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Original article

The Elderly Predominance of Elevated Blood Components Among Patients in the Internal Medicine Departments of Tobruk Medical Centre: A Cross-Sectional Analysis of 125 Cases Derived from a Primary Institutional Study of Polycythemia Vera

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Abstract
Polycythemia vera (PV) is a myeloproliferative neoplasm (MPN) characterized by uncontrolled red blood cell production, driven in approximately 95–96% of cases by the acquired JAK2 V617F mutation. Although PV predominantly affects older adults, its age-related presentation within internal medicine departments warrants focused clinical attention. This cross-sectional study aimed to evaluate the incidence and age distribution of elevated blood components among patients admitted to the male and female internal medicine departments of Tobruk Medical Centre, with emphasis on elderly predominance and associated clinical risk factors. We retrospectively reviewed patient records from the male and female internal medicine departments at Tobruk Medical Centre during 2024–2025 and identified 125 patients with elevated blood components (hemoglobin, hematocrit, white blood cell count, and/or platelet count). Cases were stratified by age group and analysed descriptively. These data constitute the internal medicine cohort (n = 125) of the wider institutional study of primary PV conducted at the same centre, published by Mtawil et al. (2026), which is used here as the primary source and reference study. The study revealed a marked increase in elevated blood components among elderly patients. Age distribution was: 20–30 years (5 cases, 4%), 31–40 years (9 cases, 7%), 41–50 years (10 cases, 8%), 51–60 years (15 cases, 12%), 61–70 years (17 cases, 14%), 71–80 years (20 cases, 16%), and 81–90 years (49 cases, 39%). Patients aged 61–90 years accounted for 65% of the cohort, and those aged 51 years and older accounted for 81%. A perfect positive correlation between age and case frequency was reported for this cohort in the primary study (Spearman $\rho = 1.00$, $p < 0.001$). The data confirm that elevated blood components consistent with PV and related MPNs predominantly affect elderly patients in internal medicine settings. The findings underscore the importance of routine hematological screening in older adults and of age-stratified management protocols in Tobruk City, consistent with the conclusions of the primary institutional study.
Keywords: *Polycythemia vera; internal medicine; elderly; JAK2 V617F mutation; Tobruk.*

INTRODUCTION

Polycythemia vera (PV) is a chronic myeloproliferative neoplasm arising from a malignant transformation of multipotential hematopoietic stem cells, characterized by panhyperplastic bone marrow proliferation and consequent erythrocytosis, frequently accompanied by leukocytosis and thrombocytosis [1,2]. The molecular hallmark of PV is an acquired somatic mutation in the Janus kinase 2 (JAK2) gene, most commonly V617F, present in approximately 95–96% of cases, with JAK2 exon 12 mutations accounting for most of the remainder [3–5]. These mutations cause constitutive activation of the JAK–STAT signalling pathway, producing cytokine-independent proliferation of hematopoietic progenitors and elevated blood viscosity, which underlies the disorder's major clinical burden: arterial and venous thromboembolism [2,11].

Internal medicine departments serve as critical gatekeepers for PV diagnosis, as patients frequently present with non-specific symptoms, fatigue, headache, dizziness, pruritus, and early satiety or are detected incidentally on routine complete blood counts [2,6]. Given the insidious onset of PV and its well-documented predilection for older adults, internal medicine practitioners play a pivotal role in early detection and timely referral for specialized hematological care [1,2].

The present article reports and discusses the internal medicine cohort of the primary institutional study of primary PV conducted at Tobruk Medical Centre, Libya, published by Mtawil et al. (2026) in the Derna Academy Journal for Applied Sciences (DAJAS) [9]. That primary study enrolled 259 patients across three departments,

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Oncology (n = 44 confirmed PV cases), Neonatal (n = 90), and Internal Medicine (male and female wards; n = 125), and demonstrated a statistically significant age dependence of elevated blood components. Here, we focus specifically on the 125 internal medicine patients, examining their age-related distribution, the representative laboratory profile of a confirmed PV case, and the clinical implications of the striking elderly predominance observed, in light of current international evidence.

