Original Article
DOI: https://doi.org/10.70749/ijbr.v2i02.291

INDUS JOURNAL OF BIOSCIENCES RESEARCH
https://induspublisher.com/IJBR
ISSN: 2960-2793/ 2960-2807

Crossref

OPEN ACCESS

Comparison of Morbidity and Mortality in Patients with Jejunoileal Perforation presented before and after 24 hours in Surgery Department

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ARTICLE INFO

Keywords

Jejunoileal Perforation, Surgery, Morbidity and Mortality.

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Declaration

Author's Contributions: All authors contributed to the study and approved the final manuscript.
Conflict of Interest: The authors declare no conflict of interest.
Funding: No funding received.

Article History

Received: 06-10-2024
Revised: 27-11-2024
Accepted: 05-12-2024

ABSTRACT

Background: Jejunoileal perforations are critical conditions that can lead to significant morbidity and mortality. Timely intervention is essential to prevent complications and improve patient outcomes. **Objective:** This study aims to compare the morbidity and mortality rates of patients with jejunoileal perforations who presented within 24 hours of symptom onset versus those who presented after 24 hours in the surgery department of Bolan Medical Complex, Quetta. It seeks to evaluate the impact of delayed presentation on surgical outcomes. **Methods:** A qualitative approach was employed, involving semi-structured interviews and patient record reviews for 120 patients diagnosed with jejunoileal perforation. The participants were divided into two groups: Group A (presented within 24 hours) and Group B (presented after 24 hours). Data were analyzed thematically to identify differences in morbidity, mortality, and recovery experiences. **Results:** The findings reveal that patients in Group A exhibited significantly lower morbidity and mortality rates compared to those in Group B. Complications were noted in 30% of cases in Group B, whereas only 10% of patients in Group A experienced complications. The average hospital stay was longer for Group B, averaging 7 days compared to 3 days for Group A. **Conclusion:** Early presentation and surgical intervention in jejunoileal perforations are crucial for reducing morbidity and mortality. The study underscores the importance of timely medical attention in improving surgical outcomes and enhancing patient recovery.

INTRODUCTION

In the surgical profession, jejunoileal perforation (JIP) is a dangerous, and sometimes fatal, complication that results from disruption of the integrity of the intestinal wall through perforation in the ileum or jejunum due to trauma, infection, or inflammation (Mohamed et al., 2024; Laje, 2023). If this rupture is not tended to immediately the patient can easily develop peritonitis – that is, an infection of the peritoneum – followed in the worst-case scenario by septic shock, multi-organ failure or System inflammatory response syndrome (SIRS) (de Sire et al., 2024). Although the occurrence of JIP is not constant globally it is most likely to be observed where TB and typhoid fever are rife (Katyar et al., 2024). But even if they controlled for the fact that the illness burden remains high, getting diagnosed and treated as soon as possible significantly affects patients' outcomes and reduces morbidity and mortality rates (Attoun et al., 2023).

Morbidity associated with JIP includes processes like local infection systemic effect which is wound dehiscence, longer hospital stays and substantial critical care demanding pathology. One

more important result varying with the timeliness of presentation and the initiation of surgical intervention is mortality, the latter being identified as the patient's death within a specified postoperative period (Watanabe et al., 2021). Morbidity And Mortality two are indicators that influence decisions on resource utilisation within the hospital and patients' outcomes (Yasin et al., 2022). Given that early intervention has been proven to reduce complication rates and improve survival in JIP patients, subsequent sclerosis in addition to delayed presentation (after 24 hours of perforation) vs early presentation studies has received considerable consideration (Tranah et al., 2023).

The three key dependent variables in this research are time of presentation, morbidity and mortality. In JIP, morbidity includes any of the complications developed after the surgically repaired perforation such as infection, sepsis, and respiratory distress (Khokha, 2023). These issues make a significant impact on hospital admission, as well as quality of life, and recovery periods. Therefore, determining the frequency and severity of these problems, and understanding the relationships between these problems and early or delayed surgery are all components of assessing morbidity.

