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ORIGINAL ARTICLE

Cobalamin deficiency anemia in Moroccan elderly patients

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ABSTRACT

Background: Cobalamin (vitamin B12) deficiency is a frequent, under-recognized cause of anemia in older adults and may present with severe cytopenias and neurological involvement.

Methods: Retrospective descriptive study of hospitalized patients aged 65 years and older (January 2012-December 2025) with hemoglobin (Hb) < 12 g/dl and serum vitamin B12 <187 pg/ml. Patients with iron/folate deficiency, inflammatory anemia, chronic kidney disease, hemolysis, or myelodysplasia were excluded. Clinical features, laboratory findings, etiologies, treatment, and outcomes were summarized descriptively.

Results: Twenty-four patients were included; 75.0% were men. Mean age was 73.6 years (65-90), and mean diagnostic delay was 65 days. Gastrointestinal manifestations occurred in 83.3%, neurological manifestations in 50.0%, and hemorrhagic presentation in 8.3%. Mean Hb was 8.2 g/dl, mean corpuscular volume 110.5 fL, and 41.7% had pancytopenia. Etiologies were predominantly pernicious anemia and food-cobalamin malabsorption. All patients received intramuscular hydroxocobalamin; 25.0% required transfusion, and reticulocytosis was documented in 83.3% within a mean of 8 days.

Conclusion: Cobalamin deficiency should be considered in older adults with anemia, macrocytosis, or cytopenias - especially when gastrointestinal or neurological features are present. Early etiologic assessment and timely replacement therapy may reduce persistent neurological sequelae.

Keywords: vitamin B12 deficiency, macrocytic anemia, aged, pernicious anemia, malabsorption, pancytopenia.

Introduction

Cobalamin deficiency remains common in older adults and is frequently missed because early symptoms are non-specific and overlap with multimorbidity and frailty [1,2]. In the elderly, malabsorption mechanisms dominate, particularly pernicious anemia and impaired release of food-bound cobalamin related to gastric atrophy or reduced acidity ("food-cobalamin malabsorption") [2,3]. Untreated deficiency can lead to severe anemia, pancytopenia, neuropathy, neurocognitive impairment, and gait instability, and neurological recovery may be incomplete when treatment is delayed [1,4]. Because Moroccan data on hospitalized older adults remain limited, we aimed to describe the clinical spectrum, biological severity, etiologies, treatment, and outcomes in a single-center geriatric inpatient cohort.

Subjects and Methods

Study design and period

Single-center retrospective descriptive study including admissions from January 1, 2012, to December 31, 2025.

Flow of participants

Of the 160 records screened, 90 were excluded at initial screening, leaving 70 records for full-text review.

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Of these, 46 were excluded mainly due to incomplete key laboratory/clinical data, alternative causes of anemia, or failure to meet the biochemical definition of cobalamin deficiency. Finally, 24 patients were included in the analysis.

Participants

Patients aged ≥ 65 years with hemoglobin (Hb) < 12 g/dl and serum vitamin B12 < 187 pg/ml.

Exclusion criteria

Evidence of iron deficiency and/or folate deficiency, inflammatory anemia, chronic kidney disease, hemolysis, or myelodysplastic syndromes.

Data collection

Demographics, diagnostic delay (symptom onset to diagnosis), clinical presentation (anemia-related, gastrointestinal, neurological, and hemorrhagic), laboratory findings (Hb, mean corpuscular volume [MCV], cytopenias, and serum vitamin B12), etiologic investigations (autoimmune testing and upper gastrointestinal endoscopy with biopsies when available), treatment, and outcomes were abstracted from medical records.

Etiological classification

Cases were classified as pernicious anemia, food-cobalamin malabsorption/non-dissociation, or dietary deficiency according to available clinical, endoscopic/histologic, and immunologic information, consistent with published approaches in older adults [2,3].

Statistical analysis

Descriptive statistics (mean and range; *n* and percent).

