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Research Article

Usual Values of Gonadotropin's (FSH, LH) in Senegal Children

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Background and purpose: Hormones of the hypothalamic-pituitary-gonadal axis are important markers for the evaluation of several pediatric endocrinopathies. However, in Senegal, the reference values used by prescribers and biologists so far are those of Western countries.

Materials and methods: The study is of the prospective type over a period of 6 months carried out at the level of the biochemistry laboratory of the Dalal Jamm hospital in collaboration with the laboratories of the Abass Ndao hospital and the biochemistry laboratory of the hospital. Aristide Le dantec. Our study population consisted of 101 patients from the pediatric population and the dosage of gonadotropins was carried out by the electrochemiluminescence method. Usual gonadotropin values and their confidence intervals were calculated.

Results: Our study population consisted of 51% girls and 49% boys with an M/F sex ratio of 0.96. We divided our population into four distinct intervals and we found that the age group between 2 years and 10 years is the most represented with a percentage of 58%. For FSH we found a usual value between 0.1 and 4.685 IU/L with a median of 0.507. While for LH, we found a value between 0.1 and 3.275 IU/L and a median of 0.1. We also found that FSH and LH do not have the same gender distribution. Indeed FSH is higher in girls while LH is higher in boys.

Conclusion: Our study provided the first results in Senegalese children and the results that came from it could serve as a reference for laboratories that use the same platform. However, further studies on a larger population are necessary to confirm these data. We recommend that each laboratory establish the reference values or, failing that, the usual values according to its population but also according to the methods used.

Keywords: Gonadotrophins, Usual values, reference values, FSH, LH, Senegal

INTRODUCTION

Reference values typically assigned by laboratory information systems can be affected by growth, development, and physiological changes that occur during childhood and adolescence.

Thus, it is essential that pediatric reference values should be established to reflect these changes to help differentiate healthy children from those who need additional medical follow-up.

Pituitary hormones such as, luteinizing hormone (LH) and follicle-stimulating hormone (FSH) regulate gonadal activity and play an important role in the diagnosis of pituitary disorders, problems related to reproductive organs and precocious and delayed puberty.

Given the important role of these hormones in sexual development, circulating concentrations may differ between the neonatal period, infancy, prepubertal years, and puberty, reflecting the development and maturation processes of various organs and tissues (Kushnir et al., 2008; Aldrimère et al., 2012; Elmlinger et al., 2002; Elmlinger et al., 2005).

In addition, significant differences are also observed between the concentrations of hormones observed in boys and girls (Elmlinger et al., 2005; Soldin et al., 2005). Most studies that have calculated pediatric reference values for fertility hormones are based on very small groups of children or hospitalized patients (Elmlinger et al., 2002;Soldin et al., 2005) an approach that has been implemented doubt by some authors (Owen et al., 2010). As a result, reference values for many endocrine markers are not yet well defined (Konforte et al., 2013).

Moreover, in Senegal as in several African countries, the reference values used by prescribers and biologists so far are those of Western countries. This is why in this study; we have set ourselves the general objective of establishing usual values of FSH and LH in Senegalese children.

MATERIAL AND METHODS

This is a prospective study over a period of 6 months carried out in the city of Dakar - Senegal at the level of the Biochemistry laboratory of the Dalal Jamm Hospital in collaboration with the laboratories of the Abass Ndao Hospital and the laboratory of Biochemistry of Aristide Le Dantec Hospital.

Our study population consisted of children aged 0 to 15 years received as part of a routine check-up or hospitalized in pediatrics for benign pathologies without metabolic repercussions. Children suffering under treatment, suffering from chronic pathologies or whose parents did not consent to participate in the study were excluded.

A form detailing the terms of the study was presented and explained to the parents.

The subjects included benefited from a sample of 5 ml of venous blood at the bend of the elbow. Whole blood collected in a dry tube to obtain serum is centrifuged at 3000 revolutions per minute for 5 minutes.

