

1 **Thyrotoxic valvulopathy in a 7-year-old child: Case report and literature review**

2

3 **Abstract**

4 **Introduction**

5 Children with thyrotoxicosis may present rarely with valvulopathies. **This disease is a syndrome**
6 **complex of hyperdynamic status due to systemic manifestation of elevated circulating thyroid**
7 **hormone levels.**

8 **Case Reports**

9 O.C, a 7-year-old female child presented with abdominal pain that started seven days ago,
10 passage of loose stool that started five days ago and weight loss that started five days ago. Salient
11 findings at presentation were tachycardia, anterior neck swelling that moves with swallowing
12 with a grade 3/6 pan-systolic murmur maximal at the apex. A diagnosis of hyperthyroidism at
13 risk of thyrotoxicosis was made based on supported laboratory evidence. Echocardiography done
14 showed severe mitral regurgitation. She is on Tabs Carbimazole and Propranolol. She has
15 improved remarkably and has been on follow up

16 **Conclusion**

17 Hyperthyroidism affects multiple organ systems in the body and the heart is not spared. Most of
18 the cardiac manifestations are functional and occur as a result of the hyperfunctioning gland. A
19 high index of suspicion is required, as many of the patients present with only the consequences
20 of hyperthyroidism

21 **Keywords:** Valvopathy; echocardiography; murmurs; hyperthyroidism; child

22 **Introduction**

23 Hyperthyroidism is a disease with multisystemic manifestations. [1] The heart is an organ which
24 is highly susceptible to thyroid hormones and therefore cardiac manifestations are observed even
25 in subclinical cases of hyperthyroidism. [2] Thyroid hormones have a significant impact on
26 cardiac function and structure, with an attendant de novo cardiac condition or could uncover an
27 underlying cardiac pathology. [2] The cardiovascular manifestations of hyperthyroidism include
28 tachycardia, palpitations, bounding peripheral pulses, wide pulse pressure, hyperactive
29 precordium, and murmurs. [3] The most common cardiac complications of hyperthyroidism are
30 arrhythmias (mainly atrial fibrillation), valvulopathies, heart failure and hypertension. [3] From a
31 US based study, the incidence of pediatric hyperthyroidism and thyrotoxicosis is about 0.44
32 cases per 1000 population for children aged 0-11 years and 0.59 cases per 1000 for those aged
33 12-17 years, therefore showing increasing incidence throughout childhood. [4] Despite the
34 cardiovascular symptoms and effects being one of the major clinically significant features of
35 thyrotoxicosis, there is paucity of data on the true incidence of thyrotoxic heart disease in
36 children compared to adults. No data on the incidence or prevalence of thyrotoxic valvulopathy
37 in children has been reported. This rarity necessitated the presentation of the case reports.

38 **Case presentation**

39 O.C, a 7-year-old female presented with abdominal pain that started seven days ago, passage of
40 loose stool that started five days ago and weight loss that started five days ago. She was then
41 taken to a Teaching Hospital in Cotonou, Benin Republic where some investigations and
42 medications were given with persistence of symptoms necessitating her return to Nigeria. She
43 was then referred to UNTH from a private hospital at Nsukka. She was first seen by the
44 Gastroenterology team at UNTH where she had a colonoscopy done. Following an incidental

45 finding of a systolic murmur at the apex, she was referred to the cardiology team for further
46 evaluation. She is the first child in a monogamous family setting with 4 children. Other siblings
47 are alive, with no history of similar complaints. Parents are of the lower socio-economic class.
48 Salient findings at presentation were **dyspnoea on exertion, easy tiredness, palpitation and**
49 **sweating**, tachycardia, anterior neck swelling that moves with swallowing, spherical in shape,
50 not tender, no differential warmth and smooth to touch, wide pulse pressure, first and second
51 heart sounds with a grade 3/6 pan-systolic murmur maximal at the apex.

52 A diagnosis of hyperthyroidism at risk of thyrotoxicosis was made. Complete blood count and
53 serum electrolyte, urea and creatinine showed normal parameters . Thyroid function test (TFT)
54 done showed elevated Free T3 and T4 of 36.05 and 61.34pmol/L respectively and low TSH of
55 0.010LmiU/L. Thyroid USS showed diffuse enlargement of the thyroid gland and isthmus with
56 increased echogenicity and heterogeneous texture. Echocardiography done showed severe mitral
57 regurgitation. She is currently being managed by the Paediatric Endocrinology team, and is on
58 Tabs Carbimazole and Propranolol. Awaiting repeat of thyroid function tests and
59 Echocardiography. She has improved remarkably and now on follow up.

