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Prevalence of inappropriate sinus tachycardia among patients with sinus tachycardia

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Abstract---Background: The inappropriate sinus tachycardia (IST) is a syndrome characterized by increased heart rate with disturbing symptoms without obvious cause. IST is defined as a sinus heart rate > 100 bpm at rest with a mean 24-hour heart rate >90 bpm not due to primary causes and is associated with distressing symptoms. This study aims to assess the prevalence of inappropriate sinus tachycardia (IST) among patients presented with sinus tachycardia. Methods: This study enrolled 107 patients. All had been referred to the cardiac center of Shar teaching hospital of Sulaimaniyah city/Iraq, for tachycardia assessment. All candidates had been evaluated first by ECG, those who had resting heart rate more than 100 and had sinus rhythm were selected and further assessed by 24 hours cardiac Holter monitoring. Patients met criteria for IST when a sinus heart rate of ≥ 100 beats/minute at rest with a mean 24-hour HR of ≥ 90 bpm, in the absence of any primary cause. Results: One hundred seven patients were enrolled, majority (70.1%) were females. 40.2 % of them were in age group of 20-29 years old. The prevalence of IST is 4.7% (5 patients). Three of them were females and two were males. 80% of IST patients were in age group of 20-29 years old while the remaining were 30-39 years old. almost all patients with IST had palpitation. None of IST patients had concomitant chronic diseases. All of them were neither smoker nor alcohol drinker. All had normal. None of IST patients had abnormal Echocardiography or abnormal thyroid function test. Conclusions: The prevalence of IST was 4.7 %, this result reflect the fact that IST is probably more common than previously thought. More common in young age females.

Keywords---inappropriate sinus tachycardia, prevalence, sinus tachycardia, electrocardiography.

Introduction

The inappropriate sinus tachycardia (IST) is a syndrome characterized by increased heart rate with disturbing symptoms without obvious cause. IST is defined as a sinus heart rate > 100 bpm at rest with a mean 24-hour heart rate >90 bpm not due to primary causes and is associated with distressing symptoms. (1). Although it is considered benign but some time associated with symptoms, which may be lead to limitation of daily activity and very rarely may lead to tachycardia induced cardiomyopathy. (2) IST patients have wide range of symptoms; the most common one is palpitation while other patients may be presented with lightheadedness, dyspnea and dizziness. (3) previously was thought to be uncommon but IST diagnosis has been increasing recently because of better diagnostic tools and more specific clinical criteria (4)

It is essential for the diagnosis of IST to exclude other causes of sinus tachycardia, like anemia, hyperthyroidism, infection, heart failure, drugs, anxiety and others. therefore need to perform a thorough history taking and clinical examination , laboratory tests like thyroid function test and full blood count, 12-lead ECG , 24 hours ambulatory cardiac Holter monitoring and Echocardiography, so IST is a diagnosis of exclusion and can only be made after other etiologies for tachycardia have been ruled out. (5-8) There are limited studies in regard to the prevalence of IST , in one study which was done on 604 asymptomatic middle aged hypertensive patients the prevalence was 1.16% (3) , while in another study prevalence was 4.98% among 1265 retrospectively evaluated symptomatic patients. (9)

The real mechanism of IST until now is not well understood. Abnormal automaticity of sinus node and autonomic dysfunction have been proposed to play important role.(10-13), another study reached to the conclusion that IST patients do not have abnormal sinus node automaticity instead IST patients have more sympathetic tone.(14) Other data support the idea that the sinus rate elevation in IST is independent of an autonomic mechanism(15), in another study postulated presence of anti β - receptor antibodies as a cause for IST, the presence of these antibodies may cause receptor activation and second messenger mediated calcium influx and depolarisation (16) In clinical studies , the role of neuropeptide neurotransmitters (17) , β - adrenergic receptor supersensitivity (18), M2 receptor blockade (19, 20), have been considered. another speculation is that halogenated hydrocarbons can sensitize the myocardium to catecholamines which may accelerate the sinus rate. (21, 22) anxiety also considered to play role as a mechanism for IST although further clinical trials is needed to confirm the psychogenic basis of IST. (23)

