



A Comparative Study of Pattern of Post-Operative Leukocytosis and Fever in Elective and Emergency Surgery Cases

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

ABSTRACT

Background Leukocytosis and fever are frequent signs of inflammatory response, commonly due to infection, but may occur in malignancies, exercise, stress etc. Surgery is a form of controlled tissue injury that incites inflammation and fever by causing release of cytokines, interleukins, and other endogenous pyrogens and systemic inflammatory response syndrome (SIRS) induced by surgical trauma is a well-known entity. Leukocytosis and fever in absence of infection are common phenomena in post-operative period. The objective of the study was to know the pattern of leukocytosis and fever in post-operative phase and making comparison of the pattern between elective cases and emergency surgery cases.

Materials and Methods 100 patients admitted and operated, were divided into two groups of 50 each (elective and emergency) and assessed for post-operative pattern of fever and leukocytosis. Temperature (oral) and WBC counts were recorded on pre-operative day, and postoperatively till the WBC counts and temperature became normal and pattern recorded and results were analysed.

Results The mean body temperature and mean TLC values were higher in emergency surgery as compared to elective surgery cases both pre and post operatively with highest values seen on post-operative Day1 in both the groups. However in patients with peritonitis (subgroup in emergency surgery cases) the peak of incidence of fever and leukocytosis was seen on post-operative Day2.

Conclusions The episodes of fever and leukocytosis were seen in first 24-48 hrs post-operatively which were self-resolving and could be attributed to surgical stress and so routine workup for infectious cause may not be necessary.

Keywords: Elective, Emergency, Fever, Leukocytosis, Post-operative, Surgery

INTRODUCTION

Leukocytosis is white blood cell (WBC) count commonly infection, but may also occur in bone greater than 11,000/mm³[1,2]. It is frequently a sign tumors, leukemia, following strenuous exercise, of inflammatory response^[2], most

epilepsy, emotional stress, pregnancy, anesthesia, and epinephrine administration.^[1]

Fever is rise of normal core temperature of individual exceeding the normal daily variation and occurs in connection with increase in hypothalamic set point. Temperature exceeding 38°C (100.4°F) and persisting for more than two postoperative days are generally considered to be clinically significant.^[3] The causes of post procedural fever range from inflammation or drug reaction to life threatening necrotizing soft-tissue infection (NSTI).^[4]

Surgery is a form of controlled tissue injury that incites inflammation and fever by causing release of cytokines, interleukins, and other endogenous pyrogens. Leukocytosis and fever in absence of infection are common phenomena in post-operative period. The systemic inflammatory response syndrome (SIRS) induced by surgical trauma is a well-known entity, leading to fever and/or leukocytosis in absence of infection.^[5] SIRS represented by leukocytosis, C-reactive protein, platelets count, interleukin-6, and tumor necrosis factor-alpha level was found to be increased during surgical management of peritonitis in an animal model, and when comparing the laparotomy to the laparoscopy approach, the inflammatory response was significantly higher in the first.^[6] The amount of tissue trauma seems to have a causal relationship with the release of IL-6 and thus to development of fever.^[7,8-12]

This physiologic adaptation to surgery often is evident in first 48 hours after surgery and is responsible for postoperative fever and leukocytosis. This physiologic response to surgery is a part of healing so costly laboratory workup or treatment will not improve overall outcomes.^[13-16]

The demarcation or variation in the intensity of leucocytosis and fever due to different surgical or postsurgical conditions remain an important topic for evaluation with changing times and with changing management protocols. This study was conducted to know the pattern of leukocytosis and fever in post-operative phase and making comparison of the pattern between elective and emergency surgery cases.

MATERIAL & METHODS

The study was conducted on 100 patients who underwent elective or emergency surgeries. It was an observational and comparative study. The study was approved by the ethical committee.

STUDY DESIGN

It was an observational and comparative study. 100 patients from year 2017-2019 who underwent elective and emergency surgeries in Rajindra Hospital, Patiala were selected.

The patients were divided into two groups:

1st group (50 patients): Comprising of patients who were admitted for elective surgery (e.g. Cholecystectomy, Thyroid surgery, Breast surgery, Elective Ileostomy Closure, etc.) and who underwent a single surgical procedure. Time of surgery and surgical stimulus were comparable.

2nd group (50 patients): Comprising of patients who landed in emergency with an evidence of infection and required emergency surgery i.e. Acute Abdomen requiring emergency laparotomy (e.g. Perforation peritonitis, Gut gangrene, obstruction, strangulation, cases requiring resection anastomosis, etc.)

