Fentanyl vs. Morphine in Acute Renal Colic: Impact on Emergency Department Length of Stay

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ABSTRACT

Renal colic is a common urological emergency marked by acute, severe pain, often requiring opioid analgesia in the emergency department (ED) when NSAIDs are ineffective or contraindicated. Despite widespread use, direct comparisons between morphine and fentanyl remain limited. To compare the efficacy of intravenous morphine and fentanyl in adults with renal colic, with ED length of stay as the primary outcome. Secondary outcomes included recurrence of ED visits, discharge, and admission rates. This retrospective study analyzed 1,620 patients aged 16–65 who presented with flank pain at two tertiary hospitals in Bahrain. Inclusion criteria were confirmed renal colic, VAS >4, opioid administration, and adequate documentation. Patients were grouped based on the initial opioid received. Variables analyzed included demographics, pain scores, rescue analgesia use, ED length of stay, disposition, and recurrence. Statistical analysis was conducted using SPSS with one-way ANOVA and Tukey HSD tests. In the cohort, 40.8% received morphine and 59.1% received fentanyl, with fentanyl initially linked to a significantly shorter emergency department stay (195 vs. 237 minutes; $p<0.001$), though this difference disappeared after adjusting for factors like pain score, age, gender, and renal stone history. While admission and recurrence rates were comparable, fentanyl was associated with higher discharge rates and morphine with fewer referrals, even after controlling for confounders. Both opioids proved effective for renal colic management. Opioid choice should be guided by clinical context and distinct pharmacokinetic properties. Further prospective studies are warranted to refine opioid selection in this setting.

Keywords: renal colic, opioids, fentanyl, morphine, emergency medicine, retrospective study.

INTRODUCTION

Renal colic is a common and often intensely painful clinical condition caused by the obstruction of urinary flow, characteristically due to nephrolithiasis. The incidence of nephrolithiasis has increased globally over the past decades, 12% of world population were found to be affected by renal colic in their lifetime, occurring more commonly in males between the age of 20 to 49 years[1]. In a retrospective study done in Bahrain in December 2014, it was found that 486 patients were diagnosed with kidney stones for the first time during that year, and the average number was 40.5 patients per month,[2] making it a condition emergency physicians tend to face on a daily basis.

The observed increase in prevalence is thought to be linked to changes in lifestyle, including physical inactivity, poor dietary patterns, and environmental factors such as global warming[3]. Seasonal variation and fasting have also been identified as significant factors influencing the incidence of urolithiasis. A study conducted in Riyadh, Saudi Arabia, in 2019 found that acute presentations of urolithiasis were more frequent during the summer season, accounting for 31.22% of cases[4]. Similarly, a 2018 study from Bahrain reported a higher frequency of emergency visits for urolithiasis during the month of Ramadan (38.2%) compared to other months, a finding likely related to the effects of fasting[5]. Nephrolithiasis is characterized by sudden onset of intense flank pain that may radiate to the lower abdomen or groin. This is believed to be attributed to the stone passage through the urinary tract. The severity and the characteristic of this pain lead to frequent and recurrent visits to emergency departments worldwide. The primary objective in treating this condition is to achieve rapid and adequate pain relief.

The decision-making process for selecting analgesic drugs involves weighing their efficacy against potential side effects. Opioids remain a viable choice as either a first or second-line analgesic. Morphine and fentanyl are both opioid analgesics commonly used in the management of renal colic due to their potent pain-relieving properties. However, they differ in their pharmacokinetic profiles.

Morphine has long been considered the standard opioid for acute pain management owing to its efficacy. It has an onset time of approximately 15–20 minutes when administered intravenously[6].

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It exhibits a half-life of about 2–3.5 hours, making it effective for sustained pain relief, though its active metabolites can accumulate in patients with renal insufficiency, potentially prolonging its effects[7].

The volume of distribution (Vd_ss) for morphine is typically 3–5 L/kg, and its duration of action can last several hours (up to 7 hours), which is beneficial for longer-term management of pain[8]. Side effects include nausea, vomiting, and hypotension[9].