Ethics approval

This retrospective study used anonymized medical record data; in accordance with institutional policy, formal ethics committee review was not required, and informed consent was waived.

Results

Baseline characteristics

Twenty-four patients met the inclusion criteria. Men accounted for 75.0% (*n* = 18), with a sex ratio of 3:1. Mean age was 73.6 years (65-90). The mean diagnostic delay was 65 days (Table 1).

Clinical presentation

Anemia-related symptoms were present in all patients (100%, *n* = 24). Gastrointestinal manifestations occurred in 83.3% (*n* = 20), neurological manifestations in 50.0% (*n* = 12), and hemorrhagic presentation in 8.3% (*n* = 2) (Table 2).

Laboratory findings, etiologies, and outcomes

Mean Hb was 8.2 g/dl, and mean MCV was 110.5 fL. Pancytopenia was present in 41.7% (*n* = 10). The mean serum vitamin B12 level was 53 pg/ml. Etiologies are summarized in Figure 1. All patients received intramuscular hydroxocobalamin. Transfusion was required in 25.0% (*n* = 6). A reticulocyte response occurred in 83.3% (*n* = 20) with a mean time to response of 8 days. When follow-up was documented, blood counts normalized by 3 to 6 months (Table 3).

Table 1. *Baseline characteristics (n = 24).*

Variable	Value
Male sex, *n* (%)	18 (75.0)
Female sex, *n* (%)	6 (25.0)
Mean age, years (range)	73.6 (65-90)
Mean diagnostic delay, days	65

Table 2. *Clinical manifestations (n = 24).*

Manifestation	*n* (%)
Anemia-related symptoms	24 (100)
Gastrointestinal manifestations	20 (83.3)
Neurological manifestations	12 (50.0)
Hemorrhagic presentation	2 (8.3)

Discussion

This 14-year cohort of hospitalized Moroccan older adults with cobalamin deficiency anemia (*n* = 24) demonstrates a stable clinical pattern: severe hematologic presentation, frequent gastrointestinal complaints, and a substantial burden of neurological manifestations. This aligns with major reviews and guidance describing cobalamin deficiency in later life as common, clinically heterogeneous, and often recognized late because symptoms are attributed to aging, multimorbidity, or medication effects [1,2]. The mean diagnostic delay observed in our setting likely reflects these real-world diagnostic barriers and has clinical relevance because delayed therapy is associated with a higher risk of incomplete neurological recovery [1,4].

Diagnostic considerations in older adults

Macrocytosis is frequently treated as a "signal" for cobalamin deficiency; however, in geriatric practice, the MCV may be normal or only mildly elevated when mixed etiologies coexist (iron deficiency, inflammation, recent blood loss, and transfusion). Although such mixed patterns were excluded by design, they are common in routine care and contribute to delayed recognition. In addition, total serum vitamin B12 has analytical and biological limitations. A critical review emphasizes pitfalls of total B12 measurement and supports using functional biomarkers (methylmalonic acid and homocysteine) or active B12 (holotranscobalamin) when

