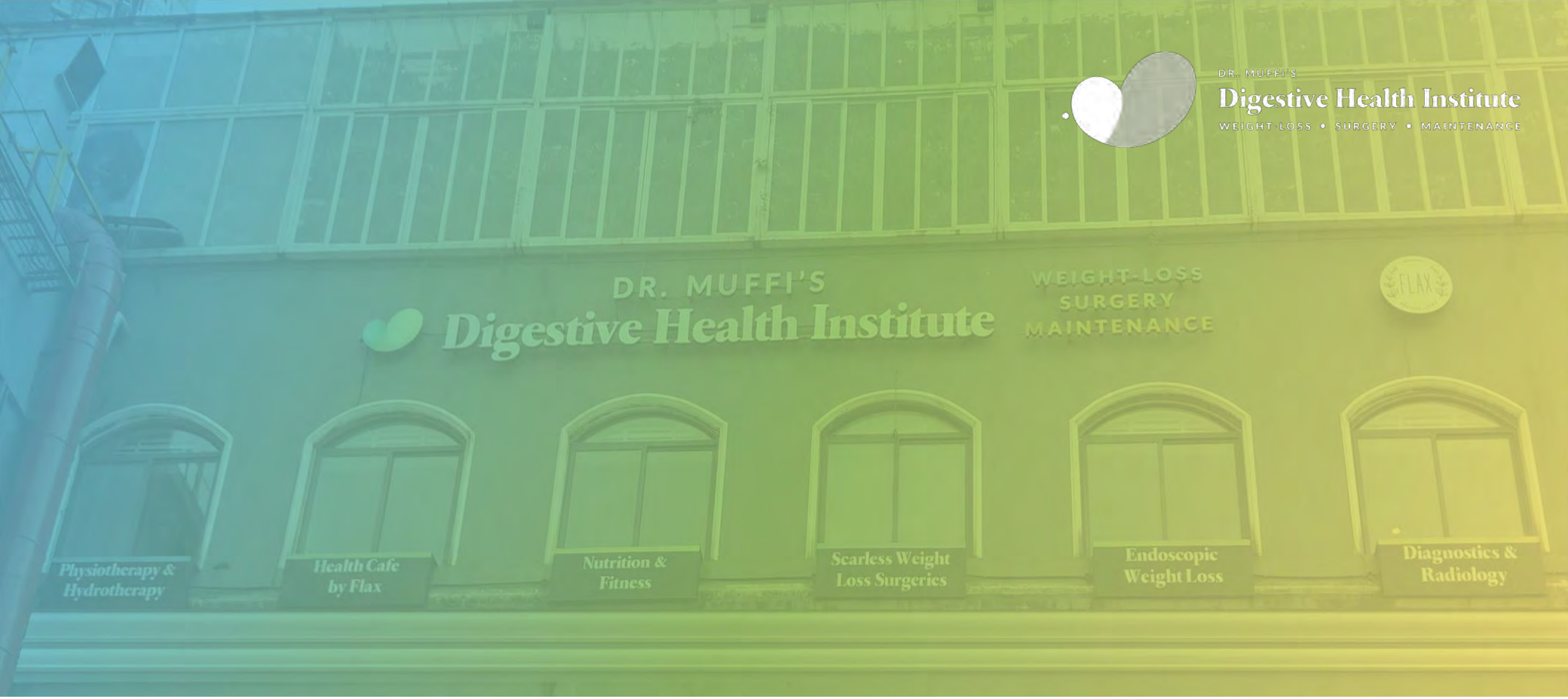

DR. MUFFI'S
Digestive Health Institute
WEIGHT-LOSS • SURGERY • MAINTENANCE

Importance of Bariatric Nutrition and Current Worldwide Guidelines

Carlyne Remedios

Digestive Health Institute - Mumbai , India

Several guidelines recommend adopting the MDT approach for the care of bariatric surgical patient [1-5]