Serum is collected in tubes labeled with an identification number and stored at -20°C until assayed. The latter was carried out on the Cobase411 automaton (Roche diagnostic) using electrochemiluminescence technology.

Data were entered and coded on Windows Excel 2010 (Microsoft, Redmond, USA) and then analyzed using SPSS Statistics 24 (IBM, Chicago, IL, USA).

Excel software was also used to present the tables and graphs, as well as to group the modalities of certain variables before their analysis.

Descriptive statistics presented the data in the form of tables and figures. She then summarized the qualitative variables as proportions (percentages) and the quantitative variables as medians [Interquartiles].

For qualitative variables, comparison of percentages required Pearson's chi-square test with Yates' correction where necessary for small samples.

The Wilcoxon-Mann-Whitney U test was used to compare 2 asymmetric quantitative variables (distribution that does not follow the Gauss-Laplace normal law). In the case of more than 2 quantitative variables, we used the Kruskall-Walis H test to compare them.

In order to eliminate outliers, we used the DIXON method.

A type I error value α of 0.05 was considered as the statistical significance threshold (p 0.01 = very significant and p 0.001 = highly significant).

RESULTS

The Kruskall Wallis H test did not prove the existence of any statistically significant difference between the groups (p=0.178) **(Figure 1).**

Usual values of FSH and LH were 0.507 and 0.1 IU/L respectively **(Table 1).**

FSH and LH do not have the same gender distribution. Indeed FSH is higher in girls while LH is higher in boys **(Figure 2 and 3).**

For FSH, we found a peak between 2 months and 2 years in girls while in boys the secretion is earlier **(Table 2).**

For LH, the peak is observed only in boys before 2 months **(Table 3).**

Table 1. Usual values of gonadotropins in the study population.

	FSH	LH
N	99	
Median (UI/l)	0.507	0.1
Usual values (95% CI) (IU/l)	0,100 – 4,685	0,100 – 3,275

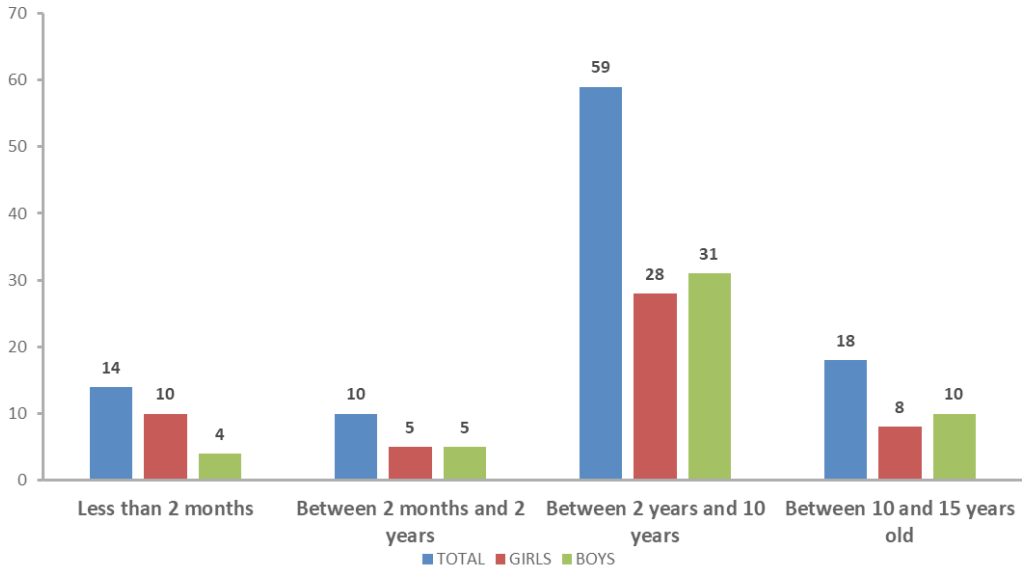

Figure 1. Distribution of the population according to age and sex.

