industry or mixed with sanitation, which are summarized in **Table 1**.

Table 1. Treated water samples from the pharmaceutical industry.

No	Sample	Source	Temp (ºC)
(1)	Treatment of the Wastewater pharmaceutical Industry	Medico Labs	0.5 ±5
(2)	Treatment of the Wastewater and Wastewater pharmaceutical Industry	Medico Labs	0.5 ±7
(3)	Treatment of the Wastewater pharmaceutical Industry	Ibn Hyan Pharma	0.5 ±6
(4)	Treatment of the Wastewater and Wastewater pharmaceutical Industry	Ibn Hyan Pharma	0.5 ±4

Design of Manual Cleaning Columns (SPE)

The fillings of a number of (expired) chromatographic separation columns containing Octadecylsilane were emptied, these fillings were activated with a group of polar phases, filtered and dried at 120˚C for a period of 45 min, then weighed 250 mg of the last, and placed in syringes Plastic capacity 10 mL, equipped with glass wool before and after finely weighed filling with a total number (8) purification columns.

Preparation of standard solutions

Both methyl methoxy hydrochloride (DH) was accurately weighed at 100.02 mg, diclofenac sodium (DS) at 100.03 mg, and mefenamic acid (MA) at 100.01 mg. Each calculated weight (with respect to the purity of each separately) was dissolved in standard volumetric flasks of 100 ml each containing 20 mL of a mixture of (high purity distilled water: methanol) at a ratio of (50:50) v/v% (solvent). It was placed on the Ultrasonic device, and the volume was completed with the same solvent up to the standard mark. The prepared solution represents the standard solution with a concentration of 1000 µg/mL, and the solution of each substance was prepared with an appropriate extension solution containing the studied materials with a concentration of 20 µg/mL.

Working method for preparing treated water sample

Water samples were collected from collecting tanks at a volume of 500 mL as shown in **Table 1** and filtered micronically, and kept in the refrigerator at a temperature of (5 ± 0.5˚C). $KAl(SO_4)_2.12H_2O$, the sample was filtered micronically, then treated with 5 mL of EDTA-Na_2 solution sodium salt of EDTA acid at a concentration of 5 g/L and the sample filtered micronically, then washed with 5 mL of a solution under sodium chloride at a concentration of 0.2 mg/L The sample was filtered micronically and finally it was treated with 5 mL of ascorbic acid solution at a concentration of 25 mg/L, then the sample was micronized and the medium pH was adjusted at 7 with 85% phosphorous acid and passed through soft treatment on purification columns designed manually washed away the rest in columns with 10 mL three batches of mobile phase. Taking 1 mL of the treated sample size and applied by the method of standard additions to get ready for injection into a separation column for your HPLC.

RESULTS & DISCUSSION

The chromatographic separation conditions were set to define each of the standard solutions containing the studied materials: (DH), (DS) and (MA) after making precise chromatographic separation conditions for each one separately and then to separate the mixture until reaching the ideal separation chromatographic conditions suitable for the quantification process. Conditions are listed in **Table 2**.

Table 2. Ideal chromatographic conditions.

Column	**C_{18} (4.6 × 250 mm, 5 µm, 10Aº)**
Mobile Phase	(Acetonitrile: Methanol: TEA 1%)
v\v\v %	(45: 20: 35) v\v\v% pH=3 Adjust by H_3PO_4 85%
Volume Inject (µL)	20
Temperature ˚C	25
Flow Rate (mL/min)	2
Wavelength (nm)	220

Linear filed of studied compounds

To identify the linear field between the analytical signal (top surface area) and the studied compound concentration. Standard solutions containing the sum of the pain relievers and NSAIDs studied were prepared at the linear field: (0.0001-20.0000) µg/ml. Due to (DH) and (0.0005-25.0000) µg/ml due to (DS) and (0.0002-20.0000) µg/ml is due to the substance (MA), and these solutions were injected successively as shown in **Figures 1-4** and **Table 3**.

