Clinical, Laboratory, and Electrocardiographic Findings in Colchicine Toxicity: 10 Years of Experience

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Background: We aimed to investigate the clinical, laboratory, and electrocardiographic (ECG) findings of colchicine poisoning and to evaluate if there is a correlation between them and the two major outcomes of this toxicity which are respiratory/cardiovascular failure and death.

Materials and Methods: Medical records of 34 colchicine-intoxicated patients that were treated in our center during the past 10 years were retrospectively evaluated. The patient’s clinical presentation, vital signs, laboratory tests, ECGs, and outcomes were reviewed.

Results: Abdominal pain, and hypotension at presentation had significant correlation with mortality (p = 0.003, OR: 2.2 [4.1, 7.9], p = 0.029, OR: 13.0 [1.5, 111.8]). Mortality significantly occurred in those with sinus tachycardia, hypokalemia, metabolic acidosis, and impaired liver and kidney function tests (p-values = 0.025, 0.007, 0.04, and 0.008, respectively). All the patients had some ECG abnormalities. Most frequent ECG abnormalities were pathologic ST segment elevation and depression (70%), left atrial enlargement (48%), and sinus tachycardia (37%), PR elevation in aVR lead (37%), and T wave inversion (37%).

Conclusions: Colchicine toxicity is a dangerous entity regarding the cardiovascular events and requires close general and cardiac monitoring.

Keywords: colchicine toxicity, colchicine poisoning, intoxication, ECG manifestations, mortality

INTRODUCTION

Colchicine is a natural alkaloid compound primarily used to treat gouty arthritis, familial Mediterranean fever, amyloidosis, and severe constipation refractory to standard medical therapy (1, 2). It has also been suggested as a potential treatment for Bechet’s disease, pericarditis, and atrial fibrillation after cardiac surgery. The mechanism of action is to forestall microtubule aggregation and subsequently down-regulate microtubule-based inflammatory cycles including chemotaxis (3). Colchicine is available as intravenous injection, solution, tablet, and capsule (4).
In addition to the therapeutic effects, colchicine can also be toxic due to its narrow therapeutic range. Acute overdose of colchicine is rare but constitutes one of the most serious clinical toxicology emergencies with high morbidity and mortality rates (5). Supportive care is the cornerstone of treatment and Fab fragment antibodies that are used as experimental antidote are not commercially available, making it a potentially dangerous entity (6, 7).

The toxicity of colchicine seems to be dose-dependent (6, 8). It is generally accepted that the maximum safe dose of colchicine is about 1.2 mg/day (9). Colchicine is therapeutic at 0.015 mg/kg, toxic at 0.1 mg/kg and fatal at 0.8 mg/kg (6, 7). However, death and severe sequelae are well documented at lower doses (7, 8). Fatal overdose of colchicine has been delineated in several articles where blood or plasma levels varied from 10 to 250 ng/ml (1, 2, 10).

Abdominal pain, nausea, vomiting, and diarrhea are the principal clinical manifestations of colchicine toxicity. Multi-Organ involvement is the major cause of death. In the first 10-24 h after ingestion, patients present with symptoms mimicking gastroenteritis, which are absent for intravenous users. 24 h to 7 days after ingestion is the time for multi-organ presentation and recovery follows after 7 days (7).

Cardiogenic shock secondary to direct colchicine-induced cardiac toxicity is another major cause of death. Colchicine causes direct cellular toxicity that ends up in decreased myocardial contractility (11). It is also considered to interfere with cardiac pulse generation and conduction. However, the mechanism behind the abnormal rhythms is not well understood (12, 13).

We designed this study to evaluate the different aspects of colchicine toxicity as related to the clinical, laboratory, and ECG manifestations and to see which one correlates more with respiratory/cardiovascular failure and death. Also, we aimed to find more about ECG changes that can happen from cardiac toxicity.

MATERIALS AND METHODS

Study Design
Retrospective single center evaluation of colchicine toxic cases who were referred to the emergency department of Loghman-Hakim Hospital—the main referral toxicology center in Tehran, Iran—between January 2011 and January 2021. The study was reviewed and approved by Institutional Review Board of Shahid Beheshti University of Medical Sciences (IR.SBMU.MSP.REC.1398.116).

Inclusion and Exclusion Criteria
Colchicine-poisoned patients either as the sole agent of toxicity or as the main cause of toxicity were included. Colchicine poisoning was confirmed based on the patient history as well as signs and symptoms of the toxicity on presentation. Symptoms such as abdominal pain, nausea, vomiting were noted and subsequent manifestations such as bone marrow suppression and alopecia were included. Evaluation of serum colchicine level was not available in our center.

Patients with history of ischemic heart disease, heart failure, severe valvular heart disease, and severe renal failure [Glomerular Filtration Rate (GFR) < 30 ml/min] (14) or hepatic failure [cirrhosis or Aspartate Aminotransferase/alanine aminotransferase (AST/ALT) > 1,000 U/L] (15) were excluded. Patients who had concomitantly overdosed on a cardiotoxic medication or substances such as amphetamine or methadone were also excluded.

Variables
Patients’ demographic characteristics and point of care signs and symptoms, dosage of colchicine causing the toxicity, ECG, and lab tests were reviewed. Respiratory status and the need for mechanical ventilation was noted. Mortality was noted.

Point of care ECGs were evaluated by a cardiologist using the standard normal ranges for each (16) (Table 1). Heart rate, rhythm, axis, atrial abnormalities, PR interval, PR deviation, pathologic Q wave, QRS duration, ventricular enlargement, ST-T abnormalities, J-point elevation, early repolarization, Brugada pattern, abnormal U wave, and corrected QT intervals (QTc) were all evaluated.

Statistics
Quantitative variables were given as mean (±SD) and median [interquartile range; IQR] for variables with normal and non-normal distribution, respectively. Data was analyzed using Pearson Chi-square, Fisher’s exact test, t-test, and Mann-Whitney U-test. Measure of association between binomial exposure and outcome was expressed using odds ratio (OR) and 95% confidence interval. Roc curve was used to define the best cut-off for instantaneous sensitivity and specificity in continuous variable with significant association with mortality. Data was analyzed using statistical package for social sciences (SPSS) software version 27. P-values < 0.05 were considered to be statistically significant.

RESULTS
A total of 34 colchicine-intoxicated patients were evaluated. There were no patients with known cardiovascular or other significant comorbidities. Sixteen patients had intentionally overdosed to attempt suicide; two had accidentally overdosed on colchicine, and in other 16, the intention was not clear.

History and Primary Symptoms
Almost all patients were conscious upon arrival and were able to communicate with the physician and report symptoms. Subsequently, some gradually lost consciousness.