In comparison, fentanyl is associated with fewer gastrointestinal side effects compared to morphine[9]. Fentanyl is a synthetic opioid characterized by a rapid onset of action which is almost immediate when given by intravenous route, with peak effects observed as early as 5 minutes,[10] because its lipophilic nature allows it to cross the blood-brain barrier more rapidly[11]. It has a similar half-life and volume of distribution as morphine[6] but is approximately 100 times more potent. However, its effects are more short-lived, typically lasting 30–60 minutes due to rapid redistribution into skeletal muscles and adipose tissues[7,10] compared with morphine's long half-life.

Both opioids are metabolized primarily in the liver—morphine by glucuronidation, which produces active metabolites, and fentanyl by CYP3A4 enzymes. However, fentanyl does not produce significant active metabolites, making it a better choice for patients with renal insufficiency[11].

No direct head-to-head trials of morphine vs. fentanyl in renal colic were identified. Furthermore, multiple broad trials compared each of these drugs to different opioids. A recent systemic review of 71 identified randomized clinical trials, comparing opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), and acetaminophen, have demonstrated that both are effective in alleviating the severe pain associated with renal colic.[9] Nonetheless, the choice between the two often depends on patient-specific factors, clinical setting, and provider experience.

This retrospective study aims to evaluate and compare the efficacy and clinical outcomes associated with the use of intravenous morphine and fentanyl in the management of acute renal colic among adult

