

Geospatial mapping of patients presenting for Emergency Laparotomy to a Private Sector Tertiary Care Hospital in Pakistan

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Abstract

Objective: To geospatially map patients presenting for emergency laparotomy.

Methods: The cross-sectional study was conducted at Aga Khan University Hospital, Karachi, from July 1, 2015, to June 30, 2018, and comprised patients who underwent emergency laparotomy. Demographic characteristics of all patients were recorded. Google Maps was used to measure the distance from their home locality to the hospital.

Results: Of the 259 patients, 184(71%) presented from within the city and 75(29%) were from outside. The overall mean age was 50 ± 20.2 years. The most common diagnosis was bowel obstruction 121(46.7%) followed by bowel perforation 112(43.2%). Of the total, 25(9.7%) patients died. The median distance travelled by patients from outside the city was significantly greater than for patients from within the city ($p < 0.001$).

Conclusions: Data on where patients are presenting from to an institution is critical for life-saving surgical procedures.

Keywords: Global surgery, Geospatial mapping, Emergency laparotomy. (JPMA 69: S-37; 2019)

Introduction

The global burden of surgical disease is enormous, but still it is inadequately described and quantified. According to estimates, just four surgical conditions requiring emergency laparotomy result in 7.1 deaths per 100,000 population per year globally.¹ Emergency laparotomy is one of the three Bellwether procedures, which together reflect a hospital's capacity to perform 44 essential surgeries.² Under the umbrella of Global Surgery (GS) and the Lancet Commission, it is aimed that by the year 2030, 80% of the world's population will have access within 2 hours to facilities with the capacity of providing essential surgical care. A specialist surgical work force density of 20 per 100,000 population is another goal.³ Even though estimates suggest that 84% of the Pakistani population is at a 2-hour driving distance to hospital staffed with a surgeon, there is just 1 surgeon for 139,299 individuals.⁴ The surgical capacity and safety of healthcare centres across Pakistan has been frequently assessed as being dismal.^{5,6} In pursuit of safe and effective surgical care, the health-seeking behaviour of patients requiring emergency laparotomy has not been studied. Our hospital is one of

the prime centres of the country and one of the only few that has acquired international accreditations over the years.

The current study was planned to geospatially map the addresses of patients who underwent emergency laparotomies. The hypothesis was that the hospital receives patients from all across the country for emergency general surgical conditions.

Subjects and Methods

The cross-sectional study was conducted at Aga Khan University Hospital (AKUH), Karachi, from July 1, 2015, to June 30, 2018, and comprised patients who underwent emergency laparotomy. All adult patients aged 16 and above were included. After approval was obtained from the institutional ethics review board, hospital-based software was used to identify patients and to retrieve records.

Patients' age, gender and addresses were recorded. Based on the addresses, two groups were formed, Within the City (WC) or Out of City (OC). Operative diagnoses were divided into categories; gastro-intestinal (GI) obstruction, perforation, bleeding, ischaemia, and other miscellaneous conditions. The outcomes of the patients were recorded

