**L6** **16/4/2019**

**Intestinal failure (‘short bowel syndrome’)**

Intestinal failure (IF) is defined as a:-

***reduction in the function of the gut below the minimum necessary for the absorption of macronutrients and/or water and electrolytes such that intravenous supplementation is required to support health and/or growth.***

The term can be used only when there is both:

• a major reduction in absorptive capacity and

• an absolute need for intravenous fluid support.

IF can be further classified according to its onset, metabolic consequences and expected outcome.

• **Type 1 IF**: an acute-onset, usually self-limiting condition with few long-term sequelae. It is most often seen following **abdominal surgery** or in the context of **critical illness**. Intravenous support may be required for a few **days to weeks.**

**• Type 2 IF:** far less common. The onset is also usually acute, following some intra-abdominal catastrophic event (ischaemia, volvulus, trauma or perioperative complication). Septic and metabolic problems are seen, along with complex nutritional issues. It requires multidisciplinary input (nursing, dietetic, medical, biochemical, surgical, radiological and microbiological) and support may be necessary for **weeks to months.**

**Type 3 IF:** a chronic condition in which patients are metabolically stable but intravenous support is required **over months to years**.

**It may or may not be reversible**

**Magement**

IF is a complex clinical problem with profound and wide-ranging physiological and psychological effects, which is best cared for by a dedicated multidisciplinary team. The majority of IF results from:-

* short bowel syndrome
* with chronic intestinal dysmotility and chronic intestinal pseudo-obstruction accounting for most of the remainder.

***The severity of the physiological upset correlates well with how much functioning intestine remains (rather than how much has been removed).***

**Causes of short bowel syndrome in adults**

• Mesenteric ischaemia

• Post-operative complications

• Crohn’s disease

• Trauma

• Neoplasia

• Radiation enteritis

**The aims of treatment are to:**

• Provide nutrition, water and electrolytes to maintain health with normal body weight (and allow normal growth in affected children)

• Utilise the enteral or oral routes as much as possible

• Minimise the burden of complications of the underlying disease, as well as the IF and its treatment

• Allow a good quality of life.

If the ileum and especially the ileum and colon remain intact, long-term nutritional support can usually be avoided.

