

ความสัมพันธ์ระหว่างความยาวกระดูกน่องใต้ผิวหนังกับความสูงของนักศึกษา มหาวิทยาลัยอุบลราชธานี

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The Correlation between Percutaneous Length of Fibula and Stature of Ubon Ratchathani University Students

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หลักการและวัตถุประสงค์: ความสูงเป็นหนึ่งในข้อมูลทางชีวภาพที่สำคัญของแต่ละบุคคล และมีส่วนเกี่ยวข้องในการสืบค้นอัตลักษณ์บุคคล กระดูกน่องสามารถคลำใต้ผิวหนังได้ง่ายและไม่ได้รับน้ำหนักโดยตรงจากกระดูกต้นขาจึงทำให้ความยาวไม่เปลี่ยนแปลงถึงแม้จะมีน้ำหนักที่เพิ่มขึ้นก็ตาม การศึกษานี้มีวัตถุประสงค์เพื่อหาความสัมพันธ์ระหว่างความยาวกระดูกน่องใต้ผิวหนังกับความสูงในคนไทยวัยผู้ใหญ่ตอนต้นที่อาศัยในภาคตะวันออกเฉียงเหนือซึ่งเป็นที่ตั้งของนักศึกษา มหาวิทยาลัยอุบลราชธานี

วิธีการศึกษา: กลุ่มตัวอย่าง (เพศชาย 179 ราย และหญิง 168 ราย) เป็นนักศึกษาไทยสุขภาพดีทั้งหมดของวิทยาลัยแพทยศาสตร์และการสาธารณสุข มหาวิทยาลัยอุบลราชธานี ช่วงอายุ 19-22 ปี ความยาวกระดูกน่องทั้งสองข้าง วัดจากขอบบนสุดของหัวกระดูกน่องถึงขอบล่างสุดของตาตุ่มด้านนอก ความสูงวัดในท่ายืนตรง ข้อมูลทั้งหมดวิเคราะห์ทางสถิติหาความแตกต่างค่าเฉลี่ยด้วย independent t-test และหาความสัมพันธ์ระหว่างความยาวกระดูกน่องกับความสูงของกลุ่มตัวอย่างด้วย Pearson correlation

ผลการศึกษา: ความสูงเฉลี่ยในเพศชาย (170.5 ± 6.8 ซม.) สูงกว่าเพศหญิง (158.4 ± 6 ซม.) อย่างมีนัยสำคัญ ($p < 0.05$) ความยาวเฉลี่ยของกระดูกน่องใต้ผิวหนังของเพศชาย (ชาย 39 ± 2.5 ซม. และขวา 38.9 ± 2.6 ซม.) ยาวกว่าเพศหญิงอย่างมีนัยสำคัญ (ชาย 36.6 ± 2 ซม. และขวา 36.4 ± 2.1 ซม.) ($p < 0.05$) และไม่มีความแตกต่างกันระหว่างความยาวกระดูกน่องข้างซ้ายและขวา ($p > 0.05$) ความยาวกระดูกน่องใต้

Background and Objective: The stature is one of the important biological profiles of an individual and associated with personal identification. The fibula is easily percutaneously palpable and non-weight-bearing bone due to no direct articulation from the femur. Therefore, the fibula is no changing of length from increasing body weight. This study aimed to assess the correlation between percutaneous length of fibula and stature in young adult Northeastern Thais; Ubon Ratchathani University students.

Methods: The subjects were all Thai healthy students (179 males and 168 females) from College of Medicine and Public Health, Ubon Ratchathani University. The ages were ranged from 19 to 22 years. The percutaneous lengths of fibula were measured between proximal end of fibular head and distal end of lateral malleolus. Left and right percutaneous lengths of fibula of each subject were measured. The stature was also measured in standing position. The data were statistically analyzed using independent t-test. The correlation between percutaneous length of fibula and stature was tested by Pearson correlation analysis.

