

Increasing Newly Diagnosed Inflammatory Bowel Disease and Improving Prognosis in China: A 30-year Retrospective Study From a Single Center

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Abstract

Background: We aimed to characterize the trends of prognosis in Ulcerative Colitis (UC) and Crohn's Disease (CD) in a Chinese tertiary hospital.

Methods: A 30-year retrospective cohort analysis was conducted at Peking Union Medical College Hospital. Consecutive patients newly diagnosed with UC or CD from 1985 to 2014 were included. The primary outcome was in-hospital mortality. Second outcomes included surgery and length of stay in hospital. Pearson correlation coefficient was performed to determine the relationship between time and prognosis. Multivariable logistic regression analysis was performed to determine the risk factors for in-hospital mortality and surgery.

Results: In total, 1467 patients were included in this study (898 cases with UC and 569 cases with CD). Annual admissions of UC and CD rose significantly over the last 30 years (UC, $r=0.918$, $P<0.05$; CD, $r=0.898$, $P<0.05$). Decreased in-hospital mortalities were observed in patients with UC and CD (UC, from 2.44% to 0.27%, $r=-0.827$, $P<0.05$; CD, from 12.50% to 0.00%, $r=-0.978$, $P<0.05$). A decreasing surgery rate was observed in patients with CD ($r=-0.847$, $P<0.05$) while an increasing surgery rate was observed in patients with UC ($r=0.956$, $P<0.05$). Shortened average lengths of stay in hospital were observed both in patients with UC and CD (UC, from 47.83 ± 34.35 days to 23.58 ± 20.05 days, $r=-0.970$, $P<0.05$; CD, from 65.50 ± 50.57 days to 26.41 ± 18.43 days, $r=-0.913$, $P<0.05$). Toxic megacolon, sepsis shock were independent risk factors for in-hospital mortality in patients with UC. Intestinal fistula, intestinal perforation were independent risk factors for in-hospital mortality in patients with CD.

Conclusions: In this cohort, the admissions of patients with UC and CD were increased with a significantly improved prognosis during past 30 years.

Background

Inflammatory bowel disease (IBD) is a chronic idiopathic inflammation of the gastrointestinal tract. Currently, the prevalence of IBD surpasses 0.3% in the west world¹. Meanwhile, over the last few decades, newly industrialized countries have also documented a rising incidence of IBD, which poses a heavy burden on global health systems due to high rates of productivity loss and severe complications²⁻³.

In China, the first case of IBD was reported in 1956. Since then, China has experienced a great acceleration in incidence of IBD⁴. During the same time, treatment guidelines have been evolved due to updating conceptions of disease pathogenesis⁵. However, how they affect surgical rates and long-term outcomes is still under investigation. Although several studies have reported short-term trends and hospitalization costs of IBD in China^{3,6-8}, longitudinal trends of IBD in China still remains unclear.

Therefore, in order to better understand the longitudinal trends of IBD in China, we conducted this 30-year retrospective study to characterize the trends of admission, complication and prognosis in newly diagnosed IBD based on hospital administrative database.

Methods

Patients

A 30-year retrospective, hospital-based study was undertaken in Peking Union Medical College Hospital. Diagnostic codes based on International Classification of Disease – 9th Revision (ICD-9) and ICD-10 were used to search hospital administrative database. Consecutive patients diagnosed with UC (ICD-9 555, ICD-10 K51) or CD (ICD-9 555, ICD-10 K51) from 1985 to 2014 were included. Records for all admissions were retrospectively reviewed by two gastroenterologists independently. Only patients with UC or CD as primary diagnosis were included. For repeated admissions, only the first admission (with UC or CD as primary diagnosis) was included. This study was approved by the Institutional Review Board of Peking Union Medical College Hospital.

Data Collection

Data concerning demographic characteristic, phenotype, complication, surgery and in-hospital mortality were extracted from hospital administrative database. The primary outcome was in-hospital mortality. Secondary outcomes including the need of surgery, length of hospital stay and hospital cost.