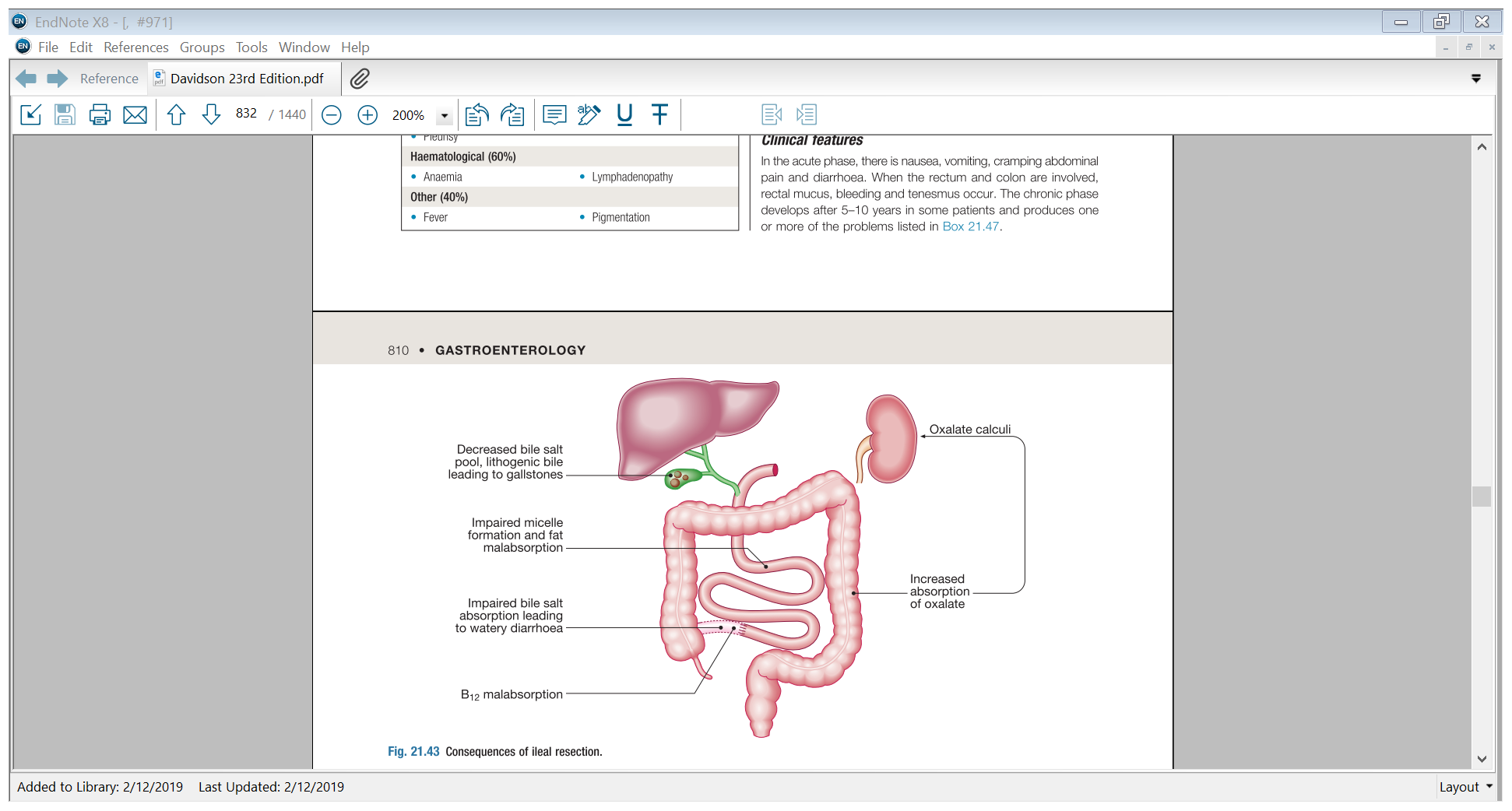
Unlike the jejunum, the ileum can adapt to increase absorption of water and electrolytes over time. The presence of the colon (part or wholly intact) further improves fluid absorption and can generate energy through production of short-chain fatty acids. *It is therefore useful to classify patients with a short gut according to whether or not they have any residual colon.*

**Jejunum–colon patients**

Those with an anastomosis between jejunum and residual colon (jejunum–colon patients) may look well in the days or initial weeks following the acute insult but develop protein-energy malnutrition and significant weight loss, becoming seriously under-nourished over weeks to months. Stool volume is determined by oral intake, with higher intakes causing more **diarrhoea** and the potential for dehydration, sodium and magnesium depletion and acute renal failure. ***The absence of the ileum leads to deficiencies of vitamin B12 and fat-soluble vitamins.***

The absorption of various **drugs**, including thyroxine, digoxin and warfarin, can be reduced.

Approximately 45% of patients will develop **gallstones** due to disruption of the enterohepatic circulation of bile acids, and 25% may develop calcium oxalate **renal stones** due to increased colonic absorption of oxalate.



**Jejunostomy patients**

Patients left with a stoma (usually a jejunostomy) behave very differently, although stool volumes are again determined by oral intake. The jejunum is intrinsically highly permeable, and in the absence of the ileum and its net absorptive role, high losses of fluid, sodium and magnesium dominate the clinical picture from the outset. *Dehydration, hyponatraemia, hypomagnesaemia and acute renal failure are the most immediate problems but protein-energy malnutrition will also develop.*

The jejunum has no real potential for adaptation in terms of absorption, so it is essential to recognise and address the issues of dehydration and electrolyte disturbance early and not expect the problems to improve with time.

