

Assessment of Thyroid Hormones in Sudanese Patients with Down syndrome

GM Bahar^{1*}, GA Modawe², SA Ahmed¹, AA Abdrabo¹

¹Alneelain University, Faculty of Medical Laboratory Sciences, Department of clinical Chemistry, Khartoum, Sudan.

²Omdurman Islamic University, Faculty of Medicine, Biochemistry Department, Omdurman, Sudan.

Accepted 19th October, 2015

Background: The close relationship between thyroid disorder and Down syndrome (DS) had been widely reported in the literature.

Objectives: The objective of this study, is to estimate the thyroid function test (TSH, T3, and T4) in patients with Down syndrome.

Methodology: This is a case control study conducted in Khartoum state during the period from January to May 2015. The blood sample was obtained from 35 patients with DS and 35 apparently healthy as a control, with age ranged between 6 to 17 year with matching age and sex with patients. The samples analyzed for Thyroid hormones by full automated chemistry analyzer TOSOH AIA 360.

Result: The (mean± SD) of serum TSH, T3, T4 in DS respectively, were (4.7±2.8, 0.6±0.5, 7.2±2.5), while in the control groups were (1.5±1.6, 0.8±0.2, 10.7±1.3), P. values < 0.05.

Conclusion: This study conducted that, T3 and T4 in is significantly decreased in Down syndrome compared to control group and also TSH is significantly increased in DS compared to control groups.

Key words: Thyroid hormones, Down syndrome, Sudanese.

INTRODUCTION

Down's syndrome, also known as trisomy 21, is a genetic disorder caused by the presence of all or part of a third copy of chromosome 21^[1]. It is typically associated with physical growth delays, characteristic facial features, and mild to moderate mental retardation. Some individuals with DS are educated in typical school classes, while others require more specialized education^[7]. Some individuals with DS graduate from high school and a few attend post-secondary education^[8]. In adulthood, about 20% in the United States do paid work in some capacity intellectual disability^[2]. The average IQ of a young adult with DS is 50, equivalent to the mental age of an 8- or 9-year-old child, but this varies widely^[3]. DS can be identified during pregnancy by prenatal screening followed by diagnostic testing, or after birth by direct observation and genetic testing. Since the introduction of screening, pregnancies with the diagnosis are often terminated^[4, 5]. Regular screening for health problems common in DS is recommended throughout the person's life. Education and proper care have been shown to improve quality of life^[6]. Some children with DS may require a sheltered work environment^[7]. Support in financial and legal matters is often needed^[10]. Life expectancy is around 50 to 60 years in the

developed world with proper health care^[3, 10]. DS is the most common chromosome abnormality in humans^[3], occurring in about one per 1000 babies born each year^[12]. It is named after John Langdon Down, the British doctor who fully described the syndrome in 1866^[11]. Some aspects of the condition were described earlier by Jean-Étienne Dominique Esquirol in 1838 and Édouard Séguin in 1844^[12]. The genetic cause of Down syndrome an extra copy of chromosome 21 was identified by French researchers in 1959^[11]. DS (DS) are one of the most common causes of developmental disability with a prevalence of 1 of every 691 live births^[13]. Persons with DS are at increased risk for various health conditions, including thyroid disease, leukemia, congenital heart defects, gastrointestinal tract abnormalities, obesity, and diabetes mellitus^[14]. Despite this increased risk of chronic diseases, life expectancy for individuals with DS has continued to improve with an estimated mean survival approaching 60 years of age^[15]. The most common thyroid abnormality is sub clinical hypothyroidism: high serum thyroid-stimulating hormone (TSH) with normal free thyroxine (T4). The incidence of hypothyroidism in DS is much more than that of hyperthyroidism. Individuals with DS have

been shown to have higher mean basal TSH levels and lower mean thyroid hormone concentrations compared with controls (16, 17). The aim of the study was to estimate the thyroid function test TSH, T3 and T4 in Down syndrome.

MATERIALS AND METHODS

Study Population

This is a case control study conducted in the period from January to May 2015-in Khartoum State, Sudan. A total of 35 samples was collected from children with DS as case, and 35 samples from healthy age matched individuals as control, the age of DS between (6 to17 years) and (15 female 20 male). The age of the control group is between (6 to 17years) and (15 female, 20 male), after obtaining ethical clearance from an ethical review board and appropriate informed consent from the subjects as well as their parents and guardian.

