Clinical audit of metformin adherence at a South Auckland General Practice

Avneet Singh, Qusai Ali

Abstract
Type 2 diabetes mellitus is a prevalent chronic health disease in New Zealand (NZ), which disproportionately affects Pacific populations. Furthermore, Pacific patients have the lowest rates of anti-diabetic medication adherence in NZ. We have investigated the adherence to oral metformin at a South Auckland based Pacific-focused general practice (PFGP) with numerous interventions targeted towards the Pacific population. We then compared our results with regional and national NZ-based studies on metformin adherence, to see if there is increased metformin adherence at PFGP.

Introduction
Diabetes mellitus is a prevalent disease in New Zealand, affecting over 250,000 individuals and rising. 90% of them having type 2 diabetes mellitus (T2DM). However, T2DM does not affect all ethnic groups equally. The Pacific population has the highest prevalence of T2DM in New Zealand, with 20% of the 20–79 age group affected. This is much higher than Māori, at 10%, and NZ European, at 6%. The Pacific population in NZ is 3.22 times more likely to have T2DM than non-Pacific people. Additionally, this has contributed towards Pacific people having higher mortality rates compared to other ethnic groups.

Despite this, the Pacific population in New Zealand has some of the lowest rates of adherence to diabetic medications. Horsburgh et al, a large national study published in 2019, looking at metformin monotherapy adherence, demonstrated that Pacific people had a mean medication possession ratio (MPR) of 0.69. Thus, on average, they were only dispensed enough metformin during the study period to cover 69% of the days in the period. This is far from good adherence, which the medical literature has defined as an MPR of >0.80. Furthermore, the same study demonstrated that NZ Europeans had an MPR of 0.85, whilst Asians had a MPR of 0.80. Hence, whilst the Pacific population are the worst affected by T2DM, they are also the least adherent with treatment.

Some possible contributing factors to these disparities include difficulties accessing healthcare/clinics, health appointments clashing with work or other commitments, financial barriers, and language barriers. Furthermore, racial biases and cultural differences can also lead to poorer rapport with Pacific patients, contributing to worse adherence and thus health outcomes.

The present study is an audit of oral metformin adherence among Pacific patients enrolled at the Pacific-focused general practice (PFGP) in South Auckland, a primary care provider that focuses on Pacific health. PFGP have employed a range of interventions to help improve Pacific health, including hiring a majority of Pacific staff, enabling phone consults and repeats, opening on weekends, as well as having lower costs for services, including $15 consultations.

We also compared metformin adherence at PFGP to the rates seen in Horsburgh et al, to see their performance and the impacts of their interventions.

Methods
DESIGN/SETTING
We set our study period from 7th June 2019 to 7th December 2020, which covered 549 days.

We then conducted a retrospective analysis of the clinical data available at PFGP, to identify all Pacific patients who were classified with non-insulin dependent T2DM before 7th June 2019. We included those who were prescribed metformin from before the study period and had at least two prescriptions of metformin during the study period. We also included those who were co-prescribed other oral anti-diabetics, e.g. glitazones. We classified those on Galvumet as the same as patients co-prescribed metformin and vildaglaptin. Furthermore, only patients aged between 20 to 80 years old were included.

We excluded all patients who were not enrolled at PFGP from before the study period, those who transferred in the middle of the study period, casual patients, deaths, patients prescribed with insulin, patients in institutional care, and those who switched from oral metformin to other anti-diabetic medications.

We then used data on pharmacy dispensing available on TestSafe, such as dispensing dates and duration dispensed, to calculate our primary outcome, the “proportion of days covered” (PDC). This is similar to the MPR, but is a more conservative and preferred measurement of medication adherence that avoids the problems of over-estimation associated with MPR. Similarly to MPR, a PDC of >0.8 is also defined as adherent in the literature.

We calculated PDC with the following formula,

PDC = \( \frac{\text{Number of days in period covered}}{\text{Number of days in study period}} \times 100 \)

If there was an overlap in dispensing dates, we changed the start date of the next dispensation to the end date of the prior one.

ETHICS APPROVAL
Ethics approval was not required for this clinical audit, in accordance with the Health and Disability Ethics Committee for Clinical Audits/Quality Improvement/Assurance projects.

Results
Our audit included 40 patients of Pacific ethnicity. Most of these patients were Samoan, along with smaller groups of Niueans and Tongans. There were no patients of other Pacific ethnicities included in the audit (Figure 1).

The average age of the patients included was 57.55 years. The majority of the patients were between 50–70 years of age. The youngest patient in our audit cohort was 33 years old, whilst the oldest was 77 years of age (Figure 2).

OUTCOME: METFORMIN ADHERENCE
The mean PDC of the entire PFGP Pacific cohort was 0.74, meaning that on average, the Pacific patients at PFGP had oral metformin coverage for...
74% of the days in the study period. This means that they had metformin prescribed for 406 days out of the 549-day study period. The highest metformin adherence was seen in the Tongan ethnic subgroup, with a PDC of 0.85, and the lowest was observed in the Niuean ethnic subgroup, with a PDC of 0.66 (Figure 3).

The distribution of PDC across different age groups showed higher metformin adherence in older patients >60 years of age, with PDCs of 0.77 and 0.79 in the 60–69 and 70–79 age groups, respectively. Adherence was lowest in the 50–59 group, with a PDC of 0.69 (Figure 4).

When comparing metformin adherence of the PFGP cohort against national data, Pacific patients at PFGP have greater adherence than the national average for the Pacific population, PDC 0.74 compared to an MPR 0.69, respectively (Figure 5). This is despite our audit using a more conservative measure of adherence in PDC for the PFGP cohort. Whilst the disparity between the PFGP Pacific cohort and the national European data for adherence is reduced, the gap is still quite large, with a PDC of 0.74 compared to a MPR of 0.85, respectively.

