

Retrospective Practice Audit

Ethnic Comparison of Allopurinol Prescribing and Serum Urate Control in Gout: A Primary Care Audit

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Abstract

BACKGROUND: Gout disproportionately affects Māori in Aotearoa New Zealand, with documented national inequities in urate-lowering therapy and serum urate control. This audit evaluated whether differences in allopurinol prescribing and serum urate levels existed between Māori and Pākehā patients within a single large general practice. **METHODS:** A retrospective audit identified all patients coded with gout (145 Māori; 465 Pākehā). Allopurinol prescribing within the preceding 4 months was assessed. Logistic regression adjusted for age examined prescribing differences. In a random age- and sex-matched cohort, serum urate measured within 12 months was compared. The study had 98% power to detect a mean serum urate difference > 0.04 mmol/L. **RESULTS:** Māori patients were younger (mean 59 vs 68.7 years; $p < 0.001$). Crude prescribing was lower in Māori (73% vs 87%). After age adjustment, no statistically significant difference was detected (OR 0.87; 95% CI 0.59–1.28). In a age-sex matched cohort, serum urate level in 75/100 Māori and 70/100 Pākehā patients was 0.365 mmol/L (95% CI 0.33–0.38) for Māori, and 0.357 mmol/L (95% CI 0.33–0.38) for Pākehā ($p = 0.69$). **CONCLUSION:** After age adjustment, no statistically significant difference in allopurinol prescribing was observed. Mean serum urate levels were similar in a matched subgroup while controlling for

allopurinol dose and eGFR. While reassuring at practice level, unmeasured confounding limit definitive conclusions regarding equity of care at the clinician level.

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1 Introduction

Gout is prevalent in Aotearoa New Zealand, affecting approximately 8–13% of adult Māori and around 5% of adult Pākehā. Additionally, Māori are typically diagnosed at a younger age and experience greater complication rates with more frequent flares [1, 2]. Despite the availability of cheap effective urate-lowering therapy, such as allopurinol, these inequities persist.

National data indicate that Māori are less likely than Pākehā to receive allopurinol and less likely to achieve target serum urate concentrations [3]. The reasons for these disparities are complex. They include socioeconomic deprivation, differences in health literacy [4], and variation in access to care [5]. However, factors within clinical care may also play a role. Unconscious (implicit) prescriber bias—automatic cognitive processes that can influence decision-making outside conscious awareness—has been proposed as one possible mechanism through which inequities in gout management may arise, even when clinical indications are comparable between ethnic groups [6].

In gout, ethnic drivers of unconscious prescriber bias could include variation in clinician led thresholds for initiating allopurinol therapy, delay in dose escalation, erroneous or racial assumptions regarding adherence to treatment, and variations in monitoring intensity.[7] These drivers will likely operate alongside known traditional structural health inequities and together lead to the observed disparities caused by sustained hyperuricaemia and persistent disease activity [8, 9].

The purpose of this practice-based audit was to examine whether ethnic variation exists in allopurinol prescribing or serum urate levels within a large single-site general practice population. Specifically, we sought to determine whether observed prescribing patterns and biochemical outcomes were consistent with prescribing equity after accounting for differences in demographic distribution between Māori and Pākehā. This audit evaluates potential disparities in cross-sectional outcomes rather than prescriber decision thresholds or longitudinal treatment escalation, and may, therefore, serve only as an indirect indicator of prescriber-level inequity.

2 Methods

A retrospective audit was conducted of enrolled patients coded with gout for more than 12 months within a single-site large general practice. Patients were identified through the practice management system (Medtech Evolution v8.0.0.113) using diagnostic codes corresponding to gout. Extracted variables included self-identified ethnicity, sex, deprivation quintile, and date of birth, from which age was calculated at the time of audit.

From this dataset, a second subset of patients was identified who had received a prescription for allopurinol within the preceding four months (within a repeat prescription cycle), using the generic drug code for allopurinol. Logistic regression was used to assess the association between ethnicity and prescribing, adjusting for age as a continuous covariate.

For biochemical comparison between ethnicities, a random sample of 100 Māori patients was selected. An age- and sex-matched cohort of 100 Pākehā patients was generated using nearest-neighbour matching in a 1:1 ratio in R ¹ using MatchIt², with exact matching on sex and age. Matching balance was assessed prior to analysis. The most recent serum urate level, eGFR estimate and current allopurinol dose (in mg per day) was manually extracted from electronic health records for the preceding 12 months. Missing laboratory results were recorded as unavailable. For analysis and modeling serum urate levels were considered continuous, while eGFR and allopurinol dose were factorised as categorical variables, and therefore not treated as continuous (See Table 1).