Statistical analysis

Continuous variables are presented as the mean \pm SD and analyzed with Student's t-test. Categorical variables tested with the χ^2 test or Fisher Exact test. Trend analysis was analyzed by spearman correlation coefficient. Risk factors by identified by logistic regression analysis. All analyses were performed with SPSS 23 software (Chicago, IL, USA). $P < 0.05$ was considered statistically significant.

Results

Increasing newly diagnosed IBD

At first, 4114 cases were extracted from administrative database. After data review, 1346 cases were excluded because IBD was not the primary discharge diagnose, 1301 cases were excluded because of repeated admission.

At last, a total of 1467 cases were included in the final analysis, including 898 cases of UC (61.21%) and 569 cases of CD (38.79%). As showed in Table 1, the male ratio in patients with UC was lower than that in CD (1.11:1 vs 1.96:1, $P < 0.001$). The average age at admission was younger in patients with UC than in CD (41.95 ± 15.36 vs 37.62 ± 15.04 , $P < 0.001$). The peak age at admission in patients with UC and CD was 30–39 years old and 20–29 years old, respectively.

Table 1
Characteristics of patients with IBD

	IBD	UC	CD	
	N = 1467	N = 898	N = 569	P
Sex, n (%)				
Male	849 (57.87)	472 (52.56)	377 (66.26)	< 0.001
Female	618 (42.13)	426 (47.44)	192 (33.74)	
Age, yr	40.27 ± 15.38	41.95 ± 15.36	37.62 ± 15.04	< 0.001
0–9	8 (0.55)	7 (0.78)	1 (0.18)	
10–19	98 (6.68)	43 (4.79)	55 (9.67)	
20–29	338 (23.04)	180 (20.04)	158 (27.77)	
30–39	321 (21.88)	201 (22.38)	120 (21.09)	
40–49	285 (19.43)	178 (19.82)	107 (18.80)	
50–59	225 (15.34)	152 (16.93)	73 (12.83)	
60–69	135 (9.20)	97 (10.80)	38 (6.68)	
70–79	51 (3.48)	37 (4.12)	14 (2.46)	
>80	6 (0.41)	3 (0.33)	3 (0.53)	

The numbers of newly diagnosed UC and CD both increased significantly during the last 30 years. The newly diagnosed cases of UC increased from 41 cases in 1986–1990 to 373 cases in 2011–2015 ($r = 0.918$, $P < 0.05$). The newly diagnosed cases of CD increased from 16 cases in 1986–1990 to 276 cases in 2011–2015 ($r = 0.898$, $P < 0.05$).

Improving Prognosis Of Newly Diagnosed Ibd

A total of 20 patients died in this study, including 9 cases of UC (1.00%) and 11 case of CD (1.93%). Reasons of death included septic shock (7 cases, 35%), hemorrhagic shock (5 cases, 25%), multiple organ failure syndrome (4 cases, 20%), toxic megacolon (2 cases, 10%) and intestinal perforation (2 cases, 10%). The in-hospital mortality in patients with UC decreased from 2.4% in 1986–1990 to 0.3% in 2011–2015 ($r = -0.827$, $P < 0.05$). The in-hospital mortality in patients with CD decreased from 12.5% in 1986–1990 to 1.8% in 2011–2015 ($r = -0.978$, $P < 0.05$).

A total of 277 cases received operation, including 106 cases of UC (11.8%) and 171 cases of CD (30.1%). An increasing trend of annual operation rate was observed in patients with UC ($r = 0.956$, $P < 0.05$) while a decreasing trend was observed patients with CD ($r = -0.847$, $P < 0.05$).

Shortened average lengths of stay in hospital were observed both in patients with UC and CD (UC, from 47.83 ± 34.35 days to 23.58 ± 20.05 days, $r=-0.970$, $P < 0.05$; CD, from 65.50 ± 50.57 days to 26.41 ± 18.43 days, $r=-0.913$, $P < 0.05$).

