Serum protein electrophoresis is a routine test performed in the majority of medical analysis laboratories. This test allows the separation and the quantification of total serum proteins, usually into six fractions: albumin, alpha-1 globulins, alpha-2 globulins, beta-1 globulins, beta-2 globulins and gamma-globulins. It is useful in numerous pathological situations to make diagnosis, to follow evolution of a disease or to evaluate the efficiency of a treatment. Its interpretation relies on qualitative and quantitative analyses of each protein fraction. For this, reference ranges have been established for each fraction using sera from healthy adult patients. However, these classical reference ranges used to interpret serum protein electrophoresis, and particularly the gamma-globulins fraction, are not suitable for the pediatric population for which no specific reference values have been described to date.

**Aims of study:** We propose to establish for the first time in pediatric population (range from two weeks to 18 years) reference intervals for the six protein electrophoresis fractions (in % and in g/L) and particularly discuss the gamma-globulins fraction.

**METHODS**

**Samples**

We collected 591 sera from healthy patients aged from 15 days to 18 years old (Biobank from the Immunology laboratory, Dr Bertrand Evrard, CHU Clermont-Ferrand).

**Total protein electrophoresis and total protein quantification**

We performed serum protein electrophoresis using the “Capilarys Protein 6” kit (Sebia, Ref: 2003) on the automated capillary electrophoresis (CE) system Capilarys Flex Piercing® (Sebia) according to classical procedures. We used the PHORESIS software (Sebia) for the results review and interpretation of the electropherograms. We quantified total proteins in serum using TP-Total Protein kit (Siemens, Ref: GE-73) on the Dimension VISTA 1500 System from Siemens.

Thus, for each sample, we had six electrophoretic fractions in %, and the quantification of total proteins in serum. This allowed to determine the values of the six electrophoretic fractions in g/L.

**Statistics**

Statistical analysis was performed using the STATA software, version 12 (StataCorp, College Station, TX, US). Tests were two-sided, with a type I error set at α=0.05. Qualitative data were presented as sample size and associated frequencies. Quantitative data were presented as mean ± standard deviation (SD) and as median and interquartile range [Q5-Q95]. They were compared between groups using ANOVA or the Kruskal-Wallis test if the ANOVA conditions were not suitable. Normality was assessed using the Shapiro-Wilk test and the quantile-quantile plot (α droite de Henry ø).

**RESULTS**

- No statistical difference was found between sexes for different electrophoresis fractions. For gamma-globulins, medians of 12.3% and 11.3% were found respectively in girls (n=236) and boys (n=350).
- A statistical correlation was found between age and each of the six electrophoresis fractions in %. The most correlated with age, as expected, was the gamma-globulins fraction (%) with r=0.59 (p<0.01) (Fig 1).

**Identification of these five groups of age allowed us to establish reference intervals for each of the electrophoretic fraction in the pediatric population (Table 1):**

**CONCLUSIONS**

The gamma-globulins appeared as the most discriminant fraction with age in our pediatric population. We found a statistical correlation between the percentage of gamma-globulins and age with an increase of % gamma-globulins from 15 days to 7 years old. We determined five statistically different groups of age depending on the gamma-globulins fraction, and then established the reference ranges in percentage and g/L for each of the six electrophoretic fractions using the intervals method (Q5-Q95).

Our results will allow the use of suitable reference ranges in the pediatric population depending on patient’s age, to interpret correctly serum protein electrophoresis in medical laboratories. This will permit to avoid misinterpretation such as false hypo-gamma-globulinemia in children.

One can expect that age would also be a discriminant factor for gamma-globulins analysis in elderly population, a similar study in a population of seniors (>65 years old) would be useful to establish reference ranges for serum protein electrophoresis fractions from babies to old people.

Authors thank SEBIA, and the technicians from the Biochemistry and Immunology Laboratories of Clermont-Ferrand Hospital for their help in the present work.