Original Article

Indigenous disparities in adenotonsillar disease: a case series of New Zealand children

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Background: There is limited clinical data published outlining the difference in tonsillectomy rates between Māori and non-Māori in Aotearoa, New Zealand. This case series aimed to describe the clinical characteristics, treatment and outcomes of Māori and non-Māori children undergoing adenotonsillectomy in the Auckland region.

Methods: Data were obtained from the medical records of Auckland District Health Board and Counties Manukau District Health Board in Auckland, New Zealand. Clinical information was extracted following the identification of all patients under 16 years of age undergoing adenotonsillectomy between December 2015, and December 2017 in the Auckland region.

Results: A total of 1,538 children were included in this study. Of these, 334 (22%) were Māori and 1,204 (78%) were non-Māori. Maori were older (P<0.001), had lower rates of atopy (P<0.001) and had higher body mass indexes at the time of surgery (P<0.001), when compared with non-Māori. Māori were also significantly less likely to receive analgesia (P<0.001) and pre-operative antibiotics (P<0.001) in the year preceding surgery, relative to non-Māori. Tonsils and adenoids were significantly larger in the Māori population (P<0.001). Māori were more likely to have a positive throat swab for Group-A Streptococcus (GAS) (P<0.001) in the year preceding surgery. Māori were also more likely to have otitis media with effusion requiring ventilation tube insertion (P<0.001). Thirty-day readmission rates were similar between Māori and non-Māori (P=0.7).

Conclusions: This study has identified significant disparities in the clinical characteristics, comorbidities, treatment and outcomes between Māori or non-Māori children who require adenotonsillectomy in Auckland, New Zealand. The reasons for these disparities remain unknown and require further research and analysis.

Keywords: Tonsillectomy; indigenous health; adenoidectomy; adenoid; tonsil

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Introduction

Māori are the indigenous population of Aotearoa, New Zealand. Between 1840 and 1900, economic and social changes had serious adverse effects on Māori health. A large increase in the number of Europeans settling in New Zealand during this period exposed Māori to new diseases. A significant number of Māori children died early in life, from respiratory infections. It is estimated during this time that the Māori population halved to around 50,000 (1).

In more recent times health campaigns mounted by Māori and the New Zealand Government have resulted in improved Māori health, yet there still exists a number of conditions that disproportionately result in the

hospitalisation or death of Māori (1). The disparity between non-Māori and Māori hospitalisation rates for conditions such as bronchiolitis, pertussis, upper respiratory tract infections, pneumonia, and otitis media reminds us of the importance of dry housing and access to healthy food for improved health outcomes. The most common conditions for which Māori children are hospitalised include skin infections, asthma, acute upper respiratory infections, gastroenteritis, pneumonia, and dental procedures (2).

Māori tonsillectomy rates remained stable from 2000 to 2008, then increased from 2008 to 2014 (2). Between 2010 and 2014, the most common primary diagnosis for tonsillectomy in Māori children was chronic tonsillitis. Hyperplasia of tonsils or adenoids and sleep apnoea were also common (2).

While data on tonsillectomy rates in Māori versus non-Māori patients exists, it is population data with limited demographic and clinical information (2). This case series aimed to describe the laboratory and microbiological findings, clinical characteristics, clinical outcomes, and therapeutic interventions of children under the age of 16 years who had an adenotonsillectomy between December 2015 and December 2017 in the Auckland region. This article is written in accordance with the STROBE reporting checklist (available at https://ajo.amegroups.com/article/view/10.21037/ajo-19-60/rc).

Methods

Participant information

Data were collected from Counties Manukau District Health Board (CMDHB) and Auckland District Health Board (ADHB) following ethics approval (Ethics No. 17/NTA/148). The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). Informed consent was taken from parents/guardians of the patients. Patients were prospectively identified and included all patients under the age of 16 years who received an adenotonsillectomy between December 2015, and December 2017 in the Auckland region. Clinical information was subsequently extracted. Demographic data included: age, gender, ethnicity (Māori and non-Māori), and BMI. Clinical data collection included tonsil and adenoid grades, indication for surgery [recurrent tonsillitis (RT) and sleep disordered breathing (SDB)], presence of ear disease, presence of nasal symptoms, antibiotics prescribed in the community, medical comorbidities, and pre-operative bacterial throat swab. Medications prescribed at the time of discharge were noted. Outcome data included associated complications, 30-day readmission rate and post-operative visits to the general practitioner (GP).

Statistical analysis

Clinical characteristics and patient demographics were presented with descriptive statistics. Univariate analysis was utilised to assess factors associated with differences between Māori and non-Māori patients. Student's *t*-test was used to assess continuous variables, whereas Chi-square tests was utilised to assess categorical variables. A two-tailed P value <0.05 was regarded as statistically significant. IBM SPSS.24 software was used for all statistical analyses.

Results

A total of 1,538 children under the age of 16 years underwent adenotonsillectomy between December 2015 and December 2017. Of these, 334 (22%) Māori children and 1,204 (78%) non-Māori children. Clinical characteristics and demographic data are summarised in *Table 1*.