References:
1.Still CD, Sarwer DB, Blankenship J. The ASMBS Textbook of Bariatric Surgery: Volume 2: Integrated Health. [ebook]. Springer, Sept 2014. [cited 2017 Sept 28]. Available from: https://books.google.co.in/books?id=l7KNBAAAQBAJ&pg=PA185&lpg=PA185&dq=bariatric+surgery+multidisciplinary+team&source=bl&ots=8NGyx5vc32&sig=62kb2aSAOzx5o9MtT8Oyp3hOriY&hl=en&sa=X&ved=0ahUKEwiNruqzr7PWAhVDKZQKHaq5Dtk4ChDoAQhKMAc#v=onepage&q= bariatric%20surgery%20multidisciplinary%20team&f=false
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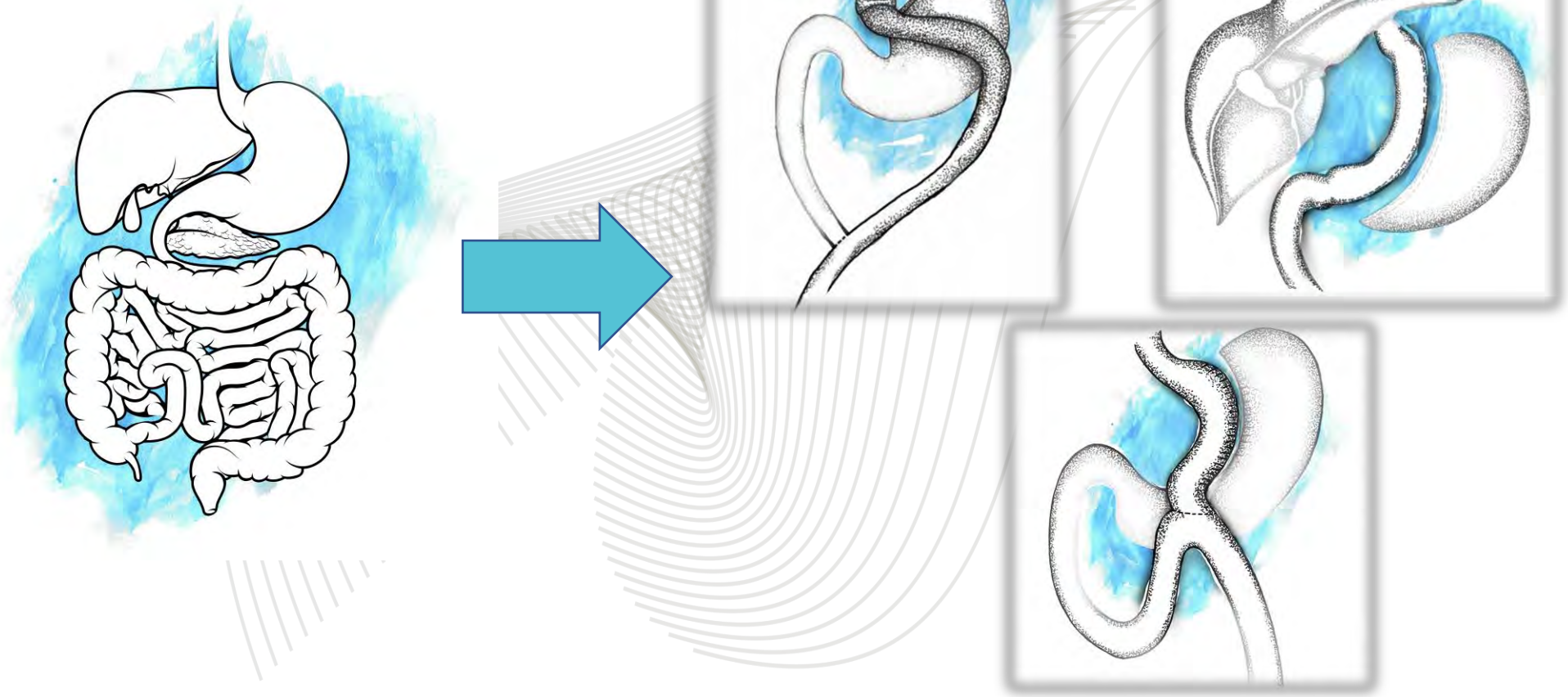
3.Ministry of Health Malaysia. Clinical Practice Guidelines on Management of Obesity. [internet]. 2004. [cited 2017 Sept 28]. Available from: http://www.moh.gov.my/penerbitan/CPG2017/3932.pdf
4.Australian Diabetes Council Bariatric Surgery Position Statement. [internet]. 2012. [cited 2017 Sept 28]. Available from: http://diabetesnsw.com.au/wp-content/uploads/2014/11/Bariatric-Surgery-Position-Statement.pdf
5.Khoo J, Eng S, Foo C. Recommendations for Obesity Management from Singapore. Journal of the ASEAN Federation of Endocrine Societies, 2014; 26(2):110.