Results: The mean stature of males (170.5 ± 6.8 cm) was significantly higher than that of females

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ผิวหนังมีความสัมพันธ์ทางบวกกับความสูงอย่างมีนัยสำคัญทั้งเพศชายและหญิง

สรุป: ความยาวของกระดูกน่องใต้ผิวหนังมีความสัมพันธ์ทางบวกกับความสูงของคนไทยในวัยผู้ใหญ่ตอนต้นซึ่งเป็นนักศึกษา มหาวิทยาลัยอุบลราชธานี การศึกษานี้เป็นข้อมูลพื้นฐานเพื่อนำไปพัฒนาเป็นสูตรคำนวณความสูง เพื่อการพิสูจน์อัตลักษณ์บุคคลของคนไทยในวัยผู้ใหญ่ตอนต้นในภาคตะวันออกเฉียงเหนือ

(158.4 ± 6 cm) ($p < 0.05$). The mean of percutaneous lengths of fibula of males (left side 39 ± 2.5 cm and right side 38.9 ± 2.6 cm) was significantly longer than that of females (left side 36.6 ± 2 cm and right side 36.4 ± 2.1 cm) ($p < 0.05$). Bilateral difference of percutaneous lengths of fibula was not significant ($p > 0.05$). The percutaneous lengths of fibula showed significant positive correlation with stature in both genders.

Conclusion: The percutaneous lengths of fibula were positively correlated with the stature in young adult Thais; Ubon Ratchathani University students. This study was basic data to develop the stature equation for personal identification in young adult Northeastern Thais.

Key word: stature, correlation, percutaneous, length, fibula

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Introduction

The information of sex, age, race, and stature are biological profiles of individual characteristics. The determination of these profiles is the important parameters for personal identification usually in skeletal remains or mutilated parts of a dead body. In forensic anthropology, the accurate estimation of stature brings to the accuracy and confidence in personal identification. There are several studies attempted to derive a regression equation for stature from measurement of body parts such as head^{1,2}, vertebral column³, and pelvis⁴. Some researchers also reported that long bones are associated with human stature that those specimens are derived from dried bone⁵ or skeletal imaging⁶⁻⁸. In addition, several studies reported the relationship between bony measurements and stature in order to determine population-specific regression equations⁶⁻¹¹. Certainly, the equation from more than one long bone gives accurate result¹². Although researchers have attempted to determine the stature equations, the equation from one population cannot be used in other populations due to ethnic variation.

In the literatures, the adult human fibula is

thin-long bone that lies lateral to tibia. It consists of proximal and distal ends called head of fibula and lateral malleolus, respectively. The fibula plays a role in serving to anchor ligaments of knee joint and forming the lateral border of ankle joint¹³. In fibular growth, the proximal epiphysis begins to fuse with the diaphysis at 12-17 years in female, and at 15-20 years in male¹³. The distal epiphysis begins to fuse with the diaphysis at 12-15 years in female, and at 15-18 years in male¹³. Head and lateral malleolus of fibula can be easily palpated and suitable for percutaneous-measurement. In addition, the fibula is non-weight-bearing bone due to no direct articulation with the femur at its proximal end. Thus, the fibula is no changing of length from increasing body weight. In Indian, Gaur and colleague¹⁴ have reported that the percutaneous lengths of fibula and tibia correlated with stature of young adult. In Thais, however, the correlation of percutaneous length of fibula and stature of young adults has never been reported. Therefore, this study aimed to assess the correlation between percutaneous length of fibula and stature of young adult Northeastern Thais; Ubon Ratchathani University students. The results from this

study could be useful for forensic science, the field of clinical anthropology, and medical appliance.

Methods

This study was conducted in College of Medicine and Public Health, Ubon Ratchathani University, Thailand, and was approved by the Ethics Committee for Human Research, Ubon Ratchathani University (UBU-REC-08/2559). The subjects were all Thai healthy students (179 males and 168 females) from College of Medicine and Public Health, Ubon Ratchathani University. All subjects were born and raised in Ubon Ratchathani, Yasothon, Amnatchareon, and Srisaket, provinces. The ages were ranged from 19 to 22 years that categorized to young adulthood¹⁵. The subjects with history of leg bone trauma were excluded.

For stature measurement, the subjects were instructed in standing position with barefooted on the floor. All subjects were measured from the floor to the vertex in the standing position by using an anthropometer¹⁶ and were collected in centimeters (Figure 1).