Complications Of Ibd

As showed in Table 2, toxic megacolon (16 cases, 1.78%) was the most common severe complications in UC, followed by intestinal perforation (13 cases, 1.45%), intestinal obstruction (9 case, 1.00%), intestinal fistula (5 cases, 0,56%) and hemorrhagic shock (3 cases, 0.33%). Intestinal obstruction was the most common severe complications in CD (128 cases, 22.5%), followed by intestinal fistula (85 cases, 14.94%), intestinal perforation (27 cases, 4.75%) and hemorrhagic shock (5 cases, 0.88%). The annual proportion of complications varied from 34.62–39.68% during study period in newly diagnosed patients with CD and varied from 3.70–7.32% in newly diagnosed patients with UC.No significant trend was observed in the proportion of complications in CD and CD.

Table 2
Complication in patients with UC and CD

	All	UC	CD	<i>P</i>
	N = 2315	N = 1313	N = 1002	
Intestinal obstruction	137 (9.34)	9 (1.00)	128 (22.50)	< 0.001
Intestinal perforation	40 (2.73)	13 (1.45)	27 (4.75)	< 0.001
Intestinal fistula	90 (6.13)	5 (0.56)	85 (14.94)	< 0.001
Toxic megacolon	16 (1.09)	16 (1.78)	0 (0.00)	< 0.001
Hemorrhagic shock	8 (0.55)	3 (0.33)	5 (0.88)	0.168

Risk Factors For Prognosis In Ibd

As shown in Table 3, multi-variable regression analysis showed that year of admission, toxic megacolon, septic shock and hematological comorbidities were independent risk factors for death in patients with UC. Intestinal fistula, intestinal perforation and sepsis shock were independent risk factors for surgery in patients with CD.

Table 3
Multi-variable regression analysis of risk factors for in-hospitality death in IBD

Characteristics	β	SE	Wald	P
UC				
Year of admission	-1.111	0.3	13.671	< 0.001
Age at admission	0.075	0.032	5.474	< 0.05
Toxic megacolon	7.393	2.907	6.47	< 0.05
Septic shock	7.188	2.673	7.232	< 0.05
Hematological comorbidities	6.137	1.734	12.524	< 0.001
Constant	-5.291	2.696	3.851	0.05
CD				
Year of admission	-0.940	0.310	9.217	0.002
Intestinal fistula	2.454	1.128	4.736	0.030
Intestinal perforation	3.460	1.325	6.819	0.009

As shown in Table 4, intestinal obstruction, intestinal perforation, canceration, toxic megacolon and hemorrhagic shock were independent risk factors for surgery in patients with UC. Intestinal fistula, intestinal obstruction and intestinal perforation were independent risk factors for surgery in patients with CD.

Table 4
Multi-variable regression analysis of risk factors for operation in IBD

Characteristics	β	SE	Wald	P
UC				
Age	0.018	0.007	7.239	< 0.05
Intestinal obstruction	2.304	0.527	19.09	< 0.001
Intestinal Perforation	4.001	0.835	22.947	< 0.001
Toxic megacolon	2.317	1.031	5.054	< 0.05
Hemorrhagic shock	2.707	1.013	7.141	< 0.05
Canceration	3.735	1.107	11.393	< 0.05
Septic shock	2.835	0.956	8.793	< 0.05
Constant	-3.586	0.635	31.915	< 0.001
CD				
Year of admission	-0.270	0.078	11.894	0.001
Intestinal fistula	0.765	0.291	6.923	0.009
Intestinal obstruction	1.114	0.238	21.947	0.000
Intestinal perforation	1.615	0.625	6.680	0.010

Discussion

Hospitalization, surgery and in-hospital mortality are important measurements for IBD management. A few studies have evaluated how these measurements changed since the introduction of new conceptions of pathogenesis and treatment strategies^{5 6}. However, longitudinal trends in newly industrialized countries remains unclear. This study points to an increasing annual admission, decreasing in-hospital mortality and shortened length of hospital of IBD patients in a territory hospital from 1985 to 2014. Complications such as toxic megacolon, sepsis shock and hematologic comorbidities were independent risk factors for in-hospital mortality in patients with UC; intestinal fistula, intestinal perforation and sepsis shock were independent risk factors for in-hospital mortality in patients with CD.

