

## Sonographic measurement of splenic length in children at Cipto Mangunkusumo Hospital

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### ABSTRACT

**Objectives** The aim of this study was to determine the 10<sup>th</sup> and 90<sup>th</sup> percentiles and medians of normal splenic lengths of Indonesian children at Cipto Mangunkusumo Hospital by ultrasonography using a method introduced by Rosenberg *et al*.

**Methods** The maximum splenic length was obtained in longitudinal coronal plane with the splenic hilum visualized. The age of the patients were recorded. The medians and 10<sup>th</sup> and 90<sup>th</sup> percentiles for each age group were determined.

**Results** Sixty-nine boys and 46 girls were examined at our institution. The youngest subject was one month old and the oldest was 15 years old. The 10<sup>th</sup> percentile, median, and 90<sup>th</sup> percentile splenic length in the 1-3 months age group were 3.421 cm, 3.795 cm, and 4.343 cm, respectively. In the 3-6 month age group these measurements were 3.689 cm, 4.29 cm, and 5.094 cm, respectively; in the 6-12 month age group 4.016 cm, 4.72 cm, and 5.366 cm, respectively; in the 1-2 years age group 4.558 cm, 5.04 cm, and 5.502 cm, respectively; in the 2-4 year age group 5.151 cm, 6.225 cm, and 6.816 cm, respectively; in the 4-6 year age group 5.774 cm, 6.415 cm, and 7.82 cm, respectively; in the 6-8 year age group 6.077 cm, 7.505 cm, and 8.228 cm, respectively; in the 8-10 years age group 6.354 cm, 7.77 cm, and 8.602 cm, respectively; in the 10-12 years age group 6.354 cm, 7.77 cm, and 8.602 cm, respectively; and in the 12-15 year age group 7.934 cm, 9 cm, and 9.919 cm, respectively. In all age groups, the 10<sup>th</sup> percentiles, medians, and 90<sup>th</sup> percentiles were smaller than those of American children as reported by Rosenberg *et al*.

**Conclusion** The normal splenic lengths of Indonesian children are smaller than those of American children as reported by Rosenberg *et al*. [Paediatr Indones 2005;45:123-126].

**Keywords:** splenic length, ultrasonography, children

On physical examination, splenic size is determined by palpation and percussion. To obtain a more accurate and reliable measurement of splenic size, a few methods have been studied. Splenic size measurements using scintigraphy have been reported; however, this method exposes patients to radiation.<sup>1</sup> Ultrasonography as a safe and practical modality to measure the spleen was used by Rosenberg *et al* on American children.<sup>2</sup> As of yet, no such study has been conducted on Indonesian children. In this study, we tried to establish the normal splenic lengths of Indonesian children in Cipto Mangunkusumo Hospital, Jakarta.

### Methods

This observational, descriptive study was conducted from July 2003 to July 2004. Ethical clearance was obtained from the Medical Research Ethics Committee of the Medical School, University of Indonesia. We sonographically evaluated the splenic

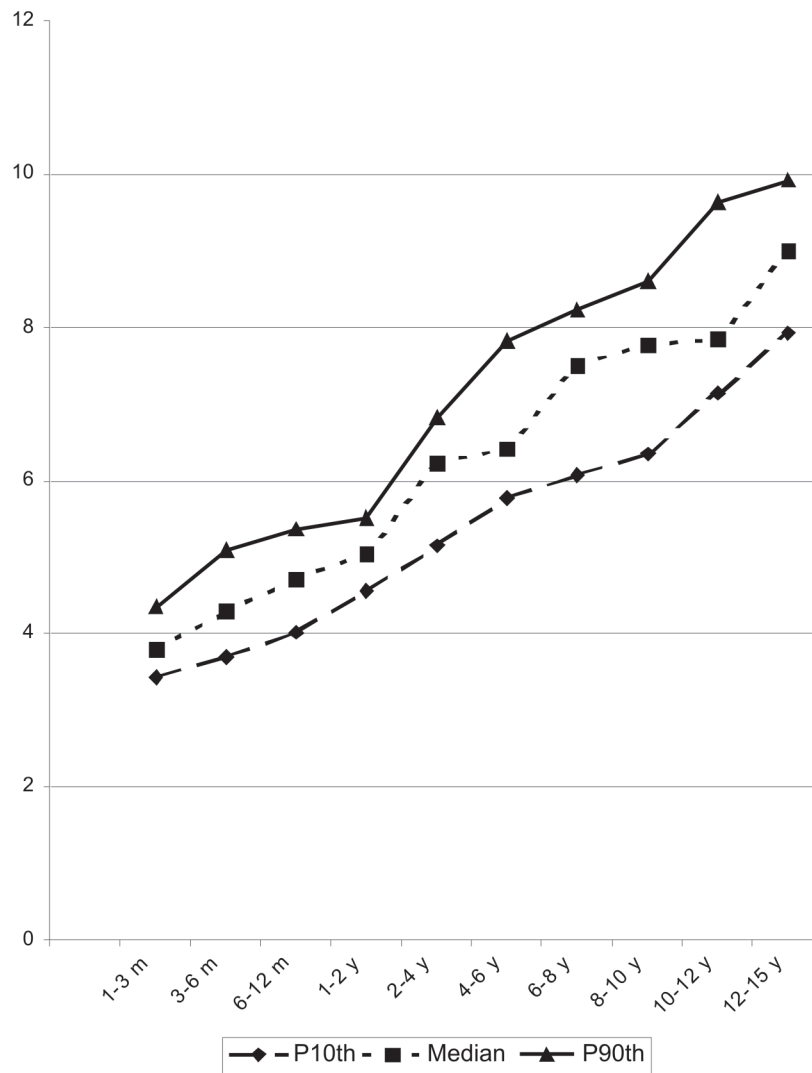
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**TABLE 1.** THE 10<sup>TH</sup> PERCENTILES, MEDIANS, AND 90<sup>TH</sup> PERCENTILES OF SPLENIC LENGTH