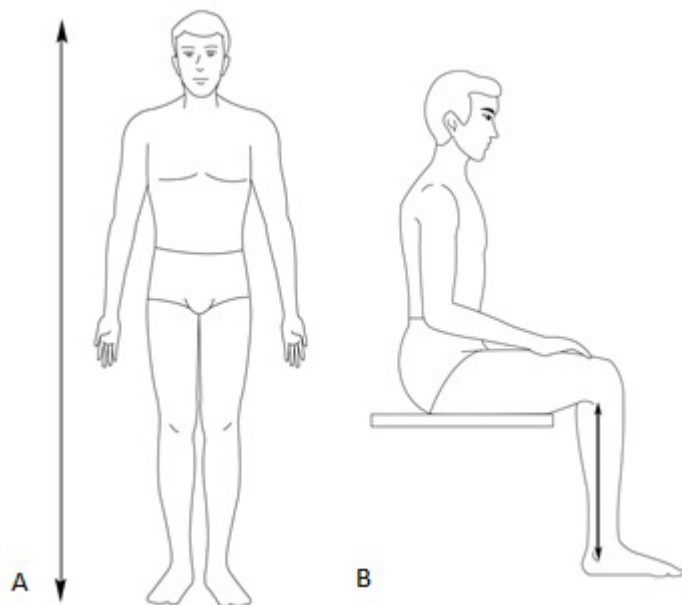


Figure 1 The drawing pictures showing the position and distance of measurement Arrow: distance of measurement, A: stature measurement with standing position, B: sitting position with measurement of the percutaneous length of fibula.

Percutaneous length of fibula was measured as the direct distance between the proximal end of palpable anatomical head of fibula and the distal end of palpable lateral malleolus and was taken the left and right sides on each individual. The measurement was taken on the sitting subjects with knees flexed at at 90° angle (Figure 1). All measurements were taken on 347 subjects twice by one examiner to determine average value.

All data were statistically analyzed using SPSS version 25.0 for Windows and MS Office Excel 2013. The significance of sex and bilateral differences was tested using independent t-test. $P < 0.05$ was set as the level of statistical significance. All data and classified data by genders, the correlation between percutaneous length of fibula and stature were analyzed by Pearson correlation analysis.

Results

The mean age of all subjects was 20 ± 1 years. The percutaneous lengths of fibula and the stature were all normally distributed. The mean stature of all subjects was 164.6 ± 8.8 centimeters (cm) (range 143.5 - 185 cm). In all subjects, the mean of percutaneous lengths of fibula in left side was 37.8 ± 2.58 cm (range 29.8 - 47 cm) and right side was 37.7 ± 2.76 cm (range 26 - 48 cm). Descriptive statistical analysis (mean, standard deviation, minimum, maximum) were classified by genders shown in Table 1. Mean values of all measurements were found to be significantly longer in males than in females ($p < 0.05$) (Table 1).

There was no significant difference between left and right sides of percutaneous lengths of fibula in both males and females ($p=0.65$). When correlation between percutaneous lengths of fibula and stature of both sexes were analyzed, statistically significant correlations were observed. The results revealed that $r=0.821$, $p<0.05$ in left side and $r=0.811$, $p<0.05$ in right side (Figure 2). In classified data by genders, there was positive correlation between percutaneous lengths of fibula and stature in male ($r=0.75$, $p<0.05$ in both left and right sides). In female, this study also

