This cross-sectional study was conducted on the drinking water resources of the city of Jolfa (East Azerbaijan province, Iran) from samples taken from 30 wells. Calcium hardness, pH, total alkalinity, TDS, temperature and other chemical parameters were measured using standard methods. The Langelier, Raynar, Puckorius and aggressive indices were calculated. The results showed that the Langelier, Raynar, Puckorius, Larson-skold and aggressive indices were 1.15 (± 0.43), 6.92 (± 0.54), 6.42 (± 0.9), 0.85 (± 0.72) and 12.79 (± 0.47), respectively. In terms of water classification, 30% of samples fell into the NaCl category and 26.6% in the NaHCO3 category and 43.4% samples in the CaHCO3, MgHCO3 and MgCl category. The sedimentation indices indicated that the water of the wells could be considered as corrosive.

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**Specifications Table**

| Subject area          | Chemistry                                                                 |
|-----------------------|---------------------------------------------------------------------------|
| More specific subject area | Describe narrower subject area                                           |
| Type of data          | Tables, Figure                                                            |
| How data was acquired | To calculate the corrosion indices, 120 water samples were collected, stored and transferred to the lab using standard methods and the water quality parameters such as temperature, electrical conductivity, total dissolved solids, pH, dissolved oxygen, calcium hardness, alkalinity, chloride and sulfate were measured. The gravimetric method was used to measure the dissolved solids and the titration method was used to determine alkalinity. Sulfate ions were measured based on turbidity measurement at 420 nm using a DR5000 spectrophotometer. Residual chlorine and pH measurement was carried out using test kits and water temperature was measured with a thermometer at the sampling points |
| Data format           | Raw, Analyzed                                                              |
| Experimental factors  | The mentioned parameters above, in abstract section, were analyzed according to the standards for water and wastewater treatment handbook. |
| Experimental features | The levels of physical and chemical parameters were determined.            |
| Data source location  | Jolfa, East Azerbaijan province, Iran                                     |
| Data accessibility    | The data are available with this article                                  |

**Value of the data**

- Calculation of corrosion indices showed that the chemical quality of the water was imbalanced and could cause corrosion to the water system and other facilities.
- The water quality and the potential for corrosion in all distribution systems is necessary to avoid economic loss and avert adverse effects on health.
- Comparison of five stability indices showed that water conditions in all parts of this study are supersaturated.

1. **Data**

The data presented here deals with monitoring of the physical and chemical properties of pH, EC, TDS, HCO₃⁻, CO₃⁻, SO₄²⁻, Cl⁻, Ca²⁺, Mg²⁺, and Na⁺ as shown in Tables 2 and 3, respectively. The results of the calculations for the Langelier, Ryzener, Puckorius, Aggressive and Larson indices are presented for Jolfa in Table 4. All indices other than the AI index indicated that the water is corrosive. The Langelier index was greater than zero in 90% of samples. Based on the average of this index, the water can be classified as supersaturated; thus, according to the Langelier index, the water is not corrosive. In all samples, (60%) the Ryzener index was between 6 and 7 and it can be concluded that the water samples are saturated (Table 4). The water samples were classified as 30% in the NaCl category, 26.6% in the NaHCO₃ category and 43.4% in the CaHCO₃, MgHCO₃ and MgCl category (Table 5).
2. Experimental design, materials and methods

2.1. Study area description

Jolfa is the capital of Jolfa county in East Azerbaijan province in Iran. Jolfa county is located in northern East Azerbaijan province at UTM coordinates of X = 45.17 to 46.31 east longitude and Y = 38.39 to 39.2 north latitude. The city borders the river Aras and the autonomous republic of Nakhchivan and the Republic of Armenia and Azerbaijan to the north [Fig. 1].

2.2. Sample collection and analytical procedures

To calculate the corrosion indices, 120 water samples were collected, stored and transferred to the lab using standard methods and the water quality parameters such as temperature, electrical conductivity, total dissolved solids, pH, dissolved oxygen, calcium hardness, alkalinity, chloride and sulfate were measured. The gravimetric method was used to measure the dissolved solids and the titration method was used to determine alkalinity. Sulfate ions were measured based on turbidity measurement at 420 nm using a DR5000 spectrophotometer. Residual chlorine and pH measurement was carried out using test kits and water temperature was measured with a thermometer at the sampling points [5–11]. The equations of the corrosion indices and their interpretations are summarized in Table 1.

