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Clinical-epidemiological characteristics and etiological structure of benign mechanical jaundice syndrome: an 11-year single-center study

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Benign mechanical jaundice (BMJ) is a common condition in gastroenterological and surgical practice. Despite its clinical significance, most studies involve mixed etiologies (benign and malignant), complicating the assessment of the features specific to benign forms. Data on the seasonality, trends in hospitalization frequency, and clinical-demographic characteristics of patients with BMJ remain limited.

Objective – to analyze the etiological structure, demographic profile, clinical presentation, hospitalization trends, and seasonality of benign mechanical jaundice based on 11 years of single-center data.

Materials and methods. A retrospective-prospective single-center study was conducted involving 1,187 patients diagnosed with BMJ and hospitalized at Kyiv City Clinical Hospital of Emergency Care between 2013 and 2024. The diagnosis was based on clinical, laboratory, and imaging findings, with malignant pathology excluded. Descriptive, correlation, regression, and variance statistics were applied.

Results. The most common cause of BMJ was choledocholithiasis (73.6 %), followed by indurative pancreatitis (7.7 %), major duodenal papilla stenosis (7.1 %), and Mirizzi syndrome (2.9 %). Females predominated (57.8 %), and the mean age was 64.7 ± 14.3 years. Seasonal variation was statistically significant ($p < 0.001$), with peaks in January, May, and November. A moderate positive correlation was observed between total bilirubin levels and time to hospitalization ($r = 0.482$; $p < 0.001$). A gradual increase in BMJ cases from 2014 to 2021 was noted ($R^2 = 0.47$).

Conclusions. Choledocholithiasis is the leading cause of benign mechanical jaundice. Patients typically present late, with higher bilirubin levels correlating with delayed hospitalization. A clear pattern of seasonality was identified, which may inform improved healthcare resource planning. This study is the first in Ukraine to provide a comprehensive analysis of benign mechanical jaundice in a large cohort with the exclusion of malignant cases.

Keywords
benign mechanical jaundice, choledocholithiasis, benign biliary obstruction, seasonality, bilirubin, indurative pancreatitis.

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Mechanical jaundice syndrome (MJS) is a clinical manifestation of impaired bile flow due to obstruction of the biliary tract, accompanied by elevated levels of direct bilirubin and characteristic symptoms of cholestasis. Obstructive jaundice can result from both malignant and benign causes; however, most epidemiological and clinical studies fail to clearly differentiate between these forms, complicating the assessment of patient characteristics specific to benign mechanical jaundice [2, 4, 19, 22, 23, 30]. For instance, a population-based study conducted within the DISCOVER program [25]

reported the overall incidence of jaundice among adults over 45 years of age but did not distinguish between malignant and benign etiologies, significantly limiting the applicability of its findings for the analysis of MJS.

At the same time, benign mechanical jaundice (BMJ) – most often associated with choledocholithiasis [1, 15, 28], biliary strictures [5, 9], or external (extraductal) compression [12, 23, 27] – frequently requires urgent hospitalization in gastroenterology and surgical departments [21]. Despite its clinical relevance for prognosis and treatment planning, the population-level prevalence of BMJ remains insufficiently studied.

An increase in the frequency of BMJ is expected due to the rising incidence of choledocholithiasis, the leading cause of benign biliary obstruction. According to the literature, choledocholithiasis is diagnosed in 10–20 % of patients with cholelithiasis (CL) [13, 18, 24]. The overall prevalence of cholelithiasis in the general population is estimated at 10–15 % in developed countries [14], with some studies reporting a rate of 2,966.7 per 100,000 individuals as of 2021 [26]. A consistent upward trend in this indicator has been observed–for example, in the United States, the prevalence of cholelithiasis increased from 7.4 % in the 1990s to 13.9 % in 2020 [28]. Consequently, a projected increase in choledocholithiasis prevalence may lead to a corresponding rise in BMJ as one of its key complications.

The relevance of studying the clinical presentation, etiological structure, and seasonal variation of obstructive jaundice stems from its high incidence, the risk of serious complications, the need for timely and appropriate treatment decisions, and the scarcity of studies involving reliably confirmed benign etiologies. Moreover, most existing studies are limited in duration and do not analyze seasonal trends or temporal shifts in the etiological spectrum.

Given these limitations, a long-term study involving a large cohort of patients with clearly verified benign obstructive jaundice is warranted. Such research would allow for detailed analysis of demographic and clinical characteristics, changes in etiological patterns over time, seasonal fluctuations, and other features of the disease course. This approach is essential to improve patient stratification, optimize care pathways, and enhance the overall effectiveness of treatment.

