



RESEARCH LETTER

Childhood exhaust burns in rural and remote regions

AUTHORS



Bronwyn R Griffin¹ PhD, Senior Research Fellow *, bronwyn.griffin@qut.edu.au

Angelin Ooi² MD Candidate, Research Assistant

Roy M Kimble³ DMed(Res), MBChB, Professor and Director of Paediatric Burns and Trauma

CORRESPONDENCE

*Dr Bronwyn R Griffin bronwyn.griffin@qut.edu.au

AFFILIATIONS

¹ School of Nursing, Faculty of Health, The Queensland University of Technology, Victoria Park Rd, Kelvin Grove, Qld 4059, Australia

² Faculty of Medicine, The University of Queensland, 288 Herston Rd, Brisbane, Qld 4006, Australia

³ Centre for Children's Burns and Trauma Research, Lvl 7, Children's Health Research Center, The University of Queensland, 62 Graham St, South Brisbane, Qld 4101, Australia; The Pegg Leditschke Children's Burns Centre, Queensland Children's Hospital, Lvl 5, 501 Stanley St, South Brisbane, Qld 4101, Australia; Faculty of Health, The Queensland University of Technology, Victoria Park Rd, Kelvin Grove, Qld 4059, Australia; and Faculty of Medicine, The University of Queensland, 288 Herston Rd, Brisbane, Qld 4006, Australia

PUBLISHED

28 September 2020 Volume 20 Issue 3

HISTORY

RECEIVED: 17 February 2020

ACCEPTED: 2 September 2020

CITATION

Griffin BR, Ooi A, Kimble RM. Childhood exhaust burns in rural and remote regions. *Rural and Remote Health* 2020; 20: 5893. <https://doi.org/10.22605/RRH5893>

ETHICS APPROVAL

Human Research Ethics Council approval was sought and satisfied from the Children's Health Queensland Ethics Committee (Ref: HREC/08/QRCH/85)

This work is licensed under a [Creative Commons Attribution 4.0 International Licence](https://creativecommons.org/licenses/by/4.0/)

FULL ARTICLE:

Dear Editor

Pediatric burns are a leading cause of childhood injuries, having significant physical and psychological impact on both parents and children¹. Although scald injuries remain the most common

mechanism of pediatric burns, several studies in Australia have observed a rising trend of vehicle exhaust system-related burns in children. Motorbikes are a frequent cause of the exhaust burn and many occur outside of metropolitan regions, where motorbikes remain a common and readily available mode of recreation and/or

transport².

Although their size tends to be small, exhaust burns are known to be deeper, require longer inpatient stays in hospital and have more complex sequelae with poorer outcomes compared to other burns².

The predominance of scald and flame injuries in children has directed focused prevention projects and campaigns. These have reduced the incidence and severity of, and improved outcomes for, various burn injuries³. However, no clear legislation or safety instructions are available in Australia to regulate motorbike use by children. Given the potential effectiveness of prevention strategies, it is essential to provide comprehensive and contemporary information to guide preventative interventions. We aim to raise awareness and provide insight to inform focused prevention strategies in childhood exhaust burns.

Data were extracted from the Queensland Pediatric Burns Registry to perform a retrospective analysis of children who presented to Queensland's tertiary referral centre for pediatric burns between 1 January 2013 and 31 December 2017. Demographic information retrieved included age, gender, residential postcode and postcode where injury was sustained. The Accessibility and Remoteness Index of Australia was utilised to classify geographical location of injuries as metropolitan or non-metropolitan.

Overall, 243 children were identified as having sustained an exhaust-burn injury (Table 1). Compared to other burns, exhaust burns were more likely to occur in non-metropolitan regions

(26.0% v 11.7%, $p < 0.001$). Exhaust burns sustained in metropolitan regions were more likely to involve younger age groups (40.1% v 8.5%, $p < 0.001$). Higher proportions of burns occurring in non-metropolitan areas resulted in a full-thickness wound (30.5% v 12.5%, $p = 0.003$), required one or more theatre visits (49.1% v 31.6% $p = 0.002$) and grafting (58.8% v 34.0%, $p = 0.002$) when compared to exhaust-burns occurring in metropolitan areas. Significantly higher proportions of exhaust-burn injuries occurring in non-metropolitan areas involved motorbikes (93.2% compared to 79.2% in metropolitan areas, $p = 0.014$).