Multidisciplinary Team

Types of Bariatric Surgery



- Types of Bariatric Surgery
- Thorough knowledge of your patient
- Knowledge of which procedure will cause what nutrient deficiency
- Medical Emergencies that can be prevented by a nutritionist such as

Wernicke's encephalopathy , Protein – Energy Malnutrition , hypoglycemia and liver failure

Nutritional Considerations

- **Pre-op situations**

- **Acute Post – op situations**

Nausea /Vomiting

Diarrhea / bloating

Constipation

- **Long term post op situations**

Dumping Syndrome & Hypoglycemia

Weight Regain

Nutritional Deficiencies

Pre –Op Diet

- Very low carbohydrate diet (800-1000 Kcals/day)
- Protein approximately 60-75 gms
- Helps reduce Visceral fat + reduce swelling on liver
- Decreases surgical time

Modifications of Pre-op Diet

- **Diabetes – Insulin Dependent**

Prevent hypoglycemia

- **Hyperuricemia**

Avoid purine rich foods

Avoid non – vegetarian sources of protein

Adequate Hydration

- **Liver disease**

Avoid Severe protein restriction

1.0 – 1.5 g/kg/IBW

Adjustments in Sodium and fluid incase of ascites and hyponatremia

- **Renal disease**

High biological value protein

Adjustment K+ incase of imbalance in electrolytes

Fluid Restriction may be required

- **Cardiac Disease**

Fluid and /or Sodium restriction

Acute Situations

SYMPTOM	REASON	WHAT SHOULD I DO?
NAUSEA/ VOMITING	Changes in the gut hormones might initially cause mild nausea or vomiting. These symptoms can also be aggravated if you eat too fast or too much, or leave long gaps between meals.	Eat slowly, and at regular intervals. Chew your food well.
CONSTIPATION	This is mainly caused by two factors – the liquid diet lacks fibre; and when you restart solids, you are eating much less than you used to.	Keep sipping on water and low-calorie fluids through the day. When you restart solids, include salads and fruit to add fibre. You can also take fibre supplements for few months post surgery.
ACIDITY	Post a sleeve gastrectomy, slight acidity is expected which can last for a few weeks.	Again, eat at regular intervals and if you like, you can take a course of antacids for the first few months after surgery.
BLOATING/ EXCESS GAS/ FLATULENCE	Again, this is a consequence of the changes in your digestive system. It can be aggravated if you eat too fast, or use a straw to drink.	Eat very slowly and chew your food thoroughly. Avoid straws. Above all, be patient with the changes your body is going through.

Acute Situations

- Persistent vomiting
- Could lead to Thiamine deficiency
- Supplemented in the absence of lab reports
- Prevent irreversible damage – Wernicke's Encephalopathy
- Stored in small amounts in the body and needs constant replenishment
- Post –op patients given infusion containing dextrose without vitamin

Dumping Syndrome & Hypoglycemia

- Hypoglycemia one of the most damaging long term consequences of bariatric surgery
- Adversely affects patient quality of life
- Dumping – Early and Late dumping
- Majority cases are late dumping (1-3 hours post a meal) causes hypoglycemia type symptoms
- Neuroglycopenia (weakness, fatigue, confusion, hunger, dizziness)
- Autonomic/adrenergic response (sweating, palpitation, irritability)

- **TESTS**
- 3-5 hour OGTT with corresponding insulin levels and / or Continuous glucose monitoring
- Management in conjunction with an experienced endocrinologist

Goals of Nutritional Management

- To treat low blood glucose levels promptly
- Avoid over-treatment and rebound hyperglycemia
- Prevent repeated future episodes of hypoglycemia
- Avoid over treatment of hypoglycemia which can lead to weight gain

Nutritional Intervention

- Patient education to recognize signs and symptoms of hypoglycemia and dumping syndrome
- Small frequent meals
- Complex carbohydrate meals + optimal protein intake
- Use of fibre supplementations
- Avoidance of refined foods , sugary drinks and Alcohol
- Avoidance of drinking fluids immediately post a meal

Cross – Referrals

- Failure to stabilize blood sugar levels with nutritional intervention
- Referral to Endocrinologist
- Prescribe Acarbose
  - alpha-glucosidase inhibitors. It works by slowing the action of certain enzymes that break food down into sugars.

Overnutrition ??

Malnutrition ??