Objective – to analyze the etiological structure, demographic characteristics, clinical manifestations, seasonal variations, and trends in hospitalization frequency among patients with benign mechanical jaundice, based on 11 years of observations at a single specialized hospital.

Materials and methods

A retrospective-prospective single-center study was conducted involving 1,187 patients diagnosed with BMJ who were hospitalized at the Kyiv City Clinical Hospital of Emergency Care between January 1, 2013, and December 31, 2024.

Inclusion criteria

- Presence of clinical signs of jaundice (e.g., yellowing of the skin and sclera);
- Elevated total bilirubin level > 2.5 mg/dL (≈ 43 μmol/L);
- Imaging-confirmed extrahepatic biliary obstruction (based on ultrasound, magnetic resonance cholangiopancreatography (MRCP), or endoscopic retrograde cholangiopancreatography (ERCP));
- Benign etiology of obstruction (e.g., choledocholithiasis, benign strictures, parasitic obstruction);
- Age ≥ 18 years.

Exclusion criteria

- Confirmed or suspected malignant obstruction (e.g., pancreatic head cancer, cholangiocarcinoma, Klatskin tumor);
- Intrahepatic causes of jaundice (e.g., hepatitis, cirrhosis, drug-induced liver injury);
- Incomplete clinical records (e.g., missing ultrasound or laboratory data);
- Age < 18 years.

The following data were collected for each patient:

- demographic information (age and sex);
- clinical data: primary complaints at the time of hospital admission;
- laboratory parameters, including total bilirubin level;
- imaging findings (results of abdominal ultrasound, MRCP, and/or ERCP);
- pre-hospital duration (time from symptom onset to hospitalization);
- hospitalization date (used to assess seasonal variation and annual trends).

The diagnosis of benign mechanical jaundice was established using a structured, stepwise diagnostic algorithm (Fig. 1). Patients were enrolled based on the following criteria:

1. Initial Clinical Screening

Patients were evaluated for clinical signs of jaundice, including:

- Yellowing of the skin and/or sclera
- Dark urine
- Acholic (pale) stools.

If any of these signs were present, further laboratory evaluation was initiated.

2. Laboratory Confirmation of Cholestasis

Laboratory tests included measurement of total and direct (conjugated) bilirubin.

Patients with direct bilirubin accounting for > 50 % of total bilirubin and total bilirubin levels > 2.5 mg/dL (43 μmol/L) were considered suspected cases of mechanical (obstructive) jaundice.

3. Initial Imaging

All patients underwent abdominal ultrasound.

In cases where dilation of the bile ducts was observed (common bile duct diameter > 6 mm), extrahepatic obstruction was suspected.

If no bile duct dilation was found, intrahepatic causes were considered, and further testing was performed, including serological assays, liver function tests, MRCP, and, when indicated, liver biopsy.

4. Verification of Etiology

If imaging confirmed the presence of biliary calculi, the patient was referred for endoscopic papillotomy (EPT) with lithoextraction (LE) or laparoscopic choledocholithotomy (LCLT) with lithoextraction.

If no stones were detected, additional imaging (MRCP, CT, or endoscopic ultrasound (EUS)) was performed. When necessary, biopsy was used to rule out malignant processes.

Statistical analysis

Descriptive statistics were used to summarize the data. Quantitative variables are presented as mean ± standard deviation (M ± SD) or as median with interquartile range (25th–75th percentile), depending on data distribution. Categorical variables are reported as absolute numbers and percentages.

The mean values were compared using Student's t-test. Spearman's rank correlation was employed to assess associations between continuous variables. To analyze hospitalization rates across different months, either the chi-squared (χ^2) test or Fisher's exact test (for small sample sizes) was applied. Regression analysis was conducted to evaluate trends in annual hospitalization rates. A p-value of < 0.05 was considered statistically significant.

All statistical analyses were performed using IBM SPSS Statistics software.

Results

A total of 1,187 patients with benign mechanical jaundice were treated during the study period, including 501 men (42.2 %) and 686 women (57.8 %) ($p < 0.001$), with a mean age of 64.7 ± 14.3 years (range: 17–97 years) (Fig. 2).

Men were significantly younger than women: 62.0 ± 14.2 years vs. 66.5 ± 14.1 years, respectively ($p < 0.001$). The mean body mass index (BMI) was 25.3 ± 4.2 kg/m^2 (range: 18.1–36.4 kg/m^2).