Exhaust burns sustained outside metropolitan regions were more severe and more likely to have longer recovery periods. Hospital visits or admissions can impose a high burden on families, especially for those residing in rural and remote regions.

The provision of adequate first aid can decrease the depth of burn and risk of skin grafting; however, children in non-metropolitan regions of Queensland are less likely to receive adequate first aid by caregivers^{4,5}. The decreased adherence to first aid in combination with increased risky behaviour could contribute to a higher risk of incidence, severity and subsequent morbidity for children in rural and remote regions.

Considering the associated morbidities with exhaust burns in rural and remote areas, prevention efforts should consider a combination of manufacturing modifications, the environment, raised parental awareness and protective clothing to reduce the number or severity of exhaust burns in children.

Table 1: Study demographics and exhaust-burn characteristics for metropolitan and non-metropolitan children recorded in Queensland Pediatric Burns Registry, January 2013 – December 2017

Characteristic		Metropolitan [†] n (%)	Non-metropolitan [†] n (%)	Pearson χ^2
Age, years (n=226)	0–4	67 (40.1)	5 (8.5)	<0.001
	5–9	52 (31.1)	26 (44.1)	
	>10	48 (28.7)	28 (47.5)	
Gender (n=227)	Female	47 (28.0)	16 (27.1)	0.899
	Male	121 (72.0)	43 (72.9)	
Mechanism of injury (n=227)	Motorbike	133 (79.2)	55 (93.2)	0.014
	Others	35 (20.8)	4 (6.8)	
Body part (n=226)	Lower limbs	110 (65.5)	42 (71.2)	0.422
	Other	58 (34.5)	17 (28.8)	
Skin graft (n=201)	Required	51 (34.0)	30 (58.8)	0.002
	Not required	99 (66.0)	21 (41.2)	
Depth (n=227)	Superficial/ SP	82 (48.8)	18 (30.5)	0.003
	Deep partial	65 (38.7)	23 (39.0)	
	Full thickness	21 (12.5)	18 (30.5)	
Theatre visit (n=226)	Not required	115 (68.5)	30 (50.8)	0.002
	Required	44 (26.2)	17 (28.8)	
	>1 visit	9 (5.4)	12 (20.3)	

[†] As defined by the Accessibility and Remoteness Index of Australia.

Acknowledgements

Thanks to the patients and clinical staff of the Pegg Leditschke Children's Burns Centre for their time helping us collect this information.

Bronwyn R. Griffin, Faculty of Health, The Queensland University of Technology

Angelina Ooi, Faculty of Medicine, The University of Queensland

Roy M. Kimble, Faculty of Medicine, The University of Queensland; Faculty of Health, The Queensland University of Technology

REFERENCES:

1 Bakker A, Maertens KJP, Van Son MJM, Van Loey NEE. Psychological consequences of pediatric burns from a child and

family perspective: a review of the empirical literature. *Clinical Psychology Review* 2013; **33(3)**: 361-371. <https://doi.org/10.1016>

/j.cpr.2012.12.006 PMid:23410718

- 2** Hyland EJ, Zeni G, Harvey JG, Holland AJA. Rural and metropolitan pediatric burns in New South Wales and the Australian Capital Territory: does distance make a difference? *Journal of Burn Care & Research* 2015; **36(4)**: e231-e237. <https://doi.org/10.1097/BCR.000000000000138> PMid:26154516
- 3** Duke J, Rea S, Semmens J, Wood F. Urban compared with rural and remote burn hospitalisations in Western Australia. *Burns* 2012; **38(4)**: 591-598. <https://doi.org/10.1016/j.burns.2011.10.015> PMid:22103987

- 4** Frear CC, Griffin B, Watt K, Kimble R. Barriers to adequate first aid for paediatric burns at the scene of the injury. *Health Promotion Journal of Australia* 2018; **29(2)**: 160-166. <https://doi.org/10.1002/hpja.184> PMid:29972718
- 5** Griffin BR, Frear CC, Babl F, Oakley E, Kimble RM. Cool running water first aid decreases skin grafting requirements in pediatric burns: a cohort study of two thousand four hundred ninety-five children. *Annals of Emergency Medicine* 2020; **75(1)**: 75-85. <https://doi.org/10.1016/j.annemergmed.2019.06.028> PMid:31474480

This PDF has been produced for your convenience. Always refer to the live site <https://www.rrh.org.au/journal/article/5893> for the Version of Record.