Case Report

Nursing Intervention in Overcoming Decreased Cardiac Output in Patients with a Medical Diagnosis of Inappropriate Sinus Tachycardia (IST) in CICU Room

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ABSTRACT

Inappropriate Sinus Tachycardia (IST), which is a condition in which a person has a heart rate of more than 100 beats per minute for no apparent reason and if left untreated it will last for months or even years. Inappropriate sinus tachycardia can cause myocardial ischemia, reduce ventricular filling time, cause decreased cardiac output, cardiomyopathy, cardiac arrest, and death. in Indonesia itself there are no studies on IST so that researchers are interested in explaining interventions that can be done to reduce discomfort in IST patients. This research uses case studies. A 30 year old woman came to the hospital with complaints of palpitations, dyspnea, nausea and vomiting. Patients are given bed rest management, hemodynamic monitoring (vital signs, lab electrolytes, EKG), administration of oxygen, deep breathing relaxation for 3 days with a duration of 10 minutes. The results of the study found complaints of chest palpitations in patients resolved with HR: 60x/minute, BP: 98/86 mmHg, RR: 17x/minute, SpO2: 99%, complaints of nausea, vomiting and tightness in patients resolved and on the last day obtained Electrolyte test results were within normal limits. The patient was given non-pharmacological therapy, namely deep breathing relaxation therapy with the result that the patient experienced a decrease in heart rate and an increase in oxygen saturation. Giving deep breathing relaxation techniques will automatically stimulate the sympathetic nervous system to reduce levels of catecholamine substances, causing blood vessels to dilate and eventually blood pressure, heart rate, respiratory rate decrease.

Introduction

Tachycardia is a condition where the heart rate is above normal. In normal humans, the heart beats regularly as much as 60-100 times per minute. Tachycardia occurs when the heart beats more than 100 times per minute, whether it's a regular or irregular beat. Tachycardia generally occurs in response to stress, illness or due to drug use or consumption of caffeine. Inappropriate Sinus Tachycardia (IST) is a condition in which a person has a resting heart rate of more than 100 beats per minute and an average heart rate in Holter 24 hours of more than 90 beats per minute, without clear physiological, pathological or pharmacological triggers (Ahmed, 2022). There is a retrospective study of 63 patients (4.98%) of 1265 patients diagnosed with IST (Inappropriate Sinus Tachycardia) based on the Heart Rhythm Society (HRS) (Shabtaie & Witt, 2020). Based on research conducted by Mustafa (2022) there were patients diagnosed with IST of 4.7% (5 patients), with 80% of the patients being in the age group of 20-29 years while the rest were aged 30-39 years. IST usually affects younger female individuals between the ages of 15 and 45 years with a prevalence 4 times higher than that of men (Ahmed, 2022).

Inappropriate Sinus Tachycardia (IST) is a clinical syndrome characterized by a sinus heart rate >100 beats per minute at rest and an average 24-hour Heart Rate >90 beats per minute without an identifiable cause. A study conducted by Shabtaie & Witt (2020) on 305 IST patients found that the results of symptoms felt by patients included palpitations (89.8%), chest pain (51.5%), fatigue (50.5%), shortness of breath (37 .0%), presyncope (37.0%), and syncope (22.0%) were the most frequently reported symptoms.

The diagnosis of IST requires exclusion of other causes of tachycardia including drugs or substances (such as anticholinergics, caffeine, and alcohol) or medical conditions (such as panic attacks, pulmonary embolism, fever, hyperthyroidism, hypovolemia, anemia, and pain). Mustafa (2022) also stated that this is very important for the diagnosis of IST by excluding other causes of sinus tachycardia, such as anemia, hyperthyroidism, infection, heart failure, drugs, anxiety and others. Therefore it is necessary to do a thorough history and clinical examination, laboratory tests such as examination of thyroid function and complete blood count, 12-lead ECG, 24-hour outpatient cardiac Holter monitoring and echocardiography, so that IST is a diagnosis of exclusion and can only be done after other etiologies have been diagnosed. tachycardia has been ruled out.

Mechanisms of IST include nodal abnormalities, autoantibodies that stimulate beta-adrenergic receptors, beta-adrenergic receptor supersensitivity, muscarinic receptor autoantibodies, or hyposensitivity, impaired baroreflex control, depression of parasympathetic/vagal efferent function, nociceptive stimulation, central autonomic overactivity, neurohumoral modulation deviate, etc. Inappropriate sinus tachycardia can cause myocardial ischemia, reduce ventricular filling time, result in decreased cardiac output, cardiomyopathy, cardiac arrest, and death (Krawiec, 2022). Decreased cardiac output, namely the inadequacy of the heart pumping blood to meet the body's metabolic needs (SDKI DPP PPNI Working Group Team, 2017). In IST patients, there is an imbalance between sympathetic and parasympathetic which ultimately increases the heart rate, causing the patient to experience symptoms of palpitations, which causes a decrease in diastolic feeling and can ultimately cause symptoms of shortness of breath and nausea and vomiting in patients (Ahmed et al., 2022). According to Purba et al. (2016) complaints of shortness in patients occur when there is a decrease in cardiac output there are changes that occur in the respiratory muscles so that this can result in oxygen supply throughout the body. So it is necessary to immediately carry out the management of IST, namely pharmacological and non-pharmacological.