Age	Splenic length (cm)		
	10 <sup>th</sup> percentile	Median	90 <sup>th</sup> percentile
1-3 months (n=8)	3.421	3.795	4.343
3-6 months (n=7)	3.689	4.29	5.094
6-12 months (n=17)	4.016	4.72	5.366
1-2 years (n=13)	4.558	5.04	5.502
2-4 years (n=24)	5.151	6.225	6.816
4-6 years (n=12)	5.774	6.415	7.82
6-8 years (n=12)	6.077	7.505	8.228
8-10 years (n=4)	6.354	7.77	8.602
10-12 years (n=14)	7.141	7.85	9.631
12-15 years (n=4)	7.934	9.0	9.919



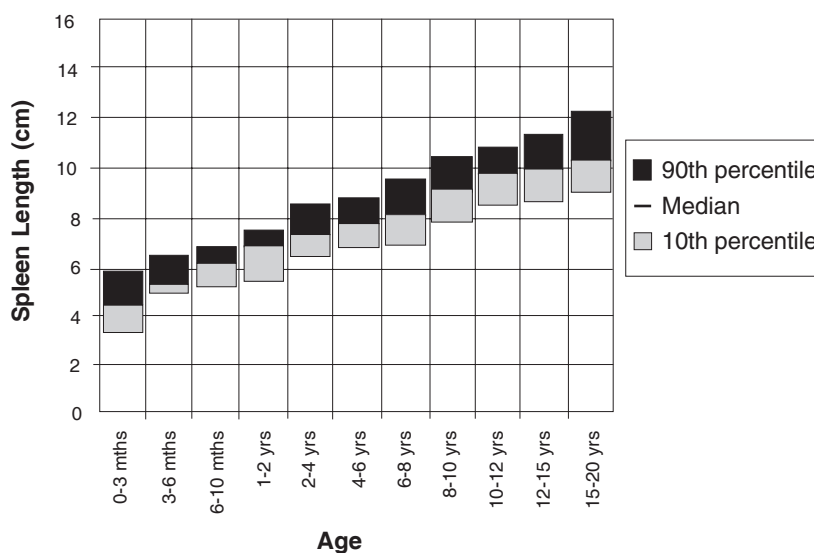
**FIGURE 1.** TENTH PERCENTILES, MEDIANS, AND 90<sup>TH</sup> PERCENTILES OF SPLENIC LENGTH PLOTTED AGAINST AGE GROUP

**TABLE 2.** THE 10<sup>TH</sup>, 90<sup>TH</sup> PERCENTILES AND MEDIANS OF SPLEEN LENGTH OF 230 CHILDREN BY ROSENBERG ET AL<sup>2</sup>