Primary hospital admission due to jaundice occurred in 1,092 patients (92.0 %), while 95 patients (8.0 %) were re-hospitalized. Since 2014, there was

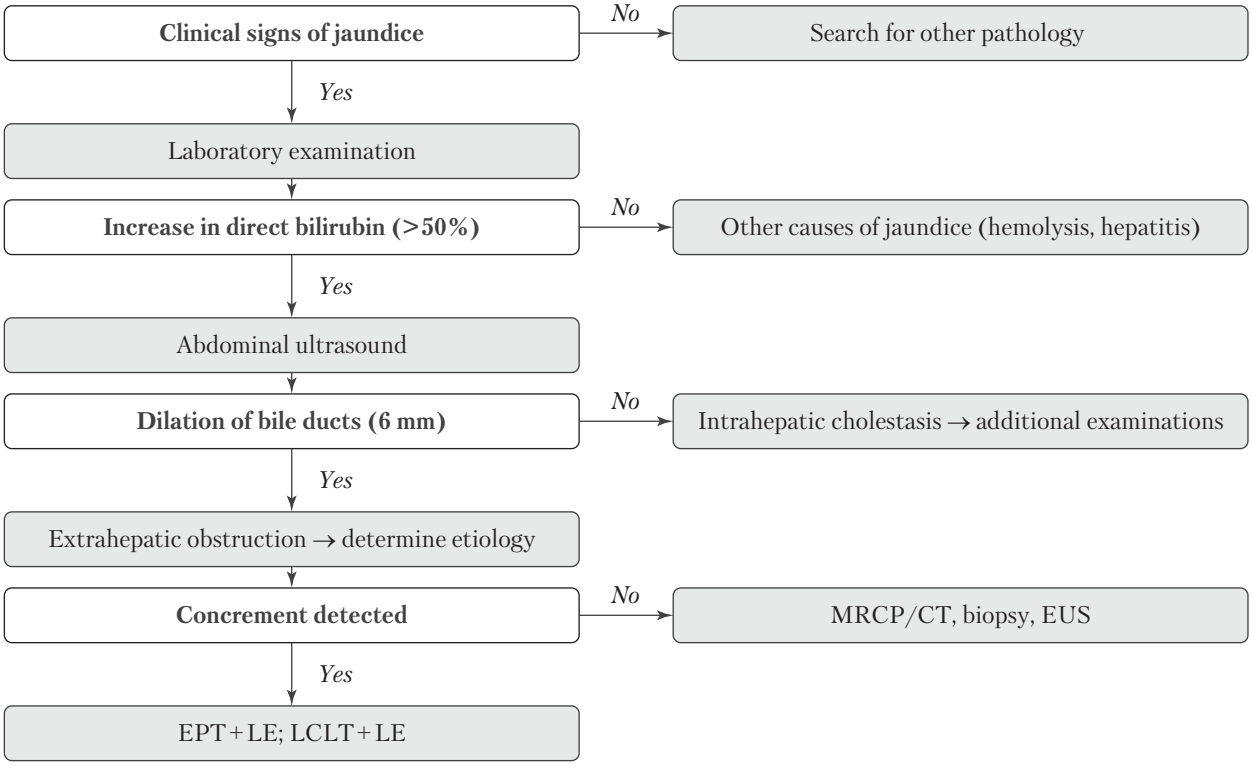

Figure 1. **Step-by-step diagnostic algorithm for mechanical jaundice of benign origin**

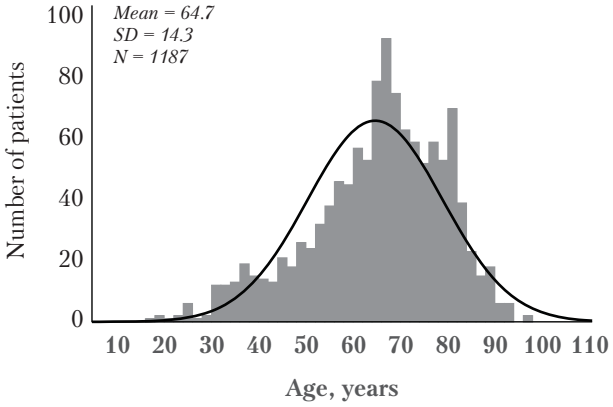

Figure 2. **Age distribution of patients with benign mechanical jaundice overlaid with a normal (Gaussian) distribution curve**

