

A cross-sectional chart of stretched penile length for Turkish children aged 0-6 years

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Abstract

Aim: Examination of the external genitalia is an important step in the routine child examination. Penile lengths of infants of different ethnicities show statistically significant differences. Therefore, standard values for penis sizes in healthy newborns and children in each country should be established. The aim of this study was to establish a normal range of 0 to 6 aged healthy children stretched penile length and to evaluate the relationship between stretched penis length and height.

Material and Methods: This was a cross sectional observational study, carried out at tertiary university hospital in Turkey. Total of 948 healthy children aged 0-6 years were included in the study. Stretched penile length (SPL) was measured from the pubic ramus to the tip of the glans. The mean stretched penil length and Stretched penile length / height ratio for each age group were calculated and percentile curves were determined for both group.

Results: The stretched penile length was 2.76 ± 0.42 cm in full-term newborns ($n = 101$). The SPL ranged from 2.98 ± 0.44 cm to 3.40 ± 0.56 cm in aged 1.1 to 12 months ($n=309$). The SPL ranged from 3.62 cm to 4.96 cm in children aged 12.1 to 72 months ($n=538$). There was a statistically significant correlation between mean stretched penis length and height ($p=0.001$).

Conclusion: These data may be useful in the follow-up of healthy children. Furthermore, this study sets an example for larger-scale studies performed using older participants population in a larger geographic region.

Keywords: Height; stretched penile length; SPL; Turkish children

INTRODUCTION

Examination of the external genitalia is an important step in the routine child examination. In the absence of detailed examinations and treatments of external genital system diseases in children, psychological development and sexual life of an individual in the future can be affected. The standard values for stretched penis length (SPL) in children are necessary for the diagnosis of certain diseases including genital anomalies (1).

Normal penis sizes, which are now accepted as standard, are obtained from three studies of Schonfeld, Feldman and Flatau (2-4). Penile lengths of infants of different ethnicity were compared with normal penis sizes in general use and found to be significantly different. For this reason, it is reported that there should be a significant difference between ethnic groups when evaluating the measurements, the averages belonging to that society must be taken into consideration (5,6). This makes it necessary to establish standard values for penile sizes in healthy neonates and children in each country. In

previous studies in our country, it has been observed that researches are generally conducted for newborn babies. Penile length measurement covering the period between 0-6 years of age was not found in the literature.

In this study, it was aimed to update the mean stretched penile length values that can be used in children aged 0-6 years, and to evaluate the correlation between the height we measured in the routine child examination and the penis length.

MATERIAL and METHODS

Study population

This cross-sectional study was carried out at the polyclinic of pediatric unit of our hospital between February 2010 and January 2011. A total of 948 boys who were not circumcised in the healthy 0-6 age group were included in the study. Healthy male newborns were included in the study if they were delivered between 37 and 42 completed gestational weeks (born at term) and within a birth weight range of 2500-4000 g. Exclusion criteria were infants

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with ambiguous genitalia, hypospadias, undescended testis, hydrocele, dysmorphism, and multiple congenital abnormalities. Infants whose mothers had received androgenic medication during pregnancy were also not included.

Study design

The subjects were grouped according to their ages as follows: newborn (0-0.9 months), 1-3 months, 3.1-6 months, 6.1-12 months, 12.1-24 months, 24.1-36 months, 36.1-48 months, 48.1-60 months, 60.1-72 months. Written informed consent was obtained from the families of all participants before starting the study. The ethical clearance was obtained from the University Non-Invasive Research Ethics Committee (Date 26/05/2009 , number 2009-9/72) and administrative permissions were obtained from the hospital management.

Measurements and Analyses

Stretched penile length was determined by the method described by Cinaz (1). All measurements were done by same physician. Penile length measurements of all participants were taken in a supine position with both legs in a flexed position. All penile length measurements were carried out on spine position and done twice for each case and average of 2 measurements were recorded. Penile length was measured from ramus pubis to the tip of glans penis with a firm ruler at room temperature while slightly stretched position, while penis was slightly stretched the measurements were recorded as centimeter (cm). The foreskin was not included in the measurement. Height of all participants was measured by the same physician. Children under two years of age were measured with a ruler which was sensitive to 0.1 cm with a fixed board on the head in the supine position. Height of children above 2 years was measured with stadiometer fixed to the wall which was sensitive to 0.1 cm.

Statistical analysis

For statistical analysis of the data, SPSS 22.0 (SPSS Inc. Chicago, IL, USA) for Windows statistic package software was used. Shapiro-Wilk test was used to determine whether the data showed normal distribution. Penile lengths, penile length/ height ratio of children were determined as mean and standard deviation, minimum-maximum and median values with respect to months. The Pearson's correlation coefficient was used to determine the presence of a linear relationship between SPL measurements and height. Level of significance was determined as $p < 0.05$. Penile lengths were given as average, standard deviation (SD), minimum and maximum values. The 3rd, 5th, 10th, 25th, 50th, 75th, 90th, 95th and 97th percentile values were calculated for SPL measurements.

