

# Influence of lymphovascular invasion on outcome of colon cancer

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**Website:**

<https://djm.uodiyala.edu.iq/index.php/djm>

**Received:** 12 February 2024

**Accepted:** 26 May 2024

**Published:** 25 October 2024

## Abstract

**Background:** Colon cancer is the third most common type of cancer. High lymphovascular levels are linked to a number of cancers, including colon cancer, while lymph vascular invasion levels as a predictor of outcome are not well understood.

**Objective:** Determine the influence of lymphovascular invasion on the recurrence of colon cancer.

**Patients and Methods:** it was collected 126 colon cancer patients who had surgery and additional chemotherapy. The patients attended in the Baquba teaching hospital oncology centre and the Al Jawad oncology centre of Alkadhemiya hospital.

**Results:** it was shown in this study that the high percentage ages of colon cancer patients was between 55-60 years, and there were more in women (57 %) than in men (43 %). The most common stage of the tumours was stage 3 (42.9 %), and in grade 2 (76.2 %). In terms of return, in this study, 71.4 % of people who had lymphovascular invasion positive and had a return of cancer in a percentage 73.3% of colon cancer patients.

**Conclusion:** LVI plays an essential role for increasing recurrence of colon cancer, and there were a strong link between them.

**Keywords:** Colon cancer, Lymphovascular invasion, Cancer recurrence, Cancer differentiation.

## Introduction

Colon cancer is the most common type of cancer in the world, with about 14,000,000 new cases and 700,000 deaths each year. In the United States, it is the second most common type of cancer that causes death (1). It was the cause of 10% of cancer deaths in 2010. Random colon tumors become much more common in people over the age of 45 to 50, regardless of age. This effect is stronger than any other factor. In almost every country, age-standardized incidence rates are lower for women than for men. However, while the general incidence has gone down, likely because of more aggressive screening of people over 50, there has been a huge rise in cases younger than 50 years old (3). From 2011 to 2015, the Iraqi Cancer Registry (ICR) showed an incidence rate of 3.22 to 4.4 per 100,000 people. A comparison study of the ICR over 30 years, from 1965 to 1994, showed that the incidence rate rose from 25% to 50% in Iraq. It happens about 2.6% of the time in Iraq, compared to 6.1% to 13.3% in developed countries and 17.1% to 51.1% in industrialized countries. It is the sixth most common cancer in Iraq (4). The GLOBOCAN 2018 report on the top 5 cancers in the world lists breast, lung, leukaemia, bladder, and colorectal cancers. Furthermore, it is advised by the most recent guidelines to check for nodal evolution in at least 12 lymph nodes (LNs) (5). For nodal staging to be accurate, the specimen must have adequate LN retrieval (6). A lower pN stage or a false-negative result could occur from a poor lymph node (ELN) examination (7). The presence of cancer cells in lymphatics or blood arteries is known as lymphovascular invasion (LVI), and it is thought to be an initial step to lymph node metastasis (8). According to numerous research, LVI positive (LVI+) is a crucial prognostic factor for a number of malignancies, such as gastric, bladder, and breast cancers (9,10,11). The prevalence of LVI in CRC ranges from 4.1 to 89.5%, according to reports (12). It was showed that LVI is linked to higher tumour grade, greater pre-CEA levels, and more advanced T and N categories (13). In addition, it was found that LVI is associated with a

number of characteristics in patients with advanced colorectal cancer, such as distant metastases, greater size, more advanced T stage, and LN involvement (14). In addition, LVI is substantially linked to a higher elevated tumour differentiation, advanced tumour stage, and CEA level (8). In individuals with colorectal cancer, LVI is a strong predictor of advanced stage and is strikingly associated with a worse prognosis. Clinicians may find it easier to effectively strategies treatment options for patients with colorectal cancer if they use the survival nomogram that incorporates LVI (15). In addition, it was showed that LVI is a strong predictive indicators for colon cancer staging (16). Thus, it is important to determine the relationship between colon cancer and LVI to reduce the risk factors for cancer recurrence and increase the awareness for these factors. Therefore, this study aims to protrude the correlation between LVI and recurrence of colon cancer.