The second important component of the TZJW is mortality, which directly answers the question of whether a patient has a chance to survive or die after treatment in JIP (Oktavian et al., 2024). Due to the formation of biofilm, more surface area being prone to bacterial colonization, act as sites for systemic infection, and chances of getting organ failure, delay in diagnosis and management are associated with a drastic rise in mortality (Ranasinghe et al., 2024). This is well illustrated by the fact that patients who presented within 24 hours of perforation have much lower mortality than those who presented later. Consequently, it becomes useful to track the mortality rates of the early and late presenters in the surgical department in order to gauge the impact of timely care to the concluded survival outcomes (Pal et al., 2024).

The only extraneous variable that does differentiate the study groups is the time of presentation: early if this is within the first 24 hours of onset of symptoms or delayed if presentation is made more than a day after the onset of the symptoms (Singh et al., 2021). Patients undergoing surgeries within 24hours of the first symptoms often experience fewer complications thus they would always visit the hospital; moves help contain the disease and prevent fluidity of the infection into the other bodily systems. However, presentation after 24 hours has been associated with higher sepsis incidence and greater dissemination of peritoneal contamination, both of which will significantly raise morbidity and mortality.

LITERATURE REVIEW

Chakravarty and Sinha (2021) noted that jejunoileal perforation (JIP) is a severe condition that carries a high mortality and morbidity rate and commonly presents with a delay or receives delayed treatment. It is therefore important that JIP be diagnosed and treated early, because it can progress rapidly from a localized infection to peritonitis or systemic septic shock and potentially multiorgan dysfunction. Quick treatment within 24hrs of the onset of signs reduces morbidity and mortality by minimizing bacterial count in the abdominal cavity (Balal et al., 2024). Such delays continue because early presentations are not matched by advancements in surgical and other investigative procedures, which remain problematic in LMICs where access to health-care facilities is often limited (Diehl et al., 2024). Consequently, enhancing patient outcomes calls for the understanding of morbidity and mortality predictors in patients admitted to JIP, especially in relation to presentation time.

Typhoid fever TB or severe injuries are among the illnesses that commonly lead to JIP because these conditions compromise the structural soundness of the intestinal wall as stated by Singh and Gupta (2019). It was also discovered in the endemic area that typhoid fever especially was a great source of JIP cases. Several research have shown that due to penetration of the bacteria into the deeper layers of the intestinal wall as well as its necrosis, enteric fever caused by Salmonella typhi complicated by intestinal perforation requires appropriate therapy (Bernard & Nicholson, 2022). As an example, Bhat et al. (2016) also found an early intervention reduces complications and improves the survival rate of patients with typhoid perforation. Similarly, but much less frequently reported, intestinal perforation has also been

associated with tuberculosis. They found that since tuberculosis is a chronic inflammatory disease and patients with this disease are often malnourished, tuberculosis caused by perforation has a higher risk of morbidity (Thioluna & Purwanta, 2024).

Several works have focused on the association between clinical results in JIP and the time of onset. Another study by Desai et al. (2017) revealed that the mortality increases with increased morbidity such as severe infections, wound dehiscence and respiratory distension, the presentation time being more than 24 hours. Peritonitis from long-term bacterial contamination of the abdominal cavity and in certain conditions septic shock have been attributed to this higher morbidity (Inukai et al., 2021; Bova et al., 2024). The Mishra et al (2021) study further reveals that patients that come to the facility with JIP are more likely to have high fatality rates compared to those presenting early. Thomas et al. (2020) is contributing to this finding because, as they mentioned, multiorgan failure, which is considered one of the leading causes of death among severe peritonitis patients, is often associated with delayed treatment. Thus, the efficacy of performing surgery as soon as possible is that localized infections cannot turn into systemic ones.