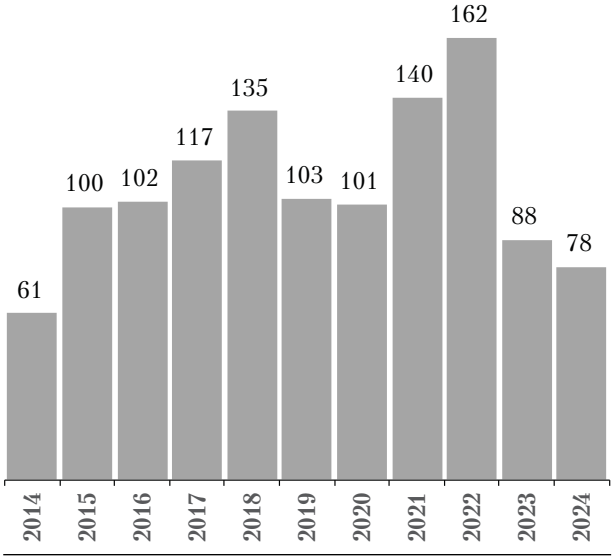

Figure 3. **Annual distribution of hospitalized patients with benign mechanical jaundice from 2014 to 2024 (n = 1,187)**

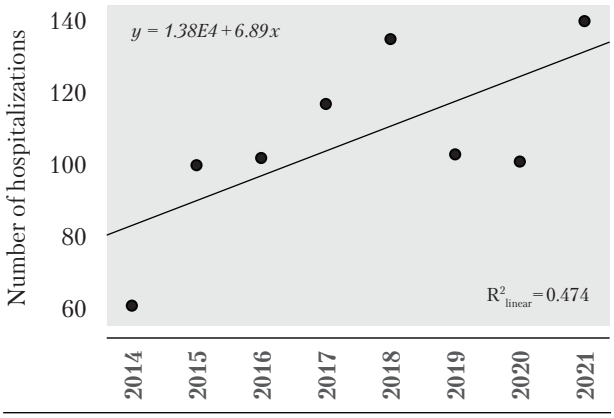

Figure 4. **Linear regression analysis of hospitalization frequency for benign mechanical jaundice between 2014 and 2021**

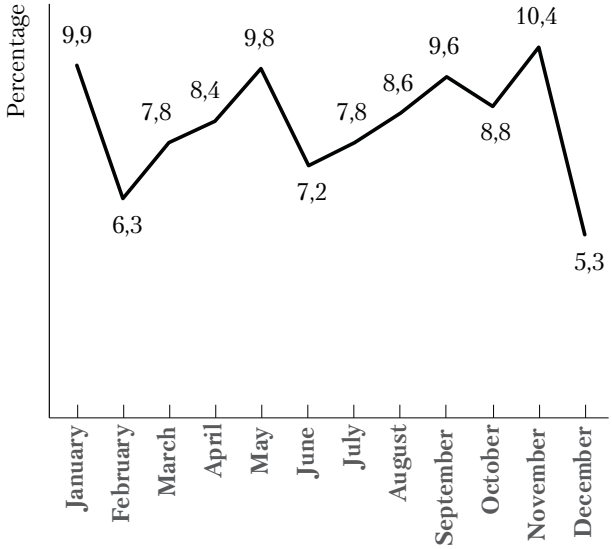

Figure 5. **Seasonal distribution of hospitalizations for benign mechanical jaundice**

a steady increase in the number of hospitalizations for benign mechanical jaundice:

In 2014, 61 patients (5.1 %) were hospitalized; by 2018, this number rose to 135 patients (11.4 %).

During the COVID-19 pandemic, hospitalization rates declined to 103 patients (8.7 %) in 2020 and 101 patients (8.5 %) in 2021. In the following post-pandemic years, a marked increase was observed: 140 patients (11.8 %) in 2022 and 162 patients (13.6 %) in 2023.

However, during the period of martial law, there was a sharp decline in hospitalizations: in 2023, 88 patients (7.4 %) were hospitalized, and in 2024, 78 patients (6.6 %) (Fig. 3).

The regression analysis of hospitalization rates from 2014 to 2021 confirmed a significant upward trend. Data from 2022 to 2024 were excluded due to extraneous variables, specifically the full-scale war in Ukraine and the COVID-19 pandemic, which could distort the trend and influence study outcomes. A linear regression of hospitalizations during 2014–2021 revealed a moderate positive trend ($R2 = 0.47$), indicating a gradual increase in the incidence of benign mechanical jaundice. The average annual increase was approximately 6.9 cases per year (Fig. 4).

Analysis of the hospitalization distribution among 1,187 patients with benign mechanical jaundice revealed significant seasonal fluctuations. The highest number of hospitalizations occurred in January, May, and November, while the lowest rates were observed in December, February, and June ($p < 0.001$) (Fig. 5).

Among the 1,187 patients, 53 (4.5 %) were hospitalized within the first day of symptom onset (either

the onset of pain or jaundice). The majority of patients were admitted between the 2nd and 5th days (493 patients, 41.5 %), followed by those hospitalized between the 6th and 10th days (560 patients, 47.2 %). A smaller group of 81 patients (6.8 %) was admitted more than 10 days after symptom onset. The average time from symptom onset to hospitalization was 5.87 ± 2.89 days (range: 1–19 days) (Fig. 6).

