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Research Article

# Assessing Thyroid Functions in Children with Down's syndrome

**Eltayeb Tayrab [1&2] and Emtinan Alkalil[1]**

[1]Department of Chemical Pathology, Faculty of Medical Laboratory Sciences,National Ribat University, Khartoum, Sudan

[2]Department of Medical Laboratories Sciences, College of Applied Medical Sciences, University of Bisha- Kingdom of Saudi Arabia.

**ABSTRACT**

Down's syndrome (DS) is a congenital disorder stemming from a chromosomal abnormality; it is resulted from the trisomy of chromosome 21. The main objective of this study was to assess the levels of thyroid stimulating hormones (TSH), triiodothyronine (T3), and thyroxine (T4) in Sudanese children with Down's syndrome, as well as observing the other associated diseases; as a secondary goal. This study was done in Gaafar Ibn Ouf Hospital, Mohammed Alamin Hamid Hospital and Ossratna Society for Disabled Children in Khartoum State- Sudan. The study included 30 Sudanese children diagnosed with Down's syndrome, and another 30 age matched healthy children served as control. Automated chemical analyzer was used to measure serum thyroid hormones. The study revealed that; the mean age of the children with DS was (5.50±1.28years), versus (5.96±0.71 years), serum TSH was (3.2 ±0.41ulU/ml), versus (2.0 ±0.23ulU/ml) with (P value = 0.0 00), serum T4 was (8.9± 0.57 ug/dl), versus (7.6±0.22 µg/ dl)and serum T3 was (1.68±0.29 µg/ dl), versus (1.64 ±0.17µg/dl) in the normal children. In the Down's syndrome group; 12(40%) had congenital heart diseases, 8(26.6%) had talking problems, 3(10%) had visual problems, and another 3(10%) had hear loss, 2(6.7%) had redundant activity, 2(6.7%) had family history. Serum TSH was significantly elevated in the children with Down's syndrome; while T3 and T4 were not significantly changed.

In conclusion; among Sudanese children with Down's syndrome serum TSH significantly increases, while congenital heart diseases and speech disorders are most common.

**Key Words:** Down's syndrome, children, thyroid function, serum, Sudan

## INTRODUCTION

Previous studies have shown that, Down's syndrome (DS) is the most common genetic disorder; occurs because of non-disjunction of chromosome 21or translocation[1]. Down's syndrome affects approximately 1 in 650-1000 live-born children World-wide[2],its prevalence increases with maternal age[1].According to the World Report on Disability; one billion people have a disability; at least 1 in 10 is a child (WHO, 2011) [3]. Besides intellectual disability, individuals with (DS) often have major congenital problems[4]. Studies conducted in Sudan indicated that the most common causes of disability are congenital and hereditary factors (WHO, 2011) [3]. Thyroid disorders are common in the (DS) population[5]. Around ten percent of Down's syndrome cases have thyroid gland problems; especially hypothyroidism[6]. Nine out of ten of all (DS) cases have a significant hearing loss[7]. In Sudan the prevalence of disability is 4.8%, and the number of children under 18 years is 15 million, indicating that approximately 720,000 Sudanese children have disabilities (WHO, 2011) [3]. The present study was aimed to determine the thyroid hormones levels in known cases of (DS);as well as observing the other associated diseases;during the normal follow up of (DS) children to some hospitals in Khartoum-Sudan.

## SUBJECTS AND METHODS

This case control study was done in Gaafar Ibn Ouf Hospital, Mohammed Alamin Hamid Hospital and Ossratna Society for Disabled Children in Khartoum State- Sudan. The study included 30 Sudanese children with Down's syndrome (diagnosed with karyotyping) and another 30 age matched healthy children served as control. Ethical approval for the study was obtained from ethical committee of Federal Ministry of Health and National Ribat University. Informed written consents were taken from the parents of the children during their visits to the above centers. Blood samples were collected in sterile condition by an expert person. Five milliliters of venous blood were collected from each subjects in plain (no additive) blood containers. Serum was separated using electric centrifuge at 3000 RPM for five minutes. Automated chemical analyzer (TOSOH AIA 360) was used to measure serum thyroid hormones including TSH, T3 and T4. Control sera used was from Biosystem (Spain). The medical information for any children was taken by a medical doctor from their medical records. The study was conducted between the period from Janruary2014 and June 2014.

