

## ORAL NUTRITIONAL SUPPLEMENTS – NUTRITIONALLY REPLETE OR INCOMPLETE?

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### ABSTRACT

**This is a case study of severe hypokalaemia in a 59-year-old lady who was reliant on a fruit-based nutritional supplement to meet the majority of her caloric and protein requirements. Through this case study, we aim to highlight the importance of identifying red flags for patients at risk of dietary complications, understanding the contents of oral nutritional supplements, and working closely with dietitians in a multidisciplinary team to provide holistic patient care.**

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### PATIENT'S REVELATION: WHAT HAPPENED?

Mdm L was a 59-year-old Chinese lady who was admitted to a community hospital for the primary purpose of receiving inpatient rehabilitative therapy for functional decline, following an eventful admission to an acute hospital for serotonin syndrome with multi-organ failure. Pre-morbidly, she was independent in activities of daily living and was ambulating in the community without assistance. She has a significant medical history of previous traumatic brain injury, syncope secondary to paroxysmal atrial fibrillation with post-conversion pause, and depression. She was on chronic medications, including mecobalamin, macrogol, bisacodyl, and a regular fruit-based nutritional supplement. During her prolonged stay in the acute hospital, she was also noted to have derangements in renal function as well as hypokalaemia, which were corrected just prior to transfer to community hospital.

### Inpatient Progress

In the community hospital, Mdm L underwent daily occupational and physical rehabilitation therapy sessions. She made good progress and achieved ambulation with minimal supervision without the need for an ambulatory aid. A dietitian also reviewed her regularly to optimise her nutrition, given her inadequate oral intake and malnourished state.

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However, one day in the third week of admission, Mdm L reported a sudden onset of inability to stand up to participate in therapy due to leg weakness. A full neurological examination conducted found that she had symmetrically reduced power in bilateral lower limbs. Immediate blood tests done revealed severe hypokalaemia with a serum potassium level of 1.7 mmol/l. The rest of her electrolytes and other biochemical tests including full blood count, thyroid function test, and liver function tests were largely unremarkable.

### Treatment and Response

Mdm L was immediately transferred to an acute restructured hospital for telemetry monitoring, further investigations, and management of hypokalaemia. A series of investigations conducted showed no evidence for any significant increased urinary or gastrointestinal losses of potassium. The cause of hypokalaemia was eventually attributed to inadequate intake of potassium-containing food or nutritional supplements. Mdm L received multiple replacement cycles of potassium intravenously until her potassium level normalised and her lower limb weakness resolved thereafter.

### Causes of Hypokalaemia

The causes of hypokalemia can be classified into

1. Abnormal losses
2. Inadequate intake
3. Transcellular shifts
4. Pseudo-hypokalemia

as listed in **Table 1** below.<sup>1</sup>

**Table 1. Causes of hypokalaemia<sup>1</sup>**

1. Abnormal potassium losses	A) Gastrointestinal losses, e.g., - vomiting - diarrhoea  B) Renal losses, e.g., - osmotic diuresis - use of diuretics - drug causes, e.g., amphotericin B - type 1 and type 2 renal tubular acidosis - hyperaldosteronism - intrinsic renal transport defects - hypomagnesemia
2. Inadequate potassium intake	Anorexia Significant cognitive impairment Starvation

<p>3. Transcellular shifts (increased potassium entry into cells)</p>	<p>Medications, e.g., insulin, beta-2 agonists, decongestants Alkalosis Refeeding syndrome Thyrotoxicosis Familial hypokalaemic periodic paralysis Hypothermia</p>
<p>4. Pseudo-hypokalaemia</p>	<p>Delayed sample analysis Significant leukocytosis &gt;75.0x10<sup>9</sup> cells/litre</p>

**Gaining Insight: What are the Issues?**

On retrospective review, the following questions arose:

1. What were the red flags for dietary complications?
2. Was oral nutritional supplementation nutritionally replete for the patient?
3. Could this incident be potentially preventable?

**STUDY THE MANAGEMENT: HOW DO WE APPLY IN OUR CLINICAL PRACTICE?**

**1. Identifying Red Flags for Dietary Complication**

The dietitian’s initial assessment on admission found that Mdm L had a 10 percent weight loss over 1-2 months from 43 kg to 38.6 kg. She had not been eating well at home before admission due to acid reflux and the passing of her husband. During the admission to acute restructured hospital, she had nasogastric (NG) feeds during her ICU stay and subsequently had minimal intake orally as she disliked the hospital food. However, she could still consume 4-6 packets (950-1,400 ml) of the fruit-based supplement a day. Her subjective global assessment was 5, indicating a mildly malnourished state. Her estimated energy requirement was 1,343-1,643 kcal/day; however, she had only been taking approximately 700-1,000 kcal/day before admission.

As Mdm L was not keen to explore other milk-based supplements, the recommended intervention was to continue the current fruit-based supplement (both regular doses and as required dosages when she could not have at least half shares of her diet) in addition to three meals a day. Our dietitian’s subsequent weekly review found that Mdm L met 100 percent estimated energy requirement from taking six packets of Resource Fruit Beverage© a day, although spontaneous food intake at mealtimes remained poor at 1/8-1/4 portions only.