The value for early presentation is also supported by the study on surgical morbidity among the JIP clients. Following intestinal perforation surgery, wound infections, abscess formation, and sepsis are the frequent post-operative consequences that increase the number of days spent in the hospital and medical costs (Hagedoorn et al., 2024). Overall, JIP that presents late in the hospital is found to have almost twice the rates of surgical complications as compared with the patients who received the treatment within the first 24 hours, as highlighted by Anwar et al. (2019). This is partly because patients who arrive late usually require complicated surgical interventions, which increase the risk of complications. Moreover, the research also confirms that late appearing patients are more prone to develop respiratory complications after surgery, mainly because of the bacterial toxins that the patient has been exposed to, which would suppress their immunity and cause systemic inflammation (Thapa et al., 2024).

Patel and Mehta (2023) opine that remaining in a low socioeconomic class, limited access to healthcare, and lack of information on appreciating gastrointestinal signs are some of the reasons for a late presentation and undesirable consequences in JIP patients. Socioeconomic factors remain the main cause of delayed medical intervention, especially in the rural areas where there may be few means of transport, and limited access to health facilities. Organizing population health intervention initiatives that inform the public and educate target high-risk groups could potentially reduce the time that patients take between presenting their concerns (Utrilla Fornals et al., 2024). Moreover, Rao et al, (2021) postulated that, the implementation of specialist abdominal emergency departments in rural hospitals could help to solve the problem of delayed presentation and consequently enhance the results.

That is why specific imaging methods, including CT and an ultrasound, should not be overlooked in the identification of JIP at the initial stage. To make surgical decisions promptly, advanced imaging can define the severity of the perforation and any peritoneal contamination that would ensue. For instance, Singh & Kumar (2022) established that early JIP diagnosis rates were way higher in the hospitals that opted for fast imaging systems to ensure that the appropriate treatments were initiated before the morbidity and death levels rose. But, in such environments, lack of access to these diagnostic tools results in a loss of time in diagnosis and treatment and creates poor outcomes for patients (Wismayer, 2021).

Hence, in the last years, making an emphasis in reducing care variability and enhancing survival rates, there has been a growing concern in developing the decision-making process for facing JIP. These therapies focus a lot on preliminary instances of shock, violent antibiotic administration and other supporting care aiming at minimising the systemic inflammatory response and promoting for early recovery (Rodrigo, 2024). Such practices as early protocols for example, have also been noted to reduce mortality among JIP patients by ensuring maximum adherence to professional care, medical and/or surgical. However, as Patel et al. (2018) argue, implementing such standards requires a great

amount of time and money, sometimes it is impossible in the hospitals.

RESEARCH OBJECTIVE

The purpose of this study therefore is to assess the effects of the presentation on morbidity and mortality of patients diagnosed with jejunoileal perforation in the Surgery Department. With the help of this brief comparison of the patients who were presented within a period of 24 hours after appearance of symptoms, the study has reasons to talk about the possibilities of postoperative complications, the days patients must spend in a hospital, and rates of mortality. For this reason, this research aims at emphasising the role of early surgeries in enhancing the lives of patients who suffer from JIP.

METHODOLOGY

These qualitative data examine morbidity and mortality profiles in JIPs patients by presenting the time of the referral. In this study, purposive sampling technique was adopted in selecting 120 patients diagnosed with JIP from the Surgery Department. Based on when they presented, the patients were split into two groups: The first group, Group A consists of individuals who presented to the doctor's office within 24 hours of developing symptoms while the second group, Group B, arrived after 24 hours of developing symptoms. Patients' own accounts of their arthroplasty journey along with data on their treatment outcomes as well as postoperative complications were collected through interviews. Also, data on clinical efficacy of the intervention was obtained from chart abstraction of patient records regarding mortality and morbidity. The qualitative data was analyzed by the thematic analysis that focused on the differences of the complications and survival rates between two groups. This method afforded valuable knowledge of the impact of early and late management of patient outcomes in JIP cases.