In the composition of percentile table and charts, data were examined as cross sectional and standard values were determined with LMS method which was developed by Cole in 1988 (7). LMS method is based on the assumption that irregularity in distribution (skewness) can be fixed with base transformation (power transformation). Best "base" number which was applied for normalization distribution for "Box-Cox transformation" was calculated for each age group and trend of distribution was summarized as a curve (L). The mean value (M) and the coefficient of variation (S) are also calculated in the same way. All results were evaluated within 95% confidence interval and $p < 0.05$ was accepted as level of statistically significant.

RESULTS

A total of 948 participants aged 0 to 6 years were included in the study. The mean stretched penis length of the participants varied between 2.76 ± 0.42 cm and 4.96 ± 0.59 cm. Minimum and maximum SPL were 1.95-6.00 cm in all participants. The number and percentage of participants

Table 1. Stretched penil length values of cases according to age groups

Age groups (months)	Number (n=948)	Stretched penil length mean±SD (cm) (minimum-maximum (cm))	Mean-2 SD	Mean+2 SD
0-1	101	2.76 ± 0.42 (1.95-3.60)	1.92	3.60
1.1- 3	96	2.98 ± 0.44 (2.20-3.70)	2.10	3.86
3.1- 6	111	3.19 ± 0.48 (2.30-4.00)	2.23	4.15
6.1- 12	102	3.40 ± 0.56 (2.30-4.50)	2.28	4.52
12.1- 24	127	3.62 ± 0.59 (2.50-4.70)	2.44	4.80
24.1- 36	102	3.93 ± 0.63 (2.80-5.10)	2.67	5.19
36.1- 48	106	4.29 ± 0.64 (3.10-5.40)	3.01	5.57
48.1- 60	101	4.63 ± 0.65 (3.40-5.90)	3.33	5.93
60.1-72	102	4.96 ± 0.59 (3.90-6.00)	3.78	6.14

Table 2. Stretched penile length / height ratio of cases according to age groups

Age groups (months)	Number (n=948)	Penil length/ Height ratio mean \pm SD (minimum-maximum)	Mean-2 SD	Mean+2 SD
0-1	101	0.053 \pm 0.008 (0.04-0.07)	0.037	0.070
1.1- 3	96	0.052 \pm 0.008 (0.03-0.07)	0.036	0.068
3.1- 6	111	0.048 \pm 0.007 (0.03-0.07)	0.034	0.062
6.1- 12	102	0.046 \pm 0.008 (0.03-0.06)	0.030	0.062
12.1- 24	127	0.043 \pm 0.008 (0.02-0.06)	0.027	0.059
24.1- 36	102	0.042 \pm 0.008 (0.03-0.07)	0.026	0.058
36.1- 48	106	0.042 \pm 0.007 (0.03-0.06)	0.028	0.056
48.1- 60	101	0.043 \pm 0.006 (0.03-0.06)	0.031	0.055
60.1-72	102	0.043 \pm 0.005 (0.03-0.05)	0.033	0.053

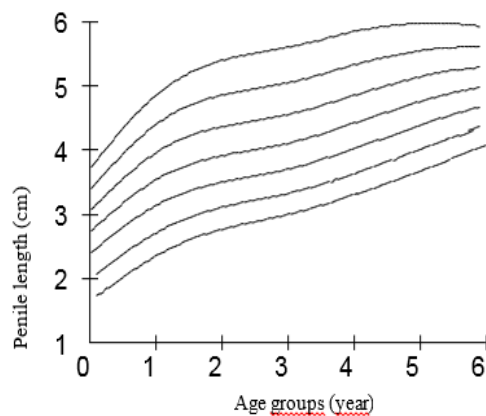


Figure 1. Penile length percentile table according to age groups

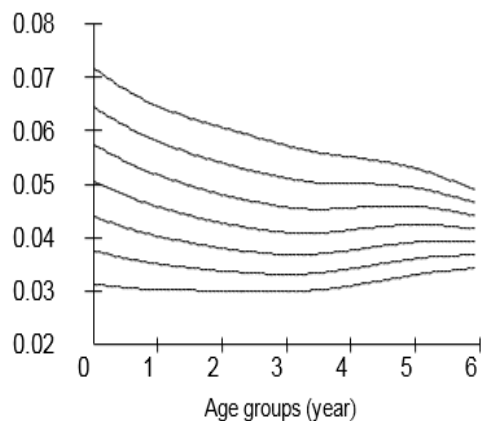


Figure 2. Stretched penile length / height ratio of cases according to age groups.

and stretched penile lengths according to age groups of cases are given in Table 1.

The relationship between height of the participants and stretched penis length was evaluated. There was a statistically significant correlation between mean stretched penis length and height. ($r=0.750$; $p<0.001$). Stretched penile length/ height ratios are given in Table 2.