The management of IST itself is divided into pharmacological and non-pharmacological. Pharmacological therapy is by administering drugs while non-pharmacological is a healing strategy without using drugs but rather caring

behavior (Mayasari, 2016). Pharmacology such as administering ivabradine, beta blockers or by performing ablation procedures. Non-pharmacological management, namely avoiding triggers or stimulants, including caffeine, nicotine, and alcohol, providing oxygenation, deep breathing relaxation therapy. This is in accordance with what Febtrina (2019) did, namely deep breathing relaxation therapy can reduce Heart Rate. Based on Bashir (2018) deep breathing relaxation will increase baroreceptor sensitivity by stimulating autonomic nervous responses through the release of endorphin neurotransmitters which have an effect on decreasing sympathetic nerve responses and increasing parasympathetic nerve responses so that they can slow down and balance brain waves and affect the stability of blood pressure, pulse and respiration.

Managing IST (controlling symptoms and reducing rates) remains a major challenge, especially because the syndrome itself is equivocal. In IST patients, hemodynamic monitoring and nursing interventions are needed to maintain hemodynamic status (blood pressure, heart rate, respiration). In Indonesia itself, there have been no studies discussing IST, and there is no literature regarding the prevalence of IST sufferers in Indonesia. Therefore researchers are interested in developing this case study which aims to intervene in IST to maintain hemodynamic status in patients so that it can be a reference for reducing discomfort in patients and improving health status in patients and preventing complications that can arise.

Method

This study uses a case study design which is research by examining a problem through a case. Data collection was carried out on November 22, 2022. The data collection technique in this study was primary and secondary data. Primary data is data sourced from patients while secondary data is derived from the patient's family and medical records. Then do data analysis and formulation of diagnoses which are then carried out planning and implementation as well as evaluation on patients.

Patient Information

Mrs.A, 30 years old, came to the emergency room at the hospital with complaints of weakness, palpitations, nausea, vomiting and shortness of breath. The patient said SMRS (Before Admission to the Hospital) In the morning at 07.00 the patient experienced palpitations and fainted in the bathroom of the halfway house for 2 minutes and was immediately examined by volunteers at the halfway house using an oximeter with HR: 170x/minute and immediately given ivabradine (7.5 mg) 1x7.5 mg PO. The client said the complaint was accompanied by vomiting 4 times. The client was transferred immediately to the CICU room (November 21 2022) Dr. Hasan Sadikin General Hospital with the main complaint of heart palpitations, nausea, vomiting. The patient said that since grade 1 high school he often fainted during ceremonies or sports (tired easily). The client said that 7 years ago he went to the cardiac clinic at his place and received treatment, namely Ivabradine 2x7.5 mg, Bisoprolol 1x10 mg, and digoxin 1x0.25 mg. The client said that he had previously been treated in a hospital inpatient room on October 15-November 9 2022 (25 days) with complaints of chest palpitations felt almost every day for 15 years. Complaints are felt to increase during activities and anxiety. Complaints are accompanied by fainting for about 2 minutes and then the client is conscious on his own. Complaints are not accompanied by chest pain. The client says he has no history of high blood pressure. The client says there is no family history of heart disease like the client. The client says his mother has a history of high blood pressure and diabetes.

Clinical Findings

Examination of vital signs found the patient was compos mentis (E4M6V5), BP 117/65 mmHg mmHg, RR: 27x/minute, T: 36.4 C, HR: 128 x/minute. General status found head, neck, thorax in normal condition, in the abdomen bowel sounds 6x/minute, during cardiac examination sounds S1, S2 were heard, there were no additional S3 sounds. Anthropometric

examination obtained Weight: 44 kg, Height: 159 cm, BMI: 17 (Light Thin) Classification based on the Ministry of Health.