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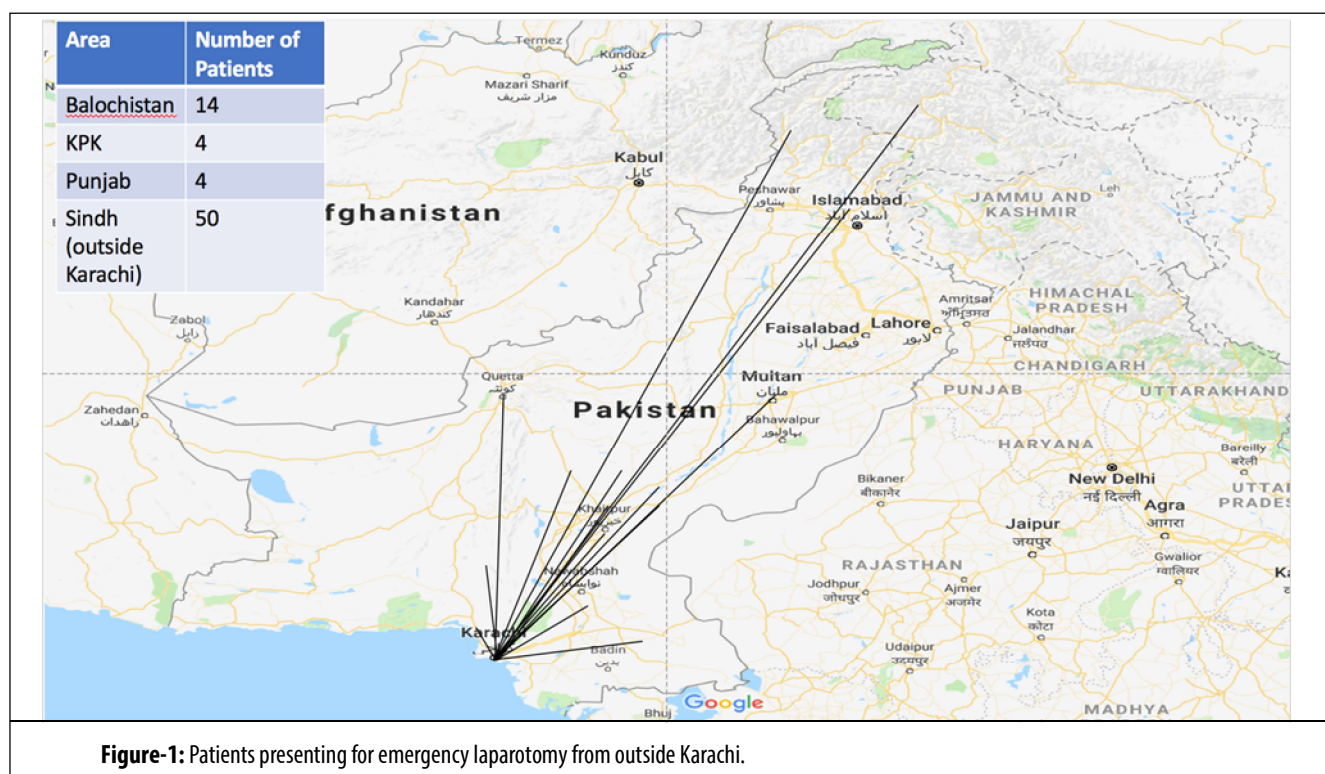


Figure-1: Patients presenting for emergency laparotomy from outside Karachi.

as either being discharged, expired or having left against medical advice. Google Maps was used to measure the distance between AKUH and the patient's address. Normally and non-normally distributed continuous variables were recorded as mean \pm standard deviation (SD) and median \pm inter-quartile range (IQR) respectively. Categorical variables were recorded as frequencies and percentages. To test for statistical significance of difference between the two groups, chi-square test was used for categorical variables, independent sample t-test for normally distributed continuous variables and Mann Whitney U Test for non-normally distributed continuous variables. The distance from the addresses to the hospital was plotted on Google Maps for better visualisation (Figures 1-2).

Results

Of the 259 patients, 184(71%) were in the WC group, while 75(29%) were from the OC group. The overall mean age was 50 \pm 20.2 years. The most common diagnosis was bowel obstruction 121(46.7%) followed by bowel perforation 112(43.2%). Of the total, 25(9.7%) patients died.

