Introduction
Parenteral nutrition-associated liver disease (PNALD) is a much-discussed topic among clinicians who care for patients receiving home parenteral nutrition (HPN). It is seen as a devastating consequence of HPN use that may lead to the need for small bowel transplantation.

Due to the number of other conditions that long-term PN patients may also have that are associated with liver dysfunction, experts have suggested that the effects of PN alone are not the cause of liver disease. In fact, some clinicians now refer to PNALD as intestinal failure-associated liver disease (IFALD). Beath and Woodward have defined IFALD as a persistent (>2 weeks) elevation of liver function tests 1.5 times above the normal reference range.*

To help determine some of the current clinical understanding of PNALD, we conducted a survey of a group of 12 physicians who work specifically with patients who require HPN.

Methods
An online survey was completed by 12 recognized medical experts to determine if a consensus of opinion on practice could be achieved. Each survey participant had over 10 years of experience in the care of HPN patients; participants included clinicians who manage either adult or pediatric patients. The survey consisted of 10 focused questions regarding PNALD. Five potential answers were provided for each question (including “I do not know”). In addition, in case none of the answer options were deemed correct, a response option titled “Other” was provided, with space to elaborate.

Results
1. What is the approximate incidence of PN-induced liver disease?
   - 1:100,000
   - 1:1,000
   - Unknown
   - Other (please specify)

2. What is the most common cause of PN-induced liver disease?
   - Albumin and protime
   - Serum bilirubin
   - Other vitamin or nutrient deficiency
   - Unknown

3. What is the most important test to make the diagnosis of PN-induced liver disease?
   - Biopsy of the liver
   - Imaging the liver
   - History of parental feeding and hospital course
   - Lab workup

4. What is the most effective treatment of PN-induced liver disease?
   - Reduce total daily PN calories
   - Reduce PN lipid dose
   - Alternative lipid source (e.g., Omegaven)
   - Liver or liver/bowel transplant

5. What is the most common risk factor for the development of PN-induced liver disease?
   - Pre-existing liver disease
   - Other (please specify): Nutritional, metabolic, genetic factors (e.g., bile acid malabsorption, high fat diet)

6. True or False: PN-induced liver disease is more common in children than adults.
   - TRUE
   - FALSE
   - Unknown

7. What is the most sensitive laboratory marker of PN-induced liver disease?
   - Serum bilirubin
   - Serum copper
   - Serum iron
   - Hepatitis B and C status determination

8. True or False: Patients who are able to take oral nutrition or tube feeding and are partially or completely able to absorb nutrients do not develop PN-induced liver disease.
   - TRUE
   - FALSE

9. True or False: Patients receiving PN less than daily (e.g., 5 days a week) are less likely to develop PN-induced liver disease than those patients receiving PN daily.
   - TRUE
   - FALSE

10. True or False: A reliable, predictive tool can be developed, based on today’s knowledge, of which patient is at major risk for developing PN-induced liver disease.
    - TRUE
    - FALSE

Conclusions
This survey indicates that there is tremendous variability in knowledge of the incidence, etiology, diagnosis, and treatment of PNALD, even among expert clinicians. An evidence-based review of the topic should be completed and areas of future research identified. This would help clinicians to have a more uniform understanding of PNALD, and would enable the development of evidence-based guidelines for treatment.

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