The most common presentations were nausea in 28 cases (82%) and vomiting in 24 (70%). Twelve patients (35%) had abdominal pain and 11 (32%) had diarrhea. Eleven (35%) reported dizziness as the main presentation. Other less frequent clinical presentations included dyspnea in 4 (12%), limb numbness in 3 (9%), facial paresthesia/numbness in 3 (9%),
TABLE 1 | Definitions used for determination of abnormal variables.

| Terminology/abbreviation | Definition |
|--------------------------|------------|
| Tachycardia<sup>a</sup>  | Heart rate > 100/min |
| Bradycardia<sup>a</sup>  | Heart rate < 60/min |
| LAD (Left axis deviation) | Mean QRS axis more positive than + 90° (usually with rS in lead I) |
| RAD (Right axis deviation) | Mean QRS axis more negative than – 30° (usually with rS in lead II) |
| LAHB LPHB                | QRS axis between – 45 and – 90° and qR pattern in AVL |
| RA abnormality           | P wave duration in lead II > 120 ms or increased duration and depth of terminal negative portion of P wave in lead V1 |
| PVC PAC                  | Premature ventricular contraction |
| PR deviation             | Deviation of PR segment from isoelectric line (segment between T and P waves) |
| First degree AV block    | All atrial impulses conducted to the ventricle with prolonged PR (> 200 ms) |
| PR interval              | From the onset of P wave to the onset of QRS |
| QRS duration             | Duration from the onset to the end of QRS |
| LVH RVH                  | Evaluated by Sokolow-Lyon and Cornell voltage criteria |
| Poor r progression       | R wave height ≤ 3 mm in V3 |
| ST elevation Cup like    | ST segment elevation from isoelectric line (segment between T and P waves) |
| Dom like                 | ST segment concave up |
| Specific ST elevation    | A ST elevation with characteristics of acute myocardial injury |
| ST depression            | ST segment depression from isoelectric line (segment between T and P waves) |
| ST abnormality           | ST elevation + ST depression |
| ST shortening            | Shortening of ST segment without elevation or depression |
| J point elevation        | Elevation of J point (point of junction between QRS and ST segment) |
| Early repolarization     | Elevation of the QRS-ST junction (J point) often associated with a late QRS slurring or notching (J wave) |
| Brugada pattern          | Coved type ST elevation with at least 2 mm (0.2 mV) J-point elevation and a gradually descending ST segment followed by a negative T-wave |
| Primary T wave inversion | Primary T-wave abnormalities due to alterations in myocardial cellular electrophysiology not due to LBBB or LVH (secondary) |
| Other T wave abnormalities| Biphasic T, Tall T, and camel hump T |
| Pathologic U wave        | U wave height > 1–2 mm, U wave height > 25% of T wave height, inverted U wave (different direction from adjacent T wave) |
| QTc (corrected QT)       | QT interval corrected with heart rate by Bazett's formula: QTc = QT/√RR |
| QTc prolongation         | QTc > 440 ms in men and > 460 ms in women |

Definitions and Measuring Criteria for ECG Variables<sup>a</sup> (17).
<sup>a</sup>Calculation for pediatrics were based on normal range for their age.

headache in 3 (9%), tremor in 2 (6%), and ataxia in one patient. The patients' characteristics are summarized in Tables 2, 3.

Significant correlation was present between abdominal pain and limb numbness with both mechanical ventilation and mortality. All patients who did not survive as well as 80% of the mechanical ventilation patients reported abdominal pain on arrival (p = 0.003, OR [95% CI] 2.2 [4.1, 7.9], and p = 0.04, OR [95% CI] 10.5 [1.1, 108.7], respectively). In the mortality and mechanical ventilation group, 60% of patients reported limb numbness, drowsiness, or tingling (p = 0.05, OR [95% CI] 18.7 [1.3, 272.1]). Dyspnea at presentation had significant association with mechanical ventilation. Almost 60% of intubated patients had shortness of breath on presentation (p = 0.006, OR [95% CI] 42.0 [2.9, 612.3]). 80% of those who died required mechanical ventilation. Low systolic and diastolic blood pressure (<90 and 60 mmHg, respectively) were significantly related to mortality (p = 0.029, OR [95% CI] 13.0 [1.5, 111.8]). 60% of patients who needed mechanical ventilation had a positive family history of rheumatoid arthritis (p = 0.029, OR: 13.0 [1.5, 111.8]). Dose of ingested colchicine has no significant correlation with mortality in this study.

**Laboratory Findings**

Patients with poor outcomes had higher blood urea nitrogen (BUN) and creatinine, creatine phosphokinase (CPK) and lactate...
TABLE 2 | Patient history and primary symptoms in mortality and mechanical ventilation groups (qualitative variables).