Table 1

| Summary of water stability indices in present study [1–4]. |
|-------------------------------------------------------------|
| **Equation** | **Index value** | **Water condition** |
| Langelier saturation index (LSI) | LSI = pH−pHs | LSI > 0 | Super saturated, tend to precipitate CaCO₃ |
| | pHS = A + B − log (Ca²⁺)− log LSI = 0 | | Saturated, CaCO₃ is in equilibrium |
| | (Alk) pH < 9.3 | | Under saturated, tend to dissolve solid CaCO₃ |
| | pHS = (9.3 + A + B) − (C + D) LSI < 0 | | |
| | pH > 9.3 | | |
| Ryznar stability index (RSI) | RSI = 2pHs−pH | RSI < 6 | Super saturated, tend to precipitate CaCO₃ |
| | 6 < RSI < 7 | Saturated, CaCO₃ is in equilibrium |
| | RSI > 7 | Under saturated, tend to dissolve solid CaCO₃ |
| Puckorius scaling index (PSI) | PSI = 2(pHeq−pHs) | PSI < 6 | Scaling is unlikely to occur |
| | pH = 1.465 + log (TALK) + 4.54 | PSI > 7 | Likely to dissolve scale |
| | pHeq = 1.465×log(TALK) + 4.54 | | |
| Larson-skold index (LS) | LS = (Cl⁻ + SO₄²⁻)/(HCO₃⁻ + CO₃²⁻) | LS < 0.8 | Chloride and sulfate are unlikely to interfere with the formation of protecting film |
| | | 0.8 < LS < 1.2 | Corrosion rates may be higher than expected |
| | | LS > 1.2 | High rates of localized corrosion may be expected |
| Aggressive index (AI) | AI = pH + log[(Alk)(H)] | AI > 12 | Non aggressive |
| | 10 < AI < 12 | Moderately aggressive |
| | AI < 10 | Very aggressive |
Table 2
Physical and chemical characteristics of water quality of distribution networks of Jolfa city.

| Number | Number | Ca\(^{2+}\) (mg/l) | Mg\(^{2+}\) (mg/l) | Na\(^{+}\) (mg/l) | K\(^{+}\) (mg/l) | CO\(_3\)\(^{2-}\) (mg/l) | HCO\(_3\)\(^{-}\) (mg/l) | TH As CaCO\(_3\) (mg/l) |
|--------|--------|-------------------|-------------------|-----------------|----------------|---------------------|-----------------------|-------------------------|
| Well W1 | 144.00 | 87.84 | 349.6 | 7.41 | 0 | 600.85 | 721.29 |
| Well W2 | 25.60 | 25.86 | 64.4 | 1.17 | 6 | 317.2 | 170.43 |
| Well W3 | 44.00 | 33.67 | 50.6 | 1.56 | 0 | 335.5 | 274.5 |
| Well W4 | 38.40 | 25.86 | 167.9 | 3.12 | 15 | 381.25 | 152.45 |
| Well W5 | 72.00 | 54.14 | 170.2 | 7.8 | 12 | 488 | 406.87 |
| Well W6 | 47.20 | 35.62 | 184 | 3.12 | 0 | 448.35 | 314.5 |
| Well W7 176.00 | 129.32 | 483 | 7.41 | 0 | 506.3 | 972.01 |
| Well W8 | 66.00 | 18.91 | 33.12 | 1.95 | 0 | 219.6 | 242.67 |
| Well W9 | 70.00 | 17.69 | 30.82 | 1.95 | 0 | 219.6 | 247.64 |
| Well W10 | 61.40 | 25.86 | 167.9 | 3.12 | 0 | 448.35 | 314.5 |
| Well W11 | 44.00 | 33.67 | 50.6 | 1.56 | 0 | 335.5 | 274.5 |
| Well W12 | 38.40 | 25.86 | 167.9 | 3.12 | 15 | 381.25 | 152.45 |
| Well W13 | 72.00 | 54.14 | 170.2 | 7.8 | 12 | 488 | 406.87 |
| Well W14 | 180.00 | 122 | 471.5 | 7.8 | 12 | 488 | 406.87 |
| Well W15 | 160.00 | 97.6 | 345 | 7.41 | 0 | 649.65 | 801.44 |
| Well W16 | 180.00 | 85.4 | 126.5 | 5.46 | 0 | 747.25 | 1022.91 |
| Well W17 | 72.00 | 56.12 | 170.2 | 7.8 | 12 | 488 | 410.89 |
| Well W18 | 88.00 | 107.36 | 200.1 | 7.02 | 0 | 585.6 | 661.84 |
| Well W19 | 32.00 | 39.04 | 11.96 | 1.17 | 0 | 366 | 290.61 |
| Well W20 | 122.00 | 163.48 | 310.5 | 3.12 | 0 | 527.65 | 1022.91 |
| Well W21 | 272.20 | 30.26 | 14.95 | 1.17 | 15 | 179.95 | 192.51 |
| Well W22 | 176.00 | 122 | 471.5 | 7.41 | 0 | 439.2 | 941.87 |
| Well W23 | 160.00 | 97.6 | 345 | 7.41 | 0 | 649.65 | 801.44 |
| Well W24 | 180.00 | 85.4 | 126.5 | 5.46 | 0 | 747.25 | 1022.91 |
| Well W25 | 52.00 | 39.04 | 31.28 | 1.17 | 0 | 366 | 290.61 |
| Well W26 | 132.00 | 168.36 | 310.5 | 3.12 | 0 | 527.65 | 1022.91 |
| Well W27 | 184.00 | 25.86 | 163.3 | 7.8 | 12 | 488 | 410.89 |
| Well W28 | 63.20 | 56.12 | 165.6 | 3.9 | 0 | 405.65 | 388.91 |
| Well W29 | 160.00 | 97.6 | 345 | 7.41 | 0 | 649.65 | 801.44 |
| Well W30 | 180.00 | 85.4 | 115 | 5.46 | 0 | 716.75 | 801.14 |
| Mean | 91.49 | 66.14 | 184.08 | 4.28 | 3.66 | 448.29 | 500.81 |
| Max | 180 | 168.36 | 483 | 7.8 | 28.8 | 747.25 | 1022.91 |
| Min | 18.4 | 17.69 | 11.96 | 1.17 | 0 | 179.95 | 152.45 |
| S.D | 55.31 | 45.48 | 148.38 | 2.52 | 8.09 | 174.63 | 300.55 |

