Original Article

# Public Awareness of Gallbladder Stones and Their Complications Among the Population of Makkah

**Raghad A. Almalki[1], Banan A. Abdulghafur[1], Rayan A. Alharthi[1], Basim M. Alshahrani[2], Hoor M. Alkhalaf[1], Aljuri I. Alhijili[1], Mohammed K. banjar[1], Zeyad O. Alsehemi[3]**

[1]College of Medicine Student, Umm Al-Qura University, Makkah, KSA.
[2]College of Medicine, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, KSA.
[3]Assistant Professor, Department of General Surgery, College of Medicine Umm Al-Qura University, Makkah, KSA.

## ABSTRACT

**Background:** Cholelithiasis, or gallbladder stones, is a significant global health issue, affecting 10-20% of adults. Despite emerging studies indicating increasing prevalence in Saudi Arabia due to lifestyle changes, localized data regarding public awareness in Makkah is limited.

**Objective:** To measure what adults in Makkah understand about gallbladder stones and their complications.

**Methods:** Between March and June 2025, we surveyed 454 adults in Makkah with a self-administered online questionnaire covering causes, symptoms and treatment. Ethical approval was obtained prior to study commencement.

**Results:** Overall, 261 respondents (57.5%) reached the good-awareness threshold, though misconceptions about gallbladder function and treatment were common. Age, sex, nationality and family history were each associated with awareness (all $p \leq 0.008$); education was not. The age relationship was non-linear, peaking at 45–59 years and lowest at 25–44 years.

**Conclusion:** While a majority of the Makkah population recognizes gallbladder stones, detailed understanding remains insufficient, so locally tailored education is warranted, particularly to clarify when gallstones require treatment.

**Keyword:** Cholelithiasis; Gallstones; Public awareness; Health knowledge; Makkah; Saudi Arabia.

## Introduction

Cholelithiasis (Gallbladder stones) are hardened deposits, primarily composed of cholesterol or bilirubin, that are formed within the gallbladder and can obstruct bile flow, leading to gastrointestinal dysfunction [1]. This condition poses a significant global health challenge, with an estimated prevalence of 10-20% among adults [2]. Saudi prevalence estimates remain sparse, but shifts in diet and activity are thought to be raising the local burden [3,4].

For many individuals, cholelithiasis remains asymptomatic; however, in those with risk factors such as female gender, obesity, rapid weight loss, or advanced age, the condition may progress to severe complications [2]. As the disease advances, it can precipitate biliary colic due to obstructed bile ducts and incite cholecystitis, an inflammatory condition of the gallbladder that may arise from both obstruction and subsequent infection. Cholecystitis often

| Access this article online | |
|---|---|
| Quick Response Code: | Website: www.smh-j.com |
| | DOI: 10.54293/smhj.v6i3.208 |

**Address for correspondence:** Raghad Adel Almalki, College of Medicine Student, Umm Al-Qura University, Makkah, Saudi Arabia.
**E-mail:** s441000280@uqu.edu.sa

**Received:** 3 May 2026 **Accepted:** 8 Oct 2026

This is an open access article by SMHJ is licensed under Creative Commons Attribution 4.0 International License.
(https://creativecommons.org/licenses/by/4.0)

Please cite this article as: Almalki RA, Banan Abdulghafur, Rayan Alharthi, Basim Alshahrani, Hoor Alkhalaf, Aljuri Alhijili, Mohammed banjar, Alsehemi ZO. Public Awareness of Gallbladder Stones and Their Complication Among the population of Makkah. SMHJ [Internet]. 2026;6(3):283-292.

© Saudi Medical Horizons Journal

necessitates urgent surgical intervention and can be life-threatening if not managed promptly [5]. Despite several national studies on gallbladder stones, a significant gap exists in localized research for Makkah. Existing investigations from other regions of Saudi Arabia reveal that while a reasonable proportion of the population is aware of gallbladder stones, a detailed understanding of the condition, including clinical manifestations, and management, is limited [5–8]. However, data reflecting the awareness and comprehension of gallbladder stones and their complications among Makkah's unique socio-cultural demographics are notably absent. The present study addressed this gap by quantitatively evaluating public knowledge on the subject. It focused on the level of awareness regarding the causes, symptoms, and treatment options of gallbladder stones, and identified specific deficits in understanding. The results are intended to guide local education efforts and support earlier recognition of gallstone complications.