| Variable                                      | Mortality P-value OR (95% CI) | Intubation P-value OR (95% CI) |
|-----------------------------------------------|------------------------------|-------------------------------|
|                                               | Yes (n = 5) No (n = 29)       |                               |
| Gender n (%)                                  | Male                         |                               |
|                                               | 2 (40)                       | 1                             |
|                                               | 11 (37.9)                    | 1.1 (0.2, 7.6)                |
|                                               | Female                       |                               |
|                                               | 3 (60)                       | 1                             |
|                                               | 18 (62.1)                    | 10 (34.5)                     |
| Pure or mix n (%)                             | Pure                         |                               |
|                                               | 4 (80)                       | 1                             |
|                                               | 19 (65.5)                    | 2.1 (0.2, 21.5)               |
|                                               | Mixed                        |                               |
|                                               | 1 (20)                       | 1                             |
|                                               | 10 (34.5)                    | 10 (34.5)                     |
| In hospital mortality cause n (%)             | Asystole                     |                               |
|                                               | 3 (60)                       | 0                             |
|                                               | 29 (100)                     |                                |
|                                               | VT                           |                               |
|                                               | 1 (20)                       | 0                             |
|                                               | Bradycardia                  |                               |
|                                               | 1 (20)                       | 0                             |
|                                               | PMH HTN n (%)                |                               |
|                                               | Normotensive                 |                               |
|                                               | 4 (80)                       | 0.276                         |
|                                               | 28 (96.6)                    | 0.1 (0.01, 2.8)               |
|                                               | Unknown                      |                               |
|                                               | 1 (20)                       | 0.75                          |
|                                               | 1 (3.4)                      |                                |
|                                               | PMH DM n (%)                 |                               |
|                                               | Nondiabetic                  |                               |
|                                               | 4 (80)                       | 0.276                         |
|                                               | 28 (96.6)                    | 0.1 (0.01, 2.8)               |
|                                               | Unknown                      |                               |
|                                               | 1 (20)                       | 0.75                          |
|                                               | 1 (3.4)                      |                                |
|                                               | PMH FMF n (%)                |                               |
|                                               | 0                            | 0.147                         |
|                                               | 3 (10.3)                     | 0.8 (0.5, 1.2)                |
|                                               | No Cardiac FH n (%)          |                               |
|                                               | 5 (100)                      | 0.17                          |
|                                               | 29 (100)                     | 0.8 (0.5, 1.2)                |
|                                               | FH Rheumatologic n (%)       |                               |
|                                               | 2 (40)                       | 0.205                         |
|                                               | 4 (13.8)                     | 4.2 (0.5, 33.3)               |
|                                               | Unknown                      |                               |
|                                               | 2 (40)                       | 0.735                         |
|                                               | 14 (48.3)                    |                                |
|                                               | Usage Cause n (%)            |                               |
|                                               | Suicidal                     |                               |
|                                               | 2 (40)                       | 0.735                         |
|                                               | 14 (48.3)                    |                                |
|                                               | Unintentionally              |                               |
|                                               | 0                            | 0.735                         |
|                                               | 2 (6.9)                      |                                |
|                                               | Unknown                      |                               |
|                                               | 3 (60)                       | 0.735                         |
|                                               | 13 (44.8)                    |                                |
|                                               | Conscious L.O.C              |                               |
|                                               | 4 (80)                       | 0.147                         |
|                                               | 29 (100)                     | 0.8 (0.5, 1.2)                |
|                                               | 1                             | 1 (3.4)                       |
|                                               | Primary presentation dizziness n (%) |                       |                               |
|                                               | 1 (20)                       | 0.5                           |
|                                               | 10 (34.5)                    | 1.1 (0.2, 7.6)                |
|                                               | Primary presentation nausea n (%) |                       |                               |
|                                               | 5 (100)                      | 0.559                         |
|                                               | 23 (79.3)                    | 1.3 (1.0, 1.5)                |
|                                               | Primary presentation vomiting n (%) |                       |                               |
|                                               | 5 (100)                      | 0.291                         |
|                                               | 19 (65.5)                    | 1.5 (1.2, 2.0)                |
|                                               | Primary presentation abdominal pain n (%) |                       |                               |
|                                               | 5 (100)                      | 0.003                         |
|                                               | 7 (24.1)                     | 4.1 (2.2, 7.9)                |
|                                               | Primary presentation nonPO n (%) |                       |                               |
|                                               | 5 (100)                      | 0.291                         |
|                                               | 19 (65.5)                    | 1.5 (1.2, 2.0)                |
|                                               | Primary presentation dyspnea n (%) |                       |                               |
|                                               | 2 (40)                       | 0.094                         |
|                                               | 2 (6.9)                      | 9.0 (0.9, 89.3)               |
|                                               | Primary presentation diarrea n (%) |                       |                               |
|                                               | 3 (60)                       | 0.3                           |
|                                               | 8 (27.6)                     | 3.9 (0.5, 28.1)               |
|                                               | Primary presentation depressed mood n (%) |                       |                               |
|                                               | 0                            | 1                             |
|                                               | 4 (13.8)                     | 1.2 (1.0, 1.3)                |
|                                               | Primary presentation tremor n (%) |                       |                               |
|                                               | 0                            | 1                             |
|                                               | 2 (6.9)                      | 1.074 (0.973, 1.186)          |
|                                               | Primary presentation limb numbness n (%) |                       |                               |
|                                               | 2 (40)                       | 0.05                          |
|                                               | 1 (3.4)                      | 18.667 (1.3, 272.1)           |
|                                               | Primary presentation facial paresthesia/numbness n (%) |                       |                               |
|                                               | 1 (20)                       | 0.389                         |
|                                               | 2 (6.9)                      | 3.4 (0.2, 46.4)               |
|                                               | Primary presentation ataxia n (%) |                       |                               |
|                                               | 1 (20)                       | 0.147                         |
|                                               | 2 (6.9)                      | 0.8 (0.5, 1.2)                |
|                                               | Primary presentation headache n (%) |                       |                               |
|                                               | 1 (20)                       | 0.147                         |
|                                               | 2 (6.9)                      | 0.8 (0.5, 1.2)                |
|                                               | Intubation n (%)             |                               |
|                                               | 4 (80)                       | 0.001                         |
|                                               | 8 (10)                       | 112.0 (5.8, 2168.3)           |

Dehydrogenase (LDH), liver function tests, and international normalized ratio (INR) (Table 4).

The odd [95% CI] of 84 times [4.1, 1715.6] for death was achieved using the cut-off of 1.35 mg/dl for creatinine level (p = 0.003). It was 17 [1.3, 223.1] for LDH ≥ 1,551 (p = 0.035), 5 [2.1, 12.0] for AST ≥ 85 mg/dl (p = 0.02), 8 [2.2, 29.2] for INR ≥ 2.64 (p = 0.01), 7 [2.9, 18.0] for BUN ≥ 34.5 (p = 0.002), and 7 [1.9, 25.2] for PTT ≥ 37.5 s (p = 0.015).

Bicarbonate level (but not pH) was significantly lower in the mortality group and so were serum potassium and calcium levels (Table 4).

**Electrocardiographic Findings**

Point of care ECGs for 27 patients were available. Thirteen (38%) were male and median [IQR] age was 22 years. Five patients were intubated and five passed away during the hospital stay. All patients had some ECG abnormalities. Sinus tachycardia and bradycardia were detected in 10 (37%) and one patient, respectively. Mean heart rate was significantly higher in patients who were eventually intubated or died (p = 0.02). One patient was reported to have premature ventricular complexes (PVC). Other abnormalities seen were left atrial enlargement in 13 patients (48%), PR elevation in aVR lead in 10 (37%), pathologic Q wave in 10 (37%), ST segment elevation in 7 (37%), ST segment depression in 9 (33%), Brugada pattern in 6 (22%), T wave inversion in 10 (37%), and pathologic U wave in 2 (7%). None of these changes were related to mechanical ventilation and death in a statistically significant manner. ECG abnormalities reported are summarized in Tables 5, 6.

Three of the cases (11%) had prolonged QTc interval. Mean QTc [IQR] was 426 ms [402.75 to 448.75 ms] in the mechanical ventilation and mortality groups (p = 0.20). QTc, PR interval, and
### TABLE 3 | Patient history and primary vital signs in mortality and intubation groups.