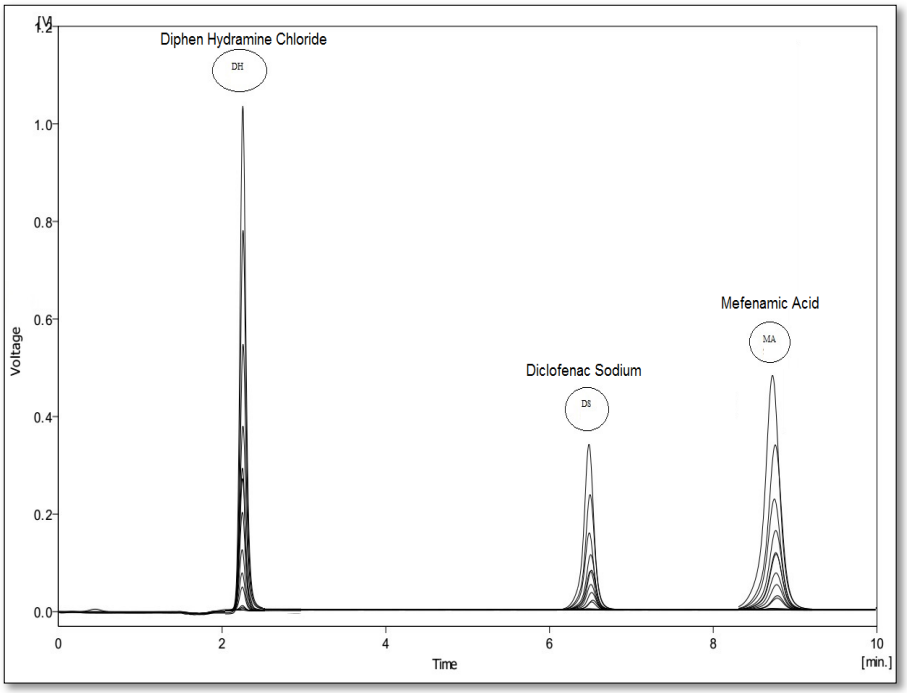

Figure 1. The standard series of total compounds studied at concentrations of standard solutions.

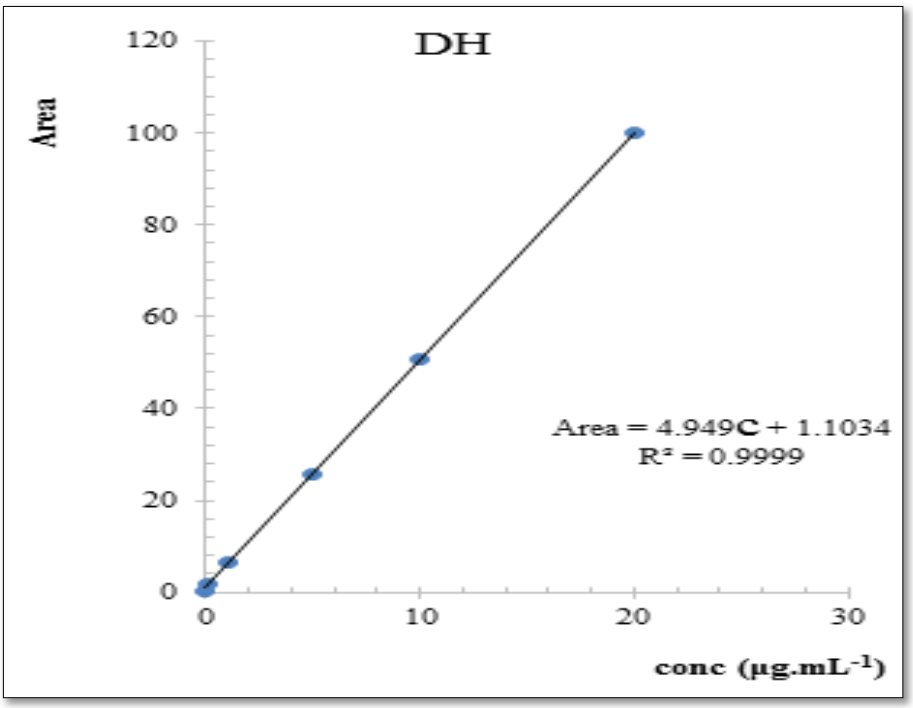

Figure 2. The standard DH line diagram at linear range (0.0001-20.0000) µg/ml.