## Methods

We surveyed the adult public of Makkah, Saudi Arabia, over four months between March and June 2025. Eligible respondents were Makkah residents aged 18 or over who consented to take part, drawn from a range of educational and occupational backgrounds. We excluded minors, anyone with health-professional training, and anyone who had gallbladder disease or surgery, since both confer the knowledge, the survey was designed to measure. At 95% confidence and 5% precision, 385 responses were required for the Makkah adult population; we oversampled by 10–15% against incomplete returns and analyzed 454. Recruitment was by convenience; the questionnaire link circulated on social media and through neighborhood groups across the city. The instrument was self-administered in Arabic through Google Forms. We drafted the items from the published literature, had them reviewed by subject experts for content validity, and piloted them for clarity; pilot responses were not carried into the analysis. It had four parts: demographics (age, sex, nationality, education); knowledge items covering risk factors, symptoms, complications, diagnosis and treatment; information sources; and attitudes toward disease severity and care-seeking. Overall awareness of gallbladder stones was assessed using 13 objective knowledge-based items. Correct answers scored one and all others zero, with "I do not know" counted as incorrect. For questions allowing multiple responses, a correct score was assigned only when all correct options were selected without choosing incorrect options. Attitudinal and perception-based items were not included in the awareness score. The total awareness score was calculated for each participant and converted into a percentage. A threshold of 60% separated good from poor awareness.

***Statistical analysis***

Analysis used SPSS v28 (IBM, Armonk, NY). Categorical data were reported as counts and percentages. Associations with awareness level were tested by $\chi^2$, substituting Fisher's exact test where expected cell counts fell below five. Tests were two-tailed with significance at $p < 0.05$.

Ethical considerations: Taking part was voluntary; consent was captured electronically before the first question, and no identifying details were recorded. Ethical approval was obtained from the Biomedical Research Ethics Committee at Umm Al-Qura University, Makkah, Saudi Arabia (Approval No. HAPO-02-K-012-2025-09-2857). The protocol followed the Declaration of Helsinki, and respondents could stop at any point.

## Results

Participants were predominantly young to middle-aged: 158 (34.8%) were 18–24, 144 (31.7%) were 45–59, 142 (31.3%) were 25–44 and 10 (2.2%) were 60 or over. Most of them were female (260, 57.3%), Saudi (408, 89.9%) and Bachelor's degree-educated (285, 62.8%). A family history of gallstones was reported by 316 (69.6%), most often in a mother (80, 25.3%) or father (62, 19.6%) (Table 1). General knowledge, risk-factor awareness and epidemiological perceptions are presented in (Table 2). Most participants reported being familiar with gallstones (398, 87.7%). Regarding the hereditary nature of gallstones, 181 participants (39.9%) believed that gallstones are hereditary, while 183 (40.3%) disagreed. More than half of the participants knew that gallstones affect women more than men (246, 54.2%); however, 156 participants (34.4%) were unsure. When asked about the primary role of the gallbladder, most participants correctly identified bile storage and concentration (307, 67.6%); however, notable proportions also incorrectly attributed bile production (275, 60.6%), fat droplet breakdown (242, 53.3%), and hormone secretion (201, 44.3%) to the gallbladder. Awareness of diagnosis, treatment, and management are shown in (Table 3). More than half of the participants believed that removal of the gallbladder is necessary once gallstones are discovered (259, 57.0%), while 148 participants (32.6%) correctly indicated that gallbladder removal is not always required. A considerable proportion of participants reported non-

evidence-based approaches, including drinking water or fluids (145, 31.9%), parsley or barley syrup (143, 31.5%), and herbs (77, 17.0%). Regarding the most effective treatment for gallstones, the majority of participants correctly identified surgical intervention as the optimal approach (305, 67.2%). With respect to diagnostic methods, ultrasound was the most frequently identified tool for diagnosing gallstones (270, 59.5%). Overall awareness was good in 261 respondents (57.5%) and poor in 193 (42.5%) (Figure 1). Awareness varied significantly with age ($p = 0.001$), sex ($p = 0.001$), nationality ($p = 0.008$), family history ($p = 0.004$) and prior familiarity with gallstones ($p = 0.001$), but not with education ($p = 0.682$). The age relationship was non-linear, peaking at 45–59 years (98, 68.1%) and lowest at 25–44 years (63, 44.4%). Good awareness was more common among males (133, 68.6%) than females (128, 49.2%), among Saudis (243, 59.6%) than non-Saudis (18, 39.1%), and among those with a family history (196, 62.0%) than without (55, 50.5%) (Table 4).