Data Analysis

To acquire 120 patients' clinical and experience database, a clear and systematic approach to this qualitative study on JIP was formulated. These patients were selected purposely from the Surgery Department to ensure that each one presents the different outcome associated with early as well as delayed presentation. Based on when they appeared, patients were divided into two groups for comparison analysis: The first group was composed of the patients who approached the therapist within the first 24 hours of the development of the symptoms, and the second group was composed of patients who approached the therapist after 24 hours of developing the symptoms. Due to the time-based grouping, we were able to assess the impact of delayed presentation with regards to morbidity and mortality, capture information about the patient's condition at presentation and the immediate and delayed post-surgical complications and, overall recovery process.

The qualitative raw material was collected chiefly through semi-structured interviews with the patients. To capture first-time effects, all these interviews were done at different intervals, at admission, after surgery during rehabilitation period if not before discharge and if possible, at follow up. The patients were allowed to express what they felt like during the study through semi structured interviews and ensured that some issues regarding the process of getting better were touched on. These subjects included the nature of the patients' course, the problems encountered in gaining swift access to medical care, as well as their own overall assessment of their level of regained health and quality of life after the surgery. The patient interviews with consent involved videography and then converted to text format to ensure accurate thematic analysis.

In addition to the data derived from patient questionnaires, the records were also reviewed to obtain necessary clinical information for patient interviews, including details of the diagnostic tests, operations that were performed, mor immediate complications following the surgery and any additional interventions required. This documentation did give our data collection a quantitative spin where we could be able to explore morbidity markers such as hospital length of stay, respiratory problems as well as wound infection. For patients who died, mortality data were looked at, with focus on identifying shared features which could be associated with late presentation.

In the course of data handling, patient identifiable information was kept private according to the patient's consent through assigning numbers to code the patients' interviews & records. The relevant clinical information was then matched with data regarding the development, progression,

and characteristics of the patient's presenting complaints and actual detailed case descriptions were developed for all study participants. This study aimed at justifying resource allocation for better patient treatment in contexts characterized by late presentation of patients by incorporating information that is clinical, with that which is perceived by the patient to discover if there are variations in patients' outcomes that demand immediate action in handling JIP cases.

Thus, the data collection procedure was significant in the constitution of the thematic analysis as well as for building up a method with which to compare morbidity and death outcomes for the early presenting and late presenting JIP patients.

RESULTS

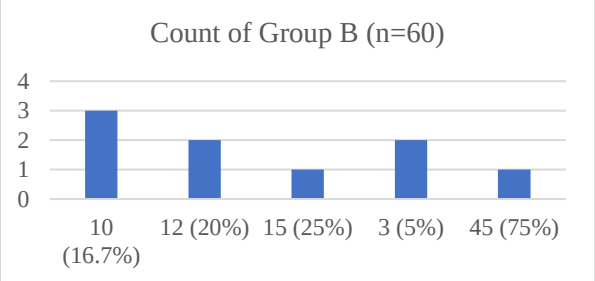
The descriptive results on morbidity and mortality in patients with jejunoileal perforation (JIP), according to when they presented to the surgery department, are shown in this section. Patients who arrived within 24 hours are in Group A, and those who arrived after 24 hours are in Group B. The significance of prompt surgical intervention is highlighted by the study, which shows significant trends in complications, duration of hospital stays, and death between the two groups.