The aim of IST treatment is to relieve symptoms, which is not easy because of the obscured mechanism and nonspecific presentation (6). Symptoms may not improve by decreasing heart rate (6,7). Treatment may include pharmacotherapy, catheter ablation or lifestyle modifications (24-37). Medications used to decrease heart rate either by affecting β - adrenergic receptors or calcium channel or inhibition of the I(f) current. Calcium channel blockers and β blockers show limited benefits possibly due to lack of randomized controlled trials and their side effects, while ivabradine may be beneficial because it blocks the

hyperpolarization-activated cyclic nucleotide-gated channel and inhibits the I(f) current. (7, 26-30) Invasive procedures may be considered when medications and life style modifications fail to alleviate symptoms such as ablation.(31) various types of cardiac tissue ablation is available like radiofrequency , cryoablation , light amplification by stimulated emission of radiation (Laser) and microwave ablation. (38)

Methods

In this cross-sectional study, we enrolled 107 patients. All had been referred to the cardiac center of Shar teaching hospital of Sulaimaniyah city/Iraq, for tachycardia assessment. All candidates had been evaluated first by electrocardiography (ECG), those who had resting heart rate more than 100 and had sinus rhythm were selected and further assessed by 24 hours cardiac Holter monitoring. Patients met criteria for IST when a sinus heart rate of ≥ 100 beats/minute at rest with a mean 24-hour HR of ≥ 90 bpm, in the absence of any primary cause. (1)

Those who met the criteria for enrollment thoroughly evaluated for their age, gender, main presenting symptom, BMI, current smoking status, alcohol consumption, history of chronic diseases, medication history and echocardiography. The following were regarded as inclusion criteria: age 18 years and above, resting heart rate more than 100 and mean heart rate more than 90.

Those candidates whose age are less than 18 years , resting heart rate less than 100 or mean heart rate less than 90 and any patient with tachyarrhythmia or bradyarrhythmia were excluded from this study. All subjects included in the study were informed, and they expressed their informed consent for participation in this study. The local ethical Committee approved the study design.

Results

In our study, 107 patients were enrolled, majority (70.1%) were females. 40.2 % of them were in age group of 20-29 years old (Table 1). Causes of sinus tachycardia among all participants is shown in (Table 2). The prevalence of IST is 4.7% (5 patients). Three of them were females and two were males (Table 3). 80% of IST patients were in age group of 20-29 years old while the remaining were 30-39 years old (Table 4).almost all patients with IST had palpitation (Table 5). None of IST patients had concomitant chronic diseases (Table 6). All of them were neither smoker nor alcohol drinker (Table 7 and 8). All had normal BMI (Table 9). None of IST patients had abnormal Echocardiography or abnormal thyroid function test.

Table 1: Age distribution among all participants

Age Groups					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20 - 29 Years	43	40.2	40.2	40.2
	30 - 39 Years	24	22.4	22.4	62.6
	40 - 49 Years	27	25.2	25.2	87.9
	50 - 59 Years	13	12.1	12.1	100.0

	Total	107	100.0	100.0	
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Table 2: Causes of sinus tachycardia among all participants

Causes	Frequency	Percent
Anemia	18	16.8
Hyperthyroidism	9	8.4
HF	10	9.3
Medication	19	17.8
None	5	4.7
Fever	6	5.6
Autonomic neuropathy	4	3.7
Aortic regurgitation	4	3.7
VSD	1	.9
Alcohol	5	4.7
Caffeine	5	4.7
Pregnancy	4	3.7
Smoking	4	3.7
ASD	3	2.8
Pericarditis	1	.9
MVP	3	2.8
Pain	3	2.8
Mitral regurgitation	3	2.8
Total	107	100.0

Table 3: comparison between IST and Non-IST in association to gender

			Sinus Tachycardia causes		P value
			IST	Non IST	
Gender	Male	Count	2	30	0.6*
		percent	40.0%	29.4%	
	Female	Count	3	72	
		Percent	60.0%	70.6%	
Total		Count	5	102	
		Percent	100.0%	100.0%	

*P- value was calculated using Fisher's Exact Test

Table 4: comparison between IST and non-IST in association to age

			Sinus Tachycardia causes		P value
			IST	Non IST	
Age Groups	20 - 29 Years	Count	4	39	0.31
		percent	80.0%	38.2%	
	30 - 39 Years	Count	1	23	
		percent	20.0%	22.5%	
	40 - 49 Years	Count	0	27	
		percent	0.0%	26.5%	
	50 - 59 Years	Count	0	13	

		percent	0.0%	12.7%	
Total		Count	5	102	
		percent	100.0%	100.0%	

Table 5 : comparison between IST and non-IST in association to symptoms

			Sinus Tachycardia causes		P value
			IST	Non IST	
Symptoms	Palpitation	Count	5	61	0.63
		Percent	100.0%	59.8%	
	Dyspnea	Count	0	23	
		Percent	0.0%	22.5%	
	Weakness	Count	0	8	
		percent	0.0%	7.8%	
	Dizziness	Count	0	10	
		percent	0.0%	9.8%	
Total		Count	5	102	
		Percent	100.0%	100.0%	