## Discussion

Gallstone disease is common worldwide, and earlier international surveys have repeatedly found patient knowledge of it to be limited [9]. In this cross-sectional survey of 454 adults in Makkah, overall knowledge (13-item score; ≥60% = good) showed a moderate level of public understanding, with 57.5% classified as having good knowledge. Knowledge level varied by participant characteristics: age, sex, nationality, family history, and self-reported familiarity were significantly associated with knowledge (males and Saudis more frequently met the "good" threshold), while educational level was not. The pattern observed, high "name recognition" but gaps in physiology and management, suggests that information reaching the community may be fragmented: people know gallstones exist, but not when they are clinically important or how decisions are made. This has practical implications because gallstone disease is often asymptomatic, and management depends strongly on whether symptoms or complications are present; routine surgery is not recommended for most asymptomatic cases, whereas symptomatic disease is typically treated definitively with cholecystectomy. Misconceptions such as "every detected stone needs removal" may therefore drive unnecessary anxiety and unrealistic expectations, while reliance on unproven remedies could delay timely evaluation when warning features occur. The association between knowledge and family history/familiarity plausibly reflects "exposure learning": prior patient contact, family discussions, or healthcare interactions can improve practical understanding. In contrast, the lack of association with formal education suggests that health literacy here is not simply a function of schooling; it may depend more on targeted health messaging (primary care counseling, community campaigns, and trusted digital sources) that specifically clarifies (i) what the gallbladder does, (ii) which symptoms warrant assessment, and (iii) why treatment differs for incidental versus symptomatic stones [10]. The demographic gradients (sex, nationality, and certain age bands) may indicate differential access to accurate information, language/cultural barriers, or varying health-seeking behaviors. National and regional surveys have similarly reported high awareness of the term "gallstones" but variable depth of knowledge and associations with demographic factors [5,6,8]. The high familiarity level observed in Makkah parallels a Saudi study reporting that ~88.7% of participants knew about gallstones [7]. The misconception that gallbladder removal is universally required echoes a recurring theme in public surveys: respondents often overestimate the need for surgery or underestimate the role of symptom-based decision making. This contrasts with clinical guidance emphasizing expectant management for most asymptomatic stones and prioritizing surgery when symptoms or complications occur [10]. Between-study differences (including the proportion classified as "good knowledge" and which factors are significant) likely reflect heterogeneity in scoring methods, cut-offs, sampling frames (single-city vs multi-region), and whether questionnaires emphasize physiology, risk factors, or treatment. Notably, some Saudi studies have found education to be associated with knowledge, whereas in our cohort it was not, suggesting that local context and information pathways may outweigh formal attainment in determining understanding [5,6,8]. Collectively, the evidence supports the need for standardized, locally tailored public education that corrects persistent misconceptions and aligns community expectations with guideline-concordant care [10]. The gaps in understanding of gallbladder function, risk factors, and management, despite high general familiarity with gallstones, indicate a need for targeted health education initiatives. Public health campaigns and primary care counseling should focus on clarifying symptom-based decision making, appropriate indications for surgical intervention, and the distinction between asymptomatic and symptomatic

**Table 1:** Socio-demographic characteristics of the study participants, Makkah, Saudi Arabia (N=454).

| Socio-demographics | No | % |
|---|---|---|
| **Age in years** | | |
| 18-24 | 158 | 34.8 |
| 25-44 | 142 | 31.3 |
| 45-59 | 144 | 31.7 |
| 60+ | 10 | 2.2 |
| **Gender** | | |
| Male | 194 | 42.7 |
| Female | 260 | 57.3 |
| **Nationality** | | |
| Saudi | 408 | 89.9 |
| Non-Saudi | 46 | 10.1 |
| **Educational level** | | |
| Less than high school | 12 | 2.6 |
| High school education | 116 | 25.6 |
| Bachelor's degree | 285 | 62.8 |
| Post-graduate degree | 41 | 9.0 |
| **Have any of your family members experienced gallstones?** | | |
| Yes | 316 | 69.6% |
| No | 109 | 24.0% |
| I don’t know | 29 | 6.4% |
| **If yes, mention the relationship** | | |
| Mother | 80 | 25.3 |
| Father | 62 | 19.6 |
| Sister | 52 | 16.5 |
| Spouse | 32 | 10.1 |
| Brother | 17 | 5.4 |
| Children | 16 | 5.1 |
| Other | 16 | 5.1 |