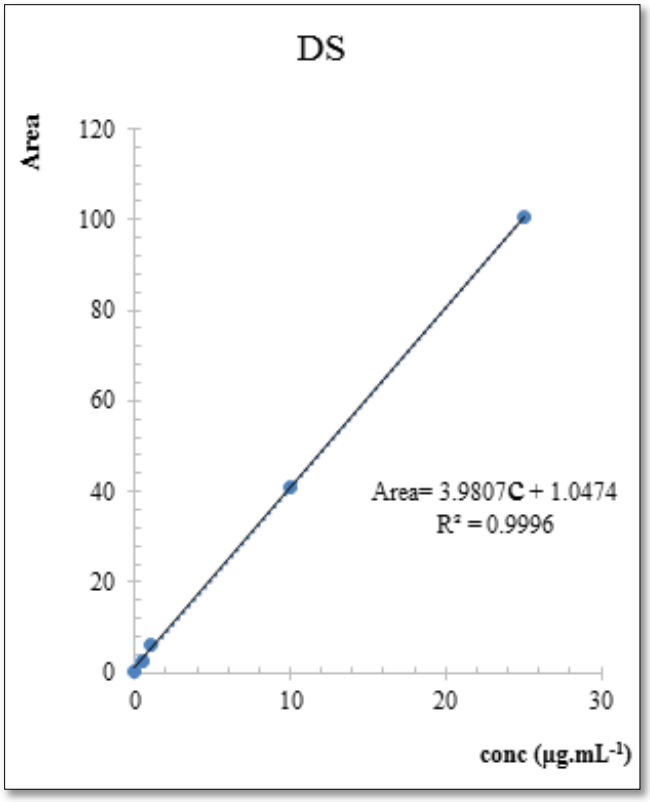

Figure 3. The standard "DS" composite graph at the linear range (0.0005-25.0000) µg/ml.

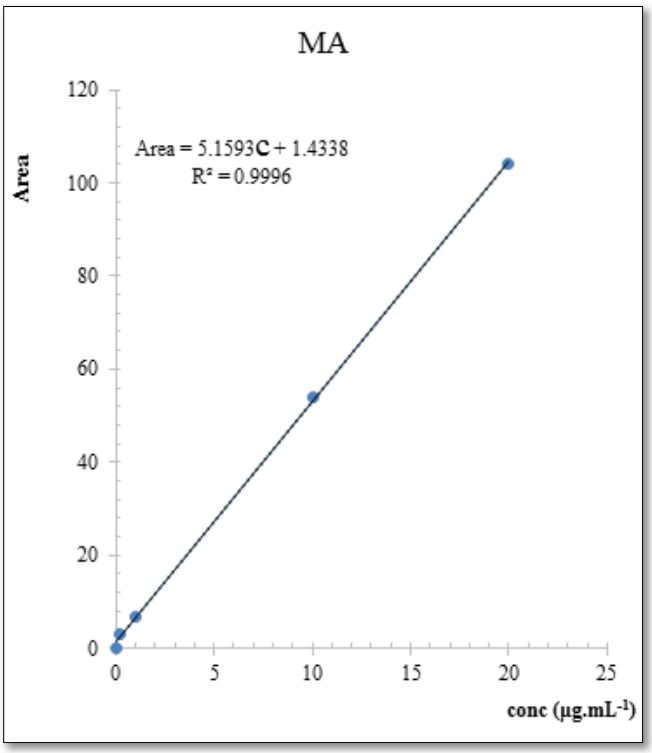

Figure 3. The standard "DS" composite graph at the linear range (0.0005-25.0000) µg/ml.

