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Original Article

Penile length of newborns and children in Surakarta, Indonesia

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Abstract

Background Penile length is a factor for assessing abnormalities in external genitalia. To diagnose micropenis, a condition in which penile length is < - 2.5 standard deviations (SD), a reference is required for diagnosis. Age and race/ethnic groups are factors that contribute to normal penile length. To date, Indonesia does not have such a reference for normal penile length in newborns and children.

Objective To assess normal penile length in newborns and children in Surakarta, Central Java, in which the majority population is of Javanese ethnicity.

Methods We studied male newborns and children who were patients in Moewardi Hospital from January 2011 to January 2012. We included males aged 0-18 years whose parents provided informed consent. We excluded children with undescended testis, hypospadia, ambiguous genitalia, congenital anomalies, or syndromes (such as Down syndrome). For penile length measurements, we stretched the flaccid penis, depressed the pubic fat and placed a wooden spatula vertically along the dorsal penis. The penile length was measured from the penile base to the tip of the glans excluding the prepuce. Measurements were performed three times and a mean value was calculated for each subject.

Results Of the 300 subjects, 100 were newborns and 200 were children aged 1 month – 18 years. Two hundred ninety-six subjects (98.7%) were Javanese. The mean penile lengths of preterm (gestational age 30-36 weeks) and term (gestational age >36 weeks) newborns were 1.88 (SD 0.14) cm and 2.37 (SD 0.26) cm, respectively. The mean penile lengths by age groupings were as follows: 0-<6 months, 2.67 (SD 0.58) cm; 6-<12 months, 2.67 (SD 0.58) cm; 1-<3 years, 2.80 (SD 0.84) cm; 3-<5 years, 3.50 (SD 0.55) cm; 5-<7 years, 3.50 (SD 0.71) cm; 7-<9 years, 3.85 (SD 0.53) cm; 9-<11 years, 4.50 (SD 0.71) cm; 11-<13 years, 4.63 (SD 1.13) cm; 13-<15 years, 5.53 (SD 1.45) cm; and 15-18 years, 6.16 (SD 1.19) cm.

Conclusion Normal penile length in boys in Surakarta is smaller than the normal range reference currently in use. **[Paediatr Indones. 2013;53:65-9.]**.

Keywords: *penile length, newborn, child, Javanese*

Micropenis is commonly expressed parental worry during a child's medical outpatient visits. Parents are concerned that this condition may affect their child's fertility, or cause psychological and sexual problems in the future. Male adolescents and adults often believe that penis size affects sexual ability, although studies have provided no evidence of such.[1] Another study revealed that men with normal penile length often underestimate with their size. [2,3]

Penile length is also used to assess the external genitalia. Abnormalities in external genitalia, e.g.,

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hypospadias, micropenis, or undescended testes, may be clinical signs for disorders of sex development (DSD) in children. These conditions need further investigation for prompt diagnosis and management of DSD.[4,5]

In order to assess penile length in children, a normal penile length reference is required. Micropenis is defined as < -2.5 SD of penile length. Some studies have shown that normal penile length differs among various age groups and race/ethnic groups. To date, we do not have national reference for normal penile length in Indonesian children. As Indonesia is comprised of many ethnic groups spread throughout the country, it has been difficult to construct a national reference.[6] In this study, we aimed to assess normal penile length of newborns and children in Surakarta, the majority of which were of Javanese ethnicity.

Methods

This cross-sectional study was conducted on male newborns and children from Moewardi Hospital, Surakarta from January 2011 to January 2012. All male newborns and children, either hospitalized or from the outpatient clinic, were asked to enroll. Inclusion criteria were males aged 0-18 years whose parents provided informed consents. We excluded boys with undescended testis, hypospadias, ambiguous genitalia, congenital anomalies, or syndromes (e.g., Down syndrome).

Subjects' characteristics were collected from medical records, including birth date, birth weight, birth length, gestational age, weight, height, and race/ethnicity. If the medical record data was incomplete, parents were interviewed. Body mass index (BMI) was calculated for children with the following formula: (weight in kg)/(height in m)^2. Subjects were categorized as Javanese if at least one parent was Javanese.