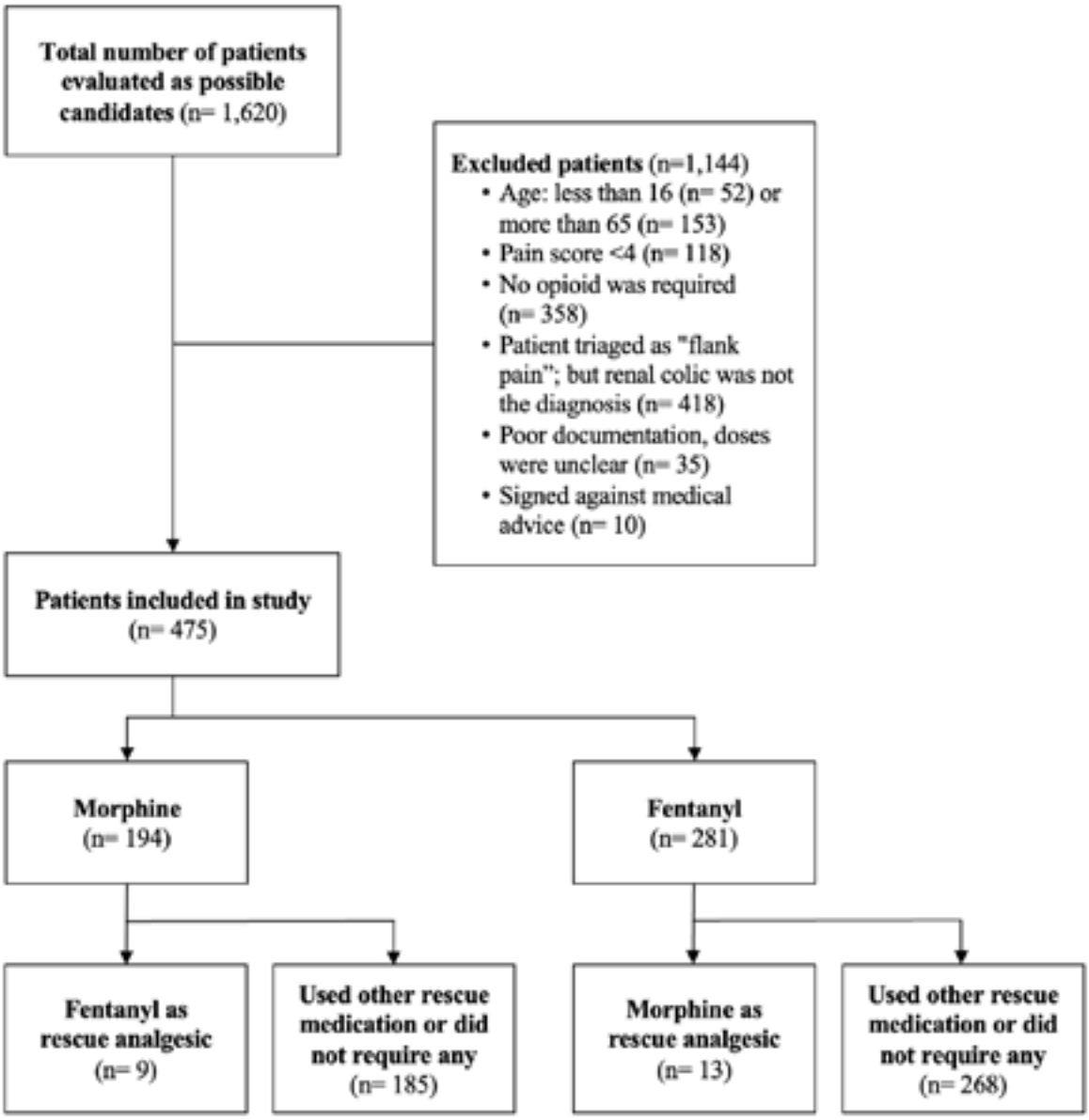

Figure 1. Flowchart of patient enrollment.

patients presenting to the emergency department. The primary outcome assessed is the length of stay in emergency department, while secondary outcomes focus on discharges, admission rate, and frequency of recurrent emergency visits.

METHODS AND MATERIALS

This research was planned as a retrospective analysis of 1,620 patients who presented to two major hospitals in Bahrain (King Hamad University Hospital and Bahrain Defence Force) and triaged with the complaint of "Flank pain" as ICD-10 code R10.9. In both hospitals, the visual analogue scale (VAS) is used as part of the Canadian triaging system. Exclusions include patients who were marked VAS <4, patients that were below the age of 16 or above the age of 65, patients who did not require any opioids as part of their management, patient files with poor documentation, those who signed against medical advice and patients who were triaged as "flank pain" but had an alternate diagnosis other than renal colic upon further examination.

Included were patients who were diagnosed with renal calculi, had a VAS score >4, required opioid administration, were between the ages of 16-65 years old and who had well-kept documentation records. Diagnosis of renal colic was usually confirmed by presence of erythrocytes in the urine as microscopic or frank hematuria, with characteristic history and pain, and further confirmation on ultrasound and computer tomography findings during urology clinic follow-ups.

Patients were categorized based on initial opioid given, rescue medications that were required, age, gender, whether the patient is a known stone former or first presentation of renal colic, the pain score at presentation, length of hospital stay in minutes, whether the patient was referred to urology, discharged from emergency department or admitted as a subsequent result. Recurrent visits were also factored into the data. Consent was not required as no patient sensitive information was obtained as part of the data during this study.

This data was first entered in Microsoft Excel, and then SPSS was used to calculate the one-way ANOVA. The ANOVA was statistically significant, so Tuckey post hoc test was done to find out where in which group the major variation lay.

RESULTS

From the period of January to December 2024, 1,620 patients were evaluated as possible candidates. Out of these, 475 patients were considered to fit our designated eligibility criteria (Figure 1).

The breakdown of which included as follows: 27.6% of the patients were found to be female (131) and 72.4% were found to be male (344). Patients that were known to be stone formers made up 54.3% of the population (258) and the rest were found to be first-time comers for the complaint, making up 45.7% (217). The average patient presenting to EMD with renal colic scored 5.76 using the VAS assessment tool (Table 1).

Patients were categorized based on the first analgesics given, whether it was morphine or fentanyl and, by rescue medications required, if any.