Table 1

Postoperative Complications by Type and Severity

Complication Type	Severity	Group A (n=60)	Group B (n=60)
Wound Infection	Mild	8 (13.3%)	12 (20%)
	Moderate	6 (10%)	15 (25%)
	Severe	1 (1.7%)	3 (5%)
Sepsis	Mild	4 (6.7%)	10 (16.7%)
	Moderate	5 (8.3%)	12 (20%)
	Severe	1 (1.7%)	3 (5%)
Respiratory Complications	Mild	5 (8.3%)	10 (16.7%)
	Severe	3 (5%)	10 (16.7%)
Extended Hospital Stay	>10 days	18 (30%)	45 (75%)

Figure 1



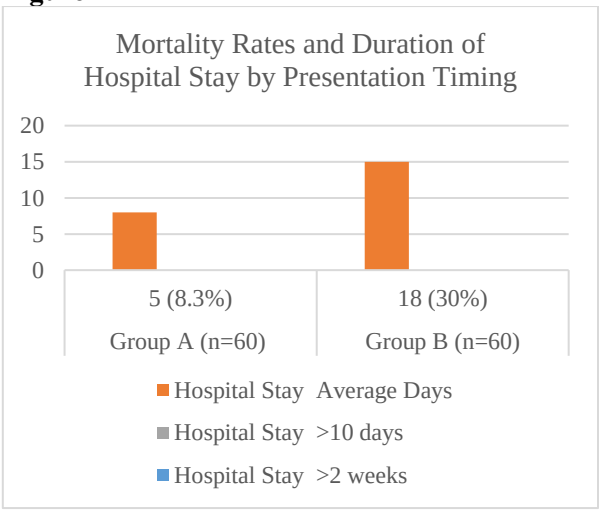
The frequency and severity of problems in all categories were higher in Group B than in Group A for patients who presented after 24 hours. Group B experienced significantly more severe wound infections and sepsis, which might result in a longer recovery time. Particularly in the severe category, patients in Group A had lower rates of complications, indicating that early intervention lessened the severity of these disorders.

Table 2

Mortality Rates and Duration of Hospital Stay by Presentation Timing

Outcome	Metric	Group A (n=60)	Group B (n=60)
Mortality	Rate	5 (8.3%)	18 (30%)
Hospital Stay	Average Days	8	15
	>10 days	18 (30%)	45 (75%)
	>2 weeks	6 (10%)	18 (30%)

Figure 2



Compared to Group A, which had a mortality rate of 8.3%, Group B had a substantially higher rate of 30%. Group B's average hospital stay was nearly twice as long as Group A's, suggesting that delayed presentation not only raised the chance of death but also resulted in longer hospital stays, most likely because of problems that needed intensive care.

Subjective Data and Analysis from Patients' Accounts

Data concerning the factors affecting presentation time was collected through interviews. According to many patients in Group B, lack of access to transportation, and inadequate financial resources were indicated as the major related factors leading to delayed presentation. Another common sighting was the client's failure to appreciate the severity of

some JIP symptoms. While Group A patients often had knowledge about or access to better-facilitated medical resources to endorse early treatments or might have less chances of suffering from more severe complications.

On balance, therefore, there is strong evidence to link; higher morbidity and death with delayed presentation in JIP cases. There were significant differences in LOS, sepsis, respiratory problems, and severe wound infections among patients arriving more than 24 hours prior to admission. These results seek to highlight that there is need to promote awareness of the public and access to health facilities to ensure that patients with JIP require early surgery.

CONCLUSION

This research focuses on why early operation is instrumental in reducing the incidence of complications and mortality in a patient with JIP. There were significantly higher values of the scores in all parameters studied in Group B, the patients who were late presenters postoperatively. The former presented within 24 hrs. Lethal outcome with this was described in Group B; local sepsis, respiratory issues, and wound infections were found to be significantly more prevalent with 30% mortality compared to 8.3% in Group A. Furthermore, there was a longer stay in Group B because more time was taken to go through recovery after an intervention, which, if delayed, can put more burden on the health care systems.

Qualitative findings were examined, including the reasons the patients delayed the presentation which included transportation constraints, financial constraints, and inadequate perception of the seriousness of JIP. Based on these findings, it can be proposed that patients' outcomes can be boosted greatly by such public health interventions aimed at facilitating the identification, access to health care facilities as well as improving the understanding of risks of delayed treatment. Healthcare systems can reduce the cases of complications, enhance the quality of survival and even the quality of managing the limited resources through timely intervention. Consequently, strategies to facilitate timely healthcare seeking are supported by present research, particularly in low-resource environments, where such delays are likely to happen.