The Friedman grading system was used to assess tonsil grade and the Clemens and McMurray grading system to assess adenoid grade. Tonsils were significantly larger in the Māori population with a mean grade of 4±0.04 compared with non-Māori 3±0.04 (P<0.001). Adenoids were also larger in the Māori population with a mean grade of 3±0.06, and with non-Māori 2±0.04 (P<0.001). Indications for surgery are summarised in *Table 2*. There were significant differences in the medical comorbidities between patient groups. Māori were less likely to have a diagnosis of asthma (17.4% Māori, compared with 31.4% non-Māori; P<0.001), eczema (18.6% Māori, compared with 35.2% non-Māori; P<0.001), allergic rhinitis (21.6% Māori, compared with 59.8% non-Māori; P<0.001), and gastroesophageal reflux disease (GORD) (2.4% Māori, compared with 9.3% non-Māori; P<0.001). Briefly, Māori patients were more likely to complain of nasal symptoms (P<0.001) and infective symptoms (P<0.001) prior to surgery. Māori patients were also more likely to have an associated otitis media with effusion requiring ventilation tube insertion at the time of adenotonsillectomy (40.1% Māori, compared with 21.1% non-Māori; P<0.001).

Throat swabs for Group-A Streptococcus (GAS) was performed in 86.2% of Māori and 74.8% of non-Māori in

Table 1 Demographic and pre-operative prescription data for children who underwent adenotonsillectomy: Māori versus non-Māori

Clinical characteristics	Māori (n=334)	Non-Māori (n=1,204)	P value
Gender			
Male	192 (57.5%)	681 (56.6%)	
Female	142 (42.5%)	523 (43.4%)	0.784
Mean age (years)	7.53±0.37	6.80±0.17	<0.001†
Mean body mass index	21.68±0.48	18.64±0.26	<0.001†
Courses of antibiotics in the year prior to surgery	2.56±0.08	3.62±0.09	<0.001†
Analgesia prescribed by general practitioner in year prior to surgery	136 (40.7%)	1,104 (91.7%)	<0.001†
Prednisone prescribed by general practitioner in year prior to surgery	10 (3%)	258 (21.4%)	<0.001†

†, significant values.

Table 2 Indication for adenotonsillectomy: Māori versus non-Māori

Indication	Māori (n=334) (%)	Non-Māori (n=1,204) (%)	P value
Sleep disordered breathing	136 (40.7)	666 (55.3)	<0.001†
Sleep disordered breathing and chronic tonsillitis	174 (52.1)	450 (37.4)	<0.001†
Chronic tonsillitis	24 (7.2)	88 (7.3)	0.939

†, significant values.

the year preceding surgery (χ^2=4.43, P<0.001). The GAS swab results were positive in 65.9% of Māori and only 27.1% of non-Māori (χ^2=13.11, P<0.001).

There were significant differences in the medications prescribed at the time of discharge between patient groups. Māori were more likely to be prescribed a course of antibiotics at the time of discharge (59.9% Māori, compared with 50.7% non-Māori; P=0.003). In regard to analgesia, Māori were prescribed paracetamol more often (100% Māori, compared with 96.7% non-Māori; P<0.001), but were less likely to be prescribed ibuprofen (50.9% Māori, compared with 62.1% non-Māori; P<0.001). There were no significant differences in tramadol prescriptions between groups (78.4% Māori, compared with 73.8% non-Māori; P=0.081).

A complication was defined as a related admission to hospital within 30 days of discharge. Thirty-day readmission rates were similar between groups, with 7.8% of Māori being readmitted compared to 8.5% of non-Māori (P=0.688). There were no significant differences in the rate of secondary haemorrhage between groups (Māori 7.5% and non-Māori 5%; P=0.117). Community prescribing records suggested that non-Māori were also more likely to see their GP and be prescribed antibiotics for a presumed infection following surgery (27.1% non-Māori and 18.6% Māori; P=0.002). However, Māori were also more likely to present to their GP with pain post-operatively and require a prescription for further analgesia (Māori 28.7% and non-Māori 17.3%; P<0.001).

Discussion

Taken together, these results suggest that significant disparities exist between Māori and non-Māori patients in regard to adenotonsillar disease in the Auckland region. These findings are consistent with global data demonstrating socioeconomic and ethnic disparities in the management of children with adenotonsillar disease worldwide (3-6). In 2015, the national rate of tonsillectomies in New Zealand was 3.7 per 100,000 children, as compared to the rate of tonsillectomies in Māori children in Auckland District Health Board (3.5 per 100,000) and Counties Manukau District Health Board (2.9 per 100,000) in the same year (7). Differences in the rates of RT and SDB based on ethnicity nationwide remain unknown.

At the time of surgery, Māori are older than non-Māori and have higher body mass indexes (BMI). A higher BMI in patients presenting for adenotonsillectomy increases

the risk of peri-operative complications, often resulting in prolonged hospital admissions (8). Childhood obesity has also been associated with an increased risk of persistent SDB symptoms despite adenotonsillectomy (9). Although Māori have larger tonsils and adenoids at the time of surgery and are more likely to have OME, it appears that Māori receive fewer courses of antibiotics, analgesia, and prednisone prior to surgery. While community prescribing is not an absolute measure of visits to the GP, it does seem likely that Māori are less likely to visit the GP prior to surgery for treatment. This may be one of the factors associated with worse disease at the time of presentation, and is certainly supported by studies that show Māori have lower overall rates of exposure to primary care despite having the greatest healthcare needs (10,11).