Table 2. Usual values of FSH according to age and sex.

FSH								
Gender	GIRLS				BOYS			
Age	Less than 2 months	Between 2 months and 2 years	Between 2 years and 10 years	Between 10 and 15 years old	Less than 2 months	Between 2 months and 2 years	Between 2 years and 10 years	Between 10 and 15 years old
N	9	5	27	8	4	5	31	10
Median (UI/l)	0,5	3,25	0,807	0,291	0,799	0,745	0,367	1,645
Usual values (95% CI) (IU/l)	0,1-0,753	2,77-4,61	0,1-4,26	0,1-1,274	0,459-1,349	0,32-0,895	0,1-1,694	0,1-4,23

Table 3. Usual values of LH according to sex and age.

LH								
Gender	GIRLS				BOYS			
Age	Less than 2 months	Between 2 months and 2 years	Between 2 years and 10 years	Between 10 and 15 years old	Less than 2 months	Between 2 months and 2 years	Between 2 years and 10 years	Between 10 and 15 years old
N	10	5	28	8	4	5	31	10
Median (UI/l)	0,1	0,1	0,1	0,1	2,36	0,1	0,1	0,118
Usual values (95% CI) (IU/l)	0,1 - 2,764	0,1	0,1 - 1,21	0,1 - 0,650	0,1 - 3,342	0,1 - 0,347	0,1 - 0,283	0,1 - 3,572

DISCUSSION

The establishment of reference values in children is a major concern for the African biologist. In fact, in most of our laboratories, the values available are those of adults and come from Western manufacturers who are the suppliers of automatons and reagents. Recent studies have highlighted a gap in the availability of pediatric reference values and their negative impact on the diagnosis of childhood diseases (Yang et al., 2006; Davis et al., 2006).

Monitoring of gonadotropin levels in pediatric patients is of

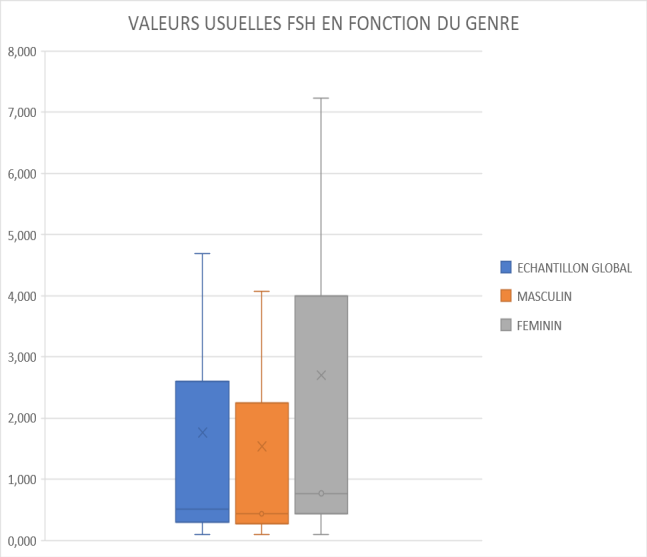

Figure 2. Usual FSH values according to gender.

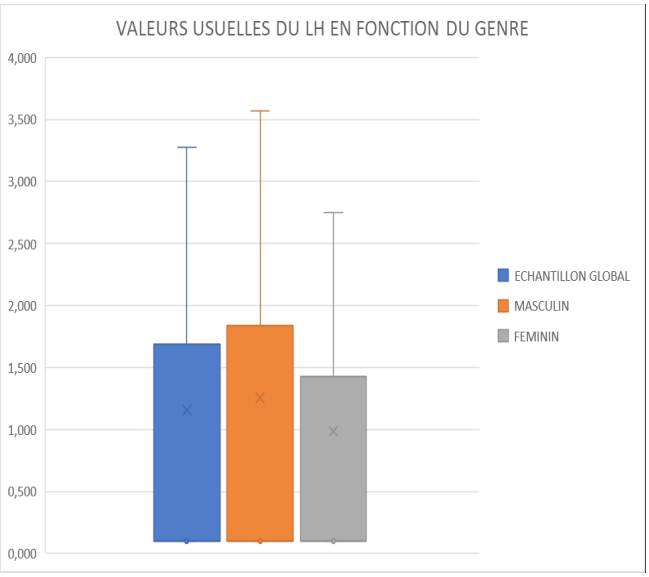

Figure 3. usual values of LH according to gender.

essential importance for the diagnosis of pubertal disorders.