In patients undergoing rehabilitation, monitoring of electrolytes was not routinely carried out unless clinically indicated. However, patients on nutritional support in hospitals should ideally have their electrolytes monitored,

though the frequency and extent should be determined by their risk factors.<sup>2</sup> For Mdm L, her last biochemical investigation done just before admission was normal, and it had not been repeated since. Given her history of extremely poor oral intake, reliance on oral nutritional supplements void of potassium, and recovery from a recent major illness, it would have been prudent to monitor her electrolytes closely to identify any electrolyte disturbances early.

**2. Understanding Oral Nutritional Supplements – Nutritionally Replete or Deplete?**

Oral nutritional supplements are either sterile liquids, semi-solids, or powders, which provide macronutrients (energy, protein) and micronutrients (vitamins, minerals). However, not all supplements are nutritionally complete. Mdm L had been taking the fruit-based supplement for a long time as her main source of nutrition. Whilst this fruit-based supplement contained multiple micronutrients (including sodium, phosphate, manganese, selenium, iron, copper, zinc, iodine, chromium, and molybdenum, as well as vitamin A, D, E, K, C, B1, B2, B3, B6, B12, folic acid, pantothenic acid, biotin, and choline), it did not contain potassium, which is essential for bodily functions.

There is currently no local guideline for recommended daily average for potassium consumption. However, the adequate daily intake (AI) of potassium in the US/Australia is 2,800 mg for women and 3,800 mg for men above 19 years old, while the recommended daily average (RDA) in the UK is 3,500 mg for adults aged 19 to 64 years of age. Although Mdm L was assessed to be meeting her daily estimated energy requirements from the fruit-based supplement, it was inadequate in replenishing essential micronutrients such as potassium, resulting in severe deficiency. It is crucial to ensure that nutritional prescriptions for patients provide adequate energy and protein and fluids, and micronutrients.<sup>3</sup> Some supplements are formulated for specific groups of patients and hence may be lower in certain nutrients. An example would be that renal feeds are more deficient in potassium and phosphate, which benefit this group of patients. Awareness of the nutritional content of feeds will guide clinicians and physicians in the monitoring of nutrient deficiencies.

Some of the common oral nutritional supplements of low/no potassium used in our local hospitals and their respective constituents are summarised in **Table 2**.

**Table 2. Common oral nutritional supplements of low/no potassium used in local hospitals**

Supplement	Company	Type	Caloric density	Calories per 100 ml (Kcal)	Protein per 100 ml (g)	Potassium per 100 ml (mg)	Potassium per 100 Kcal
Resource Fruit Beverage©	Nestle	Fruit-based, regular	1 kcal/ml	105	3.8	Nil	Nil
Fortijuice©	Nutricia	Fruit-based, High-calorie	1.5 Kcal/ml	150	4	9	6
Novasource Renal©	Nestle	Milk-based, Renal, High calorie and protein	2 Kcal/ml	201	9	82	41
Fresubin Renal©	Fresenius Kabi	Milk-based, Renal, Low protein	2 Kcal/ml	200	3	100	50
Nepro LP©	Abott	Milk-based, Renal, Low Protein	1.8 Kcal/ml	182	4.5	114	63

## CONCLUSION

Many of our patients in hospitals require oral nutritional supplements. We often focus only on caloric intake and rely heavily on the expertise of dietitians to optimise nutrition for our patients. In the case of Mdm L, it is essential to recognise and be aware that she was on a low potassium fruit-based supplement that is not nutritionally complete and that she would have benefited from closer monitoring of electrolytes or prophylactic potassium supplementation.

This case highlights the importance of recognising red flags for patients at risk of dietary complications. The patient of discussion had a known history of inadequate oral intake during acute hospital admission and throughout her community hospital stay. She had a prolonged period of NG feeds while she was critically ill and was recovering from a major illness that predisposed her to electrolyte disturbances and potentially refeeding syndrome. This patient had recurrent episodes of hypokalaemia, requiring multiple replacement cycles of intravenous potassium before her community hospital transfer. Her poor appetite was further compounded by depression and prolonged hospitalisation.

In such patients, more frequent monitoring of electrolytes will be warranted. While dietitians play a major role in assessing patient's dietary requirements and recommending appropriate diet and nutritional supplements, it is equally crucial for physicians to be equipped with a basic understanding of nutritional supplement contents to identify potential nutritional deficiencies that our patients are at risk of. It is also imperative to keep in mind that the concept of nutrition encompasses both macronutrients and micronutrients and recognise that adequate caloric intake is not equivalent to adequate micronutrients intake. It is also essential to be aware that not all nutritional supplements are balanced or complete. Thus, the false perception that

adequate intake of daily dietary supplements equates to a comparable meal substitute needs to be rectified. It is also important to be mindful that fruit-based supplements contain minimal or no potassium.

Finally, close collaborative work between physicians and dietitians in a multidisciplinary team is fundamental in providing our patients with the best holistic care. Direct feedback and advice should be encouraged when red flags or gaps in care have been identified to improve the care delivery.

## REFERENCES

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