| Variable                          | Mortality          | Intubation          | **P-value** |
|-----------------------------------|--------------------|---------------------|-------------|
|                                   | **Yes (n = 5)**    | **No (n = 29)**     |             |
| Age                               | Median: 18 | 22 | 0.689* | 37 | 21 | 0.234* |
| IQR                               | 13, 43.5 | 17, 28.5 | 0.689* | 14, 59 | 16.5, 28 |         |
| Mean                              | 26.2 | 23.6 |             | 36.8 | 21.8 |             |
| SD                                | 16.7 | 12.8 |             | 23.9 | 9.4  |             |
| Min, max                          | 10, 50 | 2, 89 |             | 10, 69 | 2, 41 |             |
| Admission days                    | Median: 2 | 2 | 0.851† | 2 | 2 | 0.851† |
| IQR                               | 1.4, 5 | 1.3 |         | 1.4, 5 | 1.3 |         |
| Mean                              | 2.6 | 2.3 |         | 2.6 | 2.3 |         |
| SD                                | 2.1 | 1.7 |         | 2.1 | 1.7 |         |
| Min, max                          | 1.6, 6.5 | 1.8 |         | 1.6 | 1.8 |         |
| ICU duration day                  | Median: 0 | 0 | 0.571† | 0 | 0 | 0.571† |
| IQR                               | 0, 4 | 0.1 |         | 0.4 | 0.1 |         |
| Mean                              | 1.6 | 0.6 |         | 1.6 | 0.6 |         |
| SD                                | 2.6 | 1.0 |         | 2.6 | 1.0 |         |
| Min, max                          | 0, 6 | 0.4 |         | 0.6 | 0.4 |         |
| Colchicine dose of ingestion (mg) | Median: 29 | 20 | 0.505† | 38 | 20 | 0.157† |
| IQR                               | 17.3, 39.5 | 13, 30 |         | 18.7, 70 | 12, 28.7 |         |
| Mean                              | 28.5 | 26.8 |         | 42.8 | 24.2 |         |
| SD                                | 12.3 | 23.6 |         | 33.7 | 19.3 |         |
| Min, max                          | 16, 40 | 3, 100 |         | 16, 100 | 3, 100 |         |
| SBP mmHg                           | Median: 90 | 110 | 0.011† | 100 | 110 | 0.188† |
| IQR                               | 87.5, 100 | 100, 120 |         | 87.5, 110 | 100, 120 |         |
| Mean                              | 93 | 109 |         | 99 | 107.8 |         |
| SD                                | 6.7 | 11.8 |         | 13.4 | 12.2 |         |
| Min, max                          | 85, 100 | 85, 120 |         | 85, 120 | 85, 120 |         |
| DBP mmHg                           | Median: 65 | 70 | 0.037† | 65 | 70 | 0.3† |
| IQR                               | 62.5, 67.5 | 67.5, 80 |         | 62.5, 75 | 65, 80 |         |
| Mean                              | 65 | 72.2 |         | 68 | 71.6 |         |
| SD                                | 3.5 | 7.2 |         | 7.6 | 7.2 |         |
| Min, max                          | 60, 70 | 60, 80 |         | 60, 80 | 60, 80 |         |
| PR                                 | Median: 99 | 96 | 0.93* | 88 | 96 | 0.672* |
| IQR                               | 80.5, 110 | 86, 110 |         | 82, 110 | 86.5, 111 |         |
| Mean                              | 96.5 | 97.2 |         | 94.4 | 97.6 |         |
| SD                                | 16.1 | 15.6 |         | 14.7 | 15.7 |         |
| Min, max                          | 78, 110 | 70, 130 |         | 78, 110 | 70, 130 |         |
| RR                                 | Median: 17 | 16 | 0.69† | 16 | 16 | 0.609† |
| IQR                               | 13, 18 | 15, 20.5 |         | 14, 18 | 15.20.7 |         |
| Mean                              | 16 | 17.8 |         | 16 | 17.9 |         |
| SD                                | 2.8 | 4.6 |         | 2.4 | 4.6 |         |
| Min, max                          | 12, 18 | 11, 31 |         | 12, 18 | 11, 31 |         |
| T centigrade                       | Median: 37.2 | 37 | 0.472† | 37.2 | 37 | 0.643† |
| IQR                               | 37.05, 37.3 | 37, 37.3 |         | 37.3, 37.4 | 37, 37.4 |         |
| Mean                              | 37.2 | 37.1 |         | 37.2 | 37.1 |         |
| SD                                | 0.1 | 0.3 |         | 0.1 | 0.3 |         |
| Min, max                          | 37, 37.3 | 36.5, 38 |         | 37.3, 37.4 | 36.5, 38 |         |
| O₂ Sat percentage                 | Median: 95.50 | 97 | 0.119† | 96 | 97 | 0.338† |
| IQR                               | 95, 96.75 | 96, 98 |         | 95, 97.5 | 97, 0 |         |
| Mean                              | 95.75 | 96.76 |         | 96.2 | 96.7 |         |
| SD                                | 0.957 | 1.921 |         | 1.3 | 1.9 |         |
| Min, max                          | 95, 97 | 91, 100 |         | 95, 98 | 91, 100 |         |

*Applying t-test; †Applying Mann-Whitney U-test.
### TABLE 4 | Lab test results in patients who eventually underwent intubation and those who were expired.

| Variable        | Mortality | P-value | Intubation | P-value |
|-----------------|-----------|---------|------------|---------|
|                 | Yes (n = 5) | No (n = 29) |            | Yes (n = 5) | No (n = 29) |
| Sodium (mEq/L)  |            |         |            |         |
| Median          | 144        | 140     | 0.185*     | 143      | 140        |
| IQR             | 137, 146.5 | 138, 142|            | 136, 146 | 138, 142   |
| Mean            | 142.5      | 140.0   |            | 141.4    | 140.1      |
| SD              | 5.3        | 3.1     |            | 5.2      | 3.1        |
| Min, max        | 135, 147   | 131, 146|            | 135, 147 | 131, 146   |
| Potassium (mEq/L) |          |         |            |         |
| Median          | 3.4        | 3.85    | 0.007†     | 3.5      | 3.9        |
| IQR             | 3.1, 3.6   | 3.6, 4.5|            | 3.15, 3.55| 3.7, 4.5   |
| Mean            | 3.3        | 4.1     |            | 3.4      | 4.1        |
| SD              | 0.3        | 0.6     |            | 0.2      | 0.6        |
| Min, max        | 3, 3.6     | 3.1, 5.7|            | 3, 3.6   | 3.1, 5.7   |
| BUN (mg/dL)     |            |         |            |         |
| Median          | 39         | 30      | 0.008†     | 38       | 28         |
| IQR             | 35.5, 42.2 | 19, 32.5|            | 33, 41.5 | 19, 32.7   |
| Mean            | 39         | 27.7    |            | 37.4     | 27.6       |
| SD              | 3.4        | 14.2    |            | 4.6      | 14.5       |
| Min, max        | 35, 43     | 0.90, 76|            | 31, 43   | 0.9, 76    |
| Creatinine (mg/dL) |          |         |            |         |
| Median          | 1.4        | 0.9     | 0.008†     | 1.4      | 0.9        |
| IQR             | 1.1, 1.55  | 0.8, 1.1|            | 0.9, 1.5 | 0.8, 1.1   |
| Mean            | 1.35       | 0.9466  |            | 1.3      | 0.9        |
| SD              | 0.25166    | 0.22198 |            | 0.3      | 0.2        |
| Min, max        | 1, 1.6     | 0.5, 1.5|            | 0.9, 1.6 | 0.5, 1.5   |
| CPK (U/L)       |            |         |            |         |
| Median          | 1,364      | 141     | 0.087†     | 1,051    | 140.5      |
| IQR             | 154, -     | 108.6   |            | 300, 3335| 102, 417.5 |
| Mean            | 1836.7     | 443.3   |            | 1562     | 426.9      |
| SD              | 1962.2     | 691.1   |            | 1693.669 | 707.3      |
| Min, max        | 154, 3,992 | 53, 2,800|           | 154, 3,992| 53, 2,800 |
| CKMB (U/L)      |            |         |            |         |
| Median          | -          | 19      |            | -       | -          |
| IQR             | -          | 8. -    |            | 8. -    | -          |
| Mean            | -          | 688.3   |            | 688.3   |            |
| SD              | -          | 1168.8  |            | 1168.8  |            |
| Min, max        | -          | 8, 2,038|            | 8, 2,038|            |
| Troponin (ng/mL) |          |         |            |         |
| Median          | 0.9        | 0.29    |            | 0.9      | 0.29       |
| IQR             | 0.9, 0.9   | 0.08, - |            | 0.9, 0.9 | 0.08, -    |
| Mean            | 0.9        | 0.29    |            | 0.9      | 0.29       |
| SD              | -          | 0.30    |            | -       | 0.30       |
| Min, max        | 0.9, 0.9   | 0.08, 0.5|          | 0.9, 0.9| 0.08, 0.5  |
| LDH (U/L)       |            |         |            |         |
| Median          | 3169.5     | 523.5   | 0.029†     | 1,608    | 505        |
| IQR             | 1228.5, 6012.7| 406.5, 1290.5|    | 1,006, 5585.5| 406, 1,317|
| Mean            | 3470.2     | 1197.1  |            | 2958.2   | 1212.3     |
| SD              | 2548.6     | 1541.1  |            | 2486.4   | 1581.8     |
| Min, max        | 1,102, 6,440| 283, 5,840|        | 910, 6,440| 283, 5,840 |
| Phosphorus (mg/dL) |        |         |            |         |
| Median          | 2.8        | 5.3     | 0.42*      | 2.8      | 5.3        |
| IQR             | 2.8, 2.8   | 3.2, 8.1|            | 2.8, 2.8 | 3.2, 8.1   |
| Mean            | 2.8        | 5.6     |            | 2.8      | 5.6        |
| SD              | -          | 2.6     |            | -       | 2.6        |
| Min, max        | 2.8, 2.8   | 2.6, 9  |            | 2.8, 2.8 | 2.6, 9     |
| Calcium (mg/dL) |            |         |            |         |
| Median          | 7          | 8.8     | 0.045*     | 7        | 8.8        |
| IQR             | 6.5, -     | 8.9, 7  |            | 6.5, -   | 8.9, 7     |
| Mean            | 7          | 8.84    |            | 7        | 8.84       |
| SD              | 0.70711    | 0.85323 |            | 0.70711  | 0.85323    |
| Min, max        | 6.5, 7.5   | 8, 9.7  |            | 6.5, 7.5 | 8, 9.8     |