The clinical presentation of benign mechanical jaundice was typical in most patients, with cholestasis-related symptoms predominating. All patients (100 %) exhibited yellowing of the skin and sclera. Other common symptoms included dark urine (86.8 %), pale stools (79.2 %), pruritus (61.2 %), and right hypochondrial pain (83.0 %). Additionally, some patients reported dyspeptic symptoms such as nausea, flatulence, and bitterness in the mouth; neurovegetative symptoms including irritability and insomnia; as well as allergy-like manifestations such as skin rashes. These less frequent complaints highlight the systemic impact of bile stasis and may play a role in early diagnosis and differentiation from functional disorders (Table 1).

The total bilirubin level was 209.62 ± ± 76.95 μmol/L, ranging from 88.6 to 417.2 μmol/L (Fig. 7). The direct bilirubin level was 120.68 ± 39.24 μmol/L, ranging from 39.4 to 254.2 μmol/L (Fig. 8).

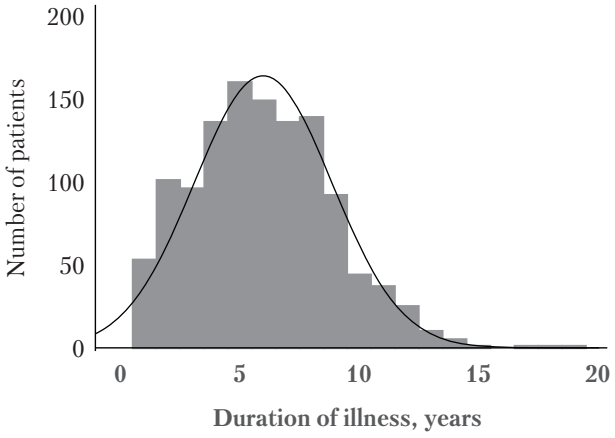

Figure 6. **Distribution of patients by duration of illness prior to hospitalization, presented with an overlaid Gaussian (normal) distribution curve**

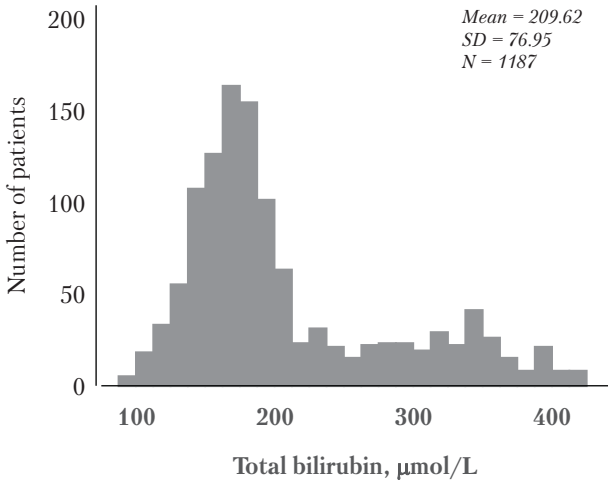

Figure 7. **Distribution of patients with benign mechanical jaundice by total bilirubin level**

Table 1. **Clinical complaints in patients with benign mechanical jaundice**

Indicator	Value
Main complaints	
Yellowing of skin and sclera	1187 (100.0 %)
Darkening of urine	1030 (86.8 %)
Pale stools	940 (79.2 %)
Itching of the skin	727 (61.2 %)
Pain in the right hypochondrium (paroxysmal or dull)	985 (83.0 %)
Mild	363 (30.6 %)
Moderate	305 (25.7 %)
Severe	271 (22.8 %)
Very severe	46 (3.9 %)
Right shoulder sign	514 (43.3 %)
Nausea, vomiting	582 (49.0 %)
General weakness, fatigue	703 (59.2 %)
Elevated body temperature > 36.9 °C	552 (46.5 %)
Body temperature in febrile patients, °C (M ± SD)	37.9 ± 0.5
Fever	204 (17.2 %)
Decreased appetite	439 (37.0 %)
Bitter taste and dry mouth	415 (35.0 %)
Additional complaints	
Postprandial heaviness; discomfort in the epigastric region or right side	378 (31.8 %)
Flatulence, abdominal bloating	332 (28.0 %)
Heartburn, belching, halitosis	261 (22.0 %)
Insomnia, irritability, anxiety	249 (21.0 %)
Unstable stool (alternating diarrhea and constipation)	201 (16.9 %)
Palpitations, blood pressure fluctuations	142 (12.0 %)
Skin rash, cholestatic dermatitis	83 (7.0 %)