Reasons for Nutritional Deficiencies among the Obese

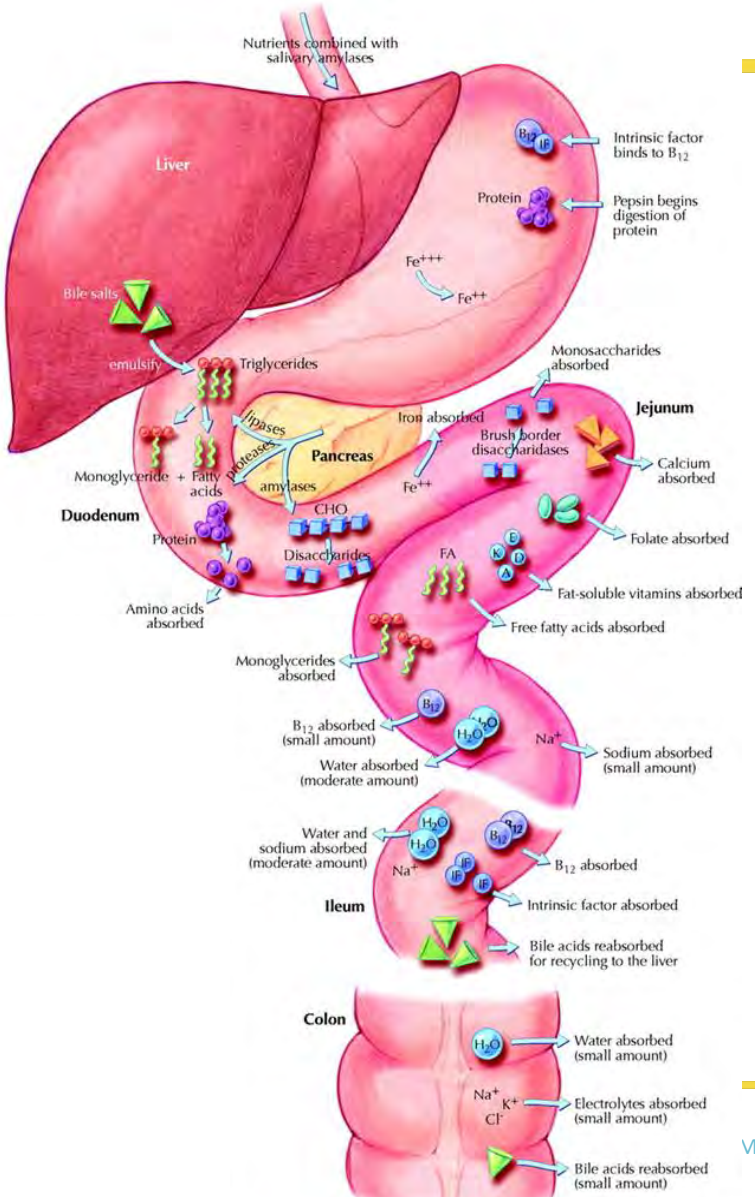
- Poor Food Choices
- Side Effects of Medications
- Sedentary Lifestyles
- Chronic dieting

Most Common Nutritional Deficiencies

- Iron
- Vitamin B12
- Vitamin D3
- Calcium
- Protein

Post Surgery

- Reduced Intake
- Reduced Gastric Acid
- Reduced Intrinsic Factor
- Bypassed stomach ,duodenum and part of the jejunum
- Delayed mixing of pancreatic and gastric juices
- Food aversions and intolerances



Iron

- Reduced gastric acid for conversion to absorbable ferrous state
- Most efficient absorption in the duodenum and proximal jejunum
- Increased gastric emptying and decreased intestinal transit time

Vitamin B12

- Reduced gastric acid to release bound form of Vitamin B12 from food
- Reduced Intrinsic Factor due to resection of stomach
- Bypassing majority of the stomach

Calcium

- Reduced gastric acid production required for calcium absorption
- Bypassing of most active absorption sites – duodenum

Vitamin D3

- Bypassing absorption sites – Jejunum and ileum
- Delayed mixing of bile juices
- Reduced absorption area

Protein

- More pronounced in malabsorptive procedures – SADI-S ,BPD ,DS ,Long limb gastric bypass

- Lack of intake , food aversions , food intolerances

Folic Acid

- Stored in small amounts in the body - requires constant replenishment
- Reduced food intake
- Bypassing of primary absorption sites – Jejunum

Fat soluble nutrients & Trace Nutrients

- Vitamin A , E , K , Zinc & Copper , Selenium , Magnesium

- More pronounced in malabsorptive procedures – SADI-S ,BPD ,DS , Long limb gastric bypass

- Replacement of these vitamins and mineral is critical for the success of the surgery .

