hct), mean corpuscular volume (MCV), mean cell haemoglobin (MCH), and mean cell haemoglobin concentration (MCHC), and red cell distribution width (RDW) were significantly different between the two groups, the authors concluded that erythrocytic indices were useful as biomarkers to differentiate iron deficiency anaemia from iron deficiency.

In statistics, when data sets of variables are compared between two groups, it is important to realise that the variables should be independent of how the population groups are defined. If any of the variables is part of the group definition, the result of the comparison is intrinsically biased and thus invalid. This is an error of circular analysis where artefactual results are obtained when study subjects have been manipulated in favour of a test variable.[2]

In this study, haemoglobin or Hb, one of the indirect means of measuring total red cell mass, has been used to define group A and group B. It is of no surprise that the mean Hb levels between the two groups of patients are statistically different. Hct (in %), the other way of indirect measurement of total red cell mass and can be roughly estimated by multiply Hb (in g/dL) by 3, is another way of expressing haemoglobin. Furthermore, MCV=Hct/red cell count; MCH = (Hb × 10)/red cell count; and MCHC = Hb/(MCV × red cell count). Thus, all these variables vary in relation to Hb. The statistically significant findings when computing and comparing these variables are thus expected. This is like comparing billionaires and millionaires and concluding that the banks accounts and wealth assets of billionaires are significantly more than those of millionaires.

Hence, because of these flaws in the study design, the study findings are meaningless and the conclusion drawn is invalid.

References

1. Arkbayram HT, Orkmez M. Evaluation of erythrocytic indices in children with iron deficiency. HK J Paediatr (new series); 30:3-7.
2. Makin TR, Orban de Xivry JJ. Ten common statistical mistakes to watch out for when writing or reviewing a manuscript. Elife 2019;8:e48175.

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