Table 3
Physical and chemical characteristics of water quality of distribution networks of Jolfa city.

| Number | Well | ALK as CaCO\(_3\) (mg/l) | CL\(^{-}\) (mg/l) | SO\(_4\)\(^{2-}\) (mg/l) | EC (μmhos/cm) | TDS (mg/l) | pH | HCO\(_3\)\(^{-}\) (mg/l) | CaH as CaCO\(_3\) (mg/l) |
|--------|------|-----------------|----------------|----------------|----------------|-------------|-----|-----------------|-------------------------|
| W1     | 600.85 | 532.5 | 235.2 | 3060 | 1788 | 8.2 | 600.85 | 360 |
| W2     | 323.20 | 24.85 | 48 | 663 | 374.4 | 8.7 | 317.2 | 64 |
| W3     | 320.15 | 28.4 | 48 | 654 | 430.8 | 8.7 | 314.15 | 110 |
| W4     | 335.50 | 42.6 | 48 | 573 | 465 | 8.1 | 335.5 | 136 |
| W5     | 396.25 | 60.35 | 96 | 1092 | 627.6 | 9 | 381.25 | 46 |
| W6     | 500.00 | 152.65 | 144 | 3330 | 1903 | 9 | 381.25 | 46 |
| W7     | 448.35 | 184.6 | 86.4 | 636 | 863.4 | 8.8 | 448.35 | 180 |
| W8     | 506.30 | 754.375 | 528 | 7080 | 2436 | 8.2 | 506.3 | 440 |
| W9     | 219.60 | 69.225 | 36 | 620 | 403 | 7.77 | 219.6 | 165 |
| W10    | 219.60 | 69.58 | 35.52 | 620 | 403 | 7.77 | 219.6 | 175 |
| W11    | 219.12 | 18.46 | 45.12 | 574 | 340 | 8.37 | 190.32 | 153.5 |
| W12    | 225.70 | 69.935 | 38.4 | 640 | 416 | 7.8 | 225.7 | 172.5 |
| W13    | 649.65 | 532.5 | 273.6 | 3140 | 1884 | 7.4 | 649.65 | 400 |
| W14    | 313.90 | 213 | 254.4 | 1673 | 1003.8 | 8.6 | 298.9 | 110 |
| W15    | 741.15 | 230.75 | 124.8 | 2130 | 1278 | 7.5 | 741.15 | 300 |
| W16    | 454.45 | 443.75 | 139.2 | 2290 | 1374 | 7.9 | 454.45 | 150 |
Table 3 (continued)