**Management of short bowel patients (and ‘high-output’ stoma)**

**1. Accurate charting of fluid intake and losses**

• Vital: oral intake determines stool volume and should be restricted rather than encouraged

**2. Dehydration and hyponatraemia**

• Must first be corrected intravenously to restore circulating volume and reduce thirst

• Stool volume should be minimised and any ongoing fluid imbalance between oral intake and stool losses replenished intravenously

**3. Measures to reduce stool volume losses**

• Restrict oral fluid intake to ≤ 500 mL/24 hrs

• Give a further 1000 mL oral fluid as oral rehydration solution containing 90–120 mmol Na/L (St Mark’s solution or Glucodrate, Nestlé)

• Slow intestinal transit (to maximise opportunities for absorption): Loperamide, codeine phosphate

• Reduce volume of intestinal secretions: Gastric acid: omeprazole 20 mg/day orally Other secretions: octreotide 50–100 μg 3 times daily by subcutaneous injection

**4. Measures to increase absorption**

• Teduglutide (a recombinant glucagon-like peptide 2) significantly reduces requirements for intravenous fluid and nutritional support.

**Small bowel and multivisceral transplantation**

Long-term intravenous nutritional support remains the mainstay of therapy for chronic IF but has its own morbidity and mortality. The 10-year survival for patients on long-term home parenteral nutrition is approximately 90%.

The majority of deaths are due to the underlying disease process but 5–11% will die from direct complications of parenteral nutrition itself (especially catheterrelated sepsis).

**Potential indications for small bowel transplantation**

Complications of central venous catheters

• Central venous thrombosis leading to loss of two or more intravenous access points

• Severe or recurrent line sepsis

• Recurrent severe acute kidney injury related to dehydration

Metabolic complications of parenteral nutrition

• Parenteral nutrition-related liver fibrosis, cirrhosis and liver failure

**Energy balance in old age**

• Body composition: muscle mass is decreased and percentage of body fat increased.

• Energy expenditure: with the fall in lean body mass, basal metabolic rate is decreased and energy requirements are reduced.

• Weight loss: after weight gain throughout adult life, weight often falls beyond the age of 80 years. This may reflect decreased appetite, loss of smell and taste, and decreased interest in and financial resources for food preparation, especially after loss of a partner.

***Ethical and legal considerations in the management of artificial nutritional support***

• Care of the sick involves the duty of providing adequate fluid and nutrients

• Food and fluid should not be withheld from a patient who expresses a desire to eat and drink, unless there is a medical contraindication (e.g. risk of aspiration)

• A treatment plan should include consideration of nutritional issues and should be agreed by all members of the health-care team

• In the situation of palliative care, tube feeding should be instituted only if it is needed to relieve symptoms

• Tube feeding is usually regarded in law as a medical treatment. Like other treatments, the need for such support should be reviewed on a regular basis and changes made in the light of clinical circumstances

***A competent adult patient must give consent for any invasive procedures, including passage of a nasogastric tube or insertion of a central venous cannula***

• If a patient is unable to give consent, the health-care team should act in that person’s best interests, taking into account any wishes previously expressed by the patient and the views of family

• Under certain specified circumstances (e.g. anorexia nervosa), it is appropriate to provide artificial nutritional support to the unwilling patient

BMI: less reliable in old age as height is lost (due to kyphosis, osteoporotic crush fractures, loss of intervertebral disc spaces).

**Alternative measurements** include arm demispan and knee height, which can be extrapolated to estimate height.

**Artificial nutrition at the end of life**

Such scenarios may present when someone is approaching the end of life, or in the face of weight loss due to advanced respiratory or cardiac failure, malignancy or dementia

In selected cases, a decision **not to intervene** may be appropriate.

*An intervention that merely prolongs life without preserving or adding to its quality is seldom justified, particularly if the intervention is not without risk itself.* Such decisions are not taken lightly and careful scrutiny of each case is necessary.

There should be a thoughtful and sensitive discussion explaining what artificial nutrition can and cannot achieve involving the multidisciplinary team looking after the patient as well as next of kin and, in some cases, legal representatives.