Patients variables like age, sex, socio-economic strata, nutritional status were recorded on a proforma. Along with diagnosis, procedure, length of operation, type of anaesthesia and post-operative events were also recorded. Four parameters i.e. Radial Pulse, Blood Pressure, Temperature (oral) and WBC counts were recorded on pre-operative day, 1st post-operative day, 2nd post-operative day and subsequently every day till the WBC counts and temperature became normal.

INCLUSION CRITERIA:

- 1) Elective and emergency surgeries having comparable duration (time of surgery) and surgical stimulus were included.
- 2) Type of anaesthesia required included only General Anaesthesia (GA)

EXCLUSION CRITERIA:

- 1) Cases requiring Spinal Anaesthesia (SA), Local Anaesthesia (LA) were excluded.
- 2) Cases having post-operative infection were excluded.

A predesigned proforma was used to collect the information for individual cases and patients were followed daily till their WBC counts and temperature became normal. Student t test and Chi Square test were performed and results obtained.

RESULTS The mean body temperature and mean TLC values were higher in emergency surgery as

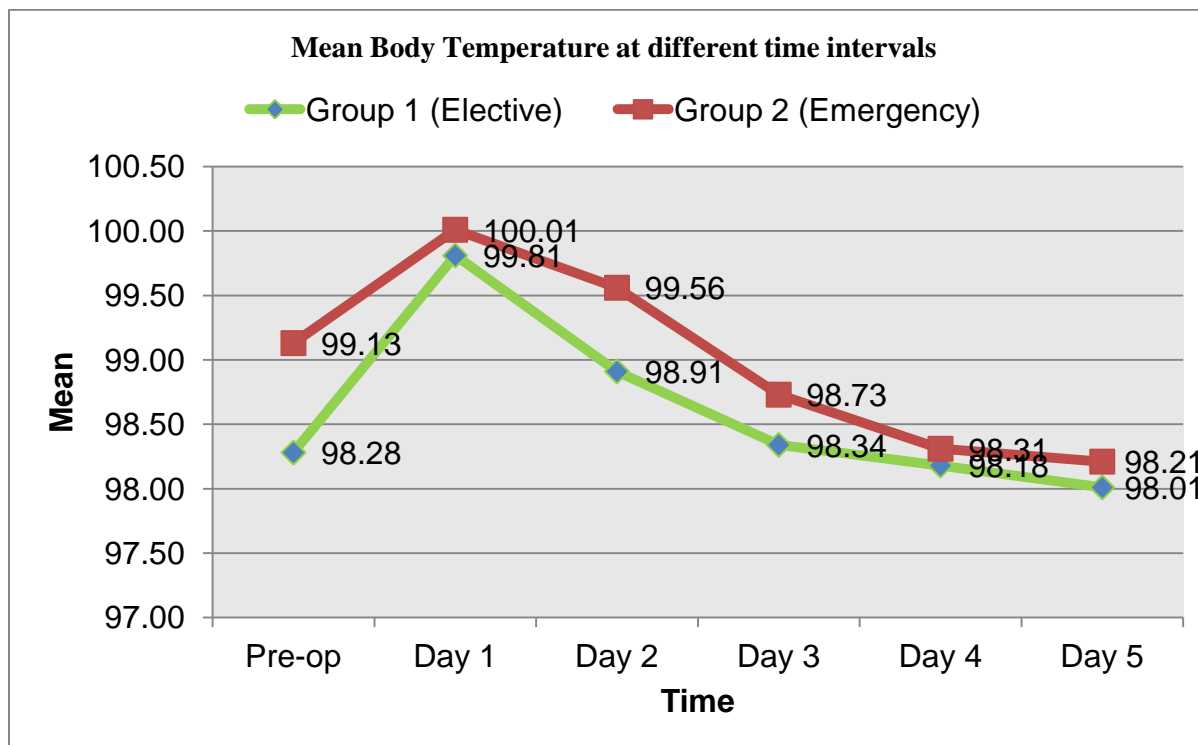
compared to elective surgery cases both pre and post operatively with highest values seen on post-operative Day1 in both the groups. However in patients with peritonitis (subgroup in emergency surgery cases) the peak of incidence of fever and leukocytosis was seen on post-operative Day2.

Table 1: Mean Body Temperature of patients (pre –operative & post-operative from Day 1 to Day 5) in both groups.