The number of patients in total receiving morphine was 194 (40.84% of patients), 9 of which went on to receive fentanyl as a rescue medication (1.89%) and 185 of which received another analgesic or did not require further rescue analgesia (38.95%). The number of patients receiving fentanyl was 281 (59.16% of patients), 13 of which went on to receive morphine as a rescue analgesia (2.74%) and 268 went on to receive other analgesics or did not require any rescue analgesia at all (56.4%).

The rescue medication administered dependent on the physician following the case, as there are no formal guidelines in the institutes the data was collected in regarding rescue analgesia. The most frequent rescue medication used was paracetamol (135 patients, 28.4%), followed by diclofenac (98 patients, 20.6%). The most common opioid used as a rescue was fentanyl (43 patients, 9.1%) as compared to morphine (13 patients, 2.7%). Other rescue medications included the use of tramadol in 2 patients (0.4%), hyoscine in 1 patient (0.2%) and metoclopramide in 1 patient (0.2%) Table 1.

Table 1. Basic characteristics of the patients

Variables	N	%
Age (mean ± SD)	40.28 ± 10.97	
Gender		
Female	131	27.6
Male	344	72.4
History of kidney stones		
First time	217	45.7
Known case	258	54.3
Pain score	5.76	1.27
Route variable		
Morphine □ Fentanyl	9	1.89
Fentanyl □ Morphine	13	2.74
Morphine □ Others /None	185	38.95
Fentanyl □ Others /None	268	56.42
First analgesics		
Morphine	194	40.84
Fentanyl	281	59.16
Rescue medications		
Morphine	13	2.7
Fentanyl	43	9.1
Paracetamol	135	28.4
Diclofenac	98	20.6
Tramadol	2	0.4
Hyoscine	1	0.2
Metoclopramide	1	0.2

SD–Standard deviation

Main Outcomes

The primary outcome of this study is the length of stay of patients receiving morphine vs the patients that have received fentanyl. Secondary outcomes are discharges from the emergency department, revisit rate and the admission rates of the patients presenting with renal colic. All are reflected in Tables 2 and Table 3.

Table 2 shows the association of the prescribed analgesic with the length of stay within the emergency department. For the morphine group, the length of stay averaged 237.361 minutes, whereas the length of stay in the fentanyl group was less, averaging 194.993 minutes (p value <0.0001). However, the standard deviation varied, from +/- 129.78 minutes for the morphine group and 88.325 minutes for the morphine group.

For patients that have received first morphine and then fentanyl as a rescue and fentanyl and then morphine as a rescue, the data shows that, again, the group that received fentanyl first as an initial opioid then morphine as a rescue medication stayed less in the emergency department than the group that received morphine first, then fentanyl as a rescue medication (247 minutes and 330 minutes, respectively). This data is further exemplified by the patients that had received fentanyl first, and then received other medication or no further medication, still

had a length of stay averaging around 192.44 minutes, as compared to the morphine group that had received other medication or no further medications, who had an average time of 232.854 minutes (p value <0.0001).

In total, 319 patients were discharged (67.2%) and 156 patients were admitted (32.8%). The referral and admission rate were similar, with 158 patients being referred for further admission (33.3%) and 317 patients being discharged from emergency department (66.7%). The length of stay on average was 212.3 minutes, with a standard deviation of 109.9 minutes. 99 patients were recurrent visitors in the emergency department (20.8%) and 376 patients did not return after discharge (79.2%). As mentioned previously, 54.3% of patients were known to be stone formers.

Table 2. The association of the prescribed analgesic medications with the length of stay in the emergency department in minutes

Variable	n	mean ± SD	*p*–value
Route variable			
Morphine □ Fentanyl	9	330.00 ± 135.322	<0.0001
Fentanyl □ Morphine	13	247.538 ± 143.947	
Morphine □ Others /None	185	232.854 ± 128.180	
Fentanyl □ Others /None	268	192.444 ± 84.315	
First analgesics			
Morphine	194	237.361 ± 129.78	<0.0001
Fentanyl	281	194.993 ± 88.325	