- Knowledge of the surgical procedure + knowledge of deficiency symptoms are key attributes that every bariatric nutritionist should posses

Current Worldwide Guidelines

- ASMBS - 2008 / Reviewed - 2017
- IDF statement – 2011
- AACE/TOS/ASMBS Guidelines - 2008 / Reviewed - 2013
- Interdisciplinary European Guidelines on Metabolic and Bariatric Surgery – 2013

  (IFSO-EC) and European Association for the Study of Obesity (EASO)
- BOMSS – UK - 2014
- Bariatric Nutrition Guidelines for the Indian Population – 2016

ASMBS Guidelines

ASMBS Allied Health Nutritional Guidelines for the Surgical Weight Loss Patient

Allied Health Sciences Section Ad Hoc Nutrition Committee:
Linda Aills, R.D. (Chair)[a], Jeanne Blankenship, M.S., R.D.[b], Cynthia Buffington, Ph.D.[c], Margaret Furtado, M.S., R.D.[d], Julie Parrott, M.S., R.D.[e,*]

Table 5
Suggested Postoperative Vitamin Supplementation

Supplement	AGB	RYGB	BPD/DS	Comment
Multivitamin/mineral supplement				
*A high-potency vitamin containing 100% of daily value for at least 2/3 of nutrients Begin with chewable or liquid Progress to whole tablet/capsule as tolerated Avoid time-released supplements Avoid enteric coating Choose a complete formula with at least 18 mg iron, 400 μg folic acid, and containing selenium and zinc in each serving Avoid children's formulas that are incomplete May improve gastrointestinal tolerance when taken close to food intake May separate dosage Do not mix multivitamin containing iron with calcium supplement, take at least 2 hr apart Individual brands should be reviewed for absorption rate and bioavailability Specialized bariatric formulations are available	100% of daily value*	200% of daily value*	200% of daily value*	Begin on day 1 after hospital discharge
Additional cobalamin (B_{12}) Available forms include sublingual tablets, liquid drops, mouth spray, or nasal gel/spray				
Intramuscular injection	—	1000 μg/mo	—	Begin 0–3 mo after surgery
Oral tablet (crystalline form)	—	350–500 μg/d	—	
Supplementation after AGB and BPD/DS may be required				
Additional elemental calcium Choose a brand that contains calcium citrate and vitamin D_3 Begin with chewable or liquid Progress to whole tablet/capsule as tolerated Split into 500–600 mg doses; be mindful of serving size on supplement label Space doses evenly throughout day Suggest a brand that contains magnesium, especially for BPD/DS Do not combine calcium with iron containing supplements: To maximize absorption To minimize gastrointestinal intolerance Wait ≥2 h after taking multivitamin or iron supplement Promote intake of dairy beverages and/or foods that are significant sources of dietary calcium in addition to recommended supplements, up to 3 servings daily Combined dietary and supplemental calcium intake >1700 mg/d may be required to prevent bone loss during rapid weight loss	1500 mg/d	1500– 2000 mg/d	1800– 2400 mg/d	May begin on day 1 after hospital discharge or within 1 mo after surgery

ASMBS Allied Health Nutritional Guidelines for the Surgical Weight Loss Patient

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Table 5
Continued

Supplement	AGB	RYGB	BPD/DS	Comment
Fat-soluble vitamins	—	—	10,000 IU of vitamin A	May begin 2–4 weeks after surgery
With all procedures, higher maintenance doses may be required for those with a history of deficiency	—	—	2000 IU of vitamin D	
Water-soluble preparations of fat-soluble vitamins are available	—	—	300 μg of vitamin K	
Retinol sources of vitamin A should be used to calculate dosage				
Most supplements contain a high percentage of beta carotene which does not contribute to vitamin A toxicity				
Intake of 2000 IU Vitamin D_3 may be achieved with careful selection of multivitamin and calcium supplements				
No toxic effect known for vitamin K_1, phytonadione (phyloquinone)				
Vitamin K requirement varies with dietary sources and colonic production				
Caution with vitamin K supplementation for patients receiving coagulation therapy				
Vitamin E deficiency has been suggested but is not prevalent in published studies				
Optional B complex	1 serving/d	1 serving/d	1 serving/d	May begin on day 1 after hospital discharge
B-50 dosage				
Liquid form is available				
Avoid time released tablets				
No known risk of toxicity				
May provide additional prophylaxis against B-vitamin deficiencies, including thiamin, especially for BPD/DS procedures as water-soluble vitamins are absorbed in the proximal jejunum				
Note >1000 mg of supplemental folic acid, provided in combination with multivitamins, could mask B_{12} deficiency				

Bariatric surgery: an IDF statement for obese Type 2 diabetes

J. B. Dixon[a], P. Zimmet[a,*], K. G. Alberti[b], F. Rubino[c], on behalf of the International Diabetes Federation Taskforce on Epidemiology and Prevention

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[b]*Imperial College London, London, United Kingdom*
[c]*Weill Cornell Medical College of Cornell University, New York, New York*

Accepted 5 April 2011

Table 8
A summary of more common nutritional concerns for each procedure

	LAGB	SG	RYGB	BPD	BPD-DS
Iron	+	++	+++	+++	++
Thiamine	+	++	+	+	+
Vitamin B12	+	++	+++	++	++
Folate	++	++	++	++	++
Calcium	+	++	++	+++	+++
Vitamin D	+	+	++	+++	+++
Protein	+	+	+	++	++
Fat-soluble vitamins and essential fatty acids	+	+	+	+++	+++

BPD, bilio-pancreatic diversion; BPD-DS, bilio-pancreatic diversion with duodenal switch; LAGB, laparoscopic adjustable gastric band; RYGB, Roux-en-Y gastric bypass; SG, sleeve gastrectomy.