All measurements were done in a private, non-air-conditioned, medical room, with temperature of 25-35^{0}C. Parents accompanied the subjects during measurement-taking. One trained medical doctor, wearing disposable gloves, measured subjects' penile lengths and was assisted by nurses. Measurements were performed by stretching the flaccid penis, depressing the pubic fat, and placing a wooden spatula vertically along the dorsal side of the penis. The penile length was measured from penis base to the glans excluding the prepuce. Penile length results were the mean of three consecutive measurements.

Descriptive data for mean penile length and standard deviations are shown by the following age groupings: newborns: gestational age 30-36 weeks, or gestational age > 36-43 wks; children: 0-<6 months, 6-<12 months, 1-<3 years, 3-<5 years, 5-<7 years, 7-<9 years, 9-<11 years, 11-<13 years, 13-<15 years, and 15-18 years. Newborn penile length data was analyzed to evaluate correlations between penile length and gestational age, birth weight, and birth length. Children's penile length data was analyzed to evaluate correlations between penile length and weight, height and body mass index (correlation coefficient, r). Nonparametric statistics were used for abnormally distributed data.

Results

There were 300 subjects included in this study, consisted of 100 newborns and 200 children. Newborn subjects were cared for in the neonatal ward. Subjects <18 years of age were patients in the outpatient clinic or in wards. The characteristics of newborns and children are described in **Table 1.a.** and **Table 1.b.**, respectively. Two hundred ninety-six subjects (98.7%) were of Javanese ethnicity.

Table 1. Baseline characteristics of subjects
Table 1.a. Newborns (n=100)

Characteristics	n=100	
Gestational age, n (%)		
30-36 weeks	8	(8)
>36 weeks	92	(92)
Weight for gestational age, n (%)		
SGA	75	(75)
AGA	24	(24)
LGA	1	(1)
Birth weight, grams		
Mean (SD)	2930	(574)
Minimum	1000	
Maximum	4900	
Birth length, cm		
Mean (SD)	47.5	(3.0)
Minimum	36	
Maximum	52	
Javanese ethnicity, n (%)	100	(100)

*SGA: small for gestational age; AGA: appropriate for gestational age; LGA: large for gestational age

Table 1.b. Children (n=200)

Characteristics	n=200
Age groups, n (%)	
1-<6 months	30 (15)
6-<12 months	19 (9.5)
1-<3 yrs	38 (19)
3-<5 yrs	30 (15)
5-<7 yrs	19 (9.5)
7-<9 yrs	17 (8.5)
9-<11 yrs	9 (4.5)
11-<13 yrs	16 (8)
13-<15 yrs	15 (7.5)
15-18 yrs	7 (3.5)
Race, n (%)	
Javanese/Javanese	182 (91)
Javanese/Non-Javanese	10 (5)
Non-Javanese/Non-Javanese	8 (4)

Table 2 shows the overall normal range of subjects' penile lengths by age group. In newborn subjects, Pearson's correlation test revealed correlations between penile length and gestational age (r=0.51, P=0.0001), birth length (r=0.51, P=0.0001), and birth weight (r=0.71, P=0.0001) (**Figure 1**, **Figure 2**, and **Figure 3)**.

In children, there was no correlation between penile length and body mass index (r=0.134, P=0.059) (**Figure 6),** but there were correlations between penile length and body weight (r=0.73, P=0.0001) and body height (r=0.78, P=0.0001) (**Figure 4** and **Figure 5**).

Table 2. Normal range of penile length in newborns and children by age group

Age groups	Mean penile length (SD), cm
Newborns	
30-36 wks	1.88 (0.14)
>36-43 wks	2.37 (0.26)
Children	
1-<6 months	2.67 (0.58)
6-<12 months	2.67 (0.58)
1-<3 yrs	2.80 (0.84)
3-<5 yrs	3.50 (0.55)
5-<7 yrs	3.50 (0.71)
7-<9 yrs	3.85 (0.53)
9-<11 yrs	4.50 (0.71)
11-<13 yrs	4.63 (1.13)
13-<15 yrs	5.53 (1.45)
15-<18 yrs	6.16 (1.19)