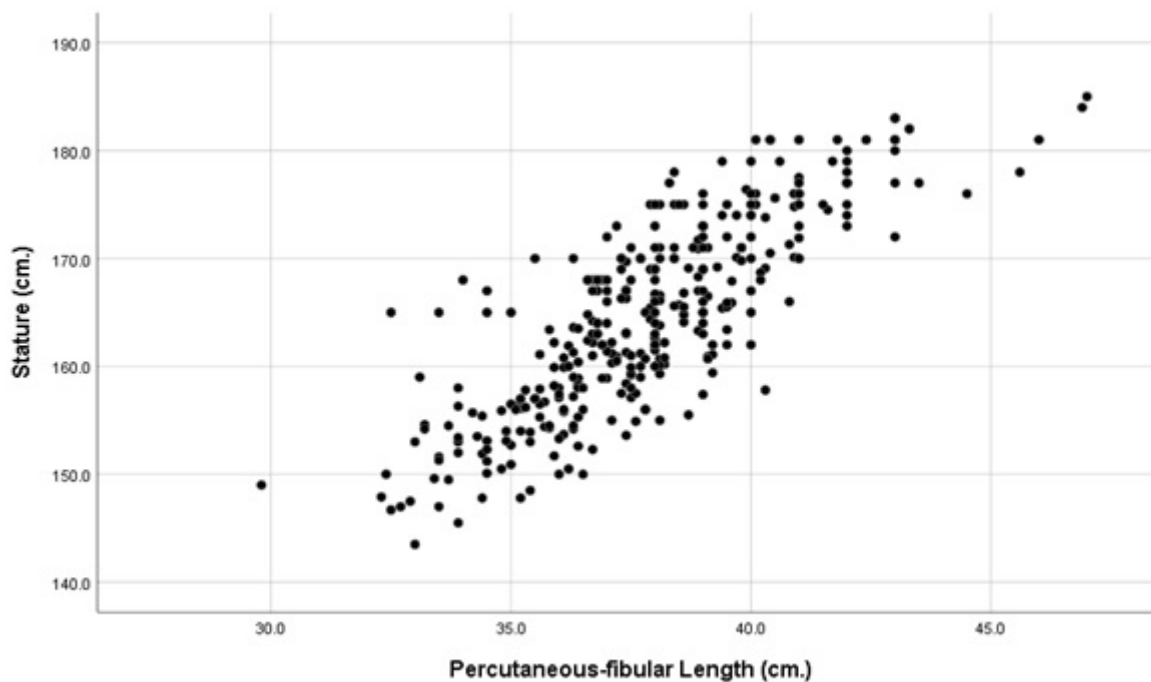


Figure 2 The contribution of correlation between the percutaneous lengths of fibula and the stature of both sexes.

Table 1 Descriptive statistics for percutaneous lengths of fibula and stature by genders (Male = 179; Female = 168).

Measurement	Stature (cm)		Fibular length (cm); left side		Fibular length (cm); right side	
	Male	Female	Male	Female	Male	Female
Mean	170.5*	158.4	39*	36.6	38.9	36.4
Std.Deviation	6.8	6.0	2.5	2.0	2.6	2.1
Minimum	150.0	143.5	32.5	29.8	33.0	26.0
Maximum	185.0	174.8	47.0	41.0	48.0	42.5

showed positive correlation between percutaneous length of fibula and stature ($r=0.81$, $p<0.05$ in left side; $r=0.77$, $p<0.05$ in right side).

Discussion

This study presented that the mean stature of males (170.5 cm) was significantly higher than that of females (158.4 cm). In young adult of Thai population (ages 16-25 years), the mean stature of males (171.36 cm) was higher than that of females (159.32 cm) that reported by Nectec¹⁷. Compared to Chinese, the mean stature of Thais was shorter. The average of stature in males (173 cm) was higher than

that of female (161 cm)¹⁸. In Indian, the mean stature of males (168.1 cm) was higher than that of female (157 cm)¹⁹ that showed shorter as compared with Thais. In contrast to France's people, the mean stature of both males and females was higher than that of Thais and it was showed 182 cm in males and 167.8 cm in female²⁰. The difference in the stature among different populations may be caused from genetic variation, nutrition, and life-style activities²¹. In this study, the mean percutaneous lengths of fibula of males (left side 39 cm and right side 38.6 cm) were significantly longer than that of females (left side 36.6 cm and right side 36.4 cm). Similar to

Japanese, the mean lengths of fibula of males (38.7 cm) were longer than that of female (36.1 cm)²². Compared to Bulgarian, the mean lengths of fibula were shorter than that of this study in both sexes; 36.4 cm in males and 34.38 cm in females²³. Compared to Northern Thais⁵, the mean percutaneous lengths of fibula in Northeastern Thais were longer. However, the mean lengths of fibula of Northern Thais were received from dried bone measurement showed as 35.8 cm in males and 33.2 cm in female⁵. Compared to France²⁰, the mean percutaneous lengths of fibula of Northeastern Thais were shorter in both sexes. However, the mean lengths were received from measurement between center of knee and tip of lateral malleolus showed as 43.3 cm in males and 39.6 cm in females²⁰. The mean fibular lengths of males in many populations were longer than that of female which was similar to Northeastern Thais in this study. The factors for the difference of bone lengths between males and females may be affected from genetic variation, nutrition, lifestyle activity, occupation, and sex hormones. Possibly, sex hormones control longitudinal bone size at growth plate, especially estrogen hormone²⁴. In male, since the level of estrogen hormone is low, it is affected to delay closure of epiphyseal plate cartilage contributes to greater bone length in male²⁴.

In this study, the percutaneous lengths of fibula were positively correlated with stature of males ($r=0.75$ in both sides) and females ($r=0.81$ in left and $r=0.77$ in right sides). Similar to Bulgarian, the correlation between stature and fibular lengths was positively correlated in both males and females²³.

Conclusion

The percutaneous lengths of fibula of male were longer than that of female. Particularly, the statures of both sexes were correlated to the percutaneous lengths of fibula of both left and right sides. These results could be developed as equation of stature estimation for personal identification in local young adult Thai population.

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