| | | |
|---|---|---|
| Uncle | 14 | 4.4 |
| Grandparents | 9 | 2.8 |
| Me | 9 | 2.8 |
| Aunt | 8 | 2.5 |
| Others | 1 | 0.3 |

**Table 2:** General knowledge, risk factors, and epidemiological awareness about gallstones, Makkah (N=454).

| **Awareness item** | **No.** | **%** |
|---|---|---|
| **Are you familiar with gallstones?** | | |
| Yes | 398 | 87.7 |
| No | 56 | 12.3 |
| **Do you believe that gallstones are a hereditary condition?** | | |
| Yes | 181 | 39.9 |
| No | 183 | 40.3 |
| I don’t know | 90 | 19.8 |
| **Do gallstones have a greater impact on women compared to men?** | | |
| Yes | 246 | 54.2 |
| No | 52 | 11.5 |
| I don’t know | 156 | 34.4 |
| **Are gallstones considered a life-threatening condition?** | | |
| Yes | 297 | 65.4 |
| No | 65 | 14.3 |
| I don’t know | 92 | 20.3 |
| **What is the typical age range for individuals who develop gallstones?** | | |
| < 20 years | 3 | 0.7 |
| 21–40 years | 187 | 41.2 |
| 41–60 years | 252 | 55.5 |
| > 60 years | 12 | 2.6 |

| | | |
|---|---|---|
| **Do you believe that regular physical activity and a healthy lifestyle can lower the risk of developing gallstones?** | | |
| Yes | 385 | 84.8 |
| No | 42 | 9.3 |
| I don't know | 27 | 5.9 |
| **What is the primary role of the gallbladder?** | | |
| Stores and concentrates bile | 307 | 67.6 |
| Produces bile | 275 | 60.6 |
| Breaks down fat droplets | 242 | 53.3 |
| Secretes digestive hormones | 201 | 44.3 |
| I don't know | 43 | 9.5 |
| **Which foods worsen the symptoms of gallstones?** | | |
| High-fat/high-sugar foods | 381 | 83.9 |
| Meat | 197 | 43.4 |
| Chocolate | 216 | 47.6 |
| Whole grains | 18 | 4.0 |
| Fish | 13 | 2.9 |
| Coffee | 48 | 10.6 |
| Legumes | 35 | 7.7 |

**Table 3:** Awareness of diagnosis, treatment options, and management of gallstones, Makkah (N=454).

| **Awareness item** | **No.** | **%** |
|---|---|---|
| **Is it necessary to remove the gallbladder when gallstones are discovered?** | | |
| Yes | 259 | 57 |
| No | 148 | 32.6 |
| I don't know | 47 | 10.4 |
| **Are there any therapeutic methods available that help to remove gallstones?** | | |
| Yes | 378 | 83.3 |
| No | 21 | 4.6 |
| I don't know | 55 | 12.1 |

| | | |
|---|---|---|
| **If yes, which of the following are treatment methods for gallstones?** | | |
| Endoscopic removal | 319 | 70.3 |
| Medications | 183 | 40.3 |
| Laser fragmentation/lithotripsy | 262 | 57.7 |
| Surgical intervention | 242 | 53.3 |
| Parsley/barley syrup | 143 | 31.5 |
| Drinking water/fluids | 145 | 31.9 |
| Herbs | 77 | 17 |
| I don't know | 20 | 4.4 |
| **Which treatment is most effective for gallstones?** | | |
| Surgical intervention | 305 | 67.2 |
| Medications | 52 | 11.5 |
| I don't know | 97 | 21.4 |
| **Which surgical procedure is typically used to remove gallstones?** | | |
| Laparoscopic removal | 299 | 65.9 |
| Open surgery | 61 | 13.4 |
| Better not to do surgery | 14 | 3.1 |
| I don't know | 80 | 17.6 |
| **How to diagnose gallstones effectively?** | | |
| Ultrasound | 270 | 59.5 |
| Medical history | 183 | 40.3 |
| Clinical examination | 186 | 41 |
| Liver function test | 107 | 23.6 |
| Urinalysis | 87 | 19.2 |
| X-ray | 115 | 25.3 |
| I don't know | 60 | 13.2 |