According to current recommendations, techniques based on electrochemiluminescence are considered gold standard methods for serum gonadotropin measurements (Carel et al., 2009) This method is applied to the Roche Diagnostics e411 automaton, used in our study. However, at present, this manufacturer does not offer any reference value in children. This poses a real problem for the clinical biologists.

Establishing the usual values of these parameters in paediatrics is therefore a necessity, especially since the available values, which are those of adults cannot be applied to children.

Our study concerned 101 children aged 0 to 15 years with a predominance of the age group between 2 and 10 years old. This suggests that it is the most consulted pediatric population in our structures. This age range also reflects the period when puberty disorders are most diagnosed.

The usual values of FSH and LH found in our study population are respectively (0.1-4.68 IU/l) and (0.1-3.27 IU/l). They are different from those proposed by the manufacturer for adults.

FSH and LH do not vary in the same way in the two sexes.

Indeed for FSH the rates are higher in girls compared to boys.

Similar results were found by some authors such as Zec et al (Zec et al., 2012) who used the same device as ours but also by other authors (Chan et al., 2009; Elmlinger et al.,2002; Konforte et al., 2013;Koskas et al., 2007; Soldin et al., 2005).

According to Koskas et al (Koskas et al., 2007) the higher levels of FSH in girls would be secondary to the concentrations of activin-A and may explain the earlier onset of puberty in the latter.

Unlike FSH, LH levels are higher in boys. These data corroborate those of other studies: (Zec et al., 2012; Chan et al., 2009; Koskas et al., 2007, Soldin et al., 2005).

However, Konforte and his collaborator (Konforte et al., 2013) had not found any difference according to sex for LH, and in the study by Elmlinger (Elmlinger et al.,2002) the increase in LH in boys was observed only after 10 years.

If the evolution of the hormones is the same in most studies, differences are however observed in the concentrations. These differences could be linked to the variability of these hormones, which depends on several factors: the diversity of circulating molecular forms characterized mainly by their glycan chains; the varying specificities of monoclonal antibodies provided with commercial assays; and the use by manufacturers of different international standards.

The distribution of gonadotropin levels according to age shows a particular distribution.

For FSH, there is an increase in the neonatal period followed by a peak in the age group of 2 months-2 years. From the age of 2 years, the secretion decreases to resume around the age of 10 years. While for LH, after an increase during the first 2 months, the rates fall to resume after 10 years. This distribution of gonadotropins can be superimposed on that reported by various authors (Chan et al., 2009; Konforte et al., 2013) However, in some studies LH was undetectable during the neonatal period. These data demonstrate the transient increase in gonadotropins in infants due to the temporary absence of negative feedback occurring in the first months after birth. Towards the end of the first year of life, concentrations of gonadotropins and sex steroids in the blood decline and remain at low levels throughout childhood. According to some authors, this transient activation of the hypothalamic-pituitary-gonadal axis plays an important role in postnatal gonadal development in boys and girls (Kuiri et al., 2011; Main et al., 2005)

However, our study has limits: the number of samples in certain groups is very low, which could create a bias in the representativeness. Thus studies including a large number of children aged 0-1 years will be considered.

CONCLUSION

Our study provides the first data in Senegalese children and the results that came out of it could serve as a reference for laboratories that use the same platform. As expected, gonadotropins vary according to sex but also according to different age groups with a particular evolution during the first years of life.

However, further studies on a larger population are needed to confirm these data.

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