SD–Standard deviation

Table 3. Case outcomes

Variable	n	%
Discharged	319	67.2
Yes		
No	156	32.8
Referred	158	33.3
Yes		
No	317	66.7
Admitted	66	13.9
Yes		
No	409	86.1
Length of stay (mean ± SD)	212.3	109.09
Recurrent visit dichotomous		
Yes	99	20.8
No	376	79.2

SD–Standard deviation

A Tuckey's HSD post hoc test (Table 4) revealed statistically significant differences in the group that received morphine first and then fentanyl as compared to the group that received only morphine or fentanyl, even when given with other non-opioid analgesics. The group that was given morphine then fentanyl stayed longer in the emergency department as compared to the group that received fentanyl with other non-opioid analgesics (p value 0.001) or morphine and other non-opioid analgesics (p value 0.038). It was also found that morphine with other medications or by itself was found to be associated with longer stays in emergency department, of approximately 40 minutes longer, as compared to fentanyl or fentanyl with other medications (p value 0.0001).

Table 5; reflects multivariable logistic regression between order of prescribed opioids and patient outcomes. It was found that the association is of a ratio as 1:1 between fentanyl and morphine in comparison of length of stay when accounting for all the data (*p*-value 0.026 and 0.032 for morphine as COR and AOR, *p*-value for 0.032 and 0.0001 for fentanyl in the COR and AOR respectively).

Table 6; shows the binary logistic regression for the association between the first opioid the patient has received and the difference in patient outcomes in terms of length of stay, recurrent visits, discharge, referral and admission. The statistically significant data can be noted when considering when it comes to length of stay, discharges and referral rates.

When it came to length of stay, the morphine and fentanyl group have no meaningful difference in the length of stay (<0.0001 for OCR and <0.0001 for AOR) as noted in both Table 5 and Table 6 when adjusting all factors.

Without the adjustment of factors, the Tuckey post hoc comparison suggested a reduced emergency visit stay in fentanyl over morphine as noted in the data in Table 4. However, this was found not to be true, when considering variations of pain scores, age, gender and history of prior renal stones.

Table 6; shows the binary logistic regression for the association between the first opioid the patient has received and the difference in patient outcomes in terms of length of stay, recurrent visits, discharge, referral and admission. The statistically significant data can be noted when considering when it comes to length of stay, discharges and referral rates.

Patients that received fentanyl over morphine had a 43.9% chance to be discharged from the emergency department (p value 0.065 COR, p value 0.005 AOR). Morphine, however, was associated with a 33.5% decrease in referral rates as compared to fentanyl (p value 0.039 COR, p value 0.002 AOR).

DISCUSSION

The findings outlined in our study above showed in terms of length of hospital stay, there were no significant differences between the morphine and fentanyl group. Initially, in the Tuckey post hoc analysis, it was found that patients that received morphine, on average, stayed 40 minutes longer than the fentanyl group. However, when accounting for age, gender, pain score, history of kidney stones and need for rescue medication, the data shows that, statistically, they are very similar when comparing them for length of stay.

This is not too surprising considering that length of stay is not actually related to the patient's actual length of stay, but factors such as

"time for the first analgesic to be given, after adjusting for sex, triage urgency, location of initiation of care, departure destination and measures of workload"[13] and is not actually only dependent on pharmacokinetics of the medications. As mentioned in the methodology, this was only taken over a year and only included King Hamad University Hospital and Bahrain Defence Force, hence is limited by the fact that it is only a year of data and does not include one of the major hospitals in Bahrain, that is Salmaniya Medical Complex, where a large majority of the population is seen. So, whilst this data is accurate (p values suggest statistical significance), it might not be representative of the whole of the Bahraini population.