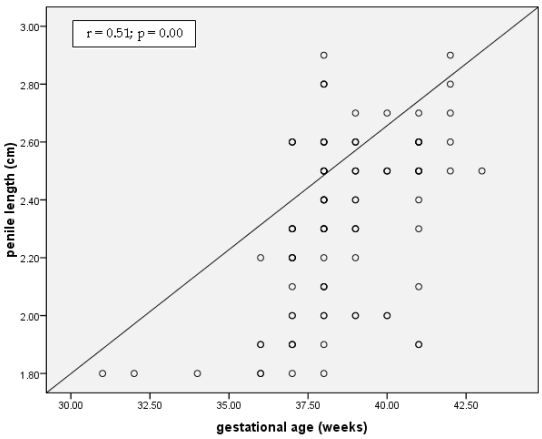

Figure 1. Scatter plot of the correlation between gestational age and penile length in Javanese newborns (r=0.51, P=0.0001)

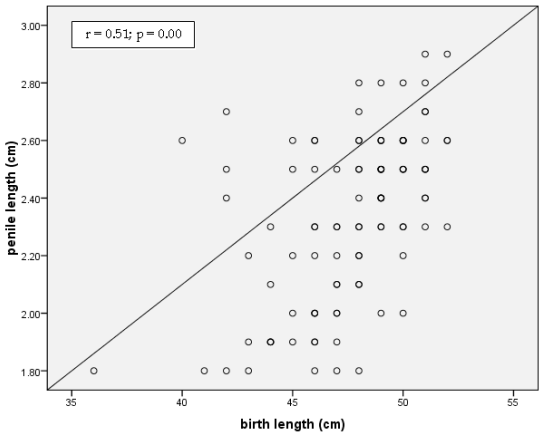

Figure 2. Scatter plot of the correlation between birth length and penile length in Javanese newborns (r=0.51, P=0.0001)

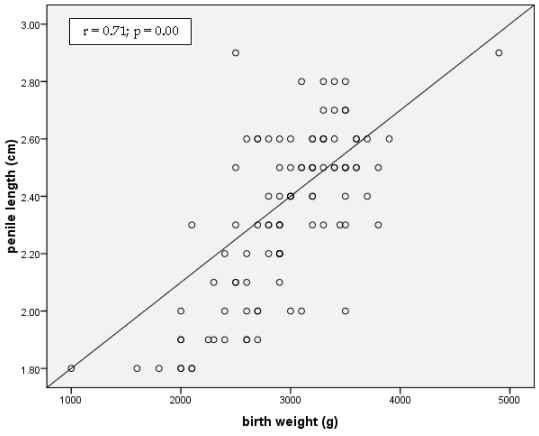

Figure 3. Scatter plot of the correlation between birth weight and penile length in Javanese newborns (r=0.71, P=0.0001)

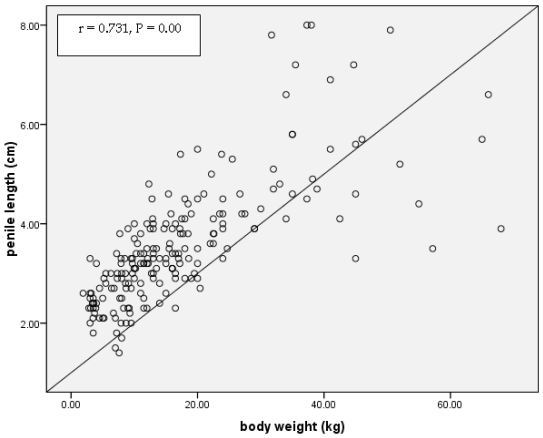

Figure 4. Scatter plot of the correlation between body weight and penile length in Javanese children (r=0.731, P= 0.0001)