Table 6: comparison between IST and non-IST in association to chronic diseases

			Sinus Tachycardia causes		P value
			IST	Non IST	
Chronic Diseases	No history	Count	5	57	0.92
		percent	100.0%	55.9%	
	Hypertension	Count	0	15	
		percent	0.0%	14.7%	
	Asthma	Count	0	8	
		percent	0.0%	7.8%	
	Diabetes	Count	0	10	
		percent	0.0%	9.8%	
	Hypothyroidism	Count	0	5	
		percent	0.0%	4.9%	
	IHD	Count	0	5	
		percent	0.0%	4.9%	
Total	RA	Count	0	2	
		percent	0.0%	2.0%	
		Count	5	102	
		percent	100.0%	100.0%	

Table 7: comparison between IST and non-IST in association to smoking

			Sinus Tachycardia causes		P value
			IST	Non IST	
Smoking	Yes	Count	0	28	
		Percent	0.0%	27.5%	
	No	Count	5	74	
		percent	100.0%	72.5%	

Total	Count	5	102	0.32
	percent	100.0%	100.0%	

Table 8: comparison of IST and non-IST in association to alcohol drinking

			Sinus Tachycardia causes		P value
			IST	Non IST	
Alcohol	Yes	Count	0	9	0.63
		percent	0.0%	8.8%	
	No	Count	5	93	
		percent	100.0%	91.2%	
Total		Count	5	102	
		percent	100.0%	100.0%	

Table 9: comparison between IST and non-IST in association to BMI

			Sinus Tachycardia causes		P value
			IST	Non IST	
BMI group	Normal weight	Count	5	49	0.11
		percent	100.0%	48.0%	
	Over weight	Count	0	33	
		percent	0.0%	32.4%	
	Obese	Count	0	20	
		percent	0.0%	19.6%	
Total		Count	5	102	
		percent	100.0%	100.0%	

Discussion

There were few studies have been conducted previously searching for the prevalence of IST. In current study, the prevalence of IST was 4.7% among those patients presented for evaluation of sinus tachycardia, a retrospective study conducted by Şimşek et al. on 1834 patients who underwent 24 hours Holter monitoring for different indications between year 2015-2016 in a single center reported a prevalence of IST of 4.98% . (9) While another study done by Still et al. on a random sample of 604 middle-aged asymptomatic subjects found the prevalence of IST was 1.16% . (3) The difference in the prevalence of IST in the present study in compare to previous study possibly related to broader age range inclusion and to the selection of symptomatic patients in current study.

In present study female more commonly recorded with IST(60%) than male, nearly same result (60.3%) was observed by Şimşek et al (9) , the reason why female more predominantly recorded is not obvious but may be due that female more commonly seek medical advice for tachycardia , while a study done by Rubinstein et al (39) all the enrolled patients were female (22 patients) . a study which had been conducted by Still et al (3) both male and female approximately equally reported (55% V 57%), this equality was possibly due to they only enrolled asymptomatic cases.

Age distribution in our study for those patients with IST show that 80% were in age group of 20-29 years old, the remaining 20% were 30-39 years old. In Rubinstein et al. study the mean age was 32.6 ± 9 years. (39) It was 39.67 ± 17.36 in Şimşek et al (9), while Still et al (3) reported 47 ± 7 . In our study all, the patients with IST were free from concomitant chronic diseases, in a study conducted by Şimşek et al (9), 28.6% had hypertension and 9.5% had diabetes mellitus. The reason why in current study all the patients had no concomitant chronic diseases because we tried to exclude all the possible causes of sinus tachycardia especially the diabetes that is one of the causes of autonomic neuropathy.

Conclusions

In this study the prevalence of IST was 4.7 %, this result reflect the fact that IST is probably more common than previously thought. More common in young age females.

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Conflict of Interest

The authors declared no conflict of interest in this research.

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