Table 3. Results of chromatographic analysis according to the proposed study.

Parameter	Value Calculate (DH)	Value Calculate (DS)	Value Calculate (MA)
Slope	4.9490	3.9807	5.1593
Intercept	1.1034	1.0474	1.4338
SD from Intercept	0.0010	0.0012	0.0025
Series Rang (µg/ml)	0.0001-20.0000	0.0005-25.0000	0.0002-20.0000
R^2	0.9999	0.9996	0.9996
Limit Detection (µg/ml)	0.00067	0.00147	0.000484
quantities Limit Detection (µg/ml)	0.00203	0.00301	0.00146

Checked the accuracy and validity of the proposed method

To achieve a correct and accurate chromatographic separation method with the ideal approved conditions. Standard laboratory solutions containing different concentrations of compounds studied in experimental samples located within the studied linear field were prepared. Where three standard solutions were prepared at concentrations (0.01, 0.10, 1.20) µg/mL. Based on the parent standard solutions for the studied compounds **(Figure 5)**.

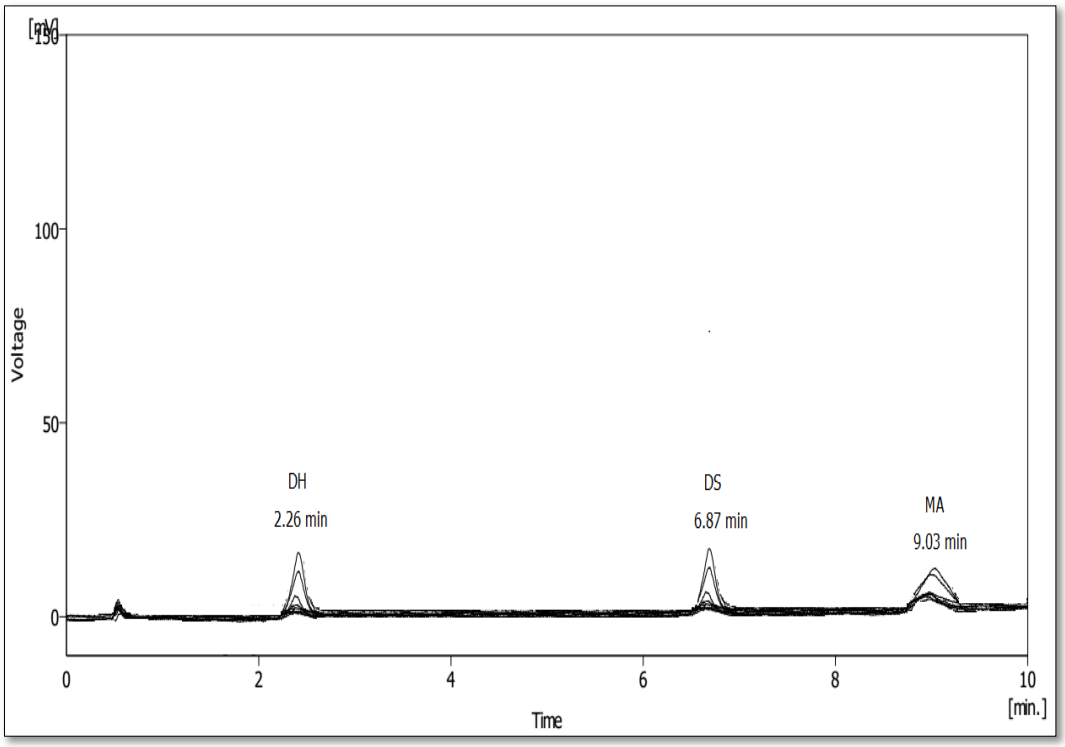

Figure 5. Chromatogram of experimental samples according to the proposed method (0.01, 0.1, 1.2) µg/ml.

The results of injecting these concentrations on the device were approved after five consecutive times, and the values of both Recovery% and RSD% were calculated at each concentration for four degrees of freedom and a confidence limit of 95%. The tested results were also listed in **Table 4**.