+, recommended daily intake (allowance) or standard multivitamin preparation likely to be sufficient.

++, significant risk of deficiency or increased requirements. Specific supplementation is appropriate especially in higher-risk groups.

+++, high risk of deficiency. Additional specific supplementation is necessary to prevent deficiency. Careful monitoring is recommended. Supplementation well in excess of daily requirements may be necessary.

AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS, THE OBESITY SOCIETY, AND AMERICAN SOCIETY FOR METABOLIC & BARIATRIC SURGERY MEDICAL GUIDELINES FOR CLINICAL PRACTICE FOR THE PERIOPERATIVE NUTRITIONAL, METABOLIC, AND NONSURGICAL SUPPORT OF THE BARIATRIC SURGERY PATIENT

Table 14
Routine Nutrient Supplementation After Bariatric Surgery[a]

Supplement	Dosage
Multivitamin	1-2 daily
Calcium citrate with vitamin D	1,200-2,000 mg/d + 400-800 U/d
Folic acid	400 μg/d in multivitamin
Elemental iron with vitamin D[b]	40-65 mg/d
Vitamin B_{12}	≥350 μg/d orally or 1,000 μg/mo intramuscularly or 3,000 μg every 6 mo intramuscularly or 500 μg every week intranasally

[a] Patients with preoperative or postoperative biochemical deficiency states are treated beyond these recommendations.
[b] For menstruating women.

OBES SURG (2014) 24:42–55
DOI 10.1007/s11695-013-1079-8

OTHER

Interdisciplinary European Guidelines on Metabolic and Bariatric Surgery

M. Fried · V. Yumuk · J. M. Oppert · N. Scopinaro · A. Torres · R. Weiner · Y. Yashkov · G. Frühbeck · on behalf of International Federation for the Surgery of Obesity and Metabolic Disorders—European Chapter (IFSO-EC) and European Association for the Study of Obesity (EASO)

Minimal Requirements and Recommendations for Follow-up After Operations Limiting Absorption of Nutrients

– BPD

- Checkup after 1 month, followed by minimal follow-up every 3 months after the operation in the 1st postoperative year, every 6 months in the 2nd year, and annually thereafter
- Lab tests are necessary to evaluate the evolution of metabolic and nutritional status and to adapt supplementation and drug treatment accordingly
- Blood tests at 1, 4 and 12 months, thereafter annually, should be done for the following:

– Liver function tests (GPT, γ-GT),
– Complete blood cell count, complete blood electrolytes tests,
– Minimal nutritional parameters should be vitamin B_{12}, 25(OH) vitamin D3, parathormone, bone alkaline phosphatase, ferritin, Ca, pre-albumin, albumin, transferrin, creatinine, prothrombin time (PPT), etc.

- Urine examination
- Lifelong daily vitamin and micronutrient supplementation (vitamins should be administered in a water-soluble form)

– Vitamins A, D, E and K
– Calcium supplementation (preferably in food, Ca citrate, recommended total intake 2 g/day).

- Minimum advised protein intake of approximately 90 g/day
- In addition, supplement of vitamins and micronutrients should compensate for their possible reduced intake and absorption and according to lab values
- In a preventive regimen, the supplementation can be administered orally
- For correction of deficits, the supplementation can be administered parenterally, except for Ca

Table 7 Vitamin and mineral supplements following gastric bypass and sleeve gastrectomy

