

# Spurious Augmentation of Mean Corpuscular Hemoglobin Concentration: Facts and Denotations

**Bashir Abdrhman Bashir**

*Department of Hematology, Faculty of Medical Laboratory Sciences, Port Sudan Ahlia College, Sudan*

## ABSTRACT

In everyday practice in hematology laboratories, fake elevated mean corpuscular hemoglobin concentration (MCHC) initiates a logical alert and needs instant corrective action to guarantee the conveyance of the right outcomes to the clinicians. The point of this perspective was to set up a (choice chart). Modern-day hematology instrumentation has become more and more innovative and dependable regarded to spurious MCHC, which may help to prevent inappropriate investigations or treatment.

**Key words:** Choice chart, hematology analyzers, laboratory practice, spurious MCHC

## INTRODUCTION

Complete hemogram abnormality identified with at least one of the deliberate parameters red blood cells (RBC), hemoglobin (HGB), mean cell volume (MCV), mean cell hemoglobin (MCH), or hematocrit (HCT) contributes to abnormal calculated RBC indices, particularly mean corpuscular hemoglobin concentration (MCHC). MCHC is one of the most characteristic irregularities produced by hematology analyzers, alarming the users about a spurious result. Raised MCHC is an uncommon event in routine laboratory practice; however, it should be overseen appropriately.<sup>[1]</sup> MCHC is also having to render and evaluate when validating the complete blood count test results, as well as troubleshoot where applicable. In everyday practice, the MCHC limit is determined by hematological analyzers (Sysmex XB 300, Japan) and is set at 36.5 g/dl. This “flag” has to be viewed in an accreditation context to evaluate the accuracy of stated parameters. It may only be an artifact, or it is a real pathological specimen. Indeed, different etiologies lead to false outcomes of RBC, HCT, or HGB estimations: 1 The presence of abnormal RBC: In cold agglutination or erythrocyte disease, and 2

the presence of abnormal plasma: In lipemic, Icteric, or hemolytic conditions.<sup>[2]</sup>

In laboratory practice, this leads to an incorrect reduction in the number of RBC, a false increase in cell volume, and, consequently, to wrong erythrocyte indexes.<sup>[1]</sup> If acquired or genetic disorders, a change in erythrocyte volume homeostasis is observed mainly with dehydration. Water loss produces diminished cell volume and increased HGB.<sup>[3]</sup> In conclusion, in uncommon instances, increased MCHC can be found in patients with severe ionic troubles or those who have been regaled with some drugs.<sup>[1]</sup> Normal MCHC does not preclude lipemia or icterus, just due to plasma opacity/turbidity may not be high enough to bring the level above the normal scope, or due to the MCHC is low to start with, due to iron deficiency for instance.<sup>[2]</sup> Increasing the overall concentration of erythrocytes is one of the useful signs that alert us to the possibility of hyperlipidemia, or opacity usually represented resulting from various components. When this happens, it is necessary to check the credibility of the test for HGB or MCHC and work to amend it.<sup>[3]</sup> In hemolysis, the RBC count may be falling. Free plasma HGB may have detected, falsely high HGB, leading to a high MCHC.<sup>[1]</sup>