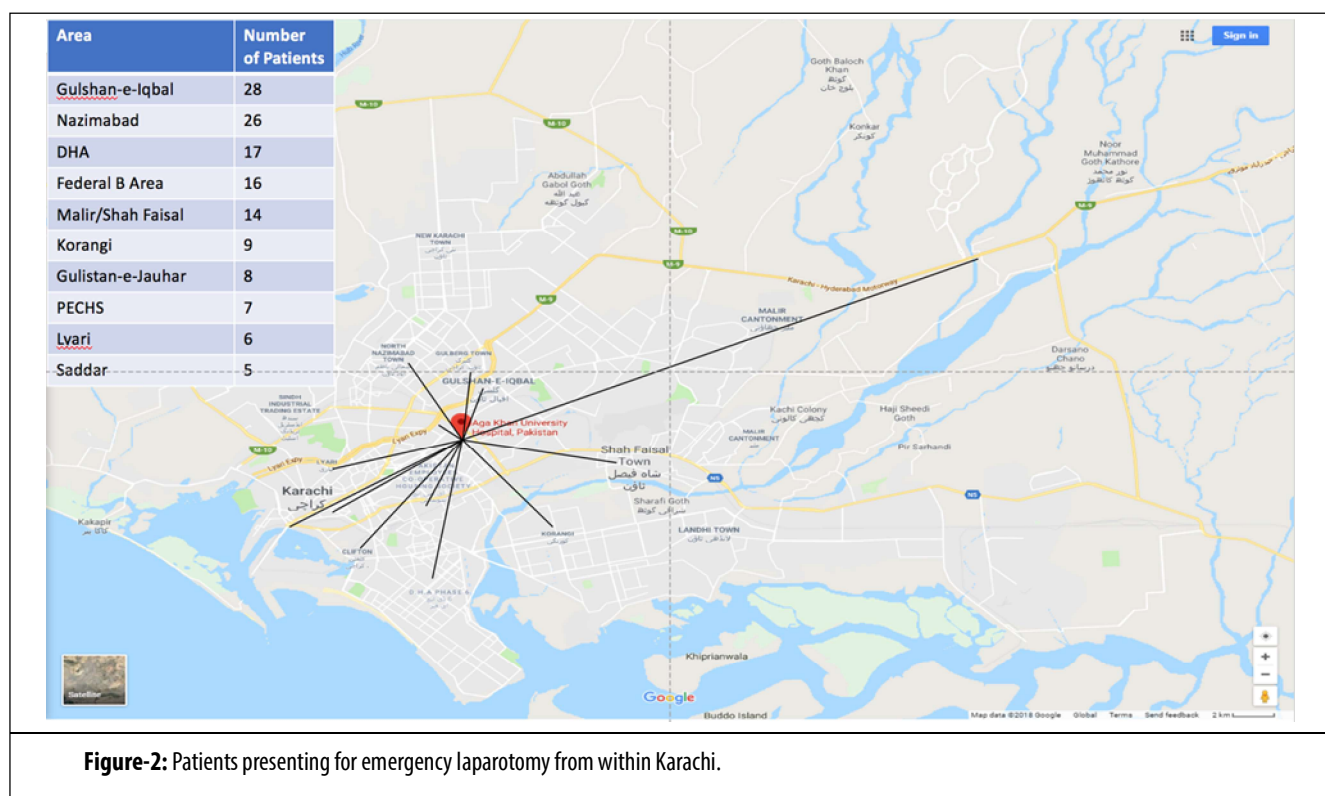
The two groups were similar in their age, gender

distribution and diagnoses. The median distance travelled by patients in the OC group was significantly greater than for patients in the WC group ($p<0.001$). Mortality in the OC group was proportionately greater than the WC group, but the difference was not statistically significant ($p=0.08$) (Table).

Table: Patients undergoing emergency laparotomy from within the city and outside the city.

	Within City (n=184)	Out of City (n=75)	p-value
Mean Age \pm SD (years)	51 \pm 20	47 \pm 19	0.08
Females (%)	78 (42.4)	117 (40)	0.7
Diagnosis (%)			
Obstruction	92 (50)	29 (38.7)	0.4
Perforation	74 (40.2)	38 (50.7)	
Ischaemia	12 (6.5)	5 (6.7)	
Bleeding	5 (2.7)	3 (4)	
Other	1 (0.5)	0 (0)	
Median Distance Km (IQR)	9 (7-12.2)	282 (150-565)	<0.001
Outcome (%)			
Discharged	167 (90)	63 (84)	0.08
Expired	16 (8.7)	9 (12)	
Left Against Medical Advice	1 (0.3)	3 (4)	