Vitamin and minerals recommended	
Multivitamin and mineral supplement should include; • iron • selenium • 2 mg copper (minimum) • zinc (ratio of 8-15 mg zinc for each 1 mg copper Preconception and pregnancy	The following meet these requirements (August 2014): • one daily Forceval (soluble and capsule) • "Over The Counter" complete multivitamin and mineral supplement, two daily e.g. Sanatogen A-Z Complete, Superdrug A-Z multivitamins and minerals, Tesco Complete multivitamins and minerals, Lloydspharmacy A-Z multivitamins and minerals Safe to continue with Forceval as vitamin A is in beta carotene form or consider pregnancy multivitamin and mineral e.g. Seven Seas Pregnancy, Pregnacare, Boots Pregnancy Support
Iron 45 to 60 mg daily 100 mg daily for menstruating women	200 mg ferrous sulphate, 210 mg ferrous fumarate or 300 mg ferrous gluconate daily 200 mg ferrous sulphate or 210 mg ferrous fumarate twice daily
Folic acid Contained within multivitamin and mineral supplement Pregnancy and preconception.	Encourage consumption of folate rich foods If deficient, check compliance with multivitamin and mineral supplement. If compliant, check for vitamin B12 deficiency before recommending additional folic acid supplements. Additional folic acid (prescribed or over the counter) if deficient. Recheck folate levels after 4 months. Additional folic acid (5 mg, but see text) preconception and first 12 weeks of pregnancy
Vitamin B12	Intramuscular injections of 1mg vitamin B12 three monthly N.B. sleeve gastrectomy patients may need less frequent injections

Chinese Cuisine

- Rice , Noodles (Wheat) , steamed buns
- Vegetables
- Fish / Meat

Japanese Cuisine

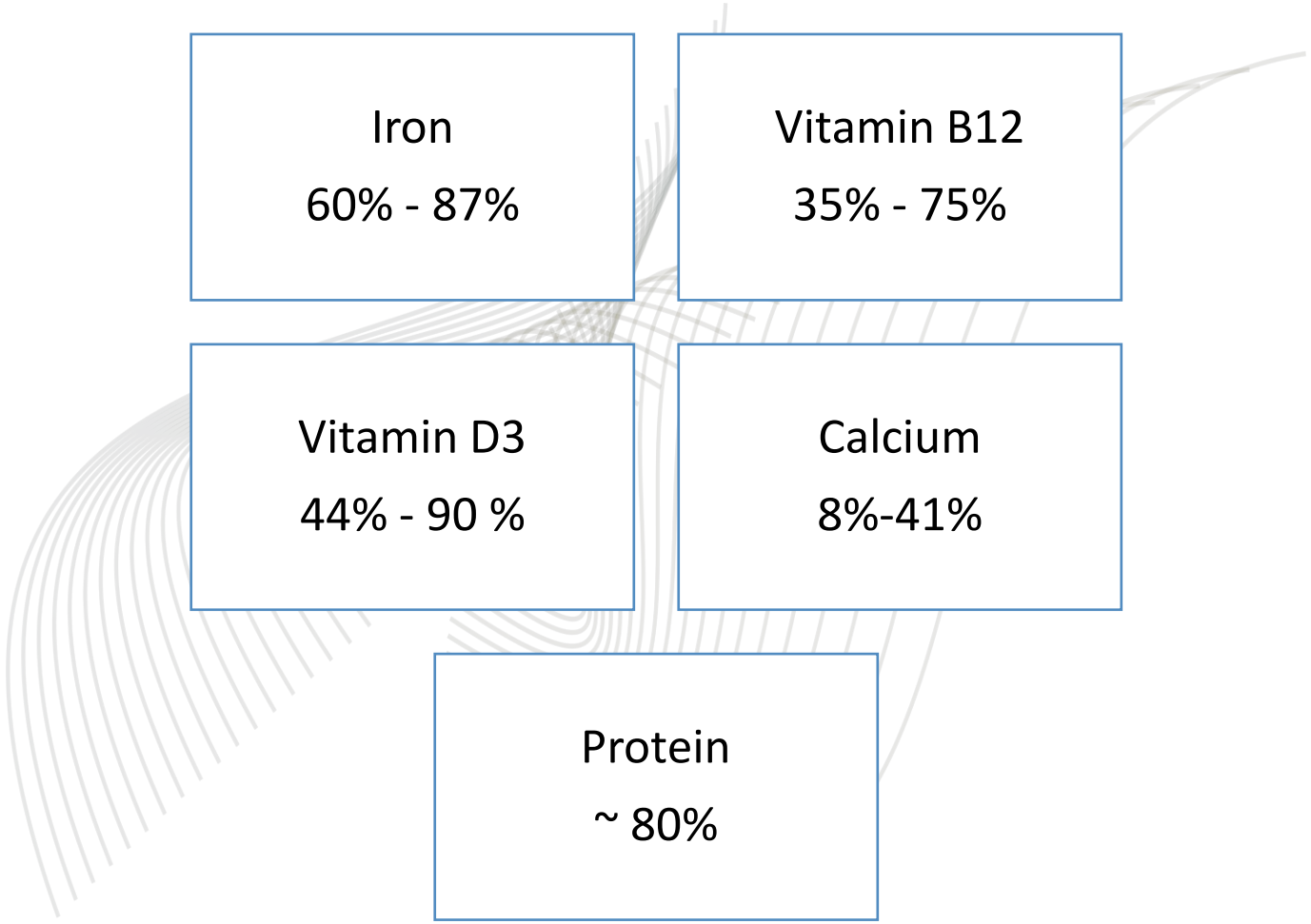
- Rice
- Seaweed
- Soup
- Fish / Seafood
- Vegetables