METHODOLOGY

Study Design, Setting, and Primary Source

This is a retrospective cross-sectional analysis conducted at Tobruk Medical Centre, specifically within the male and female internal medicine departments, during the period encompassing the latter half of 2024 and 2025. The analysis is derived from, and fully consistent with, the primary source study by Mtawil et al. (2026) [9], a multi-departmental cross-sectional investigation of primary polycythemia vera at the same institution. The internal medicine subset (n = 125) analysed here corresponds to the 125-patient cohort described in detail in that primary publication.

Data Collection

Patient records were reviewed to identify cases with elevated blood components, including hemoglobin, hematocrit, white blood cell count, and platelet count, based on complete blood count (CBC) results; patients referred for further evaluation were included, while confirmed secondary polycythemia (elevated erythropoietin) was excluded from the primary PV group, following the criteria of the primary study [9]. Cases were stratified by age group (20–30, 31–40, 41–50, 51–60, 61–70, 71–80, and 81–90 years) to determine distribution patterns. Complementary risk-factor data from the Oncology Department (44 confirmed PV patients) of the same institution were used in the primary study to contextualize the internal medicine findings with respect to hypertension, smoking, and family history [9]. Where available, diagnosis in the primary study was supported by clinical evaluation, serum erythropoietin, blood smear, bone marrow examination, and JAK2 genetic testing.

Statistical Analysis

Descriptive statistics were used to summarize the distribution of cases across age categories, with percentages calculated relative to the total cohort. Comparative analysis between departments was performed in the primary study to contextualize the internal medicine findings, including Spearman's rank correlation for age versus case frequency and chi-square testing for categorical risk factors [9].

RESULTS

Diagnostic Laboratory Profile of a Representative PV Patient

Table 1 presents the comprehensive metabolic panel and complete blood count of a patient with confirmed polycythemia vera from the primary study [9]. All major blood components were elevated above normal reference ranges, consistent with trilineage myeloproliferation.

As shown in Table 1, hemoglobin (20.5 g/dL), hematocrit (62.5%), and WBC count (12.35 k/mm^3) were markedly elevated, consistent with major diagnostic criteria for PV [2,6]. The elevated creatinine (2.43 mg/dL) and BUN (71 mg/dL) suggest possible renal involvement, while the markedly prolonged APTT (49 sec) and elevated troponin I (34.5 ng/ml) indicate coagulopathy and potential cardiac strain — illustrating the multisystem vulnerability of PV patients presenting to internal medicine services [11].

Table 1. Comprehensive metabolic panel and complete blood count for a patient with polycythemia vera.

Test	Result	Reference Range
Sodium	135	135–145 mmol/L
Potassium	5.4	3.5–5.1 mmol/L
Chloride	98	98–107 mmol/L
Bicarbonate	25	21–32 mmol/L
Blood Urea Nitrogen	71	7.0–20.0 mg/dL
Creatinine	2.43	0.5–1.3 mg/dL
Glucose	178	70–99 mg/dL
Alanine Aminotransferase	49	12–78 unit/L
Aspartate Aminotransferase	122	3–37 unit/L
Alkaline Phosphatase	145	12–78 unit/L
Total Protein	5.8	6.4–8.2 g/dL
Total Bilirubin	4.7	0.2–1 mg/dL
White Blood Cells	12.35	4.7–11.0 k/mm^3
Hemoglobin	20.5	13.2–18.0 g/dL
Hematocrit	62.5	39–49%
Platelets	338	189–440 k/mm^3
Troponin I	34.5	<0.04–0.09 ng/ml
Myoglobin	649	14.0–106.0 ng/ml
APTT	49	23.1–34.1 sec

Distribution of Elevated Blood Components in the Internal Medicine Departments

A total of 125 patients with elevated blood components were identified in the male and female internal medicine departments [9]. The distribution across age groups revealed a clear predilection for older age categories (Table 2).