REFERENCES

1. Mohamed, S., Küçük, A., Sheikh, O., SARAÇ, A., Adam, M., Ibrahim, I., Osman, M., Ali, N., & Mohamud, A. (2024). A 5-Year Retrospective Study of Gastrointestinal Atresia in a Tertiary Care Hospital in Mogadishu, Somalia. *Open Access Surgery*, *Volume 17*, 123–129. https://doi.org/10.2147/oas.s457913
2. Laje, P. (2023). Abdominal Surgical Emergencies in Neonates. *NeoReviews*, *24*(2), e97–e106. https://doi.org/10.1542/neo.24-2-e97
3. Sire, R. de, Mantia, A. L., Bonacci, L., Testa, A., Guarino, A. D., Rispo, A., Nardone, O. M., & Castiglione, F. (2024). Inflammatory Bowel Diseases and Nephropathies: Exploring the Gut–Kidney Axis. *Life*, *14*(12), 1541–1541. https://doi.org/10.3390/life14121541
4. Katyar, I. R., Khatti, S. N., Raza, A., Abbas, K., Rizvi, M. B., & Ahmad, Z. (2024). Postoperative Outcomes And Surgical Complications In Typhoid Ileal Perforation. *Pakistan Journal of Health Sciences*, 89–93. https://doi.org/10.54393/pjhs.v5i06.1742
5. Attoun, M. A., Mousa, S., Ayoub, A., Alnasser, A. K., Alkaram, E. H., Khubrani, F. A., Alzahrani, K. J., Alatawi, K. A., Almutairi, N., & Alnami, A. G. (2023). The Management of Intussusception: A Systematic Review. *Curēus*, *15*(11). https://doi.org/10.7759/cureus.49481
6. Watanabe, Y., Murata, M., Hirota, M., & Suzuki, R. (2021). Whole jejunoileal diverticulosis with recurrent inflammation and perforation: A case report. *International Journal of Surgery Case Reports*, *84*, 106020–106020.