**Nutrition and dementia**

Weight loss is seen commonly in people with dementia, and nutritional and eating problems are a significant source of concern for those caring for them. It is appropriate to:

• Screen for malnutrition

• Assess specific eating difficulties (e.g. Edinburgh Feeding Evaluation in Dementia questionnaire)

• Monitor and document body weight

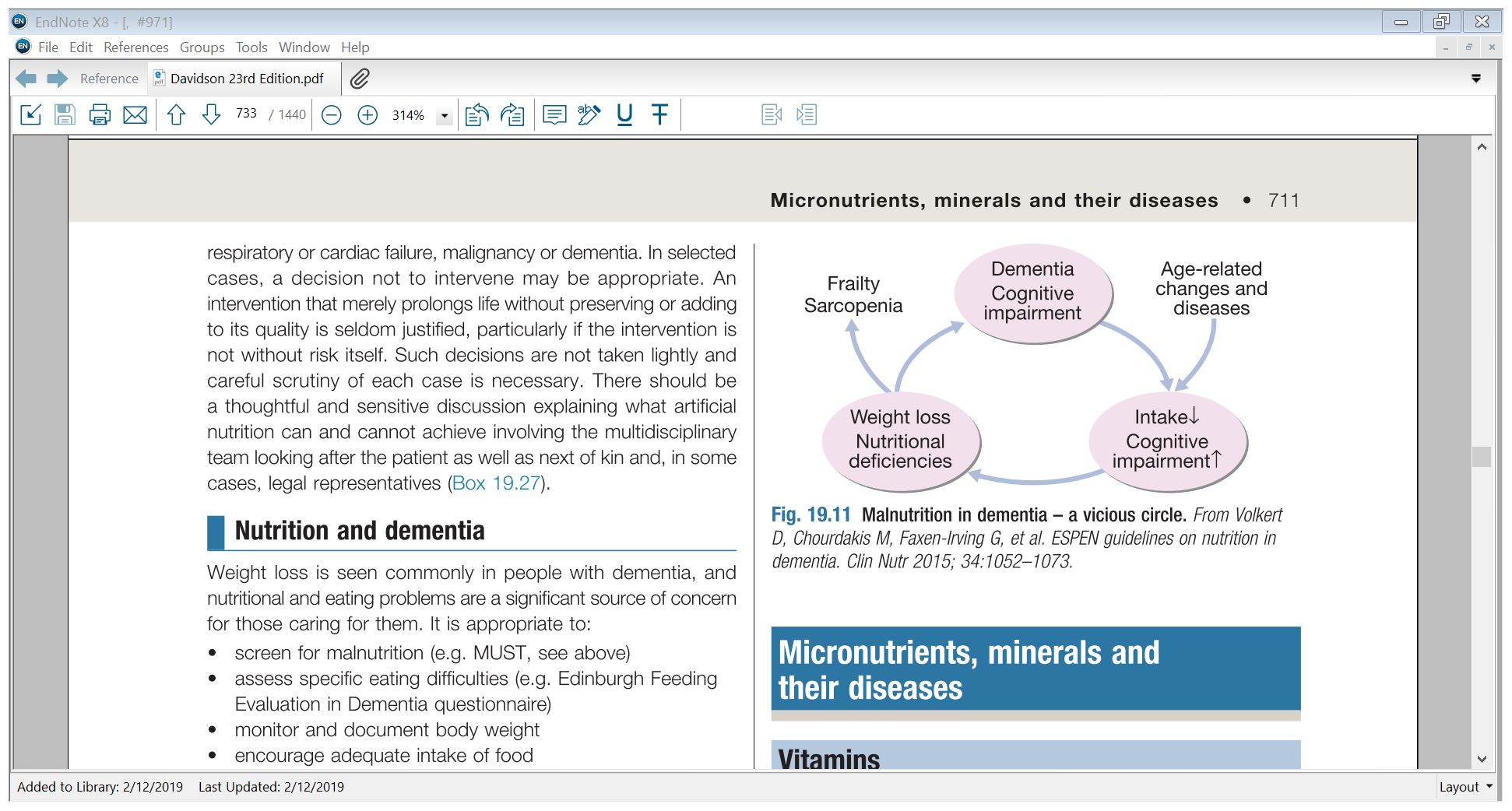
• Encourage adequate intake of food

• Use oral nutritional supplements.