(Continued)
TABLE 4 | Continued

| Variable                  | Mortality | P-value | Intubation | P-value |
|---------------------------|-----------|---------|------------|---------|
|                           | Yes (n = 5) | No (n = 29) |            | Yes (n = 5) | No (n = 29) |
| Magnesium (mg/dL)        | Median    | 1.9     | 1.9        | 1.9     | 1.9        | -          |
|                          | IQR       | 1.9, 1.9 | 1.8, 1.9   | 1.9, 1.9 | 1.8, 1.9   | -          |
|                          | Mean      | 1.9     | 1.9        | 1.9     | 1.9        | -          |
|                          | SD        | -       | 0.14142    | -       | 0.14142    | -          |
|                          | Min, max  | 1.9, 1.9 | 1.8, 1.9   | 1.9, 1.9 | 1.8, 2     | -          |
| Blood sugar (mg/dL)      | Median    | 131.5   | 87.5       | 0.741*  | 106       | 87         | 0.632*     |
|                          | IQR       | 52, -   | 78.7, 108.2| 52, -   | 77, 109    | -          |
|                          | Mean      | 131.5   | 97.3       | 123     | 96.7       | -          |
|                          | SD        | 112.4   | 25.6       | 80.8    | 26.4       | -          |
|                          | Min, max  | 52, 211 | 68, 161    | 52, 211 | 68, 161    | -          |
| WBC (10^9 cells/L)       | Median    | 10,150  | 7,800      | 1†      | 10,150     | 7,800      | 1†         |
|                          | IQR       | 300, -  | 6,000, 11,900| 300, -  | 6,000, 11,900| -          |
|                          | Mean      | 10,150  | 9478.9     | 10,150  | 9478.9     | -          |
|                          | SD        | 13930.000359 | 4748.51777 | 13930.000359 | 4748.51777 | -          |
|                          | Min, max  | 300, 20,000 | 4,800, 20,200 | 300, 20,000 | 4,800, 20,200 | -          |
| Platelet (cells/L)       | Median    | 137,500 | 232,000    | 0.243*  | 137,500    | 232,000    | 0.243*     |
|                          | IQR       | 12,000, - | 172,000, 287,000 | 12,000, - | 172,000, 287,000 | -          |
|                          | Mean      | 137,500 | 225031.5789| 137,500 | 225031.6   | -          |
|                          | SD        | 177483.80208 | 91167.10574 | 177483.80208 | 91167.10574 | -          |
|                          | Min, max  | 12,000, 263,000 | 13,600, 350,000 | 12,000, 263,000 | 13,600, 350,000 | -          |
| Hemoglobin (mg/dL)       | Median    | 9.9     | 13.6       | 0.286†  | 9.95      | 13.6       | 0.286†     |
|                          | IQR       | 6.5, -  | 12.6, 16.0 | 6.5, -  | 12.6, 16   | -          |
|                          | Mean      | 9.9     | 14.1       | 9.9     | 14.1       | -          |
|                          | SD        | 4.9     | 2.2        | 4.9     | 2.2        | -          |
|                          | Min, max  | 6.5, 13.4 | 12.6, 16   | 6.5, 13.4 | 10.2, 20.2 | -          |
| AST (IU/L)                | Median    | 507     | 46.5       | 0.008†  | 507       | 46.5       | 0.008†     |
|                          | IQR       | 91, -   | 31.5, 76.25| 91, -   | 31.5, 76.2 | -          |
|                          | Mean      | 379.3   | 78.1       | 379.3   | 78.1       | -          |
|                          | SD        | 250.2   | 88.2       | 250.2   | 88.2       | -          |
|                          | Min, max  | 91, 540 | 14, 343    | 91, 540 | 14, 343    | -          |
| ALT (IU/L)                | Median    | 67      | 29         | 0.143*  | 67        | 29         | 0.143*     |
|                          | IQR       | 60, -   | 19.55      | 60, -   | 19.55      | -          |
|                          | Mean      | 67      | 38.8       | 67      | 38.8       | -          |
|                          | SD        | 9.9     | 25.4       | 9.9     | 25.4       | -          |
|                          | Min, max  | 60, 74  | 12, 100    | 60, 74  | 12, 100    | -          |
| Alkaline phosphatase     | Median    | 1530    | 229        | 0.002†  | 1,530     | 229        | 0.002†     |
|                          | IQR       | 721, -  | 187.5, 392 | 721, -  | 187.5, 392 | -          |
|                          | Mean      | 1461    | 295.5882   | 1461    | 295.6      | -          |
|                          | SD        | 708,02613 | 173.71135  | 708,02613 | 173.71135  | -          |
|                          | Min, max  | 721, 2,132 | 100, 665  | 721, 2,132 | 100, 665  | -          |
| PT                       | Median    | -       | 13.2       | -       | 12        | 13.3       | 0.462†     |
|                          | IQR       | -       | 12.1, 14.3 | 12, 12  | 12.4, 14.4 | -          |
|                          | Mean      | -       | 13.9       | 12      | 14.1       | -          |
|                          | SD        | -       | 2.4        | -       | 2.5        | -          |
|                          | Min, max  | -       | 11.8, 19.2 | 12, 12  | 11.8, 19.2 | -          |
| PTT                      | Median    | 45      | 31         | 0.001*  | 42        | 31         | 0.021*     |
|                          | IQR       | 39, -   | 27.6, 35   | 30.7, 50.2 | 27.6, 35.2 | -          |
|                          | Mean      | 45.3    | 31.4       | 41      | 31.7       | -          |
|                          | SD        | 6.5     | 4.8        | 10.2    | 4.9        | -          |
|                          | Min, max  | 39, 52  | 25, 41     | 28, 52  | 25, 41     | -          |
QRS duration were not significantly different between mortality and survival groups.