https://doi.org/10.1016/j.ijscr.2021.106020

7. Yasin, N. A., Ali, A. M., Ahmed, M. A., & Keleşoğlu, S. İ. (2022). Epidemiological Characteristics, Antimicrobial Susceptibility Profile, and Surgical Outcome of Complicated Intra-Abdominal Infection at a Tertiary Hospital in Somalia. *International Journal of General Medicine*, *Volume 15*, 7427–7434. https://doi.org/10.2147/ijgm.s379711
8. Tranah, T. H., Nayagam, J. S., Gregory, S., Hughes, S., Patch, D., Tripathi, D., ... & Joshi, D. (2023). Diagnosis and management of ectopic varices in portal hypertension. *The Lancet Gastroenterology & Hepatology*.
9. Khokha, V. (2023). *Large Bowel Perforation. In Textbook of Emergency General Surgery: Traumatic and Non-traumatic Surgical Emergencies* (pp. 1131-1142). Cham: Springer International Publishing.
10. Oktavian, A., Adipurwadi, J. C., & Agustriani, N. (2024). Jejunoileal Atresia patients Survival-associated Prognostic Factor. *Age (day)*, *8*(28), 0-28.
11. Ranasinghe, I. R., Tian, C., & Hsu, R. (2024). *Crohn disease*. In *StatPearls [Internet]*. StatPearls Publishing.
12. Pal, N. L. (2024). Unusual causes of Small bowel obstruction: a review of the literature and revisited cross-sectional imaging checklist. *Emergency Radiology*. https://doi.org/10.1007/s10140-024-02256-8
13. Singh, M., Dalal, S., & Gera, M. (2021). Spectrum of gastrointestinal perforation peritonitis in 462 consecutive patients in tertiary care institute of North India. *International Surgery Journal*, *8*(10), 2993. https://doi.org/10.18203/2349-2902.isj20213982
14. Balal, A., E Amara, U., Nashrah, U., Ali, S. M., Thapur, M., & Shaikh, N. (2024). Septic Abdomen: An Update on Its Microbiology and Management. *Applied Microbiology in Intensive Care Medicine*, 81–107. https://doi.org/10.1007/978-981-97-4006-2_7
15. Diehl, T., Ntaganda, E., & Petroze, R. (2024). Challenges and Adaptations for Neonatal Surgical Care in LMICs: The Rwandan Gastroschisis Experience. *Current Surgery Reports*. https://doi.org/10.1007/s40137-024-00430-y
16. Bernard, R., & Nicholson, M. (2022). Bacterial Infections of the Small and Large Intestine. *Textbook of Pediatric Gastroenterology, Hepatology and Nutrition: A Comprehensive Guide to Practice*, 203-218.
17. Thioluna, N. M. E., & Purwanta, R. S. (2024). Successful Management of Complex Intestinal Tuberculosis with Ileal Perforation: A Case Report. *Bioscientia Medicina Journal of Biomedicine and Translational Research*, *8*(12), 5582–5592. https://doi.org/10.37275/bsm.v8i12.1136
18. Inukai, K., Usui, A., Yamada, M., Amano, K., Mukai, N., Tsunetoshi, Y., Nakata, Y., & Yokota, J. (2019). Open abdominal management for perforative peritonitis with septic shock: a retrospective analysis on usefulness of a standardized treatment protocol. *European Journal of Trauma and Emergency Surgery*, *47*(1), 93–98. https://doi.org/10.1007/s00068-019-01132-2
19. Bova, R., Griggio, G., Vallicelli, C., Santandrea, G., Coccolini, F., Ansaloni, L., Sartelli, M., Agnoletti, V., Bravi, F., & Catena, F. (2024). Source Control and Antibiotics in Intra-Abdominal Infections. *Antibiotics*, *13*(8), 776–776.

https://doi.org/10.3390/antibiotics13080776

20. Hagedoorn, N. N., Birkhold, M., Murthy, S., Rathan, M. D., Marchello, C. S., & Crump, J. A. (2024). Mortality, morbidity, and post-operative complications of typhoid intestinal perforations: global systematic review and meta-analysis. *MedRxiv (Cold Spring Harbor Laboratory)*. https://doi.org/10.1101/2024.06.28.24309663

21. Thapa, R., Magar, A. T., Shrestha, J., Panth, N., Idrees, S., Sadaf, T., Bashyal, S., Elwakil, B. H., Sugandhi, V. V., Rojekar, S., Nikhate, R., Gupta, G., Singh, S. K., Dua, K., Hansbro, P. M., & Paudel, K. R. (2024). Influence of gut and lung dysbiosis on lung cancer progression and their modulation as promising therapeutic targets: a comprehensive review. *MedComm*, *5*(12). https://doi.org/10.1002/mco2.70018

22. Utrilla Fornals, A., Costas-Batlle, C., Medlin, S., Menjón-Lajusticia, E., Cisneros-González, J., Saura-Carmona, P., & Montoro-Huguet, M. A. (2024). Metabolic and Nutritional Issues after Lower Digestive Tract Surgery: The Important Role of the Dietitian in a Multidisciplinary Setting. *Nutrients*, *16*(2), 246. https://doi.org/10.3390/nu16020246

23. Wismayer, R. (2021). Mesenteric Venous Thrombosis in a Referral Hospital in East Africa: A Retrospective Study of Four Cases. *Journal of Advances in Medicine and Medical Research*, *33*(13), 107–116. https://doi.org/10.9734/jammr/2021/v33i1330961

24. Rodrigo, L. (Ed.). (2024). *Diverticular Bowel Disease-Diagnosis and Treatment: Diagnosis and Treatment*. BoD–Books on Demand.