Table 4. Results of the analysis of experimental samples at four degrees of freedom and confidence limit of 95%.

Recovery% ± SD	RSD%	Real Conc µg/ml	Theo Conc µg/ml	Compound
96.00 ± 0.00018	1.87	0.0096	0.0100	**DH**
95.10 ± 0.00160	1.68	0.0951	0.1000	
98.33 ± 0.02300	1.95	1.1800	1.2000	
94.10± 0.00019	2.02	0.00941	0.0100	**DS**
93.20± 0.00170	1.82	0.0932	0.1000	
99.16 ± 0.0180	1.51	1.1900	1.2000	
92.30 ± 0.00020	2.16	0.00923	0.0100	**MA**
95.70 ± 0.00170	1.77	0.0957	0.1000	
100.83± 0.02500	2.06	1.2100	1.2000	

It is noted from the results given in the above table that the regression values ranged between 92% for mefenamic acid and 93% for diclofenac sodium and 95% for diphenhydramine hydrochloride and the values for the percentage of standard percentage deviation ranged between 1.95% for the last and 2.02% for sodium diclofenac and 2.16% for mefenamic acid which indicates Good health and accuracy for the proposed method and within the analytically acceptable limits.

Analysis of treated: Water samples in the pharmaceutical industry

The proposed chromatographic conditions were applied to samples of different sources from treated water samples for the pharmaceutical industry after the samples were prepared according to what was mentioned in paragraph (4). **Figure 6** shows the returned chromatogram to determine the studied compounds (DH, DS, MA) in the treated water sample (1).

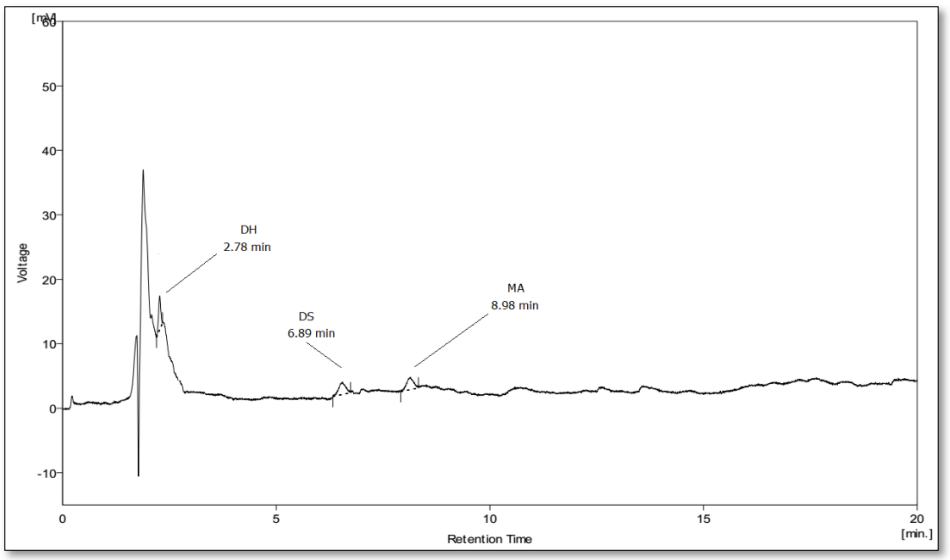

Figure 6. Chromatogram of a realistic sample of a mixture of compounds studied in the sample (1).

Given that the quantity of these materials is relatively low, therefore in order to calculate the actual concentration within the sample, and to enhance the amount of materials studied within the sample and reduce the background noise of the sample on the quantification process, the standard additions method was applied by adding increasing concentrations of the studied materials, **Figure 7** shows chromatogram The yield for the compounds studied in the treated water sample for the pharmaceutical industry according to the standard additions method.