Māori patients were more likely to require surgery for a combination of SDB and chronic tonsillitis, while non-Māori were more likely to require surgery for SDB symptoms alone. No differences for the indication of chronic tonsillitis alone were observed. Māori were also more likely to have nasal symptoms and OME at the time of surgery, which supports the theory that larger adenoids may act as a reservoir for bacterial infection.

Interestingly, the Māori patients in this cohort presented with significantly lower rates of asthma and eczema, which was not expected, as overall New Zealand population data suggests that Māori have increased rates of diagnosed asthma and eczema (12,13). The observations from this study could be due to geographic differences which may not be representative of the wider Māori population. Another possible explanation for this observation, however, is due to the association between antibiotic exposure in infancy and the development of atopy, asthma, and eczema in early childhood (14). In our cohort, Māori were prescribed antibiotics less often and subsequently presented with more severe infective symptoms. However, the lower number of antibiotic prescriptions may serve as a protective agent from the development of asthma and eczema.

In this cohort, a participant was said to have allergic rhinitis if they were prescribed nasal steroid sprays and an antihistamine in the year preceding surgery. Rates of allergic rhinitis were significantly lower in the Māori population. To our knowledge, nation-wide rates of allergic rhinitis in Māori compared with non-Māori populations do not exist. In this study, Māori also had a lower rate of GORD as determined by a prescription of a Proton Pump Inhibitor (PPI) in the year preceding surgery. This reflects the literature which notes a substantial under-representation in Māori infants using PPI's (15).

Rheumatic fever rates in New Zealand are among the highest in the developed world, impacting Māori children disproportionately (16). As previously stated, Māori patients received fewer courses of antibiotics when compared with non-Māori in this cohort, despite having a significantly higher throat swab positivity rate for GAS. Unfortunately, these results are consistent with previous findings that national prescribing guidelines for GAS positive swabs are not being adhered to in the community setting (16,17).

Differences in post-operative medication regimes between Māori and non-Māori were observed in this study. Māori are more likely to receive a prescription for post-operative antibiotics and it is likely that this is reflective of the more significant disease noted at the time of surgery. This is despite recent evidence showing no benefit in prescribing peri-operative antibiotics to improve postoperative outcomes in children undergoing tonsillectomy (18-21). Non-Māori patients were also more likely to see their GP in the post-operative period and be prescribed antibiotics at this time. Together, these findings should be considered when surgeons are deciding whether to prescribe antibiotics post-operatively. Additionally, Māori were more likely to be prescribed ibuprofen post-operatively for pain, with no associated increase in secondary haemorrhage rate. The low overall rates of ibuprofen prescription demonstrated in this study may reflect ongoing surgical concerns of increased post-tonsillectomy bleeding, despite robust systematic reviews supporting its safety in children following tonsillectomy and subsequent reduction in opioid requirement for pain management (19,22-26). Despite having higher BMI's and more significant disease, no significant differences in the rate of surgical complications were observed between Māori and non-Māori.

Limitations of this study include its sample size and retrospective nature. Furthermore, these findings may not generalisable to the whole of New Zealand, due to differences in ethnic distribution and the availability and access to specialist care, particularly between urban and rural centres. These limitations demonstrate the need for robust follow-up epidemiological studies investigating differences in the clinical presentation, management and outcomes of children undergoing tonsillectomy based on ethnicity nationwide. Further analysis should also delineate between all ethnic groups, particularly of Pacific peoples, given the known disparities in health outcomes in this ethnic group across multiple markers of health and disability (27,28).

Ultimately, this study highlights important and inequitable differences in the clinical characteristics, management and outcomes of Māori and non-Māori children undergoing tonsillectomies in Auckland, New Zealand. These findings raise critical questions as to the drivers of these disparities in New Zealand's indigenous population, and have important implications on the need for further research investigating and addressing these inequities nationwide.

Conclusions

There are well-documented differences in health outcomes between Māori and non-Māori in Aotearoa, New Zealand (29). Little is known about the adenotonsillar disease burden in the community and what disparities may exist. This study highlights disparities that exist amongst children who present for adenotonsillectomy and, as such, are at the end of the disease spectrum requiring surgical intervention. Our findings have identified issues such as differences in indications for surgery, medical comorbidities, prescribing practices and GAS swab positivity rates between Māori and non-Māori children. We hope that an increased knowledge of these disparities will raise awareness and lead to targeted interventions that reduce preventable inequalities.

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None.

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://ajo.amegroups.com/article/view/10.21037/ajo-19-60/rc

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). Ethics approval was obtained from Counties Manukau District Health Board (CMDHB) and Auckland District Health Board (ADHB) (Ethics No. 17/NTA/148) and informed consent was taken from parents/guardians of the patients.

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