

Anthropometric Wall Chart (AWC) Height for Screening Stunting Children

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ABSTRACT

Stunting is an indicator for a chronic undernourished or growth failure in the past. Stunting children may have a growth problem, low motoric skills, mental and intellectual disorders, low productivity and high risk to non-communicable diseases. It is important to detect stunting as earlier as possible. Early detection for stunting children's tool easier and practicable is needed. AWC height for age is a bigger growth chart than the formerly known as Kartu Menuju Sehat (KMS). Its vertical axis shows children's height in cm, and the horizontal axis shows children's age 3 to 5 years. It is made from durable material and easy to hang on classroom walls. Its chart has three color ribbons, green, yellow and red. It screens stunting children by reading its colored ribbons. It is used by reading AWC color on children's peak heads. Green color shows the child in good nutrition status. Yellow and red color show the child is stunting. There were 118 children aged 3-5 years from 4 kindergarten/Pre-School in Cimahi, Indonesia. There were 59 children for every gender group, with the same amount for each age groups. Their nutrition status was measured using AWC height for age and were compared to their nutrition status by height for age using WHO-NCHS 2005 reference. This study showed high Sensitivity and Specificity values ($Se = 76.9\%$, $Sp=96.2\%$, $PPV = 71.4\%$ and $NPV= 97.1\%$). AWC height chart can predict stunting children of 3-5 years old accurately.

Keywords: *Stunting, AWC height for age, children aged 3-5 years.*

I. Introduction

World Health Organization (WHO) reported that in 2011, 178 million children under 5 yo over the world were stunted.^[1] *Riset Kesehatan Dasar* (Basic Health Research) 2013 showed high stunting children prevalent in Indonesia (37.2%). It means there were about one of three children under five were stunting.^[2,3] New students' height is a specific topic to study stunting and causal factors.

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Stunting children may have growth problems, low motoric skills, mental and intellectual disorders, low productivity and high risk to non-communicable diseases. ^[1] Being stunting in child period correlates to short body posture in adult, high risk to deliver low birth weight babies, and high risk to non-communicable diseases. ^[4,5,3]

UNICEF reported that children being stunted before six months will become severely stunted at aged 2 years. ^[6] Under five years, children growth monitoring at *Posyandu* is a strategic prevention method for growth faltering early detection. In 2011, there were only 72% under five years kids were weighted at *Posyandu*. ^[7] They were 4 to 5 years old and already gone to preschools when this study conducted. Preschool existence can detect earlier growth faltering if measure routinely and there is a screening tool in school.

Anthropometry (height and weight measurements) is a secure method to assess nutritional status directly. However, the measurement result should be compared to the standard table to define the child's nutrition status. *Kartu Menuju Sehat (KMS)* - Card for Health for children under five years, has a limitation in the availability for each child and uses only weight for age index. Meanwhile, *Posyandu* (Health post) and school do not have access to stunting data yet. Therefore an easy to use screen's tool for stunting status children under five years is needed.

II. Materials and Methods

Materials

AWC is made of durable material. It is easy to put on the wall. The horizontal area (x-axis) of AWC is divided into 3 columns, which represent to age from 3 – 5 years old. The vertical area (y-axis) represents the height in cm. There are 3 colours, red shows <-3 SD height/age (severely stunted); yellow shows -3 to -2 SD height/age (stunted) ; and green shows >-2 SD height/age (normal). ^[8]

How to use AWC :

1. Ask the child to stand back on his age column on the AWC.
2. The child's body should attach to the AWC.
3. Look the colour of upper limit on child's head. ^[8]



Fig 1. How to use AWC

Methods

This study was conducted in 2017 at 4 kinder garden schools (Preschool) in Cimahi City. There were 118 subjects aged 3 to 5 years by purposive sampling method. There were 59 children for every gender group. They were matched by age and gender. The subjects were measured their height by microtoice and AWC respectively. Their nutrition status was measured using AWC height for age and were compared to their nutrition status by height for age using WHO-NCHS 2005 reference. The AWC validity was measured by sensitivity (Se) and specificity (Sp) values. The gold standard was the children's nutrition status by height for age using WHO-NCHS 2005 reference.

III. Results and Discussion

The children nutrition status by AWC in this study is showed by the figure below.

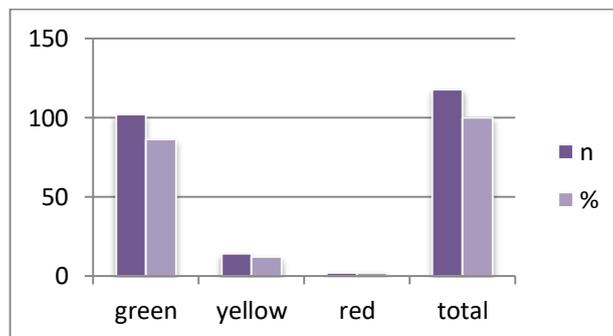


Fig 2. The nutrition status by AWC colour ribbons

The children nutrition status by height for age WHO-NCHS in this study is showed by the figure below.