However, the evidence that artificial nutritional support beyond oral supplementation improves overall functioning or prolongs life in dementia is **absent or weak**.

Success is more likely in those with mild to moderate dementia, when a temporary and reversible crisis has been precipitated by some acute event.

It is important to remember that there is strong evidence to ***avoid tube feeding*** in those with advanced dementia because this improves neither the quality nor the duration of life.

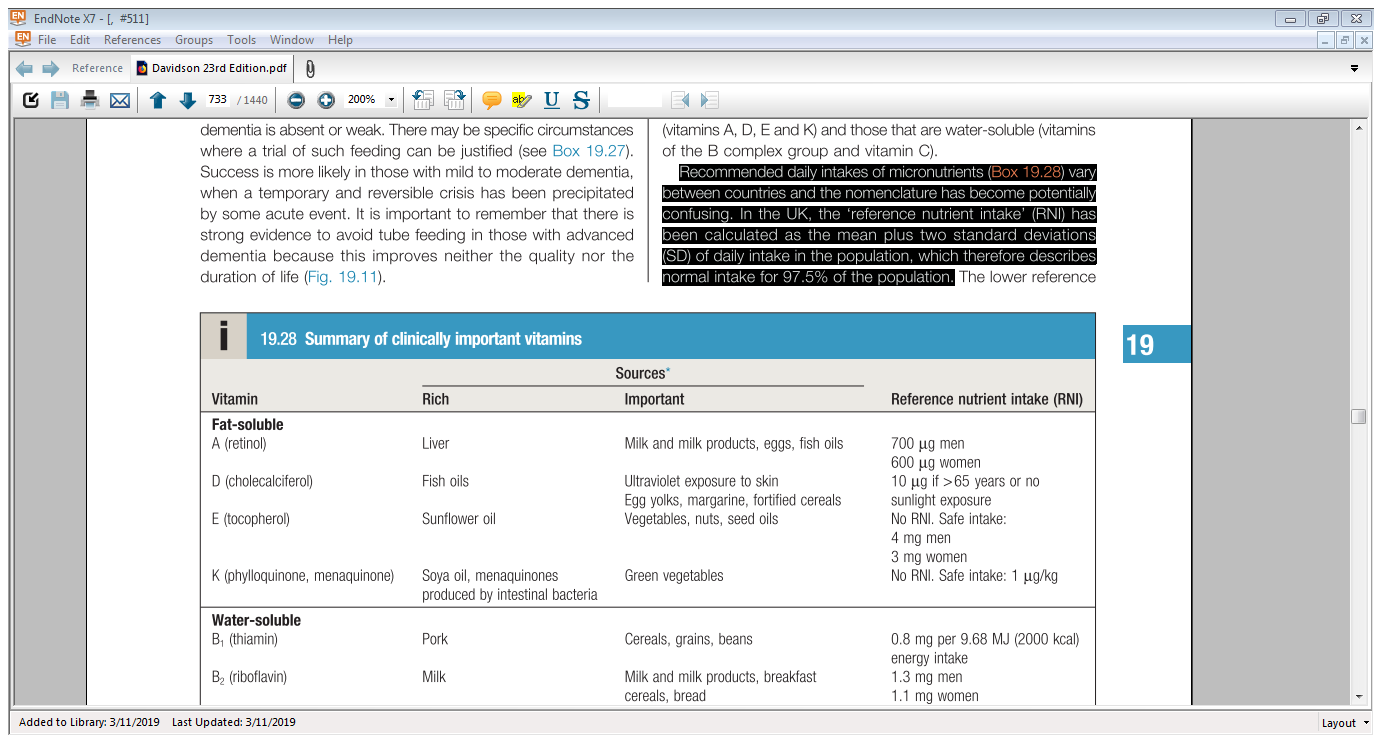


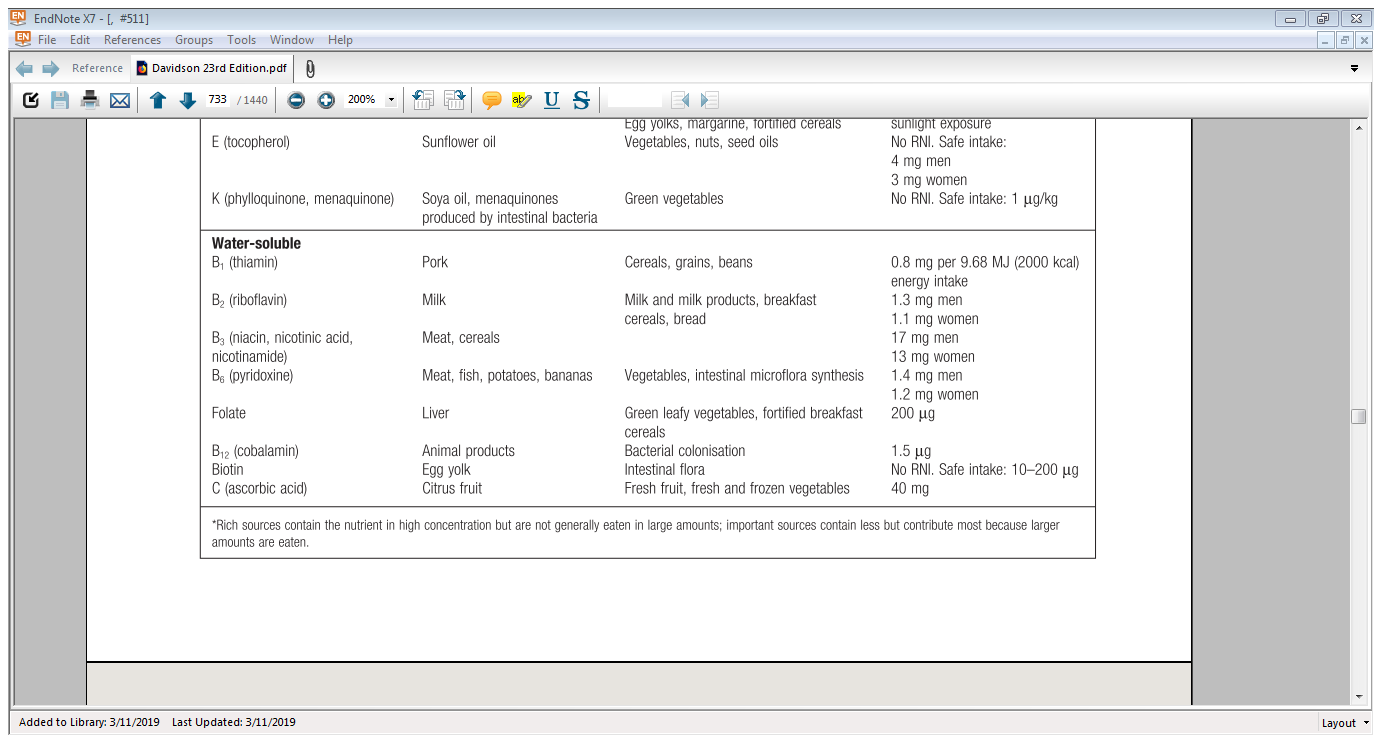
**Micronutrients, minerals and their diseases**

**Vitamins**

Vitamins are organic substances with key roles in certain metabolic pathways, and are categorized into those that are:-

* **Fat-soluble** (vitamins A, D, E and K) and those that are
* **Water-soluble** (vitamins of the B complex group and vitamin C).
* Recommended daily intakes of micronutrients vary between countries and the nomenclature has become potentially confusing.
* In the UK, the ‘reference nutrient intake’ **(RNI)** has been calculated as the mean plus two standard deviations (SD) of daily intake in the population, which therefore describes normal intake for 97.5% of the population.