### Address for correspondence:

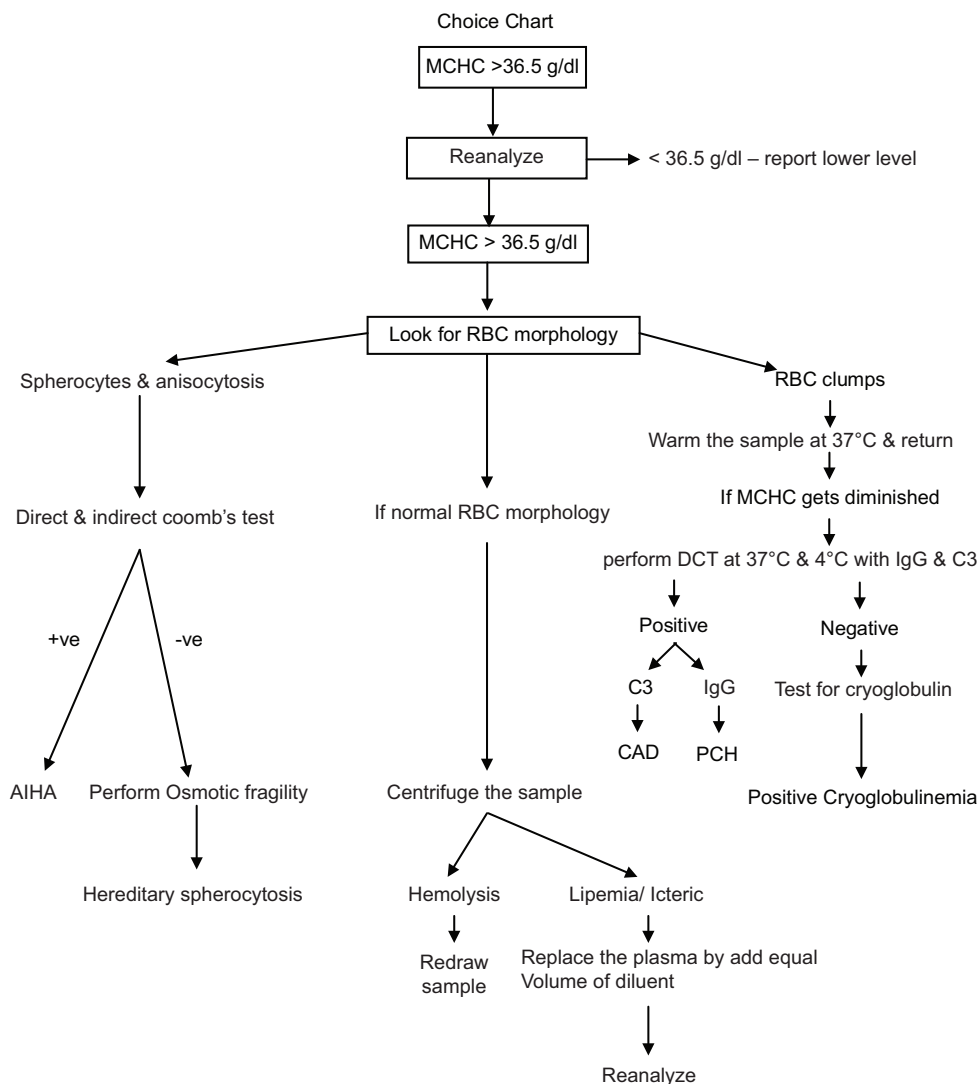
Dr. Bashir Abdrhman Bashir, Department of Hematology, Faculty of Medical Laboratory Sciences, Port Sudan Ahlia College, Sudan.

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## CONSIDERATIONS

MCH and MCHC, as good as the MCV, reflect average levels and may not adequately reflect RBC changes when mixed RBC populations exist, such as dual RBC populations in sideroblastic anemia or combined iron deficiency anemia (decreased MCV and MCH) and megaloblastic anemia (increased MCV and MCH). An elevated RDW will provide a hint to the heterogenous red cell size (anisocytosis) and/or the presence of two red-cell populations, and peripheral blood smear review can help substantiate the above determinations. Genuinely increased MCHC usually occurs in hereditary spherocytosis or some cases homozygous sickle cell disease or HGB C disease.<sup>[4]</sup>

Faced with a sample with an MCHC level of  $\geq 36.5$  g/dl, a suspect “flag” appears and the sample must be verified (plasma aspect, RBC distribution width curve, and presence or absence of morphological abnormalities of RBC on a blood smear). The common process of monitoring these samples is time-consuming and simultaneously delays the report of genuine outcomes to clinicians.<sup>[1]</sup> Curiously, a new version of the hematology analyzer by the Sysmex organization proposes new parameters acquired by the optical method such as RBC-O or HGB-O, in corresponding with the impedance technique for erythrocyte or photometry for HGB. These new parameters related to those for reticulocytes may improve the administration of MCHC  $>36.5$  g/dl. A variety of actions may be necessary due to the findings [Figure 1].



**Figure 1:** “Choice Tree” defined in case of raised MCHC  $>36.5$  g/dl. Various actions may be needed as a result of the findings, MCHC: Mean corpuscular hemoglobin concentration, DCT: Direct Coombs test, PCH: Paroxysmal cold hemoglobinuria, AIHA: Autoimmune hemolytic anemia, IgG: Immunoglobulin gamma, CAD: Cold agglutinin disease

## CONCLUSION

Modern-day hematology instrumentation has become increasingly advanced and dependable; however, an awareness of the spectrum of cell counter-related spurious MCHC results may serve to prevent inappropriate investigations or treatment. In this perspective, we propose a “choice chart” flowchart devoted to the quick management of high MCHC levels, using a standardized laboratory validation procedure. Moreover, these were significantly improved the result delivered to the clinicians and help them in their diagnosis approach.

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