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STUDY ON OUTCOME OF DIGOXIN USE IN HEART FAILURE PATIENTS

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ABSTRACT

Aim and Objective: To compare the effectiveness and safety of the treatment with digoxin (exposed) and without digoxin (Unexposed) in heart failure patients. **Materials and Methods:** A prospective comparative study was carried out in Sri Jayadeva Institute of Cardiovascular Sciences and Research, Mysuru, Karnataka. Data were analyzed using SPSS, Excel and compared between group which had digoxin therapy and which do not have digoxin therapy for heart failure. **Result:** The study involved 200 patients, with 55.5% male and 44.5% female. In the exposed group (75 patients), the mean ejection fraction was 38.5, and in the unexposed group (125 patients), it was 40.4. Heart rate means were similar between the exposed (87.72) and unexposed (87.48) groups. Hospital stays were comparable, with a mean of 5.20 days in both groups. Sodium levels were slightly lower in the exposed group, while potassium levels were similar. Urea and creatinine levels also showed little variation between groups. Adverse drug reactions occurred in 32 patients from the unexposed group and 46 from the exposed group, with different severity levels. **Conclusion:** There is no difference between effectiveness in the exposed group and unexposed group, but the safety is more in unexposed group.

KEYWORDS: Digoxin, Heart failure, Toxicity.

INTRODUCTION

Heart failure is a syndrome of ventricular dysfunction. It is mostly brought on by damage to the myocardium from a number of conditions, such as ischemic heart disease, diabetes, and hypertension.[1]

Initial clinical diagnosis is backed by chest x-ray, echocardiography, and plasma natriuretic peptide levels.

Patient education, diuretics, ACE inhibitors, angiotensin II receptor blockers, beta-blockers, aldosterone antagonists, neprilysin inhibitors, sinus node inhibitors, specialised implantable pacemakers/defibrillators, and other devices are all used in the treatment of heart failure syndrome, along with addressing the underlying cause(s) of the condition.

Heart failure can cause organ congestion because the heart may not be able to supply tissues with enough blood to meet their metabolic needs. This disorder can be brought on by issues with either the systolic or diastolic functions, or frequently both.

Both heart failure with reduced ejection fraction and heart failure with retained ejection fraction are prevalent classifications for heart failure. Acute or chronic heart failure, left or right ventricular failure, or biventricular failure are further classifications that can be made for it.

Global LV systolic dysfunction, often known as systolic HF, is the most common symptom in HFrEF. Poor LV contraction and insufficient ejection result in higher diastolic volume and pressure and a lower ejection fraction.

Digoxin, a cardiac glycoside, is prescribed to treat mild to severe heart failure as well as chronic atrial fibrillation by lowering the rate at which the heart beats.

For the best outcomes, digoxin should be administered to patients with heart failure in conjunction with a diuretic and an ACE inhibitor when clinically appropriate.

Digoxin is indicated in the following conditions:
1) To treat adult patients with mild to severe heart failure.
2) In order to boost myocardial contraction in kids with heart failure.
3) To maintain ventricular rate regulation in adults with chronic atrial fibrillation.

Digoxin causes the heart to beat faster and harder since it is a positive inotropic and a negative chronotropic drug. There is a little therapeutic window for digoxin.

Digoxin affects the cardiovascular system in ways that are hemodynamic, electrophysiologic, and neurohormonal. It results in the temporary inhibition of the Na-K ATPase enzyme, which has a number of advantageous effects. The Na-K ATPase enzyme regulates the entry and exit of sodium, potassium, and calcium to maintain the intracellular environment (indirectly). The sodium pump is another name for the Na-K ATPase. The myocardial cells intracellular sodium and calcium levels rise as a result of the sodium pump blockade by digoxin, increasing the contractile force of the heart. This improves the left ventricular ejection fraction (EF), a critical marker of heart health.

Digoxin also lowers heart rate by stimulating the parasympathetic nervous system via the vagus nerve, which has an influence on the sinoatrial (SA) and atrioventricular (AV) nodes. Neurohormonal activation, which increases norepinephrine as one of its components, has a role in the pathophysiology of heart failure. Digoxin helps to lower norepinephrine levels by stimulating the parasympathetic nervous system.

MATERIALS AND METHODS

Study design: The study was a prospective comparative study.

Study site: The study was conducted in Sri Jayadeva Institute of Cardiovascular Sciences and Research, Mysuru, Karnataka.

Study population: We observed 200 cases in the period of study.

Study period: Study was carried out for a period of Six months.

Inclusion criteria

- Patients of both the genders were included.
- Patients of age 18 years and above
- Patients diagnosed with heart failure.
- Patients receiving digoxin along with the standard treatment were included in the exposed group.
- Patients receiving standard treatment without digoxin were included in the unexposed group.