Table 4. Tuckey HSD post hoc comparison between different opioid orders in terms of length of stay in emergency department in minutes

Comparison			MD	SE	*p*–value	95% CI
Morphine □ Fentanyl vs. Fentanyl	□	Morphine	82.4620	46.0700	.279	-36.317 - 201.24
Morphine □ Fentanyl vs Morphine	□	None or Other	97.146	36.2650	.038*	3.646 - 190.646
Morphine □ Fentanyl vs Fentanyl	□	None or Other	137.556	36.0040	.001*	44.730 - 230.382
Fentanyl □ Morphine vs Morphine	□	None or Other	14.6840	30.4840	.963	- 63.911 - 93.279
Fentanyl □ Morphine vs Fentanyl	□	None or Other	55.0940	30.1730	.262	-22.697 - 132.886
Morphine □ None or Other vs. Fentanyl	□	None or Other	40.41	10.1550	<0.0001*	14.227 - 66.593

***** Significant p<0.05
MD–mean difference; SE–standard error

Table 5. Multivariable logistic regression for associations between order of prescribed opioids and patient outcomes

Outcome / Predictor	*p*-value	COR	95% CI	*p*-value	AOR†	95% CI
Length of stay (min)						
Fentanyl □ Morphine	.212	.996	0.991 - 1.002	.288	.997	0.991 - 1.003
Morphine only	0.026*	.995	0.991 - 0.999	0.032*	.995	0.991 - 1
Fentanyl only	<0.0001*	.992	0.987 - 0.996	<0.0001*	.992	0.987 - 0.996
Recurrent visits (Yes/No)						
Fentanyl □ Morphine	.775	.687	0.053 - 8.96	.921	1.143	0.082 - 15.839
Morphine only	.541	.517	0.063 - 4.269	.604	1.767	0.206 - 15.171
Fentanyl only	.435	.433	0.053 - 3.534	.525	2.002	0.236 - 17.001
Discharge (Yes/No)						
Fentanyl □ Morphine	.431	2.000	0.356 - 11.23	.456	.513	0.089 - 2.966
Morphine only	.667	.744	0.193 - 2.863	.657	1.364	0.347 - 5.363
Fentanyl only	.291	.486	0.127 - 1.858	.262	2.183	0.558 - 8.542
Referral (Yes/No)						
Fentanyl □ Morphine	.431	.500	0.089 - 2.807	.450	1.965	0.34 - 11.341
Morphine only	.716	1.285	0.334 - 4.944	.716	.776	0.198 - 3.046
Fentanyl only	.291	2.059	0.538 - 7.874	.268	.463	0.118 - 1.81
Admission (Yes/No)						
Fentanyl □ Morphine	.260	.333	0.049 - 2.257	.150	4.360	0.588 - 32.328
Morphine only	.336	2.231	0.435 - 11.455	.423	.504	0.095 - 2.691
Fentanyl only	.481	1.784	0.357 - 8.918	.576	.624	0.12 - 3.251

† Adjusted for age, gender, pain score, and history of kidney stone
***** Significant p<0.05
COR–crude odds ratio; AOR–adjusted odds ratio; CI–Confidence Interval

Table 6. Binary logistic regression for the association between the first prescribed analgesics and different patient outcomes

Outcome / Predictor	Morphine	Fentanyl	*p*-value	COR	95% CI	*p*-value	AOR†	95% CI
Length of stay (min)	237.36 ± 129.78	194.99 ± 88.33	<0.0001*	0.996	0.995 - 0.998	<0.0001*	0.995	0.993 - 0.997
Recurrent visits								
Yes	37 (37.37%)	62 (62.63%)	0.43	1.201	0.762 - 1.895	0.448	1.22	0.73 - 2.038
No	157 (41.76%)	219 (58.25%)						
Discharge								
Yes	121 (37.93%)	198 (62.07%)	0.065	1.439	0.977 - 2.12	0.005*	1.882	1.215 - 2.916
No	73 (46.80%)	83 (53.21%)						
Referral								
Yes	75 (47.47%)	83 (52.53%)	0.039*	0.665	0.452 - 0.979	0.002*	0.503	0.325 - 0.779
No	119 (37.53%)	198 (62.46%)						
Admission								
Yes	23 (34.85%)	43 (65.15%)	0.287	1.343	0.78 - 2.312	0.954	0.982	0.536 - 1.8
No	171 (41.81%)	238 (58.19%)						

† Adjusted for age, gender, pain score, history of kidney stone, the need for rescue medication
***** Significant p<0.05
COR–crude odds ratio; AOR–adjusted odds ratio; CI–Confidence Interval

It is important to note that length of stay is not the only statistically significant data that was present in our study. The use of morphine and then fentanyl showed were associated with higher length of stay as compared to use of morphine or fentanyl alone or morphine and fentanyl with other non-opioid analgesics. It was also noted that the patients that had received fentanyl over morphine had a higher chance to be discharged from the emergency department (almost half), though the patients that morphine was associated with a one-third decrease in referral rates as compared to fentanyl.