The supporting examinations carried out were blood laboratory, abdominal ultrasound, abdominal CT, thoracic CT, contrast head CT, EEG and EKG. Blood laboratory results showed that there were high and low leukocyte counts, namely, segmented neutrophils 76% (45-73%), lymphocytes 17% (18-44%), fasting glucose 106 mg/dL (70-100 mg/dL). EEG examination results (October 21, 2022): No epileptigenic waves were found. Ultrasound of the abdomen (19 October 2022) did not show paraaortic/parailiac KGB. Ultrasound of the liver, bladder, spleen, pancreas, bilateral kidneys and urinary bladder found no abnormalities. CT Thorax (21 November 2022) Results: Chest is symmetrical, skeletal and soft tissue visualized within normal limits, trachea in the middle of the mediastinum is not enlarged, COR is enlarged (-), Conclusion: no bronchopneumonia or pneumonia, no cardiomegaly is seen, CT head contrast (November 4, 2022) Conclusion: no signs of bleeding, SOL, Neoplasms and vascular malformations. Abdomen CT examination results (November 23, 2022) Conclusion: there is a smaller size picture in multiple (hypothyroid) lymph nodes, no cardiomegaly is seen. The EKG results showed sinus tachycardia

In this case the patient experienced a decrease in cardiac output with HR: 128x/minute, RR: 27x/minute, initial SpO2 of 94%, nausea, vomiting, Sinus Tachycardia ECG results.

Diagnostic Assessment

Diagnostic planning goals decrease in cardiac output is that after taking action for 3 days there is an improvement in the patient (pulse, respiration, blood pressure, oxygen saturation) within normal limits.

Theurapetics Intervention

The management given to overcome decreased cardiac output in patients is bed rest, the patient experiences an increase in Heart Rate thereby reducing diastolic Feeling resulting in a decrease in blood supply to the patient's coronary arteries and can cause pain in the patient, Semi-Fowler's position, Relaxation of deep breathing to increase O2 supply to patients and can reduce Heart Rate in patients by asking the patient to close their eyes then take a deep breath through the nose and then exhale slowly through the mouth with an expiratory phase 2 times longer than the inspiratory phase 3 times, giving oxygen using a nasal cannula (adjusted to the patient's SpO2) 3 lpm, Monitoring the patient's hemodynamics (vital signs, laboratory results (electrolytes), intake-output). Collaboration with nutritionists giving honey water (patients cannot drink plain water), to reduce nausea and vomiting felt by collaborative clients giving Lansoprazole 30 mg capsules (1x1 PO), Sucralfate syp 500 mg/ml (15 ml dose) 3x1 PO), collaboration Bisoprolol Fumarate 10 mg (1x10 mg PO), Ivabradine tablets (2x7.5 mg) PO, Herbesser caps 100 mg (1x1 PO), Trihexyphenidyl tab 2 mg (1 mg dose) 2x1/2 tab PO.

Results

On November 22, 2022 (08.30) the patient complained of palpitations, shortness of breath, nausea and vomiting (a sign of decreased cardiac output) so monitoring of vital signs (TTV) was carried out, in addition to collaborating with the administration of ivabradine tab (2 x 7.5 mg), collaboration giving Sucralfate syp 500 mg/ml (dose 15 ml) 3x1 PO) Lansoprazole 30 mg capsules (1x1 PO), fulfilling oxygenation using a 3 lpm nasal cannula, positioning the patient in semi-Fowler's position and providing deep breathing relaxation therapy.

Day	1	2	3
HR	128	57	60
RR	27	19	17
TD	117/65	96/37	98/86
SpO2	94	99	99
ECG	Sinus Tachycardia	Sinus bradycardia	Sinus bradycardia

Electrolyte Lab results on day 3

Inspection	Result
Sodium	138 mEq/L
Potassium	3.8 mEq/L
Calsium	4.9 mg/dL
Magnesium	2.3 mg/dL

From table 1, the results obtained on November 24, 2022 (day 3) the patient experienced improvement with HR: 60x/minute, BP: 98/86 mmHg. On the 3rd day, the electrolyte examination results were within normal limits.

On November 24 2022 the client experienced an increase in appetite, no complaints of nausea and vomiting, the portion of food consumed had increased. The overall results obtained complaints of chest palpitations, tightness, nausea, vomiting resolved.

Discussion

From the results of a case study conducted in patients with inappropriate sinus tachycardia (IST) who were female and aged 30 years, this is consistent with a study conducted by Ahmed (2022) IST usually affects younger female individuals between the ages of 15 and 45 years with a prevalence 4 times higher than men. In Kemal's study (2020) among 1265 patients with sinus rhythm, 4.98% (n = 63) experienced IST with 54% aged less than 35 years and 60.3% female. From the results of the study conducted, it was found that the patient had a pounding chest accompanied by an ECG picture of sinus tachycardia for approximately 15 years, this was also mentioned in accordance with the study of Olshansky & Sullivan (2013) that untreated sinus tachycardia can continue for months or years years and may produce disturbing symptoms, most commonly palpitations. However, other common symptoms include chest discomfort, fatigue, dizziness, presyncope, syncope and shortness of breath. Most patients have a resting heart rate of more than 100 beats per minute and a 24-hour Holter average heart rate of more than 90 beats per minute, with no apparent physiological, pathological, or pharmacological trigger (Ahmed, 2022).