At the turn of the 21st century, IBD became a global disease with accelerating incidence in the newly industrialized countries¹. An estimated 2.5-3 million people in Europe are affected by IBD, with a direct healthcare cost of 4.6–5.6 billion Euros per year². However, while the incidence and hospitalizations of IBD in western countries remains stable or slowly declining, literature showed an exploded trend in developing countries in the latest decade^{2 8}. Overall, the incidence of IBD in China is 3.3 per 100,000^{3 4}.

Our study showed that the annual admissions of UC and CD rose significantly over the last 30 years (UC, $r = 0.918$, $P < 0.05$; CD, $r = 0.898$, $P < 0.05$), which provides a relatively longer trends information.

More importantly, our study showed improving prognosis of IBD during study period after adjustment for complications and severe comorbidity. Decreasing in-hospital mortality and shortened length of hospital were observed in this cohort. Many factors may contribute to the improved prognosis of IBD, such as increased awareness of early detection and intervention, improved access to health care providers, improved surveillance system, and evolved treatment strategies. At the start of our study period, treatment options and strategies were different from now. Since the formal Chinese consensus of IBD released in 2000, clinician's awareness have been well improved, which may contribute the decreasing in-hospital mortality.

Surgery also plays a vital role in the treatment of IBD. Surgery in IBD is mainly used to eliminate complications or when medical therapy fails⁹. A total of 277 cases received operation in this study, including 106 cases of UC (11.8%) and 171 cases of CD (30.1%), which were in accordance with literature¹⁰. Changes of surgery rate in IBD are controversial. A meta-analysis reported a decreasing surgery rate in CD over the past several decades¹¹, while some hospital-based studies reported conflicting results¹². Our study showed a decreasing surgery rate in patients with CD ($r = -0.847$, $P < 0.05$) while an increased surgery rate in patients with UC ($r = 0.956$, $P < 0.05$). The changing pattern of surgery in CD patients was in accordance with Christopher reported a decreasing rate of surgery in CD by 3.5% per year (95% CI: -1.1%, - 5.8%) from 2002 to 2010 in Canada¹³. The decrease in surgical rates might due to the evolving practice patterns such as earlier disease detection and intervention, closer endoscopic follow-up and increasing adoption of immunosuppressive agents and biologic agents¹⁴.

As for complications in IBD, our result showed that toxic megacolon (16 cases, 1.78%) was the most common severe complications in UC, while intestinal obstruction was the most common severe complications in CD (128 cases, 22.5%), followed by intestinal fistula (85 cases, 14.94%). Moreover, the above complications were independent risk factors for in-hospital mortality and operation. However, no decreasing in complication occurrence were observed in this study in the era of biologics. This might be explained by increasing awareness, early detection and close monitoring in the management of severe complications in IBD. Prospective cohort studies with more detailed adjustment in medical therapy are needed to confirm our results.

The present study has several limitations. The first is confounding bias. This study covered a longtime span of 30 years. There exist changing diagnostic criteria and management, changing technology and economy. However, regression analysis showed that year admission was an independent risk factors for death, which means that the prognosis of UC was indeed improved during the last 30 years. Besides, as a tertiary single center, hospital-based study, the severity of patients included in this study is higher than general IBD patients. Population-based study is needed to confirm these results. And Lastly, our study focused on short outcomes of newly diagnosed IBD patients, further studies with longer follow-up

information are needed to be focused on long term outcomes of IBD patients. Therefore, this research only provides an overview of UC from single center and wish to provide information for further research.

Conclusion

This longitudinal, hospital-based study showed an increasing tendency in newly diagnosed IBD, and more importantly an improving prognosis of patients with IBD. Besides, our results showed that severe complications also have an important effect on prognosis, and early recognition and intervention is crucial in further management.

Abbreviations

UC

Ulcerative Colitis

CD

Crohn's Disease

IBD

Inflammatory bowel disease

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of Peking Union Medical College Hospital (IRB number:S-703). All patients participating gave written informed consent and authorization for use of data.

Consent for publication

Not Applicable

Availability of data and material

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Competing interests

The authors have no competing interests to declare.

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Authors' contributions

H Yang and J Qian conceptualized and designed the study. H Lv and M Jin designed the study and drafted the manuscript. M Jin, H Zhang, X Chen, M Xu, M Guo, R Zhou and Z Wang collected and analyzed data.

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