There were 13 cases of left atrial enlargement and no cases of right atrial enlargement. PR elevation in lead aVR and PR depression in the limb leads, anterolateral leads, and aVR leads were found in 10 patients. Inverted T waves and pathological Q wave in II and III were seen in 10 cases each. ST-elevation was detected in 7 patients in precordial leads, I, aVR, and aVL. Brugada-like pattern was recorded in six cases in leads V1 and V2. Poor R progression was detected in 6 ECGs in the anteroseptal precordial leads. Three cases of left posterior hemiblock were detected. Pathological U waves and left bundle branch block were detected in two cases. J point elevation, first degree atrioventricular block, and early repolarization were present in one case each.

Dynamic ECG changes were noted in six patients during their hospital stay. Except for the heart rate, none of the ECG variables found to be related to mortality and intubation. Mean heart rate was 112/min (range: 93-136/min) and 90/min (range: 40-115/min) in the mortality and mechanical ventilation groups, respectively. Mode of death was bradycardia/asystole in 4, and ventricular tachycardia in 1 patient.

**DISCUSSION**

Previous studies on colchicine poisoning are generally case reports and small case series (17–19). The clinical effects of colchicine on different organs are shown in Table 7. In this study, we evaluated clinical presentation, detailed ECG abnormalities, laboratory data on arrival, and outcome of 34 colchicine-intoxicated patients who were referred to our tertiary toxicology center during a 10-year period.

Although most of the ECG abnormalities we found in our study were not significantly related to the patient’s outcome, our detailed findings seem to be singular. Previously reported cases had shown ST elevation in patients with colchicine poisoning (20). Bradycardia and arrhythmia had been reported in severe toxicities after intravenous administration of colchicine (21). However, to the best of our knowledge, no studies have clearly detailed the ECG effects of colchicine in intoxicated patients. Colchicine effect on skeletal muscles has been discussed (22).

Clinical results are also of importance. Based on our findings, tachycardia is significantly related with intubation and mortality in colchicine-intoxicated patients; a finding that had never been reported before. Troponin level does not significantly change after colchicine poisoning although cardiac changes are common showing the fact that the nature of the damage to the cardiac cells is not ischemic or necrosis-inducing in this poisoning.

Also, previous studies have reported laboratory abnormalities in colchicine poisoning, but none had evaluated the relation of these abnormalities with mortality (23). High BUN and Cr and lower serum potassium and calcium significantly increased the risk of mortality. Renal failure, hypokalemia, and hypocalcemia are due to diarrhea and GI loss. Metabolic acidosis was another important laboratory finding associated with mortality in these patients.

If rhabdomyolysis occurs, hemoglobinuria may also cause azotemia (24). This can be considered a possible cause of...
| Variable | Mortality | P-value | Intubation | P-value |
|----------|-----------|---------|------------|---------|
|          | Yes (n = 5) | No (n = 22) |            | Yes (n = 5) | No (n = 22) |
| Rhythm   | Normal sinus n (%) | 1(25) | 15 (65.2) | 0.231 | 1 (25) | 15 (65) | 0.231 |
|          | Sinus Tachycardia n (%) | 3(75) | 7 (30.4) | 3 (75) | 7 (30) |
|          | Sinus Bradycardia n (%) | 0 | 1 (4.3) | 0 | 1 (4.3) |
| PVC      | 0 | 1 (4.3) | 1 | 0 | 1 (4.3) | 1 |
| PAC      | NAD n (%) | 2 (50) | 20 (87) | 0.187 | 2 (50) | 20 (87) | 0.187 |
|          | RAD n (%) | 1 (25) | 2 (8.7) | 1.187 | 1 (25) | 2 (8.7) | 0.187 |
|          | LAD n (%) | 1 (25) | 1 (4.3) | 1 (25) | 1 (4.3) |
|          | LAHB n (%) | 1 (25) | 2 (8.7) | 0.395 | 1 (25) | 2 (8.7) | 0.395 |
|          | LPHB n (%) | 1 (25) | 12 (52) | 0.596 | 1 (25) | 12 (52) | 0.596 |
|          | LAA n (%) | 1 (25) | 2 (8.7) | 0.395 | 1 (25) | 2 (8.7) | 0.395 |
|          | RAA n (%) | 2 (50) | 8 (34) | 0.613 | 2 (50) | 8 (34) | 0.613 |
|          | WPW n (%) | 2 (50) | 9 (39) | 0.613 | 2 (50) | 9 (39) | 1 |
|          | Pathologic Q Wave | 0 | 10 (43) | 0.264 | 0 | 10 (43.5) | 0.264 |
|          | Pathologic Q Wave Lead II | 0 | 6 (26) | 0.545 | 0 | 6 (26) | 0.545 |
|          | Pathologic Q Wave Lead III | 0 | 8 (34.8) | 0.285 | 0 | 8 (34.8) | 0.285 |
|          | Pathologic Q Wave Lead V3 | 0 | 4 (17.4) | 1 | 0 | 4 (17.4) | 1 |
|          | Pathologic Q Wave Lead V5 | 0 | 4 (17.4) | 1 | 0 | 2 (8.7) | 1 |
|          | Pathologic Q Wave Lead V6 | 1 (25) | 2 (8.7) | 0.395 | 1 (25) | 2 (8.7) | 0.395 |
|          | Tall R | 1 (25) | 2 (8.7) | 0.395 | 1 (25) | 2 (8.7) | 0.395 |
|          | Tall R_LEAD V1 | 1 (25) | 0.148 | 1 (25) | 0.148 |
|          | Tall R_LEAD V2 | 1 (25) | 0.148 | 1 (25) | 0.148 |
|          | Tall R_LEAD V4 | 0 | 1 (4.3) | 1 | 0 | 1 (4.3) | 1 |
|          | Tall R_LEAD V5 | 0 | 2 (8.7) | 1 | 0 | 2 (8.7) | 1 |
|          | Tall R_LEAD V6 | 0 | 2 (8.7) | 1 | 0 | 2 (8.7) | 1 |
|          | Deep S | 1 (25) | 1 (4.3) | 0.279 | 1 (25) | 1 (4.3) | 0.279 |
|          | Deep S LEAD V3 | 0 | 1 (4.3) | 1 | 0 | 1 (4.3) | 1 |
|          | Deep S LEAD V5 | 0 | 1 (4.3) | 1 | 0 | 1 (4.3) | 1 |
|          | Deep S LEAD V6 | 0 | 1 (4.3) | 1 | 0 | 1 (4.3) | 1 |
|          | LVH | 0 | 1 (4.3) | 1 | 0 | 1 (4.3) | 1 |
|          | RVH | Poor R Progression | 1 (25) | 5 (21.7) | 1 | 1 (25) | 5 (21) | 1 |
|          | Poor R Progression Lead_V1 | 0 | 4 (17.4) | 1 | 0 | 4 (17.4) | 1 |
|          | Poor R Progression Lead_V2 | 0 | 4 (17.4) | 1 | 0 | 4 (17.4) | 1 |
|          | Poor R Progression Lead_V3 | 0 | 4 (17.4) | 1 | 0 | 4 (17.4) | 1 |