| Number Well | ALK as CaCO₃ (mg/l) | CL⁻ (mg/l) | SO₄²⁻ (mg/l) | EC (μmhos/cm) | TDS (mg/l) | pH | HCO₃⁻ as CaCO₃ (mg/l) | CaH as CaCO₃ (mg/l) |
|-------------|---------------------|------------|--------------|---------------|------------|----|----------------------|---------------------|
| W17         | 500.00              | 156.2      | 144          | 1582          | 949.2      | 8.5| 488                  | 180                 |
| W18         | 585.60              | 399.375    | 57.6         | 2210          | 1326       | 7.7| 585.6                | 220                 |
| W19         | 366.00              | 23.075     | 24           | 720           | 432        | 7.2| 366                  | 130                 |
| W20         | 527.65              | 621.25     | 355.2        | 3360          | 2016       | 7.7| 527.65               | 330                 |
| W21         | 194.95              | 12.425     | 33.6         | 454           | 272.4      | 8.6| 179.95               | 68                  |
| W22         | 439.20              | 754.375    | 528          | 3950          | 2370       | 7.9| 439.2                | 440                 |
| W23         | 649.65              | 532.5      | 264          | 3120          | 1872       | 7  | 649.65               | 400                 |
| W24         | 747.25              | 227.2      | 144          | 2170          | 1302       | 7  | 747.25               | 450                 |
| W25         | 366.00              | 23.075     | 24           | 720           | 432        | 7.1| 366                  | 130                 |
| W26         | 527.65              | 621.25     | 374.4        | 3400          | 2040       | 7.5| 527.65               | 330                 |
| W27         | 408.70              | 53.25      | 96           | 1024          | 614.4      | 7.9| 408.7                | 46                  |
| W28         | 405.65              | 106.5      | 259.2        | 1509          | 905.4      | 7.5| 405.65               | 158                 |
| W29         | 649.65              | 532.5      | 264          | 3120          | 1872       | 7  | 649.65               | 400                 |
| W30         | 716.75              | 227.2      | 144          | 2120          | 1272       | 7.5| 716.75               | 450                 |
| Mean        | 451.95              | 257.26     | 161.65       | 1941.13       | 1092.0     | 7.8| 448.29               | 228.73              |
| Max         | 747.25              | 754.38     | 528          | 7080          | 2436       | 9  | 747.25               | 450                 |
| Min         | 194.95              | 12.43      | 4.8          | 454           | 272.4      | 7  | 179.95               | 46                  |
| S.D         | 175.43              | 248.71     | 151.68       | 1691.65       | 699.97     | 0.59| 174.63               | 138.28              |

Table 4

Results of Water stability indices calculations samples obtained from Jolfa city.