60 **Discussion**

61 Children with thyrotoxicosis may present rarely with valvulopathies as seen in our index case.
62 Birrell [5] et al reported that children with undiagnosed thyrotoxicosis in the northern region of
63 England have initially been referred to cardiologists with a heart murmur, gastroenterologists
64 with diarrhoea and failure to thrive, as well as to psychiatric/psychology services because of
65 challenging behaviour and school refusal. Griffith [6] et al also reported a 16-year-old girl with
66 complaint of chest pains, palpitations and a new onset heart murmur with bilateral exophthalmos
67 and thyromegaly.

68 **There may a link between race and mitral regurgitation in children with thyrotoxicosis.**
69 **For instance. Lester [7] et al studied 18 hyperthyroid children (9 black and 9 white), six out**
70 **of the 9 black children had findings of mitral regurgitation while none of the white children**
71 **had MR. Our index patient is of a black race. [7]**

72 There may be some genetic link with thyrotoxic valvopathy. A study done in Canada by Stefani
73 Doucette [8] et al of a 36-year woman who had been treated for thyrotoxicosis in pregnancy and
74 was eventually delivered of a neonate who had features of thyrotoxicosis. Further examination
75 revealed a systolic murmur at the lower sternal border and echocardiography finding of moderate
76 to severe tricuspid valve regurgitation. We could not follow up the siblings and parents of our
77 index patient for financial reasons. [8]

78 The clinical features range from an asymptomatic presentation to overt signs of cardiac
79 decompensation as seen in our patient. In a study by Ertek [9], the most frequent clinical features
80 were palpitation, tachycardia, exercise intolerance, exertional dyspnoea and orthopnoea. Saxena
81 et al reported Tachycardia, elevated blood pressure with wide pulse pressure, precordial apical
82 systolic murmur. It could also be asymptomatic.

83 The investigations for diagnosing a hyperfunctioning thyroid gland; Echocardiography and ECG
84 are important for the diagnosing CVS pathology in thyrotoxicosis. Echocardiography findings
85 range from demonstrating regurgitant flow in the valves (especially mitral valve) to structural
86 changes in the valve (prolapse). [2] **This was also reported in our index case ECG can show**
87 **fibrillatory waves indicative of atrial fibrillation. In the index case, the mitral regurgitation**
88 **could be from the functional and hyperdynamic effects of the thyrotoxicosis as there were**
89 **no further lesion of the mitral valve and this is always reversible after treatment. [10,11]**

90 Treatment of thyrotoxic valvopathy include the use of diuretics and anti-failure medications and

91 rarely valve replacement surgeries. [1-3] The prognosis is good especially in the paediatric
92 population Most of the valvular manifestations are “functional”. They resolve entirely or become
93 less problematic with treatment of the hyperthyroidism Resolution is within weeks to months of
94 starting the antithyroid medications. [2-4] The index case has improved remarkably and has been
95 on follow up.

96 **Conclusion**

97 Hyperthyroidism affects multiple organ systems in the body and the heart is not spared. Most of
98 the cardiac manifestations are functional and occur as a result of the hyperfunctioning gland. A
99 high index of suspicion is required, as many of the patients present with only the consequences
100 of hyperthyroidism

101 **Declaration**

102 **Funding:** This study was not funded by any organization. We bore all the expenses that accrued
103 from in study.

104 **Conflicts of Interest:** The authors declare that they have no competing interests.

105 **Ethical approval:** Not applicable

106 **Consent to participate:**

107 Patients and parents or caregivers were duly informed in detail about the disease.

108 **Written Consent for publication:** This was obtained for the purpose of publication of this
109 article.

110 **Availability of data and materials:** Data are however available from the authors upon
111 reasonable request and with permission of the corresponding Author

112 Code availability (software application or custom code): Not Applicable

113 **Authors' contributions:**

114 **CJM** conceived and designed this study while **UFA,EN, ASA** helped in critical revision of the
115 article. All authors have read and approved the manuscript.

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