

Vitamin B₆: low and very high concentrations in hospital patients

Pyridoxine is used in the treatment of many conditions but over-supplementation can result in toxicity. Here, Matt Critcher and Agata Sobczynska-Malefora investigate levels in a specific patient cohort

Pyridoxal 5'-phosphate (PLP; Fig 1) is the active coenzyme form of vitamin B₆ and is involved in over 100 enzymatic reactions, including metabolism of amino acids, carbohydrates, neurotransmitters and lipids.¹ Low vitamin B₆ status has been associated with severe malnutrition and venous thromboembolism, while very high doses of pyridoxine (B₆) supplementation lead to toxicity that presents as sensory neuropathy. Pyridoxine is used in the treatment of many conditions (eg cystinuria, homocysteinuria, seizures or peripheral neuropathy associated with isoniazid and hydralazine therapy). Pyridoxine is thought to cause toxicity when intake exceeds 2g per day (~1000x recommended daily amount [RDA]). The European Commission has recommended the upper limit for pyridoxine intake from supplements at 25 mg/day; however, the corresponding PLP concentrations in blood currently are unknown.

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RETROSPECTIVE ASSESSMENT

In the present small study, measurement of whole-blood PLP was performed using high-performance liquid chromatography (HPLC) with fluorescence detection (excitation at 320 nm, emission at 415 nm). A reference range of 35.2–110.1 nmol/L was applied (Chromsystems). The upper limit of quantification was 1011.75 nmol/L and the lower limit of quantification was 4.05 nmol/L, as specified by the manufacturer.² The study

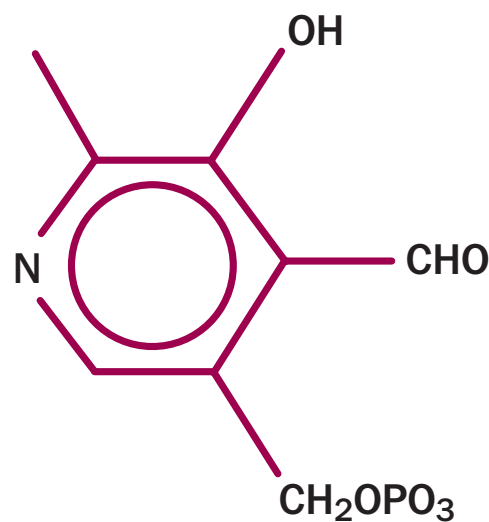


Fig 1. Structure of pyridoxal 5'-phosphate.

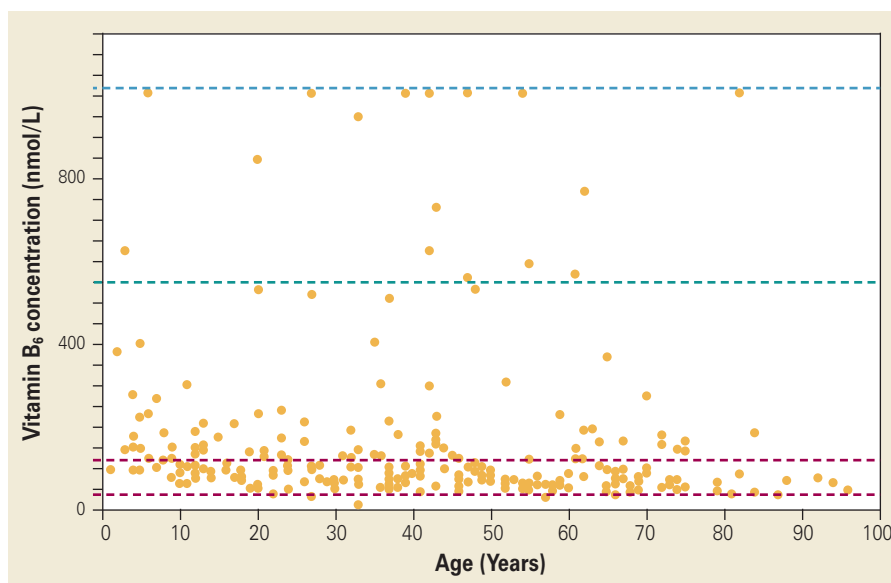


Fig 2. The distribution of PLP concentrations by age ($n=269$). Red lines indicate the upper and lower limits of the reference range. The blue line indicates the upper limit of quantification, and green indicates 550 nmol/L.

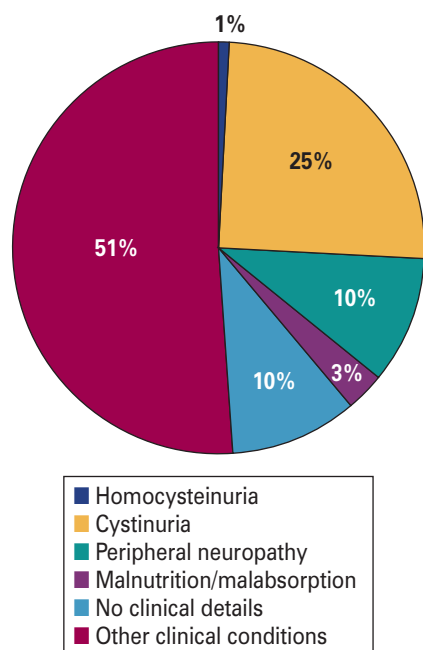


Fig 3. Proportion of the most common clinical details within the study population.

assessed retrospectively the prevalence of low and very high PLP concentrations in all specimens received for PLP analysis between March 2010 and July 2014 from patients at Guy's and St Thomas' Hospital NHS Foundation Trust.

RESULTS

A total of 269 samples were processed, 146 (54%) of which were from females. Out of the total, 47 (17%) samples were from those aged less than 18 year olds, and 42 (16%) were from those aged over 65. Concentration of PLP by patient age is shown in Figure 2. The main clinical indications for assessing PLP were cystinuria ($n=68$ [25%]), peripheral neuropathy ($n=26$ [10%]), and malnutrition/malabsorption ($n=9$ [3%]) (Fig 3). Four (2%) patients had PLP below the lower limit of the reference range and 103 (38%) above the upper limit of the reference range, including 19 (7%) patients with concentrations >550 nmol/L (five time the upper limit). Of these 19 patients, sensory neuropathy was present in three (16%) cases.

CORRELATION AND CONCLUSIONS

The presence of low vitamin B₆ status was seen in a small number of patients; however, high/very high PLP concentrations were more common, suggesting supplementation and the monitoring of compliance/response to treatment. By correlating PLP concentration with patient symptoms and dose/duration of

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pyridoxine, it may be helpful in the establishment of 'safe' limits for PLP levels in order to prevent sensory neuropathy. ■

REFERENCES

- 1 Herrmann W, Obeid R. *Vitamins in the Prevention of Human Diseases*. Berlin: De Gruyter, 2011: 75–85.
- 2 Chromsystems. *Instruction Manual for the Analysis of Vitamin B₆ in Plasma/Serum/Whole Blood* (Order Number 31000/S).

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