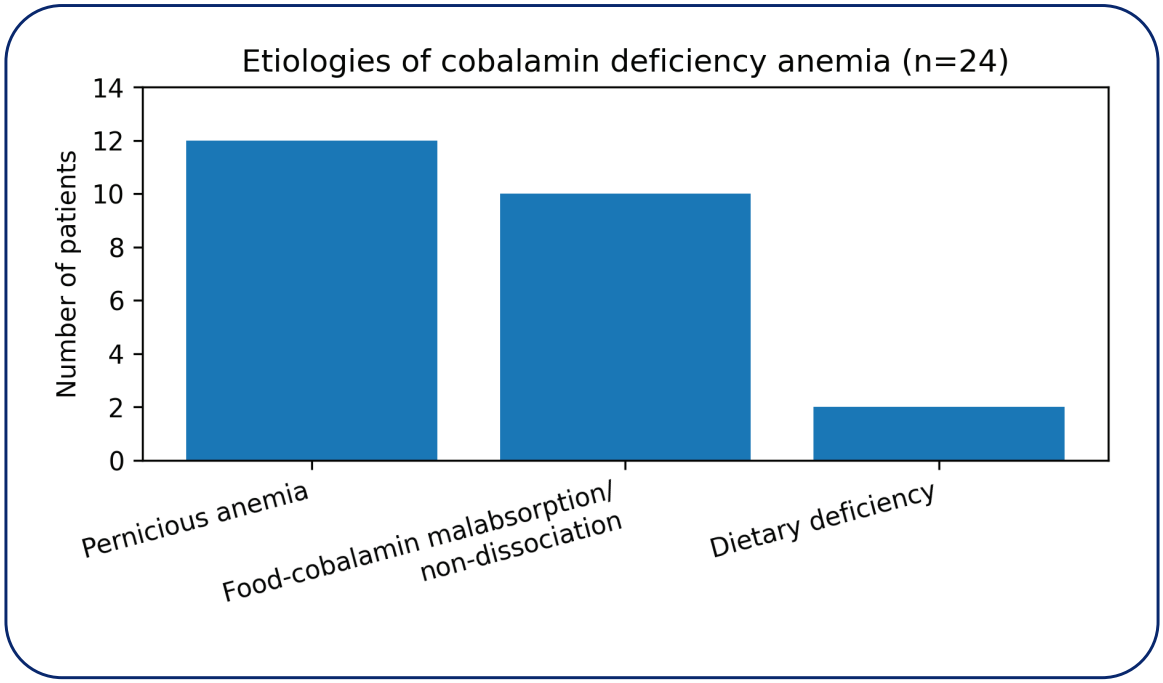

Figure 1. *Etiologies of cobalamin deficiency anemia in hospitalized older adults (n = 24).*

Table 3. *Key laboratory findings and outcomes (n = 24).*

Item	Result
Mean Hb (g/dl)	8.2
Mean MCV (fL)	110.5
Pancytopenia, *n* (%)	10 (41.7)
Mean vitamin B12 (pg/ml)	53
Transfusion, *n* (%)	6 (25.0)
Reticulocyte response, *n* (%)	20 (83.3)
Mean time to reticulocyte response	8 days
Hematologic normalization (when documented)	3-6 months

clinical suspicion is discordant with the laboratory value [5,6]. Where these tests are unavailable, clinicians can strengthen diagnostic confidence by integrating the full syndrome—macrocytosis, cytopenias, neurological signs, and response to therapy—rather than relying on a single parameter [1,5].

Clinical spectrum

Gastrointestinal manifestations were common (83.3%). In older adults, dyspepsia, anorexia, and weight loss frequently trigger broad diagnostic pathways; explicitly incorporating cobalamin deficiency into the differential may shorten time to diagnosis, especially when anemia is present. Neurological involvement affected 50% of our cohort. This is clinically important because neurological damage can occur even when anemia is not profound, and recovery may be only partial when treatment is delayed [1,4]. Routine bedside screening for distal sensory loss, gait unsteadiness, cognitive slowing, and mood symptoms should therefore be part of the initial assessment. Current guidance supports initiating replacement promptly when suspicion is strong rather than delaying for extensive confirmatory testing, particularly to reduce the risk of persistent neurological sequelae [4,7].

Hematologic severity and pancytopenia as a "marrow mimic"

Our cohort showed severe anemia (mean Hb 8.2 g/dl) and a high rate of pancytopenia (41.7%). This underscores that cobalamin deficiency can mimic primary marrow disorders, including myelodysplastic syndromes, because ineffective DNA synthesis can depress multiple lineages and produce dysplastic-appearing marrow changes [1]. In older adults, this "marrow mimic" problem has practical implications for diagnostic stewardship: vitamin B12 deficiency should be actively excluded early in the evaluation of macrocytosis and/or multilineage cytopenias, before escalating to invasive investigations or concluding chronic marrow disease [1,4]. The transfusion requirement in one-quarter of patients further suggests late or severe presentation and emphasizes the value of earlier recognition.

