



## Anthropometric Study of the Relationship between Tibia Length and Height of the Ethnic Papuans

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### Abstract

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**Background :** Height is an important main characteristic in the forensic anthropological identification process to determine the identity of a person. Estimating height based on the length of long bones such as the tibia, fibula, ulna, and humerus is one method that is widely used because it has a good correlation. This study was conducted to determine the relationship between tibia bone length and height of students of the Medical Education Study Program, Faculty of Medicine, Cenderawasih University who are indigenous Papuans.

**Methods :** This study applied correlative analytic method with a cross sectional approach. The research sample was students of the Medical Education Study Program at Cenderawasih University in 2020-2023. The tibia bone length was measured using a metline and height was measured using a microtoise directly on the research subject. Data was analysed with Pearson test.

**Results :** Fifty-five subjects (25 males, 30 females), found male height of 161.060 cm, a female height of 153.000 male tibia bone length of 26.620 cm, and female of 34.170 cm.

**Conclusion :** There was a relationship between tibia length and height with the results of the Pearson test obtained  $p$  value = <0.001.

**Keywords :** Height, Ethnic Papuans, Length of tibia bone

## INTRODUCTION

The National Disaster Management Agency (BNPB) in its report stated that in 2023 there were 4,940 cases of natural disasters in Indonesia,<sup>4</sup> the impact of these resulted in 267 people dying and 33 people missing.<sup>2</sup> In 2018 there was a huge flood and tsunami in Palu that caused many casualties.<sup>3</sup> Papua has also experienced floods with considerable impact, one of which was the 2019 flood in the Sentani Jayapura district.<sup>6</sup> Some casualties have been successfully evacuated even though their bodies are no longer intact.<sup>8</sup> Evacuation of some body parts has also been carried out; head, feet, hands, and several long bones.<sup>11</sup> Thus, forensic identification is needed to identify the victims.<sup>5</sup> Forensic anthropology is a specific branch of biological anthropology based on human anatomy and bones for identification.<sup>12</sup> The difference between one victim and another can be known through the identification process.<sup>15</sup> In the process, bones are often used by experts in identifying individuals, such as height, gender, race, time of death, age, and cause of death.<sup>10</sup>

The identification process was based on a number of key characteristics, one of which is height.<sup>9</sup> Various purposes including data collection and investigation required height.<sup>17</sup> The method that was often applied in an effort to estimate height was to use certain bones because the correlation was good.<sup>18</sup> The objective of this study was to determine the relationship between tibia length and height in students of the Medical Education Study Program at Cenderawasih University.<sup>11</sup>

## METHODS

This study was correlative analytic research with a cross-sectional design.<sup>13</sup> The subjects of this study were students of the Medical Education Study Program at Cenderawasih University and met the research criteria.<sup>14</sup> The research period was June 11–13, 2024. Sampling was done by probability sampling.<sup>16</sup> Inclusion criteria

included subjects aged 19–23 years, two generations above the subject was of indigenous Papuan ethnicity without mixed marriages and willing to participate in the study. Exclusion criteria consisted of a history of foot surgery, dislocation or fracture of bones that affect height and deformity of the leg or vertebral column. Measurement of tibia length was measured with a metline and height was measured with a microtoise directly on the research subject.<sup>7</sup> Data analysis was conducted using the Pearson test with SPSS 26.

This study has obtained permission and ethical approval from the Jayapura Health Research Ethics Committee with ethical approval letter number EC32.43-0524.

## RESULTS

Fifty-five research subjects who met the inclusion criteria were students of the Medical Education Study Program at Cenderawasih University in 2020–2023. Subject characteristics can be seen in [Table 1](#).

## DISCUSSION

The sample in this study was dominated by women (54.5%) by the age of 19 years. Based on the results of the study, the average height of men was 161.060 cm and women 153.00 cm. The average length of the tibia bone in men was 36.620 cm and women 34.170 cm. From the results of this study, it can be seen that the length of the tibia bone of men was much longer than women, thus causing the height of the male sample to be higher than women. This was in accordance with the previous study conducted by medical students at the Muslim University of Indonesia in the Bugis tribe.<sup>7</sup>

Overall, based on the results of the Pearson correlation test, it can be stated that there was a significant correlation between the tibia bone length and height in men ( $r=0.909$ ) and women ( $0.751$ ) with strong to very

TABLE 1  
Subject Characteristics

Variable		N	Positive	%
Gender	Male	25		45.5%
	Female	30		54.5%
Age	19 years old	19		34.5%
	20 years old	13		23.6%
	21 years old	18		32.7%
	22 years old	4		7.3%
	23 years old	1		1.8%

TABLE 2  
**Measures of Height and Tibia Length**

Variable		Height Mean ± SD	Height Mean ± SD
Gender	Male	160.98 ± 5.839	36.62 ± 1.823
	Female	153.00 ± 7.241	34.17 ± 1.594
Total		156.63 ± 7.704	35.28 ± 2.087

TABLE 3  
**Relationship between tibia length and height**

Variable		N	r	p
Gender	Male	25	0.909	0.001
	Female	30	0.751	
Total		55	0.864	

strong correlation and positive correlation direction. This indicated that the longer the tibia bone, the higher their height will also be. This study was in line with previous studies conducted by the medical students at Sam Ratulangi University in the Sangihe tribe.<sup>1</sup>

There are various causes of differences in height and bone length of an individual, one of which is ethnicity. Different ethnicities certainly have differences in height and bone length that are different from other ethnicities. In addition, there are also genetic and environmental factors that are quite influential in the process of physiological development of a person.

The results of this study when compared with previous studies on indigenous Papuans have a longer tibia bone length so that when referred to base on the results, it was found that indigenous Papuans, especially in men, had a high enough height.

### CONCLUSION

From this study, it was found that there was a significant relationship between the length of the tibia bone and the height of indigenous Papuan ethnic students at the Medical Education Study Program of Cenderawasih University in 2020–2023.

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