(Continued)
| Variable                                      | Mortality | P-value | Intubation | P-value |
|-----------------------------------------------|-----------|---------|------------|---------|
|                                              | Yes (n = 5) | No (n = 22) |          |         |
| Poor R Progression Lead V4                   | 0         | 1 (4.3) | 1          | 0       |
| ST Elevation                                 | 1 (25)    | 6 (26)  | 1          | 1       |
| ST Elevation Specific                         | 1 (25)    | 5 (21)  | 1          | 1       |
| ST Elevation Type                            | 4 (100)   | 19 (82) | 1          | 1       |
| ST Elevation Lead V1                         | 0         | 2 (8.7) | 1          | 0       |
| ST Elevation Lead V2                         | 0         | 1 (4.3) | 1          | 0       |
| ST Elevation Lead V3                         | 0         | 2 (8.7) | 1          | 0       |
| ST Elevation Lead V4                         | 0         | 2 (8.7) | 1          | 0       |
| ST Elevation Lead V5                         | 0         | 1 (4.3) | 1          | 0       |
| ST Elevation Lead V6                         | 0         | 1 (4.3) | 1          | 0       |
| ST Elevation Lead I                          | 0         | 1 (4.3) | 1          | 0       |
| ST Elevation Lead avr                        | 1 (25)    | 3 (13)  | 0.495      | 1 (25)  |
| ST Elevation Lead avl                        | 0         | 1 (4.3) | 1          | 0       |
| ST Depression                                | 1 (25)    | 8 (34.8)| 1          | 1       |
| ST Depression Type                           | 4 (100)   | 15 (65.2)| 0.285     | 4 (100) |
| ST Depression Lead V1                        | 0         | 1 (4.3) | 1          | 0       |
| ST Depression Lead V4                        | 0         | 1 (4.3) | 1          | 0       |
| ST Depression Lead V5                        | 1 (25)    | 3 (13)  | 0.495      | 1 (25)  |
| ST Depression Lead V6                        | 1 (25)    | 3 (13)  | 0.495      | 1 (25)  |
| ST Depression Lead I                         | 0         | 1 (4.3) | 1          | 0       |
| ST Depression Lead II                        | 0         | 4 (17.4)| 1          | 0       |
| ST Depression Lead III                       | 0         | 4 (17.4)| 1          | 0       |
| ST Depression Lead avr                       | 0         | 2 (8.7) | 1          | 0       |
| ST Depression Lead avl                       | 0         | 1 (4.3) | 1          | 0       |
| ST Changes                                   | 1 (25)    | 11 (47.8)| 0.605     | 1 (25)  |
| J Point Elevation                            | 0         | 3 (13)  | 1          | 0       |
| J_Point_Elevation_V2                         | 0         | 1 (4.3) | 1          | 0       |
| J_Point_Elevation_V3                         | 0         | 1 (4.3) | 1          | 0       |
| J_Point_Elevation_V4                         | 0         | 1 (4.3) | 1          | 0       |
| J_Point_Elevation_V5                         | 0         | 1 (4.3) | 1          | 0       |
| J_Point_Elevation_I                          | 0         | 1 (4.3) | 1          | 0       |
| J_Point_Elevation_II                         | 0         | 1 (4.3) | 1          | 0       |
| Early Repolarization Lead V2_V3_V4_V5_0      | 1 (4.3)   | 1       | 0          | 1 (4.3) |
| Brugada like syndrome rSr TYPE               | 0         | 6 (26)  | 0.545      | 0       |
| Brugada_like_symdrome_Lead_V1                | 0         | 5 (21.7)| 0.561      | 0       |
| Brugada like syndrome Lead V2                | 0         | 1 (4.3) | 1          | 0       |
| T Wave inversion                             | 0         | 10 (43.5)| 0.624     | 10 (43.5)| 1|
| T Wave inversion Lead V1                     | 0         | 4 (17.4)| 1          | 0       |
| T Wave inversion Lead V2                     | 0         | 4 (17.4)| 1          | 0       |
| T Wave inversion Lead V3                     | 0         | 5 (21.7)| 0.561      | 0       |
| T Wave inversion Lead V4                     | 0         | 3 (13)  | 1          | 0       |
| T_Wave_inversion_Lead_V5                    | 0         | 1 (4.3) | 1          | 0       |
| T Wave inversion Lead I                      | 0         | 1 (4.3) | 1          | 0       |
| T Wave inversion Lead II                     | 0         | 4 (17.4)| 1          | 0       |
| T Wave inversion Lead III                    | 0         | 1 (4.3) | 1          | 0       |
| T Wave inversion Lead avr                    | 0         | 1 (4.3) | 1          | 0       |
| T Wave Wide Lead V3_V4_V5_V6                 | 0         | 1 (4.3) | 1          | 0       |
| U wave                                       | 0         | 4 (17.4)| 1          | 0       |