Continuous variables were summarised using means and 95% confidence intervals. Differences in mean serum urate between matched groups were assessed using independent samples t-testing as near-neighbour matching was used over paired matching. Multivariable linear regression modeling was used to examine the association between ethnicity and serum urate levels among patients receiving allopurinol.

Serum urate (mmol/L) was modeled as a continuous outcome. Ethnicity was con-

¹R Core Team. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing; 2025.

²Ho, D. E., Imai, K., King, G., Stuart, E. A. (2011). *MatchIt: Nonparametric Preprocessing for Parametric Causal Inference*. *Journal of Statistical Software*, 42(8). doi:10.18637/jss.v042.i08

Table 1: eGFR and Allopurinol Categorisation.

Data	Category
eGFR (mL/min/1.73m²)	
< 30	Severe Impairment
30 - 60	Moderate Impairment
>60	Normal/Mild Impairment
Allopurinol Dose (mg per day)	
≤ 100 mg	Low Dose
> 100 mg - ≤ 300 mg	Standard Dose
> 300 mg	Escalated Dose

sidered the primary exposure variable, and controlled for allopurinol dose and renal function.

With 100 matched pairs (n=200 total), the study had approximately 98% power ($\alpha = 0.05$, two-sided) to detect a mean serum urate difference of 0.04 mmol/L, assuming variance comparable between groups.

All analyses were conducted using R version 4.5.2

Health and Disability Ethics Committee approval for this audit was sought (2026/OOS/25219) and considered exempt. All audit data are anonymised.

3 Results

There were 22,259 enrolled patients in the practice, of whom 14,303 (64%) were aged over 20 years. Among adults, 10,634 (74.3%) identified as Pākehā and 2,089 (14.6%) as Māori.

A total of 610 patients were coded with gout: 465 Pākehā (4.3% of adult Pākehā patients) and 145 Māori (6.9% of adult Māori patients).

Within the preceding four months, 406 Pākehā (87% of those with gout; 3.8% of the adult Pākehā population) and 106 Māori (73% of those with gout; 5.1% of the adult Māori population) had been prescribed allopurinol (See Table 2).

Of those prescribed allopurinol in the preceding 4 months, mean age differed significantly between groups: 68.7 years in Pākehā and 59.0 years in Māori ($p < 0.001$) (See Fig. 1).

Crude prescribing rates were significantly lower in Māori patients (106/145 73%

Table 2: Patient characteristics and outcomes by ethnicity.

	Māori	Pākehā	p-value
Practice population (>20 years)			
Adult population (n)	2,089	10,634	–
Gout coded, n (%)	145 (6.9%)	465 (4.3%)	–
Allopurinol prescribed, n (%) ^a	106 (73%)	406 (87%)	–
Male, n	85	324	–
Female, n	21	82	–
Mean age (years)	59.0	68.7	< 0.001
Age- and sex-matched audit cohort (n=100 per group)			
Serum urate available, n	75/100	70/100	–
Mean serum urate (mmol/L)	0.365	0.357	0.69
95% CI	0.34 - 0.39	0.33 - 0.38	–
Serum urate ≤0.36 mmol/L, n	42	38	–

^a After adjustment for age no statistically significant association (OR 0.87; 95% CI 0.59–1.28)