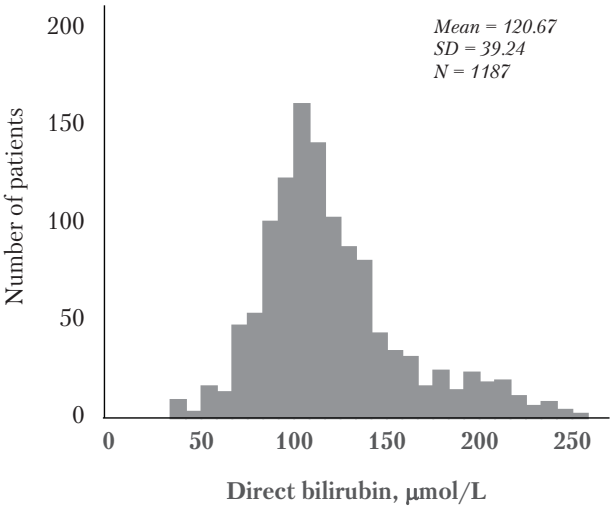

Figure 8. **Distribution of patients with benign mechanical jaundice by direct bilirubin level**

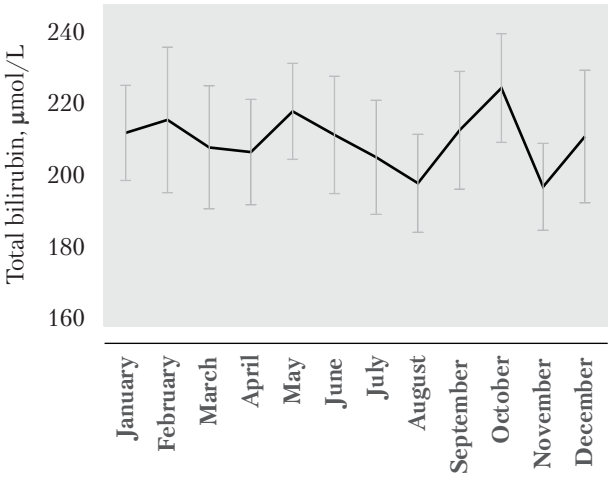

Figure 9. **Mean total bilirubin levels with 95 % confidence intervals, grouped by month of hospitalization**

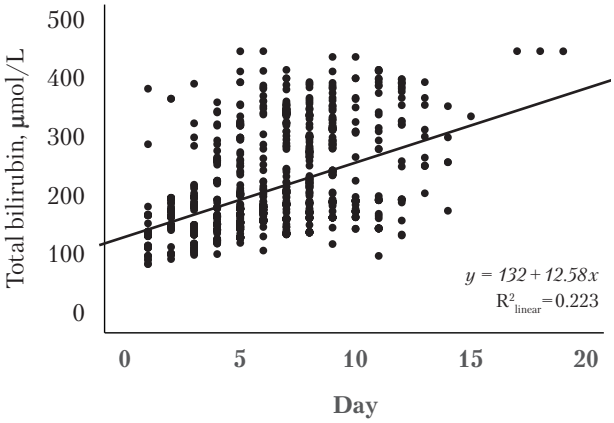

Figure 10. **Linear regression analysis of the relationship between a total bilirubin level and illness duration prior to hospitalization**

No statistically significant differences were observed in mean total bilirubin levels among patients hospitalized in different months (all $p > 0.05$) (Fig. 9).

The most common cause of mechanical jaundice was intraluminal obstruction, accounting for 73.6 % of cases, primarily due to choledocholithiasis or other manifestations of cholelithiasis. Stenosis of the major duodenal papilla was responsible for 7.1 % of cases.

External compression of the biliary tract was observed in 17.9 % of patients, most frequently caused by indurative pancreatitis (7.7 %), acute pancreatitis (6.7 %), or Mirizzi syndrome (2.9 %).

Parietal causes of biliary obstruction were rare, with strictures following surgical interventions identified in only 1.1 % of cases (Table 2).

A statistically significant positive correlation was observed between a total bilirubin level and illness duration prior to hospitalization ($r = 0.482$; $p < 0.001$), with 22.9 % of the variance in bilirubin levels accounted for by this factor ($R^2 = 0.229$) (Fig. 10).