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Table 2. Distribution of cases with high blood components by age group in the internal medicine departments (n = 125).

Age Group (Years)	Number of Cases	Percentage (%)
20–30	5	4
31–40	9	7
41–50	10	8
51–60	15	12
61–70	17	14
71–80	20	16
81–90	49	39
Total	125	100

Figure 1 illustrates the age distribution graphically, highlighting the disproportionate burden among the oldest patients.

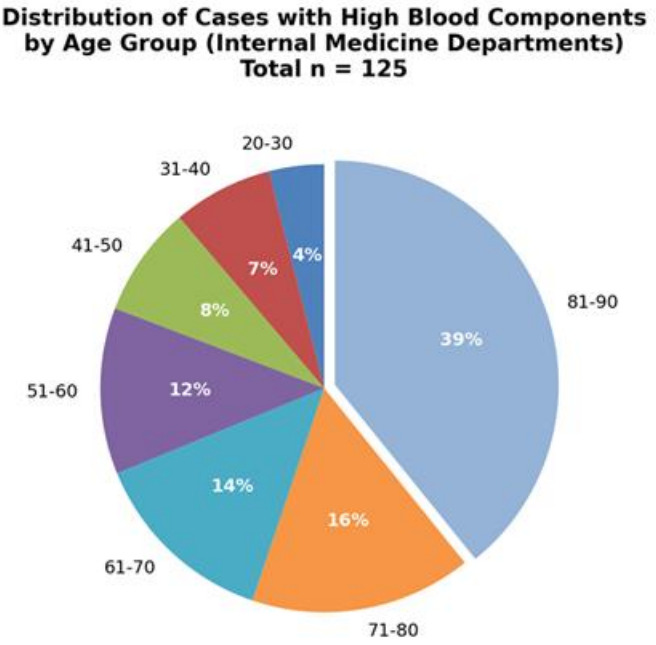

Figure 1. The percentage distribution of cases with high blood components across age groups in the internal medicine departments (n = 125).

Age-Related Trends: The data demonstrate a progressive increase in the frequency of elevated blood components with advancing age. Patients aged 81–90 years formed the largest single group (39% of all cases). Combined, patients aged 61 years and older constituted 65% of the cohort (86 of 125 cases), while those aged 51 years and older represented 81% (101 of 125). Conversely, younger adults (20–50 years) accounted for only 19% of cases. In the primary study, this gradient corresponded to a perfect positive monotonic correlation between age and case frequency in the internal medicine cohort (Spearman $\rho = 1.00$, $p < 0.001$), the strongest statistical signal reported by Mtawil et al. (2026) across all departments [9].

Comparative Context from the Primary Study: Risk Factors in Confirmed PV Cases

In the Oncology Department of the same institution, where confirmed PV cases were evaluated in the primary study [9], 44 patients (19 male, 25 females; age range 20–80 years) were identified. Confirmed PV cases clustered in the 51–80-year range (60% of cases), and patients aged ≥50 years represented 65.9% of cases, with a statistically significant association between age ≥50 and PV incidence ($\chi^2 = 4.455$, $p = 0.035$), corroborating the internal medicine age pattern.

Hypertension emerged as the most prevalent comorbidity among these confirmed PV patients, present in 23 of 25 female patients (92%) and 14 of 19 male patients (73.7%). Smoking was identified in 10 patients and was significantly more prevalent among male PV patients ($p = 0.011$; males approximately 8.4 times more likely to smoke), while gender distribution overall (43.2% male vs 56.8% female) was not significantly associated with PV ($\chi^2 = 0.818$, $p = 0.366$) [9].