In our study, the percentile chart of penile lengths was established for physicians who are in well-child Monitoring. (Figure 1) In our study, there is a significant relationship between height and SPL so height ratio and SPL percentile chart were formed. (Figure 2).

DISCUSSION

In our study, the penile length percentile chart and the relationship between the height of children and penile length of 0-6 years old children that we hope to guide physicians in our country were revealed. To the best of our knowledge, this is the first study in the 0-6 age group in Turkey. In this study, it was aimed to create SPL percentiles for the follow-up of 0-6 year old healthy children.

In our present study, we found that the mean $SPL \pm SD$ of term neonates were 2.76 ± 0.42 cm. Minimum and maximum ranges of SPL were 1.95-3.60 in term infants. There were few studies on SPL measurement from our country. Akin et al. (8) reported that the mean SPL of 1217 Turkish term infants were 3.16 ± 0.39 cm and the lower and upper limits were 2.19-4.14 cm. Cinaz et al. (1) reported that the mean SPL of term infants were 3.64 ± 0.36 cm with the minimum and maximum SPL range of 2.7 and 4.5 cm. Halil et al. (6) reported that the mean SPL of term neonates were 3.20 ± 0.55 cm and the lower and upper limits were 2.0-4.5 cm. Another study from Turkey conducted by Kutlu et al. (9), they measured the SPL of 514 term neonate and found that the SPL of term neonates was 3.77 ± 0.35 cm.

Previous studies from our country showed differences in SPL of term infants ranging from 3.16 to 3.77 cm. In gold standard study by Schonfeld and Beebe (2), mean SPL was 3.75 ± 0.3 cm, while Feldman and Smith (3) and Flatau et al. (4) reported mean SPL measurements of 3.5 ± 0.7 cm and 3.5 ± 0.4 cm, respectively. Recent studies from different countries reported different values of SPL in newborn infants. It was reported that the mean stretched penile length was 3.2 ± 0.3 cm in Iranians, 3.06 ± 0.26 cm in Japanese, 3.4 ± 0.37 cm in Egyptian and 2.86 ± 0.23 cm in Chinese neonates (10-13). Neonates SPL data obtained from our study differed from other data reported in our country and different countries. SPL measurements can be influenced by many factors like penis erection, patient body temperature, room temperature and personal measurement factors (5,6). In our study, all measurements were made by the same physician and under the same physical conditions nevertheless the fact that the data we obtained differs from the data obtained from previous studies may be due to the region where we do the study. Different data have been reported in different regions, even in the same country. Three studies from different regions of India also showed great differences in penile length measurements ranging from 2.31 to 3.57 cm (5,14,15). For this reason, it is considered that to obtain the valid percentile charts for our country, studies should be conducted with large population data covering the whole country.

In our study, it was found that SPL increased with age. In our study, mean SPL was found to be 2.76 cm in neonates while it was 4.63 cm in 5-year-olds. In similar studies, these rates have been reported to be 3.34-4.28 cm by Bhat et al. (5), 3.65-6.02 cm by Camurdan et al. (16), 3.64-6.33 cm by Cinaz et al. (1) respectively. The mean SPL values obtained in the 0-5 age group were lower than the data obtained in previous studies like neonates groups. Although the data we obtained differ from the literature data, mean SPL increase with age was found to be consistent with our data in all literature data. The fact that all measurements were performed by the same physician in our study suggested that the measurement standard was the same in all age groups.

In our study, we determined statistically significant relation between stretched penile length and height. In a similar study conducted by Camurdan et al. (16), they reported a statistically significant relationship between the child's height and SPL. Fok et al. (17) reported that there was a statistically significant relationship between height and SPL in Chinese neonates therefore the low SPL measurements of Chinese neonates from the literature data might be caused by the low height of neonates. Although it is reported in the literature that the results of different SPL measurements may be caused by measurement techniques but our data suggest that it may affect SPL values in other factors such as height of participants.

Our limitations include the fact that our study was a cross-sectional study carried out at a single region. In our study, factors such as physical environment, measurement technique and the researcher who made the measurement were considered as the reasons that may affect the SPL measurement but only height was evaluated for personal reasons that could affect SPL measurement. Another limitation of our study was that the participants were limited to the 0-6 age group. The data that could be used in the follow-up of children over 6 years of age could not be obtained for the physicians who had healthy child follow-up.

CONCLUSION

We present here normative data for stretched penile length in health children aged 0 to 6 years in boys from western city in Turkey and relationship of SPL with height. The penile length was 3.34 cm during infancy, 3.93 cm at 3 years, and 4.96 cm at 6 years, respectively. SPL values increased with age. A statistically significant correlation was found between the height of the child and SPL measurement. In the routine child examination, height of children should be taken into consideration while the length of the penis is evaluated. Stretched penil lengths in our study were found to be smaller in comparison with most of the previous studies conducted in our and other countries. The data we obtained may be useful in the follow-up of healthy children. Furthermore, this study sets an example for larger-scale studies performed using older population of participants in a larger geographic region.

Competing interests: The authors declare that they have no competing interest.

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