Data was analyzed using Statistical Package for Social Science (IBM- SPSS) version 20. *P*. value <0.05 was considered significant.

## RESULTS

Comparing the results obtained from the children with DS with that obtained from the healthy control children using t-test. The mean serum thyroid stimulating hormone (TSH) was (3.2±0.41 uIU/ml) in DS patients, versus (2.01± 0.23 uIU/ml) in the control group; with (P value = 0.0 00). Triiodothyronine (T3) was (1.68±0.29 µg/dl) in DS children, versus (1.64± 0.17 µg/dl) in the normal children; with no significant difference. Thyroxine (T4) was (8.90±0.57 µg/dl) in DS group, versus (7.62± 0.22 µg/dl) in the control group; with no significant difference, Table (1).

The study also showed that 12(40%) of DS children were males versus; 15(50%) in control group, 18(60%) of DS patients were females versus; 15(50%) in normal children. The mean age of the children with DS was (5.50±1.28years), while in control group was (5.96±0.71 years). In the DS group; 12(40%) had congenital heart diseases, 8(26.6%) had talking problems, 3(10%) had visual problems, and another 3(10%) had hear loss, 2(6.7%) had redundant activity and another 2(6.7%) had recurrent pneumonia. History of family Down's syndrome was found in 2(6.7%).

**Table 1**

**T- test for comparison of different parameters between the children with Down's syndrome and their control.**

| Items | Down syndrome group (N=30) (mean ± std) | Control group (N=30) (mean ± std) | *P. value* |
|---|---|---|---|
| Age (years) | 5.50 ± 1.28 | 5.96 ± 0.71 | |
| TSH ( uIU/ml) | 3.2 ± 0.41 | 2.01 ± 0.23 | 0.000 |
| T3 (µg/dl) | 1.68 ± 0.29 | 1.64 ± 0.17 | 0.502 |
| T4 (µg/dl) | 8.90 ± 0.57 | 7.62 ± 0.22 | 0.520 |

*Data was presented as (mean ± SD).

**N = number of cases

*P*. value <0.05 significant

## DISCUSSION

Thyroid disease in the Down's syndrome population continues to be the focus of ongoing interest. Thyroid hormones are very important for normal growth and development of infants and children; including the brain and skeleton. As serum thyroid stimulating hormone (TSH) is an initial thyroid function test as reported by Nasreen *et al* (2015)[8]; in this study TSH in Sudanese children with Down's syndrome is significantly higher, similar result was reported by Sarici *et al* (2012)[9]and Purdy et al (2014)[10]; while this finding disagrees with that found by Hestnes *et al* (1991)[11]. This may be due to hypothyroidism owing to autoimmune antibodies or other causes as reported by Rubello el al (1995)[12] and Purdy et al (2014)[10]. However; no significance change observed in the levels of both T3 and T4, in the present study, which are similar to that stated by Hestnes *et al* (1991)[11]. Down's syndrome as genetic disease is accompanied with many others diseases, which affects the life expectancy of this group of people; especially children. In this study 40% of the Sudanese children with DS have an associated congenital heart disease; this finding is similar to that reported in Libya by Elmagrpy *et al*(2011)[13]; so it is important to establish the cardiac status of all babies with the syndrome in the first few weeks of their life. Hearing loss is one of the symptoms associated with DS; which may be up to ninety percent as reported by Mazzoni *et al*(1994)[7]; but here we found only 10% of the study population with hearing problems. As the age of these children with DS increase they may develop some diseases that appear in late ages like Alzheimer's disease which occurs in high prevalence in the people with Down's syndrome as written by Visser *et al* (1997)[14]. It is well known that hypothyroidism may cause mental retardation; nowadays a new hope seemed to realize for Down's syndrome people by increasing their cognition function as reported by Michael(2015)[15].

## CONCLUSION

In Sudanese children with Down's syndrome, serum TSH significantly elevates; while triiodothyronine and thyroxine do not change significantly. Congenital heart disease and speech disorders are most common in Sudanese children with Down's syndrome.

Thyroid function for the children with Down syndrome should be done regularly under supervision of specialists.

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