Time	Group 1 (Elective)		Group 2 (Emergency)		P value [#]
	Mean	± SD	Mean	± SD	
Pre-op	98.28	0.31	99.13	0.52	<0.001**
Day 1	99.81	0.54	100.01	0.70	0.106
Day 2	98.91	0.43	99.56	0.71	<0.001**
Day 3	98.34	0.29	98.73	0.51	<0.001**
Day 4	98.18	0.17	98.31	0.26	0.004*
Day 5	98.01	0.44	98.21	0.19	0.004*

Student 't' test; *p<0.05; Significant; **p<0.001; highly significant

Table 1 shows mean body temperature of patients (pre–operative & post-operative from Day 1 to Day 5) in both the groups. The mean body temperature in the pre-operative period in group 1 was 98.28(S.D:0.31)& in Group 2 was 99.13 (S.D:0.52), the difference being statistically highly significant with p value < 0.001. Through post-operative days 1 to 5, the mean body temperature was higher in Group 2 than Group 1, the difference being statistically significant from days 2 to 5. However at post-operative day1, the difference in mean body temperature in both groups was not significant. The highest value of mean body temperature was seen on Day 1 in both the Groups.

Graph 1: Mean Body Temperature of patients in both groups at different time intervals.

Graph 1 shows the trend of mean body temperature of the patients in both the groups at different time intervals in form of line diagram. The mean body temperature of the patients was highest in both the groups at post-operative day 1, the mean temperatures being 99.81⁰F in Group 1 & 100.1⁰F in Group 2 respectively. Thereafter, the mean body temperatures of the patients in both groups showed a decreasing trend through post-operative days 1 to 5, the mean body temperatures in Group 1 being lower than Group 2 on all days post-operatively.

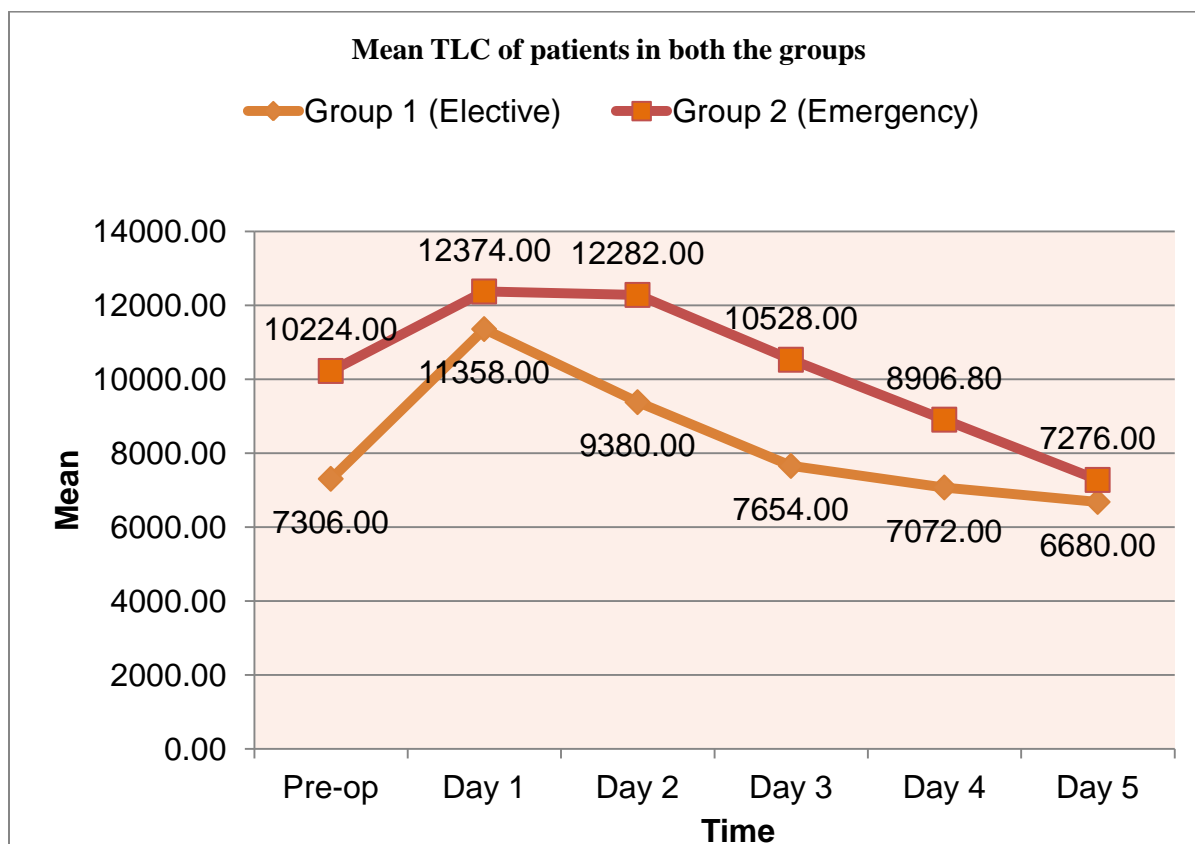
Table 2: Mean Total Leucocyte Count (pre –operative & post-operative from Day 1 to Day 5) in both groups.