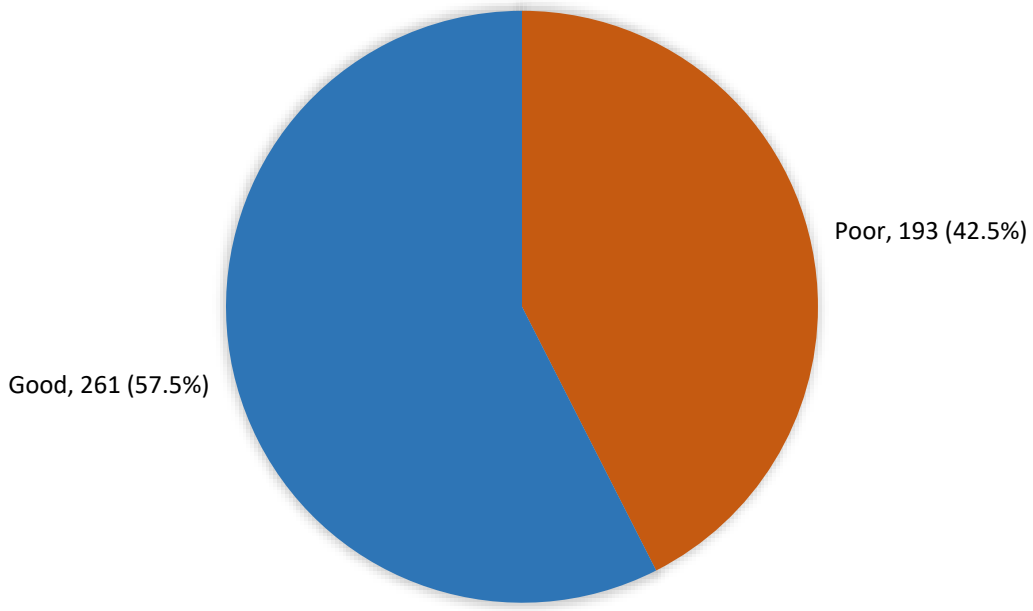



*Figure 1. The overall public awareness of gallbladder stones and their complications among the population of Makkah*

**Table 4:** Factors associated with the overall public awareness of gallstones and their complications, Makkah (N=454).

| Factors | Overall awareness level | | | | p-value |
|---|---|---|---|---|---|
| | Poor | | Good | | |
| | No | % | No | % | |
| **Age in years** | | | | | |
| 18-24 | 64 | 40.5% | 94 | 59.5% | |
| 25-44 | 79 | 55.6% | 63 | 44.4% | 0.001*^ |
| 45-59 | 46 | 31.9% | 98 | 68.1% | |
| 60+ | 4 | 40.0% | 6 | 60.0% | |
| **Gender** | | | | | |
| Male | 61 | 31.4% | 133 | 68.6% | 0.001* |
| Female | 132 | 50.8% | 128 | 49.2% | |

| | | | | | |
|---|---|---|---|---|---|
| **Nationality** | | | | | |
| Saudi | 165 | 40.4% | 243 | 59.6% | 0.008* |
| Non-Saudi | 28 | 60.9% | 18 | 39.1% | |
| **Educational level** | | | | | |
| Less than high school | 6 | 50.0% | 6 | 50.0% | |
| High school education | 54 | 46.6% | 62 | 53.4% | 0.682 |
| Bachelor's degree | 117 | 41.1% | 168 | 58.9% | |
| Post-graduate degree | 16 | 39.0% | 25 | 61.0% | |
| **Have any of your family members experienced gallstones?** | | | | | |
| Yes | 120 | 38.0% | 196 | 62.0% | 0.004* |
| No | 54 | 49.5% | 55 | 50.5% | |
| I don't know | 19 | 65.5% | 10 | 34.5% | |
| **Are you familiar with gallstones?** | | | | | |
| Yes | 145 | 36.4% | 253 | 63.6% | 0.001* |
| No | 48 | 85.7% | 8 | 14.3% | |