Including Criteria

Patient with Down syndrome

Exclusion Criteria

History of congenital cardiac defect requiring open heart surgery, history of intestinal anomalies requiring a bowel resection and/or ongoing medical intervention, history of hypothyroidism requiring medication or other chronic conditions known to affect energy balance or growth including diabetes and history of cancer.

Blood Sample

Blood samples were collected from the all DS who fulfilled the inclusion criteria. Collect the sample by phlebotomy present. 5ml of venous blood was collected from DS and controls. As soon As the blood was collected from DS and controls, it was carried to the Lab. The blood was allowed to clot and serum was separated by centrifugation at 5000 RPM for 5 minutes. It was used to estimate the main parameters. Analysis was by the Full Automated chemistry analyzer TOSOH AIA360 method.

Statistical Analysis

Spss for windows version-16 (2007) was employed for statistical analysis. The Independent 't'test procedure was used to compare the mean of the cases and controls. The result presented as mean± standard deviation a P value of .05 were accepted as statistically significant.

DISCUSSION

Results from this study suggest that the thyroid hormones of DS are less favorable than of their siblings (control), with increase concentration in TSH and low in T3 and T4 as shown in table ^[18]. There was a significant decrease in thyroid hormones in DS compared with to control group (p. <0.05). There was a significant decrease in the mean of T3 in DS when compared to control group, there was a significant decrease in the mean of T4 in DS compared to control group, while that there was a significant increase in the mean of TSH in DS compared to control group. Hypothyroidism causes delay in synaptogenesis and myelination as well as decreases the brain growth potential, as it is the hormone responsible for maintaining the basic metabolism of all the tissues. The individual anthropometric measurements were all within the 25th and 75th percentiles for the matched age and sex.

The Rao's index, though low in the Down syndrome cases with hypothyroidism than the euthyroid, was not statistically significant. Mark Selikowitz in his 5-year longitudinal study of Down syndrome patients also did not discover any statistically different growth and developmental rates between euthyroid and hypothyroid Down syndrome children. Similar findings were noted by van Trotsenburg AS et al (2005) ^[18] regarding mental development, though the physical parameters in hypothyroid Down syndrome patients with thyroxin supplementation were statistically different from the control group. As mental and physical retardation is a common denominator to both Down syndrome and hypothyroidism, and, both the conditions are known to coexist it becomes important to screen the Down syndrome children for hypothyroidism because the coexistence of both the conditions would lead to further developmental delay. In another study by Thorpe–Beeston et al 15 umbilical cord blood venous samples by cordocentesis from seventy five fetuses with congenital anomalies showed that all five with Down syndrome had elevated TSH levels while most of the others had normal TSH levels. The prevalence of 16.7% in the age group 0 – 1 year in the present study could well be taken as a reflection of the prevalence of congenital hypothyroidism. Van Trotsenburg AS et al (2003) ^[18] observed that decreased T4 concentration, left-shifted normal distribution, and mildly elevated TSH concentrations point to a mild hypothyroid state in newborns with Down syndrome could support the existence of a Down syndrome-specific thyroid (regulation) disorder.

Transient hypothyroidism is the most common form of thyroid dysfunction observed in Down syndrome patients. Mark Selikowitz had observed in his longitudinal study that 40% of these cases of compensated hypothyroidism resolved spontaneously. Gibson PA et al (2005) ^[19] served that 47% of sub clinical hypothyroid Down syndrome patients were subsequently found to have normal TSH levels after a gap of four to six years.

RESULTS

Table 1: (Mean + SD) of serum thyroid hormone in study population

Parameter	mean± SD Patient N=35	mean± SD Control N=35	P.value
TSH (U/ml)	4.7±2.8	1.6±1.6	0.000*
T3 (ng/dl)	0.6±0.6	0.8±0.2	0.054
T4 (ng/dl)	7.2±2.6	10.7±1.3	0.000*

*indicate significant value

CONCLUSION

This study conducted that, T3 and T4 in is significantly decreased in Down syndrome compared to control group and also TSH is significantly increased in DS compared to control groups.

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