| Number Well | Index |
|-------------|-------|
|             | LSI   | RSI  | PSI   | LS    | Al    |
| W1          | 1.13  | 5.93 | 5.52  | 1.28  | 13.54 |
| W2          | 0.82  | 7.05 | 7.54  | 0.09  | 13.02 |
| W3          | 1.06  | 6.59 | 7.08  | 0.24  | 13.25 |
| W4          | 0.58  | 6.94 | 6.80  | 0.27  | 12.76 |
| W5          | 1.01  | 6.98 | 7.63  | 0.39  | 13.26 |
| W6          | 1.04  | 6.42 | 6.43  | 0.59  | 13.45 |
| W7          | 0.79  | 6.52 | 6.20  | 0.60  | 12.98 |
| W8          | 1.01  | 6.18 | 5.88  | 2.53  | 13.55 |
| W9          | 0.12  | 7.50 | 7.28  | 0.48  | 12.31 |
| W10         | 0.15  | 7.45 | 7.23  | 0.48  | 12.33 |
| W11         | 0.72  | 6.93 | 7.33  | 0.29  | 12.90 |
| W12         | 0.20  | 7.40 | 7.21  | 0.48  | 12.39 |
| W13         | 0.41  | 6.58 | 5.32  | 1.24  | 12.81 |
| W14         | 0.83  | 6.94 | 7.34  | 1.49  | 13.14 |
| W15         | 0.50  | 6.49 | 5.25  | 0.48  | 12.85 |
| W16         | 0.38  | 7.14 | 6.61  | 1.28  | 12.73 |
| W17         | 1.15  | 6.19 | 6.20  | 0.60  | 13.45 |
| W18         | 0.46  | 6.78 | 5.88  | 0.78  | 12.81 |
| W19         | -0.32 | 7.85 | 6.75  | 0.13  | 11.88 |
| W20         | 0.52  | 6.65 | 5.82  | 1.85  | 12.94 |
| W21         | 0.57  | 7.46 | 8.17  | 0.24  | 12.72 |
| W22         | 0.74  | 6.41 | 5.90  | 2.92  | 13.19 |
| W23         | 0.01  | 6.98 | 5.32  | 1.23  | 12.41 |
| W24         | 0.18  | 6.64 | 4.89  | 0.50  | 12.53 |
| W25         | -0.42 | 7.95 | 6.75  | 0.13  | 11.78 |
| W26         | 0.32  | 6.85 | 5.83  | 1.89  | 12.74 |
| W27         | -0.07 | 8.04 | 7.57  | 0.37  | 12.17 |
| W28         | 0.01  | 7.47 | 6.61  | 0.90  | 12.31 |
| W29         | 0.01  | 6.98 | 5.32  | 1.23  | 12.41 |
| W30         | 0.67  | 6.17 | 4.95  | 0.52  | 13.01 |
| Mean        | 0.49  | 6.92 | 6.42  | 0.85  | 12.79 |
| Max         | 1.15  | 6.92 | 6.42  | 0.85  | 12.79 |
| Min         | -0.42 | 5.93 | 4.89  | 0.09  | 11.78 |
| S.D         | 0.43  | 0.54 | 0.9   | 0.72  | 0.47  |
| Number | Well | Water categories based on TDS | Water category based on Piper chart |
|--------|------|-------------------------------|-----------------------------------|
| W1     | Brackish water | Na⁺ | Cl⁻ |
| W2     | Fresh water    | Na⁺ | HCO₃⁻ |
| W3     | Fresh water    | Mg²⁺ | HCO₃⁻ |
| W4     | Fresh water    | Mg²⁺ | HCO₃⁻ |
| W5     | Fresh water    | Na⁺ | HCO₃⁻ |
| W6     | Fresh water    | Na⁺ | HCO₃⁻ |
| W7     | Fresh water    | Na⁺ | HCO₃⁻ |
| W8     | Brackish water | Na⁺ | Cl⁻ |
| W9     | Fresh water    | Ca²⁺ | HCO₃⁻ |
| W10    | Fresh water    | Ca²⁺ | HCO₃⁻ |
| W11    | Fresh water    | Ca²⁺ | HCO₃⁻ |
| W12    | Fresh water    | Ca²⁺ | HCO₃⁻ |
| W13    | Brackish water | Na⁺ | Cl⁻ |
| W14    | Brackish water | Na⁺ | Cl⁻ |
| W15    | Brackish water | Na⁺ | HCO₃⁻ |
| W16    | Brackish water | Na⁺ | Cl⁻ |
| W17    | Fresh water    | Na⁺ | HCO₃⁻ |
| W18    | Brackish water | Mg²⁺ | Cl⁻ |
| W19    | Fresh water    | Mg²⁺ | HCO₃⁻ |
| W20    | Brackish water | Na⁺ | Cl⁻ |
| W21    | Fresh water    | Mg²⁺ | HCO₃⁻ |
| W22    | Brackish water | Na⁺ | Cl⁻ |
| W23    | Brackish water | Na⁺ | Cl⁻ |
| W24    | Brackish water | Ca²⁺ | HCO₃⁻ |
| W25    | Fresh water    | Mg²⁺ | HCO₃⁻ |
| W26    | Brackish water | Mg²⁺ | Cl⁻ |
| W27    | Fresh water    | Na⁺ | HCO₃⁻ |
| W28    | Fresh water    | Na⁺ | HCO₃⁻ |
| W29    | Brackish water | Na⁺ | Cl⁻ |
| W30    | Brackish water | Ca²⁺ | HCO₃⁻ |
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Transparency document. Supporting information

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