*P: Pearson $X^2$ test, ^: Exact probability test, * P < 0.05 (significant).*

.

gallstone disease. Addressing these misconceptions may reduce unnecessary anxiety, unrealistic expectations regarding surgery, and delays in seeking medical care. Tailored educational interventions that consider demographic differences, including age, sex, and nationality, may further enhance health literacy and promote timely and appropriate healthcare utilization. Several caveats apply. A single-timepoint design cannot establish direction of effect, and self-report invites both recall error and socially desirable answering. Results come from one city and may not transfer elsewhere in the Kingdom. Recruitment through social media also produced a sample skewed toward degree-holders, so the awareness estimate is likely optimistic relative to the general population. Furthermore, the assessment focused on general knowledge rather than the depth of understanding or actual health seeking behavior. Future studies employing multicenter designs, validated assessment tools, and longitudinal approaches are recommended to provide a more comprehensive evaluation of public awareness and its impact on clinical outcomes.

## Conclusion

Gallstones are widely recognized among the public in Makkah, but understanding remains incomplete. Misconceptions were common regarding gallbladder function, risk factors, and treatment, particularly the belief that all gallstones require surgical removal, when management in fact depends on the presence of symptoms. Awareness was associated with demographic and experiential factors rather than formal education. Targeted health education should clarify which symptoms warrant assessment and when surgery is indicated. Multi-center studies should test whether these gaps persist elsewhere.

## Conflict of Interest

None

## Funding

None

## References

1. Jones MW, Weir CB, Marietta M. Gallstones (Cholelithiasis) [Updated 2026 Jun 19]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls. 2026; 1: 29083691. Available from: https://www.ncbi.nlm.nih.gov/books/NBK459370/

2. Hjaltadóttir K, Haraldsdóttir KH, Möller PH. Gallstones – Review. Laeknabladid. 2020; 106(10):464–72. doi:10.17992/lbl.2020.10.602

3. Alishi YA, Howaish FA, Alhamdan FA. Prevalence and Risk Factors for Gallstones among Population in Riyadh City, KSA 2017. Egypt J Hosp Med. 2017; 69(5):2384–8. doi:10.12816/0041681

4. National Organization for Rare Disorders. Acute cholecystitis [Internet]. Quincy (MA): NORD. Available from: https://rarediseases.org/rare-diseases/cholecystitis/ [Accessed 23th Jul 2019].

5. Alasmari M, Alshaiban S, Mobarki A, Jahlan R, Rajab B, Alshahrani N, et al. Assessing public knowledge and awareness of gallbladder stones and associated complications in Southern Saudi Arabia: a cross-sectional study. International Journal of Medicine in Developing Countries. 2024; 8(11): 3033–42. doi:10.24911/IJMDC.51-1730647442

6. Almetrek M, Alsharabi A, Al jarfan M, Alganmi A, Alotaibi S, Almalki F, et al. Knowledge and awareness about gallbladder stones and their complications among the general population in Saudi Arabia. Med Sci. 2022; 26(130):01–11. doi:10.54905/disssi/v26i130/ms567e2663

7. Mirghani HO, Aljuhani KF, Albuhairy AH, Alghaith MM, Alzoriri AD, Saleh KA, et al. Gallbladder stones and their contributing factors in Saudi Arabian population: Knowledge and awareness assessment. Med Sci. 2022; 26(119):1. doi:10.54905/disssi/v26i119/ms9e2026

8. Alkhathami A, Mohammad S, Althunayan M, Okal Q, Alshutily A, Alrshood A, et al. General public awareness toward gallbladder stones in Saudi Arabia. International Journal of Medicine in Developing Countries. 2021;280–6. doi:10.24911/IJMDC.51-1607279510

9. Saadallah Al-Amedy O, Ahmed Saido G, Riadh Hussein M. Assessment of the women's knowledge regarding cholelithiasis diseases in Duhok City. Mosul Journal of Nursing. 2020; 8(1):42–59. doi:10.33899/mjn.2020.164623

10. EASL. Clinical Practice Guidelines on the prevention, diagnosis and treatment of gallstones. J Hepatol. 2016; 65(1):146–81. doi:10.1016/j.jhep.2016.03.005