Discussion

Mechanical jaundice of benign origin is a common condition encountered in gastroenterological and surgical practice. However, knowledge regarding its epidemiology, demographic characteristics, pathogenetic mechanisms, and seasonal variations remains incomplete. Most published studies analyze both benign and malignant causes of jaundice [1, 2,

Table 2. **Etiological structure of biliary outflow obstruction causes in patients with benign mechanical jaundice (n = 1187)**

Cause of biliary obstruction	Number of patients
Intraluminal	
Gallstone disease, choledocholithiasis	874 (73.6 %)
Stenosis of the major duodenal papilla	84 (7.1 %)
Parietal	
Post-op strictures	13 (1.1 %)
External	
Indurative pancreatitis	91 (7.7 %)
Pseudotumorous pancreatitis (IgG4-related)	4 (0.3 %)
Acute pancreatitis	80 (6.7 %)
Duodenal diverticulum (peripapillary)	7 (0.6 %)
Mirizzi syndrome	34 (2.9 %)

4, 25, 30], complicating the understanding of the specific features and clinical course of benign cases.

Our study includes a large cohort of patients with mechanical jaundice (n = 1,187) of a clearly defined benign etiology. The mean age of patients at our center was 64.7 ± 14.3 years, which is higher than reported in other studies (ranging from 40.3 to 56.8 years) [1, 2, 4, 19]. Men were significantly younger than women (62.0 vs. 66.5 years, $p < 0.001$), suggesting potential differences in the natural history of the disease or disparities in healthcare access and screening.

Women predominated among patients with benign mechanical jaundice (57.8 %), consistent with previous reports [1, 2, 4, 22]. This likely reflects the higher prevalence of the condition in middle-aged and elderly women [14, 17].

The clinical presentation was characterized by typical signs of cholestasis: jaundice was present in 100 % of patients, dark urine in 86.8 %, and acholic stools in 79.2 %. A substantial proportion (83.0 %) reported pain in the right hypochondrium of varying intensity, consistent with the findings of Asare et al. [4], who reported severe pain in 92.2 % of cases, and Odongo et al. [19], who found that over 90 % of patients experienced pain. Less frequent but clinically relevant symptoms included neurovegetative disturbances in approximately 21 % of patients and skin rashes in 7 %. These additional symptoms, often underestimated, may aid in early diagnosis and help differentiate mechanical jaundice from other conditions, such as viral hepatitis or pancreatitis without biliary obstruction.

The median time from symptom onset to hospitalization was 5.87 days, with only 4.5 % of patients presenting within the first day. Similar findings were reported by Taylor et al. in the DISCOVER study, where over 60 % of patients with jaundice sought medical care more than three days after symptom onset [25]. These data suggest that patients and healthcare providers may underestimate or fail to recognize symptoms promptly, contributing to delays in diagnosis.

A statistically significant positive correlation was observed between total bilirubin level and duration of illness before hospitalization ($r = 0.482$; $p < 0.001$). Although the coefficient of determination ($R2 = 0.229$) indicates a partial relationship, this finding highlights the critical importance of early diagnosis and timely hospitalization to prevent progression of hyperbilirubinemia and associated complications.

The analysis of the etiological structure confirmed the predominant role of choledocholithiasis, consistent with previous reports [8, 22, 25]. Notably, its prevalence in our cohort was higher (73.6 %) compared to other studies reporting frequencies of 60.3 % [1], 57.8 % [2], and 51 % [22].

Indurative pancreatitis, acute pancreatitis, and Mirizzi syndrome accounted for 7.7 %, 6.7 %, and 2.9 % of cases, respectively, which aligns with proportions reported in other studies (6 %–8 %) [1, 2, 20, 22]. These conditions are often associated with a more severe clinical course, increased risk of infectious complications, and typically require a multidisciplinary management approach. This underscores the importance of stratifying patients not only based on clinical symptoms but also according to the likely etiology of biliary obstruction, to enable timely selection of treatment strategies– whether conservative, endoscopic, or surgical.

It is noteworthy that stenosis of the major duodenal papilla (7.1 %) was identified as a distinct nosological entity in our study. This differentiation is not consistently made in other studies, where similar lesions are often grouped with functional or post-inflammatory stenoses or benign strictures of the distal common bile duct [1]. However, several authors advocate recognizing this pathology as a separate entity with specific indications for endoscopic intervention [7, 10].

The hospitalization trends indicate a gradual increase in benign mechanical jaundice cases from 2014 to 2018, likely reflecting improved diagnostic capabilities, an aging population, and a rising incidence of choledocholithiasis, which affects approximately 10–20 % of the adult population in developed countries [14, 28]. The COVID-19 pandemic and the full-scale war in Ukraine from 2022 to 2024 significantly disrupted this trend, highlighting the impact of systemic external factors on healthcare delivery.

Hospitalization rates exhibited a distinct seasonal pattern, with peaks in January, May, and November, and troughs in December, February, and June ($p < 0.001$). This seasonal variation is likely multifactorial. It has been shown that increased consumption of foods rich in fat, protein, and cholesterol during winter and spring holiday periods contributes to enhanced bile lithogenicity and exacerbation of cholelithiasis [29]. Additionally, reduced physical activity in winter and seasonal fluctuations in hormonal levels and immune function may indirectly influence biliary system tone and predispose to biliary obstruction [16].