Time	Group 1 (Elective)		Group 2 (Emergency)		P value [#]
	Mean	± SD	Mean	± SD	
Pre-op	7306.00	1110.32	10224.00	2180.39	<0.001**
Day 1	11358.00	2267.71	12374.00	1829.22	0.015*
Day 2	9380.00	1421.84	12282.00	2296.29	<0.001**
Day 3	7654.00	1287.65	10528.00	1505.78	<0.001**
Day 4	7072.00	956.41	8906.80	1098.10	<0.001**
Day 5	6680.00	741.48	7276.00	419.70	<0.001**

#Student 't' test; *p<0.05; Significant; **p<0.001; Highly significant

Table 2 shows Mean Total Leucocyte Count (pre-operative & post-operative from Day 1 to Day 5) in both groups. The mean leucocyte count was higher in Group 2 than Group 1 both in the pre-operative period and post-operatively from days 1 to 5, the difference being statistically significant. The highest value of mean total leucocyte count was seen on Day 1 in both the Groups.

Graph 2: Mean Total Leucocyte Count (pre –operative & post-operative from Day 1 to Day 5) in both groups.



Graph 2 shows trend of Mean Total Leucocyte Count (pre –operative & post-operative from Day 1 to Day 5) in both groups in form of line diagram. The mean leucocyte count was higher in Group 2 than Group 1 both in the pre-operative period and post-operatively from days 1 to 5 with peak of TLC on Day 1 in both the groups.

Table 3: Incidence of Fever (>98.9°F) at different time intervals in Patients with and without Peritonitis in Group 2.

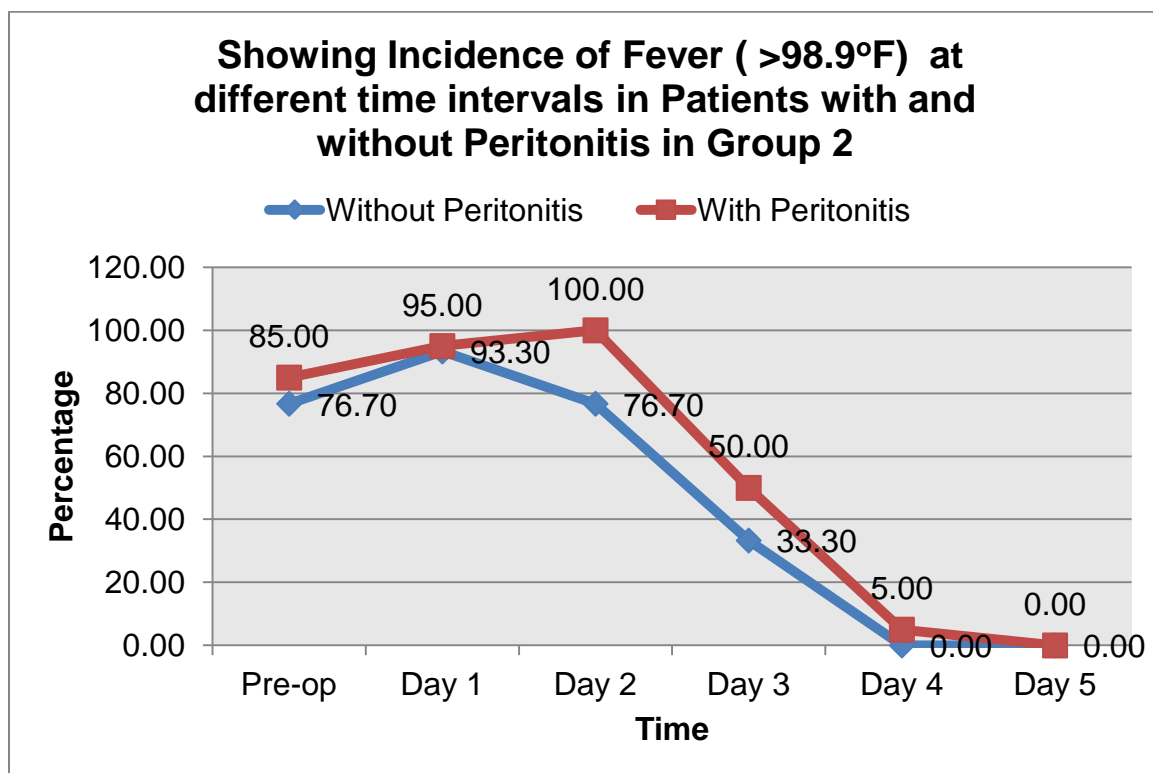
Time	Without Peritonitis (n = 30)		With Peritonitis (n = 20)		P value [#]
	N	%	N	%	
Pre-op	23	76.7	17	85.0	0.470
Day 1	28	93.3	19	95.0	0.808