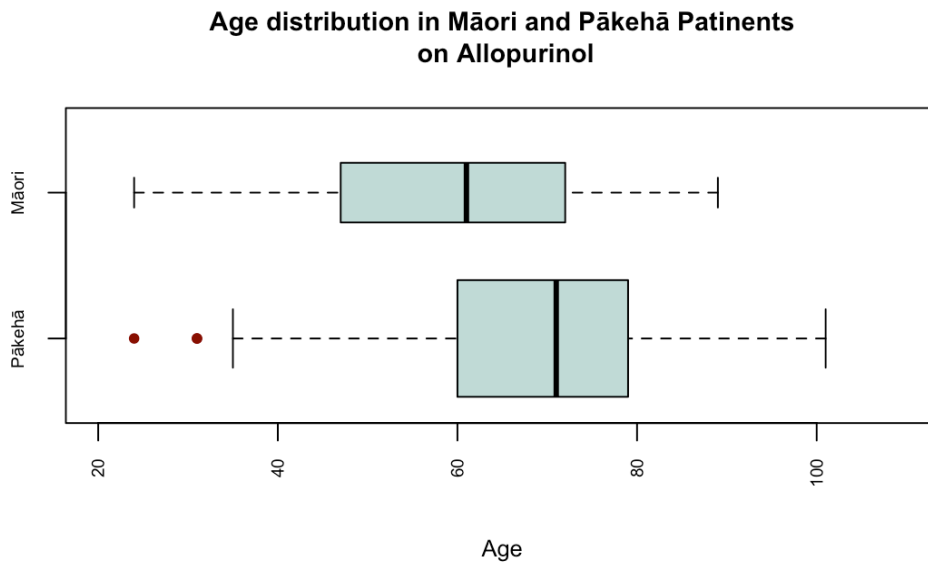


Figure 1: Age Distribution

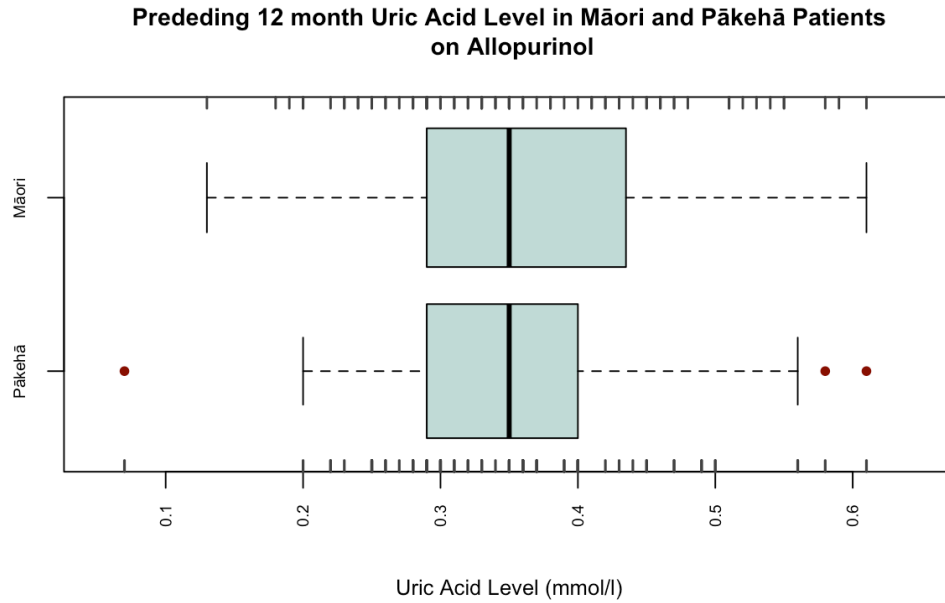


Figure 2: UA levels

vs 406/465 87% $p < 0.001$). However, Māori patients were significantly younger. After adjustment for age using logistic regression, no statistically significant association between ethnicity and allopurinol prescribing was observed (OR 0.87; 95% CI 0.59–1.28).

In the age- and sex-matched cohort ($n=100$ per group), serum urate levels within the preceding 12 months was available for 75/100 Māori and 70/100 Pākehā. Mean serum urate concentration was 0.365 mmol/L (95% CI 0.34–0.39) for Māori, and 0.357 mmol/L (95% CI 0.33–0.38) for Pākehā. The mean difference was 0.007 mmol/L ($p=0.69$) (See Fig. 2).

Multivariable linear regression was performed on the matched cohort to examine the association between ethnicity and serum urate level among patients receiving allopurinol, controlling for allopurinol dose and renal function. Ethnicity was not independently associated with serum urate level ($\beta = +0.004$ mmol/L; $p = 0.82$). Allopurinol dose was significantly associated with lower urate levels as expected, whereas renal function showed a smaller, non-significant effect. (See Fig. 3)

In sensitivity analysis, inclusion of missing renal function values as a separate categorical level did not alter the association between ethnicity and serum urate levels ($\beta=0.004$ mmol/L in complete-case analysis vs $\beta=0.004$ mmol/L in the missing-