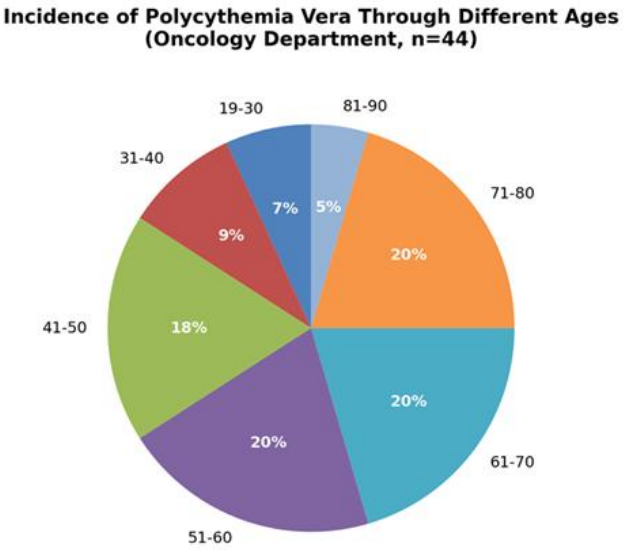

Figure 2. Bar chart showing hypertension cases among male and female PV patients in the Oncology Department (92% female vs 74% male).

While hypertension is common in both sexes, the higher observed prevalence in the female cohort may reflect loss of pre-menopausal vascular protection with advancing age. The bidirectional relationship between PV and hypertension, elevated blood viscosity increasing peripheral resistance, and pre-existing hypertension exacerbating endothelial dysfunction, creates a particularly high-risk profile requiring aggressive management [10,12].

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DISCUSSION

Age as a Critical Risk Factor

The internal medicine findings strongly support the established understanding that PV is predominantly a disease of older adults. The marked concentration of cases in the 61–90-year range aligns with international literature indicating that incidence rises steadily with age and that the great majority of patients are diagnosed after the fifth decade of life [1,2,7,8]. These findings are concordant with the department-level analysis of the same institution reported in the primary source [9].

Several mechanisms contribute to this age-related pattern. First, the accumulation of somatic mutations: the JAK2 V617F mutation is an acquired somatic event that develops over a lifetime of hematopoietic stem cell replication and environmental mutagen exposure, increasing the probability of acquiring driver mutations with age [3,5]. Second, age-related bone marrow changes, reduced stem cell diversity, increased inflammatory signalling, and replication stress in ageing hematopoietic stem cells may create a permissive microenvironment for clonal expansion of JAK2-mutant cells [13]. Third, detection bias: older patients undergo more frequent medical evaluation and routine blood testing, increasing the likelihood of detecting asymptomatic elevations in blood counts [1,2].

Clinical Implications for Internal Medicine Practice

The high prevalence of elevated blood components among elderly internal medicine patients carries significant clinical implications. Thrombotic risk is paramount: PV is associated with a substantially increased risk of arterial and venous thrombosis, including stroke, myocardial infarction, deep vein thrombosis, and pulmonary embolism [8,11,12]. Thrombotic events remain the leading cause of morbidity and mortality in PV, and a substantial proportion of patients experience vascular events before or at diagnosis [8,14]. The combination of advanced age, hypertension (highly prevalent in the studied cohort), and elevated hematocrit create a particularly high-risk profile [10,12].

Cardiovascular comorbidity represents another critical concern. The strong association between PV and hypertension observed in this and the primary study, particularly among female patients, suggests a bidirectional relationship. Elevated blood viscosity increases peripheral vascular resistance, while high hematocrit impairs nitric oxide-mediated vasodilation, further compounding hypertensive pathology [10].

Diagnostic delay remains a persistent challenge. Given the non-specific nature of early PV symptoms- headache, fatigue, dizziness, pruritus after warm baths- internal medicine physicians must maintain a high index of suspicion in elderly patients with unexplained elevations in hemoglobin or hematocrit, particularly when accompanied by leukocytosis or thrombocytosis [1,2].