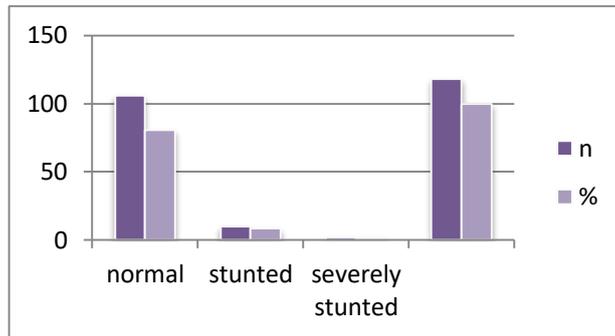


Fig 3. The nutrition status by height for age (WHO-NCHS 2005)

To validate AWC, it needs to be compared to the gold standard. As a gold standard tool is microtoice. Sensitivity (Se) and specificity (Sp) calculating are showed below.

Table 1. Crosstab Nutrition Status by AWC and Height for Age (WHO-NCHS 2005)

AWC	Nutrition Status		Total
	Stunting	Normal	
Yellow-Red	10	4	14
Green	3	101	104
Total	13	105	118

Table 2. Se and Sp Values AWC

Se	0.769	76.9
Sp	0.962	96.2
PPV	0.714	71.4
NPV	0.971	97.1

The Sensitivity and Spesivicity values are $Se = 76.9\%$, $Sp=96.2\%$, with $PPV =71.4\%$ and $NPV= 97.1\%$.

A valid measurement tool should have high Sensitivity and Specificity values that show its capability to detect stunted and normal children.^[9] This AWC height for age shows that capability. It can detect stunted child by 76.9% (Se value), and normal child by 96.2% (Sp value).

The AWC sensitivity value showed its capability to detect stunted child as 76.9% and detect normal child as 96.2%. As higher as Se and Sp values mean the tool can predict stunted child and healthy child better. If compared to AWC for school children (elementary school, aged 6 to 12 years), this AWC has more capability to predict stunted. The Se and Sp value of AWC is for children aged 6 to 12 years.

Low Se value pointing false positive. It means there a possibility some normal children (height/age) whose assess by AWC, actually stunted. On the other hand, low Sp value pointing false negative. It means there a possibility some stunted children whose assess by AWC were normal. For stunting detection, high false-positive could be a problem because stunted children are assessed normal.

This study predicted positively (PPV) stunted children by 71.4% and normal children by 97.1%. Compared to AWC height for age school children 6-12 years old, this AWC had higher PPV and NPV, i.e. 59.5% and 94.3% compared to 71.4% and 97.1% respectively.^[9] Hass and Habict reported ; for high coverage subjects goal, need a tool with high Se value; but for intervention program or cost-effectiveness goal need a tool with high PPV.^[9]

Ovid strategy stated if the tool is created for diagnostic with high Se value, the tool with $Se=98\%$ and $Sp=74\%$ should be used. Nevertheless, if with high Sp value, the tool with $Se=64\%$ and $Sp=98\%$ should be used. However, if the tool is created for prognosis with high Sp value, the tool with $Se=52\%$ and $Sp=94\%$ should be used. But, if with high Se value, the tool with $Se=90\%$ and $Sp=80\%$ should be used. Created for clinical therapy purposes, Ovid strategy suggests high Sp value. The tool with $Se=54\%$ and $Sp=99\%$ was excellent. Nevertheless, if with high Se value, choose the tool with $Se=96\%$ and $Sp=79\%$.

This study result that AWC height/age for children aged 3 to 5 years has $Se=76,9\%$ and $Sp=96.2\%$. With those values, it can be stated the AWC is valid to predict stunted children aged 3 to 5 years.

The AWC Se and Sp values can be increased by broadening tool's using areas with stunting prevalence variation and increase sample size. Sudja et.al reported that AWC for children aged 6 to 12 years has higher Se and Sp value i.e. 73,5% and 89.8% respectively, by using in broad areas of Indonesia. It means this AWC can be used nationally.^[9] The main strength of our study is that it uses representative survey data on the most vulnerable children that can be used nationally and applies appropriate statistical adjustments to the design of cluster sampling in the analysis. Our research also uses the easiest and quickest method to find out stunting in children aged 3 to 5 years. This method can be used by the general public and health workers.

The limitation of AWC is it cannot shift the stunting defining borderline because of it the borderline set up by WHO standard.

IV. Conclusion

This study showed high Sensitivity and Specificity values (Se = 76.9%, Sp=96.2%, PPV =71.4% and NPV= 97.1%). AWC height for age predicted stunting children 3-5 years old nicely. This AWC height for age can be used in preschool to screen stunted children aged 3 – 5 years.

Competing Interest

The authors of this paper have no competing interest to report.

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The authors of this paper have no acknowledgement to report.

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