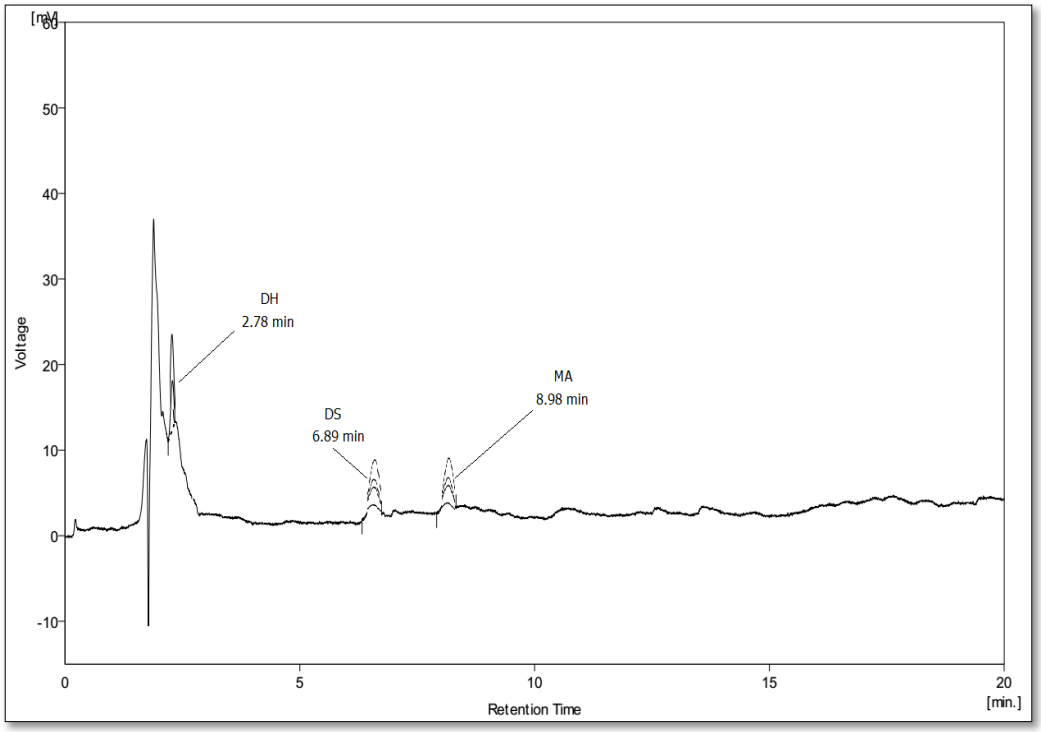

Figure 7. Chromatogram of the realistic sample of the mixture of the compounds studied in the sample (1) with standard additions

The equations of standard line charts for the standard addition's method were obtained by drawing the relationship between the surface area of the chromatographic peak produced for the concentrations after adding specific concentrations of the standard solution containing (DH, DS, MA) as in **Tables 5 and 6**. Determine the content of the treated water sample (1 and 2) from pain relievers and NSAIDs according to the standard additive method.

The high content of the studied materials compared to the results in **Table 6**. This is due to the interference of the chromatographic summit due to the studied materials with the background of the sample due to the occurrence of a chemical transformation such as the disintegration of the studied samples during the treatment process in the sample (2), at times Retention of the studied materials As noted from the previous table, the content of the samples from the studied materials was somewhat greater than the values results in **Table 6**. **Figure 8** shows the chromatogram due to determining the studied compounds (DH, DS, MA) in the treated water sample (3 and 4).

Given that the quantity of these substances is relatively low, therefore, in order to calculate the actual concentration within the sample, to enhance the amount of materials studied within the sample and to reduce as much as possible the interference from the sample background, the standard additions method was applied by adding increased concentrations of the studied materials, **Figure 9** shows the returning chromatogram To determine pain relievers and NSAIDs in the treated water sample for the pharmaceutical industry.

Standard line graph equations were obtained for the standard additions method by drawing the relationship between the surface area of the resulting chromatographic peaks of the concentrations after adding specific volumes of the standard solution containing (DH, DS, MA). The treated water sample (3 and 4) from the studied compounds according to the standard addition's method.