Metformin adherence in the Pacific cohort at PFGP was slightly lower than the mean of Counties Manukau District Health Board (DHB), the DHB within which PFGP operates, which had a mean MPR of 0.76.

Discussion

The Tongan group of patients at PFGP were more adherent to metformin than the Samoan and Niuean groups. With a PDC of 0.85, the Tongan group at PFGP showed similar adherence to the national average for Europeans. However, there was a very small sample group of Tongan patients included in this audit, which may have falsely inflated their adherence. Furthermore, the poorer adherence seen in the Niuean group is likely to be due to the smaller sample size compared to the Samoan group, rather than due to any differences in level of care.

Previous studies have shown a trend where adherence had increased with age. This was somewhat demonstrated in our audit, as patients who were >60 years old showed the greatest adherence to metformin. However, the 50–59 year old age group at PFGP had the lowest adherence, with younger groups showing higher adherence. This could partly be due to the younger age groups having far less patients in them compared to the 50-59 year old age group. However, considering the big difference between the 50-59 year old age group compared to the others, there could perhaps be barriers to healthcare experienced by that group that need to be further investigated and addressed.

A positive finding is that despite using a more conservative measure of medication adherence in this audit, the Pacific patients at PFGP showed...
greater metformin adherence compared to the national average of Pacific patients reported in Horsburgh et al. However, when compared to the Pacific population by Chepulis et al., a Waikato based study, the adherence at PFGP was lower. Chepulis et al. reported a MPR of 0.81 compared to the PDC 0.74 at PFGP. However, Chepulis et al. reported higher adherence in all ethnic groups compared to Horsburgh et al., possibly due to the fact they calculated MPR with medications dispensed up to three months after the study period ended, which would further increase the MPR compared to the results in Horsburgh et al.

It is difficult to say whether the increased metformin adherence at PFGP compared to other studies is due to the Pacific health interventions in place at PFGP. Whilst the increased metformin adherence at PFGP may indirectly infer that Pacific health interventions may have a positive impact, more studies are required to evaluate the performance of interventions in place at PFGP. Interventions include the majority-Pacific staff reducing cultural and language barriers, low consultation costs, phone consultation, and Saturday appointments. These likely reduce financial barriers and provide appointment options for busy Pacific patients.

Deprescribing is a confounding factor that may negatively affect adherence at PFGP, which operates in a decile 8 location based on NZDep2018. Thus, this indicates that the patients at PFGP are of a lower socioeconomic status. It was shown in Horsburgh et al. that deprescribing can negatively impact adherence. Thus, as shown in Figure 6, I compared our data from patients at PFGP with the mean metformin MPR at Counties Manukau District Health Board (CMDHB) provided by Horsburgh et al. This was done because PFGP is located within CMDHB, which encompasses some of the most deprived areas in Auckland. This comparison should help reduce the impacts of confounding due to deprescribing. Figure 6 shows that PFGP has marginally lower metformin adherence compared to CMDHB despite using the more conservative PDC in our audit, suggesting that ethnic inequities in the PFGP population have been reduced further than previously thought. However, I acknowledge that this could also be due to CMDHB having a higher proportion of Māori and Pacific patients, the two ethnic groups with the lowest metformin adherence.

LIMITATIONS

The biggest limitation in our audit is the small sample size, especially in the Tongan, Niuean, and younger age groups. This can make it difficult to tell if the adherence rates are truly higher or lower at the practice, as the results could be due to chance with such a small sample size.

The second biggest limitation was that we used PDC to calculate metformin adherence in this study, whilst the existing published literature uses MPR. MPR tends to over-estimate adherence, whilst PDC is more conservative. Even then, there were differences in methodology used to calculate MPR between studies.

Thus, it is unclear how much the differences in methodology or outcome measurement had contributed to the differences in metformin adherence between PFGP and data provided in Horsburgh et al. and Chepulis et al.

Another limitation of this study is that it did not look at the impact of electronic-prescribing (e-prescribing) compared to traditional paper prescribing on pharmacy dispensing records, and thus our data on metformin adherence between PFGP and data provided in Horsburgh et al. and Chepulis et al.

RECOMMENDATIONS

1. Investigate what barriers to metformin adherence, if any, are affecting the 50–59 year old Pacific age group at PFGP, perhaps in the form of open dialogue or questionnaires with these patients in their next consult.

2. Hire Pacific doctors, as whilst there is an abundance of Pacific staff at PFGP, from the receptionist to nurses, there are no Pacific doctors. Having a Pacific doctor can help further reduce cultural and language barriers for Pacific patients, which may further reduce health inequities and improve diabetic medication adherence in Pacific patients.

3. Give metformin prescriptions for 30 days instead of 28. Numerous patients were only given 28 days of metformin per dispensing, which did not last the whole month. It is unclear whether 28-day prescriptions represent blister packs or not, as this was not recorded in the practice data. However, if this does not represent blister packs, then increasing prescription duration to 30 days will give patients slightly more leeway if they have difficulty in getting their repeats on time. Furthermore, over three dispensations from a single prescription, this would result in an extra six days of medication coverage.

REFERENCES


About the authors

Avneet Singh is a Trainee Intern at The University of Auckland. His interests lie in population health, Pacific health, and otolaryngology.

Acknowledgements

The lead author would like to thank Dr Quasi Ali for his support with conducting and submitting this clinical audit for publication.

Correspondence

Avneet Singh: asin392@auburnuni.ac.nz