Exclusion criteria

- Incomplete medical or medication information
- Patients not willing to participate in the study
- Patients under the age of 18 years.
- Medico legal cases

Study tools

1. Data Collection Form: It included all the relevant data of the enrolled patients, such as demographics like name, age, gender, IP number, date of admission, address and clinical data like Past medical history, ejection fraction, co morbidities, reason for admission, vitals, lab data, cardiac biomarkers, day notes, 2D echo and doppler results, ECG and therapeutic data such as name of the drug prescribed, dose of the drug, its frequency, route of administration and date of administration of the drug.
2. Informed Consent Form: The study was properly explained to the patient, and consent was obtained willingly after the patient had been informed of all aspects of the study. In illiterate patients, the study aspects were explained to the care takers and consent was acquired.
3. The data are divided into two groups: Exposed group consist of patients who are given digoxin for heart failure treatment, Unexposed group consisting of patients without digoxin treatment for heart failure.
4. Data was entered and assembled in Microsoft Excel. The entered data was analysed with the help of Excel and SPSS using descriptive statistical analysis to find out the frequency and percentage of age and gender distribution, central tendency values of BP, heart rate, Spo2, sodium, potassium, urea, creatinine, frequency and percentage of comorbidities, ADR, drugs used and no of days in hospital. Suitable graph, tables and charts were added.

RESULTS

Among 200 patients enrolled to the study, 55.5% were male and 44.5% were female with mean average of the population being 57.8 years. In the exposed group and unexposed group, maximum and minimum ejection fraction was found to be 60% and 20% respectively. The mean ejection fraction among exposed group was found to be 38.5 and 40.4 among unexposed. Heart rate means were almost similar between both exposed and unexposed groups. Sodium levels were slightly lower in the exposed group than the unexposed group whereas potassium level were almost same. Mean urea level of patients in exposed group was 47.64 while in unexposed group it was 42.48 with standard error of mean 2.39 and 1.89 respectively. In the exposed group, patients had a mean creatinine level of 1.275 while in unexposed group it was 1.209 with standard error of mean of 0.0487 and 0.0412 respectively. Out of the 125 patients in the unexposed group, 32 among them suffered from adverse drug reactions with hypotension having the highest incidence. Among those who were exposed to digoxin, tachycardia and hypotension was the most frequent one followed by ventricular arrhythmia, bradycardia and hyponatremia. Adverse drug reactions were highest among patients in the age group of 61-80 years. In casualty assessment, as per the Hartwig's severity assessment, in the exposed study population, 46 patients are presented with ADRs, in which 39.1% (n=18) of ADRs were mild, 54.34% (n=25) were moderate and 6.52% (n=3) were serious ADRs. While among unexposed study population, 32 patients are presented with ADRs, in which 71.87% (n=23) of ADRs were mild, 25% (n=8) were moderate and 3.12% (n=1) were serious ADRs. According to Naranjo casualty

assessment, there were 31 probable and 15 possible adverse drug reactions in the exposed group while there were 15 probable and 17 possible reactions among unexposed group.

Table 1: Demographic details of the study.

Age Group	Number of Patients
20-40	23(11.5%)
41-60	91(45.5%)
61-80	80(40%)
81-100	6(3%)

Table 1 describes the detail of the age group of the study population.

Table 2: Details of different parameters in exposed and unexposed group.

Parameters		Exposed Group	Unexposed group
Ejection Fraction	Mean Standard Deviation	38.5 10.76	40.4 10.87
Systolic Blood Pressure	Mean Standard Deviation	116 13.656	119.40 12.646
Diastolic Blood Pressure	Mean Standard Deviation	74.65 11.273	78.04 10.624
Heart Rate	Mean Standard Deviation	87.72 9.81	87.48 8.120
Days of Hospital Stay	Mean Standard Deviation	5.20 2.236	4.39 1.745
Spo2	Mean Standard Deviation	96.68 1.904	96.20 2.258
Sodium	Mean Standard Deviation	135.953 4.6267	136.308 4.2931
Potassium	Mean Standard Deviation	4.1736 0.51011	4.2098 0.47655
Urea	Mean Standard Deviation	47.64 20.7	42.48 21.2
Creatinine	Mean Standard Deviation	1.275 0.421	1.209 0.4609

Table 2 indicates the comparison mean and standard deviation of different parameters in exposed and unexposed group.

Table 3: Adverse drug reactions in unexposed group.

ADR in unexposed group	Number of Reactions (Percentage)
Hypotension	11(34.37%)
Bradycardia	5(15.6%)
Hyponatremia	7(21.8%)
Icterus	3(9.3%)
Hyperkalemia	6(18.7%)

Table 3 shows the number of the adverse drug reactions occurred in the unexposed group.

Table 4: Adverse drug reactions in exposed group.

ADR in exposed group	Number of Reactions (Percentage)
Tachycardia	10(21.7%)
AV Block	3(6.52%)
Ventricular Arrhythmia	8(17.39%)
Ventricular Fibrillation	2(4.34%)
Hypotension	11(23.9%)
Bradycardia	7(15.2%)
Hyponatremia	5(10.86%)

Table 4 describes the number of the adverse drug reactions in the exposed group.