These results can be expected when referencing the pharmacokinetics of each of the drugs[6,7,8,11,12]. Though morphine's onset time is longer (15-20 minutes) than that of fentanyl (as early as 5 minutes), the overall difference between both in real time is not statistically significant. However, it is important to take into context though we are measuring length of stay, medication side-effects are important to note. Morphine is very emetogenic, leading to increased nausea and vomiting, whilst fentanyl is a very euphorigenic drug[14], thereby increasing the risk of addiction. There was no properly documented data regarding the side effects of the medications from either system in either two major hospitals, so it was excluded from our data and not mentioned in our results, though we did look for this data. We also propose the possibility of a future review regarding patients who have received fentanyl and development of fentanyl addiction in the Middle East, as it is a fast-growing problem worldwide as noted by a 2019 article in *Trans Psychiatry*[15] and in a 2020 article in *Am J Addict*[16]. However, a small article 2022 article looked into 707 patients that received fentanyl that were discharged from emergency department that concluded those treated with fentanyl did not consume more opioids within two weeks of their discharge from emergency department—but is limited by its small sample size, short duration of study and its applicability on a global scale is questionable[17].

The higher discharge rate in the fentanyl group can also be explained when it comes to referencing the peak effect of fentanyl, as the peak effect is reached in 30-60 minutes, which contrasts with the 2-3.5 hours that morphine is required from. Hence why patients that had received fentanyl had a more likelihood of being discharged from emergency department earlier because they reached the peak effect of the medication faster than when they received morphine[6,7,10].

Considering peak effect time and duration of action again, it can also explain why, in general, patients that had received morphine were less likely to be referred than fentanyl. Fentanyl has a shorter duration of action due to redistribution, whereas morphine has a long half-life in comparison so patients that received morphine were likely to settle from their pain, despite a longer stay in emergency versus fentanyl, who were likely to be discharged from emergency. The revisit and recurrence rate data that we obtained was statistically insignificant hence why it was not mentioned in the review of results, but it would be advisable to suggest looking solely at revisit rates for patients that received morphine versus those that have received fentanyl.

Though a review has been conducted to investigate data of patients being discharged from the hospital and referral rates for fentanyl vs morphine, no such study was easily accessible upon looking into the raw data. We propose, again, that this could be an opportunity for others to investigate, considering alternate diagnoses, such as biliary colic or using a longer length of time, or a larger subset of the population.

However, there are several limitations to consider when referencing this study. Some of which already have been mentioned previously, when considering that one major hospital has not been involved in the study. Another factor is the poor documentation that arose in the hospital systems. It was also noted that many patients were triaged as "flank pain" that had alternate diagnoses—some of which were just patients that had referred pain, whilst some of which were not triaged appropriately to start with. Whilst this is an error that is probably seen in most hospitals, it should still be mentioned whilst discussing the results and methodology of the study.

The data has been collected by multiple different individuals, which means that the data has a risk of being biased as different collection strategies may be used to retrieve the data. Each researcher's personal style of obtaining information and their own hospital preferences may have played a role in this research, though the researchers involved in this study are not from the same institute. Another reason for having data that were not statistically significant may be as a result of the small sample sizes (fentanyl vs morphine, morphine vs fentanyl had particularly small sample sizes of 13 vs 9, respectively) and the mixture of medications that physicians gave (ranging from paracetamol, diclofenac, hyoscine, metoclopramide) that were not consistent and made it difficult to standardize the data. It must be noted that there is a chance that other medications have been given but not documented, or further opioids were given to the patient but not documented well, thereby skewing the data further.