SD: Standard deviation, IQR: Interquartile range



Discussion

The study results show that for conditions requiring emergency laparotomy at our hospital, patients travelled very long distances from all across the country and the city. This raises a number of important questions with regards to the access, quality and safety of available surgical care facilities and health-seeking behaviour of patients. In this study, compared to WC patients, proportionately more OC patients died. Even though the difference was not statistically significant, delay in surgical intervention is proven to be an important determinant of mortality in emergency general surgery.⁷ In the event of delays in definitive care, the outcomes of emergency laparotomy become grimmer.⁷ In-patient delay in surgery of more than 24 hours is one of the 6 indicators that together are the best predictors of mortality in perforated peptic ulcer.⁸ The odds of survival decrease by 2.4% each hour from admission to surgery in patients with perforated peptic ulcer.⁹ However, most of these studies cited here focussed on in-hospital delays. Factors associated with pre-hospital delays in patients requiring emergency laparotomy and their impact on outcomes have not been well-studied. Even in developed health systems of the West, patients with perforated peptic ulcers are less likely

to receive ambulance transportation compared to other emergency conditions.¹⁰

Of the various factors that may have determined our patients' decision to travel long distances, arguably the most important is lack of access to care in their vicinities. Globally, 5 billion people are reported to lack access to safe and essential surgical care.¹¹ Pakistan is a densely populated country of over 200 million. The healthcare needs of this huge population are largely met by the private sector, with over 70% of the population making out-of-pocket payments for their healthcare needs.¹² Only 21% population has access to healthcare from public-sector hospitals.¹² The possible reasons for this may be a severe shortage of surgical care providers in district-level hospitals that was reported in a survey of 19 hospitals conducted in 1983.⁵ This shortage still exists, and it is estimated that there is 1 surgeon for 139,299 Pakistanis.⁴ Recent data regarding the availability of surgical care is lacking.

Certain procedure-specific surveys do shed light on the present state of facilities at these hospitals. The availability of signal functions of Emergency Obstetric and Newborn Care (EO&NC) was observed at only 7 out of 32 health care facilities in four districts of the province of Punjab

that were surveyed in 2012.⁶

Of interest are the distances travelled by patients within Karachi which is the largest metropolis of Pakistan and is one of the most populous cities in the world. With the prevalent traffic conditions and state of the roads, even travelling relatively shorter distances may mean a disproportionate length of time spent in reaching the hospital. Couple this with the fact that the ambulance services are stretched thin, most patients will arrive at the hospital via private or public transport, thus incurring further delays.

A number of patient-related, environmental, health systems and provider related variables have been identified as being barriers for patients in accessing surgical and pregnancy-related care in Pakistan.^{13,14} The preference for males and male children over females, and young over the elderly, illiteracy, lack of awareness and presence of untrained and alternative healers have been reported to negatively influence access to surgical care.¹³ The role of husbands and mothers-in-law in seeking maternal healthcare is reported to be very significant.¹⁴ Within maternal health, inequalities exist between the rich and the poor and between rural and urban mothers.¹⁵ Financial well-being, education and presence in cities are associated with an increased likelihood of having caesarean section.¹⁵ Caesarean section rates are reported to be 5.3% in the poorest compared to 35.3% amongst the richest women, and 11.5% in rural compared to 25.6% in urban women.¹⁵

The current study has its limitations. While it has reported the geographical location of patients, it does not account for the burden of disease. It is a single-centre study and thus results cannot be generalised. Moreover, it does not describe the impact geographical location and long-distance travel has on the disease severity and on the outcomes of surgical intervention.

However, the study has raised important questions with regards to patients' access to emergency laparotomy. Further prospective and population-based studies are needed to understand the factors influencing accessibility to emergency general surgery and to better elucidate the health-seeking behaviour of our population.

Conclusion

Data on where patients are presenting from to an institution is critical for life-saving surgical procedures. The impact that time to presentation has on the outcomes

of emergency laparotomy, however, needs to be explored further.

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Conflict of Interest: None.

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