Age (Number)	Length of Spleen (cm)			
	10th %ile	Median	90th %ile	Suggested Upper Limit
0-3 months (n = 28)	3.3	4.5	5.8	6.0
3-6 months (n = 13)	4.9	5.3	6.4	6.5
6-12 months (n = 17)	5.2	6.2	6.8	7.0
1-2 years (n = 12)	5.4	6.9	7.5	8.0
2-4 years (n = 24)	6.4	7.4	8.6	9.0
4-6 years (n = 39)	6.9	7.8	8.8	9.5
6-8 years (n = 21)	7.0	8.2	9.6	10.0
8-10 years (n = 16)	7.9	9.2	10.5	11.0
10-12 years (n = 17)	8.6	9.9	10.9	11.5
12-15 years (n = 26)	8.7	10.1	11.4	12.0
15-20 years (n = 17)				
Female	9.0	10.0	11.7	12.0
Male	10.1	11.2	12.6	13.0

lengths of children initially referred for abdominal ultrasonography for the evaluation of abdominal pain or urinary tract infection, which were unrelated to the spleen. The subjects did not suffer from any hepatic, hematologic, oncologic, or traumatic condition. Neonatal patients were not included. Patients were grouped into the age groups of 1-3 months, 3-6 months, 6-12 months, 1-2 years, 2-4

years, 4-6 years, 6-8 years, 8-10 years, 10-12 years, and 12-15 years. During the examination, patients were positioned supine or in a slightly right lateral decubitus position. Maximum splenic length was obtained in the longitudinal coronal plane with the splenic hilum visible. Each patient's age was recorded. The median and 10<sup>th</sup> and 90<sup>th</sup> percentiles for each age group were determined.



**FIGURE 2.** THE 10<sup>TH</sup>, 90<sup>TH</sup> PERCENTILES AND MEDIANS OF SPLEEN LENGTH OF 230 CHILDREN BY ROSENBERG ET AL<sup>2</sup>

## Results

One hundred and fifteen patients were studied, comprising 69 boys and 46 girls. The youngest patient was one month old and the oldest was 15 years old. Patients aged 2 to 4 years formed the largest group.

**Table 1** and **Figure 1** show the 10<sup>th</sup> percentiles, medians, and 90<sup>th</sup> percentiles of the splenic lengths of our patients in each age group. The 10<sup>th</sup> percentile, median, and 90<sup>th</sup> percentile splenic length in the 1-3 month age group were 3.421 cm, 3.795 cm, and 4.343 cm, respectively; in the 3-6 month age group 3.689 cm, 4.29 cm, and 5.094 cm, respectively; in the 6-12 month age group 4.016 cm, 4.72 cm, and 5.366 cm, respectively; in the 1-2 year age group 4.558 cm, 5.04 cm, and 5.502 cm, respectively, in the 2-4 year age group 5.151 cm, 6.225 cm, and 6.816 cm, respectively; in the 4-6 years age group 5.774 cm, 6.415 cm, and 7.82 cm, respectively; in the 6-8 year age group 6.077 cm, 7.505 cm, 8.228 cm, respectively; in the 8-10 year age group 6.354 cm, 7.77 cm, and 8.602 cm, respectively; in the 10-12 year age group 6.354 cm, 7.77 cm, and 8.602 cm, respectively; and in the 12-15 year age group 7.934 cm, 9 cm, and 9.919 cm, respectively.

## Discussion

Previous studies have reported splenic measurements based on volume or mass. Splenic volume is linearly associated with age or weight,<sup>3</sup> and a nomogram using a volume formula has been established by Ditttrich *et al.*<sup>4</sup> Although volume or mass measurement is a more accurate method in comparison to length measurement, Rosenberg *et al.*<sup>2</sup> found these methods to be unpractical and established a more practical method. He determined the maximum splenic length on longitudinal coronal plane sonogram with the splenic hilum visualized. He also calculated the 10<sup>th</sup> and 90<sup>th</sup> percentiles and medians of these maximum

splenic lengths. Another previous study using ultrasound was reported by Niederau.<sup>5</sup> He found that the longitudinal and transverse diameters had poor correlation with physical data such as weight, height, and body surface area. Furthermore, as longitudinal and transverse diameters correlated well with the diagonal diameter and cross-sectional area, he concluded that these diameters were sufficient to estimate the size of the spleen. As Rosenberg's method is more practical, we attempted using it in our institution.

The results of this study shows that the 10<sup>th</sup> percentiles, medians, and 90<sup>th</sup> percentiles of the normal splenic lengths of our patients were smaller than the measurements of Rosenberg *et al.*<sup>2</sup> (**Table 2** and **Figure 2**), except for the 10<sup>th</sup> percentile in the 1-3 month age group. This might be caused by the exclusion of neonatal patients in our study. Race and nutrition might explain the smaller splenic lengths of our patients when compared to those in Rosenberg's study. However, further study is needed to explore this possibility.

## References

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