

## EXTENDED ABSTRACT

# Urinary Pyridinium Crosslinks as a Sensitive Biomarker of Linear Growth in Adolescents

Aslis Wirda Hayati<sup>1</sup>, M Yusuf MF<sup>2</sup>, Hardinsyah<sup>3</sup>, Yessi Alza<sup>1</sup>

<sup>1</sup> Department of Nutrition, Health Polytechnic of Riau, Ministry of Health, 28122 Sukajadi, Pekanbaru, Indonesia

<sup>2</sup> Department of Environmental Health, Health Polytechnic of Tanjungpinang, Ministry of Health, 29124 Bukit Bestari, Tanjungpinang, Indonesia

<sup>3</sup> Department of Community Nutrition, Faculty of Human Ecology, IPB University, 16680 Dramaga, Bogor, Indonesia

Corresponding author's email: aslis@pkr.ac.id

## SUMMARY

The research aimed to assess urine Pyd as an indicator that can be used to detect stunting incidents. The research design was a cross-sectional study. The subjects consisted of 64 selected teenagers (12-15 yo) from SMPN 1 Kampar in Riau Province. Subjects were measured on January 2022. The indicators of nutrition status were urine Pyd and HAZ as gold standards. Curve of receiver operating characteristic was used to assess the ability of diagnostic test. The ability of urine Pyd in diagnosing stunting was good (AUC area of 70.0%). The urine Pyd qualified as a predictor for the incidence of stunting.

**Keywords:** Sensitivity, Stunting adolescents, Linear growth indicators, Pyridinium crosslinks, Height

## INTRODUCTION

Stunting is a major nutritional issue worldwide (1). One of the efforts to reduce the prevalence of stunting is to provide a reliable stunting detector. Treatment is more effective at an early stage if stunting can be detected at a preclinical stage. The early detection is part of stunting prevention, that is detecting the possibility of experiencing stunting in children without symptoms. The current stunting indicator is height for age z-score (HAZ). The results of measuring height are often dubious obtained by using measuring gauges and standardization of instruments. The urine Pyd is expected to be an indicator of stunting with bone growth disorders associated with bone resorption (2). The Pyd is dissolved by osteoclastic cells and excreted in the urine (3). The objective of this study is to evaluate the validity of urine Pyd against the HAZ gold standard that can be used to measure linear growth related to early detection of stunting.

## MATERIALS AND METHODS

This cross-sectional study involved 64 selected teenagers (12-15 yo) from SMPN 1 Kampar in Riau Province. Subjects were measured on January 2022. The indicators of nutrition status were the urine Pyd and HAZ as gold standard. Height gauges (microtoise) used STATURE METER. The urine was collected between 7:00 and 10:00 am by using sterile pot; it was then stored in freezer at

-20oC (until further analysis). Pyd measurements were performed by using MicroVue™ PYD EIA kit and a Spectrophotometer. The analysis of urine samples was carried out at Prodia Jakarta. The curve of receiver operating characteristic (ROC) was used to assess the ability of the diagnostic test and to determine the cut of point test results from urine Pyd to detect stunting. The ability of a test is declared appropriate if the area under the curve (AUC) is 0.7 (4).

## RESULTS AND DISCUSSION

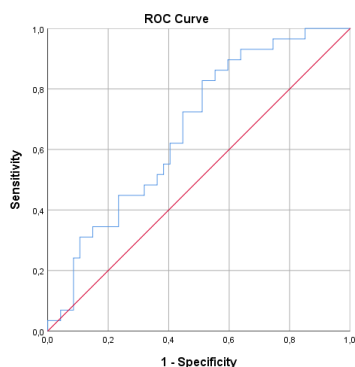
The prevalence of stunting subjects was 34.4% (Table I). This result revealed that the value was higher than the prevalence of stunted adolescents aged 13-15 years in Riau Province, namely 25.5% (1). The urine Pyd is not only to measure linear growth in the age group of adolescents aged 12-15 years but also applies to the age group of neonates (0-3 days) and the group of children aged 4-6 years (2). In the future, urine Pyd is expected to be used for pregnant women.

The ability of urine Pyd in diagnosing stunting was good with an AUC area of 0.700 (70.0%) at measurement. The sensitivity of the urine Pyd test to state positive for the ones experiencing stunting was 72.4%. The higher the sensitivity of a test, the more positive test results are obtained in the ones who are stunted or the fewer the number of false negatives (5). The specificity of the urine Pyd test for negative shows that for the ones who did

**Table 1: Indicators of linear growth**

Variable	n	Value*
HAZ		
Stunting	22	-2.4±0.3
Normal	42	-0.5±0.6
Height (cm)		
Stunting	22	145.4±3.5
Normal	42	158.8±5.6
Pyd (nmol/mmol creatinine)		
Stunting	22	173.7±75.0
Normal	42	133.0±69.1

NOTE: Mean ± SD



**Fig 1: Curve of receiver operating characteristic (ROC)**

— Urine Pyd ROC area: 0.7  
 — Reference

not experience stunting was 53.2%; specificity of the urine Pyd test described the number of those who had a negative test result in the ones who were not stunted (number of false positives). The urine Pyd accuracy is the proportion of the correct test’s results among all respondents examined, namely 60.5%. The predictive value of negative test that is the proportion of those who were not sick among negative test results was 75.8%. The best cut point of urine Pyd for diagnosing stunting was 133.5 nmol/mmol creatinine.

**CONCLUSION**

The urinary Pyd is considered an acceptable measurement for assessing stunting. The Pyd qualified as a predictor instrument for stunting. The Pyd has a higher sensitivity value than the specificity value. The urinary Pyd needs to be investigated further in the future regarding its reliability in groups of pregnant women and their babies.

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**REFERENCES**

1. Hayati AW, Ridwan H. The Benefits of Midmorning Snack to Combat Stunting: A Longitudinal Panel Study in the Riau Province of Indonesia. *Bentham Science Publishers*. 2022;18(7):677-688.
2. Hayati AW, Alza Y. Is Urinary Pyridinium Crosslinks Associated with Stunting in Stunting Children in Indonesia. *Enviro Research Publishers*. 2022;10(1):1-11.
3. Sureshkumar Aand Nagappan KV. A comprehensive review on the biomarkers of bone remodeling in Vitamin D deficiency. *Indonesian Journal of Pharmacy. Faculty of Pharmacy Universitas Gadjah Mada in collaboration with IAI*. 2021;32(3):280–290.
4. Putra WGAE, Sutarga IM, Kardiwinata MP, Suariyani NLP, Septarini NW, Subrata IM. *Penelitian Uji Diagnostik dan Skrining*. Denpasar: Universitas Udayana; 2016.
5. Soekersi H, Rafiqah, E. Uji Diagnostik Ultrasonografi Gray Scale dibandingkan dengan Histopatologi pada Karsinoma Payudara Tipe Invasif di RSUP Dr. Hasan Sadikin Bandung. *National Cancer Center: Dharmais Center Hospital*. 2016; 10(3):87-92.