Etiological profile: pernicious anemia and food-bound cobalamin malabsorption

Pernicious anemia (50.0%) and food-cobalamin malabsorption/non-dissociation (41.7%) accounted for the vast majority of cases, while dietary deficiency was uncommon. This distribution is consistent with the literature, indicating that, in the elderly, autoimmune

gastritis/pernicious anemia and impaired release of food-bound cobalamin are leading mechanisms [2,3]. Etiological clarification matters clinically: pernicious anemia often implies lifelong replacement and structured counseling regarding relapse risk and adherence [1,4]. A pragmatic etiologic workup includes dietary assessment, medication review, immunologic testing where feasible, and endoscopy with biopsies in selected patients to document atrophic gastritis and support classification [2,3].

Iatrogenic and medication-related contributors

Medication exposure is increasingly relevant in geriatric cobalamin deficiency. Long-term acid suppression is common; a large community-based study reported an association between chronic proton pump inhibitor or H2-receptor antagonist use and vitamin B12 deficiency, supporting systematic medication review in older adults with deficiency [8]. Metformin is another frequent exposure. Randomized and long-term cohort data have linked prolonged metformin therapy to lower B12 levels and increased deficiency risk, with risk rising with duration [9,10]. Real-world evidence also supports a time-dependent effect among long-term users [11]. These data justify periodic B12 monitoring in older adults receiving long-term metformin - especially when anemia, macrocytosis, or neuropathic symptoms develop - and reinforce reassessing indications for chronic acid suppression [8,9,11].

Treatment route and monitoring

All patients received intramuscular hydroxocobalamin with the expected reticulocyte response in most cases, consistent with guideline-based management [4,7]. Evidence also supports high-dose oral cobalamin as an effective alternative for many patients; systematic review and randomized trials show comparable biochemical and hematologic correction in selected cases, which may simplify maintenance therapy when adherence is reliable [12-14]. Nevertheless, many clinicians favor initial parenteral therapy for hospitalized patients, severe anemia, or neurological involvement to ensure reliable absorption and rapid repletion [4,15]. Documenting reticulocytosis and subsequent normalization of blood counts provides practical confirmation of diagnosis and therapeutic response.

Limitations

This study has limitations inherent to a retrospective single-center design: modest sample size, non-uniform availability of etiologic tests, and incomplete follow-up in some records. Functional biomarkers were not consistently available, reflecting real-world constraints. Despite these limitations, the cohort provides actionable messages: test early in older adults with anemia, macrocytosis, pancytopenia, neuropathy, or persistent digestive complaints; clarify etiology where possible; and treat promptly to reduce the risk of persistent neurologic morbidity [1-4,7].

Conclusion

Cobalamin deficiency is an important, treatable cause of severe anemia and cytopenias in Moroccan elderly inpatients and frequently presents with gastrointestinal and neurological manifestations. Early recognition, etiological assessment centered on pernicious anemia and food-cobalamin malabsorption, medication review, and timely replacement therapy are essential to optimize recovery and limit neurological morbidity [1,4,7].

List of abbreviations

Hb	hemoglobin
IM	intramuscular
MCV	mean corpuscular volume

Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

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Ethical approval

Given the observational /non-interventional design of the study, formal ethics approval was not sought.

Authors' contribution

Authors' contributions: All authors contributed to the clinical care of the patients and to data acquisition. I.E.K. conceived the study, curated the data, and drafted the manuscript. A.R. and Y.S. critically revised the manuscript for important intellectual content. All authors approved the final version and agree to be accountable for all aspects of the work.

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