Indian Cuisine

- Rice , Rotis (Wheat/ Millets)
- Pulses
- Vegetables
- Poultry / Lamb / Fish – Optional

Diversity across the country

% Nutritional Deficiencies among Indians



% Nutritional deficiency among Indian Obese

OBES SURG (2016) 26:1057–1068
DOI 10.1007/s11695-015-1836-y

ORIGINAL CONTRIBUTIONS

Bariatric Nutrition Guidelines for the Indian Population

Carlyne Remedios[1] · Aparna Govil Bhasker[1,2] · Neha Dhulla[1] · Shilpa Dhar[1] · Muffazal Lakdawala[1,2]

Table 1 Percentage of common pre-operative nutritional deficiencies in the morbidity obese population

Iron (μg/dl)	Vitamin B_{12} (pg/ml)	Calcium (mg/dl)	Vitamin D_3 (ng/ml)	PTH (pg/ml)	Protein (gms/dl)	Albumin (gms/dl)
43	56.7	11	35	42.45	10	9.38

Springer

Remedios C, Govil Bhasker A, Dhulla N, Dhar S, Lakdawala M. Bariatric Nutrition Guidelines for the Indian Population.

Causes of Deficiencies

Common Nutritional Deficiencies	Reasons
Iron	***Vegetarianism*** Heam iron VS Non-heam iron (15 – 40 % VS 1-5% absorbability) High intake of phytates & Tannins
Vitamin B12	***Vegetarianism*** Low intake of meats among Non-vegetarians Bio-availability Genetic Influence among Asian Indians
Vitamin D3	***Vegetarian diets*** High intake of fiber rich foods and phytate rich foods Low intake of dietary calcium Genetic pre disposition Clothing – Influenced by religious and social beliefs Sedentary lifestyles ***Skin pigmentation***

Causes of Deficiencies

Common Nutritional Deficiencies	Reasons
Calcium	• High consumption of phytate rich foods retards absorption of calcium in the gut • Low dietary intake in early growing years • Vitamin D3 deficiency
Protein	•***Vegetarianism*** • Incomplete protein – lacking essential amino acids lysine and trypthophan • Cereal and pulse need to be consumed in the right combination to complete the protein

Guidelines

Nutrient	Recommendation
Iron	28–30 mg/day Ferrous fumarate or ferrous glycinate preferably with added ascorbic acid to enhance absorbability
Vitamin B12	500 to 1000 mcg intramuscularly at least every fortnightly Sublingual tablets / drops or nasal administration of 1000– 1200 mcg as a maintenance dose
Vitamin D3	30,000 IU intramuscularly weekly or fortnightly for 6-8 weeks 30,000 / 60,000 IU as a maintenance dose Oral administration
Calcium	1000–1200 mg of calcium citrate
Protein	1-1.5 g/ kg IBW Malabsorptive procedures it should be calculated as 1.5 – 2g/kg IBW

Remedios C, Govil Bhasker A, Dhulla N, Dhar S, Lakdawala M. Bariatric Nutrition Guidelines for the Indian Population.

Guidelines

Nutrient	Recommendation
Folic Acid	Severe deficiency: 400 mcg in addition to daily adult multivitamin Daily adult multivitamin for maintenance
Thiamine	Exclusive B – complex formulation in the immediate post – op phase until one 1 month Severe deficiency or persistent vomiting IM / IV administration
Fat soluble vitamins and Minerals	6 monthly doses of Intramuscular injections or Specific supplementation in presence of deficiency
Trace Elements	Not as commonly seen. But should be screened pre-op and 6 monthly

Remedios C, Govil Bhasker A, Dhulla N, Dhar S, Lakdawala M. Bariatric Nutrition Guidelines for the Indian Population.

Conclusion

- Every bariatric Surgeon needs to have an MDT approach for a successful practice
- Nutritionists are an important prong in MDT
- Bariatric Nutrition is unique and differs from routine nutrition courses
- Need for specialized courses for training younger nutritionists
- Nutritionist can prevent nutritional complications and bridge a gap between the surgical practice and the rest of the MTD (endocrinologist + nephrologist + hepatologist
- Asia having vast cultural diversity should have its own set of guidelines

Thank You

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