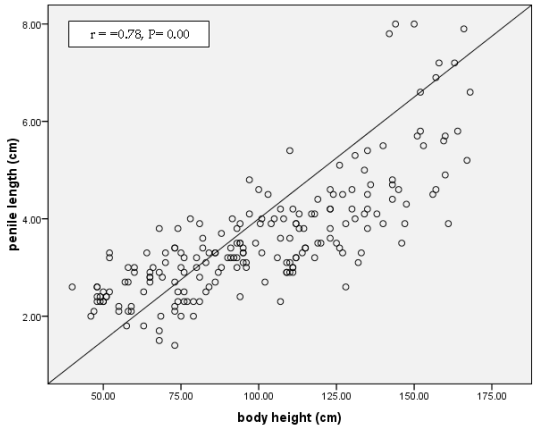

Figure 5. Scatter plot of the correlation between body height and penile length in Javanese children (r=0.78, P= 0.0001)

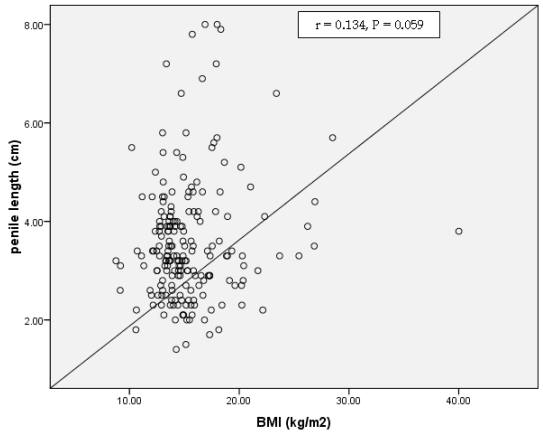

Figure 6. Scatter plot showing no correlation between body mass index and penile length in Javanese children (r=0.134, P=0.059)

Discussion

Up till now, this is the only study on penile length in newborns and children from Moewardi Hospital, Surakarta, Central Java. We found that subjects' mean penile lengths by age group were shorter than the reference data currently used in Indonesia, from Schonfeld *et al*.[7] Because almost all subjects in our study were Javanese, we suggest that Javanese children have shorter penile length than that of subjects used for the reference data.

The mean penile length of full term newborn Javanese infants in this study was 2.37 (SD 0.26) cm, shorter than that reported in previous studies. An Indonesian study previously reported a mean penile length of 2.9 (SD 0.2) cm in Indonesian infants.[6] Studies from other countries also reported longer penile length in full term infants: Malaysia, 3.5 (SD 0.4) cm;[8] Singapore, 3.6 (SD 0.4) cm;[9] Saudi Arabia, 3.55 (SD 0.57) cm;[10] and Turkey, 3.65 (SD 0.27) cm.[11] Cheng PK *et al*. recommended that a micropenis diagnosis be applied to full term newborns with penile length < 2.4-2.5 cm.[12] However, from our study we conclude that this cut off should be shorter for males of Javanese ethnicity.

The mean penile length in preterm infants in this study was 1.88 (SD 0.4) cm. Univariate analysis revealed correlations between birth weight, birth length and gestational age to penile length ($P<0.05$), but only birth weight had a strong positive correlation ($r=0.71$). Linear regression analysis on these factors revealed that only birth weight influenced penile length ($P<0.05$). In contrast, Tuladhar *et al*. reported that gestational age correlated with penile length (PL=2.27+0.16 GA, PL=penile length; GA=gestational age).[13] Also, a Malaysian study reported that birth weight and birth length had positive correlations with penile length.[8]

Penile length in children is differs among age groups and race/ethnic groups. Many countries have attempted to construct penile length references.[11,14-16] An Indian study reported that all children (> 1 year old) need further evaluation if their penile length is < 1.9 cm, based on its reference data.[14]

In our non-newborn subjects, we found that penile length correlates with height and weight, but not with body mass index. Studies in adults have reported inconsistent results between penile length

and anthropometric measurements. An Iranian study showed that penile length was correlated with height, but not with weight.[17] However, Turkish studies showed only weak correlations between them.[18,19]

A limitation of our study was the relatively small sample size compared to other studies on penile length references. More subjects in each age group would give more precise results. Also, our study was limited to only Javanese subjects. Indonesia is comprised of many ethnic populations, so data from other ethnic groups must be collected for a representative nationwide sample. In addition, we did not measure pubertal stages in our subjects. Different timings of pubertal onset may have biased our results in the adolescent age groupings.

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