Day 2	23	76.7	20	100.0	0.020*
Day 3	10	33.3	10	50.0	0.239
Day 4	-	-	1	5.0	0.216
Day 5	-	-	-	-	-

#Chi-Square test; *p<0.05; Significant; **p<0.001; Highly significant

Table 3 shows incidence of Fever ($>98.9^{\circ}\text{F}$) at different time intervals in patients with and without peritonitis in Group 2. Out of total 50 patients in Group 2, 20 presented with peritonitis pre-operatively. Among those with peritonitis (N=20), 17 (85%) had fever pre-operatively whereas fever was encountered in 23 (76.7%) out of 30 patients who did not present with peritonitis. At post-operative Day 2, fever was encountered in all the patients with peritonitis whereas 76.7% patients without peritonitis had fever, difference being statistically significant with p values 0.020. However, the difference in the incidence of fever among patients with and without peritonitis was not statistically significant pre-operatively, on Day1, 3, 4 and 5.

Graph 3: Incidence of Fever ($>98.9^{\circ}\text{F}$) at different time intervals in Patients with and without Peritonitis in Group 2.



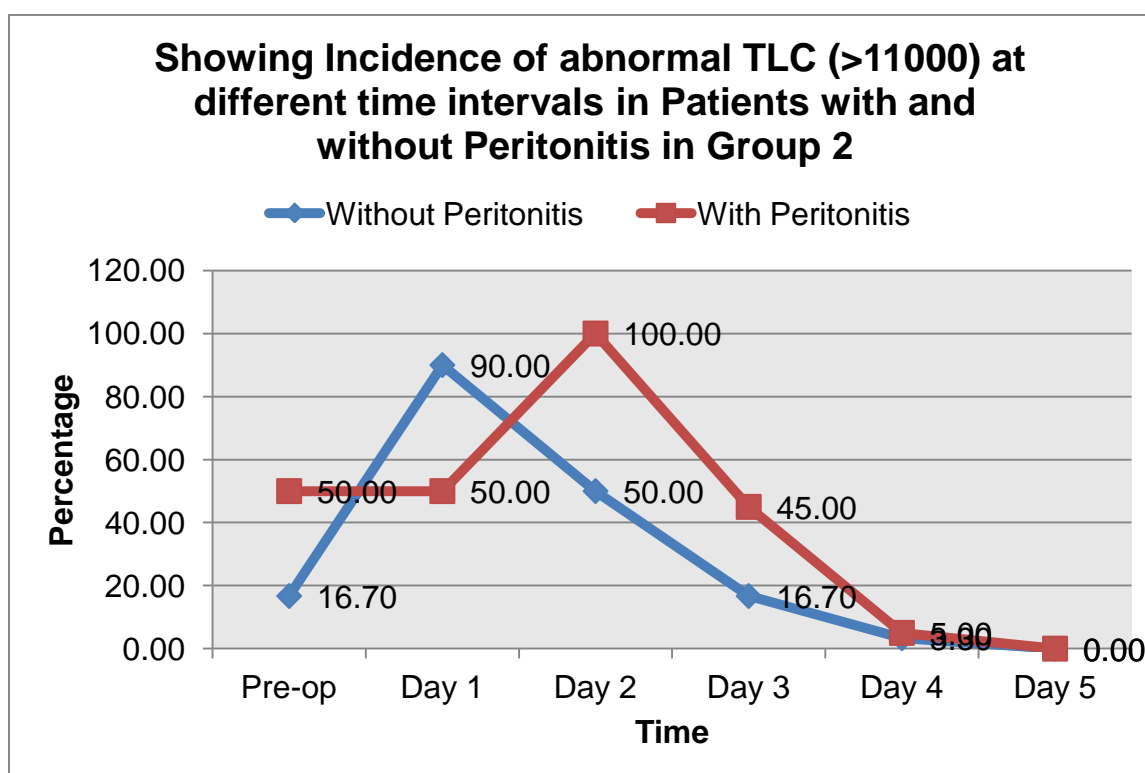
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Table 4: Incidence of high TLC (>11000) at different time intervals in Patients with and without Peritonitis in Group 2.