(Continued)
### TABLE 5 | Continued

| Variable | Mortality | | | | Intubation | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Yes (n = 5) | No (n = 22) | P-value | Yes (n = 5) | No (n = 22) | P-value |
| U wave Pathologic | 0 | 2 (8.7) | 1 | 0 | 2 (8.7) | 1 |
| U wave LEAD V3 | 0 | 2 (8.7) | 1 | 0 | 2 (8.7) | 1 |
| U wave LEAD V4 | 0 | 2 (8.7) | 1 | 0 | 2 (8.7) | 1 |
| U wave LEAD V5 | 0 | 1 (4.3) | 1 | 0 | 1 (4.3) | 1 |
| TDP 1 Dynamic Change | 1 (25) | 5 (21.7) | 1 | 1 (25) | 5 (21.7) | 1 |
| Dynamic Change Description | | | | | | |
| without ST changes, | 0 | 1 (4.3) | 0 | 1 (4.3) | |
| PR changes and T | | | | | |
| inversion in v3, v4 | | | | | |
| tall R, rSr’ in v1, | 1 (4.3) | 0 | 1 (4.3) | |
| pathologic U in inf. | | | | |
| leads, LAA in days after | 0 | | | |
| 0 | | | |
| RSR’ changes to Rs in | 0 | 1 (4.3) | 0 | 1 (4.3) | |
| v1 without QRS | | | | |
| widness | | | | |
| VT then Slow VT then | 1 (25) | 0 | 0.357 | 1 (25) | 0 | 0.357 |
| Asystole in next days | | | | |
| T wave + in 3rd day in | 1 (4.3) | 0 | 1 (4.3) | |
| v3-v4 and decreased | | | | |
| AR to 70.0 also T | | | | |
| inversion is age related | 0 | | | |
| in this case 0 | | | | |
| ST Depression in v2, | 1 (4.3) | 0 | 1 (4.3) | |
| v3, v4, v5, v6, limb2, | | | | |
| limb3, aVF in the 3rd | | | | |
| day of admission 0 | | | | |

*Applying t-test; †Applying Mann-Whitney U-test.

### TABLE 6 | Quantitative ECG findings in mortality and intubation groups.

| Variable | Mortality | | | | Intubation | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Yes (n = 5) | No (n = 22) | P-value | Yes (n = 5) | No (n = 22) | P-value |
| QTc (ms) Median | 426.5 | 402 | 0.201* | 426.5 | 402 | 0.201* |
| IQR | 402.7, 448.7 | 390, 429 | | 402.5, 448.5 | 390, 429 | |
| Mean | 426 | 407,1087 | | 426 | 407,1087 | |
| SD | 23.8 | 26.9 | | 23.8 | 26.9 | |
| Min, max | 398, 453 | 355, 464 | | 398, 453 | 355, 464 | |
| ECG rate (/min) Median | 110 | 91 | 0.025* | 110 | 91 | 0.025* |
| IQR | 96, 131 | 79, 105 | | 96, 130.7 | 79, 105 | |
| Mean | 112.2 | 89.6 | | 112.2 | 89.6 | |
| SD | 18.2 | 17.5 | | 18.2 | 17.5 | |
| Min, max | 93, 136 | 40, 115 | | 93, 136 | 40, 115 | |
| PR interval (ms) Median | 0.1 | 0.2 | 0.216† | 0.1 | 0.2 | 0.216† |
| IQR | 0.09, 0.16 | 0.12, 0.16 | | 0.1, 0.1 | 0.1, 0.2 | |
| Mean | 0.12 | 0.15 | | 0.12 | 0.14 | |
| SD | 0.03 | 0.02 | | 0.03 | 0.02 | |
| Min, max | 0.08, 0.16 | 0.12, 0.2 | | 0.08, 0.16 | 0.12, 0.2 | |
| QRS duration (ms) Median | 0.08 | 0.08 | 0.448† | 0.08 | 0.08 | 0.448† |
| IQR | 0.07, 0.08 | 0.08, 0.09 | | 0.07, 0.08 | 0.08, 0.09 | |
| Mean | 0.08 | 0.08 | | 0.08 | 0.08 | |
| SD | 0.01 | 0.01 | | 0.01 | 0.01 | |
| Min, max | 0.07, 0.08 | 0.05, 0.11 | | 0.07, 0.08 | 0.05, 0.11 | |

*Applying t-test; †Applying Mann-Whitney U-test.
azotemia in four of our patients who had CPK of more than 1,000 mg/dl and higher mortality. Arslan et al. reported a case of colchicine poisoning with evidence of myocytolysis in autopsy confirming the possible effect of the drug on myocytes. Colchicine has been known to induce myopathy in several other studies, as well (26, 27).

Similar to previous studies, the most common presentation of our patients were GI manifestations including nausea, vomiting, abdominal pain and diarrhea (8, 10) which can occur due to mucosal damage and cholera-like syndrome (28). Elevated liver enzymes and higher INR in our cases were significantly related to mortality. We think hypovolemia and hypotension might have played a role through ischemic hepatitis. Dyspnea was an important presentation of our patients and was significantly related to intubation. Case reports of acute respiratory distress syndrome due to colchicine poisoning exist in the literature but none of our patients had ARDS (29). Direct toxic effect of colchicine on respiratory muscles have already been suggested as the mechanism of respiratory involvement (30, 31) which can be argued through our results, as well.

Neuropathy was not prominent in our patients. Limb and facial numbness and paresthesia, headache, tremor, and ataxia were the most common presentations. Patients who complained of numbness, tingling, and facial paresthesia on admission had a higher risk of mortality and need for intubation. Different forms of neuropathy including myo-neuropathy, distal sensory abnormalities, nerve conduction impairment, and axonal neuropathy have been reported in previous studies and changes in microtubular network has been suggested as the probable mechanism of myopathy in these patients (7, 32).

Considering the results of the current study, BUN, creatinine, potassium, and calcium disturbances on presentation accompany with a poorer prognosis. Admission of patients with these problems to the intensive care unit and obsessive correction of the electrolyte and kidney disturbances may yield better prognosis in these patients.

**Limitations and Recommendations**

Our main limitation was inability to check serum colchicine level and to correlate it with symptoms. Another limitation was retrospective nature of the study that led to some missing data.

The low prevalence of colchicine poisoning makes it difficult to conduct a prospective study with attention to levels and cardiac poisoning. Therefore, we recommend more close attention to ECG changes, hemodynamics, and laboratory abnormalities in colchicine toxic patients to detect high risk patients who are at risk of intubation and death.

**CONCLUSION**

Colchicine toxicity is a potentially dangerous situation that needs close monitoring and management. Abdominal pain, sinus tachycardia, hypotension, elevated renal function tests and low potassium are signs of danger and might require intensive care to avoid mechanical ventilation and mortality.

**DATA AVAILABILITY STATEMENT**

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

**ETHICS STATEMENT**

The study was reviewed and approved by Institutional Review Board of Shahid Beheshti University of Medical Sciences (IR.SBMU.MSP.REC.1398.116). The need for written informed consent was waived due to the retrospective nature of the study.

**AUTHOR CONTRIBUTIONS**

MS developed the concept, made the questionnaire, wrote the manuscript, and made the tables. NZ developed the concept, edited the manuscript, and did critical thinking on the subject. AG collected the data and drafted the manuscript. HA edited the final manuscript. HH-M edited the manuscript, submitted it to the journal, and is responsible for the overall content as guarantor. All authors contributed to the article and approved the submitted version.

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