

Do the WHO head circumference standards underestimate microcephaly?

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A recently published article reviews head circumference for age standards among different populations and compares them with the WHO standards.¹ Consistent with other studies,²⁻⁵ that article reinforces the fact that the use of WHO standards overestimates the average head size and the percentage of macrocephaly in children younger than 5 years. In addition, it also shows that head circumference is smaller in the first month of life in Japan and China, and at all ages among Hindus before the age of 5 years, compared with the population used for the WHO standards.

Therefore, using the WHO standards would overdiagnose macrocephaly and underdiagnose microcephaly in children younger than 5 years, especially in European countries.

The size of the difference in head circumference compared to the WHO standards varies from birth to 24 months of age, indicating that a simple change in the inclusion limits for defining microcephaly and macrocephaly would not completely resolve such over- or underdiagnosis.

There is no explanation as to why head circumference is smaller in the populations included in the WHO study. On the one hand, we could rule out that it was due to the secular

trend because it would be expected the WHO head circumference standards—which have been recently established—to be larger and not smaller as they are. On the other hand, being a highly selected sample, with strict inclusion criteria to ensure optimal growth, the potential role of malnutrition as a cause is ruled out.⁶

Regarding the instrument used for measurement, it could be argued that the WHO used a metal tape measure, while most of the other studies used a non-extensible plastic tape measure. However, for the Norwegian standard, a metal tape measure was used and differences in percentiles were also obtained compared to the WHO standards.

Measuring head circumference is a universal practice in the follow-up of children and the diagnosis of any condition related to growth and development, which we can make based on the interpretation of this information, and this measurement has important implications at both the individual and population levels.

The overestimation of head circumference for age based on the WHO standards would increase the proportion of the healthy population diagnosed with macrocephaly, unnecessarily referring children for additional studies with higher health care costs, in addition to the

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complications that this may cause for the families. However, in clinical practice, in addition to taking into account the inclusion limits of the head circumference charts and the parents' head size, the recommendation is to use other elements to decide if further studies are required to make a diagnosis. A rapid growth in head circumference, particularly when observed together with other neurological signs or symptoms, is the strongest predictor of hydrocephalus, which is the most common and important cause of macrocephaly. However, conditions associated with head enlargement do not always increase the occipito-frontal circumference.

In addition, underestimation of microcephaly, an important neurological sign and predictor of future disability, will lead to the underdiagnosis of diseases with high morbidity in our region, such as Zika virus infection. The assessment of a child with microcephaly requires a comprehensive analysis of their history, clinical examination, and supplementary studies. Depending on the cause and severity, children may have different problems, such as intellectual disability, developmental delay, epilepsy, cerebral palsy, as well as visual and hearing disorders,⁷ whose diagnosis and treatment could be delayed due to the lack of an early and timely detection of microcephaly.

Recommendations for the use of local standards for other growth and development parameters and in clinical settings have recently been published.⁸ The findings of the study by Hui et al.¹ lead to the recommendation to use head circumference standards for each population in clinical settings, replacing the WHO standards.

In Argentina, there are no local standards available for the assessment of head circumference by age. Several years ago, the measurements made in the local population were compared with Nellhaus' data and they coincided; therefore, the Sociedad Argentina de Pediatría has recommended using that chart for the assessment of head circumference in boys and girls born at term, during childhood

and adolescence.⁹ Regarding the comparison of the Nellhaus references with the WHO standards, the latter show an overestimation of macrocephaly diagnosis between 7 months and 5 years of age in both males and females (del Pino, 2023, unpublished data). However, it would be advisable to have local standards in place for the assessment of head circumference in our population.

To conclude, the use of the WHO standards overestimates relative head circumference in young children aged 0 to 5 years; macrocephaly is overdiagnosed while microcephaly is underdiagnosed, with the exception of some Asian countries. Establishing limits for inclusion or using head circumference standards specific to each local population may be necessary to reduce the number of misdiagnoses. ■

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