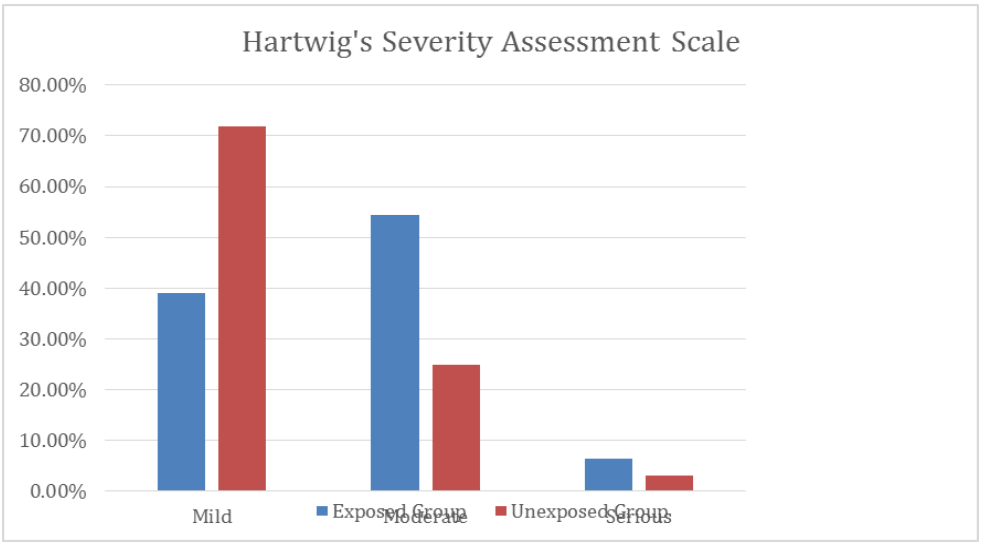

Figure 1: Hartwig's Severity Assessment Scale

Figure 1 illustrates the Hartwig's Severity assessment scale for both exposed and unexposed group.

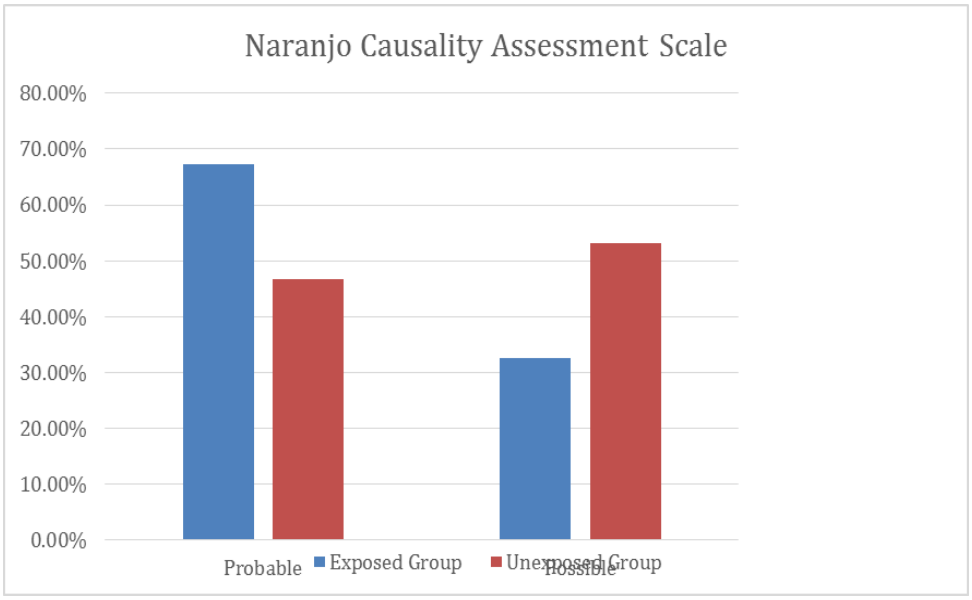

Figure 2: Naranjo Causality Assessment Scale.

Figure 2 shows Naranjo Causality assessment scale for both exposed and unexposed group

DISCUSSIONS

The study assessed the effectiveness and safety of digoxin therapy in heart failure patients over 6 months. It found that heart failure was more common in men and that the average age of patients was 57.8 years, similar to previous research.[2][3] There was no difference in heart rate or blood pressure between the digoxin-exposed and unexposed groups, conflicting with another study that suggested digoxin increased heart rate variability and sodium levels.[4][5] Potassium levels were similar in both groups.[5] Urea and creatinine levels did not change with digoxin use.[6] Length of hospital stay was longer for those exposed to digoxin, consistent with other findings.[7] Patients exposed to digoxin had a higher incidence of adverse drug reactions, with most rated as having moderate severity on Hartwig's scale.[8] Causality assessment using the Naranjo scale indicated that adverse reactions were mostly probable.[8]

The study had different limitations including short duration of study, lack of serum digoxin data and no consecutive ejection fraction data. This study could be used as a basis for future study into digoxin use in treatment for heart failure.

CONCLUSION

The study couldn't find any significant difference in the outcome of digoxin use in the heart failure patients when compared with other treatment options. But, as the risk is higher in the digoxin use, alternative options can be preferred.

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