Table 5. Equations for standard graphs to determine the compounds studied in sample (1) & sample (2) according to the standard addition's method.

Name Compound	**Standard graph line equation in Sample (1)**	**Correlation coefficient**
DH	Area=0.0392C + 0.0125	0.9703
DS	Area=0.1593C + 0.0014	0.9982
MA	Area=0.432C + 0.003	0.9990
[c] = 0, 0.01, 1.00, 5.00, 15.00 µg/mL		
Name Compound	**Standard graph line equation in Sample (2)**	**Correlation coefficient**
DH	Area=0.8782C + 0.2345	0.9871
DS	Area=8.6781C + 1.3471	0.9982
MA	Area=25.985C + 16.321	0.9991
[c] = 0, 0.01, 1.00, 5.00, 15.00 µg/mL		

Name Compound	**Calc conc µg/mL in Sample (1)**	**Ref Value µg/mL**	**t-Test**	**F-Test**
DH	0.000789	0.000214	1.231	1.856
DS	0.000187		1.754	1.7454
MA	0.000145		1.345	1.8898
Name Compound	**Calc conc µg/mL in Sample (2)**		**t-Test**	**F-Test**
DH	0.00561		2.567	1.9743
DS	0.00623		3.875	1.9521
MA	0.00498		2.895	1.9898

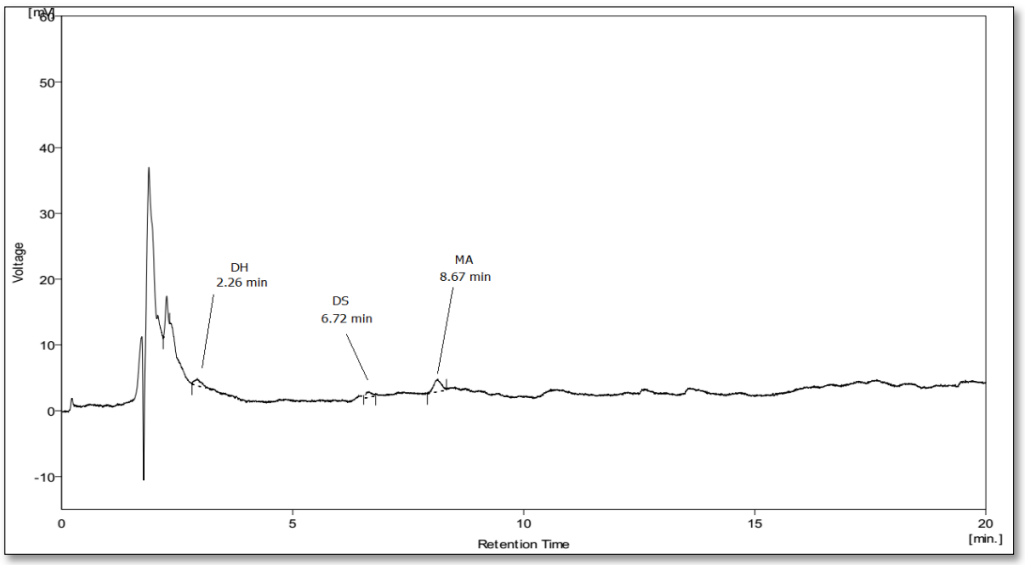

Figure 8. Chromatogram of the realistic sample of the mixture of compounds studied in the sample (4).