The lower reference nutrient intake (LRNI) is the mean minus 2 SD, below which would be considered deficient in most of the population.

These dietary reference values (DRV) have superseded the terms RDI (recommended daily intake) and RDA (recommended daily amount). Other countries use different terminology.

Additional amounts of some micronutrients may be required in pregnancyand lactation.

**Nutrition in pregnancy and lactation**

• Energy requirements: increased in both mother and fetus but can be met through reduced maternal energy expenditure.

• Micronutrient requirements: adaptive mechanisms ensure increased uptake of minerals in pregnancy, but extra increments of some are required during lactation.

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**Additional increments of some vitamins are recommended during pregnancy and lactation:**

***Vitamin A:*** for growth and maintenance of the fetus, and to provide some reserve (important in some countries to prevent blindness associated with vitamin A deficiency). ***Teratogenic in excessive amounts***.

***Vitamin D:*** to ensure bone and dental development in the infant. Higher incidences of hypocalcaemia, hypoparathyroidisim and defective dental enamel have been seen in infants of women not taking vitamin D supplements at > 50° latitude.

***Folate:*** taken pre-conceptually and during the first trimester, reduces the incidence of neural tube defects by 70%.

***Vitamin B12:*** in lactation only.

***Thiamin:*** to meet increased fetal energy demands. ***Riboflavin:*** to meet extra demands.

***Niacin:*** in lactation only.

***Vitamin C:*** for the last trimester to maintain maternal stores as fetal demands increase.

***Iodine:*** in countries with high consumption of staple foods (e.g. brassicas, maize, bamboo shoots) that contain **goitrogens** (thiocyanates or perchlorates) that interfere with iodine uptake, *supplements prevent infants being born with cretinism*

Vitamin deficiency diseases are most prevalent in developing countries but still occur in developed countries.

Older people and alcoholics are at risk of deficiencies in B vitamins and in vitamins D and C.

Nutritional deficiencies in pregnancy can affect either the mother or the developing fetus, and extra increments of vitamins are recommended in the UK.

Darker-skinned individuals living at higher latitude, and those who cover up or do not go outside are at increased risk of vitamin D deficiency due to ***inadequate sunlight exposure.***

Dietary supplements are recommended for these ‘at-risk’ groups. Some nutrient deficiencies are induced by diseases or drugs. Deficiencies of fat-soluble vitamins are seen in conditions of fat malabsorption.