There is also no standardization between the two hospitals that were involved in the study, each of them had a different method of medication and referral indications that are mere variations of different hospital-to-hospital practices. This, also, is important to discuss when discussing the data. And lastly, this is only one small study looking into one opioid versus another, and there should be more studies in the future to establish our findings, to be done within the region and in the Gulf itself.

CONCLUSION

Renal colic is a common and often intensely painful clinical condition, often necessitating the use of opioids for pain relief. In the context of which opioid leads to a reduced hospital visit, they were both found to be equal when adjusted for all odds. However, some statistically significant data was found regarding discharge and referral rates when using these two different opioids. The decision of which opioid to use is dependent on the scenario the physician is faced with and should put into account the different Pharmacokinetics of the medication being given. More research needs to be done regarding this issue to come up with more succinct conclusions.

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REFERENCE

1. Alelgin T, Petros B. Kidney stone disease: an update on current concepts. Adv Urol 2018:3068365.

2. Elshehry A, Saad M, Eid M, et al. Urolithiasis visits and trends. Bahrain Med Bull 2016;38(4):211-3.
3. Romero V, Akpinar H, Assimos DG. Kidney stones: a global picture of prevalence, incidence, and associated risk factors. Rev Urol 2010;12(2-3):86-96.
4. Alkhayat A, Alfraidi O, Almuldaj T, et al. Seasonal variation in the incidence of acute renal colic. Saudi J Kidney Dis Transpl 2021;32(2):371-6.
5. Mustafa MN, Al Omran AJ, Raees AA. Frequency of renal colic during the month of Ramadan. Bahrain Med Bull 2020;42(3):189-91.
6. Comer SD, Cahill CM. Fentanyl: receptor pharmacology, abuse potential, and implications for treatment. Neurosci Biobehav Rev 2019;106:49-57.
7. Inturrisi CE. Clinical pharmacology of opioids for pain. Clin J Pain 2002;18(4):3-13.
8. Chen YH, Sadhavisvam S, DeMedal S, et al. Short-acting versus long-acting opioids for pediatric postoperative pain management. Expert Rev Clin Pharmacol 2023;16(9):813-23.
9. Boblewska J, Dybowski B. Methodology and findings of randomized clinical trials on pharmacologic and non-pharmacologic interventions to treat renal colic pain: a review. Cent Eur J Urol 2023;76(3):212-26.
10. Koyyalagunta D, Walderman SD. Opioid analgesics. In Pain management. 2nd ed; USA, 2011.
11. Ziesenitz VC, Vaughns JD, Koch G, et al. Correction to: Pharmacokinetics of fentanyl and its derivatives in children: a comprehensive review. Clin Pharmacokinet 2018;57(3):393-417.
12. Soleimanpour H, Hassanzadeh K, Vaezi H, et al. Effectiveness of intravenous lidocaine versus intravenous morphine for patients with renal colic in the emergency department. BMC Urol 2012;12:13.
13. Hughes JA, Brown NJ, Chiu J, et al. The relationship between time to analgesic administration and emergency department length of stay: a retrospective review. J Adv Nurs 2020;76(1):183-90.
14. Motov SM, Vlasica K, Middlebrook L, et al. Pain management in the emergency department: a clinical review. Clin Exp Emerg Med 2021;8(4):268-78.
15. Han Y, Yan W, Zheng Y, et al. The rising crisis of illicit fentanyl use, overdose, and potential therapeutic strategies. Transl Psychiatry 2019;9(1):282.
16. Martinez S, Jones JD, Brandt L, et al. The increasing prevalence of fentanyl: a urinalysis-based study among individuals with opioid use disorder in New York City. Am J Addict 2021;30(1):65-71.
17. Daoust R, Paquet J, Huard V, et al. Association between fentanyl treatment for acute pain in the emergency department and opioid use two weeks after discharge. Am J Emerg Med 2022;52:137-42.