Management Considerations

Current guidelines recommend risk-stratified management of PV based on age (>60 years) and thrombotic history [1,2]. High-risk patients require cytoreductive therapy (typically hydroxyurea) in addition to phlebotomy and low-dose aspirin. The predominance of elderly patients in this cohort suggests that the majority of PV cases in Tobruk Medical Centre's internal medicine departments would qualify for high-risk management protocols.

Phlebotomy remains the cornerstone of treatment, with a hematocrit target of <45% to reduce cardiovascular death and major thrombosis [1,2]. In elderly patients with cardiovascular compromise, phlebotomy must be performed cautiously with smaller volume withdrawals to avoid hypovolemia and hemodynamic instability. Low-dose aspirin (75–100 mg daily) is universally recommended unless contraindicated, having been shown to reduce arterial thrombosis risk in a randomized trial of PV patients [15]. For patients requiring cytoreduction, hydroxyurea remains first-line, with ropeginterferon alfa-2b demonstrating non-inferiority to standard therapy in randomized trials and JAK1/2 inhibition available for hydroxyurea-resistant or intolerant disease [2,16]. Modifiable risk factors, smoking cessation, blood pressure control, and management of diabetes and hyperlipidemia, are essential adjuncts to disease-specific therapy, particularly given the smoking–male association identified in the primary study and the well-established cardiovascular harm of tobacco [9,17].

Relation to the Primary Study and Current Epidemiological Evidence

The internal medicine dataset presented here is drawn directly from the primary institutional study of Mtawil et al. (2026) [9], which across three departments (Oncology, Neonatal, Internal Medicine) established advanced age, hypertension, and smoking as the predominant associated risk factors for PV in Tobruk City, alongside the JAK2 V617F mutation. The perfect Spearman correlation between age and elevated blood components reported for the present cohort ($\rho = 1.00$, $p < 0.001$) was the strongest association documented in that study, reinforcing the centrality of age in the local epidemiology of PV.

These findings are consistent with contemporary international evidence. Registry-based studies report PV incidence rates that rise with advancing age and a median age at diagnosis in the sixth to seventh decade of life [7,18,19]. Mortality analyses similarly show age-dependent disease behaviour, with PV-related deaths concentrated in older adults [20]. Collectively, these data validate the Tobruk findings and support prioritizing routine hematological screening for patients aged 50–60 years and above in internal medicine settings.

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Limitations

This analysis is limited by its retrospective cross-sectional design, which precludes establishment of causal relationships or assessment of disease progression. The internal medicine data reflect cases with elevated blood components rather than uniformly confirmed PV diagnoses, as bone marrow biopsy and JAK2 mutation testing were not performed in all cases [9]. Nevertheless, the age distribution pattern is highly consistent with known PV epidemiology, and the complementary oncology data from the primary study provide validation through confirmed cases. Future prospective studies with longitudinal follow-up and universal molecular testing would strengthen these findings.

CONCLUSION

The internal medicine data from Tobruk Medical Centre reveal a striking concentration of elevated blood components among elderly patients, with 81% of cases occurring in individuals aged 51 years and older and 39% of all cases clustered in the 81–90-year age bracket. These findings, derived from and consistent with the primary institutional study of Mtawil et al. (2026) [9], reinforce the importance of routine hematological surveillance in older adults presenting to internal medicine services, particularly those with non-specific symptoms such as fatigue, headache, dizziness, or pruritus.

Early recognition of PV and related myeloproliferative disorders, followed by appropriate risk stratification and management, is essential to reduce the substantial burden of thrombotic complications in this vulnerable population. The high prevalence of hypertension as a comorbidity, especially among female patients, further underscores the need for integrated cardiovascular and hematological care. Internal medicine physicians in Tobruk City should maintain a low threshold for hematology referral, bone marrow evaluation, and JAK2 mutation testing in elderly patients with unexplained elevated blood counts, and age-stratified screening protocols with enhanced interdepartmental collaboration should be implemented to improve diagnostic timeliness and patient outcomes in the region.

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