The decline in hospitalizations observed in December may reflect socio-behavioral factors, such as patients' reluctance to seek medical care before the holidays. Similarly, the decrease in June hospitalizations corresponds with the start of the vacation

season, leading to a delayed accumulation of symptoms and increased hospital admissions in August and September [3, 11]. These findings suggest a seasonal sensitivity of benign mechanical jaundice, warranting further investigation incorporating dietary habits, behavioral patterns, and climatic influences.

Clinically, understanding this seasonality could aid in optimizing hospital resource allocation during peak periods, refining preventive strategies, and implementing targeted active case-finding during high-risk months.

This study has several limitations. Its single-center design restricts the generalizability of the findings to other regions or countries. The absence of a comparative group with malignant jaundice limits the ability to evaluate the differential diagnostic value of specific symptoms or biomarkers. Partial retrospective data collection may introduce information bias and result in incomplete medical records. Additionally, the lack of consideration of therapeutic approaches –such as the type of surgical intervention or endoscopic techniques – may have influenced the severity and clinical outcomes reported.

Conclusions

Benign mechanical jaundice is most commonly caused by choledocholithiasis. Patients typically present late for hospitalization, which correlates with elevated bilirubin levels. A distinct seasonality in hospital admissions was identified, offering potential opportunities for optimizing healthcare resource planning. This study is the first in Ukraine to comprehensively analyze a large cohort of patients with benign mechanical jaundice, explicitly excluding malignant cases.

Declaration of interests

The authors declare that they have no conflicts of interest.

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Authors contributions

M. V. Maksymenko: conception and design, acquisition, analysis and interpretation of data, statistical analysis, drafting the article, critical revision of the article; Y. M. Susak: conception and design, critical revision of the article; V. M. Dorosh: critical revision of the article; O. M. Lobanova, R. O. Havryliuk: acquisition, analysis and interpretation of data, statistical analysis, drafting the article, critical revision of the article.

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Клініко-епідеміологічні характеристики та етіологічна структура синдрому механічної жовтяниці доброякісного генезу: 11-річне одноцентрове дослідження

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Синдром механічної жовтяниці доброякісного генезу (СМЖДГ) часто трапляється в гастроентерологічній і хірургічній практиці. Попри високу клінічну значущість, у більшості досліджень розглядають змішану етіологію (доброякісну та злоякісну), що ускладнює оцінку особливостей перебігу доброякісних форм. Дані про сезонність, динаміку частоти госпіталізацій і клініко-демографічні характеристики пацієнтів із СМЖДГ недостатньо вивчено.

Мета — провести аналіз етіологічної структури, демографічних характеристик, клінічних виявів, динаміки та сезонності госпіталізацій пацієнтів із СМЖДГ за даними одного центру за 11 років.

Матеріали та методи. Проведено ретроспективно-проспективне одноцентрове дослідження 1187 пацієнтів із СМЖДГ, госпіталізованих у Київську міську клінічну лікарню швидкої медичної допомоги в 2014—2024 рр. Діагноз установлювали на підставі клінічних, лабораторних та інструментальних даних після заперечення злоякісної патології. Для обробки отриманих даних застосовували описову, кореляційну, регресійну та варіаційну статистику.

Результати. Найчастішою причиною СМЖДГ був холедохолітіаз (73,6 %), рідше — індуративний панкреатит (7,7 %), стеноз великого дуоденального сосочка (7,1 %) і синдром Міріззі (2,9 %). Серед пацієнтів переважали жінки (57,8 %). Середній вік пацієнтів — (64,7 ± 14,3) року. Сезонні коливання госпіталізацій були статистично значущими ($p < 0{,}001$): піки відзначено в січні, травні та листопаді. Виявлено статистично значущу кореляцію між рівнем білірубіну та тривалістю СМЖДГ до госпіталізації ($r = 0{,}482$; $p < 0{,}001$). Установлено поступове зростання частоти СМЖДГ з 2014 до 2021 р. ($R^2 = 0{,}47$).

Висновки. Доброякісна механічна жовтяниця найчастіше спричинена холедохолітіазом. Характерна пізня госпіталізація, що корелює з вищим рівнем білірубіну. Установлено чітку сезонність госпіталізацій, що може бути використано для поліпшення планування медичної допомоги. Уперше в Україні узагальнено дані про СМЖДГ у великій когорті із виключенням злоякісних випадків.

Ключові слова: механічна жовтяниця, холедохолітіаз, доброякісна обструкція, сезонність, білірубін, індуративний панкреатит.

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