

*Report*

# Ultrasound assessment of normal splenic length and spleen-to-kidney ratio in children

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**SUMMARY** Splenic lengths in 184 normal Jordanian children were measured through the hilum by ultrasound and compared with data from Hong Kong and the United States of America. The spleen to left kidney ratio was calculated to determine whether it was constant and to establish a ratio above which splenomegaly can be diagnosed. Up to age 15 years, little variation in splenic length was observed, but over 15 years splenic length was slightly lower in Jordanian males. Spleen to left kidney ratio was constant at around 1; splenomegaly is highly probable in ratios  $\geq 1.25$ .

## Introduction

The spleen is an intra-abdominal organ that is affected by several groups of diseases: inflammatory, haematopoietic, reticuloendothelial proliferation, portal hypertension and storage diseases. Gross splenomegaly can be detected both clinically and sonographically. It has been suggested there may be racial differences in splenic size [1]. Such differences would make it difficult to standardize expected splenic length and to determine non-palpable splenic enlargement.

We measured the splenic length and spleen to left kidney ratio for different age groups of children and compared these measurements with those found in other reports [2,3].

## Subjects and methods

A total of 184 children ranging in age from neonate to 20 years old (95 males and 89

females) underwent abdominal ultrasound examination. The examination was either in a supine or left anterior oblique position. The splenic length was measured from the dome to the splenic tip, through the splenic hilum. The longitudinal length of the left kidney was measured to obtain the spleen-to-kidney ratio. In all subjects, the spleen was not examined clinically and any children known to have renal disease were excluded.

The participants were divided into the same age groups as those used by Rosenberg et al. [2] and Loftus and Metreweli [3] in order that comparisons with their results could be made. All subjects were found to be developing along normal growth curves for weight and height.

## Results

Our results showed a steady, progressive increase in splenic length with age and corresponding increase in the 90th percentile,

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**Table 1 Splenic length in Jordanian children compared with children in Hong Kong and the United States of America (USA)**

Age group	No.	Jordan		USA <sup>a</sup>		Hong Kong <sup>b</sup>	
		Median	P <sub>90</sub>	Median	P <sub>90</sub>	Median	P <sub>90</sub>
0- 3 months	18 (M 12, F 6)	4.7	5.8	4.5	5.8	4.8	5.6
3- 6 months	15 (M 9, F 6)	5.4	6.1	5.3	6.4	5.8	6.5
6-12 months	18 (M 6, F 12)	6.2	6.8	6.2	6.8	6.1	7.2
1- 2 years	14 (M 10, F 4)	6.9	8.0	6.9	7.5	6.2	7.2
2- 4 years	16 (M 10, F 6)	7.1	9.0	7.4	8.6	6.7	8.1
4- 6 years	15 (M 5, F 10)	7.8	9.7	7.8	8.8	7.2	9.0
6- 8 years	16 (M 6, F 10)	8.0	10.3	8.2	9.6	7.7	9.3
8-10 years	14 (M 6, F 8)	9.3	10.4	9.2	10.5	8.0	10.5
10-12 years	13 (M 7, F 6)	9.5	10.5	9.9	10.9	8.4	11.0
12-15 years	24 (M 12, F 12)	10.4	11.5	10.1	11.4	9.5	10.6
15-20 years	9 (M)	10.5	11.5	11.2	12.6	9.8	12.0
15-20 years	12 (F)	9.8	11.5	10.0	11.7	8.8	9.3

<sup>a</sup>Source: [2]<sup>b</sup>Source: [3]

P90 = 90th percentile

M = male

F = female

up to the age of 15 years. Above 15 years, no increase in splenic length or the 90th percentile was noted. This is probably because the age of puberty in Jordan is usually between 12 years and 15 years for both boys and girls. No significant difference in splenic length was noted between males and females, even after 15 years of age.

Our results demonstrate that the splenic length in Jordanian children up to 15 years is similar to that of children from Hong Kong and the United States of America (Table 1). However, for males over 15 years the lengths were shorter. No cause for this is known and it is intended to carry out a similar comparison in the future using adults.

The spleen to left kidney ratio was around 1 for all age groups (Table 2), which

**Table 2 Splenic length to left kidney ratio**

Age	Ratio
0-3 months	0.96
3-6 months	0.92
6-12 months	1.12
1-2 years	1.05
2-4 years	1.03
4-6 years	1.04
6-8 years	1.07
8-10 years	1.03
10-12 years	0.98
12-15 years	0.98
15-20 years (male)	0.99
15-20 years (female)	0.94

is similar to the findings of Loftus and Metreweli [3].

## Discussion

Ultrasound is frequently used to examine the spleen and to rule out splenomegaly. It is a reliable, easy and noninvasive technique suitable for use with children. Markisz et al. [4] used sulfur colloid to measure the spleen volume, and Dittrich et al. [5] established a nomogram for determining the splenic size in children son-

graphically; however, these techniques are time-consuming. Rosenberg et al. found that measurement of splenic length was an easier technique and he suggested upper limit guidelines for assessing the splenic length [2]. We found no differences between these and those of our children and they can be applied to the same age groups.

Spleen-to-kidney ratio is another easy and reliable way to exclude splenic enlargement. Splenomegaly is highly probable if the spleen-to-kidney ratio is  $\geq 1.25$  in the absence of renal disease.

## References

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