Inappropriate sinus tachycardia can cause myocardial ischemia, reduce ventricular filling time, result in decreased cardiac output, end organ failure, cardiomyopathy, cardiac arrest, and death (Krawiec, 2022). In IST patients, there is an increase in sympathetic nerves which has an impact on diastolic feeling and results in a decrease in blood supply to the coronary arteries. IST patients are generally given ivabradine and bisoprolol which, if the two drugs are combined, can cause a decrease in heart rate below normal (bradycardia) so that it can result in a return The patient has decreased cardiac output. Decreased cardiac output, namely the inability of the heart to pump adequate blood to meet the tissue's need for oxygen and nutrients causes decreased cardiac output. In this case oxygen should be given to patients with shortness of breath, or oxygen saturation <95%. Providing oxygenation to IST patients is one of the therapies that aims to maintain adequate tissue oxygenation and can reduce myocardial work due to lack of oxygen supply. Oxygen is needed by myocardial cells to maintain their function, which is obtained from the coronary circulation (Wulandari et al., 2020). The patient had complaints of shortness of breath and was given nasal cannula oxygen at 3 lpm. After being given O2 with a nasal cannula of 3 lpm the O2 saturation becomes 99%. Giving oxygen to patients can increase the supply of oxygen to the heart muscle, correct oxygen imbalances and prevent infarction in patients so as to prevent complications that can occur. Increasing FiO2 (percentage of oxygen delivered) prevents tissue hypoxia, whereby increasing FiO2 will also increase PO2, this is a factor that greatly determines oxygen saturation, when PO2 is high, hemoglobin carries more oxygen and when PO2 is low, hemoglobin is also low. carry oxygen (Darmawan, 2019).

Patients are given non-pharmacological therapy. Non-pharmacological therapy is a pain relief strategy without using drugs but rather Caring behavior (Mayasari, 2016). The patient was given non-pharmacological therapy, namely deep breathing relaxation therapy for 3 days for

10 minutes every day with the result that the patient experienced a decrease in heart rate and an increase in oxygen saturation on day 3 and the patient had constant O2 saturation at 99%. The relaxation process can inhibit the autonomic nervous system and central nervous system, in addition to increasing the parasympathetic nervous system. The parasympathetic nervous system controls the digestive system, respiratory system, and heart rate during periods of rest (Fitriyah et al., 2019). Febtrina (2019) also stated that the administration of a deep breathing relaxation technique will automatically stimulate the sympathetic nervous system to reduce levels of catecholamine substances, causing blood vessel dilation and ultimately blood pressure, heart rate, respiratory frequency to decrease. Deep breathing stimulates stretch receptors, increases vagal tone, reduces sympathetic activity and the result is that it can reduce heart rate (Fitriyah et al., 2019). Deep breathing relaxation consists of slow breathing from the point of inhalation before slowly exhaling. Deep breathing relaxation can increase oxygen saturation and relaxed conditions (Upoyo & Taufik, 2019). The results of this study are in line with those conducted by Perciavalle et al. (2017) stated that relaxation techniques can improve mood and reduce heart rate. In Bashir's study (2018) it was found that there was a significant change in the patient's pulse before and after the intervention was given. The average value of the patient's pulse before administering the deep breathing relaxation technique was 83.30 and after administering the deep breathing relaxation technique the patient's pulse changed to 79.87. Deep breathing relaxation techniques can reduce the intensity of nausea, increase lung ventilation, reduce anxiety and increase blood oxygenation (Suryono et al., 2020). IST patients can undergo catheter ablation but it is very rare and only done as a last resort after other therapies are given and ineffective (Amin, 2019).

Inapproriate sinus tachycardia is a chronic medical condition and can be associated with a significant reduction in quality of life. Treatment is diverse and remains a major challenge especially because IST is a complex syndrome. Interprofessional collaboration is needed because through good collaboration and collaboration, patient safety, satisfaction, and quality of life increase. Managing patients with IST namely lifestyle modification, non-pharmacological and pharmacological interventions. In this case, patients are advised to reduce their intake of caffeine and other stimulants, carry out regular sports activities and maintain adequate fluid and salt intake (Ruzieh et al., 2018).

Conclusions

Inappropriate Sinus Tachycardia (IST) is a clinical syndrome characterized by a sinus heart rate >100 beats per minute at rest and an average 24-hour Heart Rate >90 beats per minute without an identifiable cause. In this case the patient experienced the most common symptoms of palpitations, shortness of breath, nausea and vomiting. The patient has been given management including lifestyle modification, compliance with oxygenation, non-pharmacological interventions deep breathing relaxation which can reduce heart rate while also reducing respiration rate and increasing oxygen saturation, administering oxygenation.

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