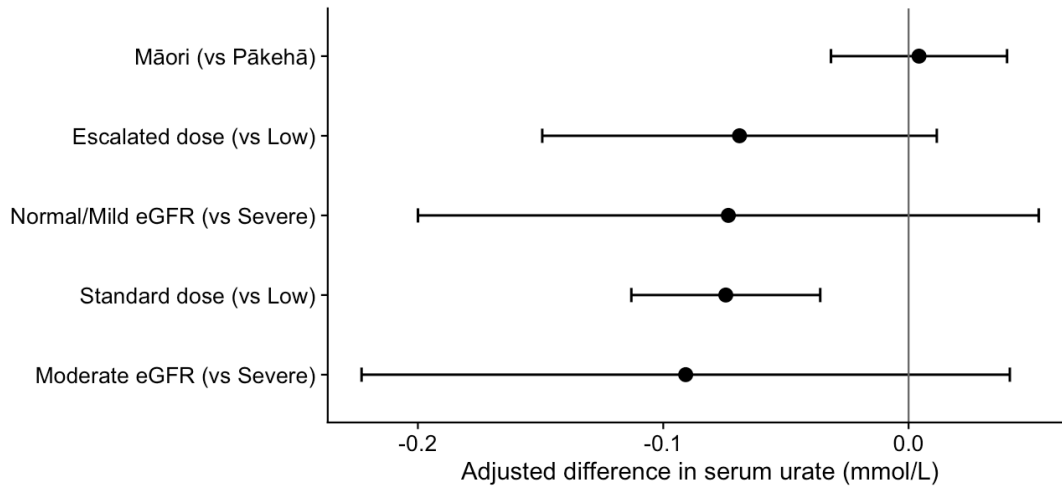


Figure 3: Adjusted associations with serum urate concentration

category model). Effect estimates for allopurinol dose and renal function were similarly unchanged, and results were consistent in models that reduced the influence of extreme urate values as outliers. Addition of NZDep quintile to the multivariable model did not materially alter the association between ethnicity and serum urate ($\beta=0.0068$ mmol/L; $p=0.74$), and effect estimates remained stable.

4 Discussion

This single-site practice-based retrospective audit did not identify a statistically significant difference in allopurinol prescribing, after adjustment for age as a cofounder, between Māori and Pākehā. Although crude prescribing rates appeared lower among Māori patients, Māori patients were notably younger, and this age difference largely accounted for the observed disparity. In the age- and sex-matched subgroup, mean serum urate concentrations and the proportion achieving a target (≤ 0.36 mmol/L) were similar between Māori and Pākehā. This held true when controlling for allopurinol dose and renal function in multivariable analysis. In sensitivity analysis complete-case and missing-category models produced near-identical ethnicity estimates, indicating that exclusion of observations with incomplete laboratory data did not bias the primary outcome. Similarly, there was no model variation when outliers were controlled. Additionally, adjustment for neighbourhood deprivation (NZDep) did not change the ethnicity estimate, suggesting that deprivation, as measured in

this dataset, did not confound the association between ethnicity and achieved urate among patients receiving allopurinol.

These findings are reassuring for this practice; however they contrast with national data demonstrating persistent inequities in allopurinol dispensing and biochemical control among Māori. The younger age distribution among Māori patients in this cohort is consistent with reports of earlier disease onset and greater cumulative disease burden, and crude prescribing differences following age adjustment suggests that demographic composition within the practice, rather than prescriber-level bias, largely explains the observed variation in prescribing. This does not negate broader structural inequities in gout care across Aotearoa New Zealand, but indicates that, in this setting, crude disparities were primarily attributable to age distribution rather than demonstrable prescriber-level inequity.

Despite the multivariable analysis being well powered, there are significant limitations to this retrospective audit. Most importantly, the failure to find a difference between ethnicity, allopurinol use and serum urate levels does not establish the presence of equitable care, or implicit prescriber bias, within the practice. Being a single practice audit means these findings cannot be generalised to other practices or populations, and being retrospective in nature can lead to unmeasured cofounders introducing significant bias. The confidence interval around the adjusted odds ratio in allopurinol prescribing rates does not exclude modest differences in prescribing, and prescribing was defined only as receipt of a prescription within four months (a prescription repeat cycle). This study did not take into account medication adherence, dose adequacy, escalation to target, or time from diagnosis to allopurinol initiation. Equity in gout management requires not only comparable initiation rates between Māori and Pākehā but also comparable quality, intensity and timeliness of treatment. Despite the matched cohort analysis failing to demonstrate a clinically meaningful difference in serum urate between Māori and Pākehā on allopurinol, the analysis did not control for disease duration, other comorbidities, and socioeconomic factors.

National health data consistently demonstrate disparities in gout outcomes between Māori and Pākehā. This audit highlights the limitations of relying solely on crude cross-sectional prescribing rates or single serum urate measurements to understand these inequities. More informative approaches may include prospective data collection examining time from diagnosis to initiation of allopurinol, time to dose escalation, and time to achievement of target serum urate concentrations [10]. Embedding prompts and recall systems within practice management software may facilitate this process [11]. Stratifying such longitudinal measures by ethnicity would provide more meaningful indicators of equity in gout management than simple prescribing rates alone.

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