**Gastrointestinal disorders that may be associated with malabsorption of fat-soluble vitamins:-**

• Biliary obstruction

• Pancreatic exocrine insufficiency

• Coeliac disease

• Ileal inflammation or resection

**Vitamin deficiency in old age**

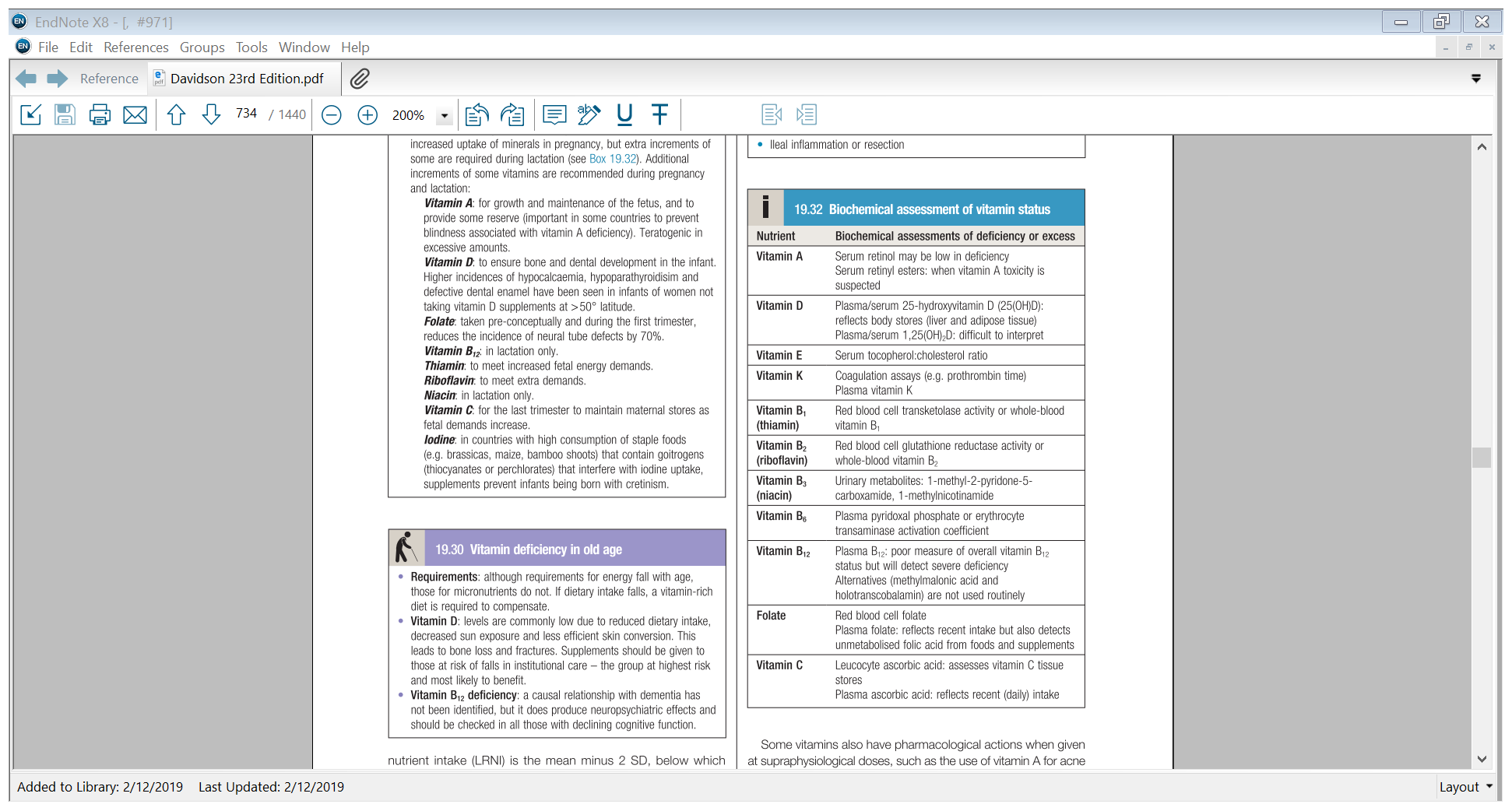
• Requirements: although requirements for energy fall with age, those for ***micronutrients do not***. If dietary intake falls, a vitamin-rich diet is required to compensate.

• Vitamin D: levels are commonly low due to reduced dietary intake, decreased sun exposure and less efficient skin conversion.

This leads to ***bone loss and fractures***.

Supplements should be given to those at risk of falls in institutional care – the group at highest risk and most likely to benefit.

• Vitamin B12 deficiency: a causal relationship with dementia has not been identified, but it does ***produce neuropsychiatric effects and should be checked in all those with declining cognitive function.***



some vitamins also have pharmacological actions when given at supraphysiological doses, such as the use of vitamin A for acne. Taking vitamin supplements is fashionable in many countries, although there is no evidence of benefit. Toxic effects are most serious with high dosages of vitamins **A, B6 and D.**

Investigation of suspected vitamin deficiency or excess may involve biochemical assessment of body stores. *Measurements in blood should be interpreted carefully, however, in conjunction with the clinical presentation.*

**Fat-soluble vitamins**