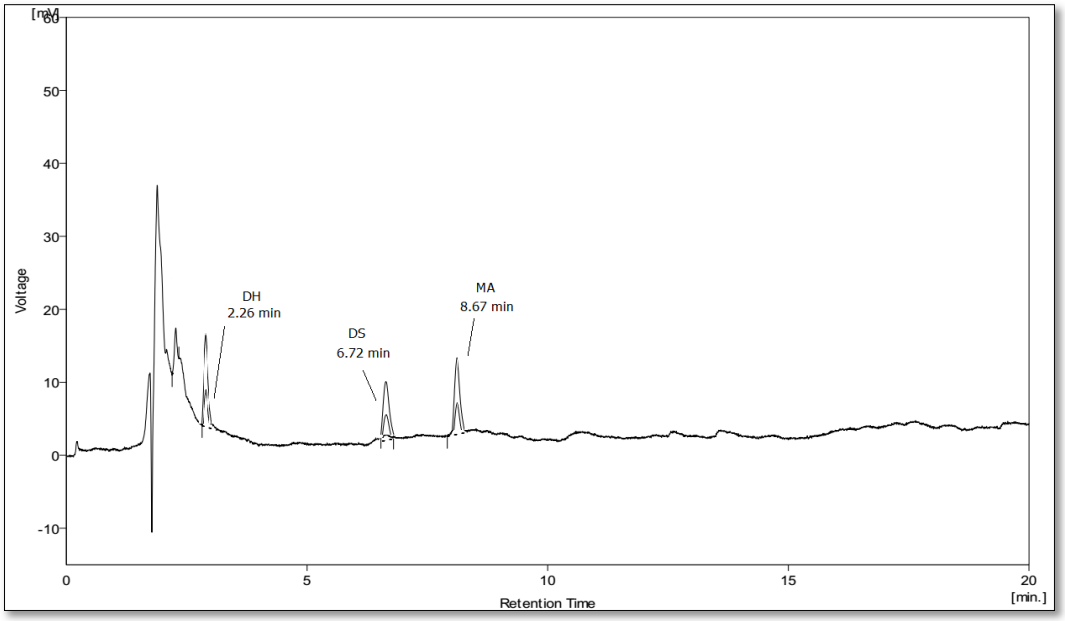

Figure 9. Chromatogram of the realistic sample of the mixture of the compounds studied in the sample (2) with standard additions.

Table 6. Standard graph equations to determine the compounds studied in the sample (3) & Sample (4) according to the standard addition's method.

Name Compound	**Standard graph line equation in Sample (3)**	**Correlation coefficient**
DH	Area=30.439C – 0.4027	0.9386
DS	Area=5.7749C + 0.069	0.9805
MA	Area=21.601C + 0.1389	0.9858
[c] = 0, 0.10, 1.00, 5.00, 20.00 µg/mL		
Name Compound	**Standard graph line equation in Sample (4)**	**Correlation coefficient**
DH	Area=41.231C + 23.566	0.9568
DS	Area=12.7890C + 5.678	0.9789
MA	Area=27.9124C + 16.864	0.9987
[c] = 0, 0.10, 1.00, 5.00, 20.00 µg/mL		

Name Compound	**Calc conc µg/mL in Sample (3)**	**Ref Value µg/mL**	**t-Test**	**F-Test**
DH	0.000210	0.000214	3.455	3.2211
DS	0.0002354		3.122	6.323
MA	0.000310		2.087	7.2322
Name Compound	**Calc conc µg/mL in Sample (4)**		**t-Test**	**F-Test**
DH	0.00986		4.6743	5.1246
DS	0.00784		4.1235	6.7864
MA	0.01974		3.6743	6.3116

CONCLUSIONS

Very low concentrations of (DH, DS, MA) were identified in the pharmaceutical wastewater samples using RP-HPLC technology. The proposed analytical method achieved high accuracy and sensitivity, with excellent detection limits. The result of the study, and compared with the reference results, shows that the appropriate chemical treatment of the pharmaceutical industry residues containing such compounds is better in relation to the recommended concentrations according to the World Health Organization without being treated by mixing with wastewater that affects little on the background of the sample because of the possibility of a chemical transformation that raises from Quantitative ratios of materials studied in the sample when mixing wastewater with the pharmaceutical industry's waste.

ACKNOWLEDGEMENT

This research aimed to suggest an analytical, chromatographic method: Sensitive, accurate, fast and reliable results, to determine the very low concentrations of months and more pain relievers and NSAIDs used locally and globally in the waters of the pharmaceutical industry wastes, as the latter is dumped in large quantities to agricultural areas And vital to direct contact with the environment, which affects human health and society.

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