Time	Without Peritonitis (n = 30)		With Peritonitis (n = 20)		P value [#]
	N	%	N	%	
Pre-op	5	16.7	10	50.0	0.012*
Day 1	27	90.0	10	50.0	0.002*
Day 2	15	50.0	20	100.0	<0.001**
Day 3	5	16.7	9	45.0	0.029*
Day 4	1	3.3	1	5.0	0.768
Day 5	-	-	-	-	-

#Chi-Square test; *p<0.05; Significant; **p<0.001; Highly significant

Table 4 shows incidence of high TLC (>11000) at different time intervals in Patients with and without Peritonitis in Group 2. Incidence of TLC >11,000 was highest in patients with peritonitis on Day2 while in patients without peritonitis this incidence was highest on Day1. Difference of incidence in both subgroups was statistically significant pre operatively and through days 1 to 3 post operatively.

Graph 4: Incidence of higher TLC (>11000) at different time intervals in Patients with and without Peritonitis in Group 2.

Graph 4 shows incidence of higher TLC (>11000) at different time intervals in patients with and without Peritonitis in Group 2 in form of line diagram. Incidence of TLC >11,000 was highest in patients with peritonitis on Day2 while in patients without peritonitis this incidence was highest on Day1.

DISCUSSION

In our study, incidence of post-operative fever was highest in first 48 hours which can be attributed to surgical stress as supported by different studies e.g. Saavedra *et al*^[17], Garibaldi RA *et al* (72% patients)^[8], Frank SM *et al*^[15], Circiumaru B *et al*^[18]. The peak of incidence of fever was seen on Day1 in both the Groups however the incidence of fever decreased earlier in elective cases as compared to emergency cases i.e. most of elective cases became afebrile by Day3 while patients undergoing emergency surgeries had a comparatively prolonged duration of fever which may be due to higher physiological stress in emergency cases.

Increase in TLC is seen in post-operative period usually in first 48 hours after surgery and becomes normal after this period. This can be attributed to surgical stress and is usually a physiological response to stress as supported by different studies like Bozkurt IH *et al*^[19], Tompkins C *et al*^[20], Barak Cohen *et al*^[21]. Pre-operatively and on all the post-operative days mean TLC was higher in emergency surgery as compared to elective surgery cases. The peak of mean TLC was seen on post-operative Day1 in both the groups. Leukocytosis (TLC >11,000) was seen for First 48 hours in emergency cases while in elective cases leukocytosis was seen in first 24 hours and TLC returned to normal pre-op values earlier in elective surgery as compared to emergency surgery cases.

The peak in incidence of fever was seen on post-operative Day 1 in patients without peritonitis while in patients with peritonitis this peak was seen on post-operative Day2 (48 hours) as supported by Ahmad Mahamid *et al*^[22] in their study. The incidence of fever decreased earlier in patients without peritonitis as compared to patients having peritonitis i.e. patients without peritonitis became afebrile by Day 4 while patients having peritonitis had a comparatively prolonged duration of fever.

Similarly, the incidence of TLC >11,000 was highest in patients with peritonitis on Day2 (48 hours) as supported by Ahmad Mahamid *et al*^[22] in their study, while in patients without peritonitis this incidence was highest on Day 1. TLC returned to normal pre-operative values earlier in patients without peritonitis as compared to those having peritonitis.

CONCLUSION

The highest value of mean body temperature and TLC is usually seen on post-operative Day1 with episodes of fever and leukocytosis seen in first 24-48 hrs post-operatively which are self-resolving and can be attributed to surgical stress. This pattern is usually prolonged in Emergency cases especially in patients with peritonitis. Fever and Leukocytosis in Post-operative period can occur as physiological response to surgery and should not always be attributed to infectious pathology. So routine workup to identify infectious cause may not be beneficial and lead to unnecessary wastage of resources.

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