## Patients and Methods

It was collected 126 patients in this study in total. The results for the study were gathered from the Baquba teaching hospital oncology centre and the Al-Jawad oncology centre from October 2023 to March 2024. There were recorded other factors in the study that have an effect on colon cancer return, but their effects on recurrence were left out. The inclusion criteria of the patients including, patient completed surgery and chemotherapy and regular follow-up. The exclusion criteria of the patients including, the following character, de novo metastasis colon cancer, comorbidity –patient suffering from severd comorbid disease that have effect on survival of patients like diabetes mellitus and thyroid disease, strict diet for any cause or anorexia, inoperable patients or patients refuse surgery for any cause, discontinue adjuvant chemotherapy, second or more primary cancers,

and family history of colon cancer.

### Study design

All the patients in this study had LVI measured by histopathology during surgery or biopsy to find out how lymphovascular invasion affected the return of cancer.

The information of the patients was collected included:

- 1-Gender and age
- 2-Date of diagnoses of colon cancer
- 3-Date and type of surgery
- 4-Date of first chemotherapy
- 5- Performance state and bowel obstruction or perforation at presentation
- 6-Tumour location and pathological macroscopically feature of malignancy

7-Differentiation and depth of penetration and lymph node status of tumors

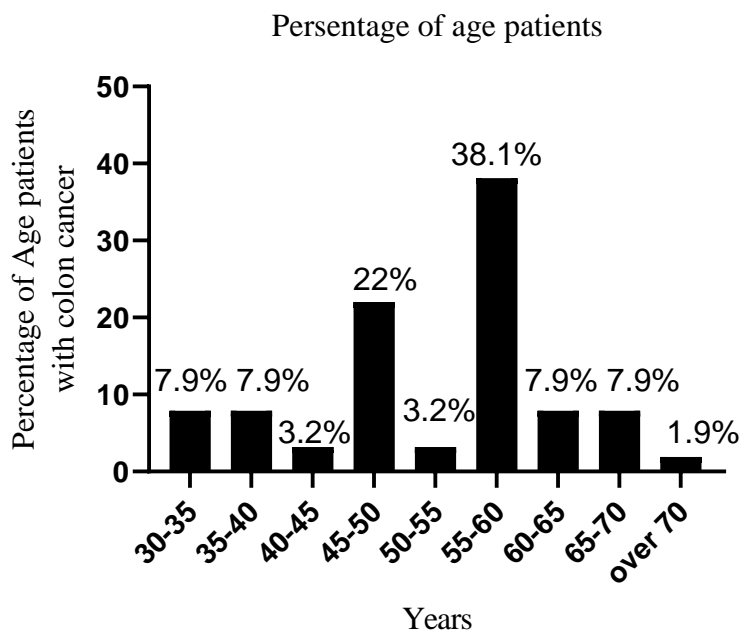
8- Recurrence if present and time from diagnoses to recurrence.

### Statistical analysis

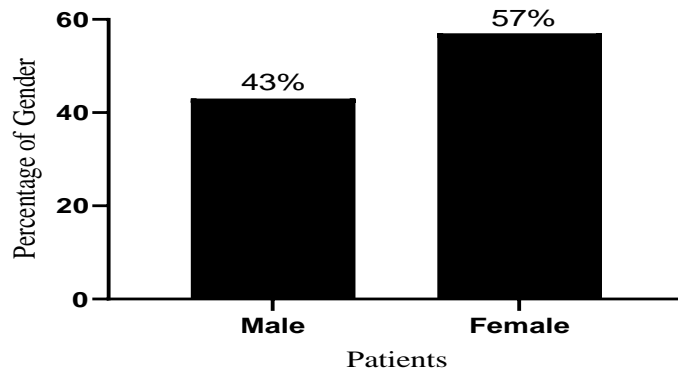
Statistical Package for the Social Sciences (SPSS) version 25 was used to look at the data. The results were shown as a percentages of cancer patients.

### Results

The total number of study patients were 126 that were diagnosed with colon cancer. The Figures 1 and 2 demonstrated distribution of patients according to their ages and gender, respectively. It was shown that the most dangerous ages for colon cancer are between 55-60 years and it was found in the female (57 %) more than in male (43 %).



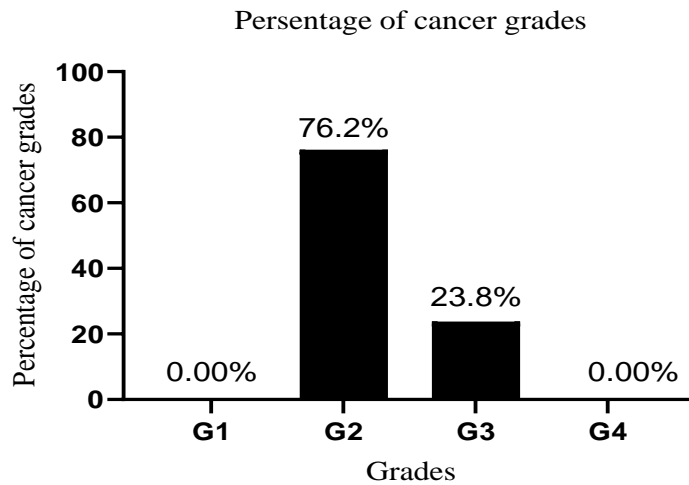
**Figure 1.** Distribution of patients according to their ages.



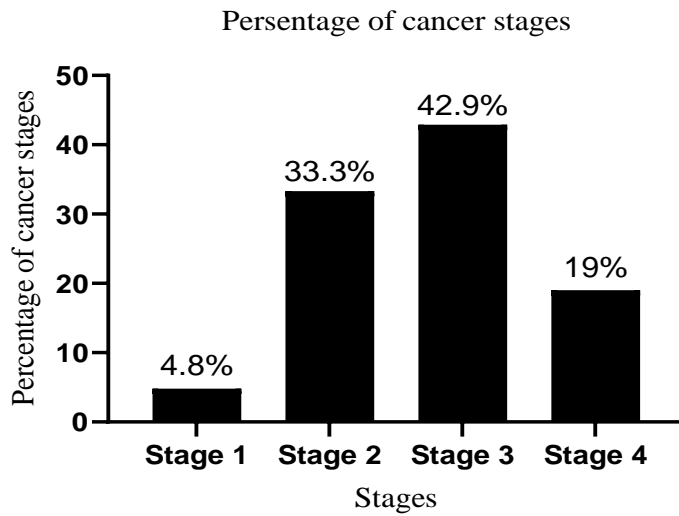
**Figure 2.** Distribution of patients according to their gender.

The tumor characteristics including grade and stage were obtained in this study and showed in figure 3 and 4, respectively. It was demonstrated that 76.2 % of the colon cancer cases were in grade 2 and 23.8% in the grade 3. Interestingly,

it was shown that there are not found any case in the grade 1 and 4 in this study. In addition, it found that 42.9% and 33.3 % of the cases in the stage 3 and 2, respectively. However, the stages 1 and 4 appeared in 4.8% and 19% of the colon cancer cases.

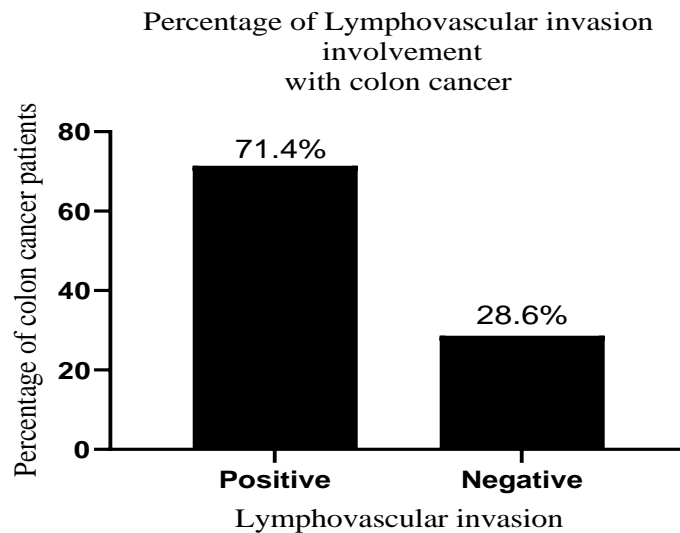


**Figure 3.** Distribution of patients by tumor grades.



**Figure 4.** Distribution of patients according to cancer stages.

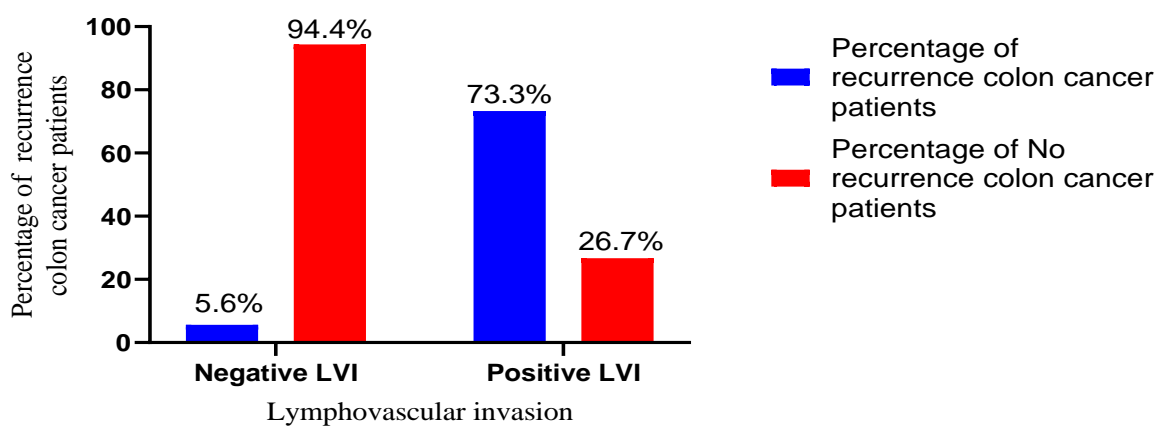
It was noticed that 71.4 % of study patients have lymphovascular invasion Positive and 28.6 % appeared Negative for lymphovascular invasion (Figure 5).



**Figure 5.** The percentages of lymphovascular invasion in the colon cancer patients.

It was shown in Figure 6 that the association between prevalence of recurrence of malignancy and lymphovascular invasion (LVI). In this study, 94.4% of patients with lympho-vascular invasion negative were not appeared recurrence colon cancer. However, 73.3% of patients with lymphovascular invasion positive were complained from recurrence

of malignancy. In addition, it was shown that 5.6% of LVI Negative were suffering from recurrence colon cancer and 26.7% of patients with positive LVI were not appeared recurrence colon cancer (Figure 6).



**Figure 6.** The percentage of recurrence colon cancer patient's camper with lymphovascular invasion.

## Discussion

In this study, it was demonstrated the role of lymphovascular invasion on the result (recurrence) of colon cancer. It was shown that high percentage ages of colon cancer patients were between 55-60 years and high percentage of patients from women. In addition, it was found that the colon cancer grade two is the higher percentage of cancer occur in the patients, and stage three was the highest percentage grade that effected most patients. Furthermore, it was shown that most colon cancer had lymphovascular invasion positive. In the current study, most common patients had a return of cancer, high percentage of those who did had lymphovascular invasion positive. This fits with the results of the 2017 study by Bandamiri et al., which found that the overall five-year recurrence rate was 56.8%. However, it seems higher than what Aghili and colleagues found in 2010 in Iran, where they found that 30% of all recurrences happened recently

(17,18). The research done by Fatemi and colleagues in 2015 showed that neither gender nor age was significantly linked to CRC coming back after surgery (19). In addition, in the 2015 study by Micu et al., there was no statistically significant difference between the ages of patients with cancer recurrence and those who did not have a recurrence ( $p=0.08$ ). There was also no statistically significant difference between the genders of the two groups ( $p=0.4$ ). In the Micu et al. study, the level of differentiation had a statistically significant effect on the disease-free period, with grade four (G4) being significantly linked to cancer coming back (20). Bandamiri found in 2017 that patients with colon cancer recurrence were older than those who did not have a recurrence ( $P=0.035$ ). It was reported that women had a much lower chance of recurrence (43.5%) than men (56.5%) ( $P=0.041$ ) (17). This result fits with what other studies have found: older

patients have a much higher chance of getting CRC again, as seen in the Aghili et al. study from 2010 and the Westberg et al. study from 2015 (18,21,22). In this study, it was appeared that high percentage of patients with lymphovascular invasion had their cancer come back. There was a strong link between the rate of cancer coming back and lymphovascular invasion. They found that lymphovascular invasion happened much less often in patients who did not have a recurrence than in patients who did have a recurrence. In a 2018 study by Yamano that looked at 3039 people with colon cancer who had surgery that was successful, the results showed that lymphovascular invasion, venous invasion, and clinical stage were all significantly linked to return (23). There were no strong links ( $P \geq 0.05$ ) between the frequency of return and pathological traits, tumour site, differentiation, tumour status, lymph nodes, or stage of the tumour. Our results are different from what Micu and colleagues found in their study in 2015. They said that people with colon cancer who have more lymph nodes involved have a worse outlook and a higher chance of the cancer coming back (20). It was explain by Ooki et al.'s study from 2017 found that having more lymph nodes involved was strongly linked to CRC coming back (24). Additionally, Yamano et al.'s 2018 study found that male sex, emergency surgery, vascular and perineural invasion, and problems after surgery were all linked to a higher chance of recurrence (23).

## Conclusion

for lowering body weight may lower the risk of colon cancer and make it possible for people to live longer without getting worse. Moreover, it should be screening schemes for people to find colon cancer early to reduce the number of cases of LVI.

## Recommendations

It was found in this study, it was need more studies with large sample sizes and different centres. In addition, it was recommended that keep the people for lowering body weight may lower the risk of

colon cancer and make it possible for people to live longer without getting worse. Moreover, it should be screening schemes for people to find colon cancer early to reduce the number of cases of LVI.

## Source of funding

This research received no specific grant from any funding agency in the public, commercial, or not for profit sectors (the author received no financial support for the research, authorship, and or publication of article) and it was done by using self-funding.

## Ethical clearance

Consents documents of patients will be catchup this research with full information about patients colon cancer were mentioned. The patients were informed about this study and accepted orally to be enrolled and the approval of this study was obtained from two hospitals (Baquaba teaching hospital oncology centre and the Al Jawad oncology centre of Alkadhemiya hospital) for including its patients in this study. Thus, every patient received inquiry form comprised full information about disease status in relation to this study (Document no. 2024AHM826).

## Conflict of interest

The author acknowledges no conflict of interest in this study.

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## تأثير الغزو اللمفاوي الوعائي على نتيجة سرطان القولون

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### الملخص

**الخلفية الدراسية:** سرطان القولون هو ثالث أكثر أنواع السرطان شيوعًا. ترتبط المستويات اللمفاوية الوعائية العالية بعدد من أنواع السرطان، بما في ذلك سرطان القولون، في حين أن دور مستويات الغزو اللمفاوية الوعائية كمؤشر على مدى عوده السرطان ليست مفهومة جيدًا.

**الهدف من الدراسة:** تحديد تأثير الغزو اللمفاوي الوعائي على تكرار سرطان القولون.

**المرضى والطرق:** تم جمع ١٢٦ مريضًا بسرطان القولون الذين خضعوا للجراحة والعلاج الكيميائي الإضافي. حضر المرضى مركز الأورام في مستشفى بعقوبة التعليمي ومركز أورام الجواد في مستشفى الكاظمية.

**النتائج:** أظهرت هذه الدراسة أن النسبة المئوية العالية لأعمار مرضى سرطان القولون كانت بين ٦٠-٥٥ عامًا، وكان هناك المزيد لدى النساء (٥٧٪) مقارنة بالرجال (٤٣٪). كانت المرحلة الأكثر شيوعًا للأورام هي المرحلة ٣ (٤٢,٩٪)، وفي الدرجة ٢ (٧٦,٢٪). من حيث العودة، في هذه الدراسة، ٧١,٤٪ من الأشخاص الذين لديهم غزو وعائي لمفي إيجابي وكان لديهم عودة السرطان بنسبة ٧٣,٣٪ من مرضى سرطان القولون.

**الاستنتاجات:** يلعب LVI دورًا أساسيًا في زيادة تكرار سرطان القولون، وكان هناك ارتباط قوي بينهما.

**الكلمات المفتاحية:** سرطان القولون، الغزو